TECHNICAL SPECIFICATION

OF

CONSTRUCTION POWER SYSTEM AND ASSOCIATED ELECTRICAL FACILITIES

FOR

2000 TPD COAL TO AMMONIUM NITRATE PROJECT

OF BCGCL

AT LAKHANPUR, JHARSUGUDA (ODISHA)

1	06.02.2026	06.02.2026	CLIENT'S COMMENTS INCORPORATED	SS/RP	SKB	RKV
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REV.	REV.DATE	EFF. DATE	PURPOSE	PREPD.	REVWD.	APPD.

CONTENTS

LIST OF ATTACHMENTS

SECTION – 1.0

GENERAL SPECIFICATION

1.0 GENERAL

1.1 INTRODUCTION

1.1.1 This section defines the electrical scope of work for construction power system covered under this tender. The intent of this specification is to define the requirements for the supply, installation, testing and commissioning of the construction power distribution system consisting of various electrical equipment, lighting system, earthing system, cabling system and other miscellaneous works covered under the scope of this tender for Coal to Ammonium Nitrate Project of M/s Bharat Coal Gasification & Chemicals Limited (M/s BCGCL).

1.1.2 The work shall be carried out to the best workmanship like manner, in conformity with these specifications, approved drawings/ construction drawings and the instructions of the owner or Engineer-in-Charge from time to time.

1.1.3 The contract shall include clearing of temporary constructions, waste materials and loose earth, which might get collected in and nearby the work site during execution of work and after final completion under this contract.

1.1.4 **It shall be Contractor's responsibility to visit site and acquaint themselves with the existing situations at Site and consider all such aspects for making the quotation. Upon receipt of quotation, it shall be deemed that Contractor has taken all aspects related to Site conditions into consideration in their offer.**

1.2 STANDARDS

1.2.1 The equipment supplied through this tender shall comply with the requirements of latest revision of codes & standards attached or referred with the tender document.

1.2.2 In case of any conflict between the various documents, it is contractor's responsibility to bring the same to the notification of Owner/ PDIL for their interpretation and get it clarified during pre-bid queries. In case CONTRACTOR fails to convey the same during pre-bid queries, the most stringent one shall be followed and Owner's/ PDIL decision in this regard shall be final and binding. Any cost/ time implication on account of above shall not be admissible.

1.2.3 In case of imported equipment, codes and standards of the country of origin may be followed, if these standards are equivalent or stringent than the applicable Indian standards and meet the statutory regulations of the approving Indian statutory authorities.

1.2.4 In addition, the work shall also conform to the requirements of latest editions/ amendments of the following:

- The Indian Electricity Act/ CEA guidelines and rules framed there under
- The Fire Insurance Regulations
- The regulations laid down by Electrical Inspectorate (CEA)
- The regulations laid down by the Factory Inspector
- Applicable Codes of Practice of the Bureau of Indian Standards
- Any other regulations laid down by the Central, State or Local Authorities from time to time during the execution of this contract.

1.2.5 In case of any conflict between the various documents, the following order of precedence shall apply, unless otherwise expressly and specifically agreed in writing by the Owner/PDIL.

- Local regulatory and statutory requirement
- Schedule of Rates / Overall Single Line Power Distribution Diagram
- Technical Specification
- Installation Standards (PDS Standards)
- Applicable IS/IEC standards

1.3 **GUARANTEE**

1.3.1 The contractor shall guarantee the installation for satisfactory operation against any defects of workmanship and materials (supplied by the contractor) for a period as specified elsewhere. Any damage or defect connected with the erection of materials, equipments or fittings supplied by the contractor that may be discovered at the time of issue of the completion certificate, or arise or come to light thereafter, shall be rectified or replaced by the contractor at his own expense as deemed necessary and as per the instruction of Owner or Engineer-in-Charge within the time limit specified by the Owner or Engineer-in-Charge.

1.3.2 The above guarantee shall be applicable for the quality of work executed as well as for all equipments/ cables/ fixtures/ fittings/ materials supplied by the contractor.

1.4 **ENGINEERING AND JOB SPECIFIC REQUIREMENTS**

1.4.1 Contractor shall ensure that all electrical equipment shall comply with the site and system conditions, ratings and other technical requirement specified elsewhere with the documents attached with the tender.

1.4.2 Various equipments (to be supplied by Contractor) covered in this tender, shall be in compliance with the requirements defined in equipment datasheets and specifications attached/ referred. Besides these, job specific requirements as defined in respective clauses for individual equipment in this document shall also be complied with.

1.4.3 For equipment, where OWNER/ PDIL standard specifications are not available. CONTRACTOR/ SUPPLIER shall use their own specification, developed based on project specific requirement and good engineering practices prevalent in process industry, so as to ensure satisfactory operation and maintenance conditions. CONTRACTOR to however check from OWNER/ PDIL with respect to availability of standard/ specification, before use of their own specification.

1.4.4 CONTRACTOR shall note that wherever standard datasheets for equipment are not attached with tender, equipment data sheets for such equipments shall be prepared by the CONTRACTOR/ SUPPLIER based on relevant codes and specifications and the data sheet shall contain all technical data and information which is essential for the purpose of review and technical acceptability, detailed engineering, installation, testing, repair and maintenance, replacement, etc. of the equipment. CONTRACTOR to however check from OWNER/ PDIL with respect to availability of standard datasheet, before use of their own datasheet.

1.4.5 CONTRACTOR shall note that bill of material furnished with the offer will be retained for information and records only and shall not be contractual binding. All materials and components as required to meet tender specifications and functional requirement shall be included in the CONTRACTOR’s scope without any cost and time implication to the purchaser.

1.4.6 The equipment shall in general conform to latest revision of statutory regulations, Indian Standards, IEC/ Other international standards applicable for the country of origin of the equipment.

1.4.7 All equipment shall be subject to routine and acceptance tests as per applicable specifications.

1.5 **SITE CONDITION**

a.	Maximum / Minimum Ambient Temperature	:	47.19 ^{0}C/ 10.17 ^{0}C
b.	Equipment Design Temperature (IS-9676)	:	50 ^{0}C
c.	Soil Resistivity	:	As per Soil Investigation Report
d.	Altitude above mean sea level	:	Less than 1000m above MSL
e.	Seismic Zone	:	As per IS-1893
f.	Humidity	:	95% at 50 ^{0}C

g. Environment : Dusty, Tropical and Corrosive as found in Fertilizer / Process Industry

1.6 **UTILIZATION VOLTAGES**

i. Main HV Distribution Voltage : 6.6 kV AC $\pm$ 10%

ii. LV Distribution Voltage : 415V AC $\pm$ 10% TPN

iii. High Mast : 415V AC $\pm$ 10% TPN

2.0 BRIEF DESCRIPTION OF ELECTRICAL SYSTEM

The construction power system of BCGCL Project comprises of the following:

The construction power shall be made available at 6.6 kV through a single feeder from the existing 6.6 kV Switchboard at the MCL/ Local Authority Substation, located approximately 2.5 km from the proposed plant site. The scope of the Owner shall include extension of 6.6 kV power supply up to the designated receiving point located near the plant battery limit, nearest to the Construction Power Substation location, as indicated in the plot plan.

The incoming 6.6 kV power supply, through overhead transmission line or underground cable, shall be terminated at the receiving gantry or 2-pole/4-pole terminal structure by the Owner.

Downstream of the aforesaid receiving gantry or 2-pole/4-pole terminal structure, the scope of the Construction Power Contractor shall commence.

Design, engineering, supply, construction, erection, testing and commissioning of two (02) separate and independent 2-pole/4-pole terminal structures and all associated electrical, civil and structural works, including further extension, distribution, protection, metering and utilization of construction power, shall be entirely within the scope and exclusive responsibility of the Construction Power Contractor.

Conversion of a single incoming 6.6 kV feeder into two (02) independent 6.6 kV outgoing feeders shall be carried out through standard and approved tee-off / jumper arrangement on the 2-pole/4-pole terminal structures, in accordance with applicable utility practices and statutory requirements.

Two (02) independent incoming 6.6 kV power supplies from the aforesaid 2-pole/4-pole terminal structures shall feed two (02) outdoor-type 6.6 kV Ring Main Units (RMUs). Construction power at 6.6 kV shall be made available to major LSTK Contractors of the Project from the outgoing feeders of the RMUs. Further extension of 6.6 kV construction power from the RMU outgoing feeders up to their respective battery limits shall be within the scope of the concerned LSTK Contractors.

For construction power requirements in the OSBL areas, the outgoing feeders of the 6.6 kV RMUs shall feed four (04) numbers Compact Sub-Stations (CSS), each rated 630 kVA, distributed uniformly across the plant area.

Within each Compact Sub-Station, the incoming 6.6 kV power shall be terminated at a 6.6 kV RMU, from where power shall be fed to a 6.6/0.433 kV distribution transformer for stepping down the voltage to 415 V. The transformer secondary shall feed a 415 V Power Control Centre (PCC) / switchboard. Construction power supply to various OSBL packages and their respective contractors shall be made available from the said 415 V PCC, which shall be located within the Compact Sub-Station.

415 V Feeder Pillar (630 A rating) and 30 Mtr. High Flood Light Masts shall be provided in accordance with the enclosed specifications, data sheet and drawings. These shall be fed from the outgoing feeders of the respective 415V PCCs located within the nearest Compact Sub-Stations, as indicated in the plot plan. Cabling including supply, laying and termination from 415V PCC to feeder pillar shall be in Construction Power Contractor’s scope.

Further extension of 415 V construction power from the outgoing feeders of the 415 V PCCs located within the Compact Sub-Stations up to the respective battery limits shall be within the scope of the concerned OSBL package contractors.

The Contractor shall refer to the Overall Single Line Power Distribution Diagram, Drawing No: PC-298-7411-0985), enclosed with the tender, for the proposed construction power distribution arrangement for the project.

3.0 SCOPE OF WORK (ELECTRICAL)

3.1 GENERAL

The electrical scope of work under this tender shall include but not be limited to basic and detailed engineering, manufacturing, supply, transportation to site, inspection at manufacturer's work, erection, testing, commissioning of all equipment, supply of all mandatory spares, commissioning spares, special tools and tackles, cabling, earthing, lighting works as defined in the drawings, standards, equipment datasheets, standard specifications, etc. attached or referred with the tender document.

3.2 SCOPE OF BASIC AND DETAILED ENGINEERING

The scope of basic and detailed engineering includes sizing and selection of electrical equipment, cables, earthing, lighting system, and preparation of layouts and other items covered in the scope of CONTRACTOR. This shall include but not be limited to the following:-

3.2.1 Design and selection of 6.6 kV 2-pole / 4-pole terminal structures, including detailed engineering selection and arrangement of all electrical equipments to be mounted on the structures, along with tariff metering room.

3.2.2 Equipment Sizing covering 6.6 kV Outdoor Type RMUs, 6.6 kV RMU inside CSS, 6.6/0.433 kV Distribution Transformers, 415V Power Control Centres (PCCs) within Compact Sub-Stations (CSS), Cable Sizing, etc.

3.2.3 Complete design engineering for prefabricated Compact Sub-Station (Refer Technical Specification Doc. No: PC-298-7411-0814 for Compact Sub-Station).

3.2.4 Design of earthing system and lightning protection system for the construction power system equipment.

3.2.5 Design of complete lighting system (illumination system) for the construction power system package.

3.2.6 Preparation of miscellaneous engineering document such as electrical equipment list, cable schedule, interconnection drawing, etc.

3.2.7 Sizing for cable trenches for construction power cabling. Design of foundation for Compact Sub-Station, high masts, feeder pillar and other electrical equipments. All associated work related to civil, structural, etc. as defined in this document or in Civil/ Structural specifications.

3.2.8 Preparation of electrical layouts such as cabling layouts, earthing & lightning protection layout, lighting layouts.

3.2.9 Preparation of bill of materials for cabling, lighting, earthing and lightning protection and miscellaneous items.

3.2.10 Relay Co-ordination studies, protection coordination drawings, relay setting calculations, and relay configuration/parameterization for the complete system shall be within the scope of CONTRACTOR. Protection coordination shall be carried out considering the existing 6.6 kV feeder at the MCL/ Local Authority end, the existing incomer protection, and the new downstream network. In case coordination cannot be achieved with the existing CT ratios and relay characteristics, suitable mitigation measures, such as provision of interposing CTs or CT ratio revision, shall be proposed by the Contractor, subject to approval of the Owner and MCL/ Local Authority.

3.2.11 Preparation of specification for procurement of electrical equipment in CONTRACTOR's scope of supply, review of vendor/sub vendor drawings and then submission of electrical equipment drawing for review/ information, preparation of site executable (AFC-Approved for Construction) engineering drawings and details for installation work, wherever applicable.

3.2.12 Collection of data from site/ Owner as required for carrying out detailed engineering.

3.2.13 Shop inspection and testing procedures and QA schedule.

3.2.14 Field testing and commissioning procedures.

3.2.15 Preparation of as-built drawings on completion of the project for final records.

3.2.16 Preparation of operation and maintenance schedule/ manuals.

3.2.17 Interface engineering and drawing, as required for the completeness of erection, testing and commissioning of electrical system.

3.2.18 The CONTRACTOR while performing design and engineering activities shall adhere to following guidelines:

a) CONTRACTOR, if not covered but required shall prepare any additional specifications for equipment or bulk material. CONTRACTOR shall follow current national & international standards/specifications for the equipment that are not covered by OWNER/ PDIL's specifications.

b) The drawings attached with tender define the basic system design and distribution philosophy for the package and are for guidance purpose only. CONTRACTOR shall develop detailed drawings and submit for Owner/PDIL review.

c) Contractor to note that equipment ratings and quantity, wherever specified in the NIT and Single Line Diagram (SLD) shall be considered as minimum rating & minimum quantity. Contractor shall be responsible to verify the same and provide equipment with higher rating & quantity subject to minimum rating as per NIT requirements. Compliance shall be without any extra cost and time implications to owner.

3.2.19 Any other work/activity which is not listed above, but however is necessary for completeness and satisfactory operation of the electrical system.

3.3 SCOPE OF SUPPLY, ERECTION, TESTING AND COMMISSIONING

The electrical scope covered under this package includes but shall not be limited to supply erection, testing and commissioning of the following:

3.3.1 6.6 kV 2-pole / 4-pole structures for incoming 6.6 kV overhead line termination with associated looping / jumpering arrangement, GO/AB (Gang operated Air Break) isolator, lightning arresters, line hardware (jumpers, strain insulators, cross-arms), complete earthing including LA earth pits, and all statutory safety fittings such as danger boards and anti-climbing devices.

3.3.2 6.6 kV (UE) XLPE insulated, armored, FRLS type PVC outer sheath, HV cables with aluminum conductor.

3.3.3 6.6kV, 630A, 21 kA (3 Sec), outdoor type Ring Main Units (RMUs) -1 & 2.

3.3.4 6.6kV, 630A, 21 kA (3 Sec), indoor type Ring Main Units (RMUs)

3.3.5 6.6/0.433kV, 630 kVA, Dry Type Distribution Transformers.

3.3.6 415 V, 1000 Amps, 50 kA (1 Sec) fixed type, Power Control Centre (PCC) Switchboards.

3.3.7 Compact Sub-Stations to house above said indoor type 6.6kV RMUs, 6.6/0.433kV Dry Type Distribution Transformers, associated 415V Power Control Centre (PCC), internal lighting, cabling, earthing & lightning protection system complete as per Technical Specification of Compact Sub-Station. (For details of Compact Sub-Station refer Technical Specification Doc. No: PC-298-7411-0814).

3.3.8 415 V, 630 Amps, 50 kA (1 Sec) and fixed type, single front, IP-55 Outdoor “Kiosk" type Feeder Pillar.

3.3.9 Complete earthing and lightning protection system including G.I. earth electrodes in test pits, earth grid using GI strips, earth plates, earth strips, wire ropes, and all associated materials. Earthing System shall be of maintenance free type (chemical earthing).

3.3.10 All incoming and outgoing, XLPE Insulated, aluminum/ copper conductor, armored, FRLS type PVC Outer sheath MV cables (1100 V grade) for power, control and lighting purpose.

3.3.11 All cabling accessories i.e. heat shrinkable type straight through joints, heat shrinkable type end termination kits, cable glands, lugs, cable markers, identification tags, GI saddles, saddle bars, GI pipes, structural supports for cable trays, etc. as required for laying of 6.6 kV cables.

3.3.12 All cabling accessories i.e. heat shrinkable type straight through joints, heat shrinkable type end termination kits, cable glands, lugs, cable markers, identification tags, GI saddles, saddle bars, GI pipes, structural supports for cable trays, etc. as required for laying of 1100 V cables.

3.3.13 30 meter high flood light mast complete with 24 x 350 W LED lighting fixture, feeder pillar and accessories suitable for safe area.

3.3.14 Indoor lighting for 6.6 kV RMUs-1 & 2 (outdoor type), including outdoor area lighting around the RMUs, lighting inside the associated outdoor sheds for 6.6 kV RMUs-1 & 2 and indoor lighting of all compact substations including outdoor area lighting around all the compact substations.

3.3.15 Supply and installation of all other hardware like nuts, bolts, washers, spring washers, grouting bolts etc. necessary for completion of job.

3.3.16 Supply and installation of GI Canopy for all outdoor electrical equipments .

3.3.17 Supply and installation of any other equipment not specifically mentioned above but covered under the Schedule of Rates, as required for the successful completion of the job.

3.3.18 Complete civil works required for installation of equipment, comprising of design, excavation, construction of foundation, disposal of surplus earth up to 1000 meter, providing shoring, shuttering, dewatering (if required) for RMUs and Compact Sub-Stations, feeder pillar and high mast including outdoor sheds for both the RMUs.

3.3.19 Construction of buried Precast Plain Concrete protection slabs for buried underground cables.

3.3.20 Supply and installation of miscellaneous material like sand, bricks, plain cement concrete, bitumen etc. for minor civil works.

3.3.21 Supply & filling of stone dust/fine river sand in Cable trenches including providing of brick protection by second class brick.

3.3.22 Scope of work under this contract shall be inclusive of breaking of walls/ floors and chipping of concrete foundations necessary for the cable laying, installation of equipment, materials and making good of the same (if any).

3.3.23 CONTRACTOR shall include painting and marking/ sign writing of all buses, individual incomers, all outgoing feeders etc. with details such as tag no., feeder rating, CT details, sending end source reference etc. for all switchboards. Painting and marking of important parameters of all other indoor and outdoor equipments (supplied and/ or installed by CONTRACTOR) is also included in CONTRACTOR’s scope. No separate payment for same will be admissible.

3.3.24 Safety equipments as per CEA guidelines.

3.3.25 Supply and Installation of all other accessories not specifically mentioned herein but nevertheless necessary for completion of the job as per specifications, drawings and instruction of Engineer-in-charge.

Note-1: Quantities given in Schedule of Rates (SOR) are tentative. Contractor shall take approval of Engineer-in-Charge / Owner before ordering of equipment / materials.

Note-2: Any other item, work or activity not specifically listed but required for the complete, safe and satisfactory functioning of the electrical system in accordance with the

specifications, approved drawings, applicable standards and instructions of the Engineer-in-Charge shall be deemed to be included within the scope of work.

3.4 The scope of work shall also include digging of earth and refilling for directly buried cables, earth strips, cable protection pipes, earth pits, ground mounted lighting pole foundations; civil works such as making earth pit inspection chambers with covers, grouting of equipment base plate, channels, supports and foundation bolts, chipping of concrete or in brick work for earth strips, pipes or other minor chipping for foundation preparation, if required, cutting holes in walls for racks, risers, light fitting brackets, sealing of cable entries and making good the same after installation of the equipment and levelling, and other minor similar jobs as per directions of Owner / Engineer-in-Charge.

3.5 All major Civil works pertaining to 2-pole/4-pole terminal structures, 6.6 kV RMUs, Compact Sub-Stations, High Masts, Feeder Pillar Box, etc. making all foundations and cable trenches etc) and minor civil work (like cutting, chipping, grouting, making opening in floor / wall etc. for equipment foundation and cabling work) pertaining to electrical equipment are in the scope of work of the contractor and shall be done as per technical specification of civil enclosed elsewhere in the NIT.

3.6 The contractor shall obtain the necessary clearance from Electrical Inspector of Odisha for complete electrical installation. All necessary drawings, calculations, test certificates and record of site tests etc. as required by the Inspector shall be furnished. Any modification / rectification as required by Electrical Inspector shall be carried out free of cost by the contractor. However, necessary statutory fee shall be deposited by the owner.

3.7 Operation & Maintenance of all the electrical equipment supplied/ erected/ tested/ commissioned by the contractor shall be in the scope of the bidder as specified in Section 4.0.

3.8 This specification shall be read in conjunction with all referred standards, associated drawings, specification sheets / data sheets and Schedule of Rates for Electrical Works (Supply, Erection, Testing & Commissioning) - Doc. No. PC-298-7411-0990.

3.9 Quantities indicated in the Schedule of Rates (SOR) are approximate and these may increase or decrease or some items may even be deleted at the time of actual execution. However, the value of total increase or decrease shall be limited to ±25% of the contract value irrespective of the changes in quantity of individual items.

3.10 In case of any discrepancies between Technical Specification and Schedule of Rates (SOR) in respect of description of equipment / work, the details indicated in the Schedule of Rates (SOR) shall prevail.

4.0 OPERATING REQUIREMENTS

4.1 All equipment and accessories shall be suitable for trouble free and continuous service at their rated capacity in the specified ambient and system conditions.

5.0 INSPECTION & TESTING AT MANUFACTURER'S WORKS

5.1 All major electrical equipments i.e. 6.6 kV RMUs, Compact Sub-Stations, High Mast Lighting System, Feeder Pillar Box, HT XLPE insulated armoured cables and other materials, etc. shall be subject to inspection by Owner/ PDIL/ authorized representative/TPIA at manufacturers' works. CONTRACTOR/ Supplier shall furnish all necessary information concerning the supply to Owner/ PDIL.

5.2 Contractor/ Supplier shall ensure that type test certificates for all electrical equipments offered shall not be more than ten (10) years old. In cases where the available type test certificates are older than ten (10) years, or where any design change has been carried out during this period without corresponding type testing, the Contractor/ Supplier shall conduct the requisite type tests at CPRI/ERDA/CMRI/CIMFR or any NABL-accredited/ authorized testing laboratory. Such type testing shall be carried out prior to dispatch of the equipment, entirely at the Contractor's/Supplier's own cost and without any impact on the delivery schedule. In the absence of explicit confirmation with this requirement, the offered equipment shall be liable for outright rejection.

5.3 Type, routine and acceptance tests to be conducted on all equipment shall include all tests as specified in standard specifications enclosed with the package.

5.4 All routine and acceptance tests as specified by the applicable standards shall be carried out by the Contractor/ Supplier. Any other test and quality assurance requirements as defined elsewhere in the package shall also be complied.

6.0 ERECTION, TESTING & COMMISSIONING

6.1 Installation, testing and commissioning of equipment shall be performed in accordance with supplier's instructions and directions of the engineer-in-charge. No cut-out/ cable pull pit shall be left open and shall be covered with chequered plates by contractor.

6.2 The contractor shall undertake erection of all equipment in accordance with good engineering practices in conformity with statutory regulations and Code of Practice and to the entire satisfaction of the owner.

6.3 All electrical equipment shall be said to be installed and mechanically complete after circuit testing, primary and secondary injection testing and loop simulation is complete. Due care and consideration shall be given to the installation of all equipment, materials and facilities.

6.4 Contractor shall prepare all the engineering layouts for the package. Contractor shall also supply as built drawings for complete installation.

6.5 The contractor shall arrange all the necessary erection tools, tackles, testing and measuring instruments and shall supply erection materials and consumables.

6.6 The contractor shall be deployed competent testing contractor at site for testing and commissioning of the electrical system.

6.7 The contractor shall clear the site after commissioning of the equipments / system and obtain the Site Clearance Certificate from owner's Engineer-in-charge.

6.8 Electrical installation work shall be subjected to inspection by owner / his authorised representative, statutory bodies like Electrical Inspector, Factory Inspector and where applicable by equipment supplier's engineer. The contractor shall carry out without extra cost to owner rectifications / modifications desired by the above authorities to make the installation conforming to I.E. Rules etc.

6.9 The owner may reject any portion of the work considered defective or of poor workmanship and the contractor shall make good these defects without extra cost to owner.

7.0 CO-ORDINATION WITH OTHERS

7.1 The contractor shall co-ordinate with owner's other contractors / agencies / equipment vendors working at site and providing all assistance and interface to them for proper and timely execution of the works.

7.2 Obtaining clearance and approvals for installation/ drawings from Central Electricity Authority / any other statutory authority for energizing the complete electrical facilities covered under this tender.

7.3 It may be noted that no separate payment shall be made for any statutory approvals and the cost shall be deemed to be built in the rates quoted for various SOR items.

8.0 SPARE PARTS

8.1 Mandatory spares for all electrical equipment are included in CONTRACTOR's scope of supply and shall be included in the base price. Same shall be as per Schedule of Rates.

8.2 Commissioning spares for all electrical equipment are included in CONTRACTOR's scope of supply and shall be included in the base price.

8.3 Unit rates for two years recommended O&M (Operation & Maintenance) spares along with list of recommended spares for each equipment shall be provided by CONTRACTOR along with offer.

8.4 All spare parts shall be identical to the parts used in the offered electrical equipment.

9.0 TOOLS

9.1 The contractor shall supply at least one set of all special tools required for maintenance of the equipment supplied by them.

10.0 SCHEDULE

10.1 Bidder shall furnish bar chart for complete scope of their works.

11.0 DEVIATIONS

11.1 Clause-wise deviations, if any, from this specification shall be clearly indicated in the offer with reasoning.

12.0 POWER ARRANGEMENT FOR CONSTRUCTION OF THIS PACKAGE WORK

12.1 Construction power for this package shall be arranged by the contractor at his own cost, either by DG set or any other arrangement. Owner shall not provide any electrical power for the same.

SECTION – 2.0

EQUIPMENT SPECIFICATION

2.1 GENERAL

2.1.1 Equipment to be supplied by the contractor shall conform to relevant Indian Standards, Engineering Standards, Specification Sheets & Drawings enclosed.

2.1.2 Equipment shall also comply with the requirement of Statutory Acts, Rules & Regulations.

2.1.3 All equipments shall be suitable for operation in following systems, ambient conditions & area classification:-

2.1.3.1 <u>System Details</u>

6.6KV ± 10%, 3 Ph., 50 Hz
415V ±10%, 3 Ph. & N, 50 Hz
240V ±10%, 1 Ph, 50 Hz

2.1.3.2 <u>Fault Level</u>

6.6KV : 21 kA for 3 second

415V : 50 kA for 1 second

2.1.3.3 <u>Ambient Conditions</u>

Temp. Max./Min./Design Ref. : 47.19° / 10.17° / 50° C
Relative Humidity : 100% (Max.)
Alt. above MSL : < 1000 m
Atmospheric pollution : Dusty, Tropical and Corrosive

2.1.3.4 <u>Area Classification</u>

Area : Safe
Classification : Not Applicable
Temp. Class : Not Applicable
Gas group : Not Applicable

2.1.4 Make of the equipment / components shall be as specified elsewhere in this specification. Make of the equipment / components not indicated shall be subject to owner's approval.

2.1.5 Drawings & Documents for various equipments as indicated in respective Engineering Standards shall be furnished. For other equipments, GA drawings & descriptive catalogues shall be furnished along with the bid.

2.2 EQUIPMENTS

2.2.1 **6.6 KV SF_6 INSULATED OUTDOOR TYPE RING MAIN UNIT (RMU)**

2.2.1.1 SF6 insulated 6.6KV, 630A, 21kA for 3 second, metal enclosed Ring Main Unit shall be suitable for operating at the specified rating continuously, with the specified voltage and frequency variations under the ambient conditions, without exceeding the permissible temperature rise and without any detrimental effect on any part. RMU shall also conform to the specification sheet (attached in this specification) and Feeder Details (attached in this specification).

2.2.1.2 6.6KV RMU shall conform to IEC 62271-200 & 100 (for switchgear and VCB), IEC 60265-1(for General Purpose switches), IEC 62271-102 (for Disconnectors and Earthing switches) and IEC 60694 (for Common clauses).

2.2.1.3 The Ring Main Unit shall be suitable for outdoor installation, and have the configuration as below:
One no. 630 A VCB as incoming, five nos. 630 A VCB as outgoing, CT and PT for metering and protection, Trivector meter/Energy Meter as recommended by local electricity board, protective relays (microprocessor based numerical relays) etc.

2.2.1.4 Incoming and outgoing cable sizes shall be as indicated in the SLD and Specification Sheet and Feeder Details.

2.2.1.5 Suitable arrangement for DC power for the RMU is to be provided by the vendor. Spare power pack with inside and outside isolation shall be provided. DC Voltage shall be 110V DC / 220V DC. Power pack shall have the battery back-up of 1 hours.

2.2.1.6 Following safety devices to be provided:

Controls and Fuse protection box to protect the operator from the moving parts and from the auxiliary voltages present inside.

Pressure relief valves which assure the gas flow-off in case of a possible internal arc, without causing breaks on the front part.

Key lock shall be provided for preventing wrong operation.

Door interlock device, allowing to open the switchgear protective boxes only when the earthing switch is positioned on “closed earth”.

Interlock on the fuse-holder cover, preventing to place the cover itself on the fuse-holder when the fuse is not mounted inside it, so preventing to put into service.

Device on the fuse compartment door, signaling the fuse blown condition through a coloured indicator and preventing the door itself to get closed when it was opened by blown fuse.

2.2.1.7 Following interlocks to be provided:
Interlock between VCB and earthing switch.
Interlock between VCB of the transformer protection unit and fuse compartment door.

2.2.1.8 All protective relays shall be microprocessor based numerical relays.

2.2.1.9 RMU shall be mechanically operated device with VCB ON/OFF via handle.

2.2.1.10 RMU shall be suitable for Internal Arc Classification (IAC AFL) withstand current of 21kA for 1 sec.

2.2.1.11 RMU major live-parts like busbars, jumpers, VCBs and Isolators enclosed in an IP67 (partial submersion proof) tank made by robotically welding non-magnetic and non-ferrite stainless steel sheet with high-quality corrosion-proof performance (AIS Grade 304).Further, the complete enclosure shall be filled with SF6 gas at above atmospheric pressure to increase compactness, improve clearances and prevent live-conductor from coming in contact with external environmental deterrents like dust, moisture, pollution etc. The gas shall be monitored via temperature compensated monitor provided on front facia, and shall be refillable at site.

2.2.1.12 5 Years of warranty to be provide for the offered RMU.

2.2.1.13 Bidder to recommend required no. of spares for 5 years of operation and maintenance with unit price of each spare.

2.2.1.14 Metering CT & PT in all the feeders shall be of Accuracy class 0.2.

2.2.2 COMPACT SUB-STATION

For details, refer Technical Specification of Compact Sub-Station (Doc. No: PC-298-7411-0814) attached elsewhere in the NIT document.

2.2.3 DRY TYPE DISTRIBUTION TRANSFORMER

2.2.3.1 The equipment shall comply with the requirements of the latest revision of the following standards issued by BIS (Bureau of Indian Standards) unless otherwise specified.

IS 1271	Thermal evaluation and classification of electrical installation
IS 2705	Current Transformer

IS: 10028	Code of Practice of selection, installation and maintenance of Transformers
IS:11171	Dry Type Power Transformer
IS: 60529	Degree of protection provided by enclosures (IP code)

2.2.3.2 Transformer shall be suitable for installation and satisfactory operation in tropical, humid and corrosive atmospheres.

2.2.3.3 Dry Type Distribution Transformer shall comply to Table 7.1 of ECBC guidelines for losses and efficiency requirements.

2.2.3.4 The transformers shall have core type construction. The core shall be assembled out of low-loss, non ageing; high permeability cold rolled grain oriented steel laminations.

2.2.3.5 The windings shall be of high-grade electrolytic copper. The insulation system for cast resin transformers shall comprise of windings cast under vacuum, free of voids in a homogenous uniform laminate of epoxy resin/ polyester resin. The totally assembled core and coil assembly, for resin impregnated transformers, shall be vacuum pressure impregnated to effectively make it impermeable to moisture, dirt, salt, air and other industrial contaminants.

2.2.3.6 The entire core assembly shall be covered with a resin-based lacquer for corrosion protection.

2.2.3.7 Lifting lugs shall be provided for core and winding assemblies.

2.2.3.8 The HV and MV windings shall have class 'F' or better insulation. The temperature rise of windings under continuous full load shall not exceed the maximum allowable temperature for the appropriate class of insulation as per IS 11171, above the design temperature specified in the data sheet.

2.2.3.9 The insulation material used shall be non-hygroscopic, non- inflammable and self-extinguishing if ignited by direct flame or arc. No toxic or harmful gases shall form during heating and for burning. The insulation materials shall be sufficiently resistant to ageing.

2.2.3.10 The transformers shall be capable of withstanding the thermal and mechanical effects of a dead short circuit on any or all winding terminals with full voltage maintained on other windings as per IS. The transformers shall sustain a symmetrical short circuit on secondary terminals for 2 seconds without damage or impairment.

2.2.3.11 Each limb shall have two solid state winding temperature monitoring elements to initiate an alarm and trip for winding over temperature.

2.2.3.12 The transformers for Indoor & outdoor location shall have minimum degree of protection as IP 23 & IP 54 respectively. However the marshalling box, cable termination box, bus-duct termination chamber etc. shall have a degree of protection not less than IP-55.

2.2.3.13 All fasteners and bolts shall be galvanized.

2.2.3.14 The transformers shall be spray-painted or powder coated with epoxy paint.

2.2.3.15 Windings shall be brought out on suitable nickel-plated copper terminals for cable termination. HV side termination shall be from the bottom. Suitable disconnection chambers shall be provided to permit the transformer to be removed without disconnecting the cable termination. The MV side termination shall be by bus-duct or cable.

2.2.3.16 The high voltage and medium voltage cable termination arrangement shall be complete with cable box and bolted type undrilled cable gland plates. Non-magnetic gland plate shall be provided for single core cables.

2.2.3.17 Primary cable box shall be able to withstand specified primary system fault level for 0.2 secs.

2.2.3.18 Terminal chamber for bus duct termination shall have a gasketed cover plate, bolted to it. Separate inspection covers shall be provided to facilitate connection and inspection.

2.2.3.19 All protection, alarm and indication devices and neutral CTs shall be wired by means of PVC insulated cables up to the marshalling box. There shall be two gland plates, one for internal wiring to the marshalling box from various devices which shall be glanded and pre-wired, while the second gland plate shall be removable and undrilled for glanding outgoing cables.

2.2.3.20 One neutral terminal inside the cable box/ MV bus-duct connection chamber and a separate neutral terminal outside shall be provided for earthing of transformer winding neutral on the secondary side. The neutral terminal shall be complete with connector block assembly for easy termination of GI earth strip/cable.

2.2.3.21 The neutral CT shall be mounted as below:-.

a) CT for 51 G shall be located in the earth path after bifurcation of neutral.

b) CT for 64 R can be located before bifurcation of neutral.

2.2.3.22 Supporting arrangement for GI strip/cable as applicable shall be provided for connection of neutral bushing to earth/NGR.

2.2.3.23 Two earthing terminals shall be provided on the transformer frame for transformer body earthing. Suitable lifting arrangement shall be provided in the transformer frame. The transformer shall be supported on flat rollers.

2.2.3.24 Type of cooling shall be ANAN.

2.2.3.25 All protective, alarm and indicating devices shall have minimum 1 no. potential free contact each for alarm and trip. All transformers must be provided with at least the following:

a) Bi-directional flat rollers

b) Rating and terminal marking plate

c) Marshalling box

d) Lifting hooks and jacking pads, towing holes

e) Earthing terminals

f) Neutral CT

g) Off-circuit tap changer

h) Temperature monitoring system

2.2.3.26 Temperature monitoring system shall be supplied with temperature sensors fitted in each limb. Temperature monitoring system shall initiate alarm and trip for winding over temperature. Alarm and trip temperatures shall be site settable. The monitoring system shall also have an indicating device.

2.2.3.27 The average audible sound level for the transformers at a distance of 300 shall not be more than 70 db.

2.2.3.28 Owner/ owner's representatives shall be given free access to enter the plant and inspect the equipment at any time during fabrication. However, 4 weeks advance notice shall be given by vendor to witness the final tests. The final tests shall include the following:

a) Visual and dimensional check
b) Bill of material
c) Measurement of winding resistance
d) Measurement of voltage ratio and check of voltage vector relationship
e) Measurement of impedance voltage and load loss
f) Measurement of no load loss & current
g) Induced over voltage withstand test
h) Separate-source voltage withstand test (HV Test)
i) Measurement of insulation resistance before and after HV test
j) Noise level check
k) Correctness of nameplate

2.2.3.29 Type test certificate of similar rating of dry type transformer shall be furnished for TPIA review during inspection. Type test shall comprises of following test:

a) Partial discharge test

b) Temperature rise test

c) Short circuit test

d) Lightning impulse test

2.2.4 **SWITCHBOARDS**

2.2.4.1 The switchboards shall consist of an assembly of a series of floor mounting, identical, metal clad, cubicle type panels placed side by side to form a compact assembly and shall be extensible on either side.

2.2.4.2 The complete assembly shall be dust, dam and vermin proof having minimum degree of protection IP 4X for HV switchboards and IP-52 for LV switchboards up to 1600A rating and IP-4X for LV switchboards above 1600A rating.

2.2.4.3 The bus-bars shall be amply sized to carry the rated continuous current under the specified ambient temperature without exceeding the limits specified in IS: 8084. The thermal rating of the bus-bars shall be designed to withstand the system fault current for 3 seconds for HV Switchboard and for 1 second for LV Switchboard without exceeding the limiting temperature. Calculation for bus-bar sizing shall be furnished along with the offer.

2.2.4.4 Horizontal bus-bars shall run in a separate compartment through the entire length of the board and shall be of same cross-section throughout. Stepped bus-bars shall not be acceptable.

2.2.4.5 The bus-bars shall be rigidly supported at equal intervals to withstand the stresses due to full short circuit and also to take care of thermal expansion.

2.2.4.6 All external hardwares shall be cadmium plated. The hardwares for fixing the removable parts shall be provided with retaining devices.

2.2.4.7 The doors and the removable covers shall be provided with non-deteriorating neoprene gaskets. Gaskets without any discontinuity shall be preferred. Gaskets shall be held in position in groove, in shaped sheet steel work or these shall be of U type.

2.2.4.8 All the components shall be accessible for inspection and maintenance without the necessity of removing the adjacent ones. Their mounting shall be accessible and ensure the necessary degree of safety.

2.2.4.9 C.T.s shall be class F insulated and vacuum impregnated or resin cast type and shall conform to IS: 2705. The C.T.s shall be rigidly mounted and shall be easily accessible for maintenance and testing.

2.2.4.10 The C.T.s output shall be minimum 15 VA per phase and in any case, the output shall be adequate for the protection and metering duties involved with sufficient margin. The C.T.s shall have the following accuracies for the various applications:

	Application	Class of Accuracy as per IS: 2705
i)	For metering service	1
ii)	For use with protective relays	5 P
iii)	For use with restricted earth fault and differential relays	PS

2.2.4.11 The C.T. cores for metering and protection shall be separate.

2.2.4.12 The V.T.s shall be class F insulated and vacuum impregnated or resin cast type conforming to IS: 3156

2.2.4.13 The rated output of each VT shall be adequate for the relays, meters and associated wiring connected to it with sufficient margin and shall not be less than 200 VA per phase for HV Switchboard and 50VA per phase for LV Switchboard.

2.2.4.14 The accuracy class of V.T.s shall be 1 as per IS: 3156.

2.2.4.15 Mounting height of components requiring operations and observation shall not be lower than 300 mm and higher than 1800 mm.

2.2.4.16 All live parts which are accessible after opening of front and back door/cover shall be properly insulated or provided with insulating barrier to prevent accidental contact. Phase insulating barriers shall be provided between the breaker poles. Removal facility shall be provided for all such barriers.

2.2.4.17 Switchboard shall be provided with following inter locks and safety features:

i) It shall not be possible to open the compartment door unless the breaker is drawn to isolated position.

ii) The withdrawn and engagement of a circuit breaker shall not be possible unless it is in open position.

iii) The operation of a circuit breaker shall not be possible unless it is in fully service, test or isolated position.

iv) It shall not be possible to close the circuit breaker in service position unless all auxiliary and control circuits are connected.

v) A breaker of the lower rating shall be prevented from engaging with the stationary element of higher rating.

vi) Insertion of the manual mechanism shall render the motorised mechanism in operation.

vii) Circuit breaker 'ON', 'OFF' indication shall be provided at the back of each panel. Alternatively, alarm shall be provided in case panel back door is opened with breaker "ON".

viii) Caution nameplate shall be provided at the back of incomer's panels where terminals are likely to remain live and isolation is possible only from remote end.

2.2.4.18 The wiring shall be carried out with flexible stranded PVC insulated copper conductor cables of 1100 Volt grade. The minimum size of wires shall be as follows:

C.T. Circuit	--	2.5 Sq. mm
V.T. and Control Circuits	--	1.5 Sq. mm

2.2.4.19 Suitable arrangement for DC and auxiliary AC power for each switchboard is to be provided by the vendor. Spare power pack with inside and outside isolation shall be provided. DC Voltage shall be 220V DC and AC Auxiliary Voltage shall be 240V AC. Power pack shall have the battery back-up of 6 hours.

2.2.4.20 Automatic safety shutter, with Padlocking facility for locking in closed position, to completely cover the spouts for the bus-bars and cable connection when the breaker is withdrawn.

2.2.4.21 LOTO locking system to be provided for safety purpose while taking clearance for maintenance work. For this necessary Hasps and locks shall be provided in the switchboards.

2.2.4.22 Test push buttons shall be provided for checking the healthiness of control circuit interlock in all feeders.

2.2.4.23 Push buttons for checking the healthiness of indication lamps in all feeders shall be provided.

2.2.4.24 Auxiliary AC power is to be tapped from the feeder itself.

2.2.4.25 Name plate shall be of Aluminium / black Perspex with white engraving and of minimum 3 mm thick.

2.2.4.26 Vendor to submit the schematic diagram for all the switchboards along with the bid and for owner/consultant approval before commencement of manufacturing.

A. 6.6 kV HV SWITCHBOARD (6.6 kV INDOOR TYPE RMU INSIDE CSS)

2.2.4.27 HV switchboard shall conform to IEC 62271-200 (for switchgear), IEC62271-100 (for VCB) and IEC 60694 (for common clause).

2.2.4.28 HV Switchboard shall be manufactured and supplied by the OEM of the Circuit Breaker. Design & manufacturing of HV switchboard by channel partner, franchise or sub-vendor of the OEM shall not be acceptable in any case.

2.2.4.29 The HV switchboard shall be indoor, metal enclosed, draw out type, equipped with Vacuum Circuit Breakers (VCB) for all feeders. 6.6KV Switchboard shall also conform to the specification sheet (attached in this specification) and Feeder Details (attached in this specification).

2.2.4.30 The circuit breakers shall be of the 3 phase, single break, single level, horizontal draw-out, horizontal isolation type. The medium of arc quenching shall be vacuum.

2.2.4.31 The framework of the cubicles shall be bolted / welded construction. The minimum thickness of sheet steel shall be 3 mm for base channel and 2 mm for other members. The doors and covers shall be fabricated from cold rolled sheet steel. Suitable reinforcement, wherever necessary, shall be provided.

2.2.4.32 Each cubicle shall be provided with front access door with handle lock and key for breaker compartment and a removable back cover. The door hinges shall be concealed type. Front doors of the panels shall mechanically stop in full open position to facilitate removal of breakers and for ease of maintenance.

2.2.4.33 Rated short circuit breaking capacity for HV Switchboard shall be 21kA for 3 sec.

2.2.4.34 HV Switchboard shall be suitable for Internal Arc (AFLR) withstand current of 21kA for 1 sec.

2.2.4.35 HV switchboard VCB's rated operating sequence shall be O-0.3sec-CO-3min-CO.

2.2.4.36 The bus-bars shall be for three phases. The bus-bars and connection shall be made of high conductivity electrolytic grade copper of rectangular cross-section.

2.2.4.37 The bus-bars chamber shall be sufficiently spacious and shall have separate screwed covers for maintenance purpose. It shall be adequately ventilated and shall allow the escape of the hot gases.

2.2.4.38 The clearance and creepage distance shall be adequate to meet the BIL of the equipment.

2.2.4.39 Type test certificate from an independent testing authority shall be furnished along with the offer for each rating and type of circuit breaker & similar type of HV switchboard.

2.2.4.40 The circuit breaker shall be mounted on truck. The circuit breakers shall have three positions, i.e. service, test and isolated with the cubicle door closed. Necessary stoppers shall be provided to prevent the excessive movement of the breaker cradle than desired for the position. Service and test positions of the breaker shall have monitoring switch having 2NO+2NC contacts.

2.2.4.41 Positive earthing of circuit breaker frame shall be maintained at every position of circuit breaker. The earthing contact shall be line/scrapping type and not of point type. The circuit breaker shall have unbreakable phase barriers between the poles.

2.2.4.42 Tips of main contacts shall be silver plated and tips of arcing contacts shall have tungsten alloy or superior material fittings.

2.2.4.43 The circuit breaker shall have thermal relay with reset mode for spring charging motor protection.

2.2.4.44 Separate earthing shall be provided for instruments (relay & meter) from power equipment (C.B., body).

2.2.4.45 Integral earthing switch interlocked with breaker and trolley position shall be provided for safe operation in each panel.

2.2.4.46 Proper Lifting arrangement shall be provided on the switchboard panels for handling at site.

2.2.4.47 Rack in / out of all the circuit breakers (Service / Test / Isolated Positions) shall be from outside of the panels i.e. without opening the breaker compartment door.

2.2.4.48 All the Line and Bus PTs shall be of draw-out type.

2.2.4.49 Inter-tripping of primary and secondary circuit breaker of transformer Feeders and Outgoing feeders shall be provided. Transformer circuit breaker will trip on all faults through lockout relay.

2.2.4.50 Provision for inspection of cable terminations through transparent inspection window shall be provided in HV switchboard.

2.2.4.51 The bus-bars, both horizontal and vertical including bus bar joints, shall be provided with Heat Shrinkable (Raychem make) sleeved. Insulating shrouds shall be provided for all joints of insulated bus-bars. Sleeving material shall have adequate electrical, thermal and mechanical properties to withstand impulse level, temperature rise during normal and short circuit condition and allow easy bending of bus bars

2.2.4.52 All power Cable shall be terminated through Heat Shrinkable Termination Kits in HV switchgear. Hence, suitable arrangement for support of power cables in cable compartment shall be provided.

2.2.4.53 Earth bus shall be brought back to cable compartment and earthing bolt shall be provided to ground cable armours. A separate earth bus shall run for Surge Arrestors. Body earthing and earthing for SA / LA shall run separately.

2.2.4.54 All spare contacts of relays, switches, contactors shall be wired to the terminal block. 20% Spare terminals shall be provided.

2.2.4.55 In HV Switchboard, Incomer and all transformer feeders shall be provided with separate Winding Temperature Alarm, Trip for Winding Temperature on primary as well as secondary side in addition to the protection indicated in the feeder details. Separate auxiliary relays shall be provided for these protections.

B. 415V LV SWITCHBOARD (POWER CONTROL CENTRE)

2.2.4.56 LV switchboard shall conform to IEC 60947.

2.2.4.57 Low voltage switchboard shall be metal clad, arranged with self supporting units and assembled together in a row. 415V Switchboard shall also conform to the Specification Sheet and Feeder Details attached elsewhere in the NIT.

2.2.4.58 Rated short circuit breaking capacity for 415V switchboard shall be minimum 50 KA for 1 sec.

2.2.4.59 The incoming circuit breaker feeders shall be in single tier formation.

2.2.4.60 A suitable barrier shall be provided between the circuit breaker and the associated control, protective and indication devices including instrument transformers.

2.2.4.61 Adequate arrangement for earthing shall be provided to safeguard the operator or other personnel from electric hazards under all conditions of operation.

2.2.4.62 The main bus bars of LV switchboards shall have heat shrinkable insulated sleeves suitable for rated voltage and shall be made of high conductivity aluminium alloy. At joints of these busbars removable shrouds shall be provided.

2.2.4.63 Bus bars shall be of uniform cross section and supported on non-hydroscopic FRP insulators with adequate clearances and creepage distance to prevent flash over due to effect of dust/moisture.

2.2.4.64 Sufficient bus supports shall be given to give adequate mechanical strength during short circuits.

2.2.4.65 A continuous ground bus shall be provided at the bottom in the PCC for grounding.

2.2.4.66 All feeders of PCC shall be provided with draw out type air circuit breakers.

2.2.4.67 Busbar clearances shall conform to relevant Indian Standard/IEC for equipment voltages up to and including 500 V AC.

2.2.4.68 The clearances and creepage distances shall not be lower than the values specified below:

i)	Minimum clearance between two live conductors	--	20 mm
ii)	Minimum clearance between live parts and accidentally dangerous part	--	20 mm
iii)	Minimum creepage distance	--	28 mm

2.2.4.69 The draw out modules shall be standardized and it shall be possible to interchange any module with a module of same size. The components to control the equipment like switch, starter, fuse, auxiliary relay etc. shall be wired as a unit on the individual module. Safety shutter shall be provided to prevent direct access to live parts when the chassis is removed.

2.2.4.70 The modules shall be so placed that largest one is placed at the bottom of the panel. Type modules shall be at least 300 mm from the base channel.

2.2.4.71 The number of modules shall be so decided that the cables in the cable alley are not over crowded. However the number of module in any panel shall not exceed six.

2.2.4.72 The minimum size of module shall be 200 mm for switch fuse feeders.

2.2.4.73 The minimum clear width of cable alley shall be 250 mm.

2.2.4.74 The entire draw out construction should be designed for safe operation during placement or removal of chassis. An earthing arrangement shall be provided which will make contact first before the power contacts are made and break last. Each module shall control one motor in general.

The door shall be interlocked so that it cannot be opened unless the isolating switch on that module is OFF. However, it shall be provided with a door defect mechanism for intentional opening when on line for testing and inspection purpose.

2.2.4.75 Control switches for breaker control shall be provided in each breaker cubicle. Circuit breaker shall be interlocked to prevent withdrawal of a closed breaker or insertion of a closed breaker. Each breaker shall be provided with anti pumping device.

2.2.4.76 Provisions shall be made to manually close/trip circuit breakers on loss of control voltage.

2.2.4.77 The switchboards shall be suitable for extension at both the ends.

2.2.4.78 There shall be three positions for Breaker/Contactor trolley: - Service, Test and Isolate. In service position, the power connections shall be made; but in test and isolate mode, the power connection of bus bars shall be automatically removed.

2.2.4.79 Suitable shutter arrangement shall be provided to protect the person from accidental contact with live bus in trolley chamber.

2.2.4.80 FRP supports shall be used for bus bars with adequate clearances and creepage distance to prevent flash over due to effect of dust moisture.

2.2.4.81 Protective relays for incoming and outgoing feeders shall be microprocessor based numerical type. Drawout type relays shall be used. Protective relays shall be mounted on the front of the switchgear panel.

2.2.4.82 All meters shall be digital multifunctional meters. Additionally digital type ammeter, voltmeter and Hour Meter shall be provided separately for various feeders.

2.2.4.83 A continuous ground bus shall be provided at the bottom of the switchgear and in cable connection side for grounding the switchgear, breaker trolley as well as to ground the cable glands.

2.2.4.84 The minimum thickness of sheet steel used in HV and LV switchgear shall be as under:-

a) Base Channel minimum 3.0 mm
b) Load Bearing Members minimum 2.0 mm
c) Doors and covers minimum 1.6 mm

2.2.4.85 The switchboard shall have adequate short-circuit ratings and be suitably sized for the load and spare capacity foreseen. The short time rating of busbar shall be 3 seconds for HV switch boards and 1 second for other boards.

2.2.4.86 Every enclosure door that provides access to live parts operating at 240 V AC and above shall be mechanically interlocked with a circuit interrupting device on the supply side such that when the door is open, the equipment is de-energised.

2.2.5 LIGHTING SUB DISTRIBUTION BOARD

2.2.5.1 LSDB shall be provided with incoming and outgoing feeders as indicated SLD attached with this specification and specification sheet (attached in this specification) having IP-65 degree of protection.

2.2.5.2 Incomer feeder shall be provided with 63A TP and Switched Neutral MCCB and 3 nos. feeder circuit of 63A DP MCB having 9 Nos. outgoing of 16 A DP MCB (i.e. 3 nos. 16 A DP MCB per circuit).

2.2.5.3 The enclosure for LSDB shall be fabricated out of 2.5 mm thick cold rolled sheet steel having dust, vermin and weatherproof construction conforming to IP54 as per IS: 13947. 4 nos. holes suitable for 12mm bolts shall be provided outside the enclosure for fixing the LSDB.

2.2.5.4 The miniature circuit breakers (MCBs) shall be so mounted inside the enclosure that their operating knobs project outside for ease of operation. The cut out for the knobs on the enclosure shall be lined with gaskets. For further protection against ingress of dust, the portion where the knobs have protruded out shall be provided with another external cover, internally hinged at the top, gravity operated and with a knurled knob at the bottom. The external cover shall be flushed with the main cover. Continuous neoprene gasket shall be provided to make the board completely dust and weatherproof.

2.2.5.5 All external hard ware of diameter less than 8 mm shall be of stainless steel and those of diameter 8 mm and above shall be of mild steel cadmium plated or zinc passivated.

2.2.5.6 The LSDB shall have top entry arrangement for outgoing cables and bottom entry for incoming cable provided with heavy-duty double compression type aluminium cable glands suitable for 1.1 KV XLPE-A-FRLS PVC outer-sheathed cables.

2.2.5.7 Three phase and neutral bus bar system of adequate size shall be provided to which all outgoing and incoming MCBs shall be connected.

2.2.5.8 The internal wiring shall be carried out by means of single core PVC insulated 2.5 sq. mm stranded copper conductor cables.

2.2.5.9 Individual earth terminals shall be provided for the earth conductor of the outgoing cables beside the phase and neutral terminals.

2.2.5.10 Suitable label inscription consisting of Black Perspex with engraving for the board and circuit nos. of all outgoing feeders shall be provided. The label inscription of the board shall contain description and code no. as indicated in specification sheet. The circuit nos. of outgoing feeders shall be serially indicated as 1L, 2L......... 17L, 18L.

2.2.5.11 Two earthing terminals outside the board shall be provided.

2.2.5.12 The board shall be complete with terminal block, cable glands, cable lugs and other accessories as required.

2.2.6 LED LIGHTING FIXTURES

2.2.6.1 All lighting fixtures supplied and installed under the construction power package shall be of LED type only, supplied complete with associated LED lamp and driver. All lighting fixtures shall also have independent earth terminal outside the enclosure. The lighting fixtures shall also conform to the Specification Sheet attached elsewhere in the NIT document.

2.2.6.2 LED Driver shall be suitable for surge protection up to 3 kV surges. Surge suppressor for LED fitting shall be suitable for 10KV. LED fitting driver shall take care of neutral opening for long sustained cases.

2.2.6.3 Polar curves / photometric drawings shall be submitted by vendor for the offered lighting fixtures.

2.2.6.4 LED type lighting fixtures shall fulfill the following requirements:

a) Power factor shall be >= 0.95

b) Luminous efficacy of fixture shall be minimum 100 lumen per watt. Lumens output, efficacy and other parameters of LED lamps shall be decided accordingly.

c) LED lamps and Drivers shall be provided with min. 5 years warranty period. Driver shall have valid BIS certification and the same shall be furnished during drawing review stage. The LED Driver shall comply with the requirement of IEC 61347-2-13.

d) The LED light fixtures should be tested for luminous lux level as per IES-LM-79. Type test certificates shall be furnished in compliance to same. Type test certificates for LM-79 for all fixtures shall be from a NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited Lab or UL Laboratory.

e) The LED lamp used in the lighting fixtures should be tested for the service life as per IES-LM-80. Type test certificates shall be furnished in compliance to same.

f) Fixture life time (L70) shall be > 50000 hours at ambient temperature of 40°C.

g) LED fixtures shall be complete with internal reflectors. No external reflector is envisaged for LED.

h) Vendor shall indicate the following parameters as a minimum in fixture drawings:

- Offered Fixture Wattage and LED Wattage
- Actual Consumption of Fixture
- Driver Consumption
- Fixture Life time
- Luminous Efficacy of fixture
- Lumen Output of Fixture
- Tolerance for Voltage and wattage rating
- Power factor of Fixture
- Beam Angle of Lighting Fixture
- Weight of Fixture
- LED LAMP and Driver Warranty Period
- Driver Surge Protection
- Compliance to IEC-61347-2-13 for LED Driver
- BIS Certification no. for Driver
- Driver Make and Model No.
- LED Make and Model no.
- LED type i.e. COB (Chip on Board) or Multichip etc.
- Quantity of Fixtures

2.2.6.5 The fixtures shall be provided with cable glands and a terminal block suitable for termination of copper conductor up to 2.5 sq. mm size.

2.2.6.6 The fixtures shall be so designed that it shall be possible to maintain or replace different accessories without difficulty, including replacement of lamps.

2.2.6.7 **High Mast**

a) Structure

The High mast shall be of continuously tapered, polygonal cross section, at least 16 sided, presenting a good and pleasing appearance and shall be based on proven In-tension design conforming to the standards referred to above, to give an assured performance, and reliable service.

The mast height shall be 30m, with minimum diameter of 150mm at the top and 610mm at the bottom. Minimum plate thickness of bottom section shall be 5mm and other sections 4mm.The structure shall be suitable for wind loading as per IS 875 Part III, 1987 & for 24 nos. 350 W LED Lighting fixtures.

b) Construction

The mast shall be capable of safely withstanding the strong winds prevailing at site. The deflection at the top during heavy monsoon periods shall therefore be considered in the design and the mast designed in such way that the above deflection during worst periods is kept to a minimum value.

The High mast shall be fabricated from special steel plates, conforming to BS-EN10025, cut and folded to form a polygonal section and shall be telescopically jointed and fillet welded. The welding shall be in accordance with BS: 5135. The procedural weld geometry and the workmanship shall be exhaustively tested on the completed welds. Mast shall be delivered in multiple sections of length approx.10 metres. Thus a 30 meter mast shall be delivered in three sections.

Each mast section, delivered to site, shall include one no. circumferential welded diaphragm stiffener to reduce the deflection of the mast in heavy winds. At site, the sections shall be joined together by slip-stressed-fit method. No site welding or bolted joint shall be done on the mast. The minimum overlap distance shall be 1.5 times the diameter at penetration.

The mast shall be provided with full penetrated flange which shall be free from any lamination or incursion. The welded connection of the base flange shall be fully developed to the strength of the entire section. The base flange shall be provided with supplementary gussets between the bolt holes to ensure elimination of helical stress concentration. For the environmental protection of the mast, the entire fabricated system shall be hot dip galvanised, internally and externally, having a uniform thickness of 65 microns for the bottom and top sections.

c) Door Opening

An adequate door opening of size 1000mm x 300mm shall be provided at the base of the mast and the opening shall be such that it permits clear access to equipment like winches, cables, plug and socket, etc. and also facilitate easy removal of the winch. The door opening shall be complete with a close fitting, vandal resistant, weather proof door, provided with a heavy duty double internal lock with special paddle key.

The door opening shall be carefully designed and reinforced with welded steel section, so that mast section at the base shall be unaffected and undue buckling of the cut portion is prevented.

d) Dynamic Loading for the Mast

The mast structure shall be suitable to sustain an assumed reaction arising from a wind speed as per IS: 875 (three second gust), and shall be measured at height of 10m above ground level. The design life of the mast shall be a minimum of 25 years. Wind excited oscillations shall be dampened by the method of construction and adequate allowance shall be made for the related stresses.

e) Earthing Terminals

3 Nos. earthing terminals, one for lightning protection and other two for electrical earthing of the mast, using 12 mm dia. stainless steel bolts shall be provided at convenient location on the base of the mast.

f) Lantern Carriage

i) Fabrication

A fabricated Lantern Carriage shall be provided for fixing and holding the flood light fittings and control gear boxes. The Lantern Carriage shall be of special design and shall be of steel tube construction, the tubes acting as conduits for wires, with holes fully protected by grommets. The Lantern Carriage shall be so designed and fabricated to hold the required number of flood light fittings and the control gear boxes, and also have a perfect self balance.

The Lantern Carriage shall be fabricated in two halves and joined by bolted flanges with stainless steel bolts and plastic lock type stainless steel nuts to enable easy installation or removal from the erected mast. The inner lining of the carriage shall be provided with protective PVC arrangement, so that no damage is caused to the surface of the mast during raising and lowering operation of the carriage. The entire Lantern Carriage shall be hot dip galvanised after fabrication.

ii) Junction Box

Weather proof junction box with IP65 enclosure, made of cast Aluminium shall be provided on the Carriage assembly as required, from which the inter-connections to the designed number of the flood light luminaries and associated control gears fixed on the carriage, shall be made.

g) Raising and lowering mechanism

For the installation and maintenance of the luminaries and lamps, it will be necessary to lower and raise the Lantern Carriage assembly. To enable this, a suitable winch arrangement shall be provided, with the winch fixed at the base of the mast and the specially designed head frame assembly at the top.

i) Winch

The winch shall be of completely self sustaining type, without the need for brake shoe, springs or clutches. Each driving spindle of the winch shall be positively locked when not in use, gravity activated PAWLS. Individual drum also should be operated for fine adjustment of lantern carriage. The capacity, operating speed, safe working load of the winch and the recommended lubrication and serial number of the winch shall be clearly marked on each winch.

The gear ratio may be according to manufacturer’s standard. However, the minimum working load shall not be less than 750Kg. The winch shall be self lubricating type by means of an oil bath and the oil shall be readily available grades of reputed producers.

The winch drums shall be grooved to ensure perfect seat for stable and tidy rope lay, with no chances of rope slippage. The rope termination in the winch shall be such that distortion or twisting is eliminated and at least 5 to 6 turns of rope remains on the drum even when the lantern is fully lowered and rested on the rest pads.

It should be possible to operate the winch manually by a suitable handle and / or by an external power tool. It shall be possible to remove the double drum after dismantling, through the door opening provided at the base of the mast.

Also, a winch gear box for simultaneous and reversible operation of the double drum winch shall be provided as part of the contract. A test certificate shall be furnished by the Bidder from the original equipment manufacturer, for each winch in support of the maximum load operated by the winch.

ii) Head Frame

The head frame, which is to be designed as a capping unit of the mast, shall be of welded steel construction, galvanised both internally and externally after assembly.

The top pulley shall be of appropriate diameter, large enough to accommodate the stainless steel wire ropes and the multicore electric cable. The pulley block shall be made of non-corrodible material, and shall be of die cast Aluminium alloy (LM-6). Pulley made of synthetic materials such as plastic or PVC is not acceptable. Self lubricating bearings and stainless steel shaft shall be provided to facilitate smooth and maintenance free operation for a long period. The pulley assembly shall be fully protected by a canopy galvanised internally and externally.

Close fitting guides and sleeves shall be provided to ensure that the ropes and cables do not get dislodged from their respective positions in the grooves. The head frame shall be provided with guides and stops with PVC buffer for docking the lantern carriage.

iii) Stainless Steel Wire Ropes

The suspension system shall essentially be without any intermediate joint and shall consist of only non-corrodible stainless steel of AISI 316 or better grade. The stainless steel wire ropes shall be of 7/19 construction, the central core being of the same material. The overall diameter of the rope shall not be less than 6mm. The breaking load of each rope shall not be less than 2350Kg individually, giving a factor of safety of over 5 for the system at full load as per the TR-7 referred to in the beginning of this specification. The end constructions of ropes to the winch drum shall be fitted with telluric.

The thimbles shall be secured on ropes by compression splices. Two continuous lengths of stainless steel wire ropes shall be used in the system and no intermediate joints are acceptable in view of the required safety. No intermediate joint either bolted or else is provided on the wire ropes between winch and lantern carriage.

h) Electrical System, cable and Cable Connections

The electrical connection from bottom to top shall be made with at least 5 core 2.5 sq. mm flexible round sheath power cables using copper conductors of appropriate rating. A suitable flameproof socket arrangement shall be provided at the bottom of the mast. The trailing cable shall also have an FLP plug connected at the bottom end. Also, suitable provision shall be made at the base compartment of the mast to facilitate the operation of externally mounted, electrically operated FLP power tool for raising and lowering of the lantern carriage assembly. The trailing cables at the top shall be terminated in the weather proof junction box.

i) Power Tool for the Winch

A suitable, high powered, electrically driven, flameproof, integral mounted power tool, with manual handle together with an operating stand shall be supplied for the raising and lowering of the lantern carriage for maintenance purposes. The speed of the power tool may, preferably, be slow of 1.5 to 1.8 metre/minute, so that vibrations associated with high speed operation are avoided. The power tool shall be single speed, provided with a flameproof motor of required rating, suitable for trolley mounting. The power tool shall be supplied with suitable reversible starter in flameproof enclosure. The capacity and speed of the electric motor used in the power tool shall be suitable for the lifting of the design load installed on the lantern carriage. The power tool trolley shall be so designed that it will not only be self supporting but also aligns the power tool perfectly with respect to the winch spindle during the operations. Also, a handle for the manual operation of the winch in case of problems with electrically operated tool, shall be provided and shall incorporate a torque limiter.

j) Lightning Finial

One number heavy duty, hot dip galvanised, lightning finial shall be provided for each mast. The lightning finial shall be minimum 1.2m in length and shall be provided at the centre of the head frame. It shall be bolted solidly to the head frame to get a direct conducting path to the earth through the mast body. The lightning finial shall not be provided on the lantern carriage under any circumstances in view of safety of the system.

k) Luminaries

i) Each mast shall be fitted with required numbers of specially designed non integral type high mast luminaries (IP-65) complete with separate control gear box (IP-65) suitable for 24 x 350 W LED lamps.

ii) Twin dome LED type (2x40W) Aviation Obstruction Lights of reliable design and reputed manufacturer shall be provided on top of each mast. It shall have cast aluminium housing finished in aviation yellow colour, suitable rated step-up transformer, thick glass dome mounted on cast aluminium ring and spring loaded high tension porcelain socket fitted with neon cold cathode helix light source. The light source shall be designed to give Omni-directional red colour light distribution to have maximum light output in the zone between 10^{o}C to 90^{o}C above horizontal plane.

2.2.6.8 **LED Street Lighting Fixtures**

a) LED Street Light Fitting with cool white light in Pressure Die Cast Aluminium Housing with UV Stabilized Poly Carbonate Cover with in-built power unit of 3500 lumen suitable for 240V, 50 Hz, System shall be used.

b) Lighting fixture shall have 50000 hrs. Life Time, CRI>75, IP-65.

2.2.6.9 **LED Tube Lighting Fixtures**

a) High quality LED fluorescent tube twin batten type complete with 2 X 20W tube (T5) eco friendly, no UV radiation as per the specification tabulated below:

Sl. No.	Parameter	Technical Specification
1.	Degree of Protection	IP-20
2.	Lumen output per Lamp	≥ 2000
3.	CCT	6500K
4.	Luminous efficacy	≥ 100 lm/watt
5.	CRI	>80
6.	Life	≥ 40000 burning hours
7.	PF	>0.95
8.	THD	<10%

2.2.6.10 **AVIATION OBSTRUCTION LIGHT**

a) LED type Low Intensity Aviation Obstruction Light suitable for 240V, 50 Hz supply. It shall be covered under Indian patent act (Govt of India) No. 188995. Degree of protection shall be IP-65.

b) The fixtures shall have body of corrosion resistant aluminium alloy casting and shall be suitable for outdoor use and mounting on 40 mm NB G.I. pipe. Necessary electrical threading shall be tapped in the fixture for mounting.

2.2.7 **INTERLOCKED TYPE SWITCH SOCKETS**

2.2.7.1 Interlocked type switch socket shall be of the types as specified in specification sheet (attached in this specification).

2.2.7.2 These shall be complete with heavy duty air break switches, HRC fuses, sockets & plugs. These shall be fully wired and shall be complete with cable glands, lugs, terminals etc. for external connection.

2.2.7.3 The switch socket shall be heavy duty industrial type. The interlocking arrangement shall be such that it is not possible to insert or withdraw the plug with the switch in 'ON' position. Switch socket shall also conform to specification sheet (attached in this specification).

2.2.7.4 The switch sockets shall have dust, hose and weather proof construction conforming to IP55 as per IS: 13947 and shall be suitable for outdoor use without any extra protection. All jointing surfaces shall be smoothly machined and of sufficient width to prevent ingress or dust. Further the covers shall be provided with continuous gaskets made of neoprene to prevent ingress of dust and moisture.

2.2.7.5 The enclosure of switch sockets and plugs shall be of cast aluminium alloy 4600 and suitable for fixing on wall / structure. A rain-hood shall be offered as an additional protection. Rain hood shall be of the same material as of the main enclosure. Suitable arrangement for looping of cables from one switch socket to the other shall be provided. Necessary terminals, cable glands and lugs for looping shall be provided. Also one no. threaded plug for each switch socket shall be supplied loose.

2.2.7.6 The Air break switches shall be quick make, quick break rotary type and of utilization category AC-23. Switches shall be hand operated from outside the cover. The switch handle shall remain fixed to the front cover while removing the front cover.

2.2.7.7 The sockets shall be provided with link type HRC fuses. The fuses shall be capable of withstanding a short circuit current of 50 KA and shall be delayed action type. These shall be mounted on a shrouded base.

2.2.7.8 The socket outlet shall be located in the lower part of the enclosure and shall be provided with a threaded aluminium cover attached to the body with SS chain, to protect the socket after extraction of the plug. Spring loaded automatic shutter shall not be acceptable.

2.2.7.9 The plugs shall be so constructed that these can be easily fitted in to the socket outlets and shall be provided with knurled knob arrangement for screwing on the body of the socket so that it can be securely fixed on the top. The plug base and cover shall be firmly secured to each other and shall be sufficiently robust in construction to withstand normal usage. The plug and socket contacts shall be self-aligning type with best electrical continuity.

2.2.7.10 The plug shall be provided with cable entry suitable for receiving TRS flexible heavy duty copper conductor cable of specified size. The arrangement shall be such that the conductors are relieved from strain including twisting where they are connected to the terminals and that the outer surface of the cable at the place of entry is not damaged.

2.2.8 JUNCTION BOXES

2.2.8.1 Junction boxes shall be used for looping of lighting cables in the lighting circuit of fluorescent fixtures. Junction boxes shall be made of cast aluminium having IP-55 degree of protection as per IS: 2147.

2.2.8.2 Junction boxes shall be liberally dimensioned having minimum internal dia. of 120 mm.

2.2.8.3 The junction boxes shall be 4 way, dome cover type, suitable for mounting on surface or wall complete with mounting accessories, 6 nos. 16 A terminals fitted on DMC moulded terminal block with shorting links, 3 nos. cable glands suitable for 3x2.5 sq. mm^2 copper conductor XLPE-A-FRLS PVC cable, one no. threaded plug and two external earthing terminals.

2.2.8.4 Cable glands & plugs shall be of hose proof, single compression type and shall be of rolled aluminium.

2.2.9 LIGHTING POLES

2.2.9.1 Lighting pole shall be steel tubular swaged type conforming to designation 410 SP-3 as per IS: 2713 complete with base plate, threaded stud with nuts & washers for earthing, finial taper plug, bracket on the overhang portion for fixing of lighting fixtures bolts, nuts and screws as required shall be provided.

2.2.9.2 The outer & inner portions of the poles for ground installation shall have bituminous compound coating at the bottom after galvanising.

2.2.9.3 Zinc coating shall be done by hot dip galvanising process as per IS: 2629 and shall be min. 610 gm / sq. metre.

2.2.9.4 Foundation depth for 5m and 9 m pole shall be 1250mm and 1500mm respectively as per relevant IS.

2.2.9.5 The poles shall be subjected to min. following tests:

- Thickness of galvanising (min. 80 microns)
- Drop test as per IS: 2713.
- Deflection test as per IS: 2713.

2.2.10 **HT POWER, LT POWER & CONTROL CABLES**

2.2.10.1 All HT power cables shall be made of stranded aluminium conductor with XLPE insulation, PVC inner sheathed, armoured, PVC outer sheathed FRLS type, conductor screen, insulation screen and construction as per IS: 7098 (Part 2) and as specified in the specification Sheet (attached in this specification). HT cables shall be of earthed / unearthed type as specified in the specification Sheet.

2.2.10.2 All LT power cables shall be with stranded aluminium / copper conductor with XLPE insulation, PVC inner sheathed, armoured, PVC outer sheathed FRLS type and construction as per IS: 7098 (Part 1) and as specified in the specification Sheet (attached in this specification).

2.2.10.3 All control cables shall be stranded copper conductor with XLPE insulation, PVC inner sheathed, armoured, PVC outer sheathed FRLS type and construction as per IS: 7098 (Part 1) and as specified in the specification Sheet (attached in this specification).

2.2.10.4 All control cables cores shall be identified with numerical core numbers printed on core instead of colours.

2.2.10.5 All cables shall be armoured and shall have extruded inner and outer sheath.

2.2.11 **FEEDER PILLAR**

2.2.12.1 Feeder pillars shall be single front, compartmentalized, and fixed type.

2.2.12.2 Feeder Pillar shall be suitable for installation in outdoor area with bottom cable entry and shall have degree of protection IP-55.

2.2.12.3 Feeder Pillar shall be suitable for 415V, 50Hz, TPN, 50 kA (1 sec.) with 4 pole MCCB incomer. Outgoing feeders shall also be MCCB type. Outgoing feeders shall be as per SLD attached with tender. MCCB shall be microprocessor type.

2.2.12.4 CT ratios/ details, load details, cable sizes, feeder nos., name plate details etc., for all feeders at switchboards shall be finalized at the time of review of vendor drawings which shall be taken care by the CONTRACTOR without any impact on cost and time to Owner. CT secondary for all CTs shall be 1 Amps. No interposing CT shall be provided in the protection CT secondary circuit for metering purpose.

2.2.12.5 CBCT+ ELR & contactor shall be provided for all MCCB feeder for E/F protection. Operating current of CBCT shall be considered as 100mA. All MCCBs shall be provided with shunt trip coil, earth fault, short circuit and overload protection and shall be microprocessor based.

2.2.12.6 Following test reports as a minimum shall be submitted along with GA drawing. However, all other test reports as per applicable IS/ IEC shall be provided for Owner's information.

a) Short time current withstand test.

b) Heat run test

c) Impulse and power frequency test

2.2.12 **CABLE TRAYS**

2.2.12.1 Prefabricated GI cable trays and its accessories such as coupler plates, risers, bends etc.

2.2.12.2 The finished tray and accessories shall be free from sharp edges and corners, burrs and unevenness.

2.2.12.3 Each straight length and bed shall be supplied with two coupling plates fitted at each side channel at one end. The couplings plates shall be complete with bolts, nuts and washers fitted at other four holes for fixing to adjoining member. Coupling plate shall be designed to permit longitudinal adjustment up to ±10 mm and skew up to 10°.

2.2.13 **EARTHING AND LIGHTNING PROTECTION SYSTEM**

2.2.14.1 Earthing system of the entire package shall be designed to meet the statutory requirements and shall be included in contractor's scope including interconnection with owner's earth grid and earthing of all equipment.

2.2.14.2 Lightning protection for High Mast shall comply with the requirements of IS/ IEC 62305.

2.2.14.3 Earth pits shall be painted as per following standard:-

Earth pit for equipment earthing, body earthing etc.	Green
Earth pit for transformer neutral earthing	Black
Earth pit for lightning arrestors	Blue

- The disconnection facility shall be provided for each individual earth electrode to check its earth resistance periodically.
- Location of earth electrodes shall be marked by permanent markers for easy identification. Letter writing including earth pit no., earth pit resistance, maintenance date and due date shall be written on chamber with white or black paint of required letter size as decided at site.
- All earth pits shall be interconnected. After connecting the earth strips to the earth electrodes, the earth pit entry point shall be sealed with bitumen compound.
- All Earth Pits shall be provided with suitable Earth Pit Chamber and Earth Pit Covers. Earth Pit Chamber/Cover shall be installed in such a way that they are not protruded from the ground level. They shall be in the same level as ground. Moreover, they shall give aesthetic look and shall not pose any kind of unsafe condition like tripping hazard, falling hazard etc. Earth Pit Number and Earth Pit Resistance shall be clearly written on Earth Pit Cover using suitable paint.

2.2.14 **MOUNTING STRUCTURES**

Switch sockets, cable trays, DBs, Feeder Pillar etc shall be mounted / supported on suitable structure fabricated out of standard sections of mild steel, i.e. channels, angels, flats etc conforming to IS: 266.

2.3 PAINTING

2.3.1 The equipment surface to be painted shall be pre-treated to remove all dust, scale and foreign adhering matter by suitable treatment.

2.3.2 All metal surfaces shall be painted with two coats of suitable anti-rust paint followed by two coats of anticorrosive epoxy paints.

2.3.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.

2.3.4 Unless otherwise specified, the finishing shade shall be light gray having No.631 as per IS-5.

2.4 DRAWINGS & DOCUMENTS

2.4.1 All drawings and documents shall have the following descriptions written boldly:

-- Name of Client.
-- Name of Consultant i.e. PDIL.
-- Enquiry / Order Number with Project/Plant name.
-- Equipment Code No. and Description.

2.4.2 At the time of handing over of the installation, the vendor shall supply as built drawings taking into consideration the actual execution carried out at site.

2.4.3 The vendor shall furnish a Bill of Materials covered in their offer. However, this shall be treated for information only and shall not absolve them from his obligation to supply the required items and quantities for making the plant complete as per intent of the specification.

2.4.4 Drawings and documents shall be submitted as per Annexure-I (Drawings & Documents Schedule).

2.5 MAKE OF ELECTRICAL ITEMS

2.5.1 Make of electrical items shall be as follows:

Sl. No.	Item Description	Name of Vendors
1.	6.6 kV Outdoor Type Ring Main Unit (RMU)	ABB India Ltd. Siemens Ltd. Schneider Electric India Pvt. Ltd.
2.	Compact Sub-Station	ABB India Ltd. Siemens Ltd. Schneider Electric India Pvt. Ltd.

For other electrical & civil equipments / items, refer Master Vendor List attached separately elsewhere in the NIT document.

NOTE: Items not covered above and in Master Vendor List shall be subject to Owner's/ PDIL's approval.

2.6 DEVIATIONS

2.6.1 Clause wise deviations, if any, shall be clearly indicated.

Annexure-I
Drawings and Documents Schedule

Sl. No.	Description	With bid	Post Order			Remarks
			For Review	For Information & Records	Final As built	
1.	Schedule of Vendor Documents		✓		✓	
2.	Overall Single Line Diagram		✓		✓	
3.	6.6 kV Outdoor Type RMU & Compact Sub-Station vendor drawings of HV & LV switchboards i.e. Single line diagram, schematic wiring drawing and logic diagram, interconnection diagram, bill of material, CT sizing calculation etc.			✓	✓	
4.	Vendor drawings of transformers i.e. GA, Technical details/Data sheets of Dry Type Distribution Transformer.			✓	✓	
5.	Compact Sub-Station cable, lighting, earthing, equipment layout			✓	✓	
6.	Vendor drawing for Feeder Pillars i.e. GA,SLD, schematic wiring drawing etc.			✓	✓	
7.	Relay Co-ordination, Relay parameterization & Relay setting document for RMU, Compact Sub-Station equipments i.e. HV isolator, HV switchboard including relay setting for the existing feeder at MCL / Local Authority end etc.			✓	✓	
8.	Vendor drawing for High mast lighting system i.e. data sheet, GA, its feeder pillar drawings, lighting fixture drawings & data sheet etc.			✓	✓	
9.	6.6 kV Outdoor Type RMU & Compact Sub-Station Data sheet, GA drawing of HV, LV switchboards, Dry Type Distribution Transformer		✓		✓	
10.	List of recommended maintenance spares for two				✓	

	years of operation					
11.	List of Mandatory Spares				✓	
12.	List of Commissioning Spares				✓	
13.	Type Test Certificates			✓	✓	
14.	Routine Test Certificates / Factory Acceptance Test (FAT) Certificates			✓	✓	
15.	Inspection & Test Plan (ITP)		✓		✓	Manufacturer's ITP for each equipment shall be submitted by the Contractor for review by Owner/PDIL.
16.	Overall & area wise engineering layouts i.e. cabling layout, lighting layout, earthing/lightning protection layout and equipment layout drawings including associated documents such as complete cable schedules, lighting/power panel schedules, etc.			✓	✓	
17.	Data Books/ Manuals : Installation Manual				✓	
18.	Data Books/ Manuals : Operating/ Maintenance Manual				✓	
19.	Data Books/ Manuals : Catalogues/ Brochures				✓	
20.	Equipment storage details				✓	
21.	Lighting calculation			✓	✓	
22.	Vendor drawing for 6.6kV cable, 415V cable, fire alarm system, etc.			✓	✓	

Notes:

1. "TICK" denotes applicability.
2. Post order, drawing / document review shall commence only after approval of Document Control Index (DCI).
3. Final documentation shall be submitted in hard copy (Six prints) and soft (two CDs/DVDs).
4. All drawings & documents shall be submitted in A4 or A3 paper sizes. Documents in higher paper size shall be submitted in exceptional circumstances or as indicated in the NIT/Tender.
5. Post order- The schedule of drawing / data submission shall be mutually agreed between PDIL & the bidder / contractor / supplier during finalization of Document Control Index (DCI).
6. Bill of Material shall form part of the respective drawing.
7. Also refer other department's Drawings & Documents Schedule.
8. All technical details and documents furnished with bids shall be treated as data for engineering. These shall however be subject to Purchasers review after order placement and bidder/contractor shall comply to NIT/Tender requirements without any cost & time implication to Owner/PDIL.
9. GA drawing shall be submitted along with type test certificates.

SPECIFICATION SHEET
6.6 KV SF6 INSULATED OUTDOOR TYPE RING MAIN UNIT (RMU)

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE

ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐

GENERAL		AMBIENT CONDITION		
Ref. Stds. : IS ☒ IEC ☐		Temp.- Max./Min./Design Ref. : 47.19 / 10.17 / 50°C		
Encl. Docs. :		Relative Humidity: 100%	Alt. above sea <1000 M	
Make :		ATMOSPHERIC POLLUTION	Dusts : Coal	
Maker's Ref. No. :			Vapour : Ammonia	
		LOCATION	Indoor ☒	Outdoor ☐
			Gr. Floor ☒	1st floor ☐

ADDL. SCOPE	Incoming Bus Duct ☐		Tie Bus Duct ☐	
	Erection & Comm. ☒		Supervision of Erection & Comm. ☐	
TESTS:	Routine ☒	Type ☐	Others ☐	

BASIC DATA

TAG NO. & QTY.	Item No.		
	Switch board No.		
	Description		6.6KV SF6 RMU
REFERENCE DRAWINGS	Single Line Diagram		Drg. No. PC-298-7411-0985
	Feeder Details		-----
	Auto Trip Alarm Scheme		-----
	Non Trip Alarm Scheme		-----
	Trip Ckt. Supervision Scheme		-----
	Auto C/O Scheme		-----
	P.T. Bus Arrangement		
SYSTEM DETAILS	Rated Voltage with Variation		6.6 KV ± 10%
	Rated Frequency with Variation		50Hz ± 5%
	Highest System Voltage		7.2KV
	Combined V & F Variation		± 10%
	No. of Phases & Wires		3 Phase, 3 Wire
	Insulation Level		60KV
	Fault Level		21KA for 3 second
	Earthing Mode		
BUS BARS	Rating	Continuous	630A
		Short Time for 1 sec.	21KA
	Type of Insulation		Heat Shrinkable Raychem Sleeved
CIRCUIT BREAKER	Type		Vacuum Circuit Breaker
	Breaking Capacity	Symmetrical	21KA
		% DC Component	As per IS
	Making Capacity (peak)		52.5KA
CONTROL SUPPLY	Closing & Indication		220V/110V/24V DC **
	Tripping		220V/110V/24V DC **
	Alarm / Signal		220V/110V/24V DC **
	Space Heater		240V AC
MISC. DATA	Cable Entry Top / Bottom		Bottom
	Dummy Panel Reqd. Yes / No		No
	Width of Dummy Panel		--
	No. of Dummy Panel		--
	PAINTING	Type	Epoxy Based
		Shade	631 of IS: 5
	Spares Parts Reqd. for a Period of		2 Years

** NOTE: 220V DC / 110V DC Power required for closing, tripping and indication of circuit breaker feeder shall be provided by the vendor through in-built power pack in the feeders having battery back-up of 1 hours.

FEEDER DETAILS (6.6KV Outdoor Type RMU)

SWITCH BOARD DESCRIPTION: 6.6 KV Outdoor Type RMU				CODE NO. :
GENERAL	Feeder No.		4	1,2,3,5 & 6
	Feeder Description		Incomer with Line PT	Outgoing 6.6 kV Power Feeder
	Eqpt. Code No.		6.6KV RMUs-1 & 2	6.6KV RMUs-1 & 2
	Load in KW / Amp		-- / 630A	-- / 630A
	Ref. Scheme Drg.		---	---
C. B.	Type		VCB	VCB
	Rating (Amp)		630 A	630 A
	Operating Mechanism		MWS	MWS
CURRENT TRF.	Ratio		During Detailed Engineering by Contractor♦	During Detailed Engineering by Contractor♦
	Metering	Remote ammeter	--	--
		Local ammeter	Yes	Yes
		KWH meter	Yes	Yes
	O/C & E/F / Combined Motor Protn.		Yes / --	Yes / --
	Restricted Earth Fault (REF)		--	--
	Stand By Earth Fault (SBEF)		--	--
	Differential Protn.		--	--
V. T.	Nos & Burden		3 & As reqd. subject to 100VA/Ph.min. (Min.)	--
	Ratio		6600/√3 / 110/√3	--
	Connection : Bus / feeder		--Yes	--
	Sec. Wdg. connection		Star	--
METERS	Ammeter: Nos & Range		1 No. & 0-630A	During Detailed Engineering by Contractor♦
	Voltmeter: Nos & Range		1 No. & 0-7.2 KV	--
	KWH / Trivectormeter with MDI		-- / Yes	-- / Yes
	MW / KW Meter		-- / --	-- / --
	Hour meter		--	--
	Frequency Meter / PF Meter		Yes / Yes	-- / --
	Voltage / Frequency Recorder		--	--
	Electronic multifunction meter		Yes	Yes
PROTECTIVE RELAY	Overcurrent	- IDMTL	Yes	Yes
		- High set INST.	--	--
	Combined Motor Protn. (Microprocessor		--	--
	Earth Fault	- Res. IDMTL	Yes	Yes
		- Res. INST.	Yes	Yes
		- SBEF	--	--
		- Restricted	--	--
	Stalling / single phasing		--	--
	Neutral displacement		--	--
	Differential		--	--
	Under Voltage / Synchrocheck		Yes / --	Yes / --
AUX. RELAY	Tripping Relay	Elect. Fault	Yes	Yes
		Process Fault	--	--
	Trip Ckt. Supervision		Yes	Yes
	Others as required to meet system		Yes	Yes
CONTROL SWITCH	Trip - Neutral – Close / Off-Auto-On		Yes / --	Yes / --
	Auto – Manual / Emergency Trip		-- / --	-- / --
	Local – Remote / Local – Remote - Auto		Yes / --	Yes / --
	Equipment Selection – ASS / VSS		Yes / Yes	Yes / --
PUSH BUTTON	Emg. / Close / Trip (T) / Test (Te)		-- / -- / -- / Yes	-- / -- / -- / Yes
	Alarm Accept (Ac) / Reset (R)		Yes / Yes	Yes / Yes
	Defeat Interlock		Yes	Yes
SIGNAL LAMPS	On (R) / OFF (G)		Yes / Yes	Yes / Yes
	Non Trip (B) / Auto Trip (A)		Yes / Yes	Yes / Yes
	Trip Ckt. Healthy (W)		Yes	Yes
	Panel Space Heater On		Yes	Yes
	Ready for Service / Test		Yes / Yes	Yes / Yes
AUX. EQPT.	Annuciator		Yes	Yes
	Limit Switch : Service / Test		Yes / Yes	Yes / Yes
	Panel Illumination Lamp		Yes	Yes
	MCB for Motor Space Heater		--	--
	Others as required		Yes	Yes

CABLING DATA	Power (6.6KV-UE, XLPE-A-FRLS PVC)	2-3x300mm^2 (Al)	1-3x300mm^2 (Al)
	Control (XLPE-A-FRLS PVC)	2-3x2.5 mm^2 (Cu), 1-5x2.5 mm^2 (Cu), 1-7x2.5 mm^2 (Cu), 2-12X2.5 mm^2 (Cu)	2-3x2.5 mm^2 (Cu) 2-12X2.5 mm^2 (Cu) 1-19X2.5 mm^2 (Cu)

- ♦ CT CORE-1 shall be for metering & of accuracy class 0.5.
  CORE-2 shall be for protection & of accuracy class 5P10.
- Final cable size shall be provided at the time of drawing approval.
- CT ratios are tentative and shall be finalised during drawing approval stage.
- Contact multipliers as required for safe and satisfactory operation of the system is included in vendor's scope.

TECHNICAL PARTICULARS
6.6 KV SF6 INSULATED OUTDOOR TYPE RING MAIN UNIT (RMU)

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE		
ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐		
GENERAL		
Make / Maker's Type :		
Ref. Standards		
Rated Operational Voltage with ± %		
Rated Insulation Voltage		
Rated Voltage of Aux. Circuits with ± %		
Rated Current		
Short Time Rating		
Degree of Protection of Enclosure		
Service Conditions : Indoor / Outdoor		
DRAWOUT FACILITIES	Circuit Breaker's	
	P.T.'s	
	Protective Relays	
	Meters	
SHEET STEEL TYPE & THICKNESS	Base Channel	
	Others	
Material of Gaskets		
Material of External Hardware		
Operating Height : Max. / Min.		
Space Heater Rating of each Panel		
PAINTING	Method of Pre-treatment	
	Thickness of Paint	
	Type & Shade	
Final Temperature		
PROVISIONS / FACILITIES	Safety Shutters	
	Interlocks	
	Earthing Facility	
	Base Channels with Fdn. Bolts	
	Gland Plate with Glands	
	Limit of Maximum Nos. of Cables Termination Possible	
Dimensions : L X B X H / Dim. Drg. Ref. No.		
Shipping Dimensions of Largest Package		
Weight : Static / Dynamic		
Heat Dissipation		
BUS - BARS		
Material		
SIZE	HBB	
	VBB	
	Ground	
	Supporting Calculation Attached	
MINIMUM CLEARANCE	Between Phases	
	Between Phase & Earth	
Minimum Creepage Distance		
CURRENT RATING	Continuous	
	Short Time for 3 secs.	
Max. current density for bus-bars		
Temp. Rise for : Cont. Load / Short Ckt. Current		
SUPPORT	Material	
	Voltage Class	
	BIL	
	Arrangement :Separate/Common	
Power Frequency test Voltage for 1 Min. Duration		
Material of Bus-bar Insulation		
Material of Inter Panel / Compartment Barrier		
Shrouding Material for Joints		

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE

ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐

Bus Bar Phase Identification Mark		
No. & Type of Bolts per Joint		
CIRCUIT BREAKERS		
Make / Maker's Type		
Ref. Standards		
Type of Circuit Breaker		
Principle / Collaborator		
Rated Operating Sequence		
Rated Voltage		
Rated Frequency		
No. of Poles		
CURRENT RATING	Continuous in IPH6 Enclosure	
	3 second RMS	
	Momentary (Peak)	
BREAKING CURRENT	Symmetrical KA	
	Asymmetrical KA	
	% D.C. Component	
Making Current (Peak)		
Derating Factor, if any for Site Condition		
LIMITATION OF CURRENT RATING FOR	Motor Duty	
	Capacitor Duty	
	Transformer Switching	
	Cable Charging	
Restriking Voltage (Peak)		
INSULATION LEVEL	1 Min. PF withstand Voltage	
	Impulse withstand Voltage	
No. of Breaks per Pole		
TYPE AND MATERIAL OF	Fixed Contact	
	Moving Contact	
	Arcing Contact	
Type of Closing Mechanism		
Type of Tripping Mechanism		
ARC CONTROL DEVICE	Type	
	Material of Arc Chamber	
Details of Anti – Pumping Feature		
Details of Trip Free Feature		
Total Closing Time		
Total Interrupting Time at 10%, 50%, 100% of rated		
Interrupting Capacity		
SPRING CHARGING MOTOR	Rating	
	Voltage	
	Insulation	
	Duty	
	Type	
Spring Charging Time		
VOLTAGE / CURRENT REQD. FOR	Closing	
	Tripping	
	A.C. Supply	
AUXILIARY CONTACTS	No. of Spare Contacts NO / NC	
	Contact Rating Ac / Dc	
	Convertible Type	
INSULATING OIL	Ref. Standard	
	Volume of Oil Required	
Mounting Arrangement		
Temp. Rise of Different Parts		
DETAILS FOR SF_6	SF_6 Gas Pressure	
	Wt. Of SF_6 Gas per Breaker	

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE		
ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐		
DETAILS FOR SF_6	Gas Leakage Detector Provided	
	Gas Density Monitor Provided	
DETAILS FOR VCB	Pressure inside the Interrupter	
	Contact Wear Indication Provided	
	Facility for Checking Loss of Vacuum Provided	
RECOMMENDED TIME INTERVAL FOR	Inspection of Drives	
	Inspection of Contacts	
	Quenching Devices	
	Replacement of Oil	
Dimensions : L X B X H / Dim. Drg. Ref. No.		
Type Testing Authority & Test Report Ref. No.		
Net Weight of Breaker		
CURRENT TRANSFORMERS		
Make / Maker's Type		
Ref. Standard		
Type of Primary Winding		
No. of Cores		
Ratio		
Rated Burden		
Accuracy Class		
ALF / ISF		
Thermal Limit		
Dynamic Limit		
Insulation Class / Material		
Basic Insulation Level		
Ref. Magnetisation Curve No.		
POTENTIAL TRANSFORMERS		
Make / Maker's Type		
Ref. Standard		
Winding Connection : Pri. / Sec.		
Ratio		
Rated Burden		
Accuracy Class		
Insulation Class / Material		
Basic Insulation Level		
Weight		
Dimension		
Rated Voltage Factor		
SURGE DIVERTER		
Type & Maker's Type		
Rated Voltage KV		
Nominal Discharge Current (8/20 μ sec. wave)		
Residual Voltage at Rated Discharge Current		
Power Frequency Spark Over Voltage		
1.2/50 μ sec. Spark Over Voltage		
RELAYS		
Application		
Make / Maker's Type :		
Ref. Standards		
Operating Principle		
Rated Voltage / Current		
Rated Burden		
Setting Range		
Type of Mounting		
Reset : Hand or Self		
Flag Indication Type		
Ref. Characteristic Curve Type		

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE	
ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐	
Ref. Descriptive catalogue	
INSTRUMENTS AND METERS	
Application	
Make / Maker's Type :	
Ref. Standards	
Operating Principle	
Rated Burden	
Scale Range	
Accuracy	
Size	
Type of Mounting	
CONTROL SWITCHES	
Application	
Make / Maker's Type :	
Ref. Standards	
Contact Rating	
Utilisation Category	
PUSH BUTTON	
Make / Maker's Type :	
Ref. Standards	
Contact Rating	
Utilisation Category	
SIGNAL LAMPS	
Make / Maker's Type :	
Ref. Standards	
Rated Voltage / Wattage	
Type of Lamp Holder	
Type of Globe	
Accessibility from Front	
MOULDED CASE CIRCUIT BREAKERS	
Make / Maker's Type	
Ref. Standard	
Current Rating	
Breaking Capacity	
Setting Range of Thermal Release	
Setting Range of Magnetic Release	
MINIATURE CIRCUIT BREAKER	
Make / Maker's Type :	
Ref. Standards	
Rated Current	
Breaking Capacity	
CABLE GLANDS	
Material	
Type	
TERMINAL BLOCKS	
Make	
Type	
Current Rating	

NOTE: Completely filled in Technical Particulars Sheet shall be furnished for Owner/PDIL approval before commencement of manufacturing.

Note: - For Specification Sheet of 6.6 kV Indoor Type RMU, 6.6/0.433 kV Dry Type Distribution Transformer & 415 V Switchboard, please refer Specification Sheet of Compact Sub-Station (Doc. No: PC-298-7411-SS-0814) attached with Technical Specification of Compact Sub-Station (Doc. No: PC-298-7411-0814).

SPECIFICATION SHEET
LIGHTING SUB DISTRIBUTION BOARD

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE			
ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐			
GENERAL		**AMBIENT CONDITION**	
Ref. Stds. : IS/IEC		Temp.- Max./Min./Design Ref. : 47.19 / 10.17 / 50°C	
Encl. Docs. :		Relative Humidity: 100%; Alt. above sea : <1000 M	
Vendor :		Atmospheric	Dusts : Coal
Vendor Ref. No. :		Pollution	Vapour : Ammonia
SYSTEM DETAILS		Area	Safe ☒ Hazardous ☐
Nominal Voltage with ± % : 415V ± 10%,		Hazardous	Zone : Encl. Gr. :
Rated Frequency with ± % : 50 Hz ± 5%,		Area Class	Temp. Class :
Combined V & F Variation : ± 10%,		Location Indoor ☐	Outdoor ☐
No. of Phases & Wires : 3-Phase, 4-wire			
TESTS TO BE WITNESSED: Routine ☒ Type ☐ Others ☐			

BASIC DATA		
Item No. :		
Quantity :		As per SOR
Description :		----
Code No.		
Incoming & Outgoing feeders		Refer SLD Drg. No. PC-298-1203
Degree of Protection :		IP-55
Addl. Degree of Protection :		--
Cable Type & Size	Incoming (Al)	--
	Outgoing (Cu)	1.1 KV, 3X2.5 sq. mm. (Cu) XLPE-A-FRLS PVC
Painting Type & Shade :		Epoxy based, 631of IS:5
Period for which Spares required :		2 years

MAKE OF COMPONENTS	
SWITCH	: Refer Make of Electrical Items
M.C.B.	: -do-
CABLE GLANDS	: -do-
TERMINAL BLOCKS	: -do-

TECHNICAL PARTICULARS			
General	Item No. :		
	Make & Maker's Type		
	Material & Thickness of Enclosure		
	Gasketing Material		
	COVER TYPE	Internal :	
		External :	
	PAINTING	Pre treatment	
		Shade	
	Material of Ext. Hardware < 8mm / > 8mm		
	Dimensional Drawing Reference No. :		
	Weight :		
M.C.B.	Make & Maker's Type		
	Reference Standards		
	Category of Duty :		
	Rated Current :		
	No. of Poles :		
	Type of Neutral :		
Terminal Block	Make & Type		
	Rated Current		
Cable Gland	Type :		
	Material :		

NOTE: Completely filled in Technical Particulars Sheet shall be furnished for Owner/PDIL approval before commencement of manufacturing.

SPECIFICATION SHEET
HT CABLES

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE

ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐

GENERAL	**AMBIENT CONDITION**		
Encl. Docs. :	Temp.- Max./Min./Design Ref. : 47.19 / 10.17 / 50°C		
Vendor :	Relative Humidity: 100 %	Alt. above Sea Level < 1000M	
Vendor Ref. No. :	**Atmospheric Pollution**	Dusts : Coal	
		Vapours : Ammonia	

TESTS TO BE WITNESSED: Routine ☒ Type ☐ Acceptance ☒ Others ☐

Type Tests Certificate of Similar Cable : Required ☒ Not required ☐

BASIC DATA

Item No.			1	
Ref. Stds.			IS:7098 (PART-2)	
Voltage Grade			6.6 KV (UE) POWER CABLE	
System Earthing			UE	
Type of Cable			POWER	
CONDUCTOR	ALUMINIUM/ COPPER		ALUMINIUM	
	STRANDED		STRANDED	
Insulation Type			XLPE EXTRUDED	
Inner Sheath Type			EXTRUDED PVC (ST2)	
CONDUCTOR SCREEN	Required		YES	
	Not Required		--	
Material of Conductor Screen			AS PER IS	
ARMOURING	Required		YES	
	Material		GALVANISED STEEL STRIP	
	No. of Layer		SINGLE	
Outer Sheath Type			EXTRUDED FRLS PVC TYPE-ST2	
Special Requirements			INSULATION SCREEN REQUIRED	
Drum Material			STEEL	

BILL OF QUANTITY

Item No.	No. of Core & Cross-Sectional Area in sq. mm.	Qty. in Mtr.	Preferred Drum Length	Remarks
6.6 KV (UE) XLPE insulated, armoured, FRLS PVC outer sheathed power cable of following sizes:				
1.	3CX300 sq. mm (Al)	Refer SOR	By Contractor	

SPECIFICATION SHEET
LT POWER & CONTROL CABLES

CLIENT: M/s BCGCL	**PROJECT:** EPSS (CONSTRUCTION POWER)	**PLANT:** COAL TO AMMONIUM NITRATE	
ISSUED FOR : PROPOSAL ☐	ENQUIRY ☒	ORDER ☐	FINAL ☐

GENERAL	**AMBIENT CONDITION**	
Encl. Docs. :	Temp.- Max./Min./Design Ref. : 47.19 / 10.17 / 50°C	
Vendor :	Relative Humidity: 100 %	Alt. above Sea Level < 1000M
Vendor Ref. No. :	**Atmospheric Pollution**	Dusts : Coal
		Vapours : Ammonia

TESTS TO BE WITNESSED: Routine ☒ Type ☐ Acceptance ☒ Others ☐

Type Tests Certificate of Similar Cable : Required ☒ Not required ☐

BASIC DATA

Item No.		**1-6**		
Ref. Stds.		IS:7098 (PART-1)		
Voltage Grade		1.1 KV POWER CABLE		
System Earthing		NEUTRAL SOLIDLY EARTHED		
Type of Cable		POWER		
CONDUCTOR	ALUMINIUM/ COPPER	ALUMINIUM / COPPER		
	STRANDED	STRANDED		
Insulation Type		XLPE EXTRUDED		
Inner Sheath Type		EXTRUDED PVC (ST2)		
CONDUCTOR SCREEN	Required	--		
	Not Required	--		
Material of Conductor Screen		--		
ARMOURING	Required	YES		
	Material	GALVANISED STEEL STRIP / WIRE		
	No. of Layer	SINGLE		
Outer Sheath Type		EXTRUDED FRLS PVC TYPE-ST2		
Special Requirements		--		
Drum Material		WOOD		

BILL OF QUANTITY

Item No.	No. of Core & Cross-Sectional Area in Sq. mm.	Qty. in M.	Preferred Drum Length	Remarks
1.1 KV XLPE insulated, armoured, FRLS PVC outer sheathed, Power cables of following sizes:-				
1.	3.5CX400 sq. mm (Al)	Refer SOR	By Contractor	
2.	3.5CX300 sq. mm (Al)		By Contractor	
3.	3.5CX120 sq. mm (Al)		By Contractor	
4.	3.5CX70 sq. mm (Al)		By Contractor	
5.	4CX16 sq. mm (Al)		By Contractor	
6.	3CX2.5 sq. mm (Cu)		By Contractor	

TECHNICAL PARTICULARS
CABLES

CLIENT: M/s BCGCL	**PROJECT:** EPSS (CONSTRUCTION POWER)	**PLANT:** COAL TO AMMONIUM NITRATE
ISSUED FOR : PROPOSAL ☐	ENQUIRY ☒	ORDER ☐ FINAL ☐

GENERAL		
Make		
Ref. Standard		
Item No.		
Voltage Grade		
Suitable For Earthed / Unearthed System		
No. of Cores & Size of Conductor		
CONSTRUCTIONAL DETAILS		
CONDUCTOR	Material	
	Construction	
	No. & Dia of wires per Core	
CONDUCTOR SCREEN	Material	
	Thickness	
INSULATION	Material	
	Thickness	
	Core Identification Method	
INSULATION SCREEN	Material	
	Thickness	
INNER SHEATH	Type & Material	
	Thickness	
ARMOURING	Type & Material	
	Dia of Wire / Strip Thickness	
OUTER SHEATH	Material	
	Thickness	
ELECTRICAL DATA		
CONTINUOUS CURRENT RATING WHEN LAID IN	Ground At 30^0 C	
	Air At 40^0 C	
Short Circuit Current For 1 sec.		
CONDUCTOR TEMP.	Continuous	
	Short Time	
Resistance At Operating Temp. (Ohm / KM)		
Reactance At 50 C/S (Ohm/KM)		
Capacitance (F/Km)		
Insulation Resistance		
Polarisation Index		
DERATING FACTOR CHART ATTACHED FOR	Temperature	
	Grouping	
	Exposure to Sun	
MECHANICAL DATA		
DIAMETER WITH TOLERANCE	Over Inner Sheath	
	Over Armour	
	Overall	
Weight Of Cables Per KM		
Minimum Bending Radius		
Maximum Pulling Tension		
Standard Drum Length		
Tolerance On Drum Length		

NOTE: Completely filled in Technical Particulars Sheet shall be furnished for Owner/PDIL approval before commencement of manufacturing.

SPECIFICATION SHEET
INTERLOCKING SWITCH SOCKET & PLUG

CLIENT: M/s BCGCL	**PROJECT:** EPSS (CONSTRUCTION POWER)	**PLANT:** COAL TO AMMONIUM NITRATE	
ISSUED FOR : PROPOSAL ☐	ENQUIRY ☒	ORDER ☐	FINAL ☐

GENERAL		**AMBIENT CONDITION**	
Ref. Stds. :	IS / IEC	Temp.- Max./Min./Design Ref. : 47.19 / 10.17 / 50°C	
Encl. Docs. :		Max Relative Humidity 100% Alt. above sea : <1000 M	
Vendor :		Atmospheric	Dusts : Coal
Vendor Ref. No. :		Pollution	Vapour : Ammonia
Sample Reqd. :		Area	Safe ☒ Hazardous ☐
		Hazardous	Zone : Encl. Gr. :
		Area Class	Temp. Class :
		Location :	Indoor ☒ Outdoor ☒
TESTS TO BE WITNESSED : Routine ☒	Type ☐	Others ☐	

BASIC DATA			
Item No.			
Quantity		Refer SOR (Supply)	
Rated Voltage & Frequency		415V ± 10 %, 50Hz ± 5%	240V ± 10 %, 50Hz ± 5%
Rated Current		63 Amp	25 Amp
No. of Phases & Pins		3 Ph, 4 Pin	1 Ph, 3 Pin
Degree of Protection		IP55	IP55
Addl. Degree of Protection		--	--
Cable Size	Supply	3.5CX70 mm^2 (Al)	3CX2.5 mm^2 (Cu)
	Plug	3.5CX25 mm^2 (Al)	3CX2.5 mm^2 (Cu)
Period for which Spares required		2 Years	2 Years

MAKE OF COMPONENTS	
SWITCH :	Refer Make of Electrical Items
FUSE:	-do-
SOCKETS :	-do-
PLUG :	-do-
CABLE GLANDS :	-do-
TERMINAL BLOCKS :	-do-

TECHNICAL PARTICULARS			
General	Make & Maker's Type		
	Material & Thickness of Enclosure		
	Gasketing Materials		
	Material of Ext. Hardwares < 8mm / > 8mm		
	Cable glands Type & Material		
	Painting	Pre treatment	
		Shade	
	Dimensional Drawing Reference No.		
	Weight of Switch Socket / Plug		
Switch	Make & Maker's Type		
	Reference Standards		
	Rated Current		
	Utilisation Category		
Fuse	Make & Maker's Type		
	Reference Standards		
	Rated Current		
Socket	Make & Maker's Type		
	Reference Standards		
	Rated Current		
Plug	Make & Maker's Type		
	Reference Standards		
	Rated Current		

NOTE: Completely filled in Technical Particulars Sheet shall be furnished for Owner/PDIL approval before commencement of manufacturing.

SPECIFICATION SHEET
LIGHTING FIXTURES AND ACCESSORIES

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE

ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐

GENERAL		AMBIENT CONDITION	
Ref. Stds. : IS / IEC		Temp.- Max./Min./Design Ref. : 47.19 / 10.17 / 50°C	
Encl. Docs. :		Max Relative Humidity: ≤ 100% Alt. above sea : <1000 M	
Vendor :		Atmospheric	Dusts : Coal
Vendor Ref. No. :		Pollution	Vapour : Ammonia
SYSTEM DETAILS		Area	Safe : ☒ Hazardous : ☐
Nominal Voltage : 240V ± 10%		Haz. Area class	Zone Encl. Gr. :
Rated Frequency: 50Hz ± 5%			Temp. Class :
Combined V & F variation : ± 10%		Location: Indoor ☒	Outdoor ☒

TESTS TO BE WITNESSED : Routine ☒ Acceptance ☐ Type ☐ Others ☐

BASIC DATA

Item no.		1-2		
Degree of Protection		IP65		
Addl. Degree of Protection		--		
Material of Housing		Cast Aluminium alloy		
CONTROL	Separate	Yes		
GEAR	Integral	--		
Cable Type & Size		3 x 2.5 mm^2 (Cu)		
Looping facility		Required in control gear box only		
CABLE	Required	Yes		
GLANDS	Type	Rolled Al		
MOUNTING	Required	Yes		
BRACKET	Not Required	--		
PAINTING	Type	Epoxy		
	Shade	631 as per IS: 5		
LOCATION	Indoor	--		
	Outdoor	Yes		
SAMPLE	Required	--		
	Not Required	Not Required		
Period for which Spares Required		2 years		

BILL OF QUANTITY

Item No.	Lamp Type & Wattage	Description of Fixtures	Qty.	Remarks
1.	120W LED	Street Lighting	Refer SOR	
2.	70W LED	Street Lighting		

TECHNICAL PARTICULARS
LIGHTING FIXTURES AND ACCESSORIES

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE

ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐

FIXTURE		
Item No.		
Make		
Type		
Ref. Standard		
Suitable For	Type Of Lamp	
	Wattage Of Lamp	
Suitable For Outdoor Use		
Control Gear Integral / Separate		
Degree of Protection	Fixture	
	Control Gear Box	
Additional Degree of Protection	Fixture	
	Control Gear Box	
Material & Finish	Housing	
	Reflector	
	Control Gear Box	
	Diffuser / Louvre	
	Gasket	
	Ext. Hardwares <8mm/>8mm	
Pre - treatment	Housing	
	Reflector	
	Control Gear Box	
Thickness of material	Housing	
	Reflector	
	Control Gear Box	
Minimum Mounting Height		
Spacing / Height Ratio		
Light Output Ratio - Up / Down		
Surface Temp. Rise Range (For FLP Fxt)		
Cable Gland	Type	
	Material	
	Qty. Fittings / Control Gear Box	
Threaded Plug Provided	Fixture	
	Control Gear Box	
Looping Facility Available	Fixture	
	Control Gear Box	
Mounting Bracket Provided		
Weight Of Fixture		
Catalogue attached indicating	General Arrangement	
	Light Distribution	
	Utilisation Factors	
	I FL / I Starting	
ACCESSORIES		
Ballast	Make & Maker's Type	
	Ref. Standard	
	Rating	
	Winding Wire Material	
	Insulation Class	
	Power Loss in Ballast	
Capacitor	Make & Maker's Type	
	Ref. Standard	
	Rating	
Lamp Holder	Make & Maker's Type	
	Ref. Standard	
	Rating	
Starters	Make & Maker's Type	
	Ref. Standard	

NOTE: Completely filled in Technical Particulars Sheet shall be furnished for Owner/PDIL approval before commencement of manufacturing.

TECHNICAL PARTICULARS
HIGH MAST COMPONENTS

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE

ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐

1.	HIGH MAST LIGHTING STRUCTURE	
a.	Cross section of mast in polygon (no. of sides)	
b.	Overall height of mast (mtrs)	
c.	No. of sections of mast	
d.	Individual section, thickness/dia/length (mm)	
e.	Type of joints & length of overlap joints	
f.	Weight in kgs. of mast (including base plate, door and head frame etc.)	
g.	Material of construction	
h.	Pollution Treatment	
i.	Size of base opening door	
j.	Locking arrangement of base opening door	
k.	Size of base plate dia. / thickness	
l.	Lightning protection device	
m.	Aviation lighting device	
n.	Make / enclosed Drg. ref.	
o.	Civil Design Consideration	
i)	Maximum wind speed	
ii)	Factor of safety for wind load	
iii)	Factor of safety of other load	
iv)	Factor of safety of tower	
v)	Type of foundation	
vi)	Size of foundation	
vii)	Designed load bearing capacity	
viii)	Average soil bearing capacity	
ix)	Design safety factor	
x)	Depth of foundation	
xi)	No. of foundation bolts	
xii)	PCD of foundation bolts	
xiii)	Type of foundation bolts	
xiv)	Bolt Diameter	
2.	LANTERN CARRIAGE	
a.	Material of construction	
b.	Type of construction	
c.	diameter of carriage ring (mm)	
d.	No. of joints	
e.	Buffer arrangement for carriage and mast	
f.	Load carrying capacity (kg)	
g.	Total weight of assembly with fittings (kg)	
h.	No. of fittings	
i.	Type of fittings / fixture	
3.	WINCH	
a.	No. of winch, No. of drums	
b.	Gear ratio	
c.	Capacity (kg)	
d.	Operating Speed on full load	
e.	Lubrication / type of lubricant	
f.	Tested load per drum (kg) : i Kg per drum Ii Kg per winch	
g.	factor of safety	
h.	Make	
4.	STAINLESS STEEL WIRE ROPE	
a.	Make	
b.	Grade	
c.	Number of ropes	
d.	Material and construction	
e.	Diameter (mm)	
f.	Breaking Load Capacity (kg)	
g.	Factor of Safety	

5.	CABLE	
a.	Conductor / insulation / No. of cores	
b.	Type	
c.	Make	
d.	Conductor Size / Current Capacity	
6.	POWER TOOL	
a.	Model / type	
b.	Input Supply	
c.	K.W.	
d.	Operating Speed	
e.	i) Remote control switch PB station	
	ii) Length of control cable provided	
f.	Maximum time taken for : Raising	
	Lowering	
7.	TORQUE LIMITER	
a.	Model	
b.	Lifting Capacity (kg)	
c.	Adjustability	
8.	LIGHT FITTINGS	
a.	Type	
b.	No. of fittings in each type	
c.	Type of lamp	
d.	No. of lamps / fittings	
9.	AVIATION FITTINGS	
a.	Type	
b.	Type of lamp	
c.	No. of lamps / fittings	
10.	TUBULAR POLE	
a.	Length / each section dia (mm)	
b.	Material	
c.	Treatment of material	
11.	MISCELLANEOUS	
a.	Earthing connection	
b.	Type / material of JB	
c.	Incoming cable termination with double comp. glands	

NOTE: Completely filled in Technical Particulars Sheet shall be furnished for Owner/PDIL approval before commencement of manufacturing.

SPECIFICATION SHEETS
JUNCTION BOX

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE			
ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐			
GENERAL			
Ref. Stds.		IS / IEC	
Encl. Docs.			
Make			
Maker's type			
Sample Required		Yes ☐	No ☒
AMBIENT CONDITIONS			
Temp. Max. / Min. / Design Ref.		47.19 / 10.17 / 50°C	
Rel. Humidity		100%	
Alt. Above Sea Level		<1000M	
ATMOSPHERIC POLLUTION	Dusts	Coal Dust	
	Vapours	Ammonia Vapour	
Area		Safe ☒	Hazardous ☐
Hazardous area classification		Zone: Encl. Gr.:	Temp. Class:
Location		Indoor ☒	Outdoor ☒
TESTS	Routine ☒	Type ☐	Others ☐
BASIC DATA			
Item No.	1		
Quantity	Refer SOR		
Rated Voltage	240V±10%		
Rated Frequency	50Hz±5%		
Rated Current	16A		
No. of Phases & Wires	1Phase / 3wires (PNE)		
Application	For looping of cable		
Material of Enclosure	LM-6		
Shape of Enclosure	Round		
Degree of Protection	IP-55		
Addl. Degree of Protection	--		
Type of Cover	Dome		
No. of Outlets	3 nos. + one plug		
PAINTING	Type: Epoxy based		
	Shade: 631 as per IS: 5		
SPARE	Required: Yes		
	Duration: 2 Years		
No. of Terminals: As required			
Cable gland: 4 nos.			
Stopping Plug: 1 no.			
CABLE SIZE	Incoming -- 3Cx2.5 mm^2 (Cu) 1.1 KV XLPE ARMOURED FRLS PVC		
	Outgoing -- 3Cx2.5 mm^2 (Cu) 1.1 KV XLPE ARMOURED FRLS PVC		

Note: Double compression rolled aluminium cable glands, lugs and plugs shall be provided.

TECHNICAL PARTICULARS
JUNCTION BOX

CLIENT: M/s BCGCL **PROJECT:** EPSS (CONSTRUCTION POWER) **PLANT:** COAL TO AMMONIUM NITRATE	
ISSUED FOR : PROPOSAL ☐ ENQUIRY ☒ ORDER ☐ FINAL ☐	
GENERAL	
Item No.	
Ref. Std.	
Type of Junction Box	
Make	
Maker's type	
CONSTRUCTIONAL FEATURES	
Material of Construction	
Thickness of Enclosure	
Enclosure Protection Class	
Mounting Arrangement	
Cover Fixing Arrangement	
Gasketing Material	
External Cable Sizes	
Dimensions LX B X H / Dimensional Drg. Ref. No.	
Weight	
Painting	
Type Test Certificate No.	
CABLE GLAND	
Type	
Material of Construction	
Make	
TERMINAL BLOCK	
Nos. of Terminals	
Material	
Type	
Current Rating	
Fixing Arrangement	
Make	

NOTE: Completely filled in Technical Particulars Sheet shall be furnished for Owner/PDIL approval before commencement of manufacturing.

SECTION – 3.0

ERECTION, TESTING & COMMISIONING SPECIFICATION

3.1 SCOPE OF WORK

3.1.1 The scope of work shall include storage, handling, transportation, unpacking, checking, reporting of damages / defects, assembling, erection, installation, including fabrication, alignment, levelling, grouting, welding, bolting, painting (wherever specified), etc., testing and commissioning of various electrical equipment supplied by the contractor, earthing system, fabrication & installation of steel structural etc. as per drawings & documents, specifications, standards & codes, prevalent rules & regulations and best engineering practices.

3.1.2 The scope shall also include obtaining approval from statutory authorities, as required.

3.2 SCOPE OF ERECTION

3.2.1 The scope comprises of erection / installation, testing and commissioning of electrical equipment / items as indicated in SOR.

3.2.2 Laying of cables in excavated / RCC trenches and on cable trays as required.

3.2.3 Supply of single / double compression / FLP aluminium cable glands and crimping type tinned copper cable lugs, shall be provided by the electrical contractor for which unit rates shall be quoted.

3.2.4 Excavation and back filling of cable trenches.

3.2.5 Termination of power, control and lighting cables.

3.2.6 Fabrication with supply of MS material, consumable and hardware of frames, supports, cable racks etc. as required.

3.2.7 Supply, laying & connection of the complete earthing system including supply of GI earth electrode as per sketch given, GI earthing strips, flexible earthing conductors etc.

3.2.8 Minor civil works such as digging of earth and refilling for directly buried cables, earth strips, cable protection pipes, earth electrode pits, ground mounted lighting pole foundations, civil works such as making earth pit inspection chambers with covers, grouting of base plate, channels, supports and foundation bolts, including chipping of concrete or in brick work for earth strips, pipes and other minor chipping for foundation preparation, if required, cutting holes in walls for racks, risers, light fitting brackets, sealing of cable entries and making good the same after installation of the equipment and levelling and other minor similar jobs shall be in contractor’s scope.

3.2.9 Straight - through jointing of cables (wherever required)

3.2.10 Making / providing canopies / rain hoods.

3.2.11 All hardware required for successful commissioning, whether specifically mentioned or not in the specification.

3.2.12 Concrete foundations for pedestals, lighting poles, grouting of equipments etc., including supply of grouting materials.

3.2.13 Removal of materials / scraps to the scrap yard and stores etc. as per instructions of Owner / Consultant.

3.2.14 Supply and installation of any other item not specifically mentioned but found necessary by the engineer-in-charge for satisfactory completion of job.

3.2.15 For the erection of high mast crane of appropriate capacity shall be used by the contractor.

3.2.16 All letter writing on switchboards, transformer, danger boards, sign etc shall be done by the contractor.

3.2.17 Any work not included in this tender but may be required, as decided by engineer-in-chief, such as site modification of panel wiring, mounting of additional equipment etc. for which extra payment shall be made as per the man-day-rates to be quoted for various categories of workmen.

3.2.18 "AS BUILT" drawings with all site modifications shall be prepared by making the changes on owner's drawings.

3.2.19 All major civil engineering works pertaining to electrical equipment as per Technical Specification of Civil enclosed elsewhere in the tender.

3.3 EXCLUSIONS

3.3.1 Transportation, handling, assembling, setting, aligning, levelling, plumbing and grouting of all electrical motors shall be excluded from the contractor's scope.

3.4 CODES AND STANDARDS

3.4.1 The design, manufacture, testing, installation of the equipment shall comply with the latest issue of all relevant Indian Standards and codes of practices and all applicable Statutory Acts & Regulations.

3.4.2 The contractor shall have valid "A" class licence from the Director of Electrical Safety to the Govt. of Odisha otherwise his offer shall not be considered. The contractor must have PF & ESI codes covering all persons hired by him for carrying out the job.

3.4.3 The contractor shall observe safety rules and take all necessary safety precautions to carry out the work in the plant.

3.5 GENERAL PROCEDURE FOR ERECTION

3.5.1 The general procedure governing "Transfer of equipment and materials to Contractor", erection and final acceptance of owner / consultant are given below:

3.5.1.1 <u>Storage of equipment at site</u>

a. All equipment and materials shall be properly stored by the contractor at site in the designated storage area provided by the owner. Contractor shall arrange to draw the necessary equipment / materials in the sequence required for erection and transport the same from contractor's store to erection point.

b. The contractor shall keep proper record of the materials supplied by him / owner.

c. The contractor shall ensure that all the materials drawn / supplied by him are stored indoor / under shade. However, if a package is temporarily stocked outdoor due to unavoidable reasons, this shall be ensured that the storage area is dry, hard and well-drained.

d. Goods must not be placed directly on the floor / ground but shall be kept on blocks, 60 mm to 120 mm above the floor level such that the bottom is well ventilated.

e. In case of outdoor storage, the contractor at his own cost shall provide waterproof PVC sheets/ tarpaulin to cover all goods so as to protect them from rain etc. These sheets / tarpaulin shall be removed for inspection once in a week and if found moist or mouldy, shall be dried in direct sunlight.

f. In addition to the above, the equipment manufacturer's storage instructions, if any, shall be strictly followed.

3.5.1.2 <u>Contractor's inspection at site</u>

a. On receipt of any material (supplied by the contactor) at site, contractor shall fully unpack and inspect all equipment received for completeness, signs of damages, defect etc. in the presence for owner's representative. Any damage / short supply detected shall be recorded immediately. The contractor shall be required to make good / replace / repair the defective / damaged items at no extra cost to the owner.

3.5.1.3 <u>Handling and cleaning</u>

a. The contractor shall be responsible for proper handling and cleaning of all materials / equipment drawn / supplied by him until owner / consultant finally accepts the erected equipment.

b. Equipment shall be handled with care by experienced riggers under guidance of competent supervisors and as per rigging marks given on cases. Dragging on floor shall be avoided and crane / suitable rollers shall be used for moving the equipment at any times.

c. The contractor shall be fully responsible for the safe keeping of equipment issued to him till these are erected, tested, commissioned by him and accepted by owner / consultant.

3.5.1.4 Transportation

This involves transportation of various electrical equipments / materials from contractor's store to erection site. When transporting the equipment, it shall be loaded on suitable trailer / trucks as per capacity and size of equipment, and shall be properly supported on the trailers / trucks by means of ropes / stoppers to avoid damage or tilting due to heavy jerks and vibration. Precautions, if any, displayed on equipment shall be strictly observed.

3.5.1.5 Erection Requirements

a. All work shall be carried out as per drawings supplied. Placing on foundation, aligning, grouting, connecting, fixing danger notice plate / board on equipment as specified, meggering, labelling and painting shall form part of erection requirements.

b. Fixing of supporting frames / pedestals, grouting, cutting and dressing holes in walls / ceiling and any other minor civil work necessary for installation and levelling of electrical equipment are included in electrical erection scope.

c. The scope of erection also includes cable dressing / clamping / minor rerouting, minor relocation of fittings, internal cleaning of equipment, overhauling and minor repairs.

d. Fabrication of clamps from the materials specified and clamping of cables on racks, trays etc. fixing of single core cables in tri-foil formation in aluminium clamps, earthing of cable armour and lead sheath, wherever necessary (and as per the details given by Consultant) fall under erection scope of work.

e. Marking of cables by fixing / grouting the cable marks / number tags at every 25 metres along entire route of cables are included in the scope of work. The tags shall be made of Aluminium Strips.

f. The contractor shall without any extra cost, touch up with paint all electrical equipment which are damaged / scratched during handling, erection or repair. The paint used shall match exactly the painted surface of the equipment on which touch-up is done, and shall be epoxy based.

g. The descriptions given above are only to give a preliminary idea about the scope of work and they do not limit the entire scope to these descriptions only. Hence all other parts of the tender document shall be read in conjunction with the referred standards, associated drawings, specification sheets and schedule of materials & services to assess actual scope of work.

h. The contractor shall undertake erection of all equipment specified herein in accordance with good engineering practices in conformity with statutory regulations and Code of Practice and to the entire satisfaction of the purchaser / owner.

i. The contractor shall arrange all the necessary erection tools, tackles, testing and measuring instruments and shall supply all erection materials as required.

3.5.1.6 Erection Supervision by OEM Suppliers

a. For guiding / supervising erection of sophisticated equipment, services of main equipment supplier's engineer may be made available free of cost by the contractor for the following equipment. However, this will neither absolve the contractor from his responsibility nor his obligation to provide his own supervisors or technical personnel.

- 6.6 KV Switchboard
- Dry Type Distribution Transformer
- 415V Switchboard, MLDB, Lighting Transformer, etc.

b. The contractor shall have to comply with all the directions of Engineer-in-Charge, drawings etc. issued to him within the scope of his contract by supplier's engineer.

3.6 SPECIFICATION FOR ELECTRICAL ERECTION

3.6.1 General

3.6.1.1 These specifications lay down the erection procedures to be followed for each type of equipment, over and above the general "Erection Requirements".

3.6.1.2 The contractor shall also follow manufacturer's instructions and any other instructions of consultant / Principal / Statutory bodies during erection.

3.6.1.3 Suggestive Erection Drawings shall be supplied to the successful bidder for Lighting, Earthing, Cable Tray Routing, etc. These drawings may be suitably modified, if required, to suit site requirement with the approval of owner / consultant.

3.6.1.4 As-Built Drawings shall be prepared by the bidder and supplied to owner/ consultant.

3.6.2 <u>Switch Boards</u>

3.6.2.1 <u>Handling</u>

a. As far as possible lifting of switchboards shall be done by making use of eyebolts provided. It shall be ensured that before lifting, all eyebolts are fully tightened and that panel supports, nuts and bolts are intact and tight.

b. If lifting arrangement is not provided / not feasible and final positioning by sliding is unavoidable, packing base shall be retained as long as possible and rolled on suitable pipes. Dragging of panel directly on floor by crowbars shall be avoided.

c. Maximum care shall be taken to avoid any damage to insulator, bushings, meters and protective equipment.

3.6.2.2 <u>Erection</u>

a. Check the foundation according to the drawings. Ensure that all pockets have been rightly made. Fix the datum level, and level the foundation by chipping in such a way that the prescribed point of cubicle base plate is flushed with finished floor.

b. Check the individual cubicle for any deformity and ensure that all faces are straight. Any dent on sheet steel frame shall be rectified before placing on foundation.

c. Wherever separate base frames are supplied, level the foundations in both directions (lateral and transverse) and ensure that these have been correctly levelled throughout. In case of runner rails, check the rails for level in both the directions and ensure that they are parallel to each other. Wherever base frame is fixed to cubicle, place the cubicle on foundation ensuring that holding down bolts are directly over the foundation pockets.

d. Obtain correct level of panel with respect to floor / existing bus-bar by putting shims below base frame, shims are to be supplied by the contractor. Measure the level of each frame with reference to datum and ensure that level difference between the two ends of the switchboard base frame is within ± 2 mm.

e. Cubicle shall be so adjusted that front face of all the panels are in one plane, all sides are plumb and corresponding horizontals on all panel faces (e.g. minimum lines, door edges, inter cubicle joints) line up in the same horizontal line (s). Match the cubicles and adjust properly. Provide gasket between edges, if required; so that no inter-panel gaps are seen.

f. Bolt adjacent cubicles and base frame together by drilling new holes, wherever necessary to match holes.

g. Grout the foundation bolts with mortar, run grouting mixture under base of the cubicle frame, ram to ensure solidity. After grout has set properly, tighten the foundation bolts.

3.6.2.3 <u>Bus Connections and Installation of Loose items</u>

a. Fix bus bar links and inter panel bus-bar connections with coupling bolts / supporting insulators. Clean the contact surface of bus bars and links and smear with contact grease before bolting.

b. Wherever recommended, fix shroud on the joints and fill compound, or compound may be put on joint to form smooth homogenous & spherical shaped mass and then wrapped with tape. Simple taping of joints may also be done. Recommendation of manufacturer / consultant / Principal shall be followed in this respect.

c. In case of misalignment of bus bars, adjustments may be necessary. The connecting pieces may have to be re-drilled or re-fabricated.

d. Check tightness of bus bars bolts connections with torque wrench. Follow vendor's recommendations in this regard.

e. Install all loose relays, instruments, cable boxes, metering and protective CTs, PTs etc. Before fixing the relays, make sure that they are cleaned and all packing materials have been removed from them and proper operation. Clean the contacts.

f. Connect all inter-panel bus wiring. Connections of relays and instruments shall be done as per drawings. Check the wiring according to wiring diagram.

g. Connect all earthing bus bar between the cubicles and it shall be connected at two points by Al / GI strip or cable to the main earthing ring. Fix all glands for incoming and outgoing and control cable connections on the holes provided for the purpose, as per drawings.

h. Drill holes for fixing cable glands / cable boxes as per drawings, if such holes are not provided. All spare holes, gaps etc. shall be blanked as per instructions of Principal / Consultant.

3.6.2.4 Cleaning

After erection is complete all cubicles, switches, starters, CTs, PT Chambers, Bus bar Chambers etc. should be cleaned by blowing air (preferably hot air). Surface of the insulation shall be cleaned with cloth soaked in CTC / Benzene.

3.6.2.5 Circuit breakers installation (Air Circuit Breaker)

a. Clean the contacts properly with cloth soaked in CTC / Benzene etc. Clean and lubricate the operating mechanism, check and rectify the main insolating contacts and bushings and also secondary contact for any damage / misalignment. Check the locking mechanism.

b. Manually close and trip the breaker several times and check contact alignment and pressure. Adjustment, if required, shall be done according to the manufacturer's instruction. The arc chute if despatched separately should be fixed properly, only after checking of contact alignment etc. After fixing the Arc Chute, operate manually the breaker and check the contacts make properly. Measure contact resistance with conductor. Check the operation of OFF-ON indicator.

3.6.2.6 General Checks

a. Ensure that all gaskets are in position, replace the same if found damaged.

b. All opening covers and rear doors shall be bolted with required number of bolts. Take care that no bolt/nut/ washer gets lost during handling and erection.

c. Check inter-changeability of breakers of same rating.

3.6.3 Transformer

3.6.3.1 Handling

a. Transformers shall be lifted by lugs or shackles provided for the purpose to avoid unbalance while lifting.

b. It shall be ensured that Lifting chains / slings do not interfere with any part of the transformer.

c. Cover bolts shall be checked for tightness. If found loose, it shall be tightened fully before handling. Care shall be taken that the bolt does not rotate to avoid damage of the gasket.

d. Jacks shall be used, if required, only on jacking pads provided for the purpose (jacks shall never be used under valves or radiators tubes).

e. Transformer shall never be left without putting stoppers of the wheels.

3.6.3.2 Erection

a. Foundation of the transformer shall be prepared and checked for its level as per Drg. before shifting / transferring the transformers from the stores.

b. Proper time shall be given for curing the level of rails.

c. Wheels shall be fixed before placing of the transformer in position. Wheels of the transformers shall be checked for its proper movement. Greasing shall also be done on the shaft of wheel before placing the wheels in position. Split pins must be used / placed in position before its rolling.

d. Transformer shall be placed on the prepared foundation only.

e. Transformer's wheels shall be checked for its free movement on the rails/ plates. It shall be then levelled & aligned with the bus ducts, which shall be connected on the LT side of the transformer.

f. Stoppers to the transformer wheels shall be provided immediately after alignment to prevent any movement.

g. Cloth only shall be used for cleaning purposes.

CAUTION: While working on the transformers with hand-holes or bushing holes, take care that no tools or any other foreign matters are dropped into the tanks. All the loose tools shall be properly tied and secured.

h. All accessories such as HV and LV bushings, cable end termination boxes, marshalling box, instruments, capillary tubes, silica gel breather with dried silica gel, fans etc. shall be assembled as per vendor's drawings and instructions.

i. Cables shall be connected to HV and LV terminals of transformer.

j. Control cables / power cables shall be connected to Marshalling Box. Stop push button mounted on the wall of transformer room shall be connected to trip the transformer.

k. Transformer body shall be earthed at two separate points to main earthing strip.

l. Transformer neutral shall be earthed to a separate and distinct neutral earth pit (through NER, wherever applicable) as per design and drawings.

m. Danger notice board conforming to IS: 2551 and IE Rules 1956 shall be provided on enclosure or door of the enclosure.

n. Transformer Room's door / enclosures shall be earthed as per IE Rules, 1956.

o. Safety items i.e. fire extinguishers, shock treatment chart, fire buckets with screened sand etc. shall be provided.

3.6.4 Cable Installation

3.6.4.1 General

a. All fabrication, cutting, laying, spacing, fixing etc. of cables, trays, supports, hangers etc. shall be as per drawings and instructions of Owner / Engineer-in-Charge.

b. The contractor shall keep accurate record of cable drums supplied by owner, the drum nos. and actual length of cable taken out of each drum. Each cable length shall be cut from a specific drum as per approved schedule of cable. Lengths of cable runs shown in the cable schedule are calculated lengths only, hence the actual lengths shall be measured at site before laying and cutting the cable. The contractor shall take extreme care to adjust cable runs from drums so that joints in the cable are avoided and wastage reduced to minimum.

c. For purpose of measurement of cable run for payment the length of cable between and terminations only shall be considered.

3.6.4.2 Laying

a. The cable drums should be properly mounted on jack / cable wheel. Make sure that the spindle is suitable for carrying weight of the drum without bending. Check that spindle is laying horizontal on the bearing so as to prevent the drum creeping to one side or to the other while rotating.

b. Unroll the cables from the drum in correct direction. Rotate drum only as per arrow mark given in the cable drum. Ensure that the end protection box attached to the flange of the drum is removed and securing rope cut to allow cable and move freely. Rotate the cable drum and simultaneously pull cable steadily and with even pulls and not with unnecessary jerk or strain. In no case the cable shall be allowed to twist or kink since this is likely to spring the armour and fracture the insulation and outer serving of the cable.

c. Do not drag the cable on floor or hard surface. Use only wooden / steel cable rollers for this purpose.

d. Cable should not be bent sharply to a small radius. The cable bending radius shall be as large as possible and will not be less than 15 times the outside diameter for XLPE cables and 12 times for PVC cables. At joint termination the individual core of cable shall not be bent with bending radius of less than 15 times the diameter over the insulation.

e. Where cables are laid on the MS racks, trays etc. ensure that trays / racks / supports are fixed properly in an approved manner or according to the drawings. Check from drawings that for horizontal runs of cable, bracket, risers, supports, angles are grouted or fixed in formation as required.

f. In sub-station where large no. of cables rise to panels/ switchboards, it shall be ensured that these risers do not interfere with cables on racks and rising cables do not interfere with cables on racks and rising cables do not cross the other cables in horizontal runs. Risers are to be properly supported so that weight of cable does not fall on terminations. All cable crossings shall be avoided.

g. Cable laid in trenches should be sealed at the entry to hazardous area / non-hazardous area as per direction of owner / engineer-in-charge.

h. Openings in substation basement and floors for entry of cables shall be sealed after the cables are laid.

i. Cables shall be clamped by taking care to be taken to space clamps at such intervals as to prevent buckling of cables.

j. The laying of the cable on the racks shall be done in an approved manner and according to the drawings supplied.

k. Where cables are laid in cable slits, the slits after laying of cables shall be filled with sand & lean cement mixture and plastered so that surface flushes with top of slit.

3.6.4.3 Directly Buried Cables

a. Laying of under ground directly buried cables shall include excavation of earth along the cable route, laying of Hume / GI pipes for road crossing, back filling, ramming, removing of extra earth including supply of bricks, sand etc. as per drawing and instruction of Owner / Engineer-in-Charge.

b. Where cables are directly laid into ground, trenches should be dug up to such a depth as to ensure that the depth of the top of the entire cable below the ground level is min. 750 mm for medium and low voltage cables, and min.1050 mm for high voltage cables. Before laying of cables at these trenches, bottom of the trench should be properly levelled up and all odd and sharp materials removed. Trench bottom then should be bedded with a 75 mm thick layer of sand. Approval of Owner / Engineer-in-Charge shall be taken for preparation of this bed before laying of cables. Cables shall be laid in the trenches in straight runs. Care shall be taken so that any kinds or bends are not formed. After laying of the cables, bricks shall be placed length wise on both the sides of the cables along the entire length to form trough.

c. Fill up space between bricks with sand up to height of the bricks. Then place bricks closely width wise on top of the sand layer throughout the length. Fill up loose earth in trench, ram properly to compact, remove extra earth from site. Broken bricks shall not be use for brick working. Only Class-I bricks shall be used.

d. If new cables are laid to cross existing cables, the new cable shall be laid under existing cables at depth of not less than 200 mm from the existing cable. It shall be ensured that the approach of new cable to the crossing is uniform and gradually sloped.

e. Fix cable markers at 100 Mtrs. apart and at joints on the entire cable route length of the cables. The cable markers shall be made of pre-cast concrete blocks of 300 mm x 350 mm x 350 mm size with markings of “HT CABLE”, “LT CABLE”, “Depth of Cable”, “Arrow Marks” etc. inscribed. These shall be supplied by the contractor at no extra cost and fixed as per directions of the Owner / Engineer-in-Charge. The top of the above concrete slabs shall have a smooth finish with cement only.

f. Laying of cables under road crossings etc. shall be done in pipes, and pipe ends shall be sealed with bitumen compound and sand as required after cables are laid. Backfilled soil shall be rammed thoroughly to prevent road surface cracking due to settlement of loose soil.

3.6.4.4 <u>Laying in Readymade Trenches</u>

a. RCC slabs / chequered plates lifted from trenches for laying cables shall be put back in position at close of work every day to avoid accident & damage to cables in the trench.

b. When cables pass through pipes, pipe ends shall be sealed with bitumen compound and sand as required.

c. Protection pipes shall be provided, whenever cables enter from the floor, trench etc. in the equipment and sealing in and around these pipes shall be done.

3.6.5 Cable Jointing and Termination

3.6.5.1 <u>General</u>

The scope of work shall include but not limited to the followings:

a. Soldering / crimping of sockets / ferrules and connections at all joints/ terminations as per specifications. Sockets shall be provided at all terminations except where pressure clamp type terminals are provided.

b. Glanding of cable and fixing of cable boxes.

3.6.5.2 <u>Specifications</u>

a. HT XLPE cables shall be terminated by use of heat shrink type termination kits.

b. All LT XLPE power and control cables shall be terminated through compression type gland.

c. In case of LT XLPE cables, armours shall be suitably earthed in compression type glands. For HT XLPE cables, this shall be done either in glands or by any other suitable means like bonding the armour with suitable wire and connecting same to the earth terminals inside cable box.

d. In explosion proof equipment, sealing accessories, where provided in cable box, shall be used for sealing the cable entry to the box and termination.

e. All lighting and control cables shall be provided with crimped Al / Cu Sockets before termination in junction boxes.

3.6.5.3 <u>Crimping</u>

a. For all power cables, crimping type Al lugs for Al cables and tinned Cu lugs for Cu cables shall be provided. These lugs shall be crimped on the cable conductors by means of special hand/ hydraulic crimping tools. Before crimping the socket inhibiting grease shall be smeared over the conductor. Conductor shall be shaped properly before sliding the socket over it. Crimping shall be done in an approved manner.

b. All the control cables, which shall be of copper conductor, shall be terminated without any additional lugs in screwed type terminals provided in various equipments.

3.6.5.4 Jointing

a. The jointing shall be done in an approved manner. Care shall be taken not to damage the insulation when opening the cable for jointing.

b. Before commencing soldering of the socket, conductor shall be thoroughly cleaned and insulation protected. The ferrules shall be thoroughly cleaned. Ferrule and each strand of the cable shall be thoroughly sweated with solder to tin them and fill the conductor gaps to remove all air pockets. Soldering materials of approved quality as per ISS practice shall be used. Taping of the conductors shall be done in an approved manner after crimping / soldering.

c. Filling up compound and sealing the cable box shall never be done in one operation. After the first pouring of compound, it should be topped up again with compound and then sealed.

3.6.5.5 STRAIGHT THROUGH JOINTS

a. Jointing of XLPE & XLPE cables shall be done with extreme care and manufacturer's instructions shall be strictly followed. Soldering of sockets shall also be done with extreme care as indicated above.

Earth continuity wire shall be plumbed and / or clamped. Compound shall be filled according to the instructions of manufacturers of terminating kit / cable. Joints made inside trench or on rack shall be properly supported. Wherever joints are made inside ground, brick masonry work shall be done around the joint box and filled with sand, and there after covered with earth at no extra cost.

b. A tent shall be used in all circumstances where jointing work is being done outdoor, for protection against rain and to prevent dust from being blown in to exposed joints and jointing materials. Extreme care shall be taken to maintain proper phase sequence while terminating at equipment ends. Records of connection details shall be maintained. Conductors shall be shaped properly while terminating and no sharp bends shall be given. Where numbers of cables are to be connected in parallel, proper tests shall be done before connection, so that no cross connection shall be made. No phase crossings shall be allowed for making the connections.

c. Cables shall be supported adequately at the entry to cable box / equipment so that load of cable does not come on cable glands.

d. All cables shall be meggered before and after jointing and insulation values recorded.

e. While terminating at equipment end, each core shall be properly tagged with numbering ferrules as per nomenclature given in the drawings. Wires should be dressed and clamped neatly, bolting shall be done properly.

3.6.6 **Earthing**

3.6.6.1 General

a. Earth pit shall be maintenance free type (chemical earth pit).

b. Chemical earth pits shall have Enhanced high quality UL certified 17.2 mm copper bonded (250 micron) earthing electrode/ rod along with 22.6 KG graphite based (non-bentonite) as a ground enhancing material with stainless steel clamp for connecting copper bonded rod with horizontal flat strip shall be used.

c. Backfill shall be permanent and maintenance free. (No re- charging with salts or any other chemicals) and shall maintain its earth resistance with time. Backfill shall confirm IEEE 80-2000Clause No.14.5 (d). Backfill in its set form shall have a resistivity of not more than 0.12 ohm-m. Backfill shall comply the requirements and all applicable tests as per part-7 of IEC62561.

d. Painting of all earth strip joints with anti-corrosive paints shall be carried out as per details given in drawings and instruction of Owner / Engineer-in-Charge.

e. All electrical equipment rated 415 V and above shall be connected to earth bus by two separate and distinct earth connections. All equipment rated 240 V and below shall be earthed with single earth conductor.

3.6.6.2 <u>Specifications</u>

a. Types and sizes of earthing conductors shall be as indicated in the SOR attached. All earthing installations shall conform to IS-3043.

b. Underground conductors shall run at a depth of 600 mm below ground level. Where these conductors run along with cables, they shall be laid at the same depth as cables. Where conductors run on wall, ceilings, they shall be laid on clamps or brackets made out of Al/GI strips.

c. Wherever, earthing conductor is passing through floor, walls etc. the conductor shall be taken through PVC / GI pipes.

d. All paints, enamel etc. shall be removed from point of contact before making connections.

e. Connections between G.I. strips shall be done by welding. For connecting Al conductor / G.I. wire, Al socket shall be crimped on the conductor / wire. At the equipment end, connections shall be done by bolting.

f. Connection between Al & GI shall be done by bolting. Graphite grease shall be applied on contact surfaces.

g. Epoxy resin paint or bitumen shall be applied on welded or bolted joints to prevent corrosion and taping done as indicated in the drawing. Connections between Al wires shall be done by crimping back to back Al ferrule.

h. Earth electrodes - Earth electrodes shall be provided as per drawings / specification. Work includes excavation of earth, installation of electrodes and test links etc., supply and filling of charcoal and common salt, back filling of earth and removal of extra earth as specified earlier. It also includes making brick wall around the electrode and cover as per drawings / specifications. The testing links shall be grouted on brick wall and connections with earth electrode and conductors shall be made. Distance between two electrodes shall not be less than 10 meters and may be located 4 M away from building foundation.

i. Earth pits for equipment earthing, neutral earthing and lightning protection shall be separate. However, these pits shall be inter-connected.

3.6.7 <u>Plant Lighting</u>

3.6.7.1 The electrical installation covered by this specification shall conform to relevant Indian Standards & codes of practices.

3.6.7.2 Erection of light fittings, plug sockets etc.

Fabrication of supports for lighting fittings, sockets, junction boxes shall be done as per the relevant drawings / instructions given by the owner / engineer-in-charge. These shall be grouted to walls, ceiling or welded to insert plates, steel structures etc. Insert plates on ceilings shall normally be provided. However, if required, the contractor shall weld such supports to the reinforcement rods after exposing by chipping off concrete at no extra cost. Installation of lighting fittings includes control boxes, where supplied separately and shall be done as per drawings. Before installation, checking of internal parts, assembly of accessories shall be done as per manufacturer's instruction.

3.6.7.3 The explosion-proof fittings shall be earthed through third core of the cable used for wiring. The third pin and body of 15 amps shall be earthed similarly.

3.6.7.4 Installation of explosion proof equipment shall be done strictly following manufacturer's instruction or relevant Standards. Cable termination shall be done as per relevant drawings. No drilling of holes or any change in construction of equipment or part thereof shall be done.

3.6.7.5 Wiring for normal AC supply light points and plugs shall be taken on the same brackets but wiring for emergency DC supply lights shall be taken separately. Drawings for lighting layout give only tentative location of fittings and wiring route shall be decided in consultation with owner / engineer-in-charge. Wiring shall follow shortest possible route and no. of circuit shall be bunched together to the extent possible in the same route. For wiring and laying of cables, Cl. 3.6.4 shall be referred.

3.6.7.6 Cable for wiring light points and socket outlets shall normally be laid along wall, ceilings, structures, on suitable brackets made out of M.S. / Al sheets or strips. Connections to the points with fluorescent fixtures in one circuit shall be taken through junction boxes. Junction boxes shall be suitably located for branching off from the circuit to the individual point. Wherever indicated, cables may be laid directly on walls, ceilings etc. by clamping on saddles.

3.6.7.7 Terminations shall be done in a manner as detailed in Cl. 3.6.5. Wherever indicated, the wire can be drawn through PVC bushings provided in the fittings. Relevant drawings may also be referred to.

3.6.7.8 Lamps shall be installed after installation of fittings and wirings.

3.6.7.9 All light fittings and corresponding control switches shall be numbered in a permanent way as instructed by owner / engineer-in-charge.

3.6.8 **ERECTION OF STRUCTURES**

3.6.8.1 Specification

The fabrication work shall be done as per drawings / specifications / sketches in an approved manner and to the entire satisfaction of owner / engineer-in-charge. The contractor shall take adequate measures to avoid wastage. Scrap quantity shall not exceed 2 % of total quantity used for erection.

3.6.8.2 Erection of racks, risers, supports etc.

a. Erection of racks and risers for cable supports shall be done along the cable routes as indicated in the drawings. The contractor before erection shall check the route for any obstruction like process pipe lines, structures, equipment etc. In case of obstructions, the matter shall be brought to the notice of owner / engineer-in-charge in writing and racks shall be re-routed as per his instructions.

b. As and where indicated in the drawings, supports for racks, risers etc. shall be welded on the steel structure, such as MS beams, pipe trestles, insert plates provided in the RCC column etc. for erection of racks.

c. Wherever indicated, supports for racks, risers, shall be grouted on walls. The racks, risers etc. shall be installed on such supports and those properly welded.

d. Opening on walls / floors shall be provided where racks / risers are crossing floors/ walls.

e. Heavy channels, risers may also be grouted on the floors in addition to supports provided from walls, ceilings, steel structures etc.

f. As indicated in the drawings, racks and risers shall be erected either in single tier/ multi tier formation.

3.6.8.3 Erection of supports in trench

a. Supports and Hangers shall be grouted with rag bolts on the walls of readymade concrete trench.

b. In existing trench wall, contractor may be required to provide pockets for grouting cable supports at some points. This shall be done without any extra cost to the owner.

c. In case of requirement of insert plates for support of cable rack, the contractor shall weld such plates to the reinforcement MS rods. This shall be done by chipping the concrete for exposing the reinforcement MS rods and thereafter welding the plates and making good the concrete chipping by plastering.

3.6.8.4 The pipes will have to be bent (wherever required) and fixed / embedded in floor, wall and ground for laying the cables. Neoprene bushes shall have to be fixed at the end of such pipes.

3.6.8.5 GI trays of different sizes shall be cut in size and fixed on racks and risers. Fixing of trays shall only be done after erection / welding / painting of the supports as required.

3.6.8.6 Erection of support frames for miscellaneous equipments, base channels for transformers and switchboards etc. shall be carried out at no extra cost.

3.6.8.7 Dismantling of steel fabrication and re-erecting as required by owner / engineer-in-charge shall have to be carried out by the contractor.

3.6.8.8 Dismantling of cable racks and re-erecting as required by owner / engineer in charge shall be carried out by the contractor.

3.7 GENERAL PROCEDURE FOR TESTING & COMMISSIONING

3.7.1 Before proceeding with the work, contractor shall fully inspect all installed Electrical Equipment for completeness, signs of damages, defects etc. and record all discrepancies noticed. The contractor shall be required to make good / repair / replace the damaged components at no extra cost.

3.7.2 Testing and Commissioning Requirements

a. All works shall be carried out in accordance with the drawings, supplier's instructions / manuals for equipment and as per relevant ISS & Code of Practices.

b. Before conducting test on any equipment, the contractor shall obtain permission from owner / engineer-in-charge and all tests shall be conducted in their presence.

c. Results of each test shall be recorded by the contractor immediately after the test on approved performa and counter signed by the owner's authorised representative. The test results shall be furnished in four copies in the form of 'Test Certificates'. Performa for some of the items are given in Appendix-1.

d. Copies of the record shall be handed over to owner / engineer-in-charge.

e. The Contractor shall commission all electrical equipment and carry out all pre-commissioning / commissioning tests inclusive of no-load and on-load tests on motors, and shall be responsible for final adjustments of relays, motors, instruments, starters, breakers etc. as per operational data supplied and as per directions of Engineer-in-Charge.

f. All terminals, cable joints, earth terminals which are opened for testing purposes shall be re-terminated and re-insulated by the Contractor to restore their original state.

g. Painting

The contractor shall without any extra cost, touch up with paint all electrical equipment which are damaged/ scratched during testing and commissioning work. The paint used shall match exactly painted surface of the equipment on which touch up is done.

3.7.3 Cleaning and Regular Maintenance.

Till the commissioned equipment is finally accepted by owner / engineer-in-charge, Contractor shall be responsible for regular cleaning and maintenance of all electrical equipment. The maintenance job is to be done in consultation with or on advice from the Owner/ Consultant.

3.8 TESTING & COMMISSIONING SPECIFICATIONS

3.8.1 These specifications lay down the testing and commissioning procedures to be followed for each type of equipment, over and above the general requirements laid down in specifications for erection.

Manufacturer's instructions and any other instructions of owner / engineer-in-charge / statutory bodies shall also be followed by the contractor during testing and commissioning.

The contractor shall maintain and furnish the records of all equipments i.e. HT/LT panels, motors, transformers, CT, PT, relays etc. including any special test as per manufacturer's manual.

3.8.2 Switch Boards

3.8.2.1 General Checks

a. Check all auxiliary contacts of breakers for proper make / break operation.

b. If necessary, make minor adjustments to circuit breakers mechanism, auxiliary contacts etc. for proper operation of circuit breakers. Proper greasing and lubrication or mechanism shall also be done before final commissioning.

c. Check for termination of control circuit wiring as per drawing and ensure that the terminals at equipment and panel are mechanically sound.

d. Ensure proper operation of all test operation switches and push button.

e. Contractor to arrange primary injection kit for testing of incomer breaker (rated at 3200A).

f. Check wiring of all space heaters, indication lamps bells, buzzers etc.

3.8.2.2 Insulation resistance test

a. Measure the insulation resistance of main bus-bars (Phase to phase & Phase to earth) and circuit breaker with 1000 V Megger (IR values shall generally be not less than 75 MΩ for 6.6 KV, 10 MΩ for 415 V).

b. Control wiring shall be tested with 500 V Megger (IR values shall not be less than 2 MΩ).

3.8.2.3 High Voltage Test

The test shall be conducted contacted on switch gear rated 6.6 KV and above.Test shall be as per relevant Indian Standard. However, for AC high voltage test the value shall be twice the working voltage of the switchgear plus 1000V. This voltage shall be maintained for 1 minute. Each phase shall be tested in turn with remaining phases earthed. After high voltage test, a further megger test shall be made to make sure that insulation resistance to earth has not altered appreciably. The reading of second megger test should be consistent with that of the first. (AC test voltage for 1 min. duration shall be 15KV for 6.6 KV panel).

3.8.2.4 Testing of Current Transformer

a. Insulation resistance to earth of secondary winding shall be tested with 500 V megger (remove earth connection before test).

b. Check the polarity of C.T:- Connect zero centre voltmeter in the secondary winding, connect 6 V battery with switch in the primary, close the switch and from the kick of the voltmeter, ascertain the polarity.

3.8.2.5 Testing of P.T. Insulation

Testing of H.T. & LT side of P.T. shall be done with 1000 Volts and 500 Volts megger respectively (the value shall not be less than 100 MΩ and 2 MΩ respectively).

3.8.2.6 Testing of Relays

1.0 Checking of wiring shall be done according to Manufacturer's drawings. Check relay continuity at all taps and also ensure plug bridge contact satisfactory.

2.0 Secondary injection test

Use secondary injection test set incorporating timer. Testing of all protective relays such as but not limited to over current, earth fault, differential, motor protection, under voltage relays etc. shall be done as per the procedure set by the manufacturers of the relays. All time delay relays shall be tested to verify their characteristics for IDMT and instantaneous relay pick up and drop off values shall be noted at various taps. Relays shall be tested at all taps. Errors shall be calculated and compared with permissible limits specified by manufacturers. Adjustment, such as in establishing circuit, shall be done as recommended by manufacturer. After testing, relays shall be set at values given by Consultant.

3.0 Timer relay shall be tested and calibrated and set properly.

4.0 All auxiliary relays shall be tested for proper operation.

3.8.2.7 Testing of Instruments

All indicating and recording instruments like Ammeter, Voltage meter, KWh meter etc. shall be calibrated. Zero error of each instrument shall be corrected.

3.8.2.8 Operational Test

Conduct the following operational tests after putting the circuit breaker at test and service position. Check that the fuses of proper rating are put in control circuit as per wiring diagram.

a. Close and trip the circuit breaker several times with power or manually. In case of motor operated spring charged closing mechanism, check the operation of charging motor. Ensure that it cuts in/ off properly.

b. Check the indication scheme ON, OFF, trip circuit healthy, auto-trip etc.

c. Trip the breaker by operating the protective relays (operate contact manually).

d. Check the trip free feature

e. Check the anti-pumping feature

f. Check operation of voltage selector relay scheme for supply.

g. Check annunciation scheme for AC / DC power supply failure.

h. Each motor starter shall be tested for correct operation. All operational tests to verify sequence of operation, inter-locking, alarm indication schemes (by simulating the connection) shall be done.

i. Bi-metallic type thermal over load relay shall be tested at different settings. Current shall be injected through the thermal elements (three elements can be connected in series) at twice and thrice the set value and tripping time shall be noted. The values shall be compared with the data supplied by manufacturer.

j. Single phase prevention relays shall be tested for proper operation.

k. Check that fuses of specified ratings are put in various outlets.

3.8.3 **Transformer**

3.8.3.1 Final testing before commissioning shall be done in cold condition after drying out the transformer and disconnecting H.V. and L.V. side cables by removing link in disconnecting chamber, cables and also earth connections to neutral.

3.8.3.2 At least 1000 Volt megger shall be used for 6.6 KV winding and manufacturer's test certificates shall be compared for the purpose. 500 Volt megger shall be used for auxiliary power cables and control cable and values shall be preferably more than 2 MΩ.

Polarization Index shall be recorded as below to determine whether drying is necessary or not:-

$$PI = \frac{IR\ 10\ Min}{IR\ 1\ Min}$$

Evaluation of insulation condition based	Base on PI	Drying on PI
Hazardous	< 1	Mandatory
Bad	1-1.5	Mandatory
Doubtful	1.5 - 2	Recommended
Adequate	2 - 3	No
Good	3 - 4	No
Excellent	> 4	No

3.8.3.3 Ratio Test :

3 phase, 415 volt shall be supplied on HV side for every tap position and reading shall be taken on other side. For every tap changing, supply shall be switched off for off-load changer.

3.8.3.4 Polarity Test

3 phase, 415 volts shall be applied to HV side. One terminal of HV side shall be joined to corresponding terminal of LV side, say A-a. The voltage across A-a, A-b, B-a, B-b, B-c, C-a, C-b, C-c, N-a, N-b, N-c shall be recorded and vector group shall be ascertained.

3.8.3.5 Phasing for Paralleling Operations

Two transformers shall be connected on primary side. Terminal 'a' of secondary side shall be connected to bus-bar which corresponds to the equivalent terminal of second transformer. Both transformers shall be at same tap. Then 415 volt, 3 phase supply shall be connected to primary side. Circuit breaker of second transformer shall be closed. The corresponding secondary terminal voltage of two transformers, a1-a2, b1-b2, c1-c2 shall be measured. These voltages shall be zero in case both transformers are of same polarity and phase displacement. Voltmeter of the double reading of voltage of the secondary shall be used for measuring their condition. In case of star connected secondary winding having star joint earthed, secondary terminals need not be connected as stated earlier.

3.8.3.6 Temperature Indicators

Temperature indicator shall be calibrated for the alarm contact properly.

3.8.3.7 Following points shall be checked before commissioning the transformer :-

a. General Inspections

i) Assembly of accessories and mounting shall be checked with reference to Drgs.

ii) Tightness of all cover bolts, flange etc. shall be checked.

b. Breather

i) It shall be checked that the protective cover on air passage is removed.

c. Thermometer

The connection of C.T. and Heater element for winding temperature indicator shall be checked.

d. Wiring

Wiring from instruments to marshalling box and to switch board/ control panel shall be checked.

e. HV and LV Bushing and connections.

i) Bushings shall be cleaned and connections shall be checked for outgoing and incoming lines.

ii) Gap of arcing horn (HV bushing) shall be checked.

iii) High pot test and cable and test of transformer shall be completed.

f. After all checking found O.K., the breaker for incoming of transformer shall be made ON for charging the transformer. It shall be watched for at 24 hrs. without load. Then it can be loaded after finding everything O.K.

3.8.4 **Cables**

a. All HT & LT cables shall be tested for insulation resistance with 1000 V megger after termination. IR shall be measured between phases and between phase & earth. The voltage shall be applied for 1 minute.

b. All HT cables (6.6KV) shall be tested for high voltage as per IS: 1255 after making all termination and joints followed by IR test.

3.8.5 **Lighting**

Before energising any lighting circuit, the IR values (phase to phase and phase to earth) shall be recorded for entire wiring installation. The testing shall be done with 500 V megger. After switching on the power supply, load of each circuit shall be measured.

3.8.6 **Earthing**

The continuity of earthing and resistance of each earth pit and grid shall be measured with earth megger.

3.8.7 **Miscellaneous Equipment**

Under this are included, exhaust fans, blowers, limit switches, vibrators, electro-magnets, air pressurisation unit etc. The following tests shall be conducted.

a. Measurement of insulation resistance

b. Check up the direction of rotation.

c. Operational test

3.9 DOCUMENTATION

3.9.1 For the purpose of completion certificate, the following documents will be deemed to form completion document:

a. The technical documents according to which the work was carried out.

b. Final check-list and completion report.

3.9.2 Three sets of construction drawings showing therein the modifications and correction made during the course of execution signed by Owner / Engineer-in-charge.

3.9.3 Test certificates for the materials purchased by Contractor.

3.9.4 Material appropriation statement for the materials issued by Owner for the works and list of surplus materials returned to Owner's stores duly supported by necessary documents.

3.9.5 No claim certificate by the Contractor certifying that the entire work done by him under the contract has been measured & accepted for the final bill to his satisfaction and that he will have no claim(s) concerning any work(s) or part thereof performed by him under the Contract, to Owner except otherwise indicated in the final bill.

3.9.6 The completion certification shall be issued by Owner within 30 days of the Contractor furnishing documents listed in this clause jointly certified by Owner / Engineer-in-charge and Contractor's Site Engineer.

3.10 HANDING OVER TO OWNER

3.10.1 The contractor shall hand over the complete installation as a whole. Minor works not specified or mentioned in the scope or SOR but required to complete the job as a whole will have to be done by the contractor without extra cost. Any equipment / installation shall not be deemed as handed over to Owner until the same is complete in all respect and is accepted in writing by the Owner / Engineer-in-charge.

3.10.2 The final acceptance of the work shall be after the demonstration of guarantees by the Contractor. Owner shall issue the final acceptance / taking over certificate upon fulfilment of the guarantees.

3.11 OBLIGATIONS & RESPONSIBILITIES OF CONTRACTOR

The contractor's obligations and responsibilities shall include but not limited to the following:

3.11.1 To deploy skilled, semi skilled and unskilled personnel in requisite numbers and as per scheduled programme so as to complete the WORK as per overall project schedule.

3.11.2 To deploy suitably qualified supervisors and engineers in requisite numbers to assure execution of good quality job as per best engineering practices and to the full satisfaction of Owner / Consultants.

3.11.3 Safety supervisor shall be deployed at site that monitors safety aspect during the site construction work. Contractor to note that all workers shall use PPE (helmet, safety shoes, hand gloves, goggles, double lanyard safety belt etc. and they shall be medically tested before putting into the job.

3.11.4 To prepare detailed planning and execution schedule considering the availability of fronts and materials. This shall be reviewed by Owner / Engineer-in-charge and Contractor shall be required to keep updating the same (as per the instructions of Owner / Engineer-in-charge) to take care of any changes in the availability of fronts and materials and to complete all jobs as per the overall project schedule. Owner / Engineer-in-charge shall in no way be held responsible for such changes.

3.11.5 To check for quantity compliance between bill of materials and drawings for cable, structural, earthing materials etc. and intimate Owner / Engineer-in-charge sufficiently in advance regarding discrepancies, if any.

3.11.6 **Construction power arrangement shall be done by the contractor at their own and distribution to various areas for construction shall be in the scope of the contractor**.

3.11.7 To arrange all required tools and tackles, consumables, instruments, erection materials & machineries etc. for handling erection, testing & commissioning of complete electrical installation.

3.11.8 To arrange and supply storage tanks for drinking water so as to avoid any inconvenience that may be caused due to interruption in water supply at times.

3.11.9 To provide proper storage and security arrangements for his tools, tackles, equipments, materials etc. as well as equipment and materials issued by Owner / Engineer-in-charge to Contractor. Owner / Engineer-in-charge shall not be responsible for any loss or damage to items in the custody of Contractor at site for any reason whatsoever.

3.11.10 Completion of all repairs arising out of defective work done by Contractor, Owner / Engineer-in-charge may at his discretion require the Contractor to rectify certain defects in materials caused due to bad workmanship of supplier and / or during transportation. For such work of course, the payment modalities shall be settled by mutual agreement before starting such rectification jobs.

3.11.11 To maintain all the records for men, materials and execution of job as required by law as well as Owner / Engineer-in-charge.

3.11.12 To get his work inspected by Owner / Engineer-in-charge and get approved from statutory agencies such as but not limited to Electrical Inspector, Factory Inspector etc.

All co-ordination with Statutory Authorities shall be contractor's responsibility. Only statutory fee required for approval shall be paid by the owner.

3.11.13 To make arrangements for services such as transport, medical, lighting, canteen etc. for working round the clock.

3.11.14 In addition to safety regulations indicated in this enquiry, Owner / Engineer-in-charge may issue certain safety directives, which shall have to be followed meticulously without any reservation.

3.11.15 To undertake and execute work and supply as per scope of work, scope of supply and follow Technical Conditions including specification for electrical erection, specification for electrical testing and commissioning and as per schedule of rates

3.11.16 Reconciliation of all materials issued by owner / supplied by contractor.

3.11.17 Handing over of the completed works to owner / engineer-in-charge as per procedure laid down by Consultant.

3.11.18 To submit documentation forming part of request for issue of completion certificate.

3.11.19 Clearing the site after cleaning the areas where the Contractor executed the job, stored the materials and built his office, fabrication shop etc.

SECTION – 4.0

OPERATION & MAINTENANCE OF CONTRUCTION POWER & ELECTRICAL FACILITIES

4.1 SCOPE OF WORK

4.1.1 The scope of work shall include Operation and Maintenance of all the electrical equipment supplied/erected/tested/commissioned by the Contractor for construction power system and electrical facilities. The O&M part of contract shall be initially for 2 years after handing over site to the contractor for operation and maintenance, and it may be extended for a period of one year on same price and terms and conditions of NIT.

4.1.2 The Operation and Maintenance envisage all the required tasks to ensure:

a) System availability.

b) Most efficient, effective and optimum usage of electrical system.

c) Enhance the life expectancy of equipments.

d) Regular operation and maintenance of equipments.

e) Compliance of safety rules and regulations.

f) Preventive maintenance / scheduled maintenance.

g) Break down maintenance.

h) Maximum service to consumers for maintaining uninterrupted power supply.

i) Maintenance of proper records of operation and maintenance (Log book, Registers, check list etc., shall be approved by site in-charge).

4.1.3 The Operation and Maintenance of substation shall include the following job:

a) Switching ON and Switching OFF of 0.415kV, 6.6kV Circuit Breakers, Isolators, HT/LT Panels, Substation Lights, High Mast, Street Lighting etc. as and when required according to load requirements and instructions from Engineer Site In-charge.

b) Maintaining records of all the operations, maintenances and records of loads such as voltage, current, power factor, frequency, connected load, energy consumption on hourly/ daily/ weekly/ fortnightly/ monthly/ quarterly/ half yearly and yearly basis and maintaining records of power failures with reasons.

c) Observing the substation continuously and reporting any problem or faults to the Engineer Site In-charge which require major / minor improvements/repairs.

d) Maintaining system handing over and taking over charge sheets.

e) Format for operation and maintenance shall be prepared and approved by engineer site in-charge.

f) Current and voltage settings of feeders right from 6.6kV and till the user end (at least till 415 V 3Phase level)

g) With prior intimation to Engineering Site In-charge, changing the taps of transformers as and when required.

h) Co-ordination with operators in MCL / State Electricity Board Substations for efficient, reliable operation of construction power substation.

i) Attending the faults and restoration of the power supply without delay.

j) Follow permit system (Line clearance) and maintain a permit book to facilitate system maintenance without accident / mishaps. Attending to all emergencies which may arise during the contract period such as equipment failures, fire accidents, etc., shall get acquainted with the operations of all equipments covered under the contract

k) Routine Surveillance of 0.415kV, 6.6kV indoor / outdoor equipments like 6.6 kV RMUs-1 & 2, Compact Sub-Stations, transformer, High Mast, Street Light, HT & LT Distribution Boards.

l) Observing all safety precautions and ensure safety to men and material and the equipment during the contract period.

m) Ensuring routine, preventive and breakdown maintenance works for the Maintenance of 0.415kV, 6.6kV, Indoor/Outdoor equipments like, 6.6 kV RMUs-1 & 2, Compact Sub-Stations, etc.

n) Attending to all Telephone calls and issue receipt message promptly.

4.1.4 Taking preventive maintenance such as maintenance of defective cables, transformers, Breakers, HT panels, LT panels, CT, PT etc., Contractor has to maintain a check list for preventive maintenance & upkeep the system accordingly. However contractor has to prepare a detailed check list covering all the required items and submit for Engineer Site In-charge approval before being implemented.

4.1.5 The Operation of 6.6 kV RMUs-1 & 2, Compact Sub-Stations, HT & LT Switch Gear and Distribution Systems involves deployment of right persons as mentioned elsewhere in the NIT for operation and these persons would be responsible for the work contracted for this purpose.

4.1.6 Co-ordination with SEB officials for all related works and giving reports to Engineering Officer cum Officer In-charge regarding, information from State Electricity Board and Co-ordination with Electrical Inspectorate in all relevant activities.

4.2 GENERAL INSTRUCTION TO CONTRACTOR

4.2.1 Please note that the contract may be terminated before the expiry of the contract period owing to deficiency in service or substandard quality of the service provided by the selected Company / Firm / Contractor. Further, Owner shall reserves the right to terminate contract at any time by giving two months (60 days) notice to the successful bidder.

4.2.2 The contractor shall not be allowed to transfer, assign, pledge or sub-contract its rights and liabilities under this contract to any other contractor without the prior written consent of the owner.

4.2.3 The contractor shall be bound by the details furnished by him / her to the owner, while submitting the bid or at a subsequent stage. In case, any of such documents furnished by the firm is found to be false at any stage, it would be deemed to be a breach of terms of contract making the firm liable for legal action besides termination of contract.

4.2.4 The successful contractor shall furnish the following documents in respect of the individual manpower who will be deployed to the site, before the commencement of work:

a) List of Manpower short listed by contractor for deployment at the site, containing full details i.e. Name, date of birth, marital status, address etc.

b) Bio-data of the persons.

c) Certificate of verification of antecedents of persons by local police authority.

4.2.5 In case, the person employed by the successful contractor commits any act of omission / commission that amounts to misconduct /indiscipline/ incompetence / security risks, the successful bidder will be liable to take appropriate disciplinary action against such persons, including, making good the financial loss, their removal from work, immediately after being brought to notice, failing which it would be assumed as breach of contract which may lead to cancellation of contract.

4.2.6 The selected contractor shall provide identity cards to the personnel deployed in this office carrying the photograph of the personnel and personal information such as name, date of birth, age and identification mark etc. attested by the Security officer of the plant.

4.2.7 The selected contractor shall ensure that any details of office, operational process, technical know-how, security arrangements, and administrative/organizational matters are not divulged or disclosed to any person by its personnel deployed in this office.

4.2.8 The selected contractor shall ensure the proper conduct of his personnel in plant/office premises, and enforce the prohibition of consumption of alcoholic drinks/ smoking etc.

4.2.9 The selected contractor shall immediately provide replacement and ensure that as for as possible no designated post is left vacant in any shift.

4.2.10 Owner is not liable at any stage to provide accommodation, transport, food, medical and any other requirement of their personnel deployed at the institute.

4.2.11 The duty hours should not exceed eight hours at a stretch. Continuous shifts by the same person should be avoided and no shift should remain unmanned. Odd duties/ Night shifts may be required according to the exigencies, which shall be deputed after consent of engineer site in-charge.

4.2.12 Items of Electrical equipments, headgears, torches, uniforms including rain coats, jerseys, safety shoes, hand gloves etc. for efficient conduct of duty by the contractor personnel shall be provided by the contractor and shall be in good working condition.

4.2.13 If the contractor fails to provide services to the satisfaction of the owner, the same will be communicated to the contractor in writing. If three such notices are issued to the contractor, the contract will be terminated and the contractor shall forfeit the performance Security.

4.2.14 The Electrician/Helper/supervisor deployed by the contractor shall ensure that the owner’s properties are protected from theft/pilferage/damage. After necessary investigations, if proved that the contractor/their personnel are responsible for the incident, the contractor is liable and will be penalized to the extent of the value of the loss and additional charges for each incident as decided by the competent authority.

4.2.15 The contractor shall not involve in any bribery or other unethical activities with anyone employed in the institute. The involvement in any such activity shall entail in the termination of the contract.

4.2.16 The necessary salary and other allowances due to the employees of the contractor shall be paid by him and shall strictly comply with all rules and regulations of statutory bodies and other labour laws. All employees engaged by the contractor shall be comprehensively insured for accidents and injuries.

4.2.17 During Operation & Maintenance all materials used, including oils, lubricants for replacement, topping, testing, etc., will be supplied by the owner.

4.2.18 The Contractor shall note that they shall have to carry out their work in close co-ordination with other contractors’ agencies working in the same premises.

4.2.19 In the event of contractor showing lack of attendance / negligence to work or under-performance in the opinion of Engineer Site In-charge, then the contract may be terminated at any stage without prejudice to the right of action under any other relevant clauses of the contract.

4.2.20 The contractor shall follow all security rules framed by Engineer Site In-charge from time to time regarding the removal of material from the site, the issue of identity cards, control of entry of persons and other similar matters.

4.2.21 The Contractors personnel shall not disclose any information or drawings furnished to him by Engineer Site In-charge. Any drawings, records and other information's prepared by the contractor or by Engineer Site In-charge or jointly by both for the execution of the works shall not be disclosed without the prior approval of the Engineer Site In-charge.

4.2.22 The contractor shall keep his work spot, site office and surroundings neat, clean and tidy. It should be free from dust, rubbish, scrap, surplus materials and unwanted tools and equipments. All scaffolding and temporary structure, including the tools and equipments shall be removed as soon as the job for which they are intended are completed. All equipment and material to be taken inside the sub-station building shall be cleaned thoroughly before taking them inside. The Engineer Site In-charge has right to stop the work, if the contractor fails to improve upon the cleanliness after having been notified.

4.2.23 Engineer Site In-charge shall have the right to withdraw the work-permit for any of the workmen for reasons of misconduct, incompetence in work, violation of safety and fire rules, negligence on duty etc.,

4.2.24 The knowledge/Information about availability of manpower on a daily basis shall be responsible of contractor himself, the information regarding manpower absences shall not be communicated to the Engineer Site In-charge. The contractor should ensure availability through his representative throughout the contract period who shall be responsible for manpower availability and their record keeping.

4.2.25 The contractor shall depute staff as per schedule given below:

Sr. No.	Description	1st Shift	2nd Shift	3rd Shift	Reliever#
1.	Electrician (skilled)	1	1	1	1
2.	Helper (semi-skilled)	1	1	1	
# Please note that the Reliever (skilled category) shall be competent enough to work as electrician or helper as per requirement.					

However above deployment of man power shall be for peak construction phase of the project and may vary according to the site requirement.

Payment shall be made as per actual deployment of the man power during various phases of the project.

4.2.26 The contractor shall deploy persons as detailed below:

a) Electrician/ Reliever (skilled): Having Certificate/License in Electrician trade issued by ITI/Local authorities/Govt. of India and with minimum 3 years experience in the relevant field.

b) Helpers (semi-skilled): Minimum of 2 years experience in this field.

4.2.27 The contractor shall provide a list of consumables that will be delivered every month for which the consumable charges are levied.

4.3 TECHNICAL AND GENERAL SPECIFICATIONS

4.3.1 TOOLS & TACKLES:

All tools and tackles required for the safe and satisfactory operation and maintenance including preventive and break down maintenance of the substation and related equipment shall be provided by the contractor. The careful maintenance and management of these tools will be the responsibility of the contractor.

The tools and tackles, apart from other things, must comprise of:

a) Discharge rods suitable for 6.6kV (minimum Three No's)

b) Tubular & Box Spanners - 2 sets each.

c) Complete set of all sizes of screw drivers - 2 sets

d) Complete Tool Box - 2 nos.

e) 2 Nos. Blower & Vacuum Cleaner.

f) Minimum three sets of hand gloves of each HT & LT of different voltage ratings, 5 Nos. Helmets, 5 nos. safety belts.

g) 2 Nos. of heavy duty dry cell or rechargeable (without acid) torches.

h) Rain coats and gum boots as required.

i) First aid box.

j) 1 No. Insulation tester 5 kV capacity.

k) 1 No. Insulation tester 1 kV capacity.

l) 2 nos. Multi meter Analog & Digital.

m) 2 nos. Tong tester.

n) Cable crimping tools of adequate capacity etc.

o) Extension Power supply boards (single phase).

p) Phase Sequence meters.

4.3.2 This Maintenance scope (includes both preventive and breakdown maintenance) is indicative only and shall include other maintenance activities required for satisfactory operation.

4.3.3 Breakdown maintenance shall be provided as and when the situation warrants with a failure/fault in the system. The breakdown maintenance shall be attended at the highest priority so as to make good the faulted system and putting into operation. For breakdown maintenance, the contractor shall coordinate/liaison with Engineering Officer cum Officer In-charge and the original equipment manufacturer for replacement of parts and services as necessary.

TECHNICAL SPECIFICATION

OF COMPACT SUBSTATION (CSS)

FOR

2000 TPD COAL TO AMMONIUM NITRATE PROJECT

OF

BCGCL

AT

LAKHANPUR, JHARSUGUDA, ODISHA

CONTENTS

1.0 Scope

1.1. The scope covers technical requirements of design, engineering, manufacture, assembly, testing before despatch, delivery in well packed condition of Compact Substation consisting of 6.6KV RMU, 6.6//0.433KV Dry type Transformer, 415V Switchboard, MCCB, Lightning arrestors on HV Side, Auto power factor correction equipments, lighting, earthing facility including all accessories as detailed in this specification for construction power system for Coal to Ammonium Nitrate Project of M/s Bharat Coal Gasification & Chemicals Limited (M/s BCGCL).

2.0 Reference Codes & Documents

2.1. This specification shall be read in conjunction with the following documents attached:

i) Overall Single Line Power Distribution Diagram (Drg. No: PC-298-7411-0985)

ii) Specification Sheet for Compact Substation (Doc. No: PC-298-7411-SS-0814)

2.2. The design, manufacture, testing and installation of the equipment shall comply with the latest issue of relevant Indian Standard, Codes and Regulatory requirements viz CEA / State Electrical Inspectorate, as applicable. In the absence of IS for any particular equipment or in case of imported equipment, relevant IEC shall be complied with. Below are list of applicable bare minimum standards

IS 3043	Code of practice for Earthing.
IS/IEC: 60947	LV Switch Gear & Control Gear
IEC: 60529	Degree of protection provided by enclosure
IS/IEC 62271-200	AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV
IS/IEC 62271-202	High Voltage Pre-fabricated Sub-station
IS: 2551	Danger Notice Plates
IS: 2705	Current transformers
IS: 16227/ IEC: 61869	Instrument transformers
IS/IEC: 60269	Low voltage fuses.
IS: 3156	Voltage Transformer
IS: 5578	Guide for marking of Insulated conductors
IS: 9385	Specification for HV fuses
IS: 11171	Specification for Dry type Power Transformers

IS: 10028	Code of Practice for Selection, Installation and Maintenance of Transformers
IEC:60137	Insulated bushings for alternating voltages above 1000 V
IS: 3347	Dimensions for porcelain transformer bushings for use in lightly polluted atmospheres.
IS: 3347	Fittings and Accessories for Power Transformers
NEMA TR1	Standards for Transformers, Regulators, and Reactors

2.3. In case of any contradiction between various referred standards/specifications/data sheet and statutory regulations, most stringent requirement shall govern and decision of Owner / PDIL in this regard shall be final and binding.

3.0 Site Conditions

3.1. The equipment shall be designed for the following site conditions:-

Maximum / Minimum Ambient Temperature:		47.19 ^{0}C/ 10.17 ^{0}C
Equipment Design Temperature (IS-9676):		50 ^{0}C
Minimum temperature for battery sizing		10^{0}C
Soil Resistivity	:	As per Soil Investigation Report
Altitude above mean sea level	:	Less than 1000m above MSL
Seismic Zone	:	As per IS-1893
Humidity	:	95% at 50^{0}C
Environment	:	Dusty, Tropical and Corrosive as found in Fertilizer / Process Industry

3.2. The Compact Sub-station shall be suitable for installation and satisfactory operation in tropical, humid, dusty, corrosive atmospheric site conditions.

3.3. All equipments are intended for continuous duty operation, as per nameplate rating under the specified ambient conditions.

4.0 INSTRUCTIONS TO BIDDER

4.1. The bidder shall be responsible for design, engineering and manufacturing of the equipment to fully meet the intent and requirements of this specification and attached data sheets.

4.2. Compact Substations (CSS) shall be type tested for Internal Arc Classification (IAC) in accordance with relevant IS/IEC standards. The equipment shall meet the performance requirements for IAC-A, IAC-B, or IAC-AB, demonstrating capability to safely contain and withstand an internal arc fault at full short-circuit current for a minimum duration of 0.1 seconds.

4.3. The enclosure of Compact Substation shall be fully enclosed, vermin-proof, and compartmentalized, constructed from high-quality GI sheet with a minimum thickness of 3mm thick for outer enclosure and 2mm for the rest. Both the interior and exterior surfaces shall be coated with weather-resistant epoxy-based paint or powder coating, ensuring durability in various environmental conditions. The top and side sheets of the enclosure shall be detachable, designed for easy removal. Additionally, the enclosure shall be suitable for placement on a concrete foundation.

4.4. The complete sub-station shall be mounted on an MS base frame, ensuring structural integrity to support the total weight of the sub-station. It shall be designed for lifting and relocation as a single unit without requiring the dismantling of any major equipment. he enclosure shall have a minimum ingress protection rating of IP-54. However, the enclosure housing the transformer unit may have a minimum protection rating of IP-34. Additionally, a canopy shall be installed on CSS to provide protection against rain.

4.5. The compact sub-station shall be fully equipped with an RMU, transformer, air circuit breaker, MCCB, lightning arrester on the HV side, auto power factor correction equipment, lighting and earthing facility, among other necessary components. It shall be designed in accordance with relevant standards and comply with all statutory regulations and requirements.

4.6. RMU shall be of 6.6KV, 630A, 21KA for 3 second.

4.7. The rating of transformer represent the net KVA output under the designated site conditions within the CSS enclosure, rather than the transformer's nameplate rating. Any necessary derating shall be appropriately accounted for, considering factors such as cooling efficiency and overall transformer performance.

4.8. The bidder shall appropriately account for the derating of 415V components, such as MCCB, based on site conditions. The rating of outgoing feeders specified in the datasheet shall be under rated site conditions and under in panel/in CSS enclosure conditions.

4.9. The Compact substation must feature built-in, self-contained protection and control mechanisms for short-circuit, over current, and earth fault scenarios, ensuring the safety of all electrical equipment. It should operate independently without requiring an external supply voltage. For DC power supply, an integrated DC power pack must be included as part of the Compact substation.

4.10. The compact substation will supply a mix of single-phase and three-phase unbalanced loads, including equipment such as welding machines and cutting or grinding tools anticipated during construction. All necessary protective measures will be integrated into the substation design. An energy meter will be installed for each outgoing feeder of 6.6 kV RMU and 415 V Switchboard.

4.11. The enclosure shall be designed for natural cooling, with ventilation openings configured as louvered panels. These openings shall be fitted with wire mesh featuring apertures smaller than 1 mm, except in the case of the transformer compartment, where the maximum permissible mesh opening size shall be 4 mm.

4.12. All openings, covers, and doors shall be equipped with appropriate neoprene gaskets to ensure proper sealing. The covers, doors, and roof shall form an integral part of the enclosure and shall not be accessible from the outside unless the main doors are opened. Doors shall open outward to a minimum angle of 90 degrees and shall be fitted with mechanism to secure them in the open position. The substation roof shall be designed to prevent any standing, collection, or accumulation of rainwater.

4.13. The enclosure shall be designed with separate compartments for the 6.6 KV Ring Main Unit (RMU), dry type transformers, and 415 V switchgears to ensure operational segregation and safety.

4.14. All hardware components shall be corrosion-resistant. Joints and connections shall be treated with zinc passivation, and fitted with high-quality steel bolts, nuts, and washers, which shall be securely fastened to prevent loosening.

4.15. Suitable removable eyebolts or welded ISMC channels shall be provided at designated lifting points on the CSS base frame to facilitate safe and efficient lifting of the Compact Substation (CSS).

4.16. The Compact Substation (CSS) shall be equipped with a suitable padlocking arrangement to securely lock the entire CSS, isolators, and circuit breakers in the "Open," "Close," and "Earth" positions. Additionally, a limit switch shall be installed on the transformer chamber doors to automatically trip the MV Breaker/RMU if the doors are opened while the transformer is in a live (charged) condition.

4.17. Each compartment or section shall be equipped with door-activated LED lighting to provide internal illumination upon opening, ensuring visibility and operational safety during inspection or maintenance activities.

4.18. The connection between the HV switchgear and the transformer shall be made using appropriately sized copper cables, while the connection from the transformer to the LV switchgear shall be established using suitably sized aluminium conductor cables / bus ducts.

4.19. The bus bars shall be constructed from high-conductivity aluminium / electrolytic grade copper and shall be supported on insulators made of non-hygroscopic, non-flammable materials, with a tracking index compliant with applicable Indian Standards (IS).

4.20. Bus bars and their supporting structures shall be adequately sized and mechanically braced to withstand the specified short-circuit current for a minimum duration of 1 second. Dynamic stresses shall be evaluated based on the specified peak short-circuit current. All busbar supports shall be manufactured from non-carbonizing materials that are resistant to acids and alkalis.

4.21. Bus bars shall be insulated with heat-shrinkable PVC sleeves, rated to withstand the system's line-to-line voltage for a duration of one minute. They shall be clearly marked with red, yellow, and blue colour bands at regular intervals to indicate phase identification. Protective shrouds shall be installed at all joints and tap-off points to prevent inadvertent contact with live bus bars within the LV compartment of the Compact Substation (CSS).

4.22. The hot spot temperature of bus bars, including at all joints, shall not exceed 95°C under normal operating conditions at the specified design ambient temperature.

4.23. Each cable compartment shall be equipped with three suitably sized bushings to facilitate termination of incoming and outgoing high-voltage (HV) cables. Adequate headroom shall be provided from the base of the switchgear to allow cables to bend and rise vertically to the bushings without undue stress. Cable terminations shall be carried out using heat-shrinkable termination kits, ensuring sufficient phase-to-phase clearances are maintained. Full access to all cables shall be available from the front side of the Ring Main Unit (RMU) for ease of installation and maintenance.

4.24. Wiring for control, protection, circuits shall be carried out using BIS-approved, 660 V grade, PVC-insulated, flame-retardant low-smoke (FRLS) copper conductor wires. The wiring shall be neatly bunched using cable ties and organized within plastic cable channels. Wiring connections between HV breakers or cable compartments and the relay and metering compartments shall be routed through flexible conduits fabricated from heat-resistant, insulating materials to ensure durability and safety.

For control circuits with fuse ratings up to 10 A, 1.5 sq. mm PVC-insulated copper conductor wires shall be used. For ratings above 10 A, 2.5 sq. mm copper wires shall be provided. Current Transformer (CT) circuits shall utilize a minimum conductor size of 2.5 sq. mm copper, and appropriate CT shorting links or arrangements shall be incorporated to ensure safe testing and maintenance operations.

4.25. Conductors shall be terminated using appropriately sized compression-type lugs suitable for connection to equipment terminals and terminal strips. Each terminal shall accommodate only one outgoing wire to maintain clarity and safety. All spare contacts of relays, timers, and other devices shall be properly wired to designated terminals for future utilization and easy identification.

4.26. All necessary cable glands, ferrules, cleats, and other miscellaneous items essential for the assembly, installation, and maintenance of various components—as well as any additional materials deemed necessary by the vendor—shall be supplied as part of the scope.

4.27. Breaker positions such as CLOSE, OPEN, spring-charged, test position, and service position shall be clearly indicated through mechanical means. Additionally, following electrical status indications shall also be provided:

Red – Breaker in CLOSE position

Green – Breaker in OPEN position

White – Spring-charged condition

Yellow – Breaker in TEST position

Blue – Breaker in SERVICE position

4.28. All cubicles shall be interconnected via an earth busbar running the full length of the Compact Substation (CSS). All doors and movable components shall be bonded to the earth bus using flexible copper connections. Dual-end provisions shall be provided for connecting the earth bus bar to the plant's earthing grid. All non-current-carrying metallic parts of the equipment and associated components shall be effectively earthed. The transformer neutral shall be brought out separately through a bushing for dedicated grounding. The earth busbar shall terminate in the cable compartment, where suitable earthing bolts shall be provided for grounding cable armour.

4.29. Danger plates shall be affixed to both the front and rear sides of the Compact Substation (CSS), conforming to the applicable provisions of CEA regulations and IS 2551 standards for safety signage.

4.30. Each item of equipment installed within the Compact Substation (CSS) shall be clearly identified using nameplates or polyester adhesive labels. Additionally, special warning plates/labels shall be affixed to all removable covers or doors that provide access to cable terminals and bus bars, ensuring safety awareness and hazard communication.

For equipment mounted inside the enclosure, nameplates shall be securely fastened using screws.

4.31. All metal surfaces shall be thoroughly cleaned and degreased to eliminate mill scale, rust, grease, and other contaminants. Fabricated structures shall undergo pickling followed by rinsing to remove any residual acids. The substrate shall then be primed with a coat of phosphate paint and a layer of yellow zinc chromate primer. Prior to applying the final finishing coat, the surface shall be inspected and made free of any imperfections to ensure optimal adhesion and finish quality.

4.32. The finished panels of CSS shall be cured in stoving ovens within a dust-free environment to ensure a smooth and durable surface. The final finish shall be free from defects such as pinholes, orange peel texture, paint run-offs, or any other surface imperfections. The vendor shall supply one litre of the final paint per switchboard in a non-returnable container for touch-up work at the installation site.

4.33. Compact substation shall be spray painted with two coats of epoxy based final paint or shall be powder coated.

4.34. All unpainted steel components shall undergo suitable surface treatment—such as zinc passivation to effectively prevent rust formation. For moving parts, appropriate greasing shall be applied to ensure smooth operation and protection against corrosion.

5.0 CSS EQUIPMENT SPECIFICATION

5.1. Transformer

5.1.1. The transformer shall be dry-type, Dyn11, double-wound, core-type construction. The magnetic core shall be assembled using high-grade, cold-rolled, non-aging, grain-oriented silicon steel laminations with low loss and high permeability, thoroughly insulated to minimize eddy currents. The core shall be rigidly clamped to reduce vibrations and noise. Core-fastening bolts shall be adequately insulated to mitigate additional losses and prevent the formation of hot spots. All components of the magnetic circuit shall be effectively bonded to the earth system to ensure safety and fault protection.

5.1.2. The insulating material used shall be of proven reliability and established performance. For dry-type transformers—whether Vacuum Pressure Impregnated (VPI) or dry cast resin—Class "H" insulation shall be utilized.

5.1.3. Transformer windings shall be made of high-conductivity copper and shall be robustly designed to endure the applicable thermal and dynamic stresses arising from short-circuit conditions. The winding configuration, insulation, and mechanical bracing shall ensure the integrity of the windings under these stress conditions throughout the transformer’s service life.

5.1.4. The transformer shall be equipped with a rotary-type off circuit tap changer located on the high-voltage (HV) side, providing tap adjustments in the range of +5% to -10% in steps of 2.5%. This arrangement shall enable voltage regulation to maintain output within acceptable limits under varying load and input voltage conditions.

5.1.5. The impedance voltage of the transformer, measured at the principal tap, rated current, and rated frequency, shall be 5%, subject to the tolerance limits specified in IS:2026/ IS:11171, unless otherwise specified in data sheet.

5.1.6. The transformer shall be designed and constructed to withstand impulse voltage levels in accordance with the applicable provisions of IS:2026/ IS:11171. The insulation system and clearances shall be selected to ensure adequate protection against lightning and switching surges, thereby maintaining dielectric integrity under transient overvoltage conditions.

5.2. Ring Main Unit (RMU)

5.2.1. The Ring Main Unit (RMU - Non-Extensible Type) shall consist of two numbers load break switches with integral earth switch and one number Vacuum Circuit Breaker (VCB) module.

5.2.2. Breaker shall be provided with numerical type self powered protection relay with over-current, short-circuit and earth fault protection along with required cast resin CTs and trip coil for tripping on fault. DC Power, if required, shall be part of compact substation.

5.2.3. The switchgear and all associated components shall be suitable for outdoor installation and operation. They shall be designed and constructed to endure the mechanical and thermal stresses resulting from short-circuit conditions, without incurring any damage or degradation in performance.

5.2.4. Provision shall be made for the remote operation of the switchgear breaker, enabling its tripping and control from a designated remote location, as required. This arrangement shall include all necessary interface components, wiring, and communication links to ensure reliable remote functionality and integration with the control system.

5.3. **415V ACB (Air Circuit Breaker)**

5.3.1. The circuit breakers shall be fixed type having manual operated mechanism.

5.3.2. The circuit breaker shall be inherently fitted with CT operated microprocessor based / static thermo-magnetic overload, short circuit and earth fault release devices.

5.3.3. However, for protection purpose, Air Circuit Breaker (ACB) shall be provided with external numerical type protection relays. These relay settings shall be appropriately configured to ensure selective coordination with the short-circuit protection settings of the outgoing Moulded Case Circuit Breakers (MCCBs), thereby maintaining system reliability and minimizing disruption during fault conditions.

5.3.4. The design of the Air Circuit Breaker (ACB) shall be ambient temperature compensated, ensuring that the breaker's rated current-carrying capacity remains unaffected at ambient temperatures up to 50°C. No de-rating shall be permissible under these conditions, and the ACB shall operate reliably without performance deterioration.

5.3.5. The Air Circuit Breaker (ACB) shall be designed with separate main and arcing contacts to enhance contact life and withstand repeated operations. A robust operating mechanism shall ensure quick-make and quick-break action with a trip-free feature, enabling the breaker to trip even if the operating handle is held in the ON position. The contact operation shall be bounce-free to maintain electrical integrity during switching. Clear and unambiguous visual indication of the breaker's OPEN and CLOSED status shall be provided for operational safety and ease of monitoring.

5.3.6. Separate indication shall be provided for overload and short-circuit faults, enabling clear identification of the cause of breaker operation.

5.4. **Moulded Case Circuit Breaker (MCCB)**

5.4.1. Moulded Case Circuit Breakers (MCCBs) shall be equipped with spring-assisted, quick make/break, manually operated mechanisms incorporating a trip-free feature that allows the breaker to trip independently of the operating handle position. The power contacts shall be enclosed in housings made of high-grade thermosetting insulating material, ensuring effective separation from other internal components such as the operating mechanism, trip unit, and auxiliary contacts. This design shall enhance electrical isolation, mechanical durability, and operator safety.

5.4.2. MCCB shall be suitable for direct termination to bus-bars. It shall feature a mechanism that ensures simultaneous operation of all poles during opening, closing, and tripping events, thereby maintaining system balance, operational safety, and coordinated protection.

5.4.3. MCCBs shall be equipped with microprocessor based tripping devices featuring an inverse time-current characteristic for overload and earth fault protection, and instantaneous tripping for short-circuit protection. For MCCBs rated above 125A, adjustable protection settings shall be provided to facilitate coordinated protection and flexibility in system configuration.

5.4.4. MCCBs shall be operated via a toggle or handle mechanism that provides an indication of the ON and OFF positions. The mechanism shall be designed to allow locking in the OFF position, ensuring personnel safety during maintenance or isolation procedures.

5.4.5. MCCB shall be equipped with a front-mounted "Push to Trip" button to facilitate manual tripping and functional testing of the breaker mechanism. The MCCB rating, the "Push to Trip" button, and contact position indicators shall be clearly visible and readily accessible from the front of the breaker to ensure ease of operation, testing, and status verification.

5.4.6. All MCCBs shall be furnished with microprocessor-based trip units, offering advanced protection features, accuracy, and adjustable settings for precise coordination and system reliability.

5.4.7. A common LED indicator for overload, short circuit, or earth fault conditions shall be provided on MCCB.

5.4.8. MCCBs shall be type tested to verify Type-2 coordination in accordance with IS/IEC 60947 standards. This coordination ensures that, in the event of a short circuit, the circuit breaker and associated components remain serviceable and do not pose any hazard to personnel, minimizing downtime and component replacement.

5.5. **Current Transformers**

5.5.1. Current Transformers shall be provided with cast-resin insulation for enhanced mechanical strength, thermal performance, and moisture resistance. Both primary and secondary terminals shall be clearly and permanently marked, and shall be readily accessible for wiring, termination, testing, and maintenance activities.

5.5.2. Current Transformers (CTs) shall conform to the requirements of IS:2705. The short-time current rating of each CT shall be equal to that of the associated switchboard to ensure thermal and mechanical compatibility under fault conditions. CTs shall be mounted on the stationary portion of the switchboard for ease of accessibility and maintenance. Protective CTs shall have an accuracy class of 5P with an Accuracy Limit Factor (ALF) greater than 10. Measuring CTs intended for instrumentation purposes shall have an accuracy class of 1.0 and an ALF of less than 5.0. One leg of each CT secondary shall be effectively earthed to ensure personnel safety and protection of connected equipment.

5.6. **Relays**

5.6.1. All microprocessor based numerical type protective relays shall be equipped with a manual hand-reset facility and provide distinct operating indications. For numerical relays, Light Emitting Diodes (LEDs) shall clearly display the trip status. The reset mechanism shall be accessible without requiring the relay case to be opened, ensuring safe and convenient restoration of relay readiness after operation.

5.6.2. All tripping relays shall be of the lockout type, incorporating hand-reset contacts and designed to operate reliably at the specified control voltage. The relays shall be equipped with self-coil cutoff contacts to de-energize the operating coil after tripping, preventing overheating or continuous energization. Additionally, hand-resettable operating indicators shall be provided to visually confirm relay actuation and facilitate manual restoration following a trip event.

5.6.3. The tripping relay shall be capable of operating reliably over a control supply voltage range from 50% to 110% of the specified nominal voltage. The relay's performance, including tripping accuracy and timing, shall remain consistent within this voltage variation to ensure dependable protection under fluctuating power conditions.

5.7. **Control Switches**

5.7.1. All control switches shall be of the rotary type with a cam-operated contact mechanism. Circuit breaker control switches shall be of the three-position CNT (Close–Neutral–Trip) configuration, featuring spring return to neutral from both the Close and Trip positions. The switches shall be fitted with pistol-grip handles for ease of operation and firm control.

5.7.2. Ammeter selector switches shall incorporate a make-before-break contact arrangement to prevent circuit interruption during phase selection. Each switch shall provide four distinct positions-three for selecting and reading the three-phase line currents, and one OFF position to isolate the meter when not in use.

5.7.3. Voltmeter selector switches shall similarly feature four positions, enabling measurement of phase-to-phase voltages in three positions and disconnection via the OFF position. All selector switches shall be robust in construction, clearly marked, and designed for long operational life under frequent use.

5.8. **Indication Lamps**

5.8.1. Indication lamps shall be of clustered LED type, with a minimum diameter of 5mm. The LED indicators shall be of high brightness, long-life type, and suitable for industrial environments.

5.8.2. Indication lamps shall be mounted on the front panel in such a manner that they are clearly visible from outside, without the need to open any outer doors.

6.0 Safety Requirements

6.1. The Compact Substation (CSS) shall be equipped with comprehensive safety accessories, including but not limited to: voltage presence indicators, earthing rods, fire extinguishers, insulating gloves, and other essential personal protective equipment (PPE) as per applicable safety norms.

6.2. Distinct and robust internal barriers shall be provided to physically separate the Ring Main Unit (RMU) section, Transformer compartment, and Low Voltage (LV) switchgear section, ensuring personnel safety and operational clarity.

6.3. Appropriately designed electro-mechanical or electrical interlocking mechanisms shall be incorporated to prevent the opening of access doors to live sections. These interlocks shall ensure access is restricted unless the respective equipment is de-energized, thereby providing protection against accidental contact with live bus bars or components.

7.0 INSPECTION AND TESTING

7.1. The offered Compact Substation shall be of a proven design and must have undergone successful type testing. Bidders are required to provide type test certificates for a design identical to the one being offered. These certificates must be no older than ten years as on the final bid opening date. In cases where the available type test certificates are older than ten (10) years, or where any design change has been carried out during this period without corresponding type testing, the Contractor/ Supplier shall conduct the requisite type tests before dispatch, at no additional cost and without affecting the delivery schedule.

7.2. All routine and acceptance tests as per relevant IS and approved QAP shall be carried out on each item of equipment individually, as well as on the complete assembled Compact Substation (CSS). The scope of testing shall include both mechanical and electrical performance validation to ensure full compliance with the specification and operational safety requirements.

7.3. The Owner's representative shall be granted unrestricted access to the manufacturer's facility at all reasonable times for stage-wise inspection and progress monitoring of the equipment under fabrication and assembly. A minimum of four weeks' advance notice shall be provided prior to the conduct of final routine tests and any other mutually agreed inspections. These tests shall be carried out on the complete assembled unit at the manufacturer's works. Test certificates, duly endorsed by the Owner’s representative, shall be compiled and submitted as an integral part of the final documentation.

8.0 PACKING & DESPATCH

8.1. All equipment shall be divided into manageable sections to facilitate ease of handling and protection during transportation. Packing shall be suitable for the selected mode of transport—whether by ship, rail, or trailer—ensuring the integrity of equipment during transit.

Prior to crating, equipment shall be wrapped in polythene sheets to safeguard surface finish against moisture, dust, and handling damage. The crates or cases shall be constructed with skid-type bottoms to enable proper lifting and handling using forklifts or slings.

8.2. Each package shall be clearly and permanently marked with handling and identification instructions, such as:

– “Fragile”

– “This Side Up”

– “Center of Gravity”

– Weight

– Volume

– Owner’s Particulars

– Purchase Order Number (P.O. No.)

– Any other special notations as specified in the purchase documentation

8.3. The packing shall be fully suitable for outdoor storage. The equipment shall be securely packed with adequate protection to maintain integrity throughout storage and transit.

8.4. Proper internal packing supports shall be provided within the crates to prevent any movement of equipment/components during handling and transportation, thereby protecting against damage to internal assemblies and external finishes.

8.5. Each shipment shall include:

– A complete set of installation, testing, and commissioning manuals

– A set of operation and maintenance (O&M) manuals

– A set of final approved drawings

These documents shall be enclosed in a waterproof, weather-resistant cover and securely placed inside the packing cases.

9.0 Quality Assurance Plan

9.1. After the order is placed, Vendor shall submit within two weeks their internal quality assurance plan followed for manufacturing of the equipment for approval of owner /consultant this shall be adhered to and shall be monitored by owner consultant during manufacture.

9.2. Make of switchgear component for compact substation accessories shall be as per approved list of owner standard.

10.0 Drawings and Instruction Manual

10.1. After the order is placed, Vendor shall submit within two weeks following drawings for approval:

10.1.1. General arrangement drawing, showing plan, elevation and side view, indicating all dimensions, transformer fittings & accessories etc.

10.1.2. Rating and Diagram plate.

10.1.3. G.A. of Marshalling box.

10.1.4. G.A. of Secondary Termination suitable to bus duct (air or sandwich type) with disconnecting chamber.

10.1.5. Primary Bushing drawing.

10.1.6. Bus throat connection diagram.

10.1.7. Schematic wiring diagram of marshalling box.

10.1.8. Index Sheet of the above drawing.

10.2. All the above drawings shall contain following data for reference:

10.2.1. Owner P.O. / Contract reference No. & Date.

10.2.2. Plant and location of plant.

10.2.3. Consultant's Name and Consultant Job No.

10.3. Vendor shall submit seven (7) copies of instruction manuals on installation, maintenance and operation of transformer and control devices mounted on the transformer and final approved drawings.

10.4. Vendor shall also submit soft copy of drawing to Customer and Consultant. Drawings shall be in Auto Cad and data in MS Office 365

SPECIFICATION SHEET (PC-298-7411-SS-0814)
COMPACT SUBSTATION (CSS)

CLIENT: M/s BCGCL	**PROJECT:** EPSS (CONSTRUCTION POWER)		**PLANT:** COAL TO AMMONIUM NITRATE	
ISSUED FOR : PROPOSAL ☐	ENQUIRY ☒	ORDER ☐	FINAL ☐	
GENERAL		**AMBIENT CONDITION**		
Ref. Stds. : IS ☒ IEC ☒		Temp.- Max./Min./Design Ref. : 47.19 / 10.17 / 50°C		
Encl. Docs. :		Relative Humidity: 100% Max.	Alt. above sea <1000 M	
Make :		**ATMOSPHERIC POLLUTION**	Dusts : Coal	
Maker's Ref. No. :			Vapour : Ammonia	
		LOCATION	Indoor ☐	Outdoor ☒
			Gr. Floor ☒	1st floor/2nd floor ☐
ADDL. SCOPE	Incoming Bus Duct ☐		Tie Bus Duct ☐	
	Erection & Comm. ☐		Supervision of Erection & Comm. ☒	
TESTS:	Routine ☒	Type ☐	Others ☐	

BASIC DATA			
TAG NO. & QTY.	Item No.		-
	CSS No.		-
	Description		COMPACT SUBSATION
REFERENCE DRAWINGS	Single Line Diagram		PC-298-7411-0985
	Feeder Details		Refer Overall Single Line Power Distribution Diagram
	Auto Trip Alarm Scheme		Vendor to furnish
	Non Trip Alarm Scheme		
	Trip Ckt. Supervision Scheme		
	Auto C/O Scheme		
	P.T. Bus Arrangement		
SYSTEM DETAILS	Rated Voltage with Variation		6.6 kV ± 10%
	Rated Frequency with Variation		50 Hz ± 5%
	Highest System Voltage		7.2 kV
	Combined V & F Variation		± 10%
	No. of Phases & Wires		3 Phase, 3 Wire
	Insulation Level		60 kV peak / 28kV rms BIL
	Fault Level		**21KA for 3 sec**
	Earthing Mode		Un Earthed
TRANSFORMER	Type		Dry Type
	Duty		Continuous
	Type Of Cooling		ANAN
	Fault Level on HV Side		21KA
BUS BARS	**Rating**	Continuous	630A
		Short Time for 3 sec.	21KA
	Material		Electrolytic Grade Copper
	Type of Insulation		Insulating heat shrinkable colour coded Sleeved
	Materials of busbars & rating		Electrolytic Grade Copper, 630A for phase, Size of dropper shall be same as main bus bars.
	Temp. rise of bus bars at rated current over 50^0C ambient		Vendor to furnish
	Bus bar chamber partition		6.6kV(UE), Cast resin bushings to be provided
	Bus bar joints		Cadmium plated bolts and tinned surfaces.
	Insulation		Heat shrink colour coded sleeve
	Phase Identification		Colour tapes
	Support insulations		Non-hygroscopic, non-tracking, resin cast insulator
	Bus Bar Size		Vendor to specify
	Thickness of sheet steel		

	Partitions between panels		2mm sheet steel
	Front and rear hinged doors and top covers sides and bottom		3mm sheet steel
	Insulation level		6.6kV, cast resin sleeve
	Impulse withstand value		60 KVp
	1 min. Power Frequency withstand value		28KV (RMS)
	Auxiliary connections		Silver plated, 16A plug and socket
	Safety shutters		Automatically operated shutters
	Accessories with each cubicle		Vendor to furnish
	HT section illumination lamp with switch		To be provided
	Space Heater		230V, AC, 50Hz heater with control switch
	3 Pin power socket with switch		To be provided
	Base channel		Vendor to furnish
	Name plates, inscription plates for components, switches, feeder identification		As specified
	Flexible copper connections between hinged doors and cubicle for earthing		To be provided
	Breaker accessories visible and accessible from outside		
	Mechanical breaker position		Vendor to Confirm
	Mechanical trip push		Vendor to Confirm
	Button accessible from Outside with panel		Vendor to Confirm
	Removable welded wire mesh behind the panel		To be provided wherever necessary.
	Danger notice boards and instruction plates		To be provided
	Components to be mounted on the front door of cubicle		Push buttons, control and selector switches (operating height shall not exceed 1800mm) lamps, meters, relays (all as per approved layout)
	Cable		Bottom cable entry at the rear side of cubicle
	Control Cable		Bottom cable entry at the rear side if cubicle with necessary shielding.
	Safety clearances in air between phases and phase & earth		90mm (Minimum)
CAPACITOR BANK ALONG WITH APFC	Output		NA
	Connection of capacitor Bank :		
	Type of Capacitor Bank :		
	Earthing Mode :		
	Unit in each Bank :		
	APFC Rely		
CIRCUIT BREAKER	Type		VCB in HV /ACB in LV
	No of Poles		3 (HV)/4(LV)
	Breaking Capacity	Symmetrical	21KA(HV)/50KA(LV)
		% DC Component	20%
	Making Capacity (peak)		2.5 times Breaking Capacity
	System		6.6kV (UE), 50Hz, 3 Phase System
	Highest system voltage		7.2kV
	Design ambient		50 °C
	Rated current in IP55 enclosure at 50 °C ambient		630A
	Symmetrical breaking capacity at 7.2 KV or less		21kA for 3 Sec (RMS)
	Operating Mechanism		
	Type of closing		Motorised spring charged
	Method of closing		Manual and electrical
	Rated voltage of shunt trip, C.C		24V DC
	Operating range		70-110% of rated voltage
	No. of poles / Phase		One

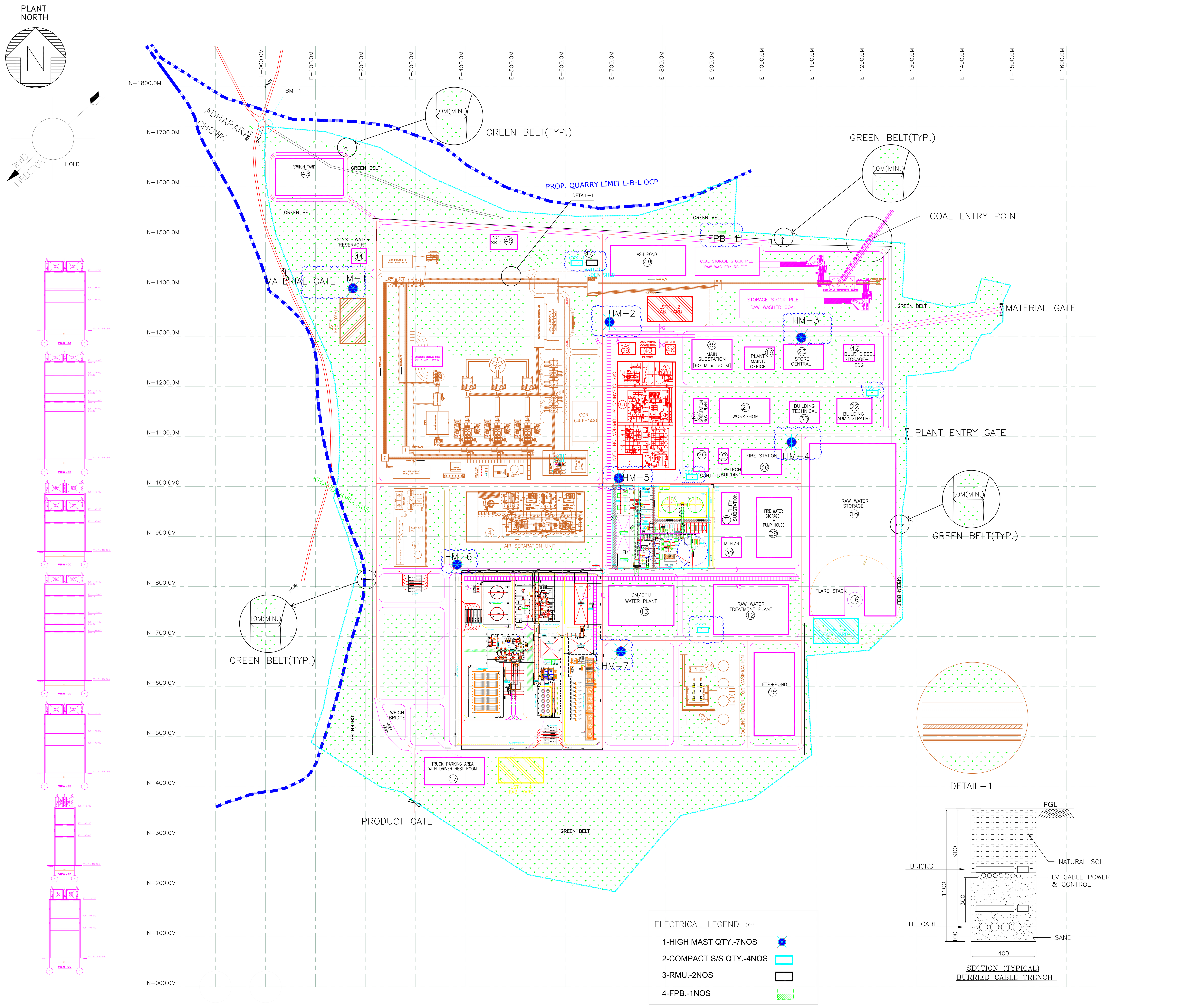
	No. of breaks / Pole	One
	Auxiliary contacts	6 NO + 6 NC (Silver plated contacts)
	Rating of auxiliary contacts	6A at 24V DC
	Wiring of auxiliary contacts	All auxiliary contacts wired to terminal block, external to draw out truck.
	Material of fixed and moving	Silver plated copper contacts with contacts self. Aligning feature having contact pressures.
	Interlock	Door interlock with breaker
	Breaker fully type tested as per	IEC-62271-200
	Provision for shunt trip and series trip. Shunt coil should be rated for 24V DC.	
	Breaker Type	
EARTH BUS BAR	Material	Cu
	Size	50x6 mm^2 (min)
ISOLATORS/LOAD BREAK	Short time current rating	21KA
CURRENT TRANSFORMER	Accuracy class for Metering	0.5
	Accuracy class for protection	5P10
	Type	Resin cast, bar primary
	Ratio, burden accuracy class, cores	a) ---/1A, 10VA (Min.), Class 0.5 for metering, 5P20 for protection for transformer feeder. (By Bidder during detailed engineering)
	Short time rating	21KA for 3sec.
	Dynamic stability	
	Impulse withstand voltage	60KV peak
	PF withstand voltage	28KV (RMS)
	Thermal overload capacity	120% continuous
	Applicable standard	IS 2705, IEC 60044-1
POTENTIAL TRANSFORMER	Type	Resin cast, natural air cooled
	Ratio	6.6kV/3 & 24V/3
	No. of Cores	----
	Connection	Star-star
	Rated burden	50VA / Phase (Min.), Class 0.5
	Voltage factor	1.1 continuous, 1.5 for 30sec
	Neutrals	Neutrals to be brought out for earthing on HV and LV side
	Insulation level	
	Impulse withstand voltage	60kV (P)
	PF withstand voltage	28kV RMS
	Protection	
	HV side	4 Amp. MCB for each phase
	LV side	4Amp. MCB
	Mounting of PT	Fixed type
	Applicable standard	IS 3156, IEC 60044-2
Indicating meters	Type of meters	Ammeters, Voltmeters, Energy meter & Multifunction Meter
	Type of movements	Digital Type
	Size	96 x 96 mm
	Mounting	Flush mounting
	Accuracy Class	0.5 Class
	Voltage / Current	24V PT, 5A CT sec current
	Range	As specified
	Applicable standard	IS 1248
Auxiliary Equipment	Protection relays	Draw out type aux. Voltage 24V DC
	Control switches	16A, 440V AC quick make quick break, flush mounted Stay-put/ spring return, IS4064

	Push buttons	1. 10A, 440V, 1NO+1NC flush 2. Emergency Push Button Shall be Mushroom type with padlocking facility
	Indicating lamps	230V AC Clustered LED type.
	Control circuit protection	MCB
	Control schemes	As per specification
Power Pack System	Rating	110V DC / 220V DC / 24V DC
	VA Burden	Vendor to furnish
Distribution Transformer - Cast Resin Dry type	General	
	Application	Industrial
	Quantity	1(One)
	Transformer type	
	Indoor / outdoor	Indoor
	Dry type / oil filled	Resin cast, Dry type
	Core type / shell type	Core type
	Auto wound / Two winding / three	Two winding
	Cooling	Air
	Max. temperature rise at rated kVA and Principle tap	
	Any winding (HV & LV) by resistance method over design ambient temp. of 50 °C	55 °C
	Type of installation	Indoor
	Short Circuit capacity of LV Side:	50kA
	Power supply system in which transformer is to be used.	
	Primary side (HV) max. Voltage	6.6 kV(UE)
	Secondary Voltage	433V
	System earthing	
	Max. and Min. 3 phase and ground Fault levels	
	a) Primary side (HV)	25 KA
	Rated Frequency	50Hz
	Rated no load voltage	
	HV winding	6.6kV
	LV winding	0.433kV
	Rated kVA at no load voltage and Principle tap	630kVA
	Overloading as per IS 6600	
	Permissible Variations	
	Percentage impedance voltage at rated current frequency, principle tap at 75 °C	---
	Frequency variations	+/- 5%
	Voltage variation	+/- 10% of rated Voltage
	Short circuit withstand capability of transformer on any tapping for 3 phase and line to ground faults across HV winding	21kA for 3 Sec
	Tappings	
	Off-Circuit / ON load	OCTC
	Manual / Automatic	Manual, by changing links, by isolating Power
	No. of Steps	7 Steps in the range of 2.5%
	Tappings on primary side	+5% to -10%
	Insulation	
	One-minute power frequency withstand voltage	
	a) HV winding	28 kV RMS
	b) LV winding	2.5 kV RMS

	1.2 x 50 micro second impulse withstand voltage level	
	a)HV winding	60kV Peak
	Induced over voltage withstand	
	a)HV winding kV (RMS)	As per IS 2026 Part III, IS 11171
	b)LV winding kV (RMS)	As per IS 2026 Part III, IS 11171
	Winding insulation category	
	a)HV-uniform / non-uniform	Uniform
	b)LVL-uniform / non-uniform	Uniform
	Winding	
	No. of winding	Two
	Winding material	Copper
	Winding connection	
	HV winding	Delta
	LV winding	Star with neutral brought out fully insulated
	Vector groups (HV-LV)	Dyn11
	Core Laminations	
	Type	CRGO
	Material	Silicon Steel
	Thickness, mm	0.3
	Diagram required	Yes
	Parallel operation	Suitable for parallel operation
	Losses	As per ECBC.
	Load loss at 50% Loading on rated voltage and frequency	----
	Load loss at 100% Loading on rated voltage and frequency	----
	Terminals Details	HT side suitable for Cable termination & LT side – Disconnecting insulated busbar with Box
	Fittings and accessories required	Lifting lugs, name plate, terminal marking plate, earthing lugs, winding temperature indicator with alarm and Trip contact (In separate marshalling box)
	Class of Protection	IP 56 for outside installations, IP 55 for indoor application
	Weight	Vendor to furnish
	Dimension	Vendor to furnish
	Efficiency	
	100% (at Unity PF)	Vendor to furnish
	75% (at Unity PF)	Vendor to furnish
	50% (at Unity PF)	Vendor to furnish
	100% (at 0.8 PF)	Vendor to furnish
	75% (at 0.8 PF)	Vendor to furnish
	50% (at 0.8 PF)	Vendor to furnish
	Current Density	1.2A sq mm for Copper
	NCT Details:	
	Location: Primary/Secondary	Secondary
	Ratio Amps	1000/1
	Class CT-1	PS
	CT-2	5P20
	Knee Point Voltage(vk) volts	Note:1
	Quantity Nos.	1 (One)
	Magnetizing Current	Vendor to furnish
	Flux Density	Vendor to furnish
	Regulation (At Unity & 0.8 PF)	Vendor to furnish
LT SWITCH	General	

BOARD	Rated voltage and frequency	415V ± 10%, 3 –phase , 4- wire , 50 Hz ±5%, maximum voltage
	Continuous current rating at design ambient temperature	1000A
	Type of enclosure as per IS 2147	IP 55 (for Indoor application) and IP 56 for outdoor application
	Min Clearance Between Phase and Neutral	25 mm
	Min. thickness of sheet steel	2mm, 3mm for outer surface
	Applicable standards	IS 2147, 8623
	Design ambient temperature	50°C
	1sec. Short time rating of switchboard with min. Busbars, feeder busbars kA (RMS)	50kA
	Dynamic through fault current with complete busbars, kA (Peak)	50kA
	Incoming termination of LT Switchboard	Al Cable / Bus Duct
	Incoming termination top/bottom	Bottom
	Outgoing feeder cable entry top/bottom	Bottom
	Min. clearances at front and back of switchboard	1.5m/1m
	Min. clearances in air in mm between live	19mm
	1-minute PF withstand voltage	2.5kV
	Bus Bar	
	Bus bar material	High Conductivity Electrolytic Grade Aluminium
	Continuous rating at Design ambient temperature	
	a) Main bus bars rating	1000A
	b) Bus connections to circuit breakers	As per rated currents of breakers
	c) Current Density : Aluminium Bus bar 0.8 A/sq. mm & for Copper Bus bar 1.4 A/sq. m	Vendor to Confirm
	Bus Bar Size	
	Phase/Neutral/Earth	Vendor to Specify as per Type tested design
	Temperature rise at rated Continuous current of the bus bars in the bus bar chamber. Non-hygroscopic, flame retardant, track resistant type with high creepage surface.	40 °C over 50 °C
	Type of bus bar insulators	Heat shrinkable PVC insulating sleeves
	Breakers	
	Type of breakers	Non-withdrawable type air circuit breakers
	Standards applicable	IS 2516
	Rated service voltage	415V, 3Ph., 50Hz
	Highest system voltage:	500V, 3Ph., 50Hz
	Rated current at design ambient for breakers	1000A
	Symmetrical breaking capacity in kA (RMS)	
	at 415V	50 kA RMS
	at 433V	50 kA RMS
	Making capacity kA (peak)	105 kA peak
	1 sec. Short time rating kA (RMS)	50 kA RMS
	With release in any setting	50 kA RMS
	Release Type	LSIG
	Range	Vendor to Specify as per Type tested design
	Thermal release setting ranges	Vendor to furnish
	Short circuit release range	Vendor to furnish
	Short circuit release timer setting range	Vendor to furnish

	No. of poles	Vendor to furnish
	Minimum clearance between Two poles	Vendor to furnish
	Operating mechanism	
	Fixed trip/trip free	Trip free
	Spring assisted /spring Charged stored	Stored energy mechanism
	Electrical operation / Manual operation	Electrical
	Auxiliary contacts	
	a)Type	Silver plate copper contents
	b)Number	6 NO+6 NC
	Current Transformers	
	Type	Resin cast / wound
	Ratio	1000/1
	Accuracy class	0.5 Class
	Burden	10 VA
	PS CT Details	1000/1 CL PS
	Indication Lamp	
	Feeder Details	
	Incomer Feeder	
	Non-Withdrawable type ACB of specified	1000A
	Stored energy, Motorised Spring Charge, Electrical Operated	Required
	Series trip direct acting temperature	Required
	Static trip release as alternative can also be	Vendor to furnish
	Mechanical ON/OFF indication, Spring	Required
	3 CTs, class 0.5, resin cast, ALF-5 for	Required
	Digital Load Manager	Required
	Auxiliary relays, control circuit protection, space heater, accessories for terminations etc. as required.	Required
CABLING	Cable Entry Top / Bottom	Bottom
	Maximum size of Incoming cable of 6.6 kV RMU-1 &2	6.6KV (UE) 1R-3Cx300 A2XFY FRLS
	Maximum size of Incoming cable of 415 V Switchboard	1.1KV, 3R-3.5Cx400 A2XFY FRLS



ELECTRICAL LEGEND :~

1-HIGH MAST QTY.-7NOS
2-COMPACT S/S QTY.-4NOS
3-RMU.-2NOS
4-FPB.-1NOS

TABLE FOR FACILITIES/UNITS

SL.NO.	BLOCK DESCRIPTION	SIZE IN METER	REMARKS
1.	COAL & LIME STORAGE	PACKAGE	
2.	GASIFICATION PLANT	PACKAGE	
3.	GAS CLEANING & PURIFICATION PLANT	215 M x 115 M	
4.	AIR SEPARATION UNIT	250 M x 100 M	
5.	LSTK -3 (AMMONIA PLANT=AMMONIA STORAGE)	210 M x 165 M	
6.	~~NITRIC ACID PLANT~~	-	
7.	~~AMMONIUM NITRA~~TE PLANT WITH PRILLING	100 M x 80 M	
8.	~~NITRIC ACID STORAGE~~	-	
9.	DELETED	-	
10.	LSTK -4 (WNA+AN PLANT+ CT+ ASSOCIATED FACILITIES)	355 M x 285 M	
11.	STEAM GENERATION PLANT	PACKAGE	
12.	RAW WATER TREATMENT PLANT	150 M x 100 M	
13.	DM/CPU WATER PLANT	130 M x 80 M	
14.	UTILITY SUBSTATION	65 M x 35 M	
15.	LAB TECH BUILDING	30 M x 20 M	
16.	FLARE STACK	R 90M	
17.	TRUCK PARKING AREA WITH DRIVER REST ROOM	120 M x 55 M	
18.	RAW WATER STORAGE	57000 SQM.	
19.	PLANT MAINT. OFFICE	60 M X 45 M	
20.	CANTEEN	45 M x 30 M	
21.	WORKSHOP	100 M x 50 M	
22.	ADMINISTRATIVE BUILDING	70 M x 50 M	
23.	CENTRAL STORE	80 M x 50 M	
24.	COOLING TOWER FOR GASIFICATION AND UTILITY	160 M x 100 M	
25.	ETP+POND	140 M x 100 M	
26.	DELETED	-	
27.	NON-TECH. SUBSTATION	50 M x 30 M	
28.	FIRE WATER STORAGE+FWPH	120 M x 70 M	
29.	DELETED	-	
30.	~~LOADING BAY ANS~~	-	
31.	~~COOLING TOWER FOR AMMONIA, NITRIC ACID AND AN PLANT~~	-	
32.	CENTRAL CONTROL ROOM	DELETED	
33.	TECHNICAL BUILDING	60 M x 45 M	
34.	~~ANP STORAGE, BAGGING & TRUCK LOADING~~	-	
35.	MAIN SUB-STATION	80 M x 60 M	
36.	FIRE STATION	80 M x 50 M	
37.	ASH SILO	PACKAGE	
38.	IA PLANT	40 M x 40 M	
39.	SRU UNIT	35 M x 25 M	
40.	MAGNESIUM NITRATE, CAUSTIC, SULPHURIC ACID STORAGE	30 M x 15 M	
41.	~~ANS STORAGE~~	-	
42.	BULK DIESEL STORAGE + EDG	-	
43.	SWITCHYARD	135 M x 75 M	
44.	CONSTRUCTION WATER RESERVOIR	30M x 30M	
45.	NG SKID	55 M x 30 M	
46.	SULPHUR PIT	20 M x 20 M	
47.	CONSTRUCTION POWER SUB-STATION	30 M x 15 M	
48.	ASH POND	150 M x 60 M	
49.	~~LOADING/UNLOADING BAY FOR NITRIC ACID~~	-	
50.	LOADING/UNLOADING BAY FOR AMMONIA	48 M x 15 M	

NOTES:-

1. ALL DIMENSIONS AND COORDINATES ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. REFERENCE BENCH MARK (⊕) POINTS IS W.R.T GLOBAL CO-ORDINATES HAVING N-2405091.480 & E-793109.852 (GRID COORDINATES N-1700.0M, E-000.0M).
3. BLOCK SIZE OF FACILITIES ARE TO BE FINALIZED AFTER GETTING VENDOR INFO.
4. * INDICATES HOLD.

LEGEND :~

OFFSITE FACILITIES
LSTK-1 FACILITIES
LSTK-2 FACILITIES
LSTK-3 FACILITIES
LSTK-4 FACILITIES

GREEN BELT AREA

TOTAL PLANT AREA WITH GREEN BELT = 350.00 ACRE (APPROX.)
PLANT AREA = 195.00 ACRE (APPROX.)
GREENBELT AREA = 155.00 ACRE (APPROX.)

ISSUED FOR TENDER PURPOSE

REV.	DATE	DESCRIPTION	PPD.	CHKD.	APPD.
P	29.01.26	ISSUED FOR TENDER PURPOSE	SS	RKP	RKV

CLIENT : BCGCL (JV OF CIL & BHEL)

REV. P1

SHEET 1 OF 1

LOCATION : MCL, LAKHANPUR AREA JHARSUGUDA, ODISHA

SCALE :- 1: 2500

TITLE : TENTATIVE LOCATION OF HIGH MAST, CSS & RMU

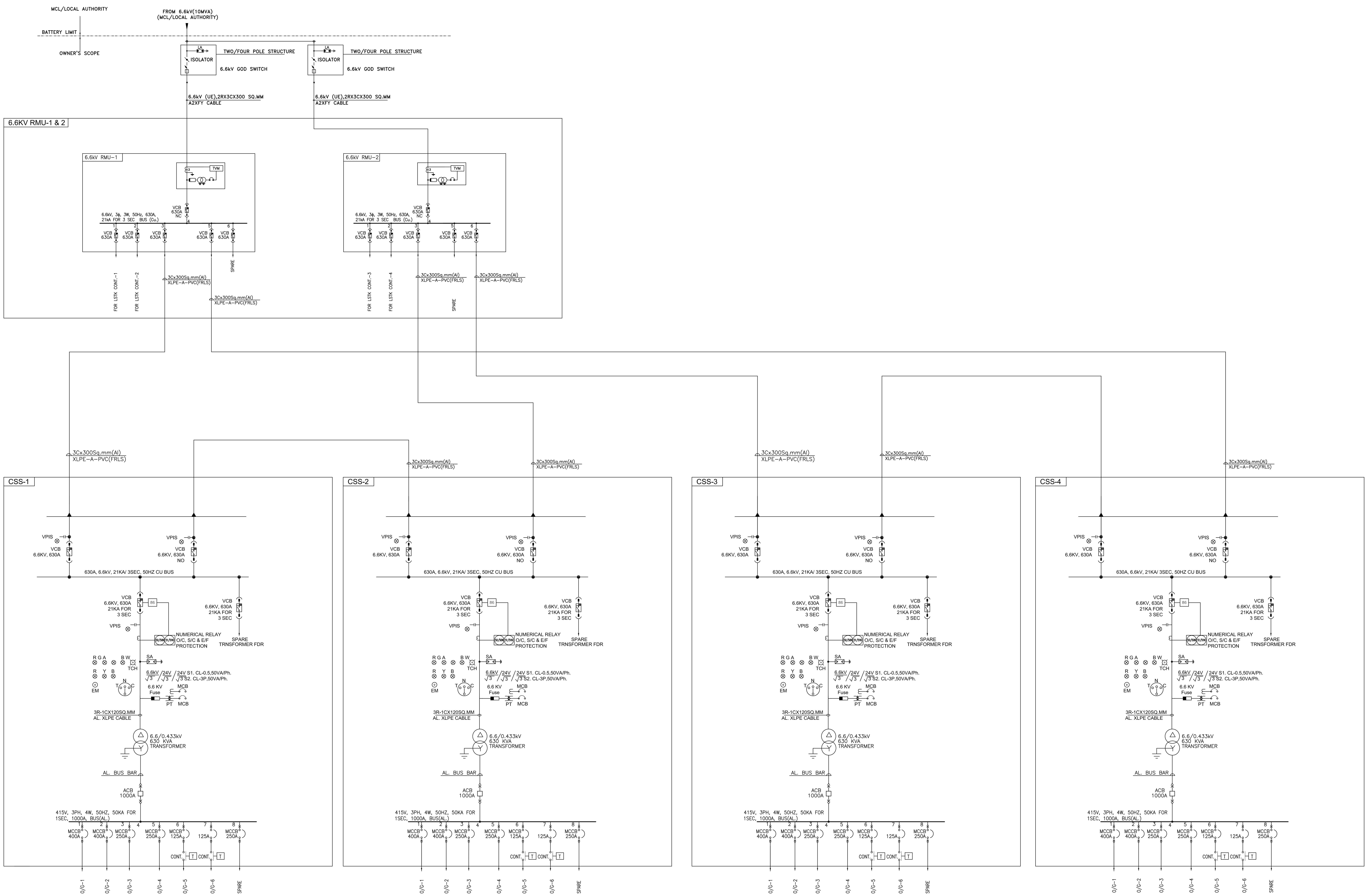
DRG. No.:~ PC-298-7411-0801

FILE :~ -----

DRG. SIZE: A0

पी डी आई एल PDIL

PROJECTS & DEVELOPMENT INDIA LTD. NOIDA



NOTE;-ALL EQUIPMENTS SHALL BE AS PER ATTACHED TECHNICAL SPECIFICATIONS

TENTATIVE FOR TENDER PURPOSE ONLY

REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
P1	06.02.26	FOR TENDER	SS	RKP	RKV
P	29.01.26	FOR TENDER	SS	RKP	RKV

CLIENT:- BCGCL

PROJECT:- 2000 TPD COAL TO AMMONIUM NITRATE PROJECT OF BCGCL AT LAKHANPUR (ODISHA)

TITLE:- OVERALL SINGLE LINE POWER DISTRIBUTION DIAGRAM

REV. P P1

SHEET 01 OF 01

SCALE: N.T.S.

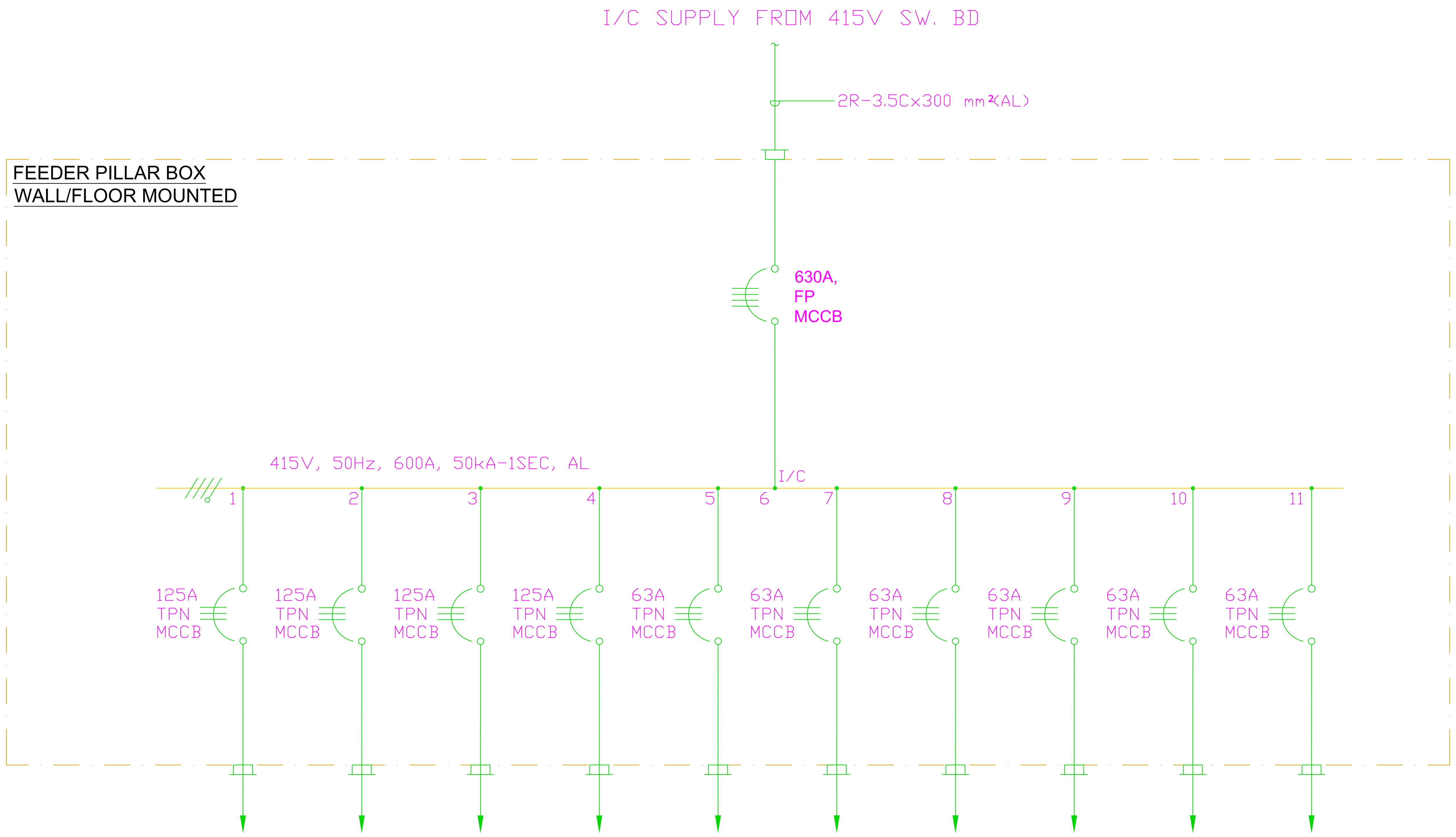
DRG. NO.- PC-298-7411-0985

FILE:

पी डी आई एल PDIL

प्रोजेक्ट्स एंड डेवलपमेंट इंडिया लिमिटेड नोएडा

PROJECTS & DEVELOPMENT INDIA LTD.-NOIDA



GENERAL NOTES:

1. BUSBAR MATERIAL - AL.
2. SYSTEM VOLTAGE - 415V, 3φ N, 50HZ
3. RATED SHORT CIRCUIT WITHSTAND - 50KA, 1 SEC
4. DEGREE OF PROTECTION (IEC 60529) - IP:55
5. PAINT SHADE - 631 OF IS:5.
6. CABLE ENTRY : INCOMER - BOTTOM
   OUTGOING - BOTTOM
7. ALL O/G FEEDERS OF 415V SW. BOARD SHALL BE PROVIDED WITH DIGITAL MULTI FUNCTION METER WHICH SHAL ALSO HAVING FACILITY OF MEASURING KVAH KWH & KVA(MD)

LEGEND:-

MCCB

CABLE GLAND

TENTATIVE FOR TENDER PURPOSE ONLY

REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
0	22.01.26	ISSUED FOR TENDER	SS	RKP	RKV

CLIENT:– BCGCL

REV. 0

SHEET 01 OF 01

SCALE: N.T.S.

PROJECT:– 2000 TPD COAL TO AMMONIUM NITRATE PROJECT OF BCGCL AT LAKHANPUR (ODISHA)

DRG. NO.– PC298-1202

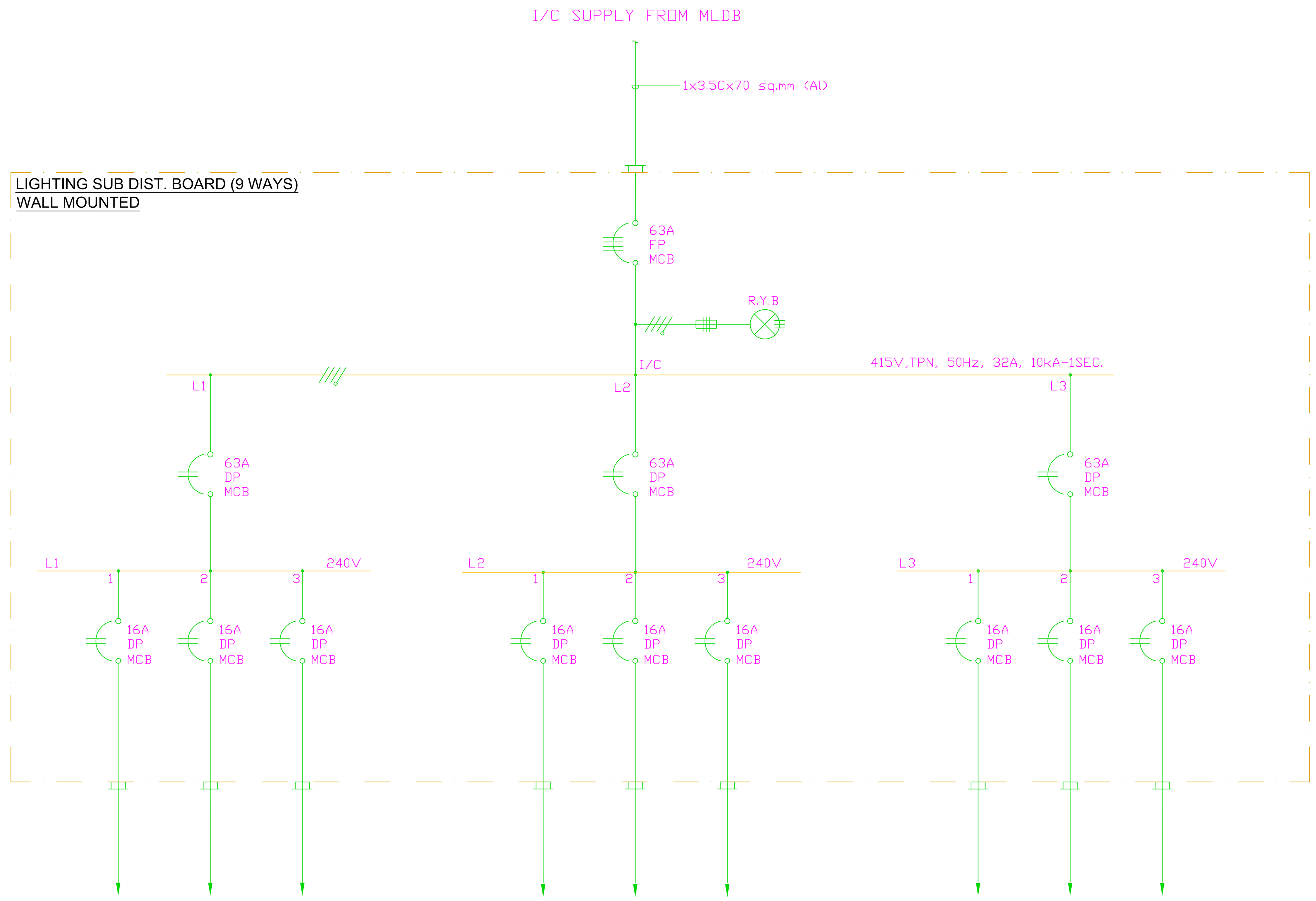
TITLE:– OVERALL SINGLE LINE DIAGRAM OF FEEDER PILLAR BOX

FILE:

पी डी आई एल PDIL

प्रोजेक्ट्स एंड डेवलपमेंट इंडिया लिमिटेड नोएडा

PROJECTS & DEVELOPMENT INDIA LTD.–NOIDA



GENERAL NOTES:

1. BUSBAR MATERIAL - AL.
2. SYSTEM VOLTAGE - 415V, 3ɸ N, 50HZ
3. RATED SHORT CIRCUIT WITHSTAND - 10KA, 1 SEC
4. DEGREE OF PROTECTION (IEC 60529) - IP:55
5. PAINT SHADE - 631 OF IS:5.
6. CABLE ENTRY : INCOMER - BOTTOM
   OUTGOING - BOTTOM

LEGEND:-

- FUSE
- INDICATING LAMP
- DP MCB WITH THERMAL ELECTROMAGNETIC PROTECTION
- SWITCH FUSE UNIT
- CABLE GLAND

TENTATIVE FOR TENDER PURPOSE ONLY

REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
0	22.01.26	ISSUED FOR TENDER	SS	RKP	RKV

CLIENT:— BCGCL

REV. 0 | SHEET 01 OF 01 | SCALE: N.T.S.

PROJECT:— 2000 TPD COAL TO AMMONIUM NITRATE PROJECT OF BCGCL AT LAKHANPUR (ODISHA)

DRG. NO.— PC298-1203

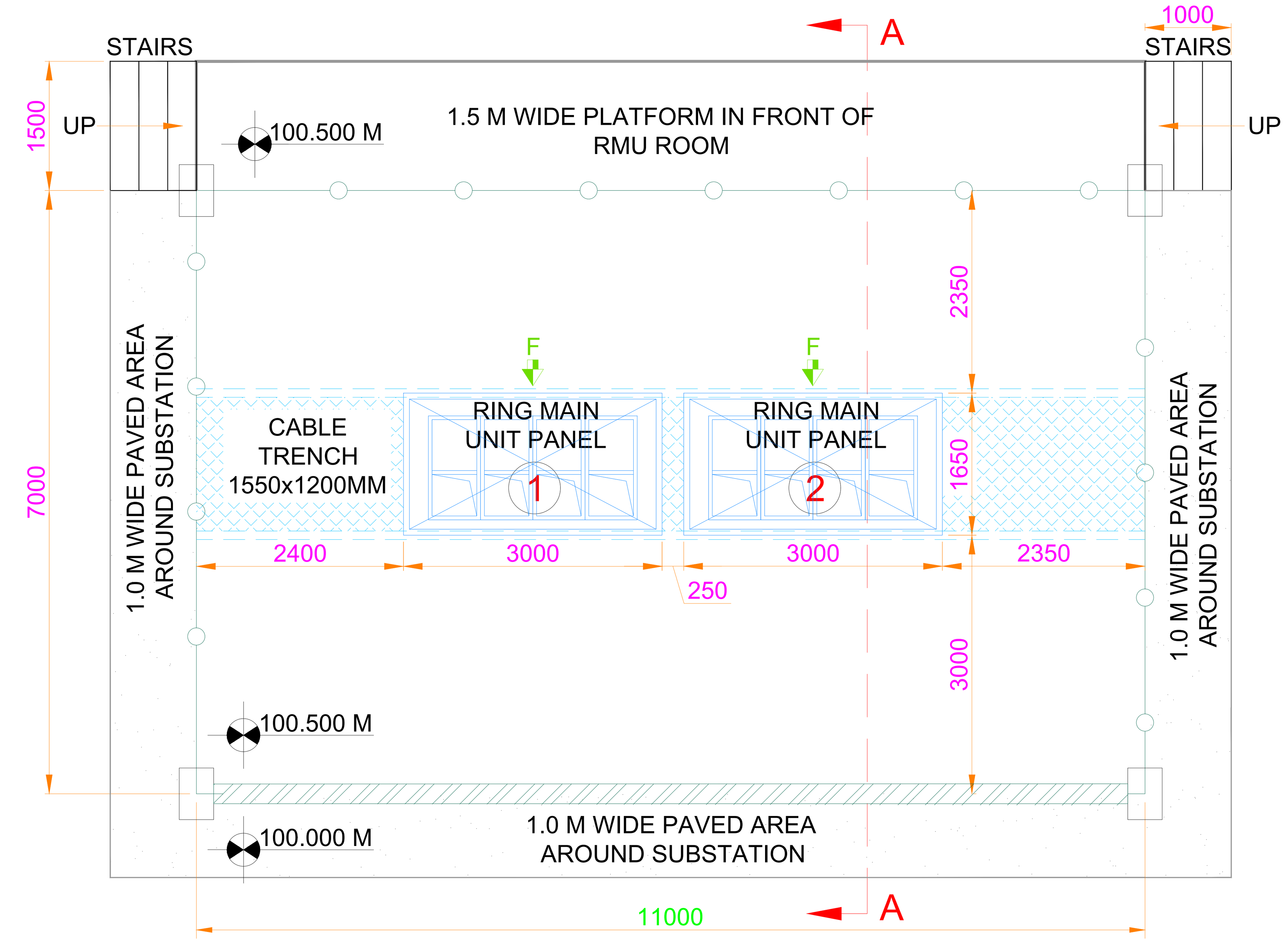
FILE:

TITLE:— SINGLE LINE DIAGRAM OF LSDB

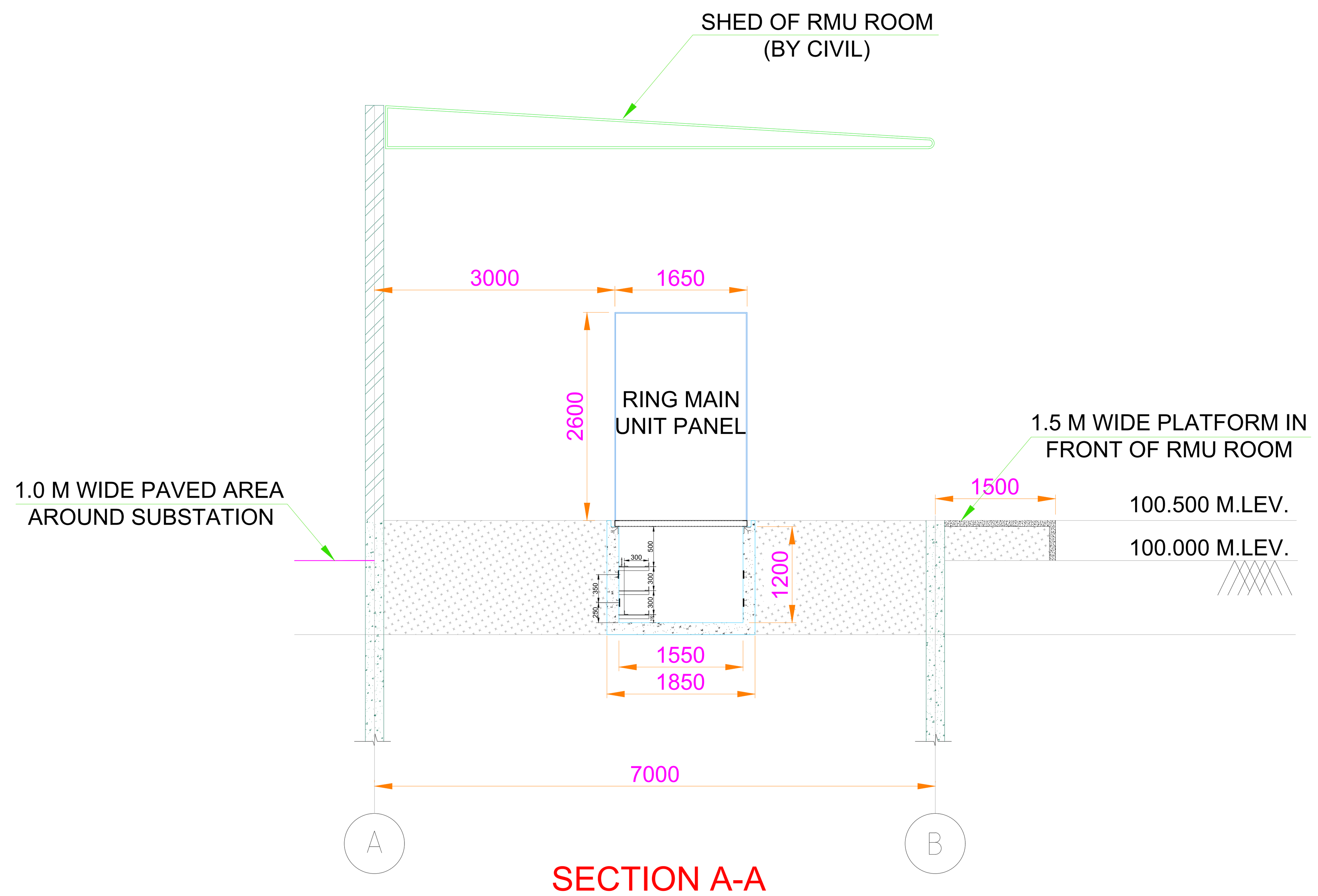
पी डी आई एल PDIL

प्रोजेक्ट्स एंड डेवलपमेंट इंडिया लिमिटेड नोएडा

PROJECTS & DEVELOPMENT INDIA LTD.—NOIDA



GROUND FLOOR PLAN AT 100.000ML & 100.500ML



SECTION A-A

NOTE:-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS OF EQUIPMENTS ARE TENTATIVE, IT SHALL BE CHANGED AS PER RESPECTIVE VENDORS REQUIREMENTS.
3. IN FRONT OF RMU ROOM 1.5M WIDE CONTINUOUS PLATFORM SHALL BE KEPT. STAIRS SHALL BE PROVIDED FOR APPROACHING THE PLATFORM.
4. THIS LAYOUT IS FOR BIDDER'S GUIDANCE.

TENTATIVE

FOR TENDER PURPOSE ONLY

REV	DATE	DESCRIPTION	PPD.	CKD.	APPD.
0	30.01.2026	ISSUED FOR ENQUIRY	BG	RKP	RKV

CLIENT: BHARAT COAL GASIFICATION AND CHEMICALS LIMITED (BCGCL)

CLIENT DOCUMENT NO.

PROJECT: 2000TPD COAL TO AMMONIA NITRATE PROJECT

PROJ. NO.	PLANT	SECTION	DEPT.
			ELET.

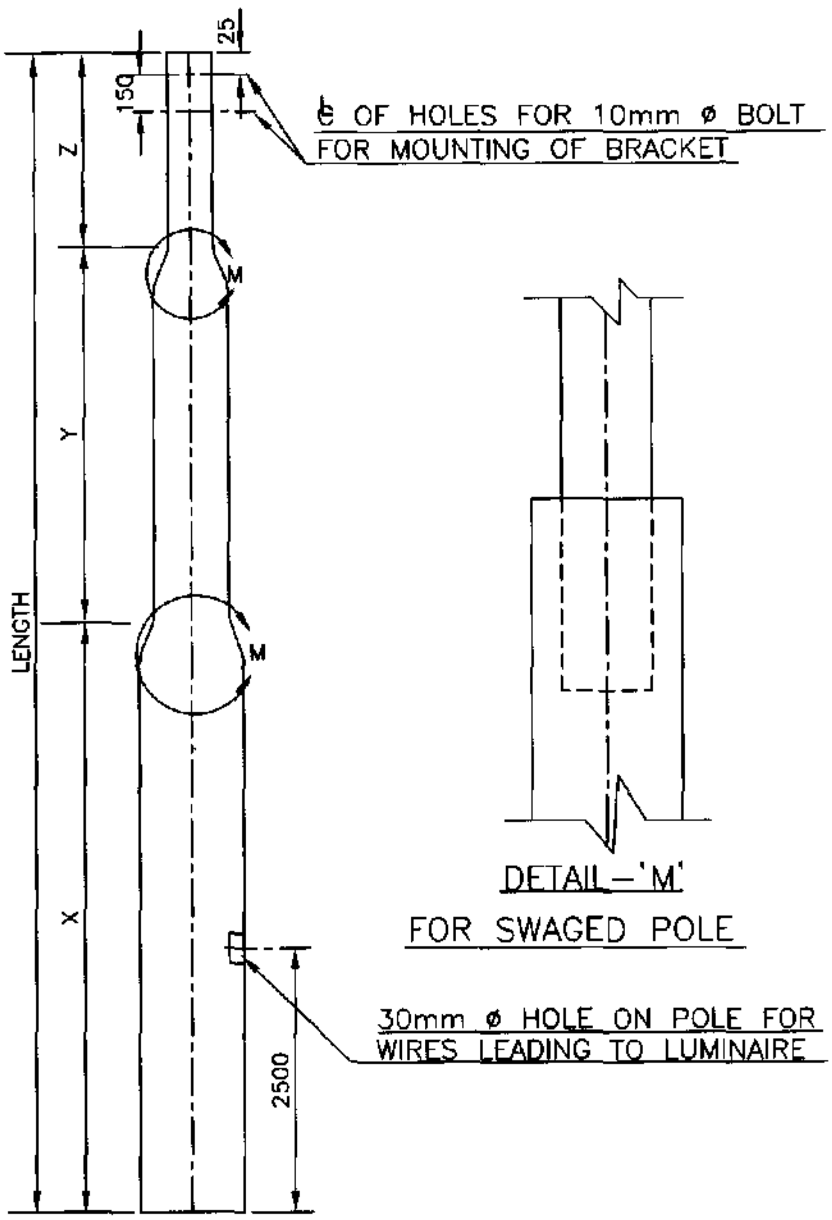
TITLE: 6.6 KV OUTDOOR TYPE RMU LAYOUT (FOR CONSTRUCTION POWER)

DWG.NO.: PC298-7411-0805 REV. 0

SCALE: NTS SHEET: 1 OF 1 DWG. SIZE. A3-SHEET

PROJECTS & DEVELOPMENT INDIA LTD.-NOIDA

STEEL TUBULAR LIGHTING POLE



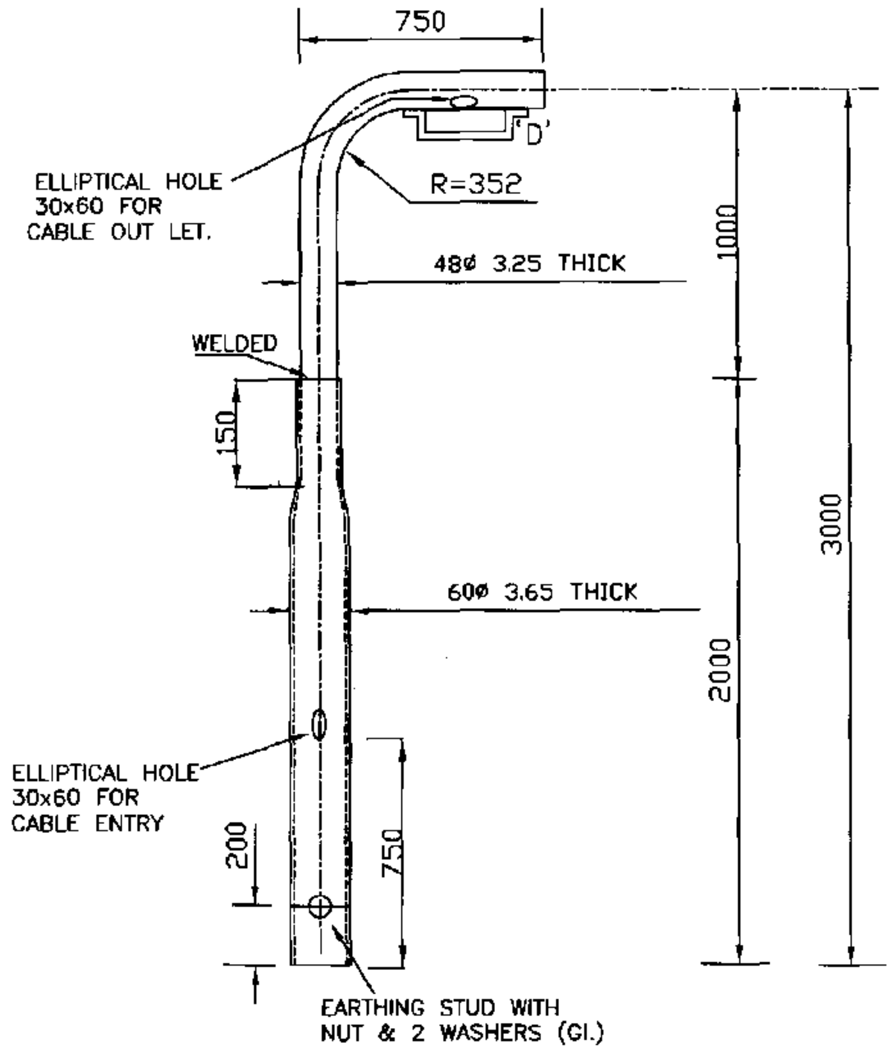
POLE DESIGNATION	LENGTH(M) X+Y+Z=L	PLANTING DEPTH(M)	DIAxTHICKNESS BOTTOM(mm)	DIA MIDDLE(mm)	DIA TOP(mm)	WEIGHT OF POLE (Kg)
410 TP3/SP3	X+Y+Z=7	1.25	114.3x4		78.1	87/85
410 TP12/SP12	X+Y+Z=8	1.5	114.3x4		78.1	101/97
410 TP13/SP13	X+Y+Z=8	1.5	139.7x4		88.9	125/119
410 TP27/SP27	X+Y+Z=9	1.5	114.3x4		76.1	113/108
410 TP30/SP30	X+Y+Z=9	1.5	139.7x4		88.9	140/133
410 TP33/SP33	X+Y+Z=9	1.5	165.1x4		114.3	170/184

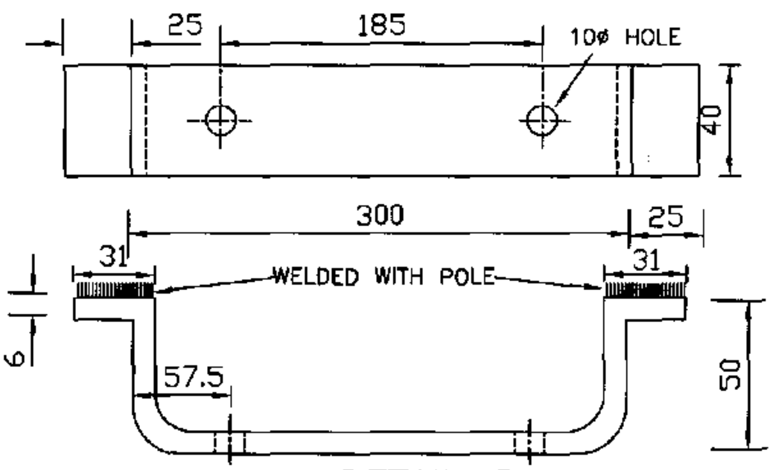
NOTE:-

1. TP REFER TO STEPPED POLE.
2. SP REFER TO SWAGED POLE.
3. POLE DESIGNATION IS AS PER IS: 1239

REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB

SWAGED POLE TYPE 'B'





DETAIL-D

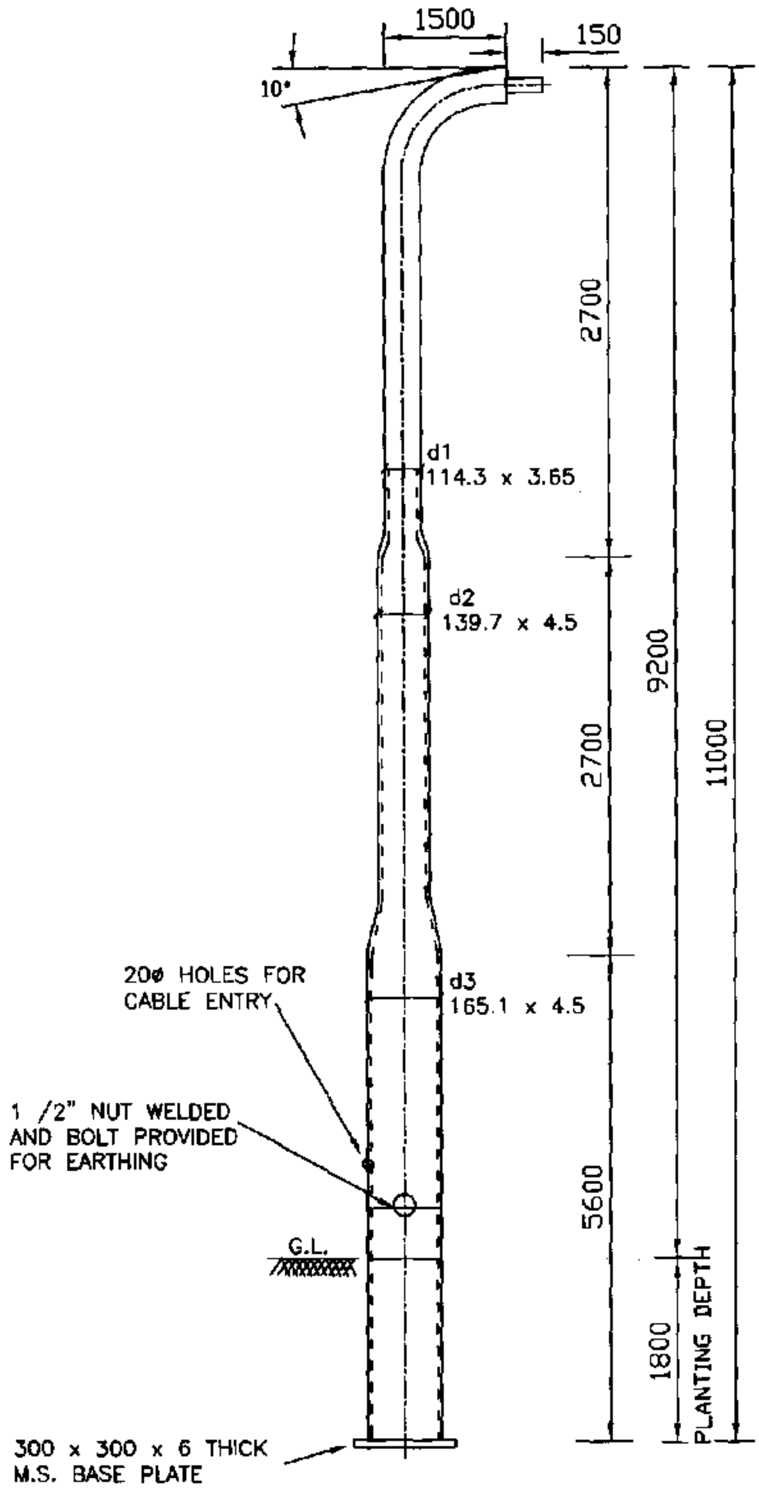
NOTE:-

1. ALL DIMENSIONS ARE IN mm

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	STEEL TUBULER LIGHTING POLE	PDS:E 203	1
		DOCUMENT NO.	REV
		SHEET 3 OF 3	

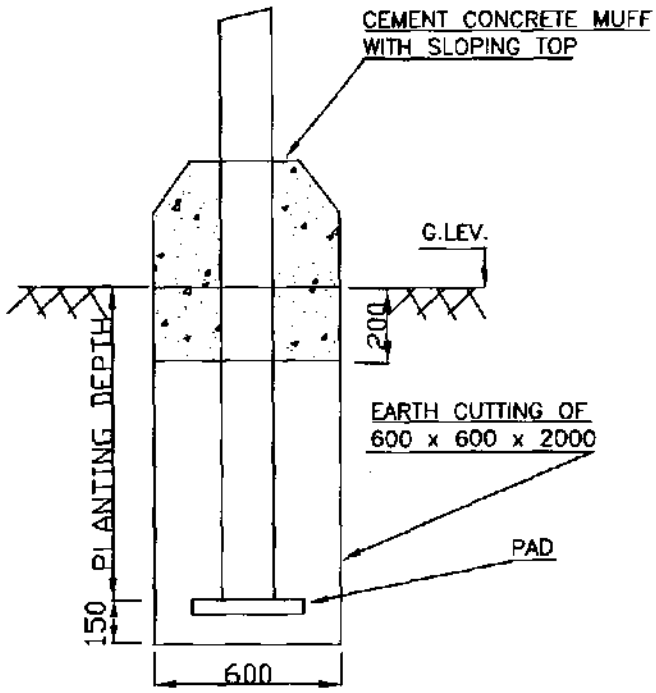
SWAGED POLE TYPE 'C'
(FOR PLANT GROUND MOUNTING)



NOTES:-

1. NIPPLE OF DIA. 45 (NIPPLE TO BE PREPd. BY DIRECT REDUCTION OF DIA OF TOP PIPE WITHOUT USE OF ANY WASHER)
2. POLE MATERIAL MS AS PER IS 1239 ABOVE GROUND PORTION TO BE PAINTED 2 COATS OF RED OXIDE PRIMER,UNDER GROUND PORTION PAINTED BITUMINUS PAINT.
3. FOR FLOOD LIGHTING POLE THE TOP PORTION NOT TO BE TILTED BUT A 300 x 300 x 6mm THICK M.S. PLATE WELDED AT THE TOP SHALL BE PROVIDED TO MOUNT FLOOD LIGHT.
4. ALL DIMENSIONS ARE IN mm

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



1. FOR PAD USE:-

a) 400x400x70 CONCRETE BLOCK FOR POLES.

b) BASE PLATE AS SHOWN IN PDS:E 205 FOR STEEL TUBULAR POLES SHALL BE USED AS PAD

C) RCC / WOOD POLES DO NOT NEED ANY PAD.

2. MUFF IS MUST FOR STEEL TUBULAR POLES AND OPTIONAL FOR OTHERS POLES, MUFF SHALL BE PROVIDED AFTER UNDER GROUND CABLING FOR STREET LIGHTING IS COMPLETED.

3. MUFF HEIGHT FROM GROUND LEVEL SHALL BE 300mm FOR ORDINARY POLES AND 457mm FOR STREET LIGHTING POLES HAVING J.B.LOCATED ON THE MUFF

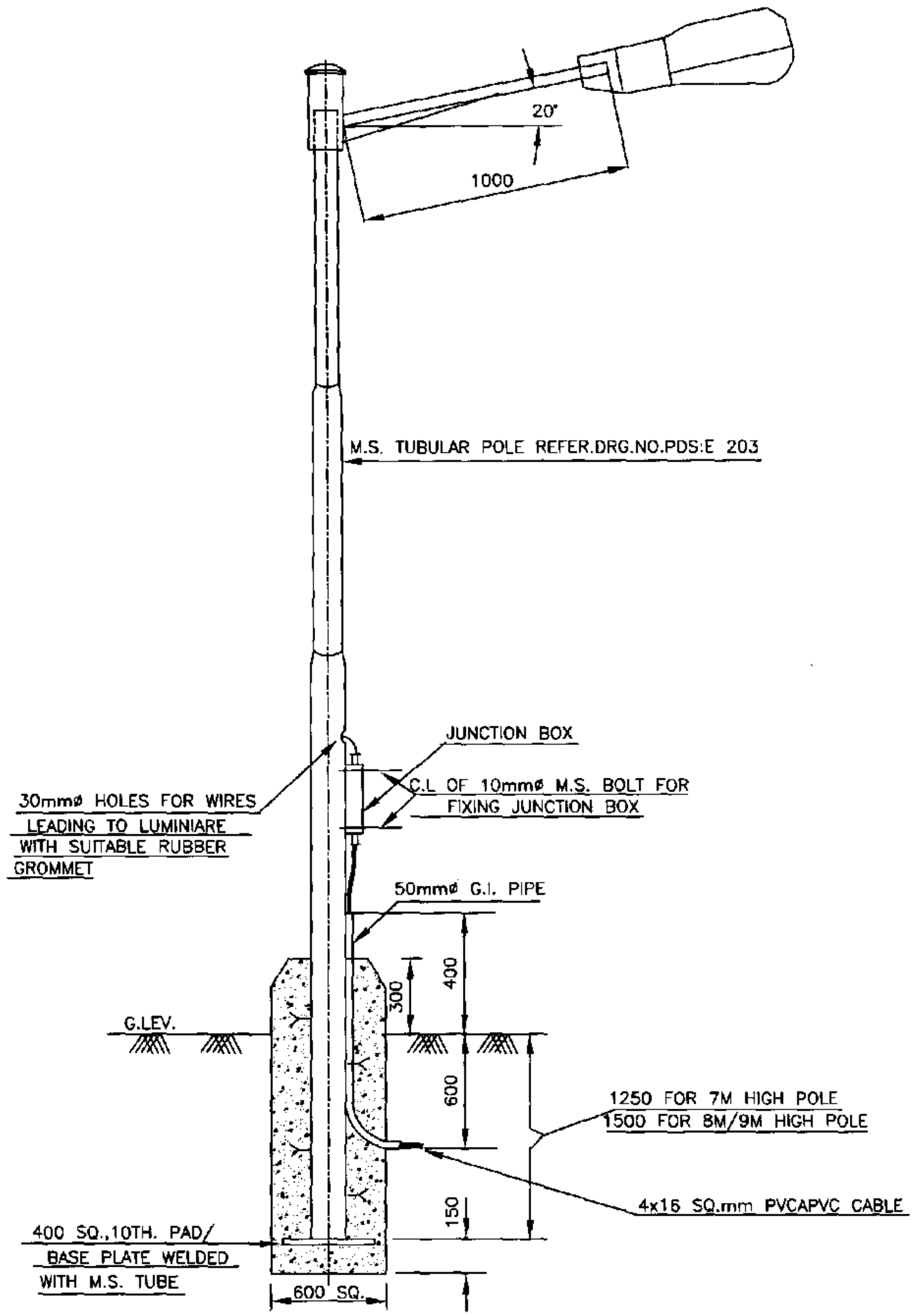
4. FOR MOUNTING OF JBS' ON THE MUFF REFER PDS:E 209

5. FOR PLANTING DEPTH REFER RELEVANT ISS.

6. ALL DIMENSIONS ARE IN mm

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

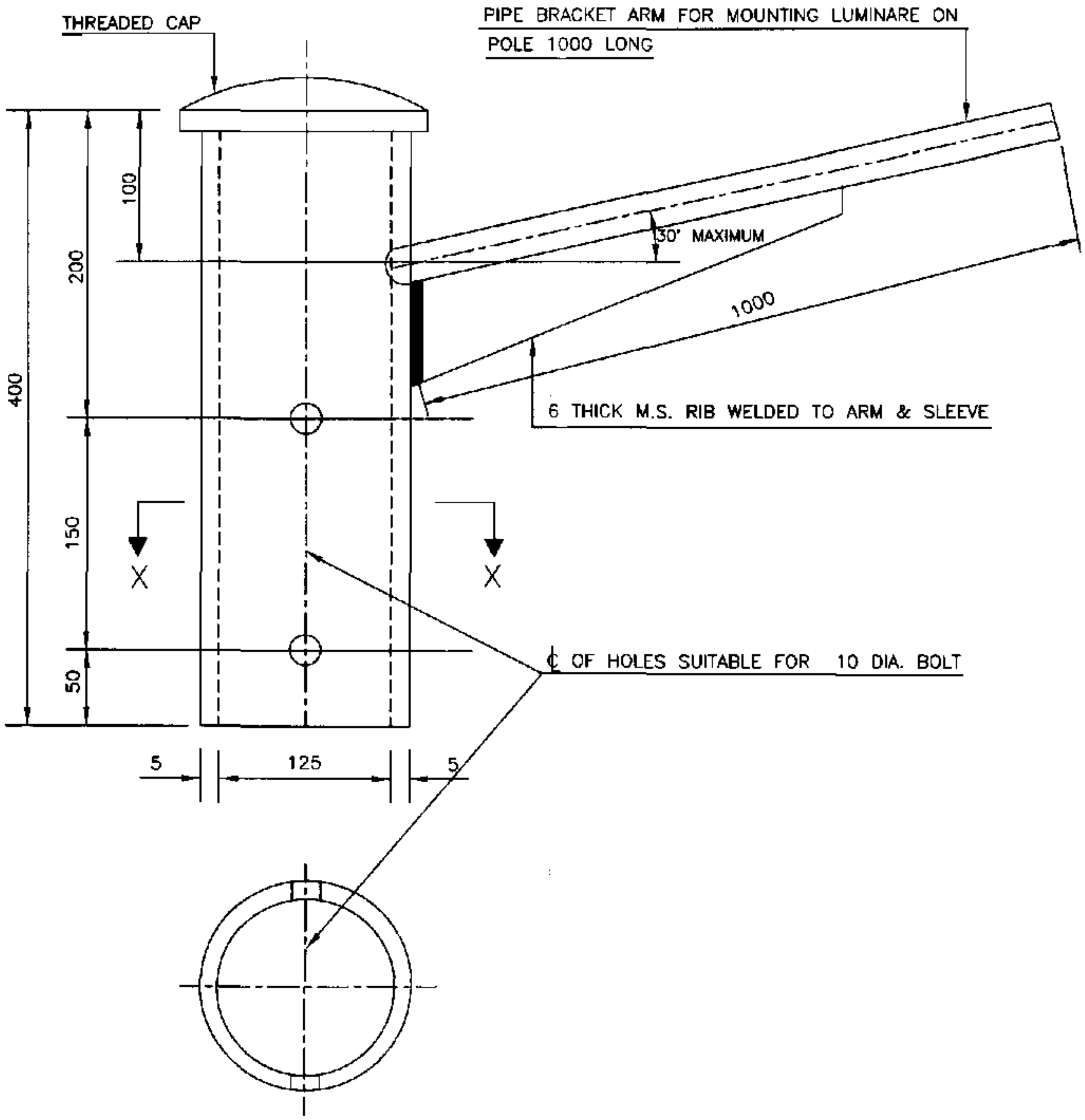
PDIL	INSTALLATION ARRANGEMENT STREET LIGHTING FIXTURES	PDS:E 206	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	



NOTE :-
ALL DIMENSIONS ARE IN mm.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	DETAILS OF BRACKET ARM FOR STREET LIGHTING POLE	PDS:E 207	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	



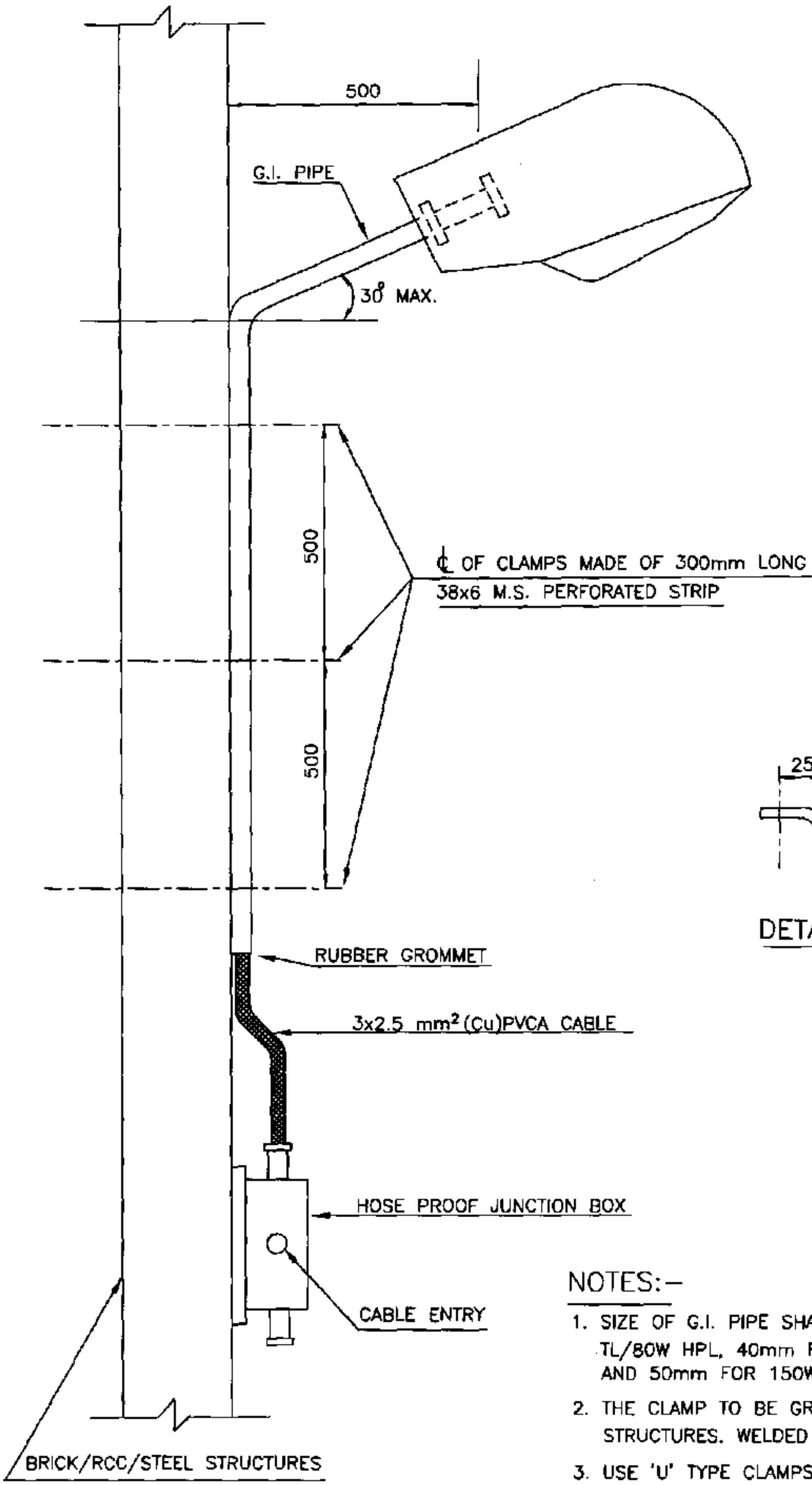
SECTION – XX

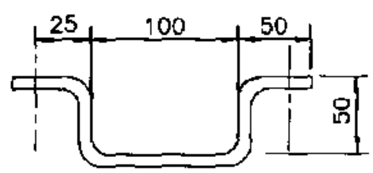
NOTES:–

1. SIZE OF PIPE SHALL BE 30mm FOR TL/80W HPL FIXTURES, 40mm FOR 70W SON/125W HPL FIXTURES AND 50mm FOR 150W SON/250W HPL FIXTURES.
2. ALL DIMENSIONS ARE IN mm.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	INSTALLATION ARRANGEMENT AREA LIGHTING FIXTURES	PDS:E 208	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	





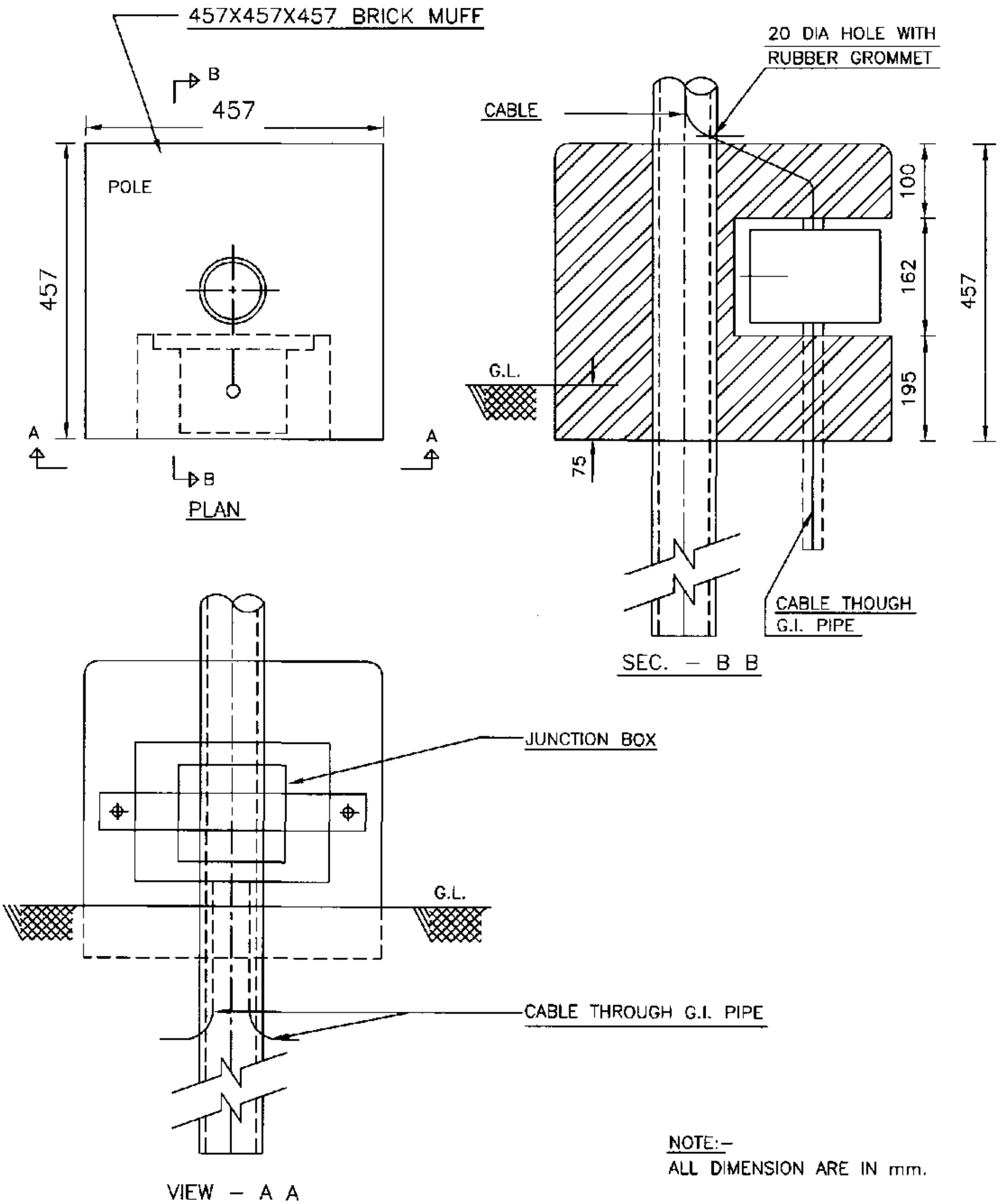
DETAILS OF CLAMP

NOTES:-

1. SIZE OF G.I. PIPE SHALL BE 30mm FOR TL/80W HPL, 40mm FOR 70W SON/125W HPL AND 50mm FOR 150W SON//250W HPL FIXTURES.
2. THE CLAMP TO BE GROUTED IN BRICK WALL/RCC STRUCTURES. WELDED TO STEEL STRUCTURES.
3. USE 'U' TYPE CLAMPS FOR RAILING.
4. ALL DIMENSIONS ARE IN mm.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

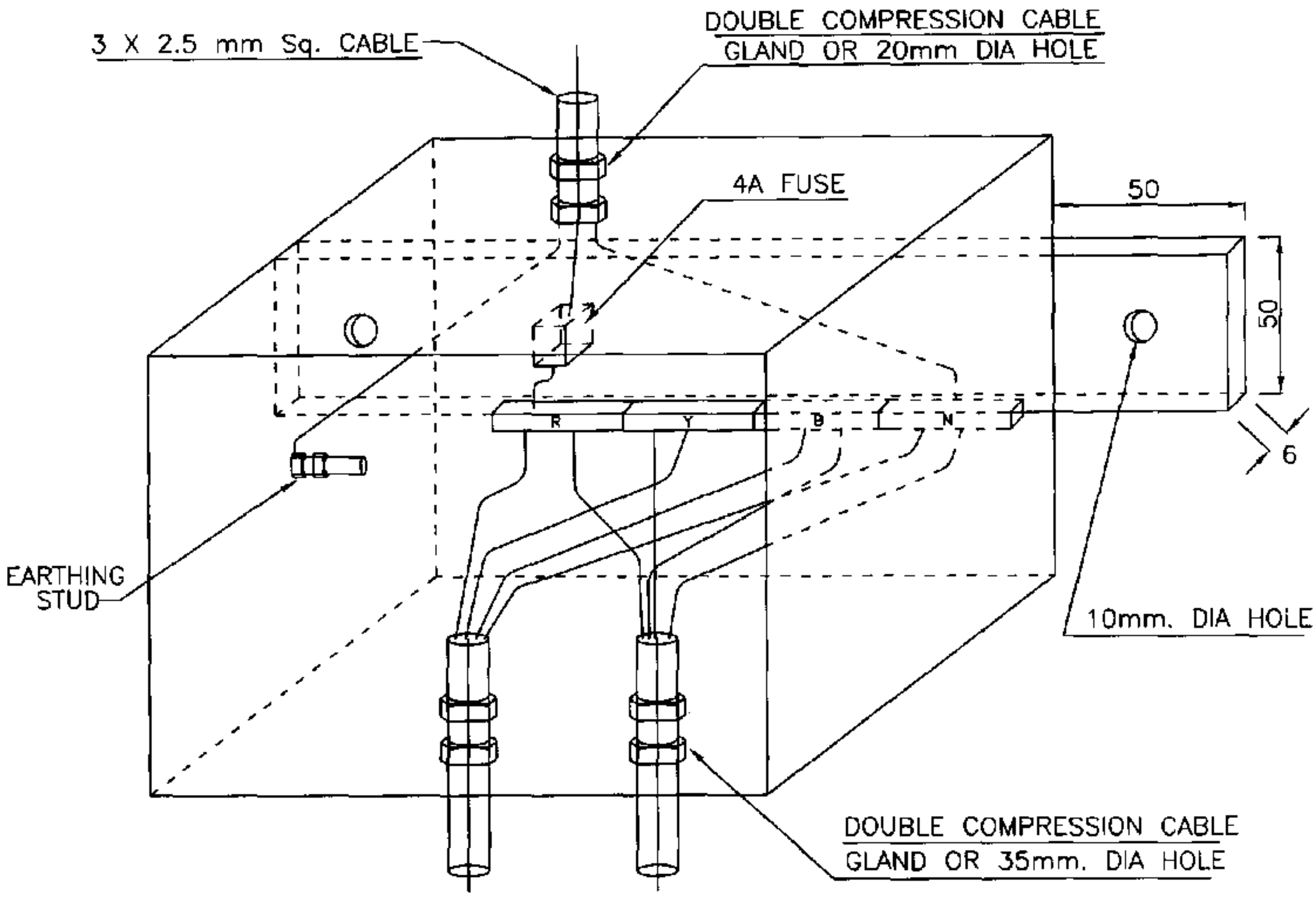
PDIL	INSTALLATION OF JUNCTION BOX IN THE MUFF FOR STREET LIGHTING POLE	PDS:E 209	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	



NOTE:–
ALL DIMENSION ARE IN mm.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

	JUNCTION BOX FOR STREET LIGHTING POLE	PDS:E 210	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	

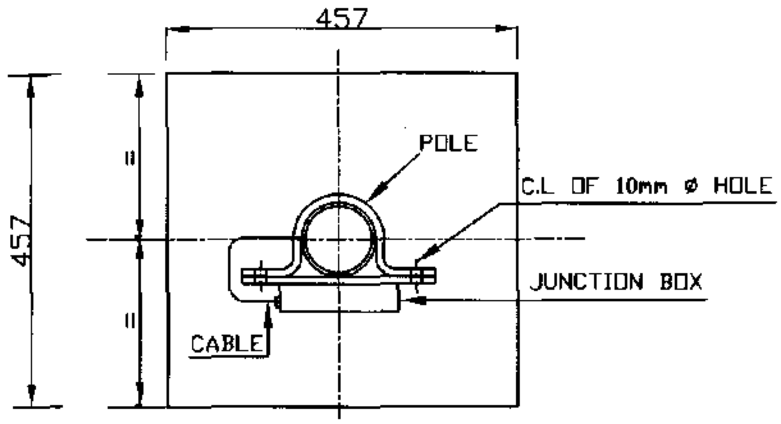


NOTE:-

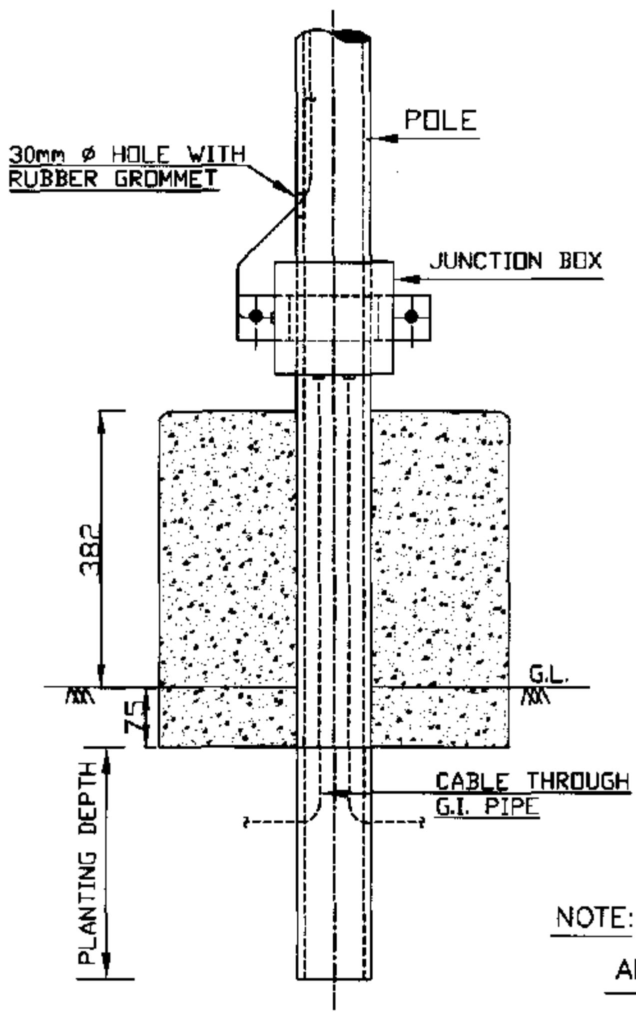
1. THE MINIMUM INTERNAL DIMENSION OF THE J.B. SHALL BE 152 X 152 X 152.
2. THE FRONT DOOR SHALL BE HINGED & LOCKABLE TYPE.
3. THE CONNECTION OF FUSE TO THE PHASE 'R' IS TYPICAL ONE THE EXACT PHASE TO WHICH CONNECTION SHALL BE MADE SHALL BE DECIDED AT SITE.
4. FOR HAZARDOUS AREA'S THESE JUNCTION BOXES SHALL BE INCREASED SAFETY TYPE AND THE FUSE NEED NOT BE PROVIDED.
5. FOR POLE MOUNTED JUNCTION BOXED THE CABLE GLAND SHALL BE SIDE MOUNTED.
6. ALL DIMENSIONS ARE IN mm.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	INSTALLATION OF JUNCTION BOX IN THE POLE FOR STREET LIGHTING POLE	PDS:E 211	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	



PLAN



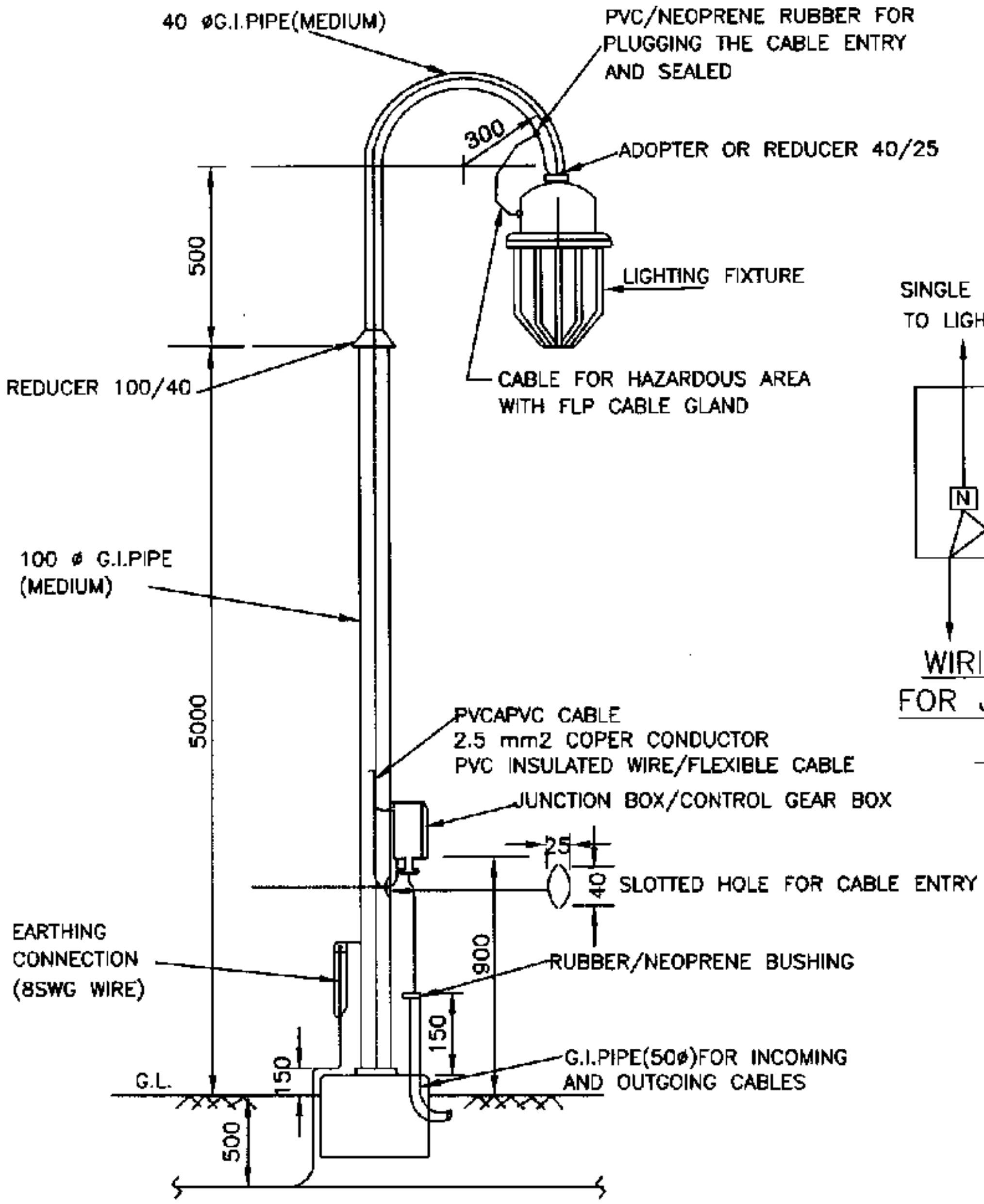
NOTE:-

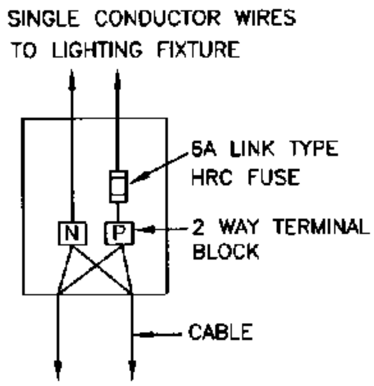
ALL DIMENSIONS ARE IN mm

ELEVATION

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

	TYPICAL INSTALLATION OF LIGHTING FIXTURE AT GROUND LEVEL	PDS:E 212	1
PDIL		DOCUMENT NO.	REV
		SHEET 1 OF 2	





WIRING DIAGRAM FOR JUNCTION BOX

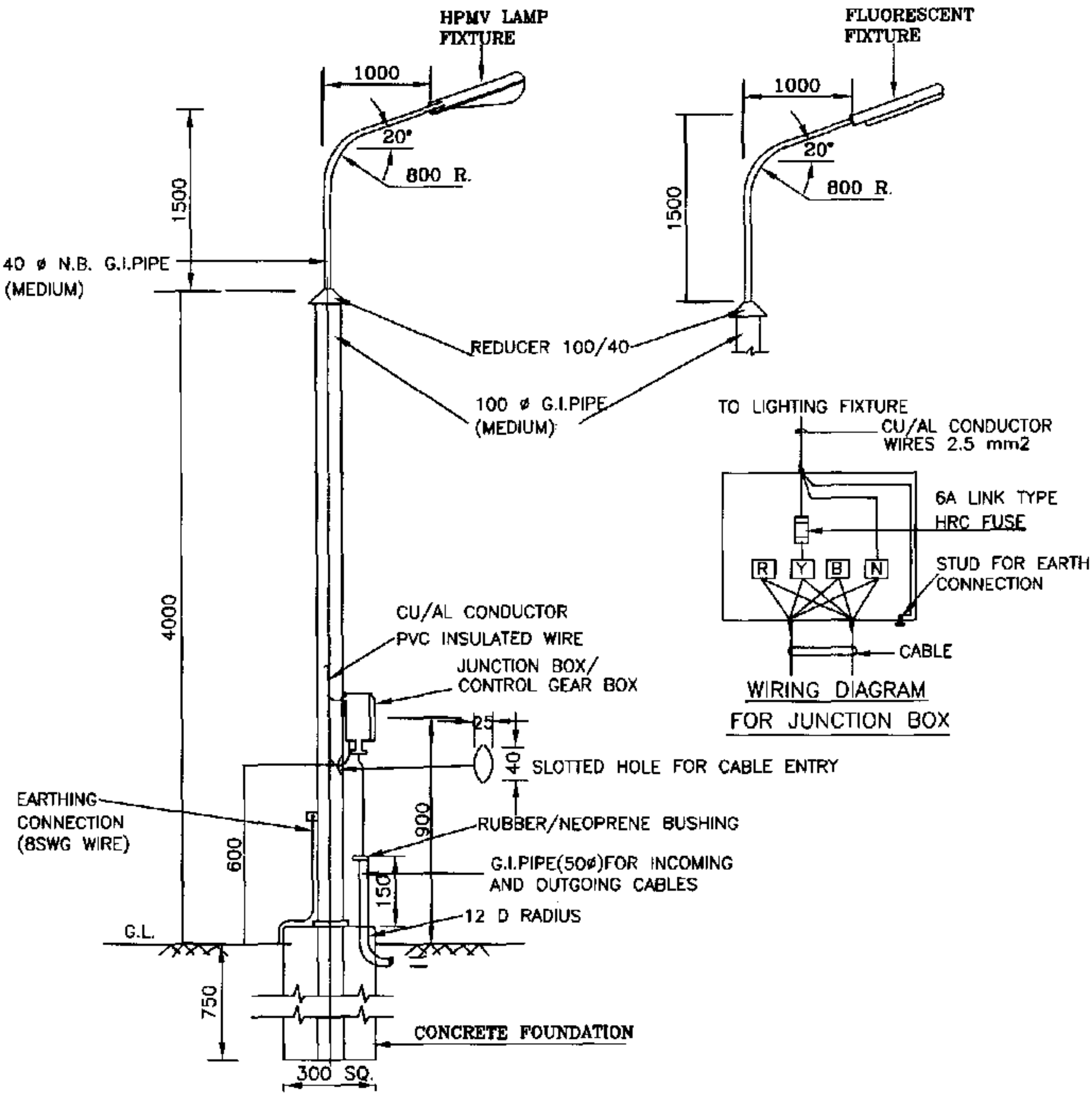
DETAIL−1

NOTE :−

1. TYPE OF FIXTURE USED SHALL BE INDICATED ON LAYOUT DRAWINGS.
2. IN HAZARDOUS AREAS 3/4 WAY FLP OR DIV 2 JUNCTION BOXES(WITHOUT FUSE) SHALL BE USED AS REQD. IN SAFE AREA JUNCTION BOX AS PER DETAIL−1 SHALL BE PROVIDED.
3. ALL DIMENSIONS ARE IN mm.

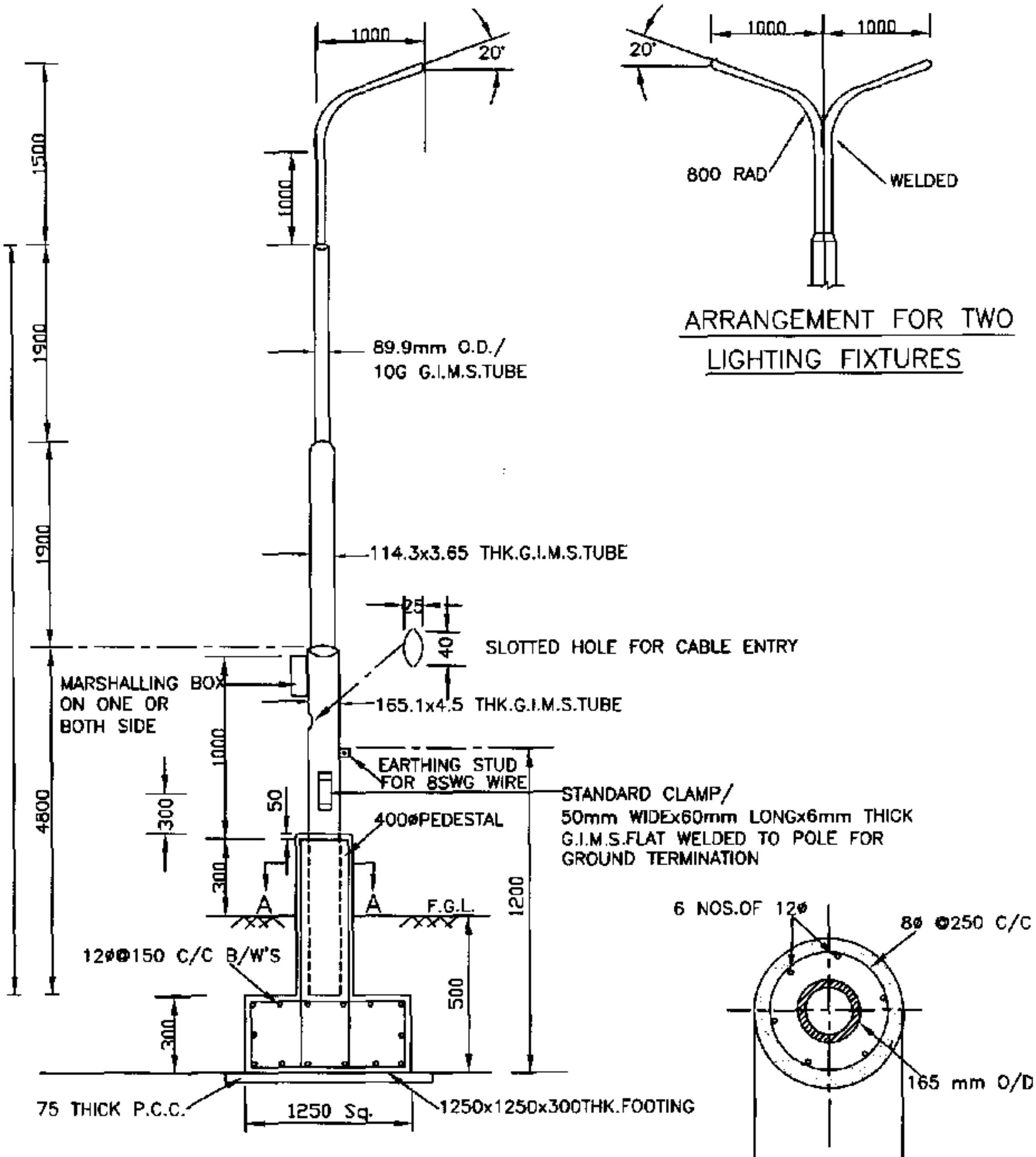
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

	TYPICAL INSTALLATION OF LIGHTING FIXTURE AT GROUND LEVEL	PDS:E 212	1
PDIL		DOCUMENT NO.	REV
		SHEET 2 OF 2	



1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	TYPICAL STREET LIGHTING POLE	PDS:E 213	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	



ARRANGEMENT FOR TWO LIGHTING FIXTURES

ARRANGEMENT FOR ONE LIGHTING FIXTURE

SECTION A–A

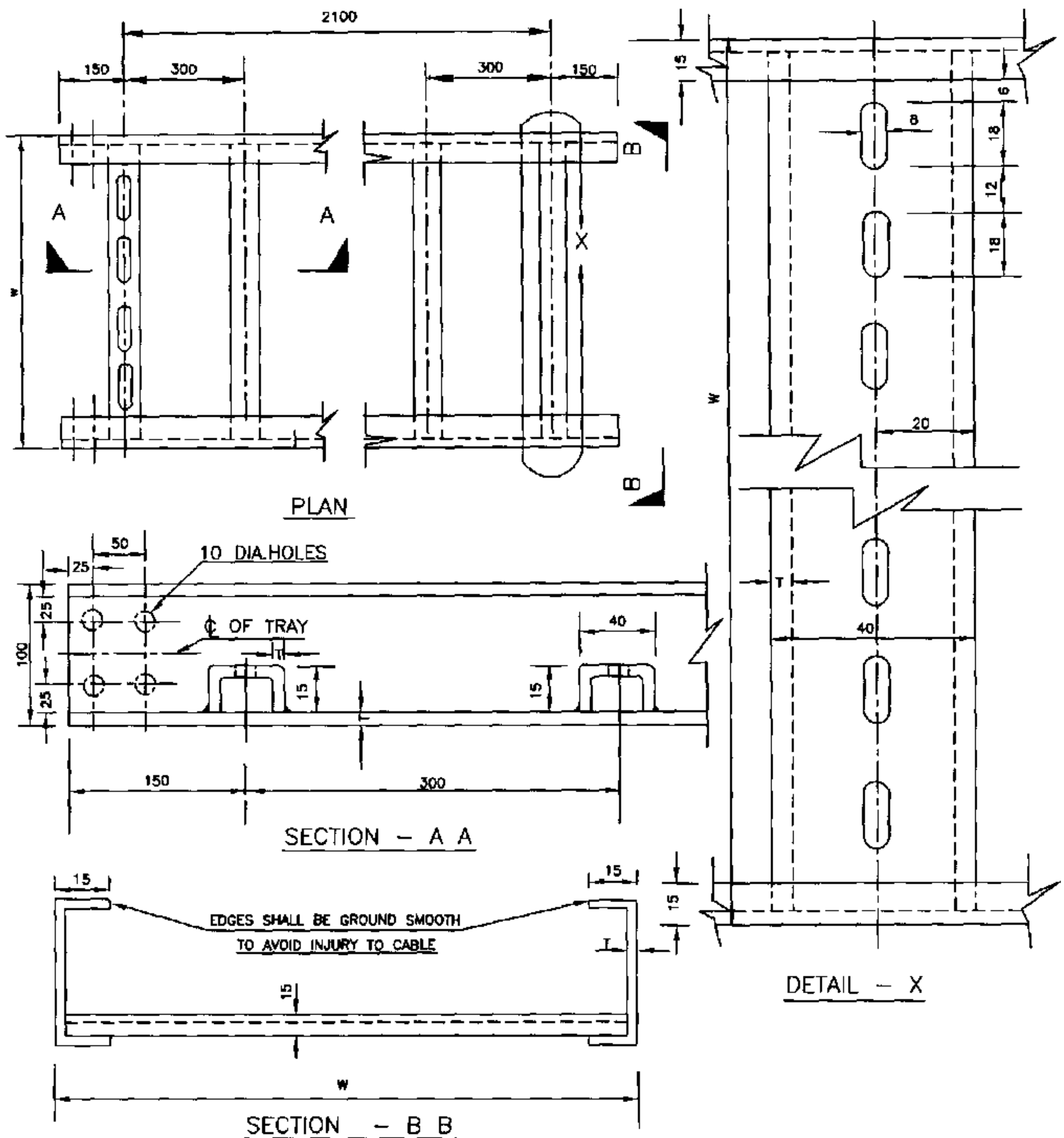
NOTE :–

1. CONCRETING AND APPROVED MOUNTING HARDWARE FOR LIGHTING FIXTURES ARE INCLUDING IN SCOPE OF SUPPLY.
2. CONCRETE FOUNDATION OF GRADE M15 SHALL BE PROVIDED.

ALL DIMENSIONS ARE IN mm.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	PRE–FABRICATED CABLE TRAY STRAIGHT RUN	PDS:E 530	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	



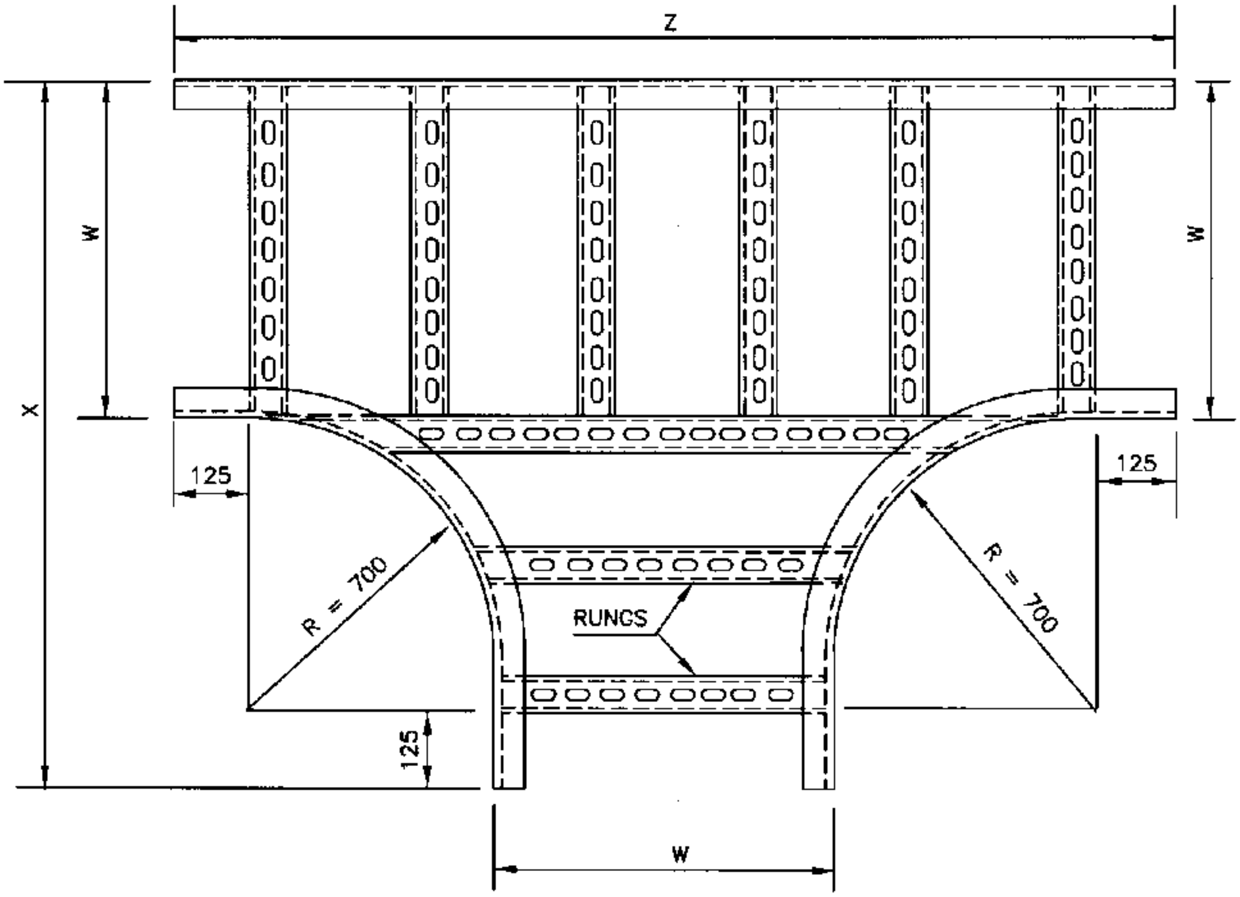
DESIGN TYPE (WIDTH)	MAX.SUPPORTING SPAN		WEIGHT/METER APPROX. IN Kg.	
	G. I.	A. L	G. I.	A. L
SR 900	2000	2000	10.5	3.6
SR 600	2000	2000	8.9	3.05
SR 450	2000	2000	8.0	2.75
SR 300	2000	2000	7.6	2.6
SR 150	2000	2000	6.8	2.33

NOTE:–

THICKNESS " T " SHALL BE 3mm FOR G.I AND 4mm.FOR AL.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

P D I L	PRE–FABRICATED CABLE TRAY HORIZONTAL TEE	PDS:E 531	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	



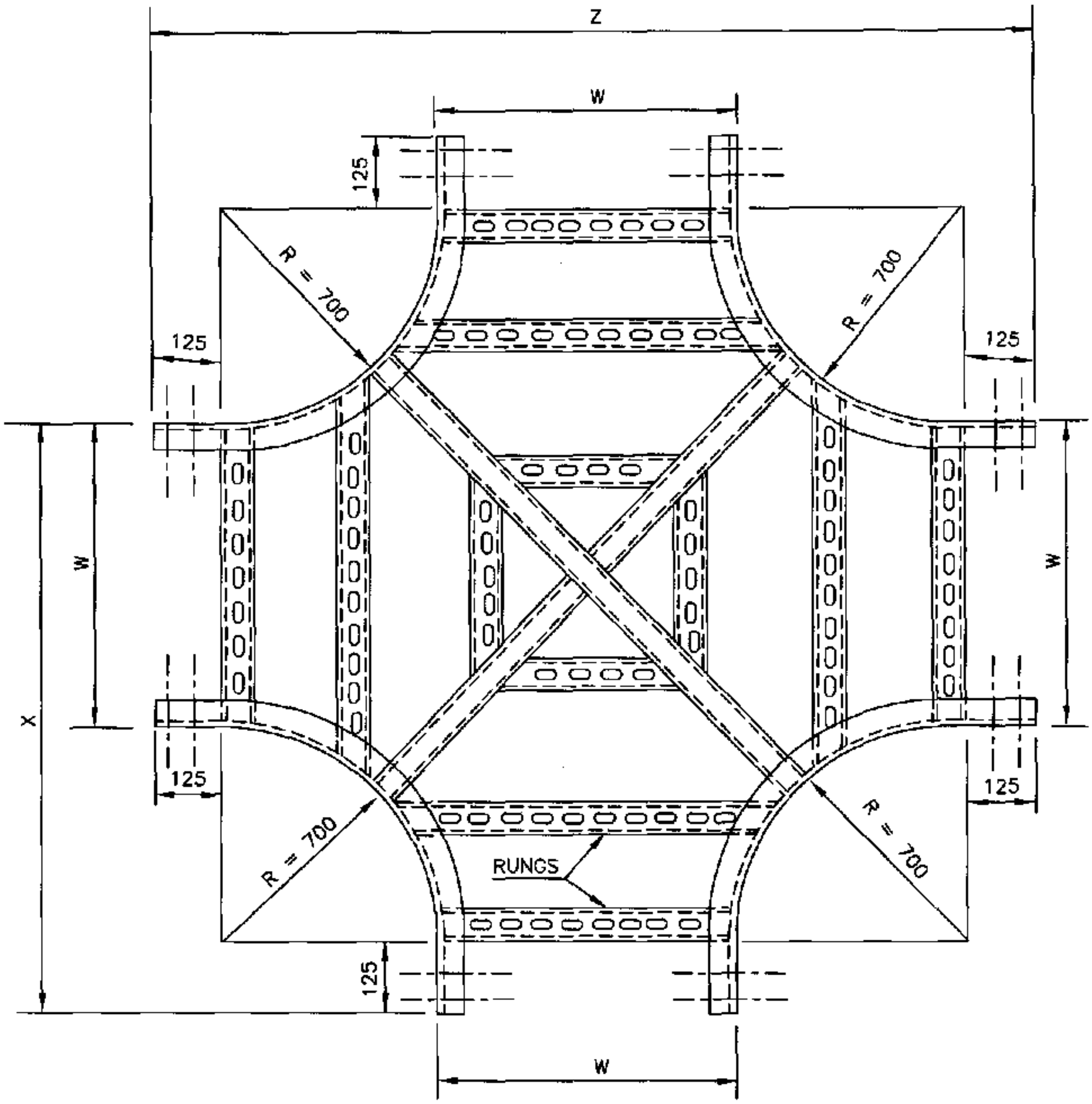
PLAN

DESIGN TYPE	W	X=R+W+125	Z=2R+W+250
HT 900	900	1725	2550
HT 600	600	1425	2250
HT 450	450	1275	2100
HT 300	300	1125	1950

NOTES :–

1. DISTANCE BETWEEN TWO RUNGS SHOULD BE APPROX. 300mm.
2. ALL DIMENSIONS ARE IN mm.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



PLAN

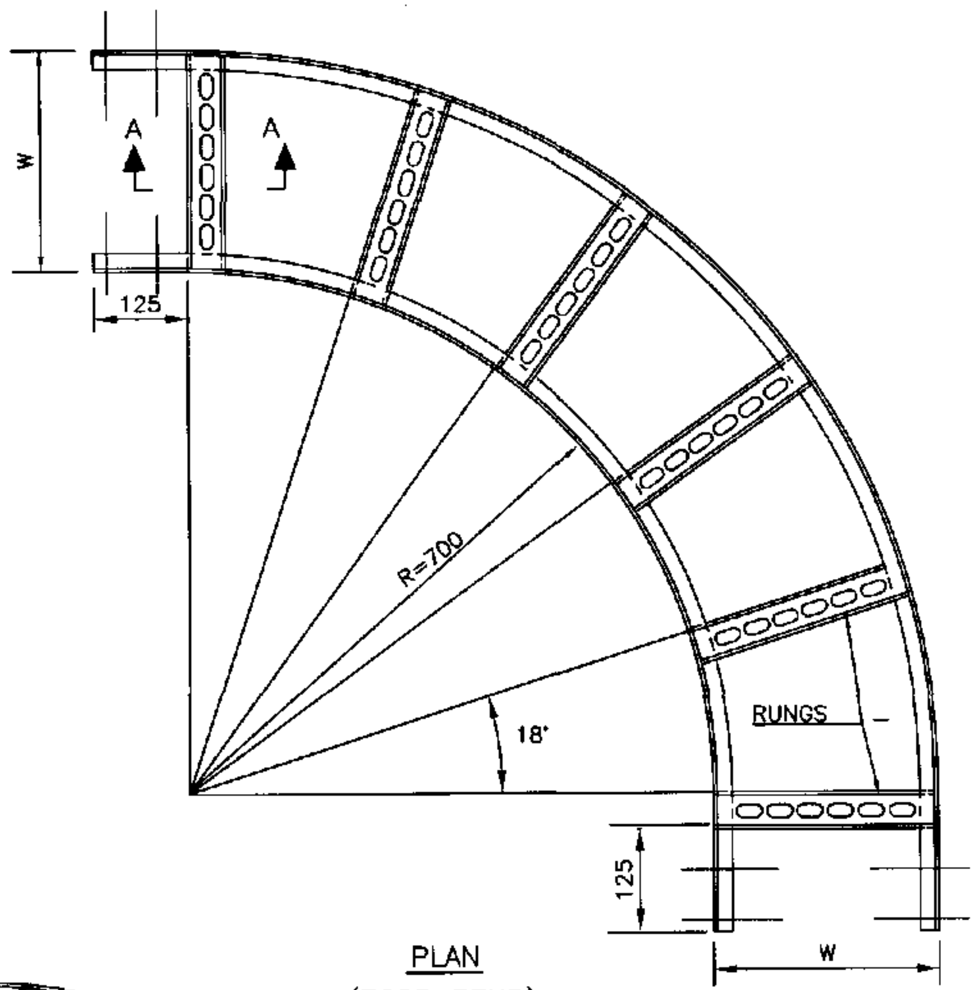
DESIGN TYPE	W	X=R+W+125	Z=2R+W+250
HC 900	900	1725	2550
HC 600	600	1425	2250
HC 450	450	1275	2100
HC 300	300	1125	1950

NOTES :-

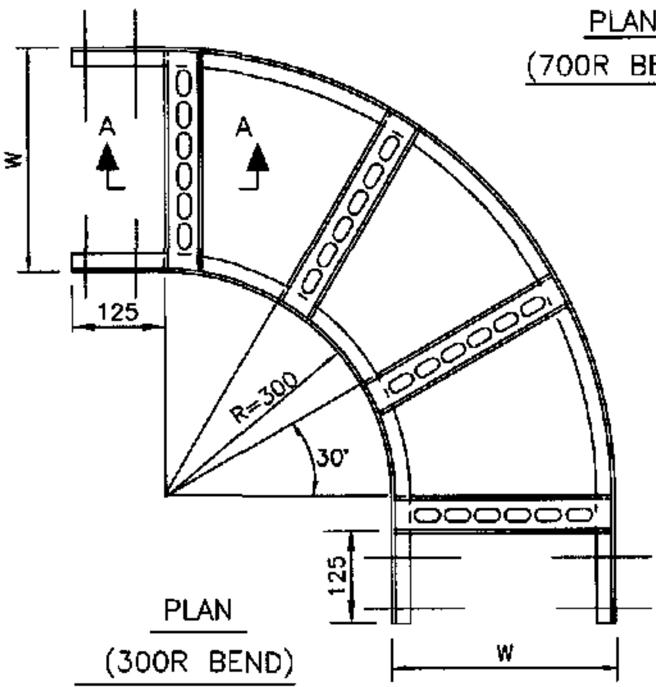
1. DISTANCE BETWEEN TWO RUNGS SHOULD BE APPROX. 300mm.
2. ALL DIMENSIONS ARE IN mm.

REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB

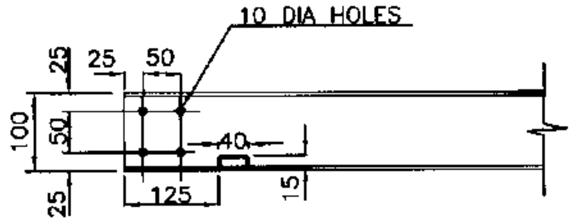
PRE-FABRICATED CABLE TRAY 90° HORIZONTAL BENDS	PDS:E 533	1
	DOCUMENT NO.	REV
	SHEET 1 OF 1	



PLAN
(700R BEND)



PLAN
(300R BEND)

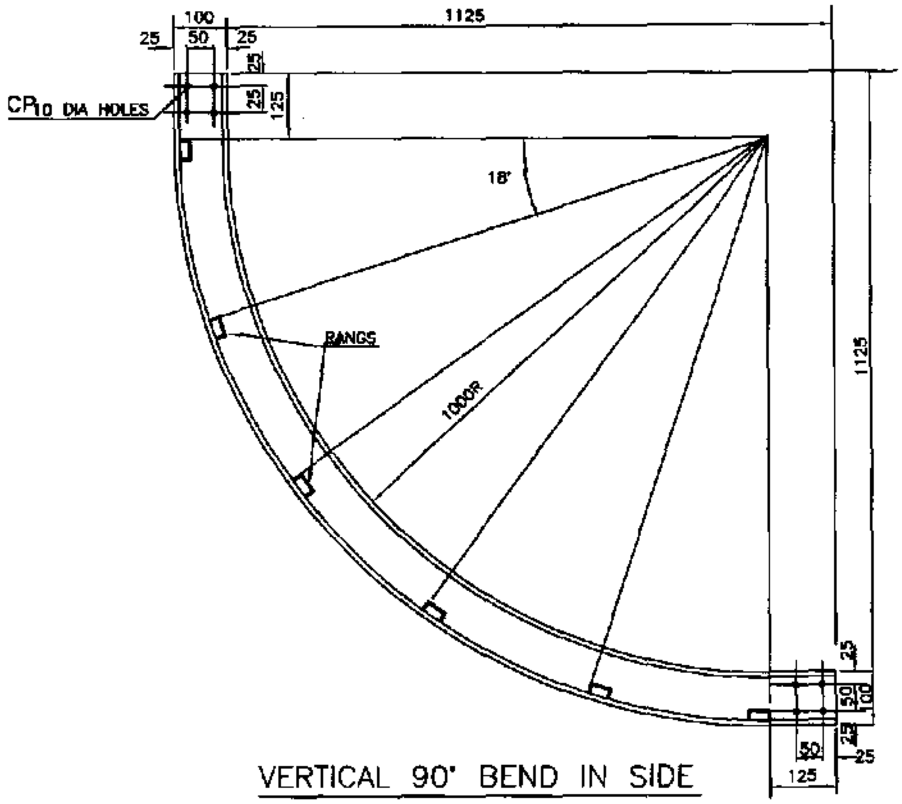


SECTION A-A

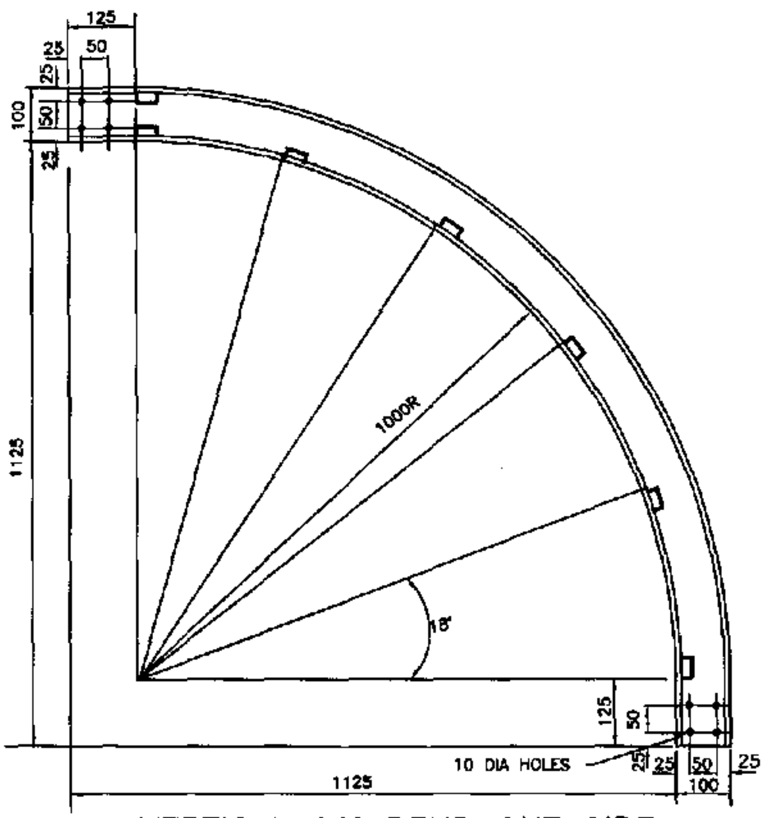
ALL DIMENSIONS ARE IN mm.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

	PRE-FABRICATED CABLE TRAY 90° VERTICAL BEND BENDING RADIUS 1000 mm	PDS:E 534	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	



VERTICAL 90° BEND IN SIDE

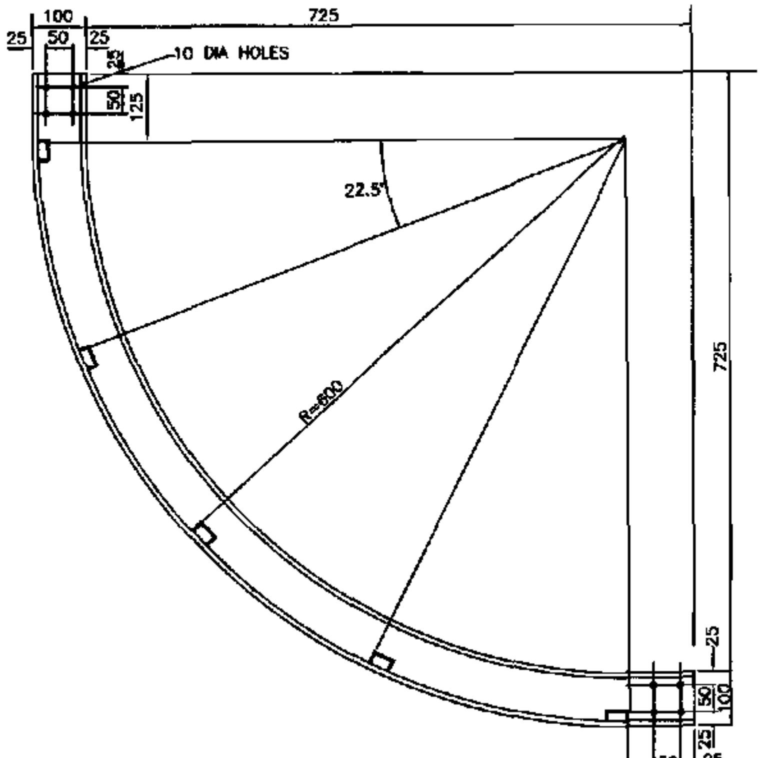


VERTICAL 90° BEND OUT SIDE

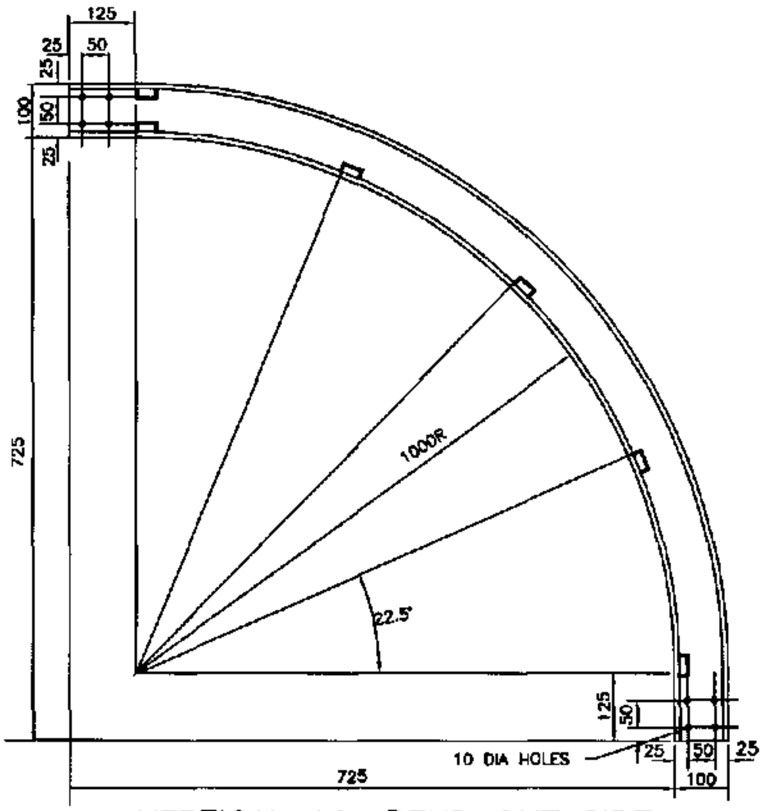
DIMENSIONS ARE IN mm.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	PRE–FABRICATED CABLE TRAY 90° VERTICAL BENDS BENDING RADIUS 600 mm	PDS:E 535	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	



VERTICAL 90° BEND IN SIDE

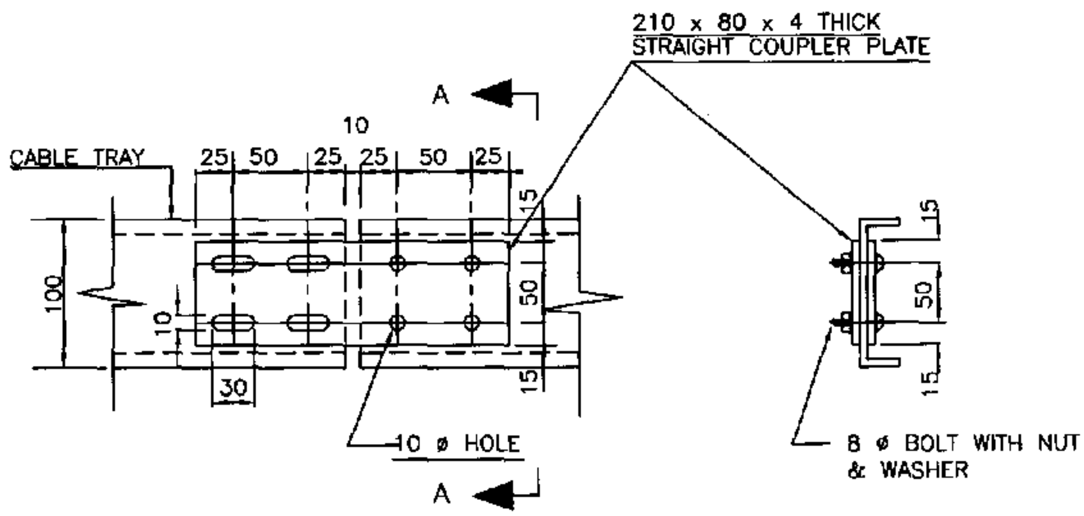


VERTICAL 90° BEND OUT SIDE

ALL DIMENSIONS ARE IN mm.

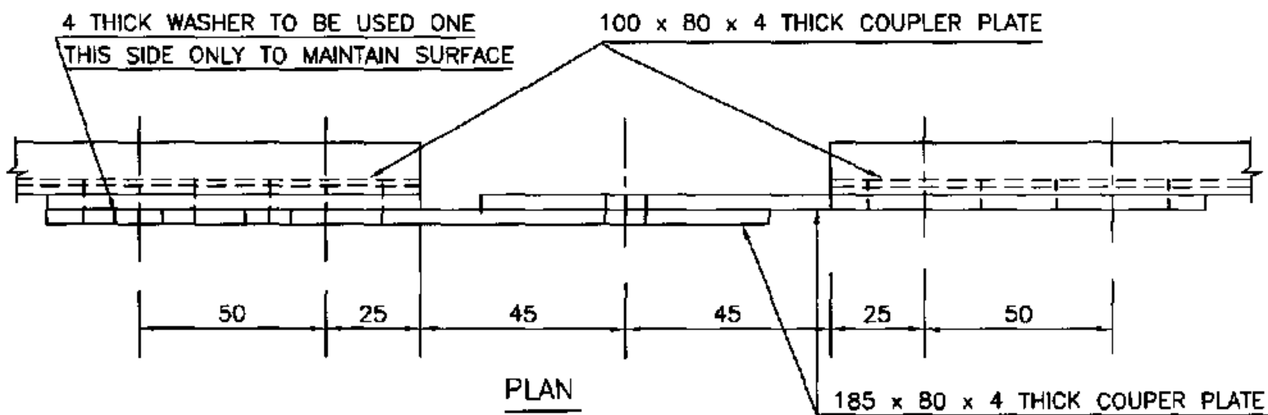
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	PRE-FABRICATED CABLE TRAY COUPLING ARRANGEMENT	PDS:E 536	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	

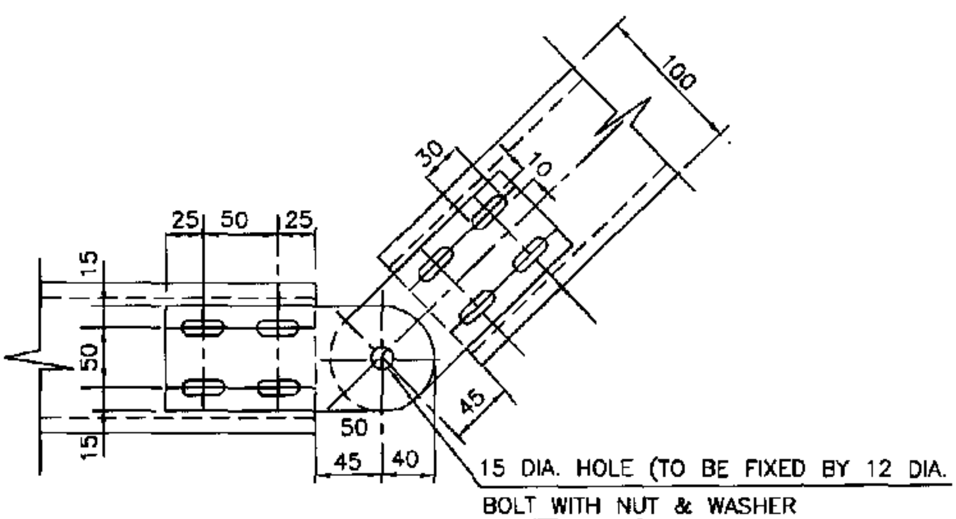


STRAIGHT RUN

SECTION A-A



PLAN
(VIEW FORM B-B)

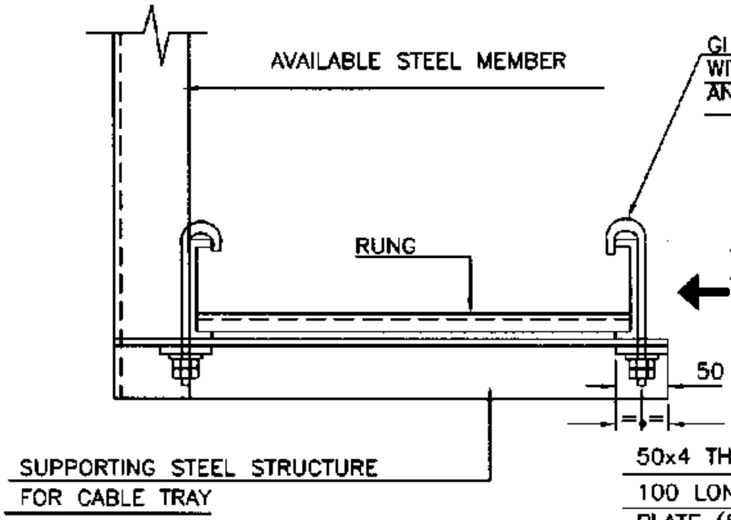


ELEVATION
(ADJUSTABLE BEND)

ALL DIMENSIONS ARE IN mm.

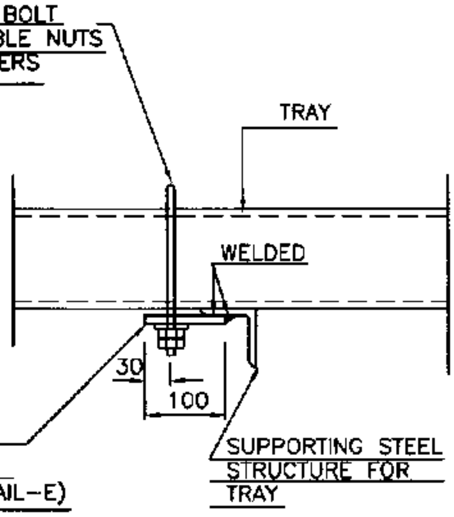
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	PRE-FABRICATED CABLE TRAY FIXING ARRANGEMENT	PDS:E 537	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	

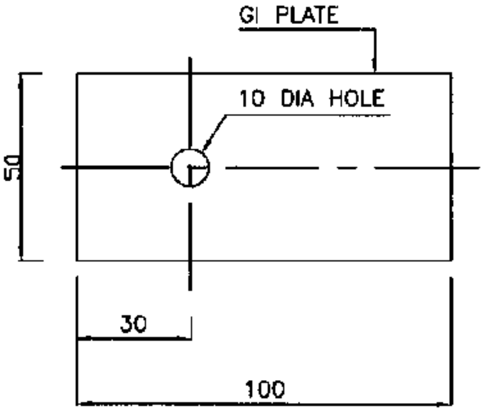


END ELEVATION

(HORIZONTAL RUN)

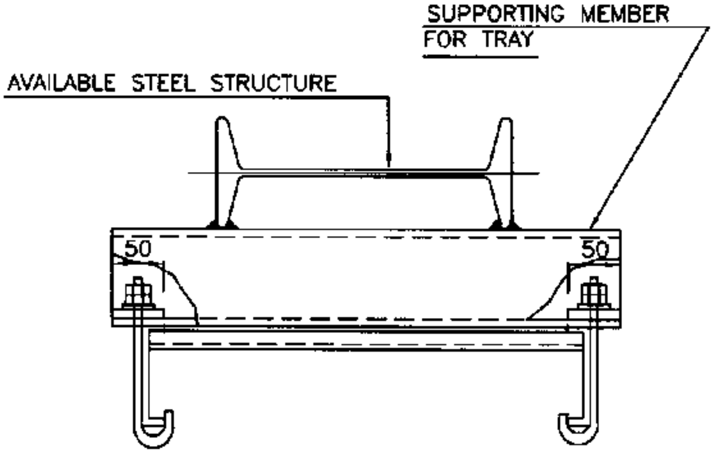


VIEW AT -X



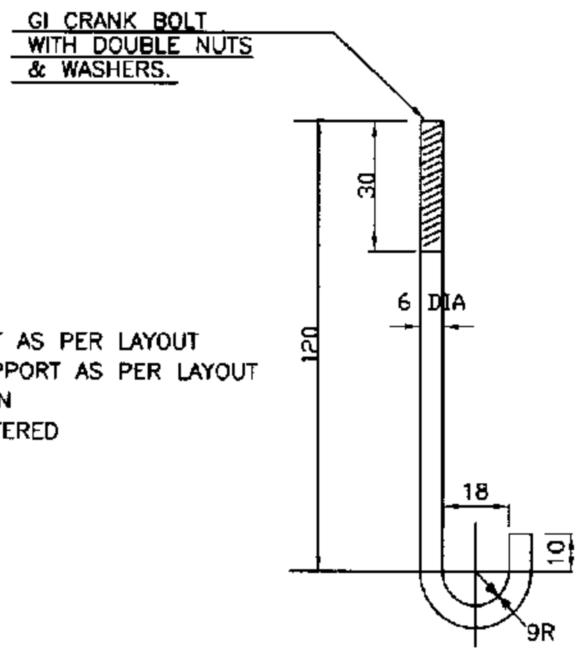
PLAN

DETAIL-E



PLAN

VERTICAL RUN (RISER)

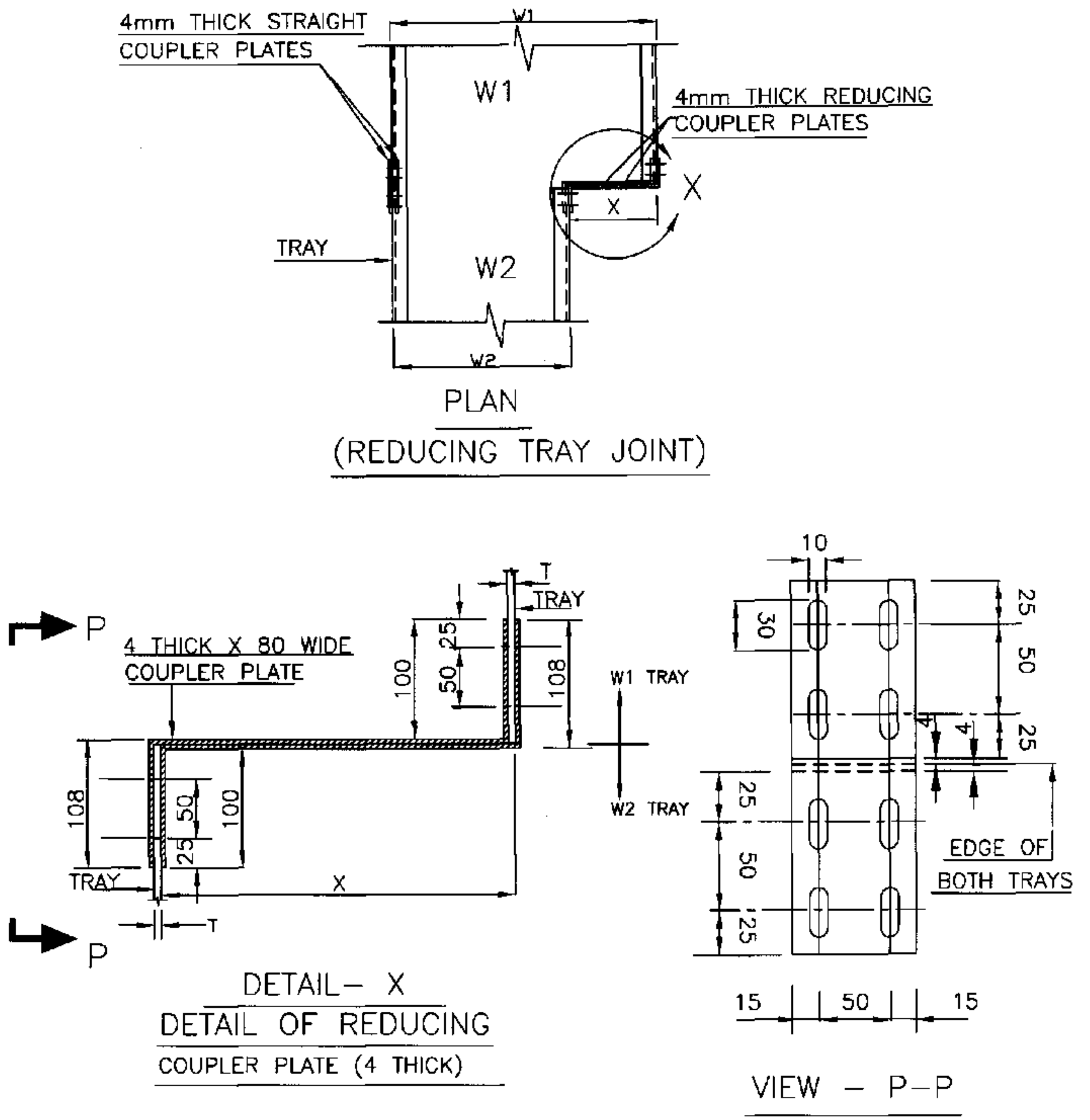


NOTES:-

1. HORIZONTAL RUN TO BE CLAMPED WITH EVERY SUPPORT AS PER LAYOUT
2. VERTICAL RUN/ RISER TO BE CLAMPED WITH EVERY SUPPORT AS PER LAYOUT
3. EACH CRANK HOOK SHALL BE SUPPLIED WITH ONE PLAIN WASHER, ONE SPRING WASHER AND TWO DOUBLE CHAMFERED HEX NUTS. THESE SHAL BE GALVANISED ITEMS.
4. ALL DIMENSIONS ARE IN mm.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

	PRE-FABRICATED CABLE TRAY REDUCING COUPLER PLATE	PDS:E 538	1
PDIL		DOCUMENT NO.	REV
		SHEET 1 OF 1	

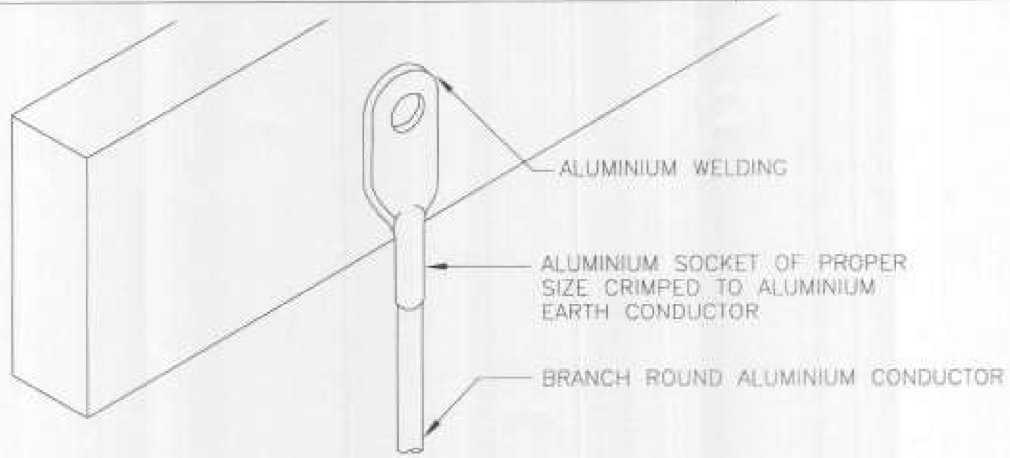


SL. NO.	W1	W2	X
1	900	600 450 300	300 450 600
2	600	450 300	150 300
3	450	300 150	150 300

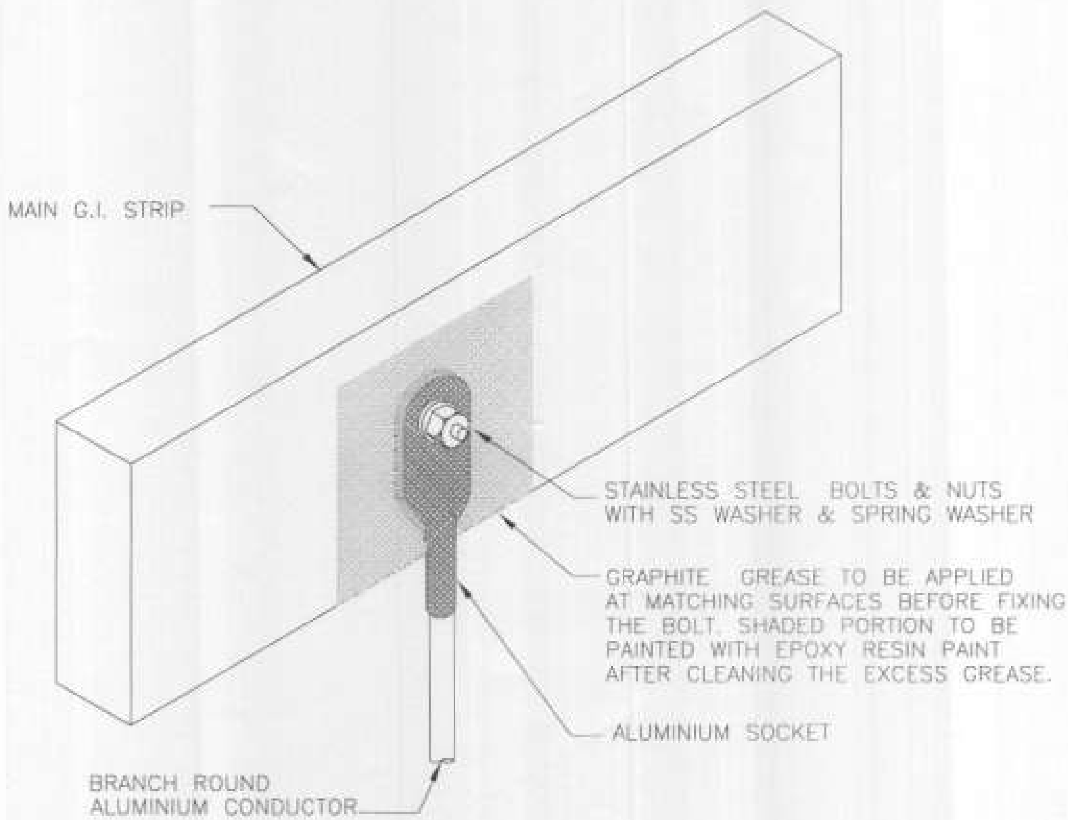
ALL DIMENSIONS ARE IN mm.

REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB

PDIL	ARRANGEMENT OF CONNECTIONS OF EARTH CONDUCTORS (T-JOINT AL STRIP & GI STRIP TO ROUND AL CONDUCTOR)	PDS:E 603	0
		DOCUMENT NO.	REV
		SHEET 1 OF 6	

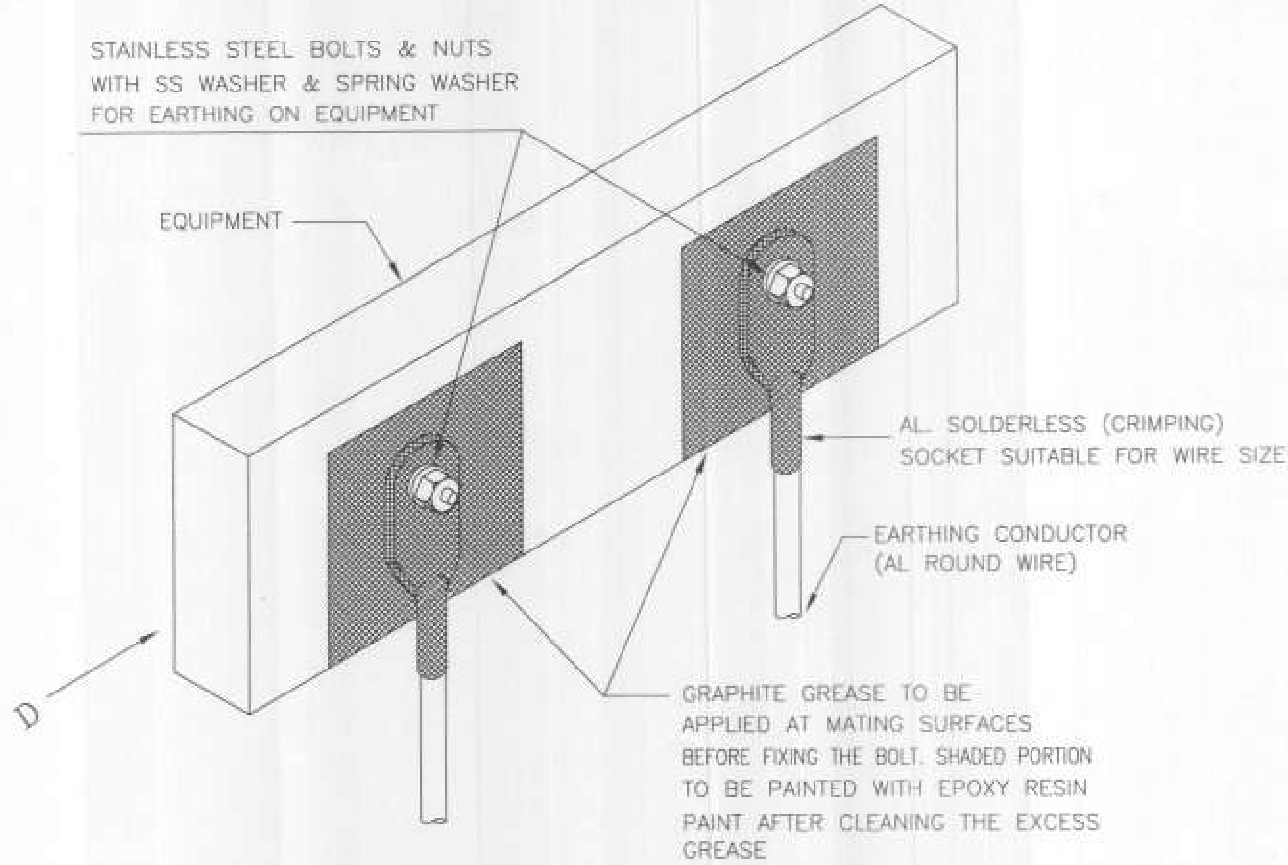


' T ' JOINT ALUMINIUM STRIP TO ROUND ALUMINIUM CONDUCTOR

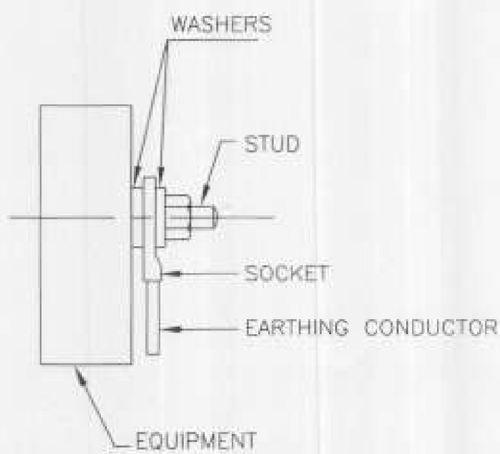


' T ' JOINT G.I. STRIP TO ROUND ALUMINIUM CONDUCTOR

0	03.01.07	15.01.07	ISSUED FOR IMPLEMENTATION	NKR	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



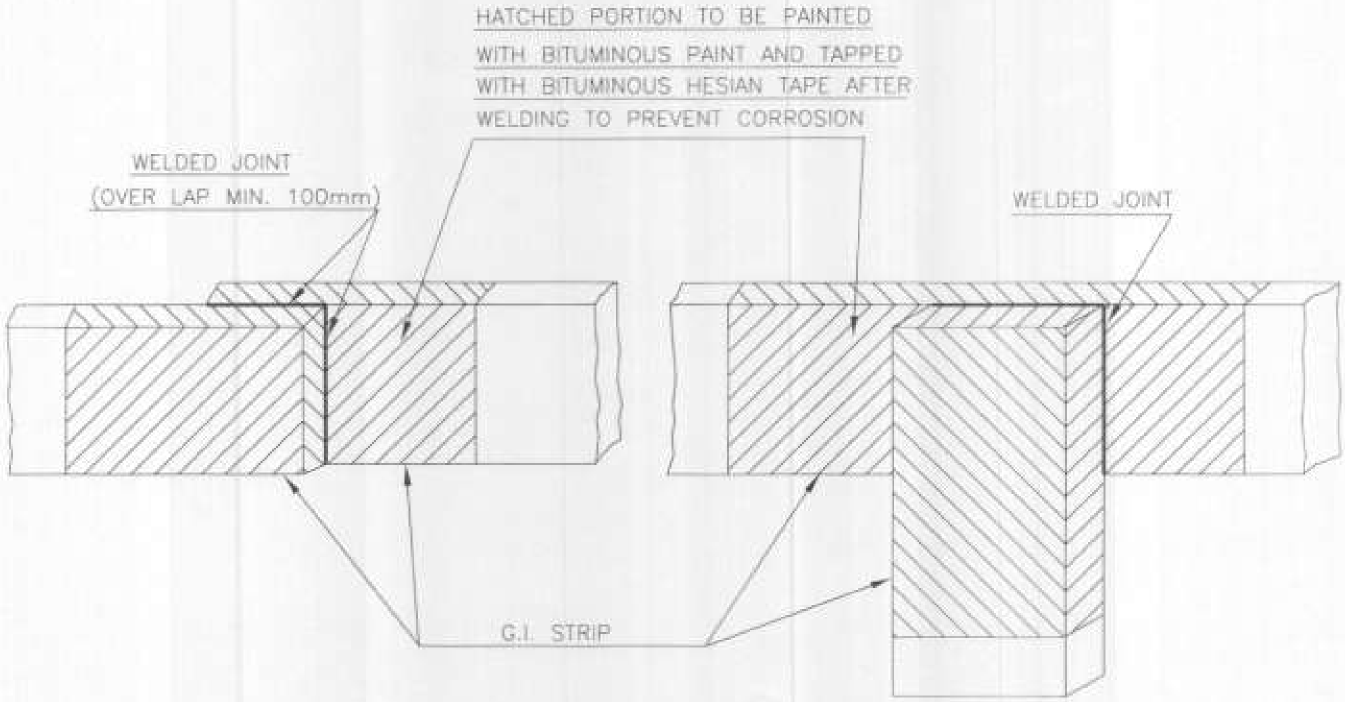
ARRANGEMENT OF DOUBLE EARTH CONNECTIONS TO EQUIPMENT



V I E W F R O M – D

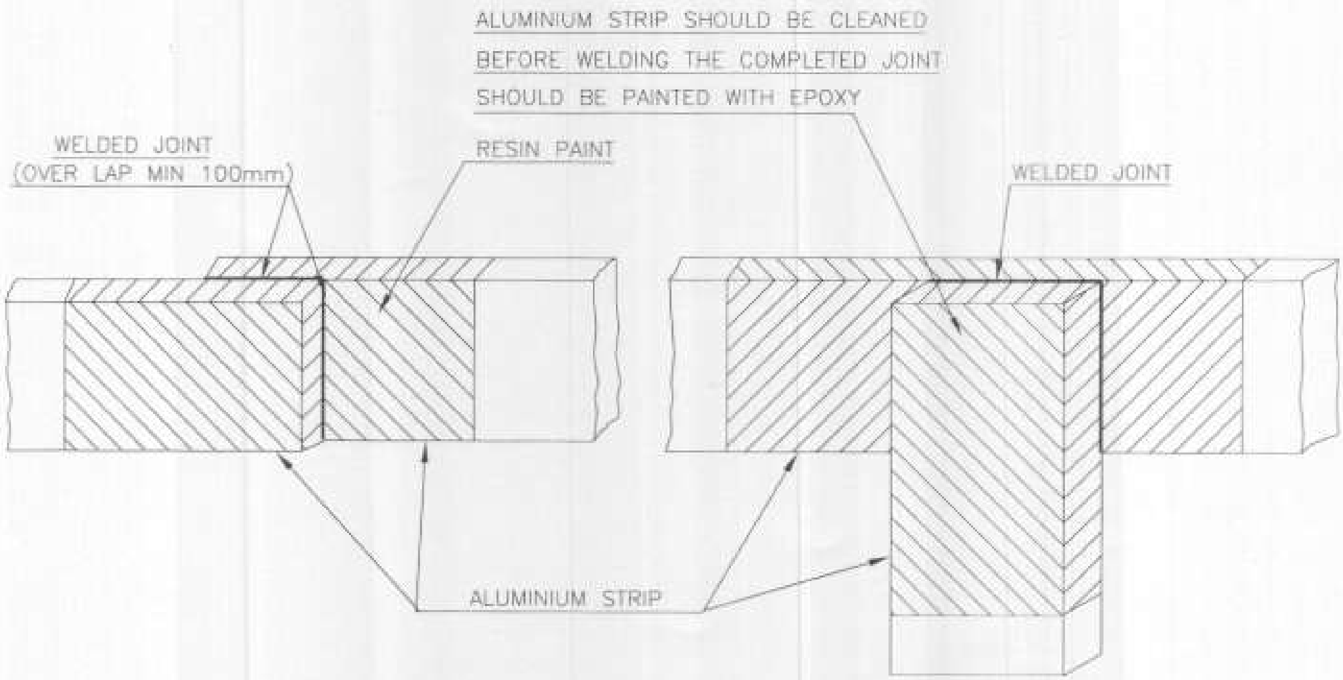
0	03.01.07	15.01.07	ISSUED FOR IMPLEMENTATION	NKR	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	ARRANGEMENT OF CONNECTIONS OF EARTH CONDUCTORS (STRAIGHT & T – JOINT G.I. & AL. STRIP)	PDS:E 603	0
		DOCUMENT NO.	REV
		SHEET 3 OF 6	



STRAIGHT JOINT G.I TO G.I. STRIP

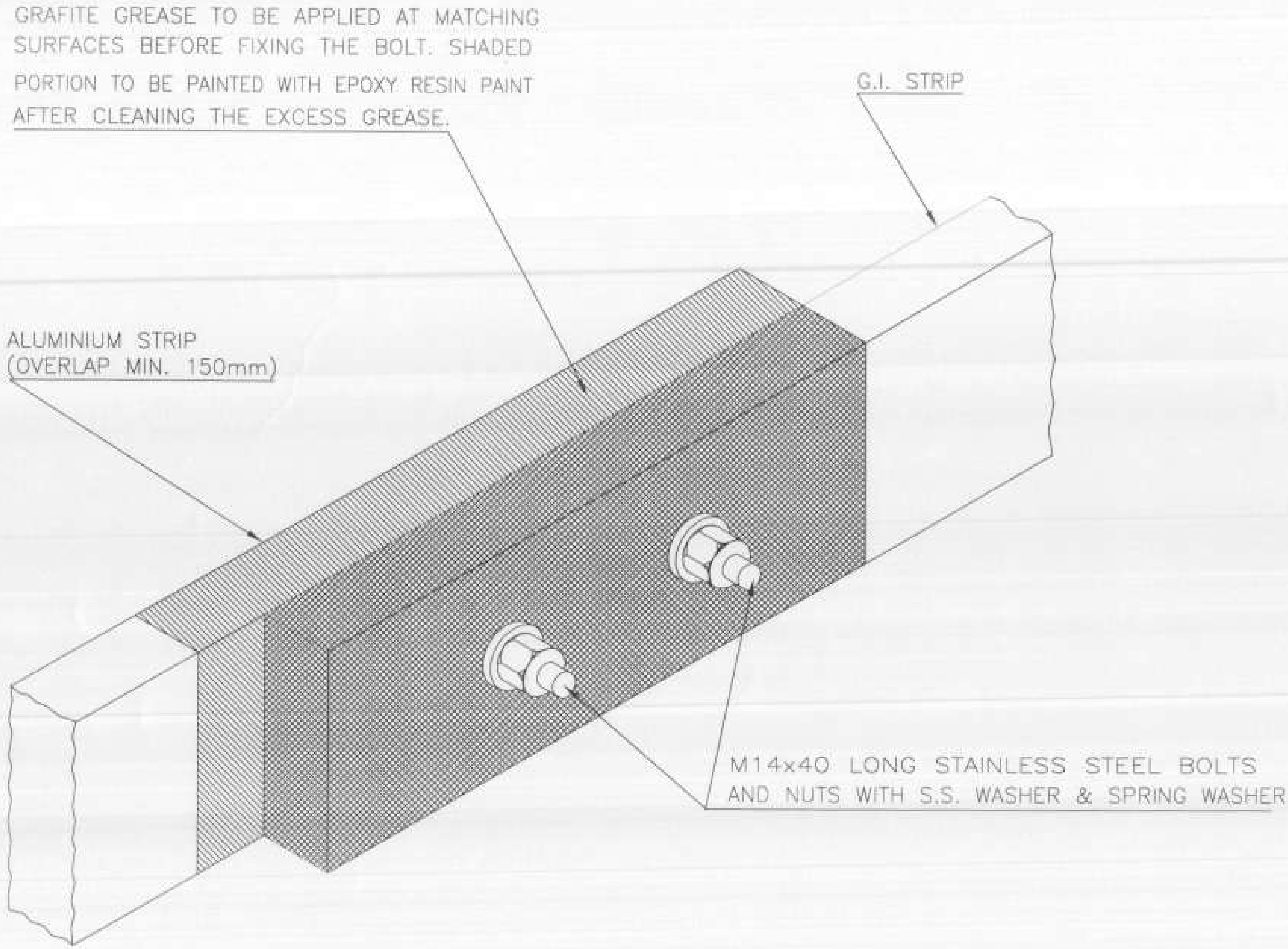
" T " JOINT G.I. TO G.I. STRIP



STRAIGHT JOINT AL. TO AL. STRIP

" T " JOINT AL TO AL STRIP

0	03.01.07	15.01.07	ISSUED FOR IMPLEMENTATION	NKR	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



ARRANGEMENT OF LAP JOINT BETWEEN
AI. EARTH STRIP TO G.I. EARTH STRIP

REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD
0	03.01.07	15.01.07	ISSUED FOR IMPLEMENTATION	NKR	AV	BB

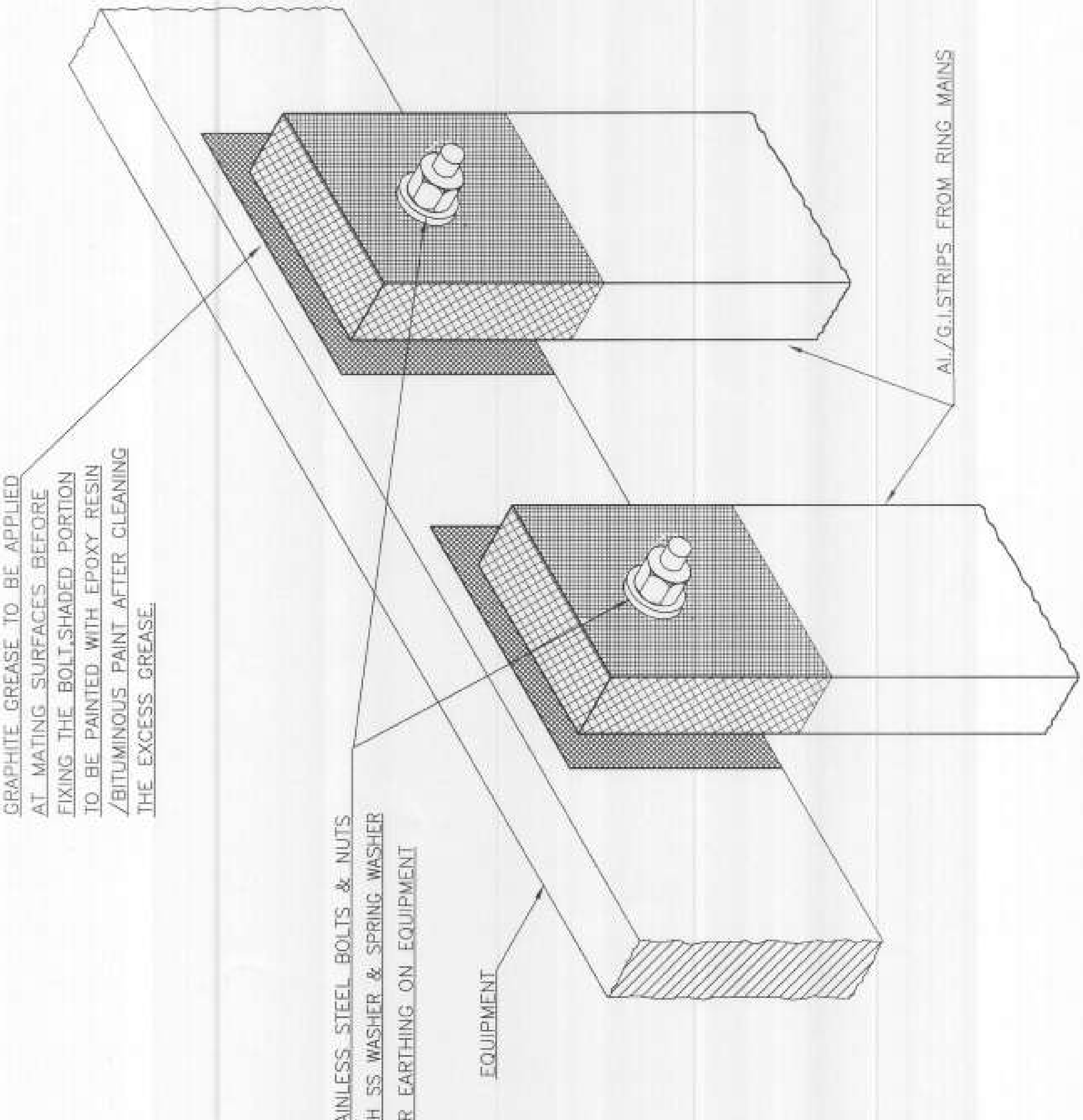
PDIL

ARRANGEMENT OF CONNECTIONS OF EARTH CONDUCTORS
STRAIGHT JOINT GI TO AL STRIP

DOCUMENT NO.	REV
PDS:E 603	0

SHEET 4 OF 6

PDIL	ARRANGEMENT OF CONNECTIONS OF EARTH CONDUCTORS TERMINATION OF AL / GI STRIP AT EQUIPMENT	PDS:E 603	0
		DOCUMENT NO.	REV
		SHEET 5 OF 6	

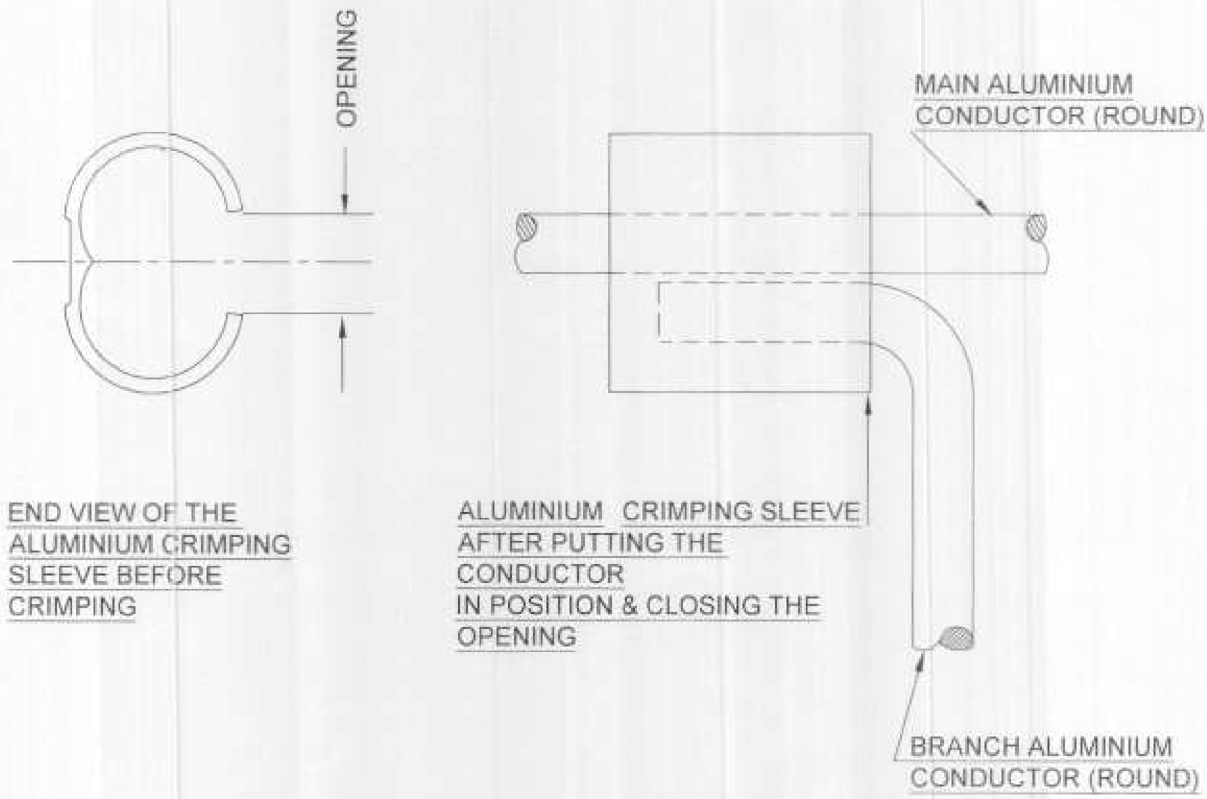


ARRANGEMENT OF DOUBLE EARTH CONNECTION ON EQUIPMENT

NOTE:-

EPOXY RESIN PAINT SHALL BE USED FOR AL STRIP AND BITUMINOUS PAINT FOR G.I.STRIP.

0	03.01.07	15.01.07	ISSUED FOR IMPLEMENTATION	NKR	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



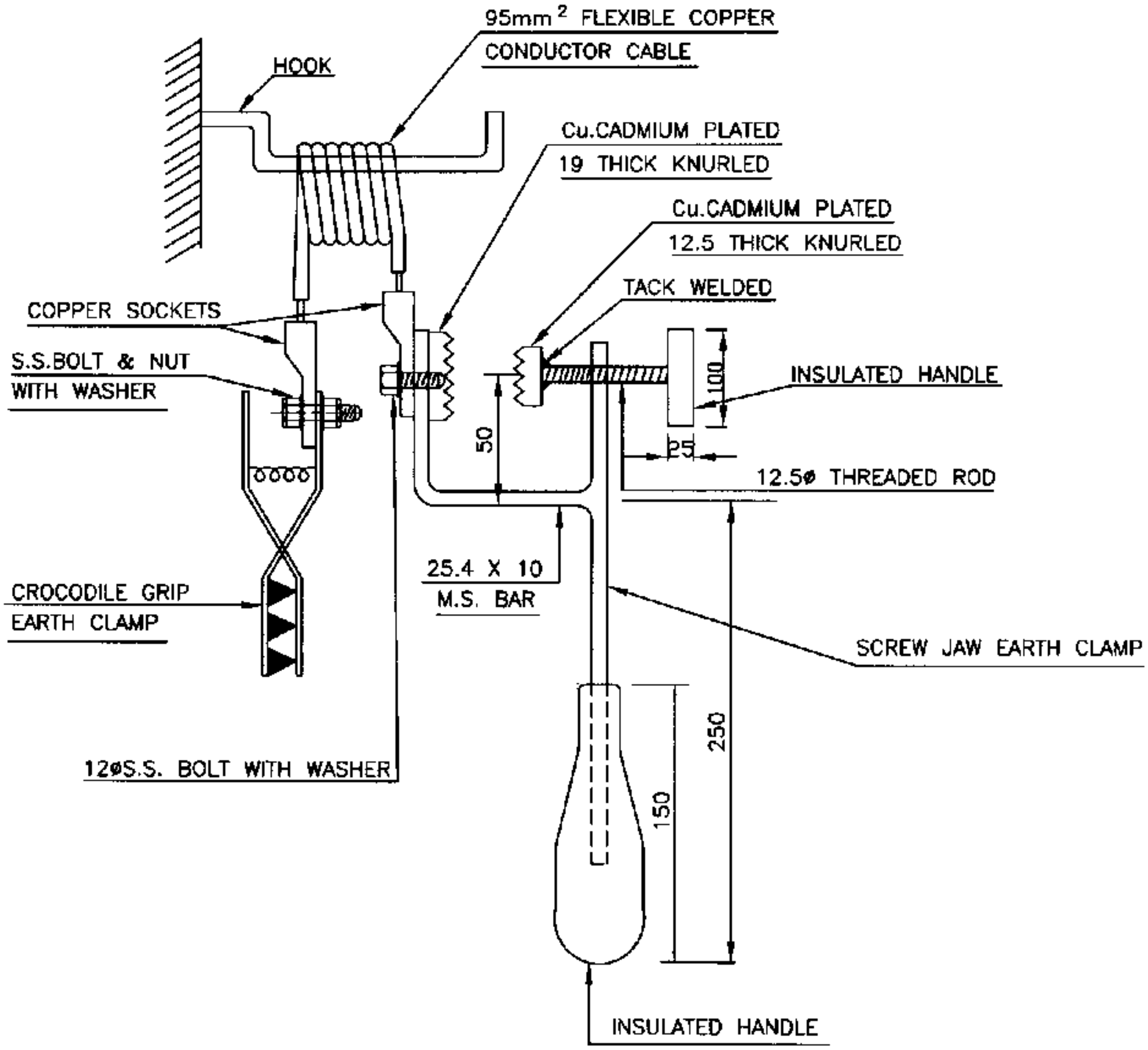
"T" JOINT ROUND ALUMINIUM CONDUCTOR TO ROUND ALUMINIUM CONDUCTOR (CRIMPING TYPE)

NOTE :-

USE CORRECT SIZE OF COMPRESSION DIES.

0	03.01.07	15.01.07	ISSUED FOR IMPLEMENTATION	NKR	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

	TEMPORARY EARTHING ARRANGEMENT FOR MOBILE EQUIPMENT	PDS:E 608	1
PDIL		DOCUMENT NO.	REV
		SHEET 1 OF 1	



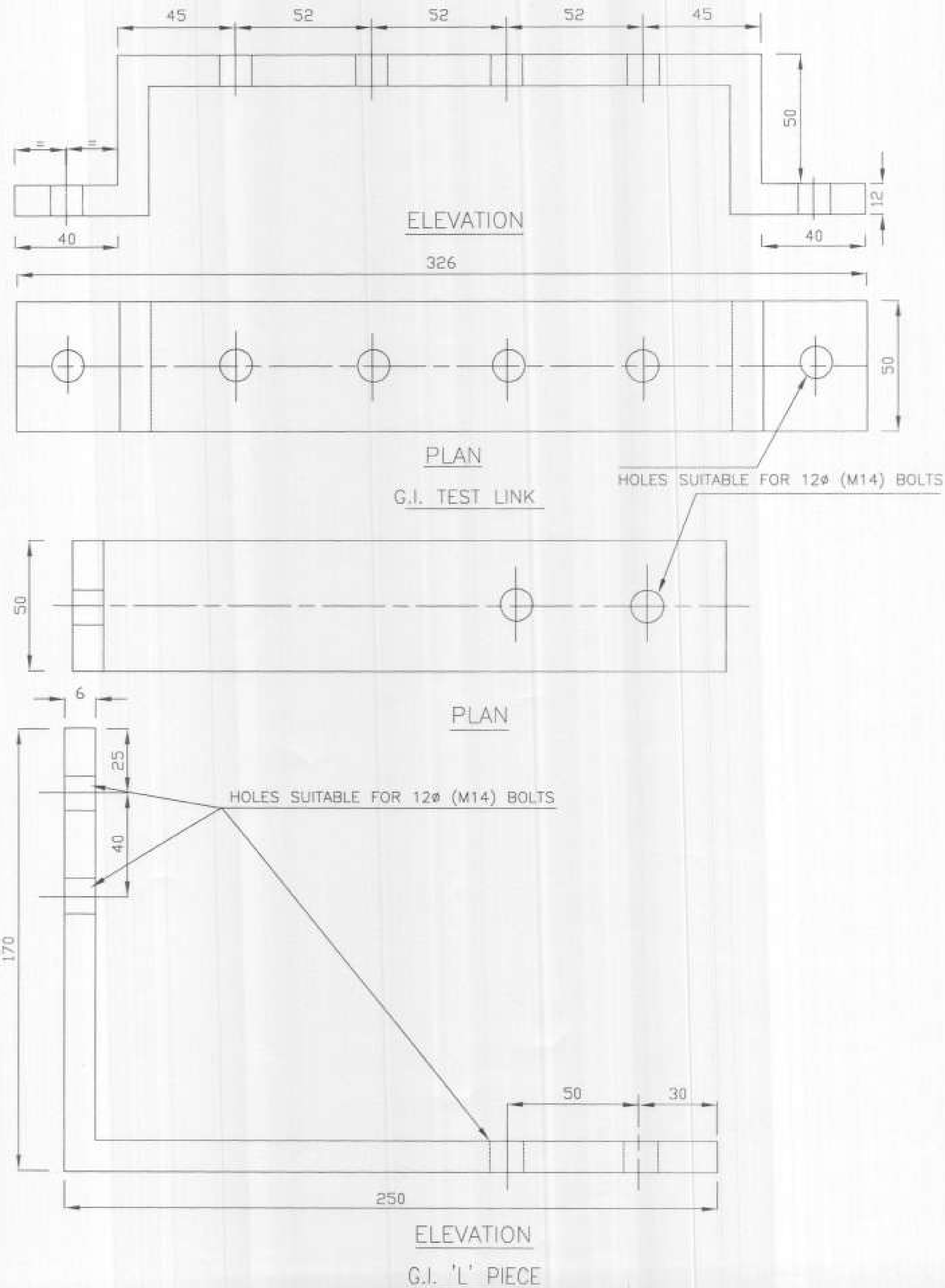
SCALE : N.T.S.

NOTE:-

1. CROCODILE GRIP CLAMP SHALL BE CONNECTED TO THE NEAR BY EARTH STRIP/ EARTH PIT & SCREW JAW CLAMP TO THE MOBILE EQUIPMENT.
2. ALL DIMENSIONS ARE IN mm.

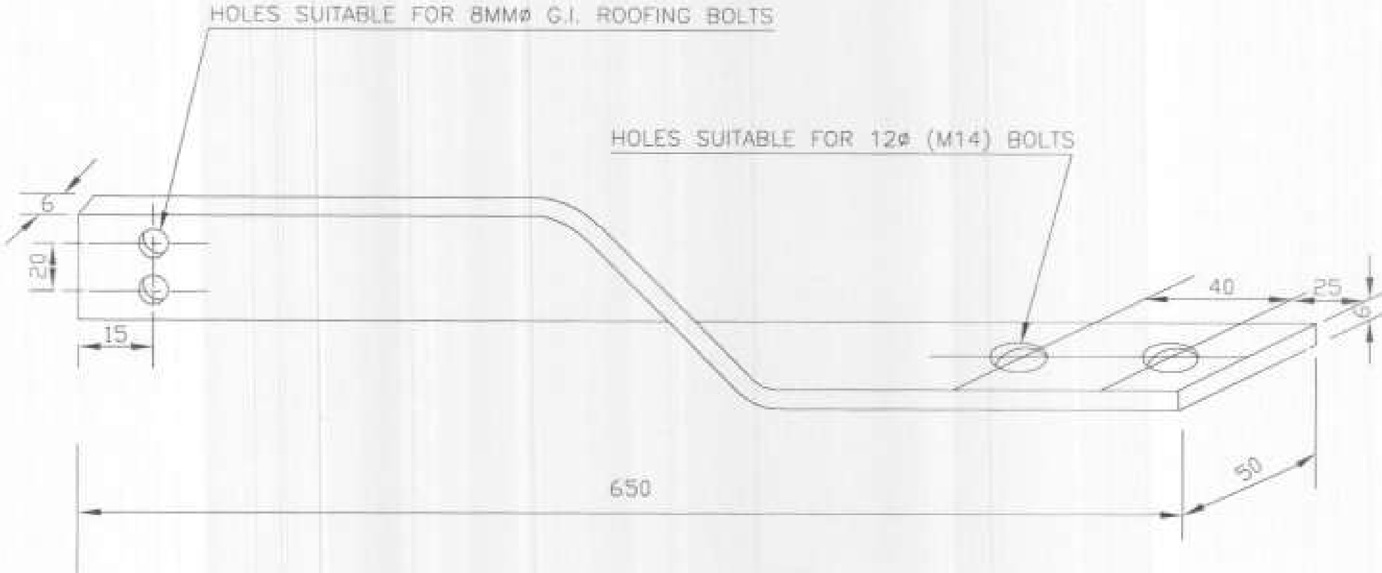
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	GI / AL. ACCESSORIES FOR EARTH PIT	PDS:E 611	0
		DOCUMENT NO.	REV
		SHEET 1 OF 2	

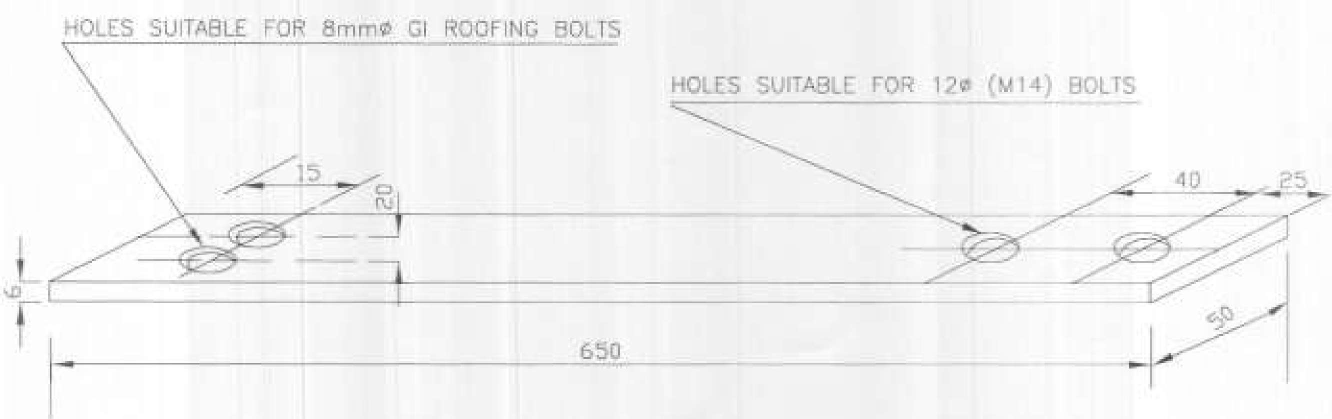


0	03.01.07	15.01.07	ISSUED FOR IMPLEMENTATION	NKR	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	GI/AL. ACCESSORIES FOR EARTH PIT	PDS:E 611	0
		DOCUMENT NO.	REV
		SHEET 2 OF 2	



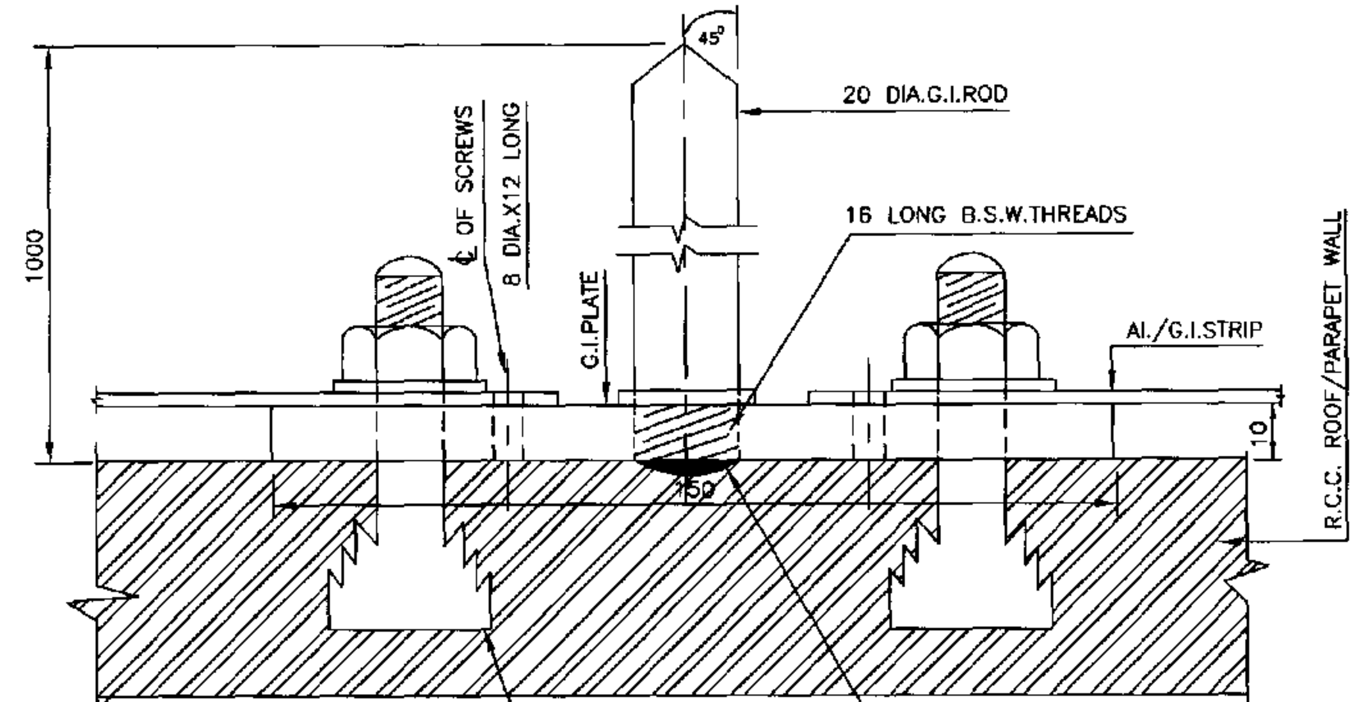
CONNECTING TWISTED ALUMINIUM FLAT PIECE



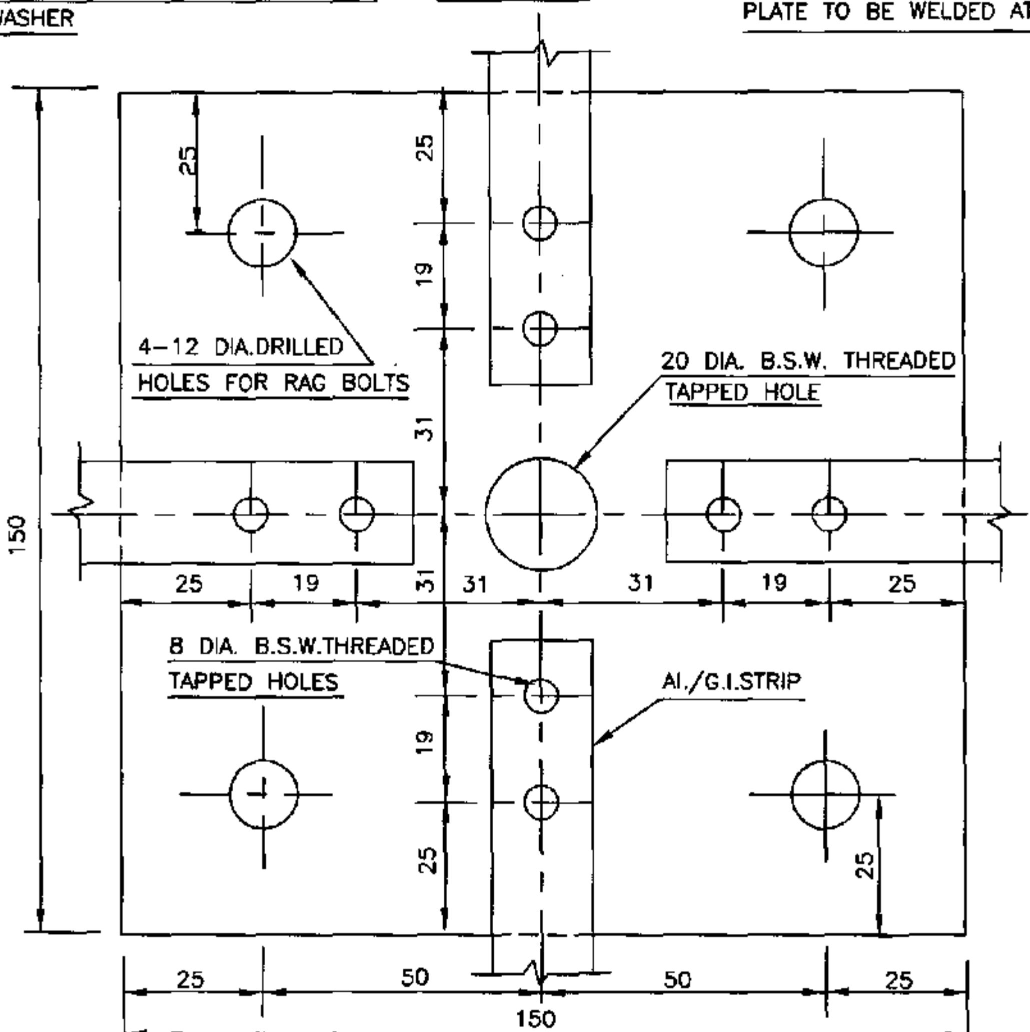
CONNECTING ALUMINIUM / G.I. FLAT PIECE

0	03.01.07	15.01.07	ISSUED FOR IMPLEMENTATION	NKR	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	FIXING ARRANGEMENT OF AIR TERMINATION AND ROOF/DOWN CONDUCTOR FOR LIGHTNING PROTECTION SYSTEM	PDS:E 614	1
		DOCUMENT NO.	REV
		SHEET 1 OF 6	

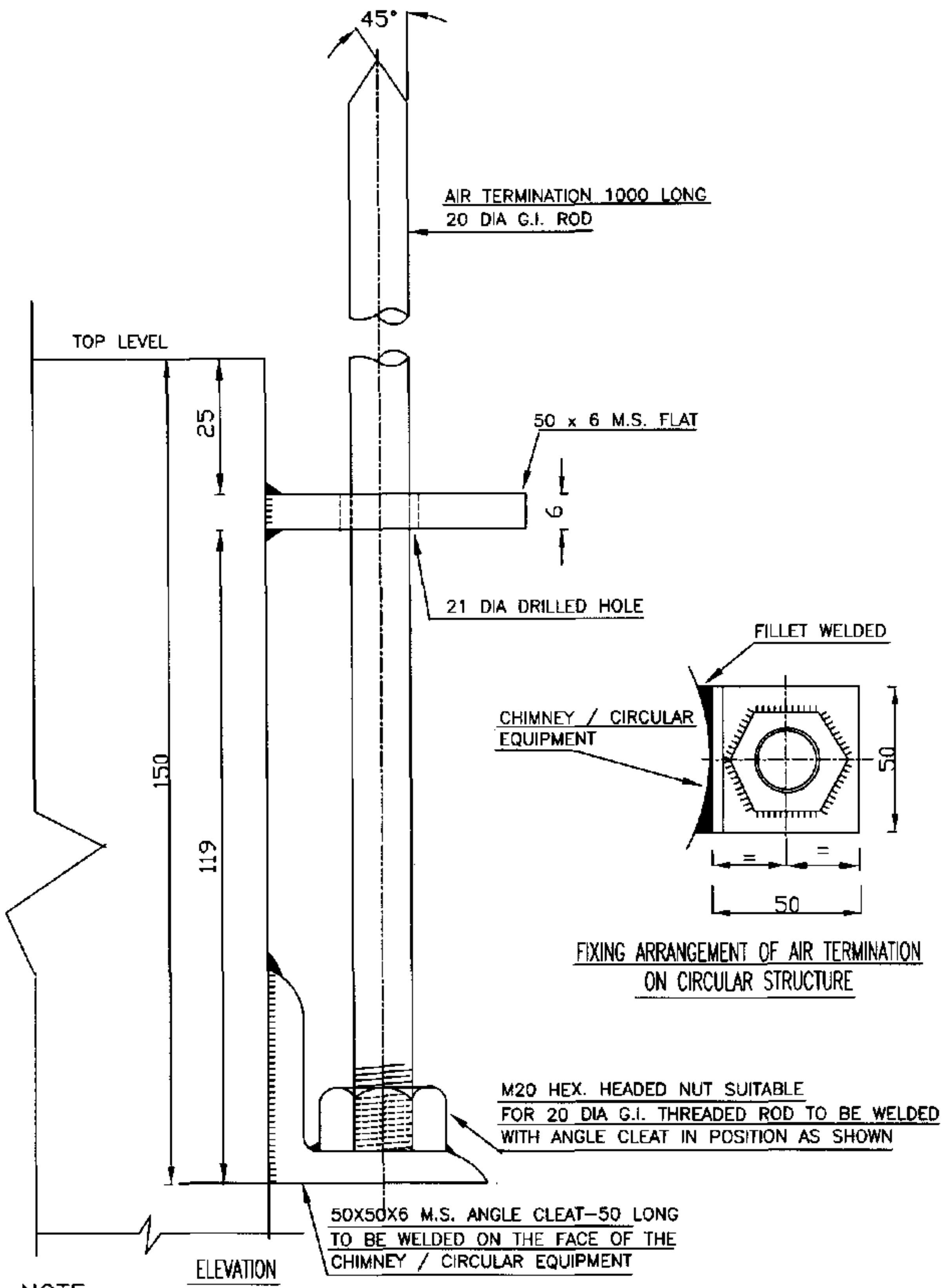


ELEVATION



PLAN

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



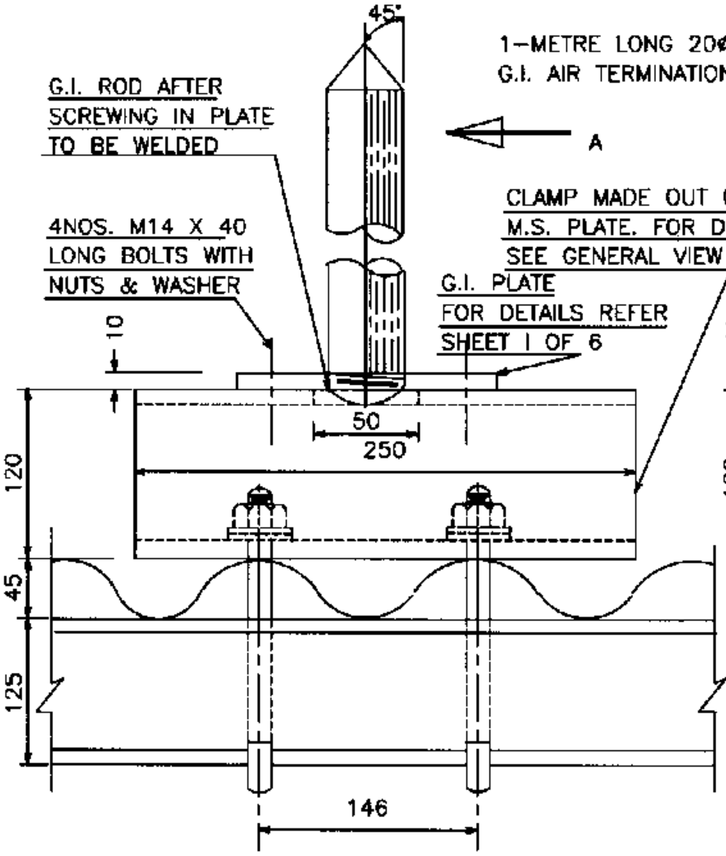
FIXING ARRANGEMENT OF AIR TERMINATION
ON CIRCULAR STRUCTURE

NOTE:-

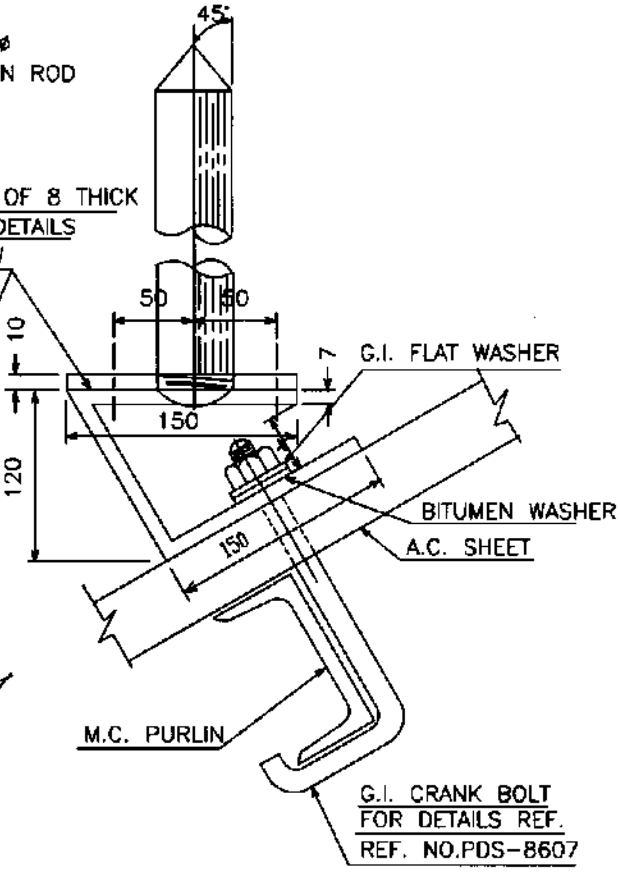
1. FOR DETAILS OF DOWN CONDUCTOR WELDED TO THE BOTTOM OF CHIMNEY / CIRCULAR STRUCTURE REFER PDS:E 613
2. ALL DIMENSIONS ARE IN mm

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

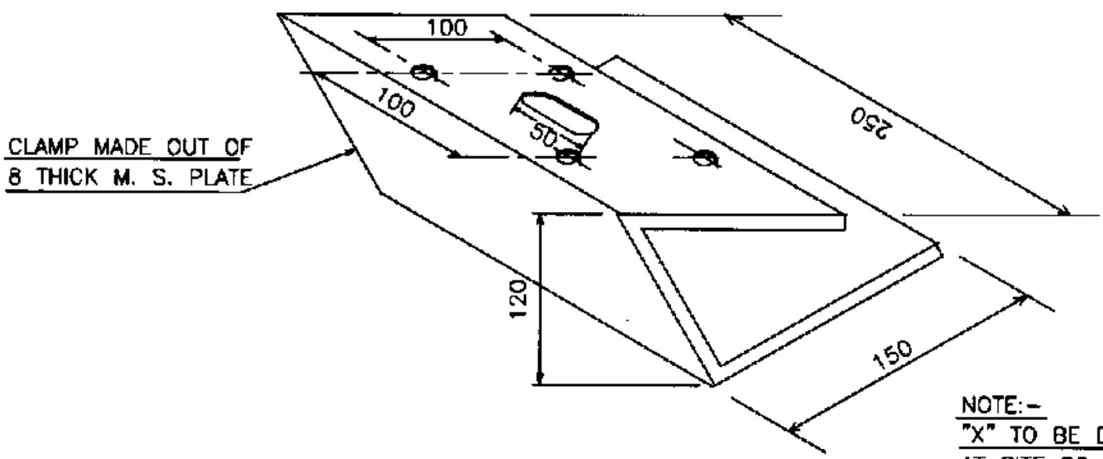
PDIL	FIXING ARRANGEMENT OF AIR TERMINATION & ROOF / DOWN CONDUCTOR FOR LIGHTNING PROTECTION	PDS:E 614	1
		DOCUMENT NO.	REV
		SHEET 3 OF 6	



FIXING ARRANGEMENT OF AIR TERMINATION ON A.C.SHEET



SIDE VIEW AT-A

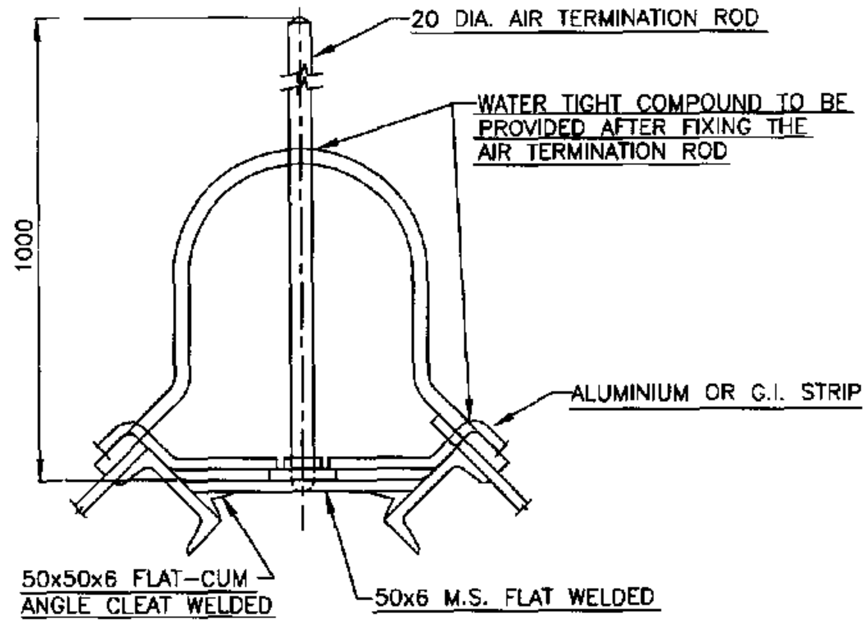


GENERAL VIEW OF CLAMP

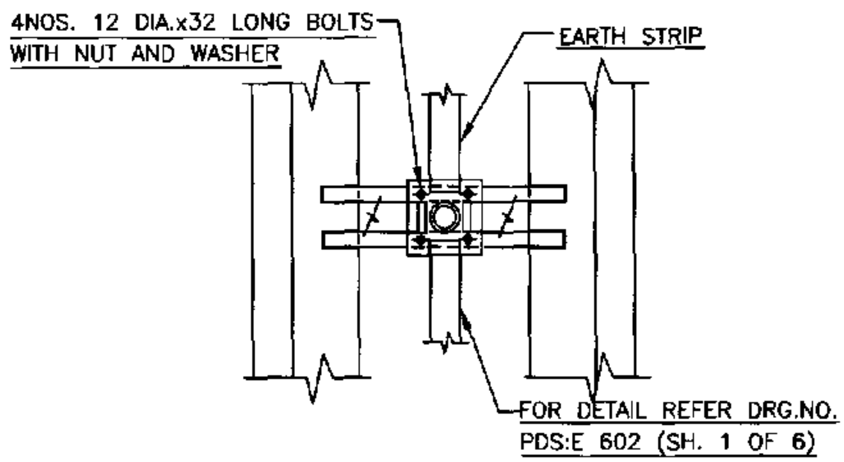
NOTE:-
"X" TO BE DECIDED AT SITE SO THAT TOP EDGE WHEN INSTALLED WILL BE STRAIGHT.

DIMENSIONS ARE IN MM.

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



ELEVATION

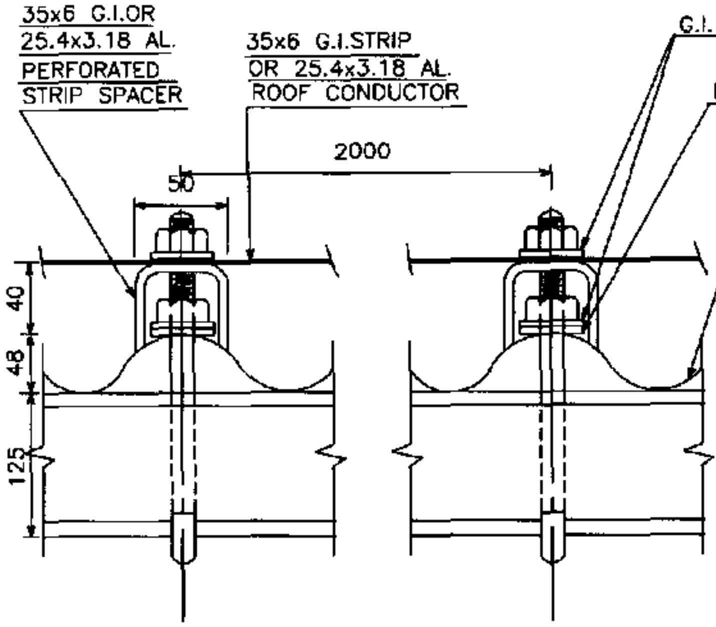


PLAN (RIDGE REMOVED)

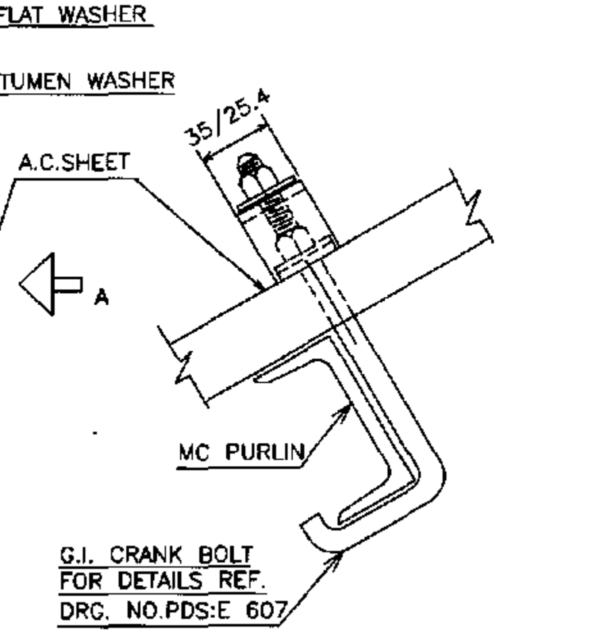
FIXING ARRANGEMENT OF AIR TERMINATION ON RIDGE OF A.C. SHEET ROOF

NOTE :
ALL DIMENSIONS ARE IN mm.

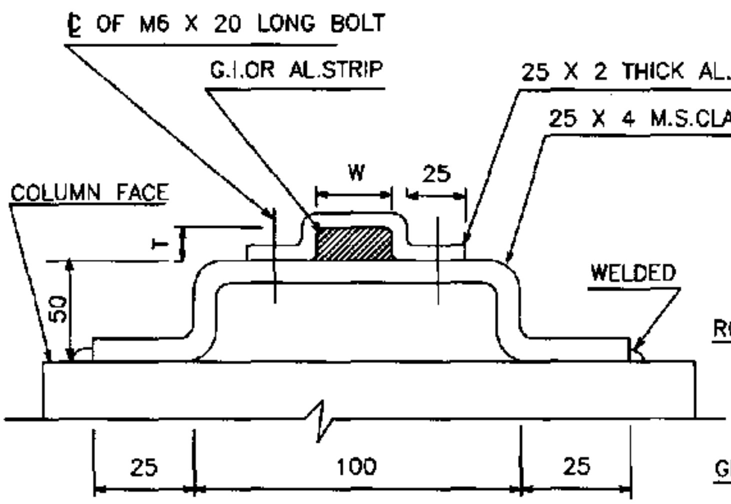
1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



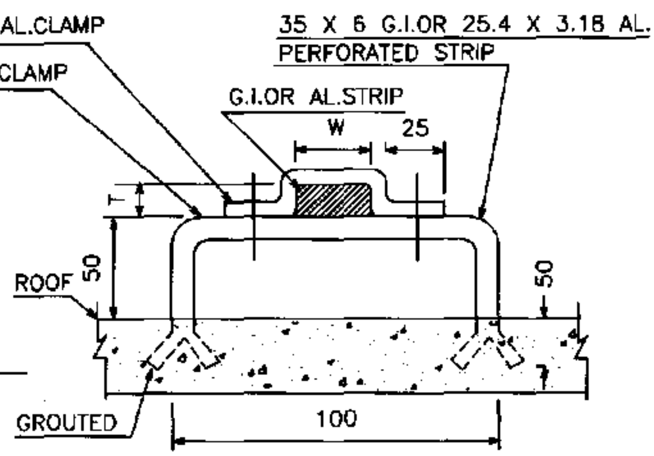
FIXING ARRANGEMENT OF ROOF/DOWN CONDUCTOR ON A.C. SHEET



SIDE VIEW AT–A



FIXING ARRANGEMENT OF ALUMINIUM OR G.I. DOWN CONDUCTOR ALONG STEEL COLUMN



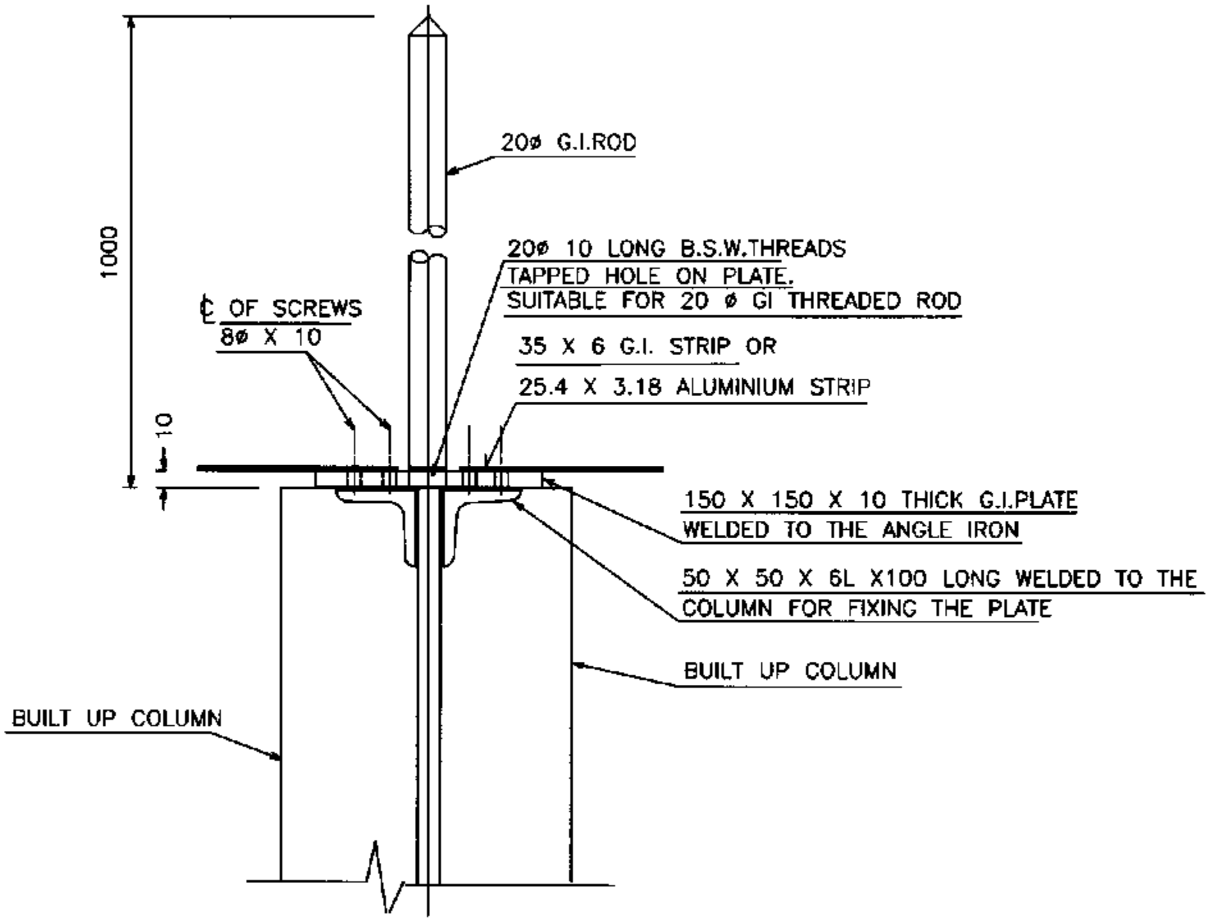
FIXING ARRANGEMENT OF G.I. OR ALUMINIUM ROOF/DOWN CONDUCTOR ALONG ROOF OR R.C.C.WORK

NOTE:–

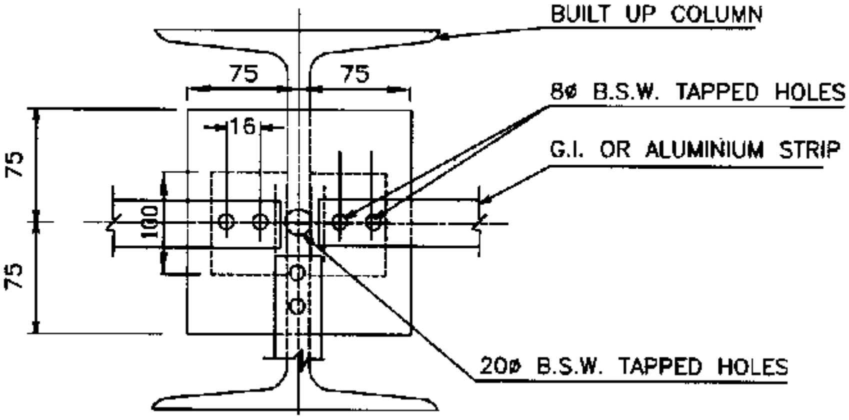
1. a) W = WIDTH OF G.I.OR ALUMINIUM EARTHING STRIP
   b) T = THICKNESS OF G.I.OR ALUMINIUM EARTHING STRIP
2. ROOF/DOWN CONDUCTOR TO BE CLAMPED @ 1 METRE INTERVAL TO THE MEMBER OF COLUMN/R.C.C. WORK
3. DIMENSIONS ARE IN MM

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	FIXING ARRANGEMENT OF AIR TERMINATION & ROOF / DOWN CONDUCTOR FOR LIGHTNING PROTECTION	PDS:E 614	1
		DOCUMENT NO.	REV
		SHEET 6 OF 6	



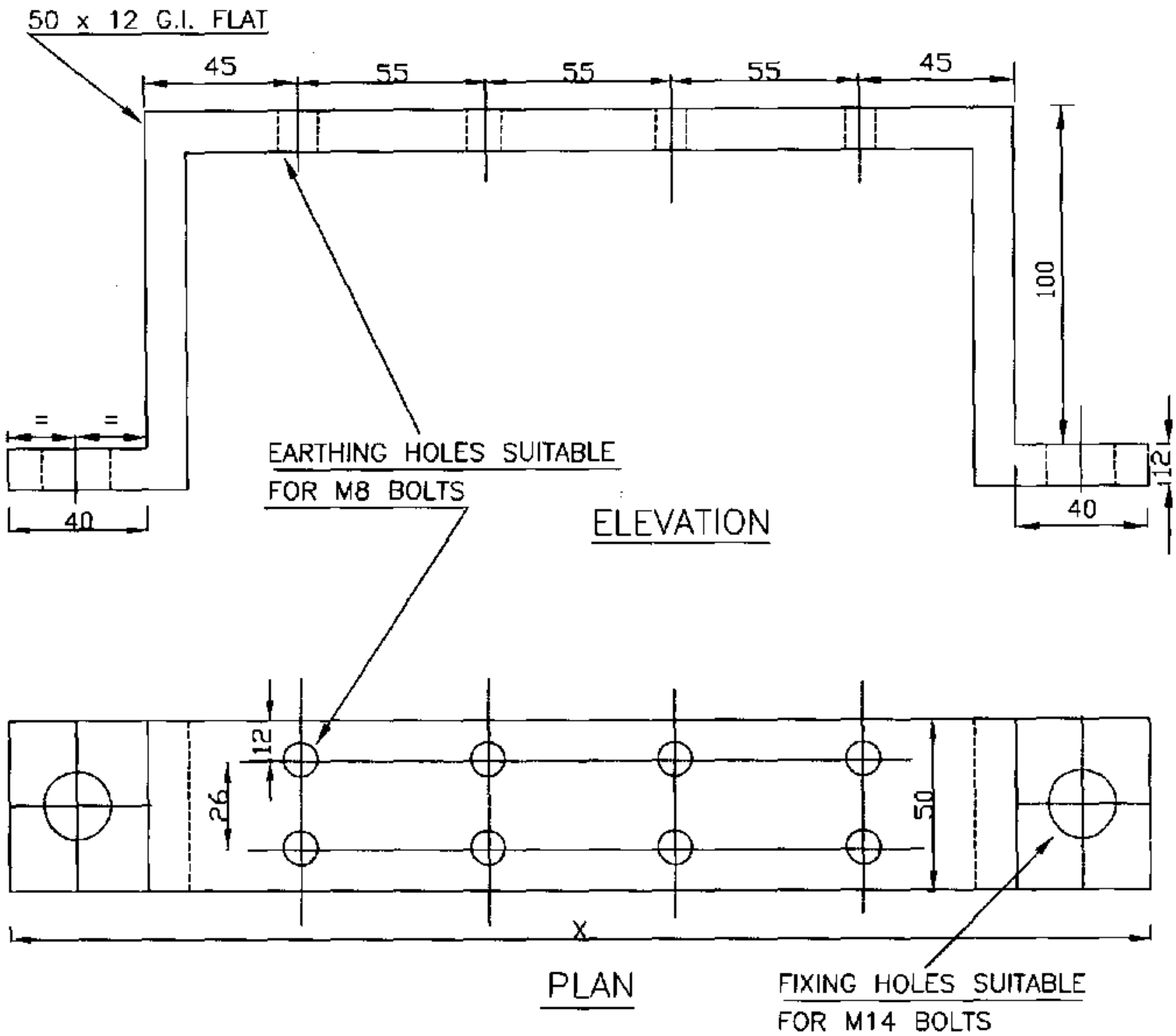
SEC. ELEVATION



PLAN

FIXING ARRANGEMENT OF AIR TERMINATION ON BUILT UP COLUMN

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



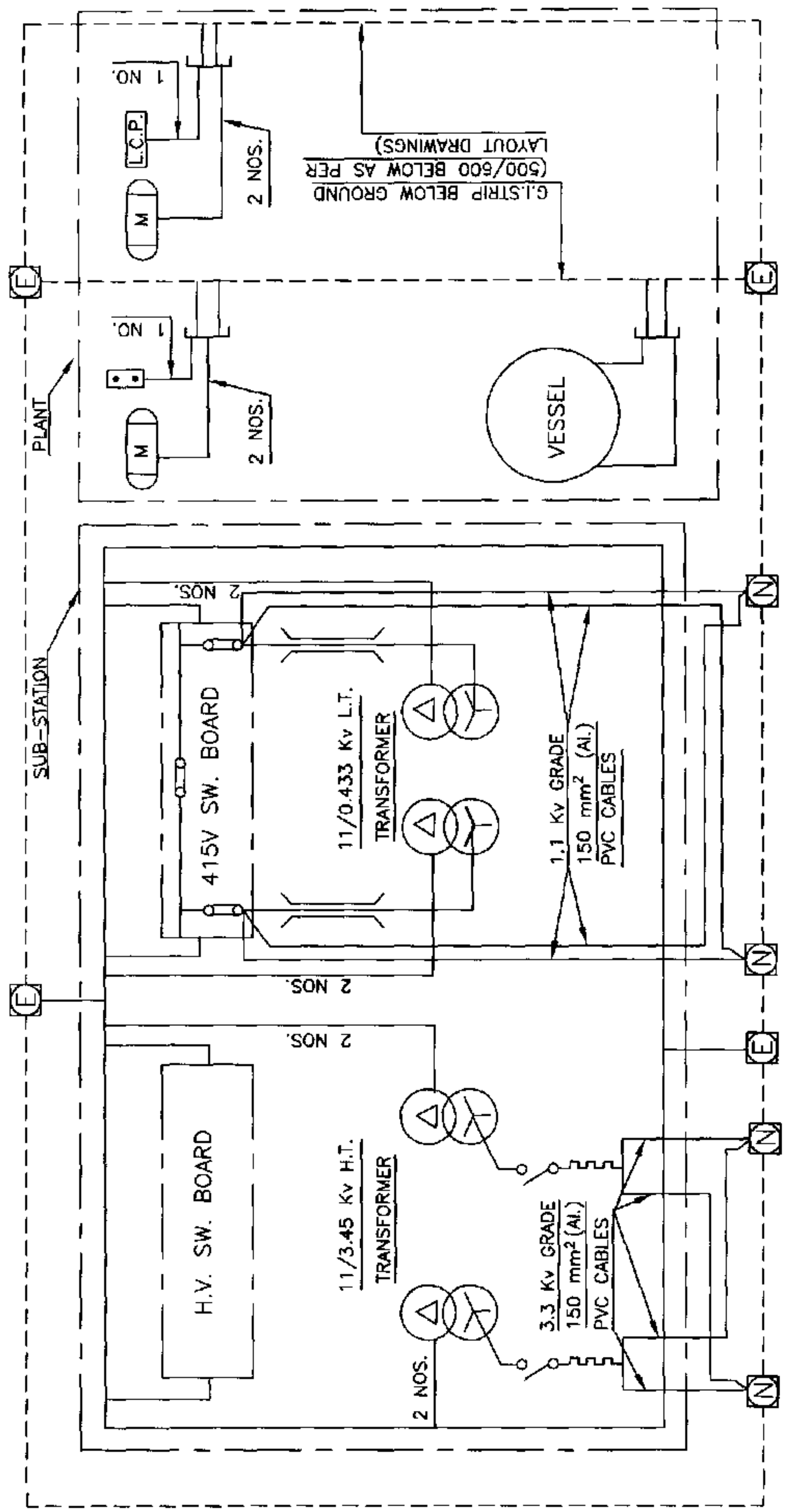
TYPE OF EARTH BUS	NO.OF EARTHING HOLES	OVERALL LENGTH x (mm)
1	8	335
2	10	390

NOTES:–

1. LOCATION OF EARTH BUS TO BE DECIDED AS PER EQUIPMENT POSITION AT SITE.
2. EARTH BUSES SHALL BE LOCATED ON STRUCTURES/COLUMNS WALLS/EQUIPMENT FOUNDATION ETC.
3. MOUNTING HEIGHT OF EARTH BUS SHALL NOT BE LESS THAN 500mm FROM FINISHED FLOOR LEVEL
4. ALL DIMENSIONS ARE IN mm

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

PDIL	TYPICAL ARRANGEMENT FOR NEUTRAL AND EQUIPMENT EARTHING	PDS:E 617	1
		DOCUMENT NO.	REV
		SHEET 1 OF 1	



REF. DRGS.

1. EARTH PIT DETAILS - PDS:E 605
2. EARTH CONDUCTOR SIZES - PDS:E 602 (2 SHEETS)

NOTE :-

EARTH BUS SHALL BE 500 ABOVE FROM FLOOR LEVEL

LEGEND

- MOTOR
- LOCAL CONTROL PANEL
- LOCAL CONTROL STATION
- NEUTRAL EARTH PIT
- EARTH PIT FOR SYSTEM
- NEUTRAL LINK
- TPN BUS DUCT
- NEUTRAL EARTHING RESISTOR
- SWITCH
- EARTH BUS

1	16.01.06	30.01.06	ISSUED FOR IMPLEMENTATION	RUNDA	AV	BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

SCHEDULE OF RATES

FOR ELECTRICAL WORKS (SUPPLY & ERECTION)

CONSTRUCTION POWER SYSTEM AND ASSOCIATED ELECTRICAL FACILITIES

FOR

2000 TPD COAL TO AMMONIUM NITRATE PROJECT

BCGCL, LAKHANPUR (ODISHA)

1	The schedule of rates is to be read in conjunction with Technical Specification of Construction Power System & Associated Electrical facilities and other relevant sections / sub sections.
2	The price indicated shall be applicable to all heights.
3	Owner/Consultant reserves the right to interpolate or extrapolate the rate for any item from the rates available for similar work in the Schedule of Rates.
4	Whenever it is mentioned in the specifications that the bidder shall perform certain work or provide certain facilities/materials or certain item or activity is in bidder's scope of services it is understood that the bidder shall do so at his own cost within the item rates unless expressly stated otherwise.
5	Unit rates shall include the cost of labour, supervision and consumables, cost towards providing necessary tools and tackles, and providing all the required facilities for execution and inspection, testing, guarantees etc. as per scope of work and Technical specification and other relevant sections / sub sections etc. listed in ITB. Minor repair and touch painting work towards providing all required facilities for execution shall be in bidder's scope.
6	All supply items shall be of superior quality. These shall conform to relevant IS and shall be of approved make.
7	Quantities mentioned in SOR are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site.
8	Any item specifically not indicated but considered necessary for completion of job shall also be quoted by the bidder under separate sheet. Work shall also include any other item of work required to complete the work in all respect as per the specifications, drawings and instructions of the Engineer-in-charge whether specifically mentioned or not in the tender document.
9	Work shall involve, at every stage, correct identification of all equipment including loose equipment from stores, identifying spare items / excess items, listing the same and carefully storing them under the custody of the contractor. Information to this extent shall be passed on to the concerned Engineer-in-charge / owner. Certification of balance items after erection and return to the Engineer in-charge / Owner so assigned.
10	The quantities indicated in SOR are estimated quantities and may change during detailed engineering as per site condition. Quantity of some or all the items may increase or decrease up to any extent at the time of actual execution, however the total contract value shall be limited to total increase or decrease of 25% only. Successful bidder shall supply the equipments at the same rate as per these change quantities, irrespective of the changes in quantity of individual items. Payment shall be made as per actual quantities executed.
11	All equipment shall be deemed to have clear tags, descriptive letter writing indicating locations / sources (from - to), cable sizes, circuit no., unit no., and any other writing required to make installation completely informative. All costs in view of above shall be deemed to have been included in installation / commissioning.
12	Work shall involve, at every stage, correct identification of all equipment including loose equipment from stores, identifying spare items / excess items, listing the same and carefully storing them under the custody of the contractor. Information to this extent shall be passed on to the concerned Engineer-in-charge / owner. Certification of balance items after erection and return to the Engineer in-charge / Owner so assigned.
11	All primary & secondary injection tests & testing of relays and other equipment as per relevant IS, code of practice for testing and commissioning shall be deemed to have been included for testing & commissioning. No extra charges shall be provided for the same.
12	The Contractor must visit BCGCL sites to assess the quantum and nature of work before quoting. However, the Contractor shall inform PDIL / BCGCL, 1 week prior to their visit to the site.
13	Owner reserve their right to execute any additional works / extra works, during the execution of work, either by themselves or by appointing any other agency, even though such works are incidental to and necessary for the completion of works awarded to the Contractor. In the event of such decisions taken by Owner, Contractor is required to extend necessary cooperation, and act as per the instructions of Engineer-in-Charge.
14	Before procurement of any equipment / material, the Contractor shall submit drawing / document, Compliance Statement supported by Product Catalogue for review / approval. PDIL / BCGCL shall indicate the quantity of equipment / material to be procured during approval of respective equipment Document.
15	Transformers, LV Switch board, shall be designed, manufactured and supplied by OEM (Original Equipment Manufacturer). Supply of these equipments from channel partner, franchise or sub vendors of the OEM/Contractor shall not be acceptable in any case.
16	Bidder to submit drawings & documents of HT switchboard, Transformers, within 15 days of issue of issue of LOI/LOA whichever is earlier for owner's approval before manufacturing of equipment.

ITEM NO.	DESCRIPTION	UNIT	Qty	Unit Price (In INR)	Total Price (in INR)
A	**SUPPLY OF ELECTRICAL ITEMS (PART A)**				
1	**Four Pole Structure with Accessories**				
	Design,Supply of 6.6 kV, 1250 A 21 kA for 3 sec,50 Hz $\pm$ 5%, 4 pole structure with one sets of incomer and two set of outgoing along with required bracing,cross arm etc for supporting the pin/strain type insulators,Guy wires as required, GOD, DO fuses (3No) with necessary 10KA lightening arresters,earth switch,CT,PT,Insulators,Jumpers,Anti climbing device,Danger board etc suitable for receiving power from MCL/SEB as per enclosed specifications, SLD, SEB guidelines etc including this shall also includes supply of chain link fencing of 2.5 mtr height around HT Yard comprising of 100x50x6 mm MS channels at every 1.8 mtr centres, 65x65x6mm angles, 8 swg GI mesh of 50x50 mm opening, washers, nuts, bolts, locknuts etc & Supply of well graded crushed stone aggregate varying in size from 20mm to 50mm mixed with clean sand in the ratio 2.5 part of stone aggrgate to 1 part of clean sand having less than 75 micron size as per enclosed specifications, SLD,SEB guidelines etc	Set	2		
2	**6.6KV RMU (OUTDOOR TYPE WITH KIOSK)**				
	Supply of SF6 insulated, 6.6KV, 630A RMU with all accessories such as 6 nos. VCB, Line PT and auxiliary transformer with metering, protection and power pack with self sustained battery bank for duration of 1 hours etc. as specified in Technical specification Doc. No. PC298-TS-0801.	Set	2		
3	**6.6KV CSS (Compact Sub Station)**				
	Design, engineering, manufacture, assembly, inspection and testing of equipment at manufacturer's works, painting, packing and forwarding, reinforcement for shipping (if required), securing and loading on sea vessel (if required), documentation, supply of Compact sub station with all the accessories in accordance with the requirements stated in technical specifications and other attached/referred Annexures & Attachments. including supply of chain link fencing of 2.5 mtr height around CSS comprising of 100x50x6 mm MS channels at every 1.8 mtr centres, 65x65x6mm angles, 8 swg GI mesh of 50x50 mm opening, washers, nuts, bolts, locknuts etc, Compact Substation shall comply with the requirements of latest revision of codes & standards attached or referred with the specifications. Please refer Technical specification of CSS (Doc no PC298-7411-0814 & PC298-TS-0801) of Compact Sub-station suitable for 6.6kV(UE)/0.433kV voltage.The CSS shall be designed for outdoor application and comply with relevant IEC/IS standards.	Set	4		
4	**INTER LOCKED TYPE Switch SOCKET & PLUG**				
4.1	Supply of Heavy duty Weather proof interlocking Switch Socket having enclosure with IP–65 degree of protection with matching Plug of following type as specified in Technical Specification Doc. No. PC298-TS-0801.				
i	63A, 5-pin, 415V	No.	2		
ii	5/25A, 3 pin, 240V	No.	2		
5	**HT & LT CABLES**				
5.1	Supply of 6.6 KV (UE) Grade, XLPE Insulated, PVC inner sheathed FRLS PVC outer sheathed cables as specified in Technical Specification Doc. No. PC298-TS-0801.				
i.	3C x 300 sq. mm (Al)	Mtrs.	6100		

ITEM NO.	DESCRIPTION	UNIT	Qty	Unit Price (In INR)	Total Price (in INR)
5.2	Supply of 1.1 KV Grade, XLPE Insulated, PVC inner Sheath, FRLS PVC outer sheathed cables as specified in Technical Specification Doc. No. PC298-TS-0801.				
i	3.5C x 400 sq. mm (Al)	Mtrs.	50		
ii	3.5C x 300 sq. mm (Al)	Mtrs.	500		
iii	3.5C x 120 sq. mm (Al)	Mtrs.	3700		
iv	3.5C x 70 sq. mm (Al)	Mtrs.	500		
v	4CX16 sq. mm (Al)	Mtrs.	500		
vi	3C x 2.5 sq. mm (Cu)	Mtrs.	1,000		
6	**CABLE GLANDS**				
6.1	Supply of heavy duty Industrial double compression rolled Aluminum cable glands suitable for the following sizes of cables as specified in Technical Specification Doc. No. PC298-TS-0801.				
A	6.6 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, Armoured, FRLS PVC outer sheathed cables.				
i	3C X 300 sq. mm (Al)	Nos.	34		
B	1.1 KV Grade, XLPE Insulated, PVC inner Sheath, FRLS PVC outer sheathed cables.				
i	3C x 2.5 sq. mm (Cu)	Nos.	60		
ii	3.5C x 400 sq. mm (Al)	Nos.	2		
iii	3.5C x 300 sq. mm (Al)	Nos.	4		
iv	3.5C x 120 sq. mm (Al)	Nos.	16		
v	3.5C x 70 sq. mm (Al)	Nos.	10		
vi	4CX16 sq. mm (Al)	Nos.	30		
7	**CABLE LUGS**				
7.1	Supply of Tinned Copper / Aluminum crimping type lugs of following sizes for termination of cables.				
i	300 sq. mm (Al/Bimetallic),6.6KV	Nos.	102		
ii	2.5 sq. mm (Cu), 1.1KV	Nos.	180		
iii	16 sq. mm (Al), 1.1KV	Nos.	120		
iv	35 sq. mm (Al), 1.1KV	Nos.	5		
v	70 sq. mm (Al), 1.1KV	Nos.	28		
vi	120 sq. mm (Al), 1.1KV	Nos.	48		
vii	150 sq. mm (Al), 1.1KV	Nos.	2		
viii	240 sq. mm (Al), 1.1KV	Nos.	2		
ix	300 sq. mm (Al), 1.1KV	Nos.	108		
x	400 sq. mm (Al), 1.1KV	Nos.	8		
8	**CABLE TERMINATION / JOINTING KITS**				
8.1	Supply of following types of cable termination / jointing kits:				
A	Indoor type Heat shrinkable end termination kit of Raychem make suitable for 6.6 KV grade XLPE-A-FRLSPVC insulated armoured cables of following sizes				
i	6.6 kV (UE), 3C x 300 sq. mm (Al) XLPE armoured cables	Nos.	22		

ITEM NO.	**DESCRIPTION**	**UNIT**	**Qty**	**Unit Price (In INR)**	**Total Price (in INR)**
B	Outdoor type Heat shrinkable end termination kit of Raychem make suitable for 6.6 KV grade XLPE-A-FRLSPVC insulated armoured cables of following sizes				
i	6.6 kV (UE), 3 x 300 sq. mm (Al) XLPE armoured cables	Nos.	5		
C	Heat Shrinkable Raychem make straight through jointing kit suitable for 6.6/1.1 KV grade XLPE-A-FRLSPVC insulated armoured cables of following sizes				
i	3C x 300 sq. mm (Al, 6.6 KV)	Nos.	5		
ii	3.5C x 300 sq. mm (Al, 1.1KV)	Nos.	1		
iii	3.5C x 120 sq. mm (Al, 1.1KV)	Nos.	1		
iv	3.5C x 70 sq. mm (Al, 1.1KV)	Nos.	1		
9	**CABLE RACK (GI LADDER TYPE CABLE TRAYS) & ACCESSORIES**				
9.1	Supply of prefabricated ladder GI cable trays and their accessories i.e. supply of all hardware required i.e. J-hooks, GI Nut, Bolt, Washers, coupling plate etc. of width 150 mm, 300 mm, 450 mm & 600 mm as per site requirement for laying of cables with standard rung spacing. Load for support span of 2.5 meter as 30, 60, 75 & 90 (in Kg/Mtr.) respectively with concentric static load as 70 Kg at the centre, as per drawings, specification and directions of Site Engineer / Engineer-in-Charge.				
A.	Straight Run Cable Trays				
i.	150mm wide	Mtrs.	50		
ii.	50mm wide	Mtrs.	50		
B	Horizontal Bends/Tees/Reducer				
i.	150 mm wide	No	3		
ii.	50 mm wide	No	3		
10	**FEEDER PILLAR**				
10.1	Supply of following Distribution Boards as specified in Technical Specification Doc. No. PC298-TS-0801.				
i.	415 V, 3 Ph & N,50KA for 1 sec floor mounted sheet steel enclosed Outdoor Type Feeder Pillar Board as per Technical Specification PC298-TS-0801. It shall consist of 1 no. incoming 400 A 4 P MCCB incomer with 6 Nos. 63A TPN MCCB and 4 Nos. 125A TPN MCCB as outgoing Feeders. All Outgoing Feeders shall have CTs and MFM.	No.	1		
ii.	Supply of 415 V, 3 Ph & N, IP55, wall/structure mounted sheet steel enclosed Feeder pillar box consisting of 1 nos. incoming 125A TPN MCCB incomer with RYB indications and 4 nos. 63A TPN MCCB outgoing feeders as for feeder pillar box as per enclosed Technical specification	Nos.	1		
11	**LIGHTING fixtures & accessories ,Junction Boxes & LSDB**				
11.1	Supply of Lighting Fixtures & Accessories				
A	240V AC,1-Ph, hose and weather proof Lighting fixtures including lamp with integral control gear box, suitable for use in safe area having IP-65 degree of protection complete with all accessories and all hardware for fixing the lighting fittings with ceiling / wall / pole / frame of following types as specified in Technical Specification Doc. No. PC298-TS-0801.				
i.	70 W LED Street Lighting Fixtures	Nos.	20		
ii.	2X18 W 4ft LED Tube Light fixture	Nos.	2		
iii	120 W LED Street Lighting Fixtures	Nos.	10		

ITEM NO.	**DESCRIPTION**	**UNIT**	**Qty**	**Unit Price (In INR)**	**Total Price (in INR)**
11.2	Supply of 63A, 415V, 3Ph & N hose proof & weatherproof junction boxes in cast aluminium (LM-6) enclosure with IP–65 degree of protection and suitable for 2 Nos. 4C x 16 Sq. mm (Al)cable & 1 nos. of 3Cx2.5 sq.mm(Cu) cable with terminal blocks of suitable size for easy termination of cables and as specified in Technical specification Doc. No. PC298-TS-0801	Nos.	10		
11.3	Supply of 25A, 230V, 1 Ph. & N, 4 way hoseproof & weather proof junction boxes in cast aluminium (LM6) enclosure complete with terminal block, rolled aluminium cable glands suitable for 3 x 2.5mm2 cable and threaded plug.	Nos.	10		
11.4	Supply of Indoor Type, wall/structural, weatherproof (IP 55) Lighting Distribution board Type DB with Bus bar - 63 A , 415 V TPN, Incomer - 1 no. 63 A 4P MCB, 3 nos. feeder circuit of 63A DP MCB & Outgoing - 9 nos. 16 A DP, MCB as indicated in attached SLD for LSDB enclosed with Technical specification	Nos.	1		
12	**HIGH MAST**				
	Supply of 30M high mast shaft in three sections suitable for wind speed as Per IS-875, with raising lowering system comprising, head frame, luminaries carriage suitable to install 24 nos luminaries of 350W LED of approved make in symmetrical arrangement, double drum winch, 6mm diameter SS wire rope, trailing cable, connector, integral power tool motor, manual handle, junction box, lightening finial, including 1 set foundation bolts manufactured from special steel along with nuts, washers, anchor plates and templates. This includes Supply of 24 nos. Integral LED Flood Light Luminaries with complete set of lamp & drivers as per technical specification the following components: Aluminum Cast luminary body, Electronic Circuit & LED drivers, Weather proof Transparent Cover, Luminary Mounting Clamps, LED Assembly.1 set Within Luminary Interconnection. Supply of 2 nos. LED type single dome aviation obstruction light (Make:Binay Opto) is also required with one high mast. This also includes Supply and installation of 1 no. outdoor stand mounted feeder pillar with 63A, 4-pole MCCB incomer, astro timer switch, 45A TP contactor for the automatic switching of luminaries, power tool control with 2 no 9A contactors and raise lower push button, Incoming and outgoing terminals suitable for required cable size(cable size shall be indicated during detail engg).. The Control Panel shall be of weather proof .Construction of shallow foundation with M25 grade concrete for the high mast considering the safe soil bearing capacity at site as 10 T/sqmtr at 2 metre depth with all materials Lightning Finial shall be insulated from body and head frame of High Mast and a separate down conductor (1Rx1Cx35 sq mm Aluminium Flexible Cable) shall run from the lightning finial to an earthing bolt independent of the high Mast structure. Electrical accessories like plug & socket, power tool motor etc at the bottom of high mast shall be weather proof.	Nos.	7		
13	**PLANT LIGHTING POLES**				
13.1	Supply of hot dip galvanized MS tubular swaged lighting poles of following types suitable for wind velocity of 170 Km/Hr and along with suitable pole junction box.				
i.	9M high ground mounted poles	Nos.	10		
ii.	7M high ground mounted poles	Nos.	20		
14	**EARTHING & LIGHTNING**				

ITEM NO.	DESCRIPTION	UNIT	Qty	Unit Price (In INR)	Total Price (in INR)
14.1	Supply of maintenance free type chemical earth pit, having Enhanced high quality UL certified 17.2 mm copper bonded (250 micron) earthing electrode/ rod along with 22.6 KG graphite based (non-bentonite) as a ground enhancing material with stainless steel clamp for connecting copper bonded rod with horizontal flat strip , Backfill shall be permanent and maintenance free. (No re- charging with salts or any other chemicals) and shall maintain its earth resistance with time. Backfill shall confirm IEEE 80-2000Clause No.14.5 (d). Backfill in its set form shall have a resistivity of not more than 0.12 ohm-m. Backfill shall comply the requirements and all applicable tests as per part-7 of IEC62561.	Nos.	38		
14.2	Supply of G.I. Earth Bus (50mm x 12mm x 390mm), with 10 nos. earthing holes and as per PDS: E 615 enclosed.	Nos.	10		
14.3	Supply of hot dip galvanized (minimum Zinc coating of 800 gms. / sq. mtr. as per IS-2629) Earthing strip / earth wire / GI Rope of the following sizes :				
i.	75mm X10mm	Mtrs.	260		
ii.	50mm X 6mm	Mtrs.	200		
iii.	25mm X 6mm	Mtrs.	100		
iv.	10 sq mm GI Rope	Mtrs.	200		
15	**MS Structure / Aluminium Sheet**				
15.1	Supply of MS structural in channels, angles, flats, plates, rods etc. conforming to IS: 226.	Te	0.5		
15.2	Supply of 2 mm thick Aluminium sheet for fabrication of Rain protective hood	m^2	10		
15.3	Supply of 8 mm thick MS Chequered plates.	Te	0.4		
16	**G.I. / HDPE PIPES**				
16.1	Supply of G. I. pipes; Medium Class as per IS 1239 (part-1) of following sizes :				
i.	50 mm NB	Mtrs.	50		
ii.	150 mm NB	Mtrs.	100		
iii.	200 mm NB	Mtrs.	100		
17	**CABLE TRENCH MATERIAL & ACCESSORIES**				
17.1	Supply of approved first class bricks of 4 inch thickness in cable trenches for cable protection including all labour and materials to make installation complete in all respect.	Nos.	115000		
17.2	Supply of fine river sand for Cable trench	M3	900		
18	**CABLE ROUTE MARKER**				
18.1	Supply of Cable route markers of Round shape made of MS of dia 200mm with suitable engraving as of HT / LT / Control / Data Cable jointed with angle of 30X30X5 mm grouted in concrete of size 150mm x150mm x 500mm.	Nos.	200		
19	**MISCELLANEOUS ITEMS**				
19.1	Supply of Caution boards / dangers boards written in ENGLISH & HINDI of the following voltages as per IS 2551 :				

ITEM NO.	DESCRIPTION	UNIT	Qty	Unit Price (In INR)	Total Price (in INR)
i.	6.6 KV	Nos.	2		
ii.	415 Volts	Nos.	5		
19.2	Supply of rubber hand gloves with IS mark suitable for the following voltages as per relevant IS :				
i.	6.6 KV	Set	1		
ii.	415 Volts	Set	1		
19.3	Supply of Shock treatment chart conforming to Indian Electricity Rules in Aluminum frame with glass.	Nos.	2		
19.4	Supply of Do & Don't chart as per Indian Electricity Rules in Aluminum frame with glass.	Nos.	2		
19.5	Supply S/S Single Line Diagram in Aluminum frame with glass.	No.	1		
19.6	Supply of portable CO2 type fire extinguisher (4.5 liter capacity).	Nos.	4		
19.7	Supply of Sand buckets with stand (each with at least 3 sand buckets).	Nos.	4		
19.8	SupplyCPR (CARDIO PULMONARY RESUSCITATION) Charts.	Nos.	2		
19.9	Supply of Exit Route / Emergency Exit Route Signage.	Nos.	2		
19.10	Supply of First aid boxes.	Nos.	2		
19.11	Supply of following Testing Items				
i.	Discharge Rod	Nos.	1		
ii.	HT megger	No.	1		
iii.	LT megger	No.	1		
iv.	Earth megger	Nos.	2		
v	Multi-meter	Nos.	2		
vi	Tong Tester	Nos.	2		
20	**Hume Pipes**				
20.1	Supply of Hume Pipes NP3 of following sizes with socket at one end:				
i.	200 mm DIA	Mtrs.	200		
21	**Mandatory Spares**				
	Supply of following Mandatory spares				
A.	**TRANSFORMERS**				
i)	HV Bushings complete with accessories for all 3 phase for 6.6KV/0.433kV Transformer.	Set	1		
iv)	LV Bushings complete with accessories for all 3 phase & neutral for 6.6KV/0.433kV Transformer.	Set	1		
v)	Complete set of gaskets	No.	1		
vi)	Dial type thermometer (6" WTI)	Set	1		
B.	**6.6KV RMU/SWITCHBOARD**				
i)	BREAKERS (OF EACH RATING)				
a.	Trip bar spring and any other spring used in the circuit breaker mechanism	Set	1		
b.	Shunt trip coil	Set	1		

ITEM NO.	**DESCRIPTION**	**UNIT**	**Qty**	**Unit Price (In INR)**	**Total Price (in INR)**
c.	Closing coil	Set	1		
d.	Micro Switch for Spring Charging	Set	1		
e.	Micro Switch for Service/Test position	Set	1		
ii)	CONTROL SWITCHES				
a.	Trip-Neutral-Close Control Switch	No.	1		
b.	Local-Remote or Auto-Manual Selector Switch	No.	1		
c.	Indication Lamps (Red, Yellow, White, Blue & Amber)	Nos.	5		
iii)	MINIATURE CIRCUIT BREAKER (OF EACH RATING)	No.	1		
iv)	RELAYS (OF EACH TYPE)				
a.	Relays of each type	No.	1		
v)	METERS				
a.	Ammeter of each type	No.	1		
b.	Voltmeter	No.	1		
C.	**LV SWITCHBOARDS**				
i)	BREAKERS (OF EACH RATING)				
a.	Trip bar spring and any other spring used in the circuit breaker mechanism	Set	1		
d.	Shunt trip Coil	Set	1		
e.	Closing Coil	Set	1		
g.	Secondary Isolating Contact Blocks	Set	1		
h.	Shutter Assembly	Set	1		
ii)	SWITCHES (OF EACH RATING)				
a.	Trip-Neutral-Close Control Switch	No.	1		
v)	RELAYS				
a.	Relays of each type	No.	1		
vi)	MCB (OF EACH RATING)	No.	1		
D	**FPB**				
i.	400A 4P MCCB	No.	1		
ii	400 A TPN MCCB	No.	1		
iii	250 A TPN MCCB	No.	1		
iv	125 A TPN MCCB	Nos.	1		
v	63 A TPN MCCB	No.	1		

Total Estimate of supply in INR (Ex. woks)

ITEM NO.	DESCRIPTION	UNIT	Qty	Unit Price (In INR)	Total Price (in INR)	Remarks
B	**ERECTION OF ELECTRICAL ITEMS (PART B)**					
1	**Four Pole Structure with Accessories**					
	Installation, erection, testing and commissioning of 6.6 kV,1250 A, 21 kA for 3 sec,50 Hz ± 5%,4 pole structure with two sets of incomer and one set of outgoing along with required bracing,cross arm etc for supporting the pin/ strain type insulators,Guy wires as required, GOD, DO fuses (3No) with necessary 10KA lightening arresters, earth switch, CT, PT, Insulators, Jumpers, Anti climbing device, Danger board etc suitable for receiving power from SEB as per enclosed specifications, SLD, SEB guidelines etc including excavation and groutinng/coping of poles, painting with primer, paint, earting as per IE rule, & IS 3043 etc this shall also includes installation of chain link fencing of 2.5 mtr height around HT Yard comprising of 100x50x6 mm MS channels at every 1.8 mtr centres, 65x65x6mm angles, 8 swg GI mesh of 50x50 mm opening, washers, nuts, bolts, locknuts etc & filling the HT yard with well graded crushed stone aggregate varying in size from 20mm to 50mm mixed with clean sand in the ratio 2.5 part of stone aggrgate to 1 part of clean sand having less than 75 micron size, compacting in 30 mm thick layers using vibratory rollers to achieve a unit weight of at least 2.2T/cu.m (IS 10028) as per enclosed specifications, SLD, SEB guidelines etc	Set	2			
2	**6.6KV RMU (OUTDOOR TYPE WITH KIOSK)**					
	Installation, testing and commissioning of SF6 insulated, 6.6KV, 630A RMU, free standing, floor mounting, cubicle type, including transportation from the owner's store to the site of erection, assembly, mounting, fixing and wiring of loose components like relays/meters, interconnection of shipping sections and inter panel wiring as necessary, inter bus bar jointing and earthing, operational and functional checking, installation on foundation including levelling and aligning, supply of foundation nuts and bolts, drilling of gland plates with requisite holes, fixing of cable glands supplied loose, plugging of all unused cable entries and other holes found in switch boards for making the same dust and vermin proof with all labour and materials to make the installation complete as per approved drawings, technical specifications and direction of engineer-in-charge, but excluding termination of incoming & outgoing cables. Job shall include rigidly fixing the frame including grouting, if necessary	Set	2			
3	**6.6KV CSS (Compact Sub Station)**					
	Installation, Erection,Testing & Commissioning ,Site Acceptance testing, proving performance guarantee of Compact Sub station with all the accessories in accordance with the requirements mentioned in specification and other attached/referred Annexures & Attachments. Compact Substation shall comply with the requirements of latest revision of codes & standards attached or referred with the specification. this shall also includes installation of chain link fencing of 2.5 mtr height around Compact Subsation comprising of 100x50x6 mm MS channels at every 1.8 mtr centres, 65x65x6mm angles, 8 swg GI mesh of 50x50 mm opening, washers, nuts, bolts, locknuts etc as per specification, standards & direction of Engineer-in-charge, Please refer Technical specification of (Doc no PC298-7411-0814 & PC298-TS-0801)	Set	4			
4	**INTER LOCKED TYPE Switch SOCKET & PLUG**					
4.1	Erection, installation, testing and commissioning of weatherproof switch cum socket/welding receptacle having IP65 protection of approved makes to be installed on walls, columns, structures, including handling, storage, transportation from store to site of installation, supply & installation of double compression cable glands, suitable lugs & WP/flame proof plugs for sealing all spare entries etc., including connection and termination of all power cables, earthing wire and conduits, etc. complete as per drawings, specifications and direction of the Site Engineer, including the cost of all labour, tools, consumable materials etc. complete in all respect. .					
i	63A, 5-pin, 415V (Weather Proof)	No.	2			
ii	25A, 3-pin, 240V (Weather Proof)	No.	2			
5	**HT & LT CABLES**					

ITEM NO.	DESCRIPTION	UNIT	Qty	Unit Price (In INR)	Total Price (in INR)	Remarks
5.1	Horizontal and vertical laying, testing (before and after laying) and commissioning of following HV (6.6KV) / LV Power & Control cables in trenches, on pre-fabricated cable trays / racks, on already installed risers, support hangers, saddles / directly buried up to 1000mm depth etc. pulling through pipes on walls / columns, steel structures including transportation of cable drums from storage yard to the site, unrolling the drum, laying the required length of cables including supply and fixing of necessary saddles, saddle bars, cable tags, Al clamps for cables laid vertical on walls / columns / structures, risers with all labour, consumable materials and necessary hardware to make installation complete in all respect as per approved standard drawings and direction of engineer-in-charge.					
A	6.6 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, FRLS PVC outer sheathed cables.					
i	3C x 300 sq. mm (Al)	Mtrs.	6100			
B	1.1 KV Grade, XLPE Insulated, PVC inner Sheath, FRLS PVC outer sheathed cables.					
i	3.5C x 400 sq. mm (Al)	Mtrs.	50			
ii	3.5C x 300 sq. mm (Al)	Mtrs.	500			
iii	3.5C x 120 sq. mm (Al)	Mtrs.	3700			
iv	3.5C x 70 sq. mm (Al)	Mtrs.	500			
v	4CX16 sq. mm (Al)	Mtrs.	500			
vi	3C x 2.5 sq. mm (Cu)	Mtrs.	1,000			
6	**TERMINATION OF CABLES**					
6.1	End termination (Indoor / Outdoor) and subsequent testing of XLPE/PVC insulated single core / multi core armoured Cables of 6.6/1.1 KV grade, Al / Cu cable using suitable Heat Shrink Termination Kit , excluding supply of glands & lugs but including Glanding, all labour and consumable materials to make installation complete in all respect. The rate shall include drilling, taping of cable insulation, crimping of lugs to the conductor, connection of the lugs to equipment terminal, supply and fixing of G.I. nuts, screws, bolts, washers and other necessary hardware, PVC tape of required grade for taping, making cable entries dust and vermin proof, earthing etc. as per instruction of manufacturer, approved drawings, specifications and directions of engineer-in-charge.					
A	6.6 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, Armoured, FRLS PVC outer sheathed cables.					
i	3 X 300 sq. mm (Al)	Nos.	34			
B	1.1 KV Grade, XLPE Insulated, PVC inner Sheath, FRLS PVC outer sheathed cables.					
i	3C x 2.5 sq. mm (Cu)	Nos.	60			
C	3.5C x 400 sq. mm (Al)	Nos.	2			
i	3.5C x 300 sq. mm (Al)	Nos.	2			
ii	3.5C x 120 sq. mm (Al)	Nos.	16			
iii	3.5C x 70 sq. mm (Al)	Nos.	10			
iv	4CX16 sq. mm (Al)	Nos.	30			
7	**STRAIGHT THROUGH JOINTS**					
7.1	Straight through jointing of HT& LT armoured cables of following sizes excluding supply of straight through jointing					
ii.	3C x 300 sq. mm (Al, 6.6 KV)	Nos.	5			
iii.	3.5C x 300 sq. mm (Al, 1.1KV)	Nos.	1			
iv.	3.5C x 120 sq. mm (Al, 1.1KV)	Nos.	1			
v.	3.5C x 70 sq. mm (Al, 1.1KV)	Nos.	1			
8	**CABLE RACK (ALUMINIUM PERFORATED TYPE CABLE TRAYS) & ACCESSORIES**					
8.1	Installation & fixing of prefabricated ladder GI cable trays and their accessories including all hardware required i.e. J-hooks, GI Nut, Bolt, Washers, coupling plate etc. of width 150 mm, 300 mm, 450 mm & 600 mm as per site requirement for laying of cables with standard rung spacing. Load for support span of 2.5 meter as 30, 60, 75 & 90 (in Kg/Mtr.) respectively with concentric static load as 70 Kg at the centre, with materials, labour, tools and tackles, consumables etc. as per drawings, specification and directions of Site Engineer / Engineer-in-Charge. The rates shall be valid for all mounting heights.					
A.	Straight Run Cable Trays					
i.	150mm wide	Mtrs.	50			
ii.	50mm wide	Mtrs.	50			
B.	Horizontal Bends					

ITEM NO.	DESCRIPTION	UNIT	Qty	Unit Price (In INR)	Total Price (in INR)	Remarks
i.	150 mm wide, 700 mm radius	Mtrs.	3			
ii.	50 mm wide, 700 mm radius	Mtrs.	3			
9	**FEEDER PILLAR**					
9.1	Installation, testing and commissioning of following floor / wall mounted Distribution Boards, including supply and fabrication of epoxy painted MS frame, operational and functional checking, drilling of gland plates with requisite holes, fixing of cable glands, plugging of all unused cable entries and other holes found in the boards to make the same dust and vermin proof with all labour and consumable materials to make installation complete as per approved drawings, specifications and directions of engineer-in-charge.					
i.	415 V, 3 Ph & N,50KA for 1 sec, floor mounted sheet steel enclosed Outdoor Type Feeder Pillar Board as per Technical Specification 5003-TS-0801. It shall consist of 1 no. incoming 630 A MCCB incomer with 6 Nos. 63A TPN MCCB and 4 Nos. 125 A TPN MCCB as outgoing Feeders. All Outgoing Feeders shall have CT & MFM.	No.	1			
ii.	415 V, 3 Ph & N, IP55, wall/structure mounted sheet steel enclosed Feeder pillar box consisting of 1 nos. incoming 125A TPN MCCB incomer with RYB indications and 4 nos. 63A TPN MCCB outgoing feeders as for feeder pillar box as per enclosed Technical specification	No.	1			
10	**LIGHTING fixtures & accessories ,Junction Boxes & LSDB**					
10.1	Installation, connection, testing and commissioning of pre-wired fluorescent / LED fixtures along with integral / non-integral control gears, lamps, tubes, chokes, starters, condensers, mounting accessories, including cable glanding, crimping of lugs on cable conductor & connecting cables at fixtures, earthing, junction boxes, etc. including supply of all connecting materials like clamps, supports, conduits, down rods etc. as required as well as transportation from store to site of erection with all labour and material to make installation complete in all respect as per approved drawings, specifications and directions of engineer-in-charge. The rates shall be valid for all mounting heights.					
i.	70 W LED Hose proof & weather proof Street Lighting Fixture complete with weatherproof cable glands, plug suitable for 3 X 2.5 mm^2 XLPE-A-PVC cable and stopping plug.and installation of suspension rod and other mounting accessories	Nos.	20			
ii.	120 W LED Hose proof & weather proof Street Lighting Fixture complete with weatherproof cable glands, plug suitable for 3 X 2.5mm^2 XLPE-A-PVC cable and stopping plug.and installation of suspension rod and other mounting accessories	Nos.	10			
iii	2X18 W 4ft LED Tube Light fixture LED Tube light fitting industrial type of approved make suspension mounting suitable for 240V AC as per Technical specification complete with 2x20 W T8 fixture with all accessories such as LED lamp/chip, electronic driver, Refelector, Terminal block etc.The fittings shall be provided with suspension accessory / wall mounting bracket depending upon directions by EIC / Site Engineer.	Nos.	2			
10.2	Installation, connection, testing and commissioning of Junction Boxes, including cable glanding, crimping of lugs on cable conductor & connecting cables, earthing etc. including supply of all connecting materials like clamps, supports etc. as required as well as transportation from store to site of erection with all labour and material to make installation complete in all respect as per approved drawings, specifications and directions of engineer-in-charge. The rates shall be valid for all mounting heights.					
i.	63A, 415V, 3 Ph. & N, 4 way hoseproof & weather proof junction boxes in cast aluminium (LM6) enclosure complete with terminal block, rolled aluminium cable glands suitable for 2Nos. 4C x 16 Sq. mm (Al) & 1 no. 3 x 2.5mm^2 cable and threaded plug.	Nos.	10			
ii.	25A, 230V, 1 Ph. & N, 4 way hoseproof & weather proof junction boxes in cast aluminium (LM6) enclosure complete with terminal block, rolled aluminium cable glands suitable for 3 x 2.5mm2 cable and threaded plug.	Nos.	10			
10.3	Indoor Type, wall/structural, weatherproof (IP 55) Lighting Distribution board Type DB with Bus bar - 63 A , 415 V TPN, Incomer - 1 no. 63 A 4P MCB, 3 nos. feeder circuit of 63A DP MCB & Outgoing - 9 nos. 16 A DP, MCB as indicated in attached SLD for LSDB enclosed with Technical specification	Nos.	1			
11	**HIGH MAST**					

ITEM NO.	DESCRIPTION	UNIT	Qty	Unit Price (In INR)	Total Price (in INR)	Remarks
11.1	Unloading, storage, handling, transportation within site from store to site of installation, erection, installation and testing & Commissioning of 30M high mast shaft in three sections suitable for wind speed as Per IS-875, with raising lowering system comprising, head frame, luminaries carriage suitable to install 24 nos luminaries of 350W LED of approved make in symmetrical arrangement, double drum winch, 6mm diameter SS wire rope, trailing cable, connector, integral power tool motor, manual handle, junction box, lightening finial, including 1 set foundation bolts manufactured from special steel along with nuts, washers, anchor plates and templates.	Nos.	7			
12	**PLANT LIGHTING POLES**					
12.1	Erection and commissioning of following hot dipped galvanized mild steel tubular swaged lighting poles including transportation of required items from owner's issue point to site and installation of poles, junction box, supply of requisite cable glands and tinned copper lugs, cable termination, necessary hardware required for excavation, providing concrete foundation (ratio of cement : sand : stone chips = 1:2:4) for ground installation, disposal of surplus earth within 30 m lead, earthing and painting with all labour to make installation complete in all respect as per instruction and directions of engineer-in-charge.					
i.	9M high ground mounted poles	Nos.	10			
ii.	7M high ground mounted poles	Nos.	20			
13	**EARTHING & LIGHTNING**					
13.1	Installation, testing and commissioning of maintenance free type chemical earth pit, shall have Enhanced high quality UL certified 17.2 mm copper bonded (250 micron) earthing electrode/ rod along with 22.6 KG graphite based (non-bentonite) as a ground enhancing material with stainless steel clamp for connecting copper bonded rod with horizontal flat strip ,Backfill etc.	Nos.	38			
13.2	Installation and commissioning of hot dip galvanized earth bus bar of size 50mm x 12mm x 390 mm with 10 holes of 14 mm dia. including all labour and materials to complete installation in all respect as per approved drawings, specifications and directions of engineer-in-charge.	Nos.	10			
13.3	Installation, testing and commissioning of Hot dip galvanized G.I. earthing strip / GI Rope running on O.H. cable trays / cable trays in underground cable trenches / buried under soil in already excavated cable trenches of depth 600mm or supported by G.I. saddles & saddle bars as mentioned below including interconnection between different earth pits, strip / cable for connection to various equipments & system neutral, necessary hardware for connection and interconnection between earth bus bars including all labour and miscellaneous materials to make installations complete in all respect as per approved drawings, specifications, instructions and directions of engineer-in-charge.					
i.	75mm X10mm	Mtrs.	260			
ii.	50mm X 6mm	Mtrs.	200			
iii.	25mm X 6mm	Mtrs.	100			
iv.	10 sq mm GI Rope	Mtrs.	200			
14	**FABRICATION OF STEEL STRUCTURE**					
14.1	Fabrication and installation of MS frame supports and brackets for various equipment base frame, miscellaneous electrical equipment support, made of channels, angles, flats etc. of different sections including bolting, welding, riveting, supply of necessary anchor bolts and grouting etc. including 2 coats of zinc rich anti-rust epoxy primer and 2 finished coats of epoxy paint including breaking wall, floor etc. and making good the same with all labour and consumable materials to complete installation in all respect as per approved drawings, specifications and directions of engineer-in-charge	Te	0.5			
14.2	Fabrication & installation of 2 mm thick Al sheet for rain protective hood for outdoor equipment e.g. motors, switch sockets, junction boxes etc.	m^2	10			
14.3	Fabrication and Installation of 8mm thick chequered plate in flooring, steps, covers over cable trenches in switch board room, painting with one coats of bitumen paint in the 50% thinner with two coats of black bitumen paints including supply of all consumables and paints.	Te	0.4			
15	**G.I. / HDPE PIPES**					

ITEM NO.	DESCRIPTION	UNIT	Qty	Unit Price (In INR)	Total Price (in INR)	Remarks
15.1	Installation of G.I. pipes of following sizes for cable protection, floor sleeves etc. fixed on a steel structure, concrete, laid in trenches including concrete cutting, bending, threading etc. to a clamp, nuts, bolts sockets, reducers, spacers, plug, bushing, chipping of concrete floor, breaking of concrete cable trench, walls and complete with all labour and material as per directions of engineer-in-charge.					
i.	50 mm NB	Mtrs.	50			
ii.	150 mm NB	Mtrs.	100			
iii.	200 mm NB	Mtrs.	100			
15.2	**WBM ROAD / CONCRETE BREAKING :** WBM Road/concrete breaking for cable trenches including required shoring strutting etc., and repairing of the road/dyke to original condition and disposing off excess materials (within the work site) job complete in all respects including the cost of labour, tools, materials, load, lift hire charges of equipments, if any, complete as per drawings, specification and directions of Site Engineer / Engineer-in-Charge.	m^3	250			
15.3	Drilling of hole under Road for laying of Pipe for Cable pulling					
i.	200 NB Dia.	Mtrs.	100			
ii.	150 NB Dia.	Mtrs.	100			
iii.	50 NB dia	Mtrs.	50			
16	**CABLE TRENCH MATERIAL & ACCESSORIES**					
16.1	Spreading of approved fine river sand in cable trenches including all labour and materials to make the installation complete in all respect as per approved drawings, specifications and directions of engineer-in-charge.	M^3	900			
16.2	Spreading of approved first class bricks of 4 inch thickness in cable trenches for cable protection including all labour and materials to make installation complete in all respect.	Nos.	115000			
16.3	Excavation for laying of cables including disposal of excavated earth, lead up to 100 mtrs. and lift up to 1.5 mtrs., disposed earth to be levelled and neatly dressed	M^3	2000			
16.4	Back filling with excavated earth in trench including consolidating each deposited layer by ramming, dressing etc.	M^3	700			
17	**CABLE ROUTE MARKER**					
	Grouting, Erection & installation of cable route markers for underground cable runs, including excavation, installation of the markers, cement concrete grouting, backfilling, materials, labour, tools and tackles, consumables etc., as per drawings, specification and directions of Site Engineer / Engineer-in-Charge	Nos.	200			
18	**MISCELLANEOUS ITEMS**					
18.1	Fixing of Caution boards / dangers boards written in ENGLISH, HINDI & Local language of the following voltages.					
i.	6.6 KV	Nos.	2			
ii.	415 Volts	Nos.	5			
18.2	Fixing of shock treatment chart written in English and Local language duly framed and approved by engineer-in-charge.	Nos.	2			
18.3	Fixing of Do & Don’t chart as per Indian Electricity Rules in Aluminum frame with glass	Nos.	2			
18.4	Fixing of S/S Single Line Diagram in Aluminum frame with glass.	No.	1			
18.5	Installation of portable CO_2 type fire extinguisher (4.5 liter capacity).	Nos.	4			
18.6	Installation of Sand buckets with stand (each with at least 3 sand buckets).	Nos.	4			
18.7	Fixing of CPR (CARDIO PULMONARY RESUSCITATION) Charts.	Nos.	2			
18.8	Fixing of High Voltage danger signage (Skull & bones).	Nos.	5			

ITEM NO.	DESCRIPTION	UNIT	Qty	Unit Price (In INR)	Total Price (in INR)	Remarks
18.9	Fixing of Exit Route / Emergency Exit Route Signage.	Nos.	2			
19	**Hume Pipes**					
19.1	Laying of reinforced cement concrete light duty hume pipe, non pressure type (NP3), centrifugally cast conforming to I.S.458 with 1:3:6 concrete casing at joints as required with necessary slope including excavation, backfilling, supply of collars, jointing of pipes with stiff mixture of cement mortar in the proportion of 1:2 (1 cement: 2 fine sand), testing of joints, complete in all respects as per specifications, drawing and the direction of the EIC/Site Engineer.					
i.	200 mm Dia.	Mtr.	200			
	Total Estimate of Erection in INR (Ex. woks)					

ITEM NO.	**DESCRIPTION**	**UNIT**	**Qty**	**Unit Price (In INR)**	**Total Price (in INR)**	**Remarks**
C	**OPERATION & MAINTENANCE**					
1.	**DEPLOYMENT OF ELECTRICIANS / RELIEVER**					
	Deployment of Electricians/Reliever (skilled) as per requirement indicated in technical specification (Doc. No. PC298-TS-0801) for carrying out various activity associated to Operation and Maintenance of Electrical system along as per direction of engineer in-charge. as per direction of engineer in-charge. (2 person x 36 months)	Man month	72			
2.	**DEPLOYMENT OF HELPERS**					
	Deployment of Helper (semi-skilled) as per requirement indicated in technical specification (Doc. No. PC298-TS-0801) for carrying out various activity associated to Operation and Maintenance of Electrical System as per direction of engineer in-charge. (2 person x 36 months)	Man month	72			
3.	**CONTRACTOR'S SERVICE CHARGES**					
	Contractor's Service Charges per Month (including all miscellaneous charges envisaged by the contractor).	Man month	36			
	Total Estimate of O&M in INR (Ex. woks)					

INDEX ELECTRICAL ENGINEERING ITEMS

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810101 : CIRCUIT BREAKERS,66KV & ABOVE.

CODE	NAME
INDIA	
1 . P0066	ASEA BROWN BOVERI LTD.
2 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
3 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
4 . P0869	VOLTAS LTD. (PUMPS & PROJECTS BUSINESS DIV)

810102 : HIGH VOLTAGE CIRCUIT BREAKERS.

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0066	ASEA BROWN BOVERI LTD.
3 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
4 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
5 . P8173	CG POWER AND INDUSTRIAL SOLUTIONS LIMITED
6 . P8104	JYOTI LIMITED
7 . P0736	SIEMENS LTD.
8 . P0802	THE MYSORE ELECTRICAL INDUSTRIES LTD.

810103 : MV ACB.

CODE	NAME
INDIA	
1 . P0113	BCH ELECTRIC LIMITED
2 . P0173	C&S ELECTRIC LTD. (Upto 6300A)
3 . P0573	GE POWER CONTROLS INDIA PVT. LTD.
4 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
5 . P0736	SIEMENS LTD.
6 . P8051	SPACEAGE SWITCHGEARS LIMITED

810104 : MOULDED CASE CIRCUIT BREAKERS (MCCB)

CODE	NAME
INDIA	
1 . P0113	BCH ELECTRIC LIMITED
2 . P0173	C&S ELECTRIC LTD. (Upto 400A)
3 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
4 . P0573	GE POWER CONTROLS INDIA PVT. LTD.
5 . P0337	HAVELLS INDIA LTD.
6 . P8060	HPL ELECTRIC & POWER PVT. LTD. (10A to 800A)
7 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
8 . P0736	SIEMENS LTD.
9 . P8051	SPACEAGE SWITCHGEARS LIMITED
10 . P8070	STANDARD ELECTRICALS LIMITED (MCCB)

810105 : MINIATURE CIRCUIT BREAKERS(MCB)

CODE	NAME
INDIA	
1 . P8068	ADHUNIK SWITCHGEARS (P) LTD.
2 . P0113	BCH ELECTRIC LIMITED
3 . P0173	C&S ELECTRIC LTD.
4 . P0337	HAVELLS INDIA LTD.
5 . P8060	HPL ELECTRIC & POWER PVT. LTD.
6 . P0384	INDIANA CURRENT CONTROL LTD.
7 . P0413	INDO ASIAN FUSEGEAR LTD
8 . P0523	LEGRAND INDIA LTD
9 . P0693	S & S POWER SWITCHGEAR LTD
10 . P8070	STANDARD ELECTRICALS LIMITED

810106 : MV ELCB

CODE	NAME
INDIA	
1 . P0173	C&S ELECTRIC LTD.
2 . P0573	GE POWER CONTROLS INDIA PVT. LTD.
3 . P0337	HAVELLS INDIA LTD.
4 . P0413	INDO ASIAN FUSEGEAR LTD
5 . P0523	LEGRAND INDIA LTD
6 . P0693	S & S POWER SWITCHGEAR LTD
7 . P0736	SIEMENS LTD.
8 . P8070	STANDARD ELECTRICALS LIMITED

810201 : EHV SWITCHES/ISOLATORS

CODE	NAME
INDIA	
1 . P0780	ELPRO INTERNATIONAL LIMITED
2 . P0693	S & S POWER SWITCHGEAR LTD
3 . P0824	TRANSLECT

810202 : HV SWITCHES/ISOLATORS

CODE	NAME
INDIA	
1 . P0066	ASEA BROWN BOVERI LTD.
2 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
3 . P8190	ELEKTROLITES (POWER) PRIVATE LIMITED
4 . P0780	ELPRO INTERNATIONAL LIMITED
5 . P0736	SIEMENS LTD.
6 . P0824	TRANSLECT

810203 : LOW VOLTAGE INDUSTRIAL SWITCHES/ISOLATORS

CODE	NAME
INDIA	
1 . P0066	ASEA BROWN BOVERI LTD.
2 . P0173	C&S ELECTRIC LTD.
3 . P0573	GE POWER CONTROLS INDIA PVT. LTD.
4 . P0337	HAVELLS INDIA LTD.
5 . P8060	HPL ELECTRIC & POWER PVT. LTD.
6 . P0440	KAYCEE INDUSTRIES LTD
7 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
8 . P0736	SIEMENS LTD.

810301 : POWER TRANSFORMER, 66 KV & ABOVE (OIL FILLED)

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0066	ASEA BROWN BOVERI LTD.
3 . P8162	ATLANTA ELECTRICALS PVT. LTD
4 . P0104	BHARAT BIJLEE LTD
5 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
6 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
7 . P0236	EMCO LIMITED (upto 100 MVA)
8 . P0392	IMP POWER LTD.
9 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
10 . P0868	VOLTAMP TRANSFORMERS LTD. (upto 132KV , 50MVA)

810302 : POWER TRANSFORMER,33KV & BELOW

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P8162	ATLANTA ELECTRICALS PVT. LTD
3 . P0104	BHARAT BIJLEE LTD
4 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
5 . P0236	EMCO LIMITED
6 . P8124	ESENNAR TRANSFORMERS (P) LTD.
7 . P0378	INDCOIL TRANSFORMERS PVT. LTD.
8 . P0432	KANOHAR ELECTRICALS LTD. (upto 10 MVA)
9 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
10 . P8157	RAYCHEM RPG PRIVATE LIMITED
11 . P8136	VARDHMAN ELECTRO-MECH PVT. LTD. (Upto 8 MVA)
12 . P0868	VOLTAMP TRANSFORMERS LTD. (upto 132KV,50MVA)
13 . P0869	VOLTAS LTD. (PUMPS & PROJECTS BUSINESS DIV)

810303 : AUXILIARY SUPPLY TRANSFORMER

CODE	NAME
INDIA	
1 . P8219	ELECTRICAL CONTROLS AND SYSTEM ((DRY TYPE CAST RESIN TRANSFORMER UP TO 11 KV, 2 MVA))
2 . P8124	ESENNAR TRANSFORMERS (P) LTD.
3 . P8111	GUJARAT PLUG-IN DEVICES PVT. LTD. (Upto 300 KVA)
4 . P0392	IMP POWER LTD.
5 . P0378	INDCOIL TRANSFORMERS PVT. LTD.
6 . P8052	KALPA ELECTRICAL PRIVATE LIMITED (DRY TYPE UPTO 100 KVA)
7 . P0079	MEHRU ELECTRICALS (FORMERLY AUTOMATIC ELECTRIC LIMITED)
8 . P8157	RAYCHEM RPG PRIVATE LIMITED
9 . P0723	SHEPHARD TRANSFORMERS LTD
10 . P8136	VARDHMAN ELECTRO-MECH PVT. LTD.

810304 : AUTO TRANSFORMER

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0104	BHARAT BIJLEE LTD
3 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
4 . P0236	EMCO LIMITED
5 . P0329	HACKBRIDGE - HEWITTIC & EASUN LTD
6 . P0378	INDCOIL TRANSFORMERS PVT. LTD.
7 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
8 . P0823	TRANSFORMERS & ELECTRICALS KERALA LTD

810305 : REACTOR

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
3 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
4 . P0329	HACKBRIDGE - HEWITTIC & EASUN LTD

810306 : EARTHING TRANSFORMER

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0104	BHARAT BIJLEE LTD
3 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
4 . P0236	EMCO LIMITED
5 . P0329	HACKBRIDGE - HEWITTIC & EASUN LTD
6 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
7 . P0823	TRANSFORMERS & ELECTRICALS KERALA LTD

810307 : CURRENT TRANSFORMERS, 66KV & ABOVE

CODE	NAME
INDIA	
1 . P8219	ELECTRICAL CONTROLS AND SYSTEM (66KV & ABOVE UP TO 220 KV)
2 . P0066	ASEA BROWN BOVERI LTD.
3 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
4 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
5 . P0079	MEHRU ELECTRICALS (FORMERLY AUTOMATIC ELECTRIC LIMITED)
6 . P0560	NAGPUR TRANSFORMERS LTD
7 . P0823	TRANSFORMERS & ELECTRICALS KERALA LTD

810308 : POTENTIAL TRANSFORMER, 66KV & ABOVE

CODE	NAME
INDIA	
1 . P8219	ELECTRICAL CONTROLS AND SYSTEM (66KV & ABOVE UP TO 220 KV)
2 . P0066	ASEA BROWN BOVERI LTD.
3 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
4 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
5 . P0079	MEHRU ELECTRICALS (FORMERLY AUTOMATIC ELECTRIC LIMITED)
6 . P0560	NAGPUR TRANSFORMERS LTD
7 . P0823	TRANSFORMERS & ELECTRICALS KERALA LTD

810309 : HV CURRENT TRANSFORMERS

CODE	NAME
INDIA	
1 . P8219	ELECTRICAL CONTROLS AND SYSTEM
2 . P8128	ANANT POWERTECH ((11 KV to 33 KV))
3 . P0066	ASEA BROWN BOVERI LTD.
4 . P8214	ASIAN ELECTRICAL & ELECTRONICS
5 . P8052	KALPA ELECTRICAL PRIVATE LIMITED
6 . P0079	MEHRU ELECTRICALS (FORMERLY AUTOMATIC ELECTRIC LIMITED)
7 . P8053	PERFECT SALES CORPORATION

810310 : HV POTENTIAL TRANSFORMER

CODE	NAME
INDIA	
1 . P8219	ELECTRICAL CONTROLS AND SYSTEM
2 . P8128	ANANT POWERTECH ((11 KV to 33 KV))
3 . P0066	ASEA BROWN BOVERI LTD.
4 . P8214	ASIAN ELECTRICAL & ELECTRONICS
5 . P8052	KALPA ELECTRICAL PRIVATE LIMITED
6 . P0079	MEHRU ELECTRICALS (FORMERLY AUTOMATIC ELECTRIC LIMITED)
7 . P8053	PERFECT SALES CORPORATION

810311 : MV CURRENT TRANSFORMERS

CODE	NAME
INDIA	
1 . P8219	ELECTRICAL CONTROLS AND SYSTEM
2 . P0036	ALSTOM LIMITED (AREVA T & D)
3 . P8128	ANANT POWERTECH
4 . P8214	ASIAN ELECTRICAL & ELECTRONICS
5 . P0378	INDCOIL TRANSFORMERS PVT. LTD.
6 . P0434	KAPPA ELECTRICALS
7 . P0079	MEHRU ELECTRICALS (FORMERLY AUTOMATIC ELECTRIC LIMITED)
8 . P8155	NEWTEK ELECTRICALS
9 . P8053	PERFECT SALES CORPORATION
10 . P0736	SIEMENS LTD.

810312 : MV POTENTIAL TRANSFORMERS

CODE	NAME
INDIA	
1 . P8219	ELECTRICAL CONTROLS AND SYSTEM
2 . P0036	ALSTOM LIMITED (AREVA T & D)
3 . P8214	ASIAN ELECTRICAL & ELECTRONICS
4 . P0378	INDCOIL TRANSFORMERS PVT. LTD.
5 . P8052	KALPA ELECTRICAL PRIVATE LIMITED
6 . P0434	KAPPA ELECTRICALS
7 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
8 . P0079	MEHRU ELECTRICALS (FORMERLY AUTOMATIC ELECTRIC LIMITED)
9 . P8155	NEWTEK ELECTRICALS
10 . P8053	PERFECT SALES CORPORATION
11 . P0736	SIEMENS LTD.

810401 : HIGH VOLTAGE SWITCH BOARD

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P8191	APPLICATION CONTROL PANELS PVT. LTD.
3 . P0066	ASEA BROWN BOVERI LTD.
4 . P8197	ASTEK ELECTRICAL INDIA PRIVATE LIMITED
5 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
6 . P0116	BIECCO LAWRIE LIMITED
7 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
8 . P8104	JYOTI LIMITED
9 . P8101	LARSEN &TOUBRO LIMITED
10 . P8041	LOTUS POWERGEAR PVT LTD
11 . P0736	SIEMENS LTD.
12 . P8176	STELMEC LIMITED
13 . P8183	TENCO SYSTEMS & SWITCH GEARS PVT. LTD.

810402 : MEDIUM VOLTAGE SWITCH BOARD(PCC/MCC)

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P8191	APPLICATION CONTROL PANELS PVT. LTD.
3 . P8197	ASTEK ELECTRICAL INDIA PRIVATE LIMITED
4 . P0113	BCH ELECTRIC LIMITED
5 . P0173	C&S ELECTRIC LTD.
6 . P8069	COSMIC POWER SYSTEMS PVT. LTD.
7 . P0231	ELECMECH CORPORATION
8 . P0573	GE POWER CONTROLS INDIA PVT. LTD.
9 . P0405	INTRELEC
10 . P8008	JAKSON ENGINEERS LTD
11 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
12 . P8041	LOTUS POWERGEAR PVT LTD
13 . P8210	RASHMI ELECTRICALS
14 . P0736	SIEMENS LTD.
15 . P8051	SPACEAGE SWITCHGEARS LIMITED
16 . P8183	TENCO SYSTEMS & SWITCH GEARS PVT. LTD.
17 . P8106	VENUS CONTROLS & SWITCHGEAR (P) LTD.

810403 : DRAW-OUT MCC

CODE	NAME
INDIA	
1 . P8129	ADVANCE PANELS & SWITCHGEARS (P) LTD.
2 . P8191	APPLICATION CONTROL PANELS PVT. LTD.
3 . P8197	ASTEK ELECTRICAL INDIA PRIVATE LIMITED
4 . P0113	BCH ELECTRIC LIMITED
5 . P0173	C&S ELECTRIC LTD.
6 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
7 . P0172	CONTROLS & SCHEMATICS PVT LTD.
8 . P8069	COSMIC POWER SYSTEMS PVT. LTD.
9 . P0231	ELECMECH CORPORATION
10 . P0573	GE POWER CONTROLS INDIA PVT. LTD.
11 . P0405	INTRELEC
12 . P8054	JASPER SWITCHGEARS LIMITED
13 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
14 . P8041	LOTUS POWERGEAR PVT LTD
15 . P8126	POWERTECH SWITCHGEARS (INDIA) PVT. LTD.
16 . P8210	RASHMI ELECTRICALS
17 . P0736	SIEMENS LTD.

810403 : DRAW-OUT MCC

CODE	NAME
18 . P8051	SPACEAGE SWITCHGEARS LIMITED
19 . P8183	TENCO SYSTEMS & SWITCH GEARS PVT. LTD.
20 . P8106	VENUS CONTROLS & SWITCHGEAR (P) LTD.
21 . P8046	VIDHYUT CONTROL(INDIA) PVT LTD

810404 : NON-DRAWOUT M.C.C.

CODE	NAME
INDIA	
1 . P0045	ANAND POWER LIMITED (upto 1800 Amp.)
2 . P0071	ASSOCIATED SWITCHGEARS & PROJECTS LTD.
3 . P8105	AVONE SYSTEM & CONTROLS
4 . P0113	BCH ELECTRIC LIMITED
5 . P0173	C&S ELECTRIC LTD.
6 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
7 . P0172	CONTROLS & SCHEMATICS PVT LTD.
8 . P8069	COSMIC POWER SYSTEMS PVT. LTD.
9 . P0231	ELECMECH CORPORATION
10 . P0226	ELECTRIC SUPPLY & SERVICES (P) LTD
11 . P0352	HINDUSTAN CONTROL & EQPT PV. LTD.
12 . P0405	INTRELEC
13 . P8054	JASPER SWITCHGEARS LIMITED
14 . P8041	LOTUS POWERGEAR PVT LTD
15 . P0670	REUNION ELECTRICAL MANUFACTURERS (P) LTD
16 . P8212	RITTAL PRIVATE LIMITED
17 . P8107	SHIVALIC POWER CONTROL (P) LTD.

810404 : NON-DRAWOUT M.C.C.

CODE	NAME
18 . P8051	SPACEAGE SWITCHGEARS LIMITED
19 . P0828	TRICOLITE ELECTRICAL INDUSTRIES PVT.LTD.
20 . P8106	VENUS CONTROLS & SWITCHGEAR (P) LTD.
21 . P8046	VIDHYUT CONTROL(INDIA) PVT LTD

810405 : ELECTROMAGNATIC TYPE CONTROL PANEL/DESKS

CODE	NAME
INDIA	
1 . P8129	ADVANCE PANELS & SWITCHGEARS (P) LTD.
2 . P0078	AUTOMATIC CONTROLS CORPORATION
3 . P0231	ELECMECH CORPORATION
4 . P0226	ELECTRIC SUPPLY & SERVICES (P) LTD
5 . P0352	HINDUSTAN CONTROL & EQPT PV. LTD.
6 . P0405	INTRELEC
7 . P8008	JAKSON ENGINEERS LTD
8 . P8041	LOTUS POWERGEAR PVT LTD
9 . P8126	POWERTECH SWITCHGEARS (INDIA) PVT. LTD.
10 . P8212	RITTAL PRIVATE LIMITED

810406 : PROGRAMMABLE LOGIC CONTROLLER.

CODE	NAME
INDIA	
1 . P0066	ASEA BROWN BOVERI LTD.
2 . P8076	HONEYWELL AUTOMATION INDIA LIMITED
3 . P0399	INSTRUMENTATION LTD
4 . P8008	JAKSON ENGINEERS LTD
5 . P0444	KERALA STATE ELECTRONICS DEV. CORPN. LTD.
6 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
7 . P0033	ROCKWELL AUTOMATION INDIA PVT. LTD.
8 . P0736	SIEMENS LTD.
GERMANY	
9 . P0348	HIMA PAUL HILDEBRANDT GMBH + CO KG
SINGAPORE	
10 . P0362	HONEYWELL HIPACK ASIA PACIFIC

810407 : STATIC TYPE CONTROL PANEL/DESKS.

CODE	NAME
INDIA	
1 . P8129	ADVANCE PANELS & SWITCHGEARS (P) LTD.
2 . P0036	ALSTOM LIMITED (AREVA T & D)
3 . P0066	ASEA BROWN BOVERI LTD.
4 . P0172	CONTROLS & SCHEMATICS PVT LTD.
5 . P0231	ELECMECH CORPORATION
6 . P0391	INDUSTRIAL INSTRUMENTS & CONTROLS
7 . P8054	JASPER SWITCHGEARS LIMITED
8 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
9 . P8041	LOTUS POWERGEAR PVT LTD
10 . P8126	POWERTECH SWITCHGEARS (INDIA) PVT. LTD.
11 . P8212	RITTAL PRIVATE LIMITED
12 . P0736	SIEMENS LTD.
13 . P0737	SILKAANS ELECTRICAL MFG. CO. PVT.LTD.

810408 : FLOOR MOUNTING TYPE DISTRIBUTION BOARDS.

CODE	NAME
INDIA	
1 . P0045	ANAND POWER LIMITED
2 . P8191	APPLICATION CONTROL PANELS PVT. LTD.
3 . P0071	ASSOCIATED SWITCHGEARS & PROJECTS LTD.
4 . P8197	ASTEK ELECTRICAL INDIA PRIVATE LIMITED
5 . P0078	AUTOMATIC CONTROLS CORPORATION
6 . P8105	AVONE SYSTEM & CONTROLS
7 . P0113	BCH ELECTRIC LIMITED
8 . P0173	C&S ELECTRIC LTD.
9 . P0172	CONTROLS & SCHEMATICS PVT LTD.
10 . P8069	COSMIC POWER SYSTEMS PVT. LTD.
11 . P8203	DURGA TECHNO INDUSTRIES
12 . P0231	ELECMECH CORPORATION
13 . P0226	ELECTRIC SUPPLY & SERVICES (P) LTD
14 . P8200	EX-PROTECTA
15 . P0573	GE POWER CONTROLS INDIA PVT. LTD.
16 . P0312	GLOBE ELECTRICAL INDUSTRIES
17 . P8114	HI-TECH ENGINEERS

810408 : FLOOR MOUNTING TYPE DISTRIBUTION BOARDS.

CODE	NAME
18 . P0352	HINDUSTAN CONTROL & EQPT PV. LTD.
19 . P0405	INTRELEC
20 . P8008	JAKSON ENGINEERS LTD
21 . P8054	JASPER SWITCHGEARS LIMITED
22 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
23 . P8041	LOTUS POWERGEAR PVT LTD
24 . P8210	RASHMI ELECTRICALS
25 . P0670	REUNION ELECTRICAL MANUFACTURERS (P) LTD
26 . P8212	RITTAL PRIVATE LIMITED
27 . P8107	SHIVALIC POWER CONTROL (P) LTD.
28 . P0736	SIEMENS LTD.
29 . P8051	SPACEAGE SWITCHGEARS LIMITED
30 . P0828	TRICOLITE ELECTRICAL INDUSTRIES PVT.LTD.
31 . P0831	TRIDENT SWITCHGEARS PVT. LTD. (upto 3200 A)
32 . P0841	UNITED ELECTRIC CO. (DELHI) PVT. LTD.
33 . P0845	UNIVERSAL INDUSTRIAL PRODUCTS
34 . P8106	VENUS CONTROLS & SWITCHGEAR (P) LTD.

810408 : FLOOR MOUNTING TYPE DISTRIBUTION BOARDS.

CODE	NAME
35 . P8046	VIDHYUT CONTROL(INDIA) PVT LTD

810409 : WALL MOUNTING TYPE DISTRIBUTION BOARDS.

CODE	NAME
INDIA	
1 . P8068	ADHUNIK SWITCHGEARS (P) LTD.
2 . P0045	ANAND POWER LIMITED
3 . P8191	APPLICATION CONTROL PANELS PVT. LTD.
4 . P0071	ASSOCIATED SWITCHGEARS & PROJECTS LTD.
5 . P8197	ASTEK ELECTRICAL INDIA PRIVATE LIMITED
6 . P0078	AUTOMATIC CONTROLS CORPORATION
7 . P8105	AVONE SYSTEM & CONTROLS
8 . P0113	BCH ELECTRIC LIMITED
9 . P0173	C&S ELECTRIC LTD.
10 . P0172	CONTROLS & SCHEMATICS PVT LTD.
11 . P8203	DURGA TECHNO INDUSTRIES
12 . P0231	ELECMECH CORPORATION
13 . P8200	EX-PROTECTA
14 . P0312	GLOBE ELECTRICAL INDUSTRIES
15 . P0337	HAVELLS INDIA LTD.
16 . P8114	HI-TECH ENGINEERS
17 . P0352	HINDUSTAN CONTROL & EQPT PV. LTD.

810409 : WALL MOUNTING TYPE DISTRIBUTION BOARDS.

CODE	NAME
18 . P0384	INDIANA CURRENT CONTROL LTD.
19 . P0413	INDO ASIAN FUSEGEAR LTD
20 . P0405	INTRELEC
21 . P8008	JAKSON ENGINEERS LTD
22 . P0523	LEGRAND INDIA LTD
23 . P8041	LOTUS POWERGEAR PVT LTD
24 . P8210	RASHMI ELECTRICALS
25 . P0670	REUNION ELECTRICAL MANUFACTURERS (P) LTD
26 . P8212	RITTAL PRIVATE LIMITED
27 . P8107	SHIVALIC POWER CONTROL (P) LTD.
28 . P8070	STANDARD ELECTRICALS LIMITED
29 . P0828	TRICOLITE ELECTRICAL INDUSTRIES PVT.LTD.
30 . P0831	TRIDENT SWITCHGEARS PVT. LTD.
31 . P8106	VENUS CONTROLS & SWITCHGEAR (P) LTD.

810410 : VARIABLE SPEED MOTOR PACKAGE

CODE	NAME
INDIA	
1 . P8082	AMTECH ELECTRONICS (INDIA) LTD. (LT)
2 . P0066	ASEA BROWN BOVERI LTD.
3 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
4 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
5 . P8098	DANFOSS INDUSTRIES PVT. LTD. (Upto 1400 KW)
6 . P8152	DELTA ELECTRONICS INDIA PVT.LTD. (VARIABLE FREQUENCY DRIVE SYSTEM UP TO 75 KW)
7 . P8178	HITACHI HI-REL POWER ELECTRONICS PRIVATE LIMITED
8 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
9 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
10 . P0033	ROCKWELL AUTOMATION INDIA PVT. LTD.
11 . P0736	SIEMENS LTD.
12 . P8142	TMEIC INDUSTRIAL SYSTEMS INDIA PRIVATE LIMITED
13 . P8120	VACON DRIVES & CONTROL PVT. LTD. (Variable Frequency Drive System)
14 . P8164	YASKAWA INDIA PRIVATE LIMITED (UPTO 355 KW)
FRANCE	
15 . P0034	ALSTHOM ATLANTIQUE
GERMANY	
16 . P0735	SIEMENS AG, GERMANY

810410 : VARIABLE SPEED MOTOR PACKAGE

CODE	NAME
ITALY	
17 . P0052	ANSALDO ROBICON
JAPAN	
18 . P0287	FUJI ELECTRIC SYSTEMS CO. LTD.
19 . P8127	TOSHIBA MITSUBISHI ELECTRIC INDUSTRIAL SYSTEMS CORPORATION
SWITZERLAND	
20 . P0130	BROWN BOVERI CORPORATION
U.K.	
21 . P0300	GEC INDUSTRIAL CONTROL LTD.

810411 : SOFT STARTER

CODE	NAME
INDIA	
1 . P8082	AMTECH ELECTRONICS (INDIA) LTD.
2 . P8098	DANFOSS INDUSTRIES PVT. LTD. (Upto 800 KW)
3 . P8178	HITACHI HI-REL POWER ELECTRONICS PRIVATE LIMITED
4 . P8071	INNOVATIVE TECHNOMATICS PVT. LTD.
5 . P8122	JAYASHREE ELECTRON PVT. LTD.
6 . P8066	KIMO ELECTRONICS PVT. LTD.
7 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
8 . P8218	LECON ENERGETICS PRIVATE LIMITED
9 . P0033	ROCKWELL AUTOMATION INDIA PVT. LTD.
10 . P0736	SIEMENS LTD.
11 . P8142	TMEIC INDUSTRIAL SYSTEMS INDIA PRIVATE LIMITED

810501 : HT POWER CABLE

CODE	NAME
INDIA	
1 . P8151	CMI LIMITED
2 . P8121	ADVANCE CABLE TECHNOLOGIES PRIVATE LIMITED
3 . P8087	APAR INDUSTRIES LTD. (UNIT: UNIFLEX CABLES)
4 . P0142	CABLE CORPN. OF INDIA LIMITED
5 . P8103	DIAMOND POWER INFRASTRUCTURE LTD.
6 . P8184	DYNAMIC CABLES LIMITED
7 . P8159	GEMSCAB INDUSTRIES LTD (Upto 33 KV (Single core upto 500 sq.mm & Three core upto 300 sq.mm.))
8 . P8195	GLOSTER CABLES LIMITED
9 . P8171	GRANDLAY ELECTRICALS INDIA
10 . P8117	GUPTA POWER INFRASTRUCTURE LTD. ((Up to 33 KV & size up to 3CX400 sq.mm and 1CX1000 sq.mm))
11 . P0337	HAVELLS INDIA LTD.
12 . P0388	INDUSTRIAL CABLES (I) LIMITED (3.3 KV PVC/XLPE & 11 KV XLPV Insulated)
13 . P8209	KEC INTERNATIONAL LIMITED
14 . P0687	KEC INTERNATIONAL LTD. (FORMERLY RPG CABLES LIMITED-
15 . P0442	KEI INDUSTRIES LIMITED (Upto 33 KV)
16 . P0574	NICCO CORPORATION LTD
17 . P8116	PARAMOUNT COMMUNICATIONS LTD. ((Up to 33 KV & size up to 3CX400 sq.mm and 1CX630 sq.mm))

810501 : HT POWER CABLE

CODE	NAME
18 . P8199	PARAMOUNT COMMUNICATIONS LTD.
19 . P8055	PLAZA CABLE INDUSTRIES LIMITED
20 . P8001	POLYCAB INDIA LIMITED (FORMERLY POLYCAB WIRES PRIVATE LTD.)
21 . P8043	RAVIN CABLES LIMITED
22 . P8217	SBEE CABLES (INDIA) LTD.
23 . P8130	STERLITE TECHNOLOGIES LTD., (6.6 kV to 33 kV)
24 . P0818	TORRENT CABLES LTD.
25 . P0843	UNIVERSAL CABLES LTD.
26 . P8177	V-MARC INDIA LIMITED

810502 : LT POWER CABLES

CODE	NAME
INDIA	
1 . P8151	CMI LIMITED
2 . P8056	ALPHA COMMUNICATION LIMITED
3 . P8087	APAR INDUSTRIES LTD. (UNIT: UNIFLEX CABLES)
4 . P8182	AXELON INDUSTRIES
5 . P0142	CABLE CORPN. OF INDIA LIMITED
6 . P8166	CHANDRESH CABLES LIMITED
7 . P8149	CORDS CABLE INDUSTRIES LTD.
8 . P0200	DELTON CABLES LTD
9 . P8103	DIAMOND POWER INFRASTRUCTURE LTD.
10 . P8184	DYNAMIC CABLES LIMITED
11 . P0260	FINOLEX CABLES LTD
12 . P8204	GEEP POLYMERS INDIA PRIVATE LIMITED
13 . P8159	GEMSCAB INDUSTRIES LTD
14 . P8112	GENUS ELECTROTECH LTD.
15 . P8195	GLOSTER CABLES LIMITED
16 . P0319	GRANDLAY ELECTRICALS (INDIA) (1.1 KV PVC/XLPE Insulated)
17 . P8171	GRANDLAY ELECTRICALS INDIA

810502 : LT POWER CABLES

CODE	NAME
18 . P8113	GRID INDIA POWER CABLES PVT. LTD.
19 . P0327	GUPTA ELECTRIC & MACHINERY STORES (GEMSCAB) (3-1/2 core 400 mm2)
20 . P8117	GUPTA POWER INFRASTRUCTURE LTD.
21 . P0337	HAVELLS INDIA LTD.
22 . P8180	HPL ELECTRIC & POWER LIMITED
23 . P0388	INDUSTRIAL CABLES (I) LIMITED (1.1 KV PVC/XLPE Insulated)
24 . P0416	J K CABLES LIMITED
25 . P8209	KEC INTERNATIONAL LIMITED
26 . P0687	KEC INTERNATIONAL LTD. (FORMERLY RPG CABLES LIMITED-
27 . P0442	KEI INDUSTRIES LIMITED
28 . P8175	KLJ PARAFLEX INDIA LIMITED
29 . P0466	KRISHNA ELECTRICAL INDUSTRIES LTD.
30 . P8193	LUMINO INDUSTRIES LIMITED
31 . P8093	MANSFIELD CABLE CO.
32 . P8187	NEC WIRE & CABLES PRIVATE LIMITED
33 . P0569	NETCO CABLE INDUSTRIES (PVT.) LTD. (Upto 3-½ core 400 mm2)
34 . P0574	NICCO CORPORATION LTD

810502 : LT POWER CABLES

CODE	NAME
35 . P0604	OMEGA CABLES LTD.
36 . P8057	PARAGON CABLES
37 . P8199	PARAMOUNT COMMUNICATIONS LTD.
38 . P8055	PLAZA CABLE INDUSTRIES LIMITED
39 . P8001	POLYCAB INDIA LIMITED (FORMERLY POLYCAB WIRES PRIVATE LTD.)
40 . P8207	POLYVION CABLES PVT. LTD
41 . P8090	PRESTIGE CABLE INDUSTRIES
42 . P0647	PREW INDUSTRIES LTD.
43 . P8147	R R KABEL LIMITED
44 . P0658	RADIANT CABLES PVT. LIMITED
45 . P8167	RAVI INDUSTRIES
46 . P8043	RAVIN CABLES LIMITED
47 . P0702	SATELLITE CABLES PVT. LTD. (3-1/2 core 400 mm2)
48 . P8217	SBEE CABLES (INDIA) LTD.
49 . P8078	SHYAM CABLES INDUSTRIES
50 . P0739	SKYTONE ELECTRICALS (I) LTD. (3-1/2 core 400 mm2)
51 . P0744	SPECIAL CABLES PVT. LTD.

810502 : LT POWER CABLES

CODE	NAME
52 . P0777	SUYOG ELECTRICALS LTD.
53 . P8086	T C COMMUNICATION PVT LTD
54 . P8109	TCL CABLES LTD.
55 . P8094	TERACOM LIMITED
56 . P0818	TORRENT CABLES LTD.
57 . P8165	TORTEK INDIA PRIVATE LIMITED
58 . P0843	UNIVERSAL CABLES LTD.
59 . P8177	V-MARC INDIA LIMITED
60 . P8206	ZENIUM CABLES LIMITED

810503 : CONTROL CABLE

CODE	NAME
INDIA	
1 . P8151	CMI LIMITED
2 . P8056	ALPHA COMMUNICATION LIMITED
3 . P8087	APAR INDUSTRIES LTD. (UNIT: UNIFLEX CABLES)
4 . P8182	AXELON INDUSTRIES
5 . P8058	BHANSALI CABLES & CONDUCTORS PVT. LTD
6 . P0142	CABLE CORPN. OF INDIA LIMITED
7 . P8166	CHANDRESH CABLES LIMITED
8 . P8149	CORDS CABLE INDUSTRIES LTD.
9 . P0200	DELTON CABLES LTD
10 . P8103	DIAMOND POWER INFRASTRUCTURE LTD.
11 . P8184	DYNAMIC CABLES LIMITED
12 . P0260	FINOLEX CABLES LTD
13 . P8204	GEEP POLYMERS INDIA PRIVATE LIMITED
14 . P8159	GEMSCAB INDUSTRIES LTD
15 . P8112	GENUS ELECTROTECH LTD.
16 . P8195	GLOSTER CABLES LIMITED
17 . P0319	GRANDLAY ELECTRICALS (INDIA) (PVC/XLPE Insulated)

810503 : CONTROL CABLE

CODE	NAME
18 . P8171	GRANDLAY ELECTRICALS INDIA
19 . P8113	GRID INDIA POWER CABLES PVT. LTD.
20 . P0327	GUPTA ELECTRIC & MACHINERY STORES (GEMSCAB) (19 core 2.5 mm2)
21 . P8117	GUPTA POWER INFRASTRUCTURE LTD.
22 . P0337	HAVELLS INDIA LTD.
23 . P8180	HPL ELECTRIC & POWER LIMITED
24 . P0416	J K CABLES LIMITED
25 . P8209	KEC INTERNATIONAL LIMITED
26 . P0687	KEC INTERNATIONAL LTD. (FORMERLY RPG CABLES LIMITED-
27 . P0442	KEI INDUSTRIES LIMITED
28 . P8175	KLJ PARAFLEX INDIA LIMITED
29 . P0466	KRISHNA ELECTRICAL INDUSTRIES LTD.
30 . P8193	LUMINO INDUSTRIES LIMITED
31 . P8093	MANSFIELD CABLE CO.
32 . P8059	N.C. CABLES LIMITED (FORMERLY NATIONAL CABLES)
33 . P8187	NEC WIRE & CABLES PRIVATE LIMITED
34 . P0569	NETCO CABLE INDUSTRIES (PVT.) LTD. (Upto 19 core 2.5 mm2)

810503 : CONTROL CABLE

CODE	NAME
35 . P0574	NICCO CORPORATION LTD
36 . P0604	OMEGA CABLES LTD.
37 . P8057	PARAGON CABLES
38 . P8199	PARAMOUNT COMMUNICATIONS LTD.
39 . P8055	PLAZA CABLE INDUSTRIES LIMITED
40 . P8001	POLYCAB INDIA LIMITED (FORMERLY POLYCAB WIRES PRIVATE LTD.)
41 . P8207	POLYVION CABLES PVT. LTD
42 . P8090	PRESTIGE CABLE INDUSTRIES
43 . P0647	PREW INDUSTRIES LTD.
44 . P8147	R R KABEL LIMITED
45 . P0658	RADIANT CABLES PVT. LIMITED
46 . P8167	RAVI INDUSTRIES
47 . P8043	RAVIN CABLES LIMITED
48 . P0702	SATELLITE CABLES PVT. LTD. (19 core 2.5 mm2)
49 . P8217	SBEE CABLES (INDIA) LTD.
50 . P8078	SHYAM CABLES INDUSTRIES
51 . P0739	SKYTONE ELECTRICALS (I) LTD. (19 core 2.5 mm2, 1.1 KV)

810503 : CONTROL CABLE

CODE	NAME
52 . P0744	SPECIAL CABLES PVT. LTD.
53 . P0777	SUYOG ELECTRICALS LTD.
54 . P8168	SVARN INFRATEL PRIVATE LIMITED
55 . P8086	T C COMMUNICATION PVT LTD
56 . P8109	TCL CABLES LTD.
57 . P8094	TERACOM LIMITED
58 . P0818	TORRENT CABLES LTD.
59 . P8165	TORTEK INDIA PRIVATE LIMITED
60 . P0843	UNIVERSAL CABLES LTD.
61 . P8177	V-MARC INDIA LIMITED
62 . P8206	ZENIUM CABLES LIMITED

810504 : FLEXIBLE CABLE.

CODE	NAME
INDIA	
1 . P8002	ANCHOR ELECTRICALS PVT. LTD.
2 . P8182	AXELON INDUSTRIES
3 . P8058	BHANSALI CABLES & CONDUCTORS PVT. LTD
4 . P8166	CHANDRESH CABLES LIMITED
5 . P0200	DELTON CABLES LTD
6 . P0260	FINOLEX CABLES LTD
7 . P8204	GEEP POLYMERS INDIA PRIVATE LIMITED
8 . P8195	GLOSTER CABLES LIMITED
9 . P8171	GRANDLAY ELECTRICALS INDIA
10 . P8117	GUPTA POWER INFRASTRUCTURE LTD.
11 . P0337	HAVELLS INDIA LTD.
12 . P8180	HPL ELECTRIC & POWER LIMITED
13 . P8075	KALINGA CABLES & CONDUIT CO.
14 . P8175	KLJ PARAFLEX INDIA LIMITED
15 . P8059	N.C. CABLES LIMITED (FORMERLY NATIONAL CABLES)
16 . P8187	NEC WIRE & CABLES PRIVATE LIMITED
17 . P0574	NICCO CORPORATION LTD

810504 : FLEXIBLE CABLE.

CODE	NAME
18 . P8199	PARAMOUNT COMMUNICATIONS LTD.
19 . P8055	PLAZA CABLE INDUSTRIES LIMITED
20 . P8001	POLYCAB INDIA LIMITED (FORMERLY POLYCAB WIRES PRIVATE LTD.)
21 . P8207	POLYVION CABLES PVT. LTD
22 . P8090	PRESTIGE CABLE INDUSTRIES
23 . P0647	PREW INDUSTRIES LTD.
24 . P8147	R R KABEL LIMITED
25 . P8167	RAVI INDUSTRIES
26 . P8078	SHYAM CABLES INDUSTRIES
27 . P0739	SKYTONE ELECTRICALS (I) LTD. (3-1/2 core, 185 mm2)
28 . P0744	SPECIAL CABLES PVT. LTD.
29 . P0777	SUYOG ELECTRICALS LTD.
30 . P8168	SVARN INFRATEL PRIVATE LIMITED
31 . P8086	T C COMMUNICATION PVT LTD
32 . P8094	TERACOM LIMITED
33 . P0818	TORRENT CABLES LTD.
34 . P8165	TORTEK INDIA PRIVATE LIMITED

810504 : FLEXIBLE CABLE.

CODE	NAME
35 . P8177	V-MARC INDIA LIMITED
36 . P8206	ZENIUM CABLES LIMITED

810505 : TELEPHONE CABLE

CODE	NAME
INDIA	
1 . P8056	ALPHA COMMUNICATION LIMITED
2 . P8058	BHANSALI CABLES & CONDUCTORS PVT. LTD
3 . P0163	CMI LIMITED
4 . P8149	CORDS CABLE INDUSTRIES LTD.
5 . P0200	DELTON CABLES LTD
6 . P0260	FINOLEX CABLES LTD
7 . P0351	HINDUSTAN CABLES LTD
8 . P0574	NICCO CORPORATION LTD
9 . P8057	PARAGON CABLES
10 . P8055	PLAZA CABLE INDUSTRIES LIMITED
11 . P8001	POLYCAB INDIA LIMITED (FORMERLY POLYCAB WIRES PRIVATE LTD.)
12 . P8090	PRESTIGE CABLE INDUSTRIES
13 . P0647	PREW INDUSTRIES LTD.
14 . P0665	RELIANCE ENGINEERS LTD.
15 . P0688	RPG TELECOM LTD
16 . P8078	SHYAM CABLES INDUSTRIES
17 . P8168	SVARN INFRATEL PRIVATE LIMITED

810505 : TELEPHONE CABLE

CODE	NAME
18 . P0850	USHA BELTRON LIMITED,
19 . P0863	VINDHYA TELELINK LTD

810506 : CABLES FOR EARTHING

CODE	NAME
INDIA	
1 . P8121	ADVANCE CABLE TECHNOLOGIES PRIVATE LIMITED
2 . P0200	DELTON CABLES LTD
3 . P0260	FINOLEX CABLES LTD
4 . P0327	GUPTA ELECTRIC & MACHINERY STORES (GEMSCAB)
5 . P0416	J K CABLES LIMITED
6 . P0569	NETCO CABLE INDUSTRIES (PVT.) LTD.
7 . P0574	NICCO CORPORATION LTD
8 . P8001	POLYCAB INDIA LIMITED (FORMERLY POLYCAB WIRES PRIVATE LTD.)
9 . P8090	PRESTIGE CABLE INDUSTRIES
10 . P8078	SHYAM CABLES INDUSTRIES
11 . P0777	SUYOG ELECTRICALS LTD.
12 . P8168	SVARN INFRATEL PRIVATE LIMITED
13 . P8086	T C COMMUNICATION PVT LTD
14 . P0843	UNIVERSAL CABLES LTD.

810507 : SPECIAL CABLES

CODE	NAME
INDIA	
1 . P8121	ADVANCE CABLE TECHNOLOGIES PRIVATE LIMITED
2 . P8056	ALPHA COMMUNICATION LIMITED
3 . P8058	BHANSALI CABLES & CONDUCTORS PVT. LTD
4 . P8057	PARAGON CABLES
5 . P8055	PLAZA CABLE INDUSTRIES LIMITED
6 . P8090	PRESTIGE CABLE INDUSTRIES
7 . P8078	SHYAM CABLES INDUSTRIES

810601 : HIGH VOLTAGE INDUCTION MOTORS

CODE	NAME
INDIA	
1 . P8158	ABB INDIA LIMITED
2 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
3 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
4 . P8140	JEUMONT ELECTRIC INDIA PVT. LTD. (Excluding Flame Proof (Exd) type Motors but Pressurised (Exp) Type Motors - upto 1300 KW; Increased Safety (Exe) Type Motors - Upto 770 KW; Non-Sparking (Exn) Typep Motors - Upto 860 KW and Safe Area Motors - Upto
5 . P8104	JYOTI LIMITED
6 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
7 . P8163	MARATHON ELECTRIC MOTORS (INDIA) LTD. (UP TO 2800KW)
8 . P8142	TMEIC INDUSTRIAL SYSTEMS INDIA PRIVATE LIMITED
9 . P8137	WEG INDUSTRIES (INDIA) PVT. LTD (Up to Frame Size 1600 and rating up to 16 MW)
FRANCE	
10 . P0034	ALSTHOM ATLANTIQUE
11 . P0426	JEUMONT INDUSTRIE
GERMANY	
12 . P0016	AEG TELEFUNKEN AG
ITALY	
13 . P0052	ANSALDO ROBICON
JAPAN	
14 . P0287	FUJI ELECTRIC SYSTEMS CO. LTD.
15 . P0539	MITSUBISHI CORPORATION

810601 : HIGH VOLTAGE INDUCTION MOTORS

CODE	NAME
16 . P0726	SHINKO ELECTRICALS CO. LTD.
17 . P0819	TOSHIBA CORPORATION
18 . P8127	TOSHIBA MITSUBISHI ELECTRIC INDUSTRIAL SYSTEMS CORPORATION ((Excludin g Flame-proof motors of frame size more than 900))
SWEDEN	
19 . P0064	ASEA BROWN BOVERI
U.K.	
20 . P0486	LAURENCE, SCOTT & ELECTROMOTORS LTD.
21 . P0621	PEEBLES ELECTRICAL MACHINES
U.S.A.	
22 . P0303	GENERAL ELECTRIC CO.
23 . P0877	WESTINGHOUSE ELECTRIC CORPORATION

810602 : MEDIUM VOLTAGE INDUCTION MOTORS

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0066	ASEA BROWN BOVERI LTD.
3 . P0104	BHARAT BIJLEE LTD
4 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
5 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
6 . P8042	ELGI ELECTRIC INDUSTRIES LTD
7 . P8102	HEM INDUSTRIES
8 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
9 . P8081	LAXMI HYDRAULICS PVT. LTD. (Upto 355L Frame Size)
10 . P8202	ROTOMOTIVE POWERDRIVES INDIA LTD.
11 . P0736	SIEMENS LTD.
FRANCE	
12 . P0034	ALSTHOM ATLANTIQUE
13 . P0426	JEUMONT INDUSTRIE
GERMANY	
14 . P0016	AEG TELEFUNKEN AG
15 . P0735	SIEMENS AG, GERMANY
ITALY	

810602 : MEDIUM VOLTAGE INDUCTION MOTORS

CODE	NAME
16 . P0052	ANSALDO ROBICON
JAPAN	
17 . P0287	FUJI ELECTRIC SYSTEMS CO. LTD.
18 . P0539	MITSUBISHI CORPORATION
19 . P0726	SHINKO ELECTRICALS CO. LTD.
20 . P0819	TOSHIBA CORPORATION
SWEDEN	
21 . P0064	ASEA BROWN BOVERI
U.K.	
22 . P0486	LAURENCE, SCOTT & ELECTROMOTORS LTD.
23 . P0621	PEEBLES ELECTRICAL MACHINES
U.S.A.	
24 . P0303	GENERAL ELECTRIC CO.
25 . P0877	WESTINGHOUSE ELECTRIC CORPORATION

810603 : MEDIUM VOLTAGE FLAME PROOF/ INCREASED SAFETY MOTORS

CODE	NAME
INDIA	
1 . P0066	ASEA BROWN BOVERI LTD.
2 . P0104	BHARAT BIJLEE LTD
3 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
4 . P8102	HEM INDUSTRIES (0.18 KW TO 200 KW)
5 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
6 . P8081	LAXMI HYDRAULICS PVT. LTD. (Upto 315L Frame Size)
7 . P8202	ROTOMOTIVE POWERDRIVES INDIA LTD.
FRANCE	
8 . P0426	JEUMONT INDUSTRIE
GERMANY	
9 . P0735	SIEMENS AG, GERMANY
ITALY	
10 . P0052	ANSALDO ROBICON
JAPAN	
11 . P0287	FUJI ELECTRIC SYSTEMS CO. LTD.
12 . P0539	MITSUBISHI CORPORATION
13 . P0819	TOSHIBA CORPORATION
SWEDEN	
14 . P0064	ASEA BROWN BOVERI
U.K.	

810603 : MEDIUM VOLTAGE FLAME PROOF/ INCREASED SAFETY MOTORS

CODE	NAME
15 . P0486	LAURENCE, SCOTT & ELECTROMOTORS LTD.
16 . P0621	PEEBLES ELECTRICAL MACHINES
U.S.A.	
17 . P0303	GENERAL ELECTRIC CO.
18 . P0877	WESTINGHOUSE ELECTRIC CORPORATION

810604 : SYNCHRONOUS MOTORS

CODE	NAME
INDIA	
1 . P0066	ASEA BROWN BOVERI LTD.
2 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
3 . P8202	ROTOMOTIVE POWERDRIVES INDIA LTD.
4 . P8137	WEG INDUSTRIES (INDIA) PVT. LTD (Up to Frame Size 1600 and rating up to 16 MW)
FRANCE	
5 . P0034	ALSTHOM ATLANTIQUE
6 . P0426	JEUMONT INDUSTRIE
GERMANY	
7 . P0016	AEG TELEFUNKEN AG
8 . P0735	SIEMENS AG, GERMANY
ITALY	
9 . P0052	ANSALDO ROBICON
JAPAN	
10 . P0287	FUJI ELECTRIC SYSTEMS CO. LTD.
11 . P0539	MITSUBISHI CORPORATION
12 . P0726	SHINKO ELECTRICALS CO. LTD.
13 . P0819	TOSHIBA CORPORATION
14 . P8127	TOSHIBA MITSUBISHI ELECTRIC INDUSTRIAL SYSTEMS CORPORATION
SWEDEN	

810604 : SYNCHRONOUS MOTORS

CODE	NAME
15 . P0064	ASEA BROWN BOVERI
U.K.	
16 . P0486	LAURENCE, SCOTT & ELECTROMOTORS LTD.
17 . P0621	PEEBLES ELECTRICAL MACHINES
U.S.A.	
18 . P0303	GENERAL ELECTRIC CO.
19 . P0877	WESTINGHOUSE ELECTRIC CORPORATION

810605 : CANNED MOTORS

CODE	NAME
INDIA	
1 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
2 . P0736	SIEMENS LTD.

810606 : GEARED MOTORS

CODE	NAME
INDIA	
1 . P0321	GREAVES COTTON & CO. LTD.
2 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
3 . P0571	NEW ALLENBERRY WORKS
4 . P8084	NORD DRIVESYSTEMS PVT. LTD.
5 . P0638	POWER BUILD LTD
6 . P8202	ROTOMOTIVE POWERDRIVES INDIA LTD.
7 . P8091	SEW EURODRIVE INDIA PRIVATE LIMITED

810701 : BATTERY CHARGER

CODE	NAME
INDIA	
1 . P0040	AMCO POWER SYSTEMS LIMITED
2 . P0154	CHHABI ELECTRICALS PVT. LTD.
3 . P0144	CHLORIDE POWER SYSTEMS AND SOLUTIONS LTD. (formerly CALDYNE
4 . P8092	DUBAS ENGINEERING PVT. LTD.
5 . P0694	HBL NIFE POWER SYSTEMS LTD.
6 . P0444	KERALA STATE ELECTRONICS DEV. CORPN. LTD.
7 . P0079	MEHRU ELECTRICALS (FORMERLY AUTOMATIC ELECTRIC LIMITED)
8 . P8131	SERVILINK ENGINEERS PVT. LTD.
9 . P0845	UNIVERSAL INDUSTRIAL PRODUCTS

810703 : STATIC TYPE UPS SYSTEM

CODE	NAME
INDIA	
1 . P0195	DB POWER ELECTRONICS PVT. LTD.
2 . P8092	DUBAS ENGINEERING PVT. LTD.
3 . P8003	EMERSON NETWORK POWER (INDIA) PVT. LTD.
4 . P0573	GE POWER CONTROLS INDIA PVT. LTD.
5 . P0360	HITACHI HI-REL POWER ELECTRONICS PVT. LTD.
6 . P0399	INSTRUMENTATION LTD
7 . P0444	KERALA STATE ELECTRONICS DEV. CORPN. LTD.
8 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
GERMANY	
9 . P0016	AEG TELEFUNKEN AG
JAPAN	
10 . P0287	FUJI ELECTRIC SYSTEMS CO. LTD.
11 . P0819	TOSHIBA CORPORATION
SWEDEN	
12 . P0064	ASEA BROWN BOVERI
U.S.A.	
13 . P0303	GENERAL ELECTRIC CO.
14 . P0742	SOLIDSTATE CONTROL INC.
15 . P0877	WESTINGHOUSE ELECTRIC CORPORATION

810705 : ELECTROSTATIC TYPE VOLTAGE STABILIZERS

CODE	NAME
INDIA	
1 . P0055	APLAB LIMITED

810801 : NEUTRAL EARTHING RESISTOR

CODE	NAME
INDIA	
1 . P0231	ELECMECH CORPORATION
2 . P8041	LOTUS POWERGEAR PVT LTD
3 . P8004	PEFCO FOUNDRY & CHEM LTD
4 . P0669	RESITECH ELECTRICALS PRIVATE LIMITED
5 . P0689	RSI SWITCHGEAR PRIVATE LTD.
6 . P0692	S R NARKHEDE ENGINEERING PVT. LTD.

810802 : EARTHING & LIGHTNING PROTECTION MATERIAL, AL WIRE/STRIP

CODE	NAME
INDIA	
1 . P0046	ANAND ELECTRIC TRADING CO.
2 . P8135	INDMARK FORMTECH PVT. LTD.
3 . P8085	JAMNA METAL COMPANY
4 . P0423	JAYANT METAL MFG CO
5 . P0504	MAHAVIR INDUSTRIAL CORPORATION
6 . P0533	METROPOLITAN INDUSTRIES
7 . P8072	PREMIER POWER PRODUCTS (CALCUTTA) PVT. LTD.
8 . P0696	SAI GALVANISERS & FABRICATORS PVT LTD

810803 : EARTHING & LIGHTNING PROTECTION MATERIAL,G.I.WIRE/STRIP

CODE	NAME
INDIA	
1 . P0046	ANAND ELECTRIC TRADING CO.
2 . P0112	BHARTI EXPORTS
3 . P8203	DURGA TECHNO INDUSTRIES
4 . P8205	INDIANA GRATINGS PRIVATE LIMITED
5 . P8135	INDMARK FORMTECH PVT. LTD.
6 . P8085	JAMNA METAL COMPANY
7 . P0423	JAYANT METAL MFG CO
8 . P0504	MAHAVIR INDUSTRIAL CORPORATION
9 . P0529	METALITE INDUSTRIES
10 . P0533	METROPOLITAN INDUSTRIES
11 . P8189	PINAX STEEL INDUSTRIES PRIVATE LIMITED
12 . P8072	PREMIER POWER PRODUCTS (CALCUTTA) PVT. LTD.
13 . P8174	R.K. Engineering Works
14 . P8179	RATAN PROJECTS AND ENGINEERING CO. PVT. LTD.
15 . P8044	RUKMANI ELECTRICALS & COMPONENTS PVT LTD
16 . P0695	SADHANA ENGINEERING CORPORATION
17 . P0696	SAI GALVANISERS & FABRICATORS PVT LTD

810803 : EARTHING & LIGHTNING PROTECTION MATERIAL,G.I.WIRE/STRIP

CODE	NAME
18 . P0753	STEALITE ENGG CO
19 . P8154	TELECOM NETWORK SOLUTIONS PVT.LTD.

810901 : MV Ex. Proof Items(Switches/Switch Skt./Plugs/Isolators/J.Box/LCS/DB)

CODE	NAME
INDIA	
1 . P0089	BALIGA LIGHTING EQUIPMENTS LIMITED
2 . P8138	EX-PROTECTA
3 . P0147	FCG FLAMEPROOF CONTROL GEARS PVT. LTD. (FORMERLY CEAG FLAME
4 . P8007	FCG POWER INDUSTRIES PVT.LTD.
5 . P0268	FLAMEPROOF EQUIPMENTS PVT. LTD.
6 . P0272	FLEXPRO ELECTRICALS PVT. LTD.
7 . P8134	INDUSTRIAL PRODUCTS EQUIPMENT
8 . P8132	KAYSONS TECHNO EQUIPMENTS PVT. LTD.
9 . P8045	PETROLEUM SAFETY PRODUCTS INDUSTRIES PRIVATE LTD.
10 . P8088	PROMPT ENGINEERING WORKS
11 . P8225	PROMPT ENGINEERING WORKS
12 . P8194	Phoenix Mecano (India) Pvt.Ltd.
13 . P8156	SHREYA EX-TECH PRIVATE LIMITED
14 . P0763	SUDHIR SWITCHGEARS PVT. LTD.
FRANCE	
15 . P0491	LEGRAND S.A.
GERMANY	
16 . P0016	AEG TELEFUNKEN AG

810901 : MV Ex. Proof Items(Switches/Switch Skt./Plugs/Isolators/J.Box/LCS/DB)

CODE	NAME
17 . P0092	BBC-BROWN BOVERI & CIE AG
18 . P0657	R STAHL SCHALTGERATE GMBH
19 . P0735	SIEMENS AG, GERMANY
20 . P0875	WEIDMULLER LTD.
ITALY	
21 . P0178	CORTEM S.p.A.
JAPAN	
22 . P0287	FUJI ELECTRIC SYSTEMS CO. LTD.
23 . P0815	TOGAMI ELECTRIC MFG. COMPANY
24 . P0819	TOSHIBA CORPORATION
SWEDEN	
25 . P0064	ASEA BROWN BOVERI
U.K.	
26 . P0187	CROUSE-HINDS (EUROPE) LTD.
27 . P0300	GEC INDUSTRIAL CONTROL LTD.
28 . P0555	M&C SWITCHGEAR

810903 : EXPLOSION PROOF LIGHTING FIXTURES

CODE	NAME
INDIA	
1 . P0089	BALIGA LIGHTING EQUIPMENTS LIMITED
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P8138	EX-PROTECTA
4 . P0147	FCG FLAMEPROOF CONTROL GEARS PVT. LTD. (FORMERLY CEAG FLAME
5 . P8007	FCG POWER INDUSTRIES PVT.LTD.
6 . P0268	FLAMEPROOF EQUIPMENTS PVT. LTD.
7 . P0272	FLEXPRO ELECTRICALS PVT. LTD.
8 . P8132	KAYSONS TECHNO EQUIPMENTS PVT. LTD.
9 . P8045	PETROLEUM SAFETY PRODUCTS INDUSTRIES PRIVATE LTD.
10 . P8225	PROMPT ENGINEERING WORKS
11 . P8148	SAIEX FLAMEPROOF EQUIPMENTS PVT LTD
12 . P8156	SHREYA EX-TECH PRIVATE LIMITED
13 . P0763	SUDHIR SWITCHGEARS PVT. LTD.

810904 : EXPLOSION PROOF PANIC LIGHTS

CODE	NAME
INDIA	
1 . P0089	BALIGA LIGHTING EQUIPMENTS LIMITED
2 . P0147	FCG FLAMEPROOF CONTROL GEARS PVT. LTD. (FORMERLY CEAG FLAME
3 . P8007	FCG POWER INDUSTRIES PVT.LTD.
4 . P0268	FLAMEPROOF EQUIPMENTS PVT. LTD.
5 . P0272	FLEXPRO ELECTRICALS PVT. LTD.
6 . P8132	KAYSONS TECHNO EQUIPMENTS PVT. LTD.
7 . P8225	PROMPT ENGINEERING WORKS
FRANCE	
8 . P0513	MAPELEC SA
GERMANY	
9 . P0148	CEAG LIGHT-UDN STROMVERSORGUNGS TECHNIK

810906 : FLAMEPROOF CABLE GLAND

CODE	NAME
INDIA	
1 . P0089	BALIGA LIGHTING EQUIPMENTS LIMITED
2 . P8216	CLEON OPTOBIZ PVT LTD.
3 . P0165	COMET BRASS PRODUCTS
4 . P8100	COMET INDUSTRIES
5 . P0211	DOWELL'S ELECTRICALS
6 . P0228	ELECTROMAC INDUSTRIES
7 . P8138	EX-PROTECTA
8 . P0147	FCG FLAMEPROOF CONTROL GEARS PVT. LTD. (FORMERLY CEAG FLAME
9 . P8007	FCG POWER INDUSTRIES PVT.LTD.
10 . P0268	FLAMEPROOF EQUIPMENTS PVT. LTD.
11 . P0272	FLEXPRO ELECTRICALS PVT. LTD.
12 . P8134	INDUSTRIAL PRODUCTS EQUIPMENT
13 . P8132	KAYSONS TECHNO EQUIPMENTS PVT. LTD.
14 . P0639	POWER ENGG CO
15 . P8088	PROMPT ENGINEERING WORKS
16 . P8225	PROMPT ENGINEERING WORKS
17 . P8194	Phoenix Mecano (India) Pvt.Ltd.

810906 : FLAMEPROOF CABLE GLAND

CODE	NAME
18 . P8148	SAIEX FLAMEPROOF EQUIPMENTS PVT LTD
19 . P8156	SHREYA EX-TECH PRIVATE LIMITED
20 . P0763	SUDHIR SWITCHGEARS PVT. LTD.

810909 : EXPLOSION PROOF EXHAUST FAN

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0147	FCG FLAMEPROOF CONTROL GEARS PVT. LTD. (FORMERLY CEAG FLAME
4 . P0268	FLAMEPROOF EQUIPMENTS PVT. LTD.
5 . P8134	INDUSTRIAL PRODUCTS EQUIPMENT
6 . P8225	PROMPT ENGINEERING WORKS
7 . P8156	SHREYA EX-TECH PRIVATE LIMITED

811001 : COMMERCIAL LTG FIXTURES

CODE	NAME
INDIA	
1 . P0085	BAJAJ ELECTRICALS LIMITED
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0337	HAVELLS INDIA LTD.
4 . P8215	INSTAPOWER LTD. (LED)
5 . P8099	KESELEC SCHREDER PRIVATE LIMITED
6 . P8211	LEGERO LIGHTING INDIA PVT. LTD.
7 . P8170	LIGHTING TECHNOLOGIES INDIA PRIVATE LIMITED (-)
8 . P8208	ORIENT ELECTRIC LIMITED
9 . P0623	PHILIPS INDIA LTD.
10 . P8186	PYROTECH ELECTRONICS PVT. LTD.
11 . P8096	SURYA ROSHNI LTD.
12 . P0881	WIPRO LIGHTING
India	
13 . P8224	LEDURE LIGHTING LIMITED

811002 : CORROSION PROOF INDUSTRIAL LTG.FIXTURES

CODE	NAME
INDIA	
1 . P0085	BAJAJ ELECTRICALS LIMITED
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0337	HAVELLS INDIA LTD.
4 . P8099	KESELEC SCHREDER PRIVATE LIMITED
5 . P0623	PHILIPS INDIA LTD.
6 . P8186	PYROTECH ELECTRONICS PVT. LTD.
India	
7 . P8224	LEDURE LIGHTING LIMITED

811003 : HOSE PROOF INDUSTRIAL LTG.FIXTURES

CODE	NAME
INDIA	
1 . P0085	BAJAJ ELECTRICALS LIMITED
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P8099	KESELEC SCHREDER PRIVATE LIMITED
4 . P0623	PHILIPS INDIA LTD.
5 . P8186	PYROTECH ELECTRONICS PVT. LTD.
6 . P8051	SPACEAGE SWITCHGEARS LIMITED
7 . P8096	SURYA ROSHNI LTD.
8 . P0881	WIPRO LIGHTING

811004 : STREET/FLOOD LTG.FIXTURES

CODE	NAME
INDIA	
1 . P0085	BAJAJ ELECTRICALS LIMITED
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0337	HAVELLS INDIA LTD.
4 . P8215	INSTAPOWER LTD. (LED)
5 . P8099	KESELEC SCHREDER PRIVATE LIMITED
6 . P8211	LEGERO LIGHTING INDIA PVT. LTD.
7 . P8170	LIGHTING TECHNOLOGIES INDIA PRIVATE LIMITED (-)
8 . P8208	ORIENT ELECTRIC LIMITED
9 . P0623	PHILIPS INDIA LTD.
10 . P8186	PYROTECH ELECTRONICS PVT. LTD.
11 . P8051	SPACEAGE SWITCHGEARS LIMITED
12 . P8096	SURYA ROSHNI LTD.
13 . P0881	WIPRO LIGHTING
India	
14 . P8224	LEDURE LIGHTING LIMITED

811005 : AIR OBSTRUCTION LIGHTS (NEON TYPE)

CODE	NAME
INDIA	
1 . P0085	BAJAJ ELECTRICALS LIMITED
2 . P0686	ELECAB POYSHA
3 . P0881	WIPRO LIGHTING

811006 : LAMPS & TUBES

CODE	NAME
INDIA	
1 . P8002	ANCHOR ELECTRICALS PVT. LTD.
2 . P0085	BAJAJ ELECTRICALS LIMITED
3 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
4 . P8006	ECE BULBS & TUBES
5 . P0337	HAVELLS INDIA LTD.
6 . P8215	INSTAPOWER LTD. (LED)
7 . P8211	LEGERO LIGHTING INDIA PVT. LTD.
8 . P8170	LIGHTING TECHNOLOGIES INDIA PRIVATE LIMITED (-)
9 . P8208	ORIENT ELECTRIC LIMITED
10 . P8005	OSRAM INDIA LTD.
11 . P0623	PHILIPS INDIA LTD.
12 . P8096	SURYA ROSHNI LTD.
13 . P0881	WIPRO LIGHTING
India	
14 . P8224	LEDURE LIGHTING LIMITED

811007 : COMPACT FLUORESCENT LAMPS

CODE	NAME
INDIA	
1 . P0085	BAJAJ ELECTRICALS LIMITED
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0337	HAVELLS INDIA LTD.
4 . P0413	INDO ASIAN FUSEGEAR LTD (Ecolite make)
5 . P8005	OSRAM INDIA LTD.
6 . P0623	PHILIPS INDIA LTD.
7 . P8070	STANDARD ELECTRICALS LIMITED
8 . P8096	SURYA ROSHNI LTD.

811101 : ALKALINE BATTERY

CODE	NAME
INDIA	
1 . P0040	AMCO POWER SYSTEMS LIMITED
2 . P0694	HBL NIFE POWER SYSTEMS LTD.
3 . P0346	HIGH ENERGY BATTERIES (INDIA) LTD.
JAPAN	
4 . P0287	FUJI ELECTRIC SYSTEMS CO. LTD.
5 . P0357	HITACHI LTD.

811102 : LEAD ACID BATTERY

CODE	NAME
INDIA	
1 . P0151	ABB INDIA LIMITED
2 . P0038	AMARA RAJA BATTERIES LTD
3 . P0249	EXIDE INDUSTRIES LIMITED
4 . P8108	MICROTEX ENERGY P LTD.

811201 : LIFT

CODE	NAME
INDIA	
1 . P0609	OTIS ELEVATOR CO (I) LTD
JAPAN	
2 . P0190	DAIICHI JITSUGYO CO., LTD.
3 . P0287	FUJI ELECTRIC SYSTEMS CO. LTD.
4 . P0581	NIPPON ELEVATOR IND.CO. LIMITED
SWITZERLAND	
5 . P0705	SCHINDLER AG

811301 : DIESEL GENERATOR SET.

CODE	NAME
INDIA	
1 . P0091	BATLIBOI & CO. LTD.
2 . P8009	BHASKAR POWER PROJECTS LTD.
3 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
4 . P8014	CATERPILLAR
5 . P0188	CUMMINS INDIA LIMITED
6 . P0292	GARDEN REACH SHIPBUILDERS & ENGINEERS LTD.
7 . P0321	GREAVES COTTON & CO. LTD.
8 . P8114	HI-TECH ENGINEERS (Upto 625 KVA)
9 . P8008	JAKSON ENGINEERS LTD
10 . P8015	JEEVAN DIESEL & ELECTRICALS LTD.
11 . P8013	KIRLOSKAR OIL ENGINES
12 . P8188	STERLING GENERATORS PRIVATE LIMITED
13 . P8010	SUDHIR GENSETS LTD.
14 . P8012	TOYO DENKI POWER SYSTEMS PVT. LTD.
15 . P8011	WARTSILLA INDIA LTD.
JAPAN	
16 . P0539	MITSUBISHI CORPORATION

811301 : DIESEL GENERATOR SET.

CODE	NAME
17 . P0821	TOYO ELECT. MFG. CO. LTD.

SWEDEN

CODE	NAME
18 . P0064	ASEA BROWN BOVERI

811401 : HIGH VOLTAGE BUS DUCT.

CODE	NAME
INDIA	
1 . P0102	BEST & CROMPTON ENGG. CO.
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0405	INTRELEC
4 . P0435	KARAMCHAND THAPAR
5 . P8041	LOTUS POWERGEAR PVT LTD
6 . P0640	POWERGEAR LIMITED
7 . P8051	SPACEAGE SWITCHGEARS LIMITED

811402 : MEDIUM VOLTAGE BUS DUCT

CODE	NAME
INDIA	
1 . P0045	ANAND POWER LIMITED
2 . P0071	ASSOCIATED SWITCHGEARS & PROJECTS LTD.
3 . P8197	ASTEK ELECTRICAL INDIA PRIVATE LIMITED
4 . P8105	AVONE SYSTEM & CONTROLS
5 . P0113	BCH ELECTRIC LIMITED
6 . P0102	BEST & CROMPTON ENGG. CO.
7 . P0173	C&S ELECTRIC LTD.
8 . P0172	CONTROLS & SCHEMATICS PVT LTD.
9 . P8069	COSMIC POWER SYSTEMS PVT. LTD.
10 . P0195	DB POWER ELECTRONICS PVT. LTD.
11 . P0312	GLOBE ELECTRICAL INDUSTRIES
12 . P0352	HINDUSTAN CONTROL & EQPT PV. LTD.
13 . P0405	INTRELEC
14 . P8041	LOTUS POWERGEAR PVT LTD
15 . P8074	MAHESHWARI ELECTRICAL MFRS. (P) LTD.
16 . P0640	POWERGEAR LIMITED
17 . P0670	REUNION ELECTRICAL MANUFACTURERS (P) LTD

811402 : MEDIUM VOLTAGE BUS DUCT

CODE	NAME
18 . P8107	SHIVALIC POWER CONTROL (P) LTD.
19 . P8051	SPACEAGE SWITCHGEARS LIMITED
20 . P0841	UNITED ELECTRIC CO. (DELHI) PVT. LTD.
21 . P8106	VENUS CONTROLS & SWITCHGEAR (P) LTD.

811501 : SWITCHYARD PACKAGE

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0066	ASEA BROWN BOVERI LTD.
3 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
4 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
5 . P8104	JYOTI LIMITED (upto 33KV only)
6 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
7 . P8016	L&T (ECE DIVISION)
8 . P0079	MEHRU ELECTRICALS (FORMERLY AUTOMATIC ELECTRIC LIMITED)
9 . P0132	RELIANCE POWER
10 . P0670	REUNION ELECTRICAL MANUFACTURERS (P) LTD
11 . P0736	SIEMENS LTD.
12 . P0798	THE AHMEDABAD ELECTRICITY CO LTD
13 . P0869	VOLTAS LTD. (PUMPS & PROJECTS BUSINESS DIV)

811502 : SUB-STATION PACKAGE

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0102	BEST & CROMPTON ENGG. CO.
3 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
4 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
5 . P8016	L&T (ECE DIVISION)
6 . P0132	RELIANCE POWER
7 . P0670	REUNION ELECTRICAL MANUFACTURERS (P) LTD
8 . P0736	SIEMENS LTD.
9 . P0798	THE AHMEDABAD ELECTRICITY CO LTD

811503 : PLANT ELECTRIFICATION PACKAGE(Major Projects)

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0453	KIRLOSKAR ELECTRIC COMPANY LTD.
4 . P8077	KMG ATOZ SYSTEMS PVT. LTD.
5 . P0132	RELIANCE POWER
6 . P0736	SIEMENS LTD.
7 . P8145	STERLING ELECTRO ENTERPRISES PVT.LTD.
8 . P0798	THE AHMEDABAD ELECTRICITY CO LTD
9 . P0860	VIDUIT AND COMPANY (I) PVT. LTD.
U.K.	
10 . P0481	LA BOUR PUMP CO. LTD.

811504 : PLANT ELECTRIFICATION PACKAGE(MINOR PROJECTS)

CODE	NAME
INDIA	
1 . P0045	ANAND POWER LIMITED
2 . P8169	ARYAN ELECTRICALS PRIVATE LIMITED (-)
3 . P8017	CHASMITA ENGRS PVT LTD
4 . P8192	GENICS ELECTROTECH PVT. LTD.
5 . P8077	KMG ATOZ SYSTEMS PVT. LTD.
6 . P8118	MEC ENGINEERS
7 . P8020	PACE PROCESS CONTROLS
8 . P8021	POWERMAX ELECTRICALS PVT LTD
9 . P0670	REUNION ELECTRICAL MANUFACTURERS (P) LTD
10 . P8018	ROHINI ELECTRIC
11 . P8145	STERLING ELECTRO ENTERPRISES PVT.LTD.
12 . P0860	VIDUIT AND COMPANY (I) PVT. LTD.
13 . P8019	ZODIAC POWER PROJECTS

811505 : AIR PRESSURISATION / VENTILLATION SYSTEM

CODE	NAME
INDIA	
1 . P0267	ABB FLAKT INDIA LTD.
2 . P0024	AIR CONDITIONING CORPN LTD
3 . P0041	AMERCIAN REFRIGERATION CO LTD.
4 . P0119	BLUE STAR LTD.
5 . P0869	VOLTAS LTD. (PUMPS & PROJECTS BUSINESS DIV)

811506 : FIRE DETECTION AND ALARM SYSTEM

CODE	NAME
INDIA	
1 . P8201	ZAP FIRE

811601 : PRE-FABRICATED AL-CABLE TRAYS

CODE	NAME
INDIA1	
1 . P8220	BRAVO CABLE TRAYS PVT. LTD. ((50MM to 1000MM))
INDIA	
2 . P8203	DURGA TECHNO INDUSTRIES
3 . P0312	GLOBE ELECTRICAL INDUSTRIES
4 . P8222	GREATWELD ENGINEERING PRIVATE LIMITED
5 . P0355	HINUSTAN VIDYUT PRODUCTS
6 . P0385	INDIANA ENGG WORKS PVT LTD
7 . P8205	INDIANA GRATINGS PRIVATE LIMITED
8 . P8135	INDMARK FORMTECH PVT. LTD.
9 . P8085	JAMNA METAL COMPANY
10 . P8089	KANADE ANAND UDYOG PVT. LTD.
11 . P8074	MAHESHWARI ELECTRICAL MFRS. (P) LTD.
12 . P0529	METALITE INDUSTRIES
13 . P0619	PAREKH ENGINEERING COMPANY
14 . P8189	PINAX STEEL INDUSTRIES PRIVATE LIMITED
15 . P8072	PREMIER POWER PRODUCTS (CALCUTTA) PVT. LTD.
16 . P8174	R.K. Engineering Works

811601 : PRE-FABRICATED AL-CABLE TRAYS

CODE	NAME
17 . P8179	RATAN PROJECTS AND ENGINEERING CO. PVT. LTD.
18 . P8223	RMG STEELS PVT. LTD.
19 . P8044	RUKMANI ELECTRICALS & COMPONENTS PVT LTD
20 . P0695	SADHANA ENGINEERING CORPORATION
21 . P0748	SREE ATREYA ENTERPRISES
22 . P0753	STEALITE ENGG CO

811602 : PRE-FABRICATED G.I. CABLE TRAYS

CODE	NAME
INDIA1	
1 . P8220	BRAVO CABLE TRAYS PVT. LTD. ((50MM to 1000MM))
INDIA	
2 . P8203	DURGA TECHNO INDUSTRIES
3 . P0312	GLOBE ELECTRICAL INDUSTRIES
4 . P8222	GREATWELD ENGINEERING PRIVATE LIMITED
5 . P0385	INDIANA ENGG WORKS PVT LTD
6 . P8205	INDIANA GRATINGS PRIVATE LIMITED
7 . P8135	INDMARK FORMTECH PVT. LTD.
8 . P8085	JAMNA METAL COMPANY
9 . P8089	KANADE ANAND UDYOG PVT. LTD.
10 . P8074	MAHESHWARI ELECTRICAL MFRS. (P) LTD.
11 . P0529	METALITE INDUSTRIES
12 . P0619	PAREKH ENGINEERING COMPANY
13 . P8189	PINAX STEEL INDUSTRIES PRIVATE LIMITED
14 . P8072	PREMIER POWER PRODUCTS (CALCUTTA) PVT. LTD.
15 . P8174	R.K. Engineering Works
16 . P8179	RATAN PROJECTS AND ENGINEERING CO. PVT. LTD.

811602 : PRE-FABRICATED G.I. CABLE TRAYS

CODE	NAME
17 . P8223	RMG STEELS PVT. LTD.
18 . P8044	RUKMANI ELECTRICALS & COMPONENTS PVT LTD
19 . P0695	SADHANA ENGINEERING CORPORATION
20 . P8067	SLOTCO STEEL PRODUCTS PVT. LTD.
21 . P0748	SREE ATREYA ENTERPRISES
22 . P0753	STEALITE ENGG CO

811603 : FRP CABLE TRAYS

CODE	NAME
INDIA1	
1 . P8220	BRAVO CABLE TRAYS PVT. LTD. ((50MM to 1000MM))
INDIA	
2 . P8022	ENERCON
3 . P8146	EPP COMPOSITES PVT.LTD.
4 . P8079	ERCON COMPOSITES (upto 600 mm wide)
5 . P8205	INDIANA GRATINGS PRIVATE LIMITED
6 . P8024	KEMROCK
7 . P8125	KEMROCK INDUSTRIES & EXPORTS LTD.
8 . P8221	MANISHA COMPOSITEK PVT. LTD.
9 . P8119	SATYAM COMPOSITES PVT. LTD.
10 . P8023	SINTEX INDUSTRIES LTD.
11 . P8083	SUMIP COMPOSITES PVT. LTD.
12 . P8213	SUMIP COMPSITES PVT. LTD.

811604 : GI PIPES & CONDUITS

CODE	NAME
INDIA	
1 . P0112	BHARTI EXPORTS
2 . P0814	INDIAN TUBE CO. (TATA DIV. OF TUBES & PIPES)
3 . P0427	JINDAL PIPES LTD.
4 . P0527	MEGHJYOT ENTERPRISES
5 . P8223	RMG STEELS PVT. LTD. (20MM TO 50MM)
6 . P8044	RUKMANI ELECTRICALS & COMPONENTS PVT LTD
7 . P0755	STEELCRAFT

811605 : PVC PIPES & CONDUITS

CODE	NAME
INDIA	
1 . P8037	A.K.G.
2 . P8039	FINOLEX INDUSTRIES LTD. (PIPES & PVC DIVN.)
3 . P8075	KALINGA CABLES & CONDUIT CO.
4 . P8055	PLAZA CABLE INDUSTRIES LIMITED
5 . P8040	POLYPACK
6 . P8038	PRAKASH INDUSTRIES LTD.

811606 : INDUSTRIAL CABLE GLAND

CODE	NAME
INDIA	
1 . P0089	BALIGA LIGHTING EQUIPMENTS LIMITED
2 . P8216	CLEON OPTOBIZ PVT LTD.
3 . P0165	COMET BRASS PRODUCTS
4 . P8100	COMET INDUSTRIES
5 . P0211	DOWELL'S ELECTRICALS
6 . P0228	ELECTROMAC INDUSTRIES
7 . P8200	EX-PROTECTA
8 . P0147	FCG FLAMEPROOF CONTROL GEARS PVT. LTD. (FORMERLY CEAG FLAME
9 . P0310	GLAND-MECH. INDUSTRIES
10 . P8134	INDUSTRIAL PRODUCTS EQUIPMENT
11 . P0639	POWER ENGG CO
12 . P0655	QUALITY & PRECISION INDL. EQUIPMENT
13 . P8025	S J METAL INDUSTRIES (JAINSON)

811607 : CABLE LUGS

CODE	NAME
INDIA	
1 . P0211	DOWELL'S ELECTRICALS
2 . P0279	FORWARD ENGG INDUSTRIES
3 . P0474	KSE ELECTRICAL PVT. LTD.
4 . P8133	MG ELECTRICA
5 . P0639	POWER ENGG CO
6 . P8025	S J METAL INDUSTRIES (JAINSON)
7 . P0851	USHA MARTIN INDUSTRIES LTD. (ISMAL DIVN)

811608 : BITUMENOUS BASED CABLE TERMINATION/STRAIGHT THROUGH JOINTING KITS.

CODE	NAME
INDIA	
1 . P0118	BIRLA 3M LTD.
2 . P0142	CABLE CORPN. OF INDIA LIMITED
3 . P0505	MAHINDRA ENGG. & CHEMICAL PRODUCTS LTD.
4 . P8026	RAYCHEM RPG LTD.
5 . P0900	YAMUNA POWER & INFRASTRUCTURE LIMITED

811609 : EPOXY BASED TERMINATION/STRAIGHT THROUGH JOINTING KITS.

CODE	NAME
INDIA	
1 . P0118	BIRLA 3M LTD.
2 . P0142	CABLE CORPN. OF INDIA LIMITED
3 . P8198	GALA SHRINK FIT (Epoxy/Cross linked Polyolefine)
4 . P8027	HARI CONSOLIDATED PVT LTD.
5 . P0505	MAHINDRA ENGG. & CHEMICAL PRODUCTS LTD.
6 . P8026	RAYCHEM RPG LTD.
7 . P0900	YAMUNA POWER & INFRASTRUCTURE LIMITED
8 . P0890	YASHWANT INDUSTRIAL WORKS PVT. LTD.

811610 : SI RUBBER BASED CABLE TERM./STRAIGHT THRU JOINTING KITS.

CODE	NAME
INDIA	
1 . P0142	CABLE CORPN. OF INDIA LIMITED
2 . P8027	HARI CONSOLIDATED PVT LTD.
3 . P0505	MAHINDRA ENGG. & CHEMICAL PRODUCTS LTD.
4 . P8026	RAYCHEM RPG LTD.
5 . P0900	YAMUNA POWER & INFRASTRUCTURE LIMITED

811611 : LIGHTING POLES

CODE	NAME
INDIA	
1 . P0112	BHARTI EXPORTS
2 . P8146	EPP COMPOSITES PVT.LTD.
3 . P8125	KEMROCK INDUSTRIES & EXPORTS LTD. (For FRP Type only)
4 . P8170	LIGHTING TECHNOLOGIES INDIA PRIVATE LIMITED (-)
5 . P0529	METALITE INDUSTRIES
6 . P8208	ORIENT ELECTRIC LIMITED
7 . P8072	PREMIER POWER PRODUCTS (CALCUTTA) PVT. LTD.
8 . P0695	SADHANA ENGINEERING CORPORATION
9 . P8119	SATYAM COMPOSITES PVT. LTD.
10 . P8213	SUMIP COMPSITES PVT. LTD.
11 . P8096	SURYA ROSHNI LTD.
12 . P8181	UTKARSH INDIA LIMITED

811612 : TRANSFORMER OIL

CODE	NAME
INDIA	
1 . P0053	APAR INUSTRIES LTD.
2 . P0381	INDIAN OIL CORPORATION LTD

811613 : INDUSTRIAL EXHAUST FAN

CODE	NAME
INDIA	
1 . P0024	AIR CONDITIONING CORPN LTD
2 . P0036	ALSTOM LIMITED (AREVA T & D)
3 . P0041	AMERCIAN REFRIGERATION CO LTD.
4 . P0085	BAJAJ ELECTRICALS LIMITED
5 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
6 . P0337	HAVELLS INDIA LTD.
7 . P0782	S.F. INDIA LTD
8 . P8028	TLT ENGINEERING INDIA PVT LTD

811701 : ELECTRO-MECHANICAL RELAYS

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0066	ASEA BROWN BOVERI LTD.
3 . P0113	BCH ELECTRIC LIMITED
4 . P0219	EASUN REYROLLE LIMITED
5 . P8104	JYOTI LIMITED

811702 : MICROPROCESSOR / NUMERICAL RELAYS

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0066	ASEA BROWN BOVERI LTD.
3 . P8173	CG POWER AND INDUSTRIAL SOLUTIONS LIMITED
4 . P0219	EASUN REYROLLE LIMITED
5 . P0485	LARSEN & TOUBRO LTD.(EL.PRODUCTS DIVN)
6 . P8123	PROK DEVICES PRIVATE LIMITED ((Over Current and Earth Fault Relay, Earth Fault Relay, Earth Leakage Relay with CBCT))
7 . P0736	SIEMENS LTD.

811703 : METERS

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P8047	HOTLINE SWITCHGEAR & CONTROLS
3 . P0392	IMP POWER LTD.
4 . P0420	JAIPUR METALS & ELECTRICAL LTD
5 . P8095	M.B. CONTROL & SYTSTEMS PVT. LTD. ((Only for Multifunctional Meter))
6 . P0526	MECO INSUTRUMENTS
7 . P0079	MEHRU ELECTRICALS (FORMERLY AUTOMATIC ELECTRIC LIMITED)
8 . P8155	NEWTEK ELECTRICALS
9 . P8123	PROK DEVICES PRIVATE LIMITED
10 . P8029	RISHABH INSTRUMENTS PVT. LTD.
11 . P0710	SEAHORSE INDUSTRIES LTD.
12 . P8196	THE MOTWANE MANUFACTURING COMPANY PVT. LTD. (ELETRICAL TESTING & MEASURING EQUIPMENTS)

811704 : RECORDERS

CODE	NAME
INDIA	
1 . P8030	ALACRITY ELECTRONICS LTD.
2 . P8022	ENERCON
3 . P0479	L & G SWITZERLAND

811801 : HIGH VOLTAGE SHUNT CAPACITORS

CODE	NAME
INDIA	
1 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0449	KAPSALES ELECTRICALS LTD.
4 . P8218	LECON ENERGETICS PRIVATE LIMITED
5 . P0730	SHREEM CAPACITORS PVT. LTD.
6 . P0843	UNIVERSAL CABLES LTD.

811802 : MEDIUM VOLTAGE SHUNT CAPACITORS

CODE	NAME
INDIA	
1 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0449	KAPSALES ELECTRICALS LTD.
4 . P8218	LECON ENERGETICS PRIVATE LIMITED
5 . P0730	SHREEM CAPACITORS PVT. LTD.
6 . P0843	UNIVERSAL CABLES LTD.

811803 : LOW VOLTAGE SHUNT CAPACITORS

CODE	NAME
INDIA	
1 . P0114	BHEL (ELECTRICAL MACHINES DIVN.)
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0449	KAPSALES ELECTRICALS LTD.
4 . P0730	SHREEM CAPACITORS PVT. LTD.
5 . P0843	UNIVERSAL CABLES LTD.

811901 : OVERHEAD CONDUCTORS-AL /ACSR

CODE	NAME
INDIA	
1 . P0037	ALUMINIUM INDUSTRIES LTD
2 . P8184	DYNAMIC CABLES LIMITED
3 . P8171	GRANDLAY ELECTRICALS INDIA
4 . P8193	LUMINO INDUSTRIES LIMITED
5 . P0574	NICCO CORPORATION LTD
6 . P8167	RAVI INDUSTRIES
7 . P8177	V-MARC INDIA LIMITED

811902 : EHV/HV INSULATORS

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0109	BHARAT HEAVY ELECTRICALS LTD.
3 . P0717	SESHASAYEE INDUSTRIES LTD

811903 : M.V.INSULATORS

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0347	HIGH TENSION INSULATORS FACTORY
3 . P0717	SESHASAYEE INDUSTRIES LTD

811904 : LIGHTNING ARRESTOR

CODE	NAME
INDIA	
1 . P0036	ALSTOM LIMITED (AREVA T & D)
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P8190	ELEKTROLITES (POWER) PRIVATE LIMITED
4 . P0234	ELPRO INTERNATIONAL LTD
5 . P0595	OBLUM ELEC. INDUSTRIES PVT LTD

812001 : TELEPHONE EXCHANGE EQUIPMENTS

CODE	NAME
INDIA	
1 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
2 . P0330	HAKOTRONICS PRIVATE LIMITED
3 . P0383	INDIAN TELEPHONE INDUSTRIES LTD.
4 . P0623	PHILIPS INDIA LTD.
5 . P0736	SIEMENS LTD.
6 . P0788	TATA TELECOM LIMITED
GERMANY	
7 . P0570	NEUMANN GMBH ELEKTRONIK
SINGAPORE	
8 . P0546	MOTOROLA SINGAPORE PTE LTD.

812002 : PAGING EQUIPMENTS / PUBLIC ADDRESS SYTEM

CODE	NAME
GERMANY	
1 . P8161	INDUSTRONIC INDUSTRIE-ELECTRONIC GMBH & CO. KG
INDIA	
2 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
3 . P0330	HAKOTRONICS PRIVATE LIMITED
4 . P0383	INDIAN TELEPHONE INDUSTRIES LTD.
5 . P0623	PHILIPS INDIA LTD.
6 . P0788	TATA TELECOM LIMITED
7 . P0795	TELEMAX CORPROATION
SINGAPORE	
8 . P8144	COMTROL PTE.LTD.
RUSSIA	
9 . P8150	ARMTEL LLC
GERMANY	
10 . P0570	NEUMANN GMBH ELEKTRONIK
INDIA	
11 . P8185	LARAON ENGINEERS AND CONSULTANTS PVT. LTD.
SINGAPORE	
12 . P0546	MOTOROLA SINGAPORE PTE LTD.
U.K.	
13 . P0289	GAI TRONICS SRL

812101 : INDUSTRIAL HEATER

CODE	NAME
France	
1 . P8153	Chromalox Etirex SAS
INDIA	
2 . P0030	ALCO HEATING CO.
3 . P0091	BATLIBOI & CO. LTD.
4 . P0234	ELPRO INTERNATIONAL LTD
5 . P0242	ESCORTS LTD
6 . P8139	FATI GENERAL EQUIPMENTS PVT.LTD.
7 . P8031	KANTILAL CHUNNILAL & SONS APPLIANCES PVT. LTD.
8 . P8032	MACNEIL & MAGOR (KILNBURN)
9 . P0535	MIDDLETON ENGG CO
10 . P8033	RAYCOLD LTD.
11 . P8034	T.M.I (TRANSFORMERS MFG. INDUSTRIES)
GERMANY	
12 . P8080	KLOPPER-THERM GmbH & Co. KG

812201 : HOSE PROOF LOCAL CONTROL STATION

CODE	NAME
INDIA	
1 . P8138	EX-PROTECTA
2 . P0147	FCG FLAMEPROOF CONTROL GEARS PVT. LTD. (FORMERLY CEAG FLAME
3 . P8007	FCG POWER INDUSTRIES PVT.LTD.
4 . P0268	FLAMEPROOF EQUIPMENTS PVT. LTD.
5 . P8047	HOTLINE SWITCHGEAR & CONTROLS
6 . P8221	MANISHA COMPOSITEK PVT. LTD.
7 . P0639	POWER ENGG CO
8 . P8212	RITTAL PRIVATE LIMITED
9 . P8160	SHRENIK & COMPANY

812202 : INDUSTRIAL TYPE SW. SOCKET & PLUG

CODE	NAME
INDIA	
1 . P0089	BALIGA LIGHTING EQUIPMENTS LIMITED
2 . P0113	BCH ELECTRIC LIMITED
3 . P0185	CG POWER AND INDUSTRIAL SOLUTION LIMITED
4 . P0144	CHLORIDE POWER SYSTEMS AND SOLUTIONS LTD. (formerly CALDYNE
5 . P0902	CYCLO ELECTRIC DEVICES & SERVICES CO.
6 . P8138	EX-PROTECTA
7 . P0147	FCG FLAMEPROOF CONTROL GEARS PVT. LTD. (FORMERLY CEAG FLAME
8 . P8007	FCG POWER INDUSTRIES PVT.LTD.
9 . P0268	FLAMEPROOF EQUIPMENTS PVT. LTD.
10 . P0523	LEGRAND INDIA LTD
11 . P8160	SHRENIK & COMPANY
FRANCE	
12 . P0491	LEGRAND S.A.
GERMANY	
13 . P0092	BBC-BROWN BOVERI & CIE AG
14 . P0657	R STAHL SCHALTGERATE GMBH
15 . P0875	WEIDMULLER LTD.
ITALY	

812202 : INDUSTRIAL TYPE SW. SOCKET & PLUG

CODE	NAME
16 . P0178	CORTEM S.p.A.

812203 : HOSEPROOF JUNCTION BOXES

CODE	NAME
INDIA	
1 . P0089	BALIGA LIGHTING EQUIPMENTS LIMITED
2 . P8138	EX-PROTECTA
3 . P0147	FCG FLAMEPROOF CONTROL GEARS PVT. LTD. (FORMERLY CEAG FLAME
4 . P8007	FCG POWER INDUSTRIES PVT.LTD.
5 . P0268	FLAMEPROOF EQUIPMENTS PVT. LTD.
6 . P8221	MANISHA COMPOSITEK PVT. LTD.
7 . P8194	Phoenix Mecano (India) Pvt.Ltd.
8 . P8212	RITTAL PRIVATE LIMITED
9 . P8160	SHRENIK & COMPANY

812204 : ELECTROMAGNETIC EQUIPMENT

CODE	NAME
INDIA	
1 . P0229	ELEKTROMAG DEVICES PVT. LTD
2 . P0638	POWER BUILD LTD
3 . P0757	STERLING CONTROLS PVT. LTD.
4 . P0760	STORM KRAFT CONTROLS

812205 : LIMIT SWITCHES / BELT MONITORING SWITCHES

CODE	NAME
INDIA	
1 . P0002	A G SYSTEM CONTROLS
2 . P0022	AG MECHANICAL ENTERPRISES (P) LTD.
3 . P8036	BALAJI ELECTRICALS
4 . P0424	JAYASHREE ELECTRODEVICES PVT. LTD.
5 . P8097	PROTOCONTROL INSTRUMENTS (I) PVT. LTD.
6 . P0691	R.K. ELECTRICAL ENGG. WORKS

812206 : LIMIT SWITCHES (FLAMEPROOF TYPE)

CODE	NAME
INDIA	
1 . P0089	BALIGA LIGHTING EQUIPMENTS LIMITED
2 . P8138	EX-PROTECTA
3 . P0147	FCG FLAMEPROOF CONTROL GEARS PVT. LTD. (FORMERLY CEAG FLAME
4 . P8007	FCG POWER INDUSTRIES PVT.LTD.
5 . P0268	FLAMEPROOF EQUIPMENTS PVT. LTD.
6 . P8097	PROTOCONTROL INSTRUMENTS (I) PVT. LTD.
7 . P8148	SAIEX FLAMEPROOF EQUIPMENTS PVT LTD

812207 : HORN/HOOTER/KLAXON

CODE	NAME
INDIA	
1 . P0089	BALIGA LIGHTING EQUIPMENTS LIMITED
2 . P8138	EX-PROTECTA
3 . P0268	FLAMEPROOF EQUIPMENTS PVT. LTD.
4 . P0883	WORTHMAX ENGINEERS

812301 : CATHODIC PROTECTION SYSTEM

CODE	NAME
INDIA	
1 . P8073	CONSTRUCTION GUILD PVT. LTD.
2 . P8110	ELECTRO PROTECTION SERVICES INDIA PVT. LTD. ((Also manufacturer of Anodes for CP System))
3 . P8141	SARK EPC PROJECTS PVT.LTD.
4 . P8143	UNDERGROUND PIPELINE & NDT SERVICES PRIVATE LIMITED
5 . P8172	UNIVERSAL CORROSION PREVENTION INDIA

PROJECT

COAL TO AMMONIUM NITRATE PLANT AT LAKHANPUR, ODISHA

PART-II : TECHNICAL

TENDER DOCUMENT OF CIVIL, RCC & STRUCTURAL WORKS FOR CONSTRUCTION POWER

FOR

Bharat Coal Gasification and Chemicals Limited

By

PROJECTS & DEVELOPMENT INDIA LTD

0	21.01.26	Issued For Tender	AR	BK	RNS
REV	**DATE**	**PURPOSE**	**PREPARED**	**REVIEWED**	**APPROVED**

CONTENTS

TECHNICAL SPECIFICATION

FOR

CIVIL, STRUCTURAL AND OTHER ALLIED WORKS

CONTENTS

1.0 GENERAL

1.1 Specifications of materials and workmanship shall be as described in the Central Public Works Department Specifications Vol. I & II (latest) include latest amendments, unless otherwise specified. These CPWD Specifications shall be deemed to form part of this contract. The **CONTRACTOR** shall procure and maintain copies of the latest CPWD Specifications at site for reference.

1.2 These technical Specifications shall be supplementary to the specifications contained in the CPWD specifications, wherever at variance, these Particular Specifications shall take precedence over the provisions in the CPWD Specifications.

2.0 REFERENCE CODES & STANDARDS

2.1 Wherever reference of IS Specifications/ or IS Codes of Practice are made in the Specifications/ Schedule of Rates or Preambles, reference shall be to the latest edition of IS (Bureau of Indian Standards).

IS - 383	Coarse & Fine aggregates from natural sources for concrete.
IS - 427	Distemper, dry, colour as required.
IS - 432	Mild Steel & Medium tensile steel bars.
IS - 456	Code of Practice for Plain and Reinforced Concrete.
IS - 515	Natural and Manufactured aggregates for use in mass concrete
IS - 730	Hook bolts for corrugated sheet roofing
IS - 800	Code of Practice for General Construction in Steel
IS - 1079	Hot rolled carbon steel sheets & strips
IS - 1081	Code of practice for fixing and glazing of metal (steel & aluminium) doors, windows and ventilators.
IS - 1161	Steel tubes for structural purposes.
IS - 1285	Wrought aluminium & aluminium alloy extruded round tube and hollow sections

IS - 1361	Steel windows for Industrial Buildings.
IS - 1363	Hexagon head bolts, screws & nuts of product grade C : Part - I Hexagon head bolts (size range M5 to M64)
IS - 1367	Technical supply conditions for threaded steel fasteners
IS - 1566	Hard - Drawn steel wire fabric for concrete reinforcement.
IS - 1786	High strength deformed steel bars & wires for concrete reinforcement.
IS - 2062	Steel for general structural purposes.
IS - 2116	Sand for masonry mortars.
IS - 2212	Code of practice for brickwork.
IS - 2386	Methods of test for aggregates.
IS - 2835	Flat transparent sheet glass
IS - 4021	Timber door, window and ventilator frames
IS - 4923	Hollow Steel sections for structural use.
IS - 4925	Concrete batching and mixing plant.
IS - 5410	Cement Paint
IS - 6477	Dimensions for wrought aluminium & aluminium alloys, extruded hollow sections.
IS - 7318	Fusion welding of steel.
IS - 10262	Recommended guidelines for concrete mix design.
IS - 14871	Products in Fibre Reinforced Cement – Long Corrugated or Asymmetrical Section Sheets and Fittings for Roofing and Cladding - Specification

3.0 EARTHWORK

3.1 Excavation

3.1.1 Excavation shall be carried out in soil of any nature and consistency, in the presence of water or in the dry, met on the site to the lines, levels and contours shown on the detailed drawings and **CONTRACTOR** shall remove all excavated materials to soil heaps on site or transport for use in filling on the site or stack them for reuse as directed by the Engineer-in-Charge.

3.1.2 Surface dressing shall be carried out on the entire area occupied by the buildings including plinth protection as directed without any extra cost. The depths of excavation shown on the drawings are the depths after surface dressing.

3.1.3 The site around all buildings and structures to a width of 3 metres beyond the edge of plinth protection, ramps, steps, etc. shall be dressed and sloped away from the buildings.

3.1.4 Black cotton soil, and other expansive or unsuitable soils excavated shall not be used for filling in foundations, and plinths of buildings or in other structures including manholes, septic tanks etc. and shall be disposed off within the contract area marked on the drawings, as directed, levelled and neatly dressed.

3.1.5 In case of trenches exceeding 2 metres depth or where soil is soft or slushy, the sides of trenches shall be protected by timbering and shoring. The **CONTRACTOR** shall be responsible to take all necessary steps to prevent the sides of trenches from caving in or collapsing. The extent and type of timbering and shoring shall be as directed by the **Engineer-in-Charge.**

3.1.6 Where the excavation is to be carried out below the foundation level of adjacent

structure, the precautions to be taken such as under pinning, shoring and strutting etc. shall be determined by **Engineer-in-Charge**. No excavation shall be done unless such precautionary measures are carried out as per directions of **Engineer-in-Charge.**

3.1.7 Specification for Earth work shall also apply to excavation in rock in general. The excavation in rock shall be done such that extra excavation beyond the required width and depth as shown in drawings is not made. If the excavation done in depth greater than required /ordered. The **CONTRACTOR** shall fill the extra excavation with concrete of mix 1:5:10 as the foundation concrete at his own cost.

3.1.8 **CONTRACTOR** shall make all necessary arrangements for dewatering / defiling as required to carry out proper excavation work by bailing or pumping out water, which may accumulate in the excavation pit from any cause/ source whatsoever. In addition to this, if required, contractor shall also install continuous dewatering pump-sets to lower the ground water table below the working level to make the area fit and safe for working.

3.1.9 **CONTRACTOR** shall provide suitable draining arrangements at his own cost to prevent surface water entering the foundation pits from any source.

3.1.10 The **CONTRACTOR** is forbidden to commence the construction of structures or to carry out concreting before **Engineer-in-Charge** has inspected, accepted and permitted the excavation bottom.

3.1.11 Excavation in disintegrated rock means rock or Boulders including brickbats which may be quarried or split with crow bars. This will also include laterite and hard conglomerate.

3.1.12 Excavations in hard rock - meant excavation made in hard rock to be done manually, or by blasting using only explosives and / or pneumatic hammers. In case of blasting, control blasting should be adopted depending on site conditions. For using explosives **CONTRACTOR** shall follow all provisions of Indian Explosives Act / Rules 1983, corrected / revised up to date.

3.1.13 In case of hard rock excavation to be carried out using explosives the, **CONTRACTOR** shall obtain the written approval in advance.

3.1.14 The measurements for excavations shall be restricted and limited to minimum excavation line as per drawing for payment purposes.

3.1.15 Adequate protective measures shall be taken to see that the excavation does not affect or damage adjoining structures. The **CONTRACTOR** shall take all measures required for ensuring stability of the excavation and safety of property and people in the vicinity. The **CONTRACTOR** shall erect and maintain during progress of work, temporary fences around dangerous excavations at no extra cost.

3.1.16 Excavation in ordinary soil means excavation in ordinary hard soil including stiff heavy clay, hard shale, or compact moorum, or any materials, which can be removed by the ordinary application of spades, shovels, picks and pick axes. This shall also include removal of isolated boulders each having a volume not more than $0.50m^3$.

3.1.17 Excavation in soft rock includes limestone, sandstone, laterite, hard conglomerates, etc. or other rock which can be quarried or split with crowbars or wedges. This shall also include excavation of tarred pavements, masonry work and rock boulders each having a volume of not more than $0.25m^3$.

3.1.18 Excavation in hard rock includes any rock bound in ledges or masses in its original form or cement concrete for which in the opinion of the Engineer-in-Charge, requires the use of compressed air, equipment, sledge hammer and blasting or non-explosive materials viz. Acconex manufactured by A.C.C. Ltd. Specifications and instructions for use shall be as per manufacturer.

3.1.19 In case of any difficulty concerning the interpretation of type of soil as mentioned above, the Engineer-in-Charge shall decide whether the excavation in a particular material is in ordinary soil, soft rock or hard rock and his decision in this matter shall be final and binding on the CONTRACTOR and without appeal.

3.2 Filling

3.2.1 Back filling of excavations in trenches, foundations and elsewhere shall consist of one of the following materials approved by **Engineer-in-Charge.**

Soil

Sand

Moorum

Hard-core

Stone/gravel

All back filling material shall be approved by the **Engineer-in-Charge.**

3.2.2 Soil filling - Soil material shall be free from rubbish, roots, hard lumps and any other foreign organic material. Filling shall be done in regular horizontal layers each not exceeding 20 cm. depth.

3.2.3 Back filling around completed foundations, structures, trenches and in plinth shall be done to the lines and levels shown on the drawings.

3.2.4 Back filling around pipes in the trench shall be done after hydro testing is done.

3.2.5 Back filling around liquid retaining structures shall be done only after leakage testing is completed and approval of **Engineer-in-Charge** is obtained.

3.2.6 Sand used for filling under foundation concrete, around foundation and in plinth etc. shall be fine/ coarse, strong, clean, free from dust, organic and deleterious matter. The sand filling under foundation shall be rammed with Mech. compactor. Sand material shall be approved by **Engineer-in-Charge**.

3.2.7 Moorum for filling, where ordered, shall be obtained from approved pits and quarries which contain siliceous material and natural mixture of clay. Moorum shall not contain any admixture of ordinary earth. Size of moorum shall vary from dust to 10 mm.

3.2.8 Hard-core shall be of broken stone of 90 mm to 10 mm size suitable for providing a dense and compact sub grade. Stones shall be sound, free from flakes, dust and other impurities. Hard core filling shall be spread and levelled in layers, 15 cm thick, watered and well compacted with ramming or with mechanical / hand compacts including hand packing wherever required.

3.2.9 If any selected fill material is required to be borrowed, **CONTRACTOR** shall make arrangements and procure such material from outside borrow pits after obtaining all necessary permissions from statutory authorities. The material of source shall be subject to prior approval of **Engineer-in-Charge**. **CONTRACTOR** shall make necessary access roads to borrow areas and maintain the same, if such access roads do not exist, at no extra cost.

3.2.10 Plinth filling shall be carried out with approved material as described earlier, in layers not exceeding 150mm, watered and compacted with mechanical compaction machines. **Engineer-in-Charge** may however permit manual compaction by hand tampers in case he is satisfied that mechanical compaction is not possible. When filling reaches the finished level, the surface shall be flooded with water, unless otherwise directed, for at least 24 hours, allowed to dry and then the surface again compacted as specified above to avoid settlements at later stage. The finished level of the filling shall be trimmed to the level specified. Compacted surface shall have at least 95% of laboratory maximum dry density. A minimum of one test per 250 sq. meters of compacted area shall be done.

3.2.11 Whenever the fill material (earth or soil) is purchased, **CONTRACTOR** shall get the approval of Engineer-in-Charge. The CONTRACTOR shall arrange to determine the following properties of the soil (at outside NABL accredited laboratory without any cost to owner) and shall get the approval of **Engineer-in-Charge**.

1. Clay content : 15% to 20%
2. Laboratory dry density (MDD) : Not less than 1600 kg/m³
3. Plasticity Index : Not more than 20
4. Optimum Moisture Content (OMC) : 8% to 12%

3.2.12 The fill shall be compacted using a vibrating compactor of not less than 1.5 tonne. The fill shall be thoroughly compacted in layers as directed but not more than 200 mm thick. Adequate water shall be used for compaction and the density after compaction shall be not less than maximum dry density obtained in test of IS: 2720 Part-8. Compacted surface shall have at least 95% of laboratory maximum dry density. A minimum of one test per 250 sq. meters of compacted area shall be done for each layer.

3.2.13 The Gravel fill shall be non plastic granular material, well graded, strong, with maximum particle size of 50 mm, with not more than 15% passing a 4.75 mm IS sieve, free of all debris, vegetable matter and chemical impurities.

3.2.14 All clods, lumps etc. shall be broken before compaction.

3.2.15 In case of grading/banking successive layers of filling shall not be placed, until the layer below has been thoroughly compacted to satisfy the requirements laid down in this specification.

Prior to rolling, the moisture content of material shall be brought to within +/-2% of the optimum moisture content as described in IS 2720 Part-7. The moisture content shall preferably be on the wet side for potentially expansive soil.

After adjusting the moisture content as described, the layers shall be thoroughly compacted by means approved by Engineer-in-Charge, till the specified maximum laboratory dry density is obtained.

General, fill shall be placed in layers not exceeding 200 mm thickness and shall be thoroughly compacted to achieve a compaction of at least 95% of laboratory maximum dry density throughout the depth of filling. Final fill of 600 mm thickness shall consist of preferably natural material in, as dug condition except that stones larger than 100 mm shall be removed. It shall be placed in layers not exceeding 200 mm thickness and compacted to achieve of at least 95% of laboratory maximum dry density. Each layer shall be tested in field for density and accepted by Engineer-in-Charge, subject to achieving the required density before laying the next layer. A minimum of one test per 250 sq meters for each layer shall be conducted.

If the layer fails to meet the required density, it shall be reworked or the material shall be replaced and method of construction altered as directed by Engineer-in-Charge to obtain the required density.

The filling shall be finished in conformity with the alignment, levels, cross-section and dimensions as shown in the drawing.

Extra material shall be removed and disposed off as directed by the **Engineer-in-Charge.**

4.0 PLAIN AND REINFORCED CONCRETE WORK

This specifications deals with cement concrete, plain or reinforced, for general use, and covers the requirements for concrete materials, their storage, grading, mix design, strength & quality requirements, pouring at all levels, reinforcements, protection, curing, form work, finishing, painting, admixtures, inserts and other miscellaneous works.

4.1 **Materials**

4.1.1 Cement: Any of the following cements may be used as required.

IS - 8112	43 Grade ordinary Portland cement

4.1.2 Water: Water used for mixing and curing concrete and mortar shall conform to the requirements as laid down in IS: 456. Sea water shall not be used for concrete work.

4.1.3 Aggregates: Coarse and fine aggregates for cement concrete plain and reinforced shall conform to the requirements of IS 383 and / or IS 515. Before using, the aggregates shall be tested (at outside NABL accredited laboratory without any cost to owner) as per IS: 2386.

Coarse aggregate: Coarse aggregate for all cement concrete work shall be broken or crushed hard stone, black trap stone obtained from approved Quarries or gravel.

Sand: Fine aggregate for concrete work shall be coarse sand from approved sources. Grading of coarse sand shall be within grading zones I, II or III laid down in IS: 383, table 4. If required the aggregates (both fine and coarse) shall have to be thoroughly washed and graded as per direction of **Engineer-in-Charge**.

4.2 **Mixing**

All cement concrete plain or reinforced shall be machine mixed. Mixing by hand may be employed where quantity of concrete involved is small, with the specific prior permission of the **Engineer-in-Charge**. 10% extra cement shall be added in case of hand mixing as stipulated in IS-456.

For large and medium project sites the concrete shall be sourced from ready- mixed concrete plants or from on site or off site batching and mixing plants (IS 4926)

4.3 **Water Cement Ratio, Laying & Curing**

Water Cement Ratio, Laying & Curing shall be done as per IS:456.

4.4 **Grades of Concrete**

4.4.1 Grades lower than M 25 shall not be used in reinforced concrete.

4.4.2 A sieve analysis test of aggregates shall be carried out (at outside NABL accredited laboratory without any cost to owner) as and when the source of supply is changed without extra charge notwithstanding the mandatory test required to be carried out as per CPWD specification.

4.4.5 All tests in support of mix design shall be maintained as a part of records of the contract. Test cubes for mix design shall be prepared by the CONTRACTOR under his own arrangements and at his costs, but under the supervision of the **Engineer-in-Charge**.

4.5 **Design Mix Concrete**

4.5.1 Design mix shall be allowed for major works where it is contemplated to be used by installing weigh batch mixing plant as per IS 4925. At the time of tendering, the CONTRACTOR, after taking into account the type of aggregates, plant and method of laying he intends to use, shall allow in his tender for the design mix i.e., aggregate/cement and water/cement ratios which he considers will achieve the strength requirements specified, and workability for concrete to be properly finished.

4.5.2 Before commencement of concreting, **CONTRACTOR** shall carry out preliminary tests (at outside NABL accredited laboratory without any cost to owner) for design mix on trial mixes proposed by him in design of mix to satisfy the **Engineer-in-Charge** that the characteristic strength is obtained. In this regard, CONTRACTOR may consult govt. approved/reputed institute to get design mix done as per IS 10262 at his own cost. The concrete mix to be actually used shall be approved by the **Engineer-in-Charge**.

4.5.3 Notwithstanding the above, the following shall be the maximum combined weight of coarse and fine aggregate per 50 kg of cement.

Grade of Concrete	Maximum weight of fine & coarse aggregates together per 50 kg of cement (for nominal mix only)
1. M - 10	480 kg
2. M - 15	350 kg
3. M - 20	250 kg

4.5.4 The workability of concrete produced shall be adequate, so that the concrete can be properly placed and compacted. The slump shall be as per IS 456.

4.6 **Testing of Concrete**

4.6.1 Testing of concrete, sampling and acceptance criteria shall be in accordance with IS 456.

4.7 **Proportioning**

Mixes of cement concrete shall be as ordered. Where the concrete is specified by grade, it shall be prepared by mixing cement, sand and coarse aggregate by weight as per mix design. In case the concrete is specified as volumetric mix, then dry volume batching shall be done, making proper allowances for dampness in aggregates and bulking in sand. Equivalent volume batching for concrete specified by grade may however be allowed by the **Engineer-in-Charge** at his discretion.

4.8 **Pre Cast Concrete**

The specifications for pre cast concrete will be similar as for the cast in situ concrete. All pre cast work shall be carried out in a yard made for the purpose. This yard shall be dry, properly levelled and having a hard and even surface. If the ground is to be used as a soft former of the units, shall be paved with concrete or masonry and provided with a layer of plaster (1:2 proportion) with smooth neat cement finish or a layer of MS sheeting. The casting shall be over suitable vibrating tables or by using form vibrators as per directions of **Engineer-in-Charge**.

The yard, lifting equipment, curing tank, finished material storage space etc. shall be designed such that the units are not lifted from the mould before 7 (seven) days of curing and can be removed for erection after 28 (Twenty Eight) days of curing. The moulds shall preferably be of steel or of timber lined with G.I .sheet metal. The yard shall preferably be fenced.

Lifting hooks, wherever necessary or as directed by **Engineer-in-Charge** shall be embedded in correct position of the units to facilitate erection, even though they may not be shown on the drgs. and shall be burnt off and finished after erection.

Pre cast concrete units, when ready shall be transported to site by suitable means approved by **Engineer-in-Charge**. Care shall be taken to ensure that no damage occurs during transportation. All adjustments, levelling and plumbing shall be done as per the instructions of the **Engineer-in-Charge**. The CONTRACTOR shall render all help with instruments, materials and staff to the **Engineer-in-Charge** for checking the proper erection of the pre cast units.

After erection and alignment the joints shall be filled with grout or concrete as directed by **Engineer-in-Charge**. If shuttering has to be used for supporting the pre cast unit they shall not be removed until the joints has attained sufficient strength and in no case before 14 (fourteen) days. The joint between pre cast roof planks shall be pointed with 1:2 (1 cement : 2 sand) mortar.

5.0 STEEL REINFORCEMENT

5.1 Steel reinforcement shall comprise:

Mild steel bars conforming to IS : 432 Part-I.

Cold twisted bars conforming to IS: 1786

CRS bars

TMT bars

Hard drawn steel wire fabric conforming to IS: 1566

5.2 All joints in reinforcement shall be lapped adequately to develop the full strength of the reinforcement as per provision of IS: 456 or as per instruction of **Engineer-in-Charge**.

6.0 FORM WORK

6.1 The shuttering or form work shall conform to the shape, lines and dimensions as shown on the drawings and be so constructed as to remain sufficiently rigid during placing and compacting of the concrete and shall be sufficiently tight to prevent loss of liquid from the concrete. The surface that becomes exposed on the removal of forms shall be examined by **Engineer-in-Charge** or his authorized representative before any defects are made good. Work that has sagged or bulged out, or contains honey combing, shall be rejected. All shuttering shall be plywood or steel shuttering.

6.2 The **CONTRACTOR** shall be responsible for sufficiency and adequacy of all form work. Centering and form work shall be designed & detailed in accordance with IS 14687 and approved by the **Engineer-in-Charge**, before placing of reinforcement and concreting.

6.3 **Stripping Time**

Forms shall not be struck until the concrete has reached strength at least twice the stress to which the concrete may be subjected at the time of removal of form work. The strength referred to shall be that of concrete using the same cement and aggregates, with the same proportions and cured under conditions of temperature and moisture similar to those existing on the work. Where possible, the form work shall be left longer as it would assist the curing.

Note 1: In normal circumstances and where ordinary Portland Cement is used, forms may generally be removed after the expiry of the following periods:

1.	Walls, columns and vertical faces of all structural members	24 to 48 hours as may be decided by the **Engineer-in-Charge**
2.	Slabs (props left under)	3 days
3.	Beam soffits (Props left under)	7 days
4.	Removal of props under slabs 1. Spanning up to 4.5 m 2. Spanning over 4.5 m	 7 days 14 days
5.	Removal of props under beams & arches: 1. Spanning up to 6 m 2. Spanning over 6m	 14 days 21 days

For other types of cements, the stripling time recommended for ordinary Portland Cement may be suitably modified.

Note 2: The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

7.0 CEMENT CONCRETE BLOCK

Cement concrete block shall be machined made in the proportion of such that mix shall not be leaner than one cement to twelve combined aggregates (by volume) but having minimum strength of 7.5 MPa. Combined aggregate shall be graded as near as possible to IS: 383. The fineness modules of combined aggregate shall be between 3.6 and 4. The concrete block shall be properly cured as per IS-456. The surface of conc. block shall have even face without any honeycomb and free from cracks.

7.1 **Mortar**

Cement and water shall confirm to the requirements laid down for cement concrete work.

7.1.1 Sand for concrete block masonry mortars shall be coarse sand generally conforming to IS: 2116. Maximum quantities of clay, fine dust, shall not be more than 5% by weight. Organic impurities shall not exceed the limits laid down in IS: 2116.

7.1.2 Mix of mortar for building concrete block shall be as specified in the item of work.

7.1.3 Mixing of the mortar shall be done in a mechanical mixer. When quantity involved is small hand mixing may be permitted by **Engineer-in-Charge**. Any mortar remaining unused for more than 30 minutes after mixing shall be rejected.

7.2 **Concrete Block Masonry**

The thickness of joints shall be 10 mm +- 3mm. Thickness of joints shall be kept uniform. In case of foundation and manholes etc. joints up to 15 mm may be accepted.

7.3 **Half Concrete Block**

All courses shall be laid with stretchers. Reinforcement comprising 2 nos. 6 mm dia MS bars shall be provided over the top of the first course and thereafter at every fourth course.

7.4 **Fixtures**

All iron fixtures, pipes spouts, hold fasts of doors and windows which are required to be built into the wall shall be embedded in cement concrete blocks 1:2:4 mix (1 cement :2 coarse sand :4 graded stone aggregate. 20 mm nominal size) of size indicated in the item.

7.5 **Curing**

Concrete block masonry shall be protected from rain by suitable covering when mortar is green. Masonry work shall be kept constantly moist on all faces for a minimum period of seven days.

8.0 STRUCTURAL STEEL WORK

This specification covers the technical requirements for the preparation of shop drawings, supply, fabrication, protective coating, painting and erection of all structural steel rolled sections, built up sections, plates and miscellaneous steel required for the completion of the work.

Steel

All structural steel used in construction within the purview of this contract shall, comply with one of the following Bureau of Indian Standard Specifications, whichever, is appropriate or as specified.

IS – 2062 Hot rolled sections and plates

IS – 1079 Cold formed light gauge sections

IS – 1161 Tubular sections

IS – 4923 Hollow sections (rectangular or square)

Fabrication

Fabrication of steel structure shall be carried out in conformity with the best modern practices and with due regard to speed with economy in fabrication and erection and shall conform to IS-800. All members shall be so fabricated as to assemble the members accurately on site and erect them in correct positions. Before dispatch to site the components shall be assembled at shop and any defect found rectified. All members shall be free from kink, twist, buckle, bend, open joints etc. and shall be rectified before erecting in position. Failure in this respect will subject the defective members to rejection.

Fabrication Drawings:

Development of Fabrication drawings shall be in contractor's scope. Connections, splices and other details shall be suitably designed based on good Engineering practice.

Electrodes:

Electrodes used for welding shall comply with IS-814 or IS - 815.

8.1 **MS Black/High Strength Bolts and Nuts**

M.S.Black or high strength bolts, nuts and washers etc. shall be as per IS-800, IS-1363 and IS-1367. Manufacturer's test certificate shall be made available to the **Engineer-in-Charge**. For bolted joints, shanks and threaded bolts are to be used to ensure that threaded length do not encroach within the thickness of connected members of dimension beyond the following limit:-

1. 1.5 mm for connected members of thickness below 12 mm and
2. 2.5 mm for connected member of thickness 12 mm and above and that adequate shearing and bearing values required as per design are achieved.

Every portion work shall have its erection mark or numbers stencilled on the member for guidance in erection and bear all necessary marks of erections as directed by the Owner / Consultant.

8.2 No part of the work is to be oiled, painted (except contact surfaces) packed, bundled, crated or dispatched until it has been finally inspected and approved by the Owner / Consultant or his authorized representative. The whole steel work before being dispatched from the Contractor's shop shall be dry and after being thoroughly cleaned from dust, mills scale, rust etc., and shall be given two coats of primer and one coat of final paint as per painting specification attached in this enquiry. Unless otherwise specified, all surfaces inaccessible after welding shall be given two coats of primer and two coats of paints as per painting specification attached in this enquiry.

8.3 The Owner / Consultant or his authorized representative shall have free access at all reasonable time to all places where the work is being carried out, and shall be provided by the Contractor at his own expenses all necessary facilities for inspection during fabrication and erection. The Owner / Consultant or his authorized representative shall be at liberty to reject the work in whole or in part if the workmanship or materials do not conform to the terms of the specifications mentioned herein. The Contractor shall remove, replace or alter any part of the work as ordered by the Owner / Consultant or his authorized representative.

9.0 PAINTING ON STRUCTURAL STEEL

The following specification shall be used for painting of structural steel work.

9.1 Scope

This specification covers the technical requirements for shop and site application of paint and protective coatings and includes; the surface preparation, priming, application, testing and quality assurance for protective coatings of structural steelwork, plate work, handrails and associated metal surfaces, which will be exposed to atmospheric for industrial plants.

9.2 Definitions

C.S	-	Carbon steel and low chrome (1-1/4 Cr through 9 Cr) alloys
S.S	-	Stainless steel, such as 304,316, 321, 347,
Non-ferrous	-	copper, aluminium and their alloys.
High Alloy	-	Monel, Inconel, Incoloy, Alloy 20, Hastelloy, etc.
DF	-	Dry Film thickness, the thickness of the dried or curved paint or coating film.

9.3 Safety Regulations

Protective coatings and their application shall comply with all national, state, and local codes and regulations on surface preparation, coating application, storage, handling, safety, and environmental recommendations.

Sand or other materials producing silica dust shall NOT be used for any open-air blasting operations.

9.4 Material Safety Data Sheets

The latest issue of the coating manufacturer's product datasheet, application instructions, and material safety data Sheets shall be available prior to starting the work and shall be complied with during all preparation and painting / coating operations.

9.5 Materials

All paints and paint materials shall be obtained from the company's approved manufacturer's list. All materials shall be supplied in the manufacturer's containers, durably and legibly marked as follows.

Specification number

Colour reference number

Method of application

Batch number

Date of Manufacture

Shelf life expiry date

Manufacturer's name or recognised trade mark.

9.6 CODE AND STANDARDS:

Without prejudice to the provision of Clause 1.1 above and the detailed specifications of the contract, the following codes & standards shall be followed. Wherever reference to any code is made, it shall correspond to the latest edition of the code.

9.7 Indian Standards:

IS-5: 1994 Colors for ready mixed paints and enamels.

IS-2379: 1990 Color codes for identification of pipe lines.

IS-2629: 1985 Recommended practice for hot-dip galvanizing on iron and steel.

IS-2633: 1986 Methods for testing uniformity of coating of zinc-coated articles.

IS-8629: 1977 Code of practice for protection of iron and steel structures from atmospheric corrosion.

IS: 110 Specification for Ready Mixed Paint, Brushing, Grey Filler, for Enamels, for Over Primers

IS: 101 Methods of test for ready mixed paints & enamels.

9.8 Other Standards:

9.8.1 Swedish Standard: SIS-05 5900-1967 / ISO-8501-1-1988

(Surface preparations standards for Painting Steel Surface).

This standard contains photographs of the various standards on four different degrees of rusted steel and as such is preferable for inspection purpose by the Engineer-in-charge.

9.8.2 DIN: 53151 Standards for Adhesion test.

9.9 The paint manufacturer's, instructions shall be followed as far as practicable at all times. Particular attention shall be paid to the following:

a. Instructions for storage to avoid exposure as well as extremes of temperature.

b. Surface preparation prior to painting.

c. Mixing and thinning.

d. Application of paints and the recommended limit on time intervals between coats.

9.10 Surface Preparation

9.10.1 Safety

All work in adjacent areas, which may negatively affect the quality of blast cleaning, and/or impose safety hazards, must be completed or stopped before the blasting operation starts.

9.10.2 Pre-Cleaning

Prior to surface preparation all weld spatter shall be removed from the surface, all sharp edges ground down and all surfaces cleaned free of contaminants including chalked paint, dust, grease, oil, chemicals and salt. All shop primed surfaces shall be water washed by means of suitable solvent, by steam cleaning, with an alkaline cleaning agent if necessary or by high-pressure water, to remove contaminants prior to top-coating.

9.10.3 Surface decontamination

Surface decontamination shall be performed prior to paint application when uncoated surface is exposed to a corrosive environment or existing paint work is to be repaired. Existing coatings shall be removed by abrasive blast cleaning, and then high pressure potable water shall be used to clean steel surfaces. Prior to application of coatings, the surface shall be chemically checked for the presence of contaminants. A surface contamination analysis test kit shall be used to measure the levels of chlorides, iron salts and pH in accordance with the kit manufacturer's recommendations.

Swabs taken from the steel surface, using cotton wool test swabs soaked in distilled water shall not be less than one swab for every 25m^2 of surface area to be painted.

Maximum allowable contaminant levels and pH range is as follows:

Sodium chloride, less than 50 microgram / cm^2;

Soluble iron salts, less than 7 microgram / cm^2; and

pH between 6 – 8

If the results of the contamination test fall outside the acceptable limits, then the wash water process shall be repeated over the entire surface to be painted, until the contaminant test is within the specified levels.

9.10.4 Abrasive blasting

All C.S materials shall be abrasive blast cleaned in accordance with relevant IS Codes. To reduce the possibility of contaminating S.S., blasting is not usually specified. However, for coatings which require a blast-cleaned surface for proper adhesion, S.S. may be blast cleaned using clean aluminium oxide or garnet abrasives (Free from any chloride or Iron / Steel contamination).When hand or power tool cleaning is required on S.S., only S.S. wire-brushes (including 410 S.S.) which have not been previously used on C.S. surfaces may be used.

The surface profile of steel surfaces after blasting shall be of preparation grade Sa 2-1/2 of Swedish Standards SIS-05-5900 (Latest Revision) or better according to ISO 8501-1 and shall be measured using the replica tape method or the comparator method.

The roughness (profile) of blast-cleaned surfaces shall be Medium (G) according to ISO 8503-2: 1988 (appendix 1) unless otherwise specified. Medium defines a surface profile with a maximum peak-to-valley height of 60-100 microns, and G indicates that the surface profile is obtained by grit blasting. For the evaluation of surface roughness Comparator G shall be used.

Abrasive blast cleaning shall NOT be performed when the ambient or the substrate temperatures are less than 3 Degree Celsius above the dew point temperature. The relative humidity should preferably be below 50% during cold weather and shall never be higher than 60% in any case.

Abrasive blast cleaning shall be performed with a clean, sharp grade of abrasive. Grain size shall be suitable for producing the specified roughness. Abrasives shall be free from oil, grease, moisture and salts, and shall contain no more than 50ppm chloride. The use of silica sand, copper slag and other potentially silica containing materials shall not be allowed.

The blasting compressor shall be capable of maintaining a minimum air pressure of 7 kPa at the nozzle to obtain the acceptable surface cleanliness and profile.

The blast cleaning air compressor shall be equipped with adequately sized and properly maintained oil and water separators. The air supply shall be checked to ensure no oil and water contamination at the beginning of each work shift.

Blast cleaning abrasive shall be stored in a clean, dry environment at all times. Recycling of used abrasive is prohibited.

After blast cleaning, the surfaces shall be cleaned by washing with clean water (Pressure 7kg/cm^2 using suitable nozzles. During washing broom corn brushes shall be used to remove foreign matter.

Assessment of the blast cleaned surfaces shall be carried out in accordance with reference code.

Blast cleaned surfaces which show evidence of rust bloom or that have been left uncoated overnight shall be re-cleaned to the specified degree of cleanliness prior to coating.

All grit and dust shall be removed after blasting and before coating application. Removal shall be by a combination of blowing clean with compressed air, followed by a thorough vacuum cleaning with an industrial grade, heavy duty vacuum cleaner.

All cleaned surfaces shall have protection from atmospheric corrosion as per IS8629:1977

9.11 **Painting system to be used is indicated below:**

Epoxy Painting:

9.11.1 All the surfaces must be abrasive blasted and 1 coat of primer, 2 coats of intermediate and 1 coat of finish paint applied in the fabrication shop before the same are shifted to site for erection. All the members must be suitably match marked for facilitating proper assembly.

After erection is over all surfaces shall be washed up as follows:

Washing with clean water (pressure 7 kg/cm^2) using suitable nozzles. During washing broom corn brushes shall be used to remove foreign matters.

Solvent washing if required to remove traces of oil grease etc.

After washing the surface as indicated above, the surfaces shall be suitably touched up to the extent required so that all the damages to the premiered surfaces caused during erection are done up.

a) The surfaces affected by welding and / or gas cutting during erection shall also be suitably touched up. Before touch up is taken up surfaces shall be prepared by mechanical means such as grinding, power brushing etc. to achieve surface finish to ST-3.

b) After touch up work is over as indicated above, all the surfaces shall be given one coat of finish paint to the required specification.

9.11.2 The following points must be observed for painting work:

1. Primer and paint shall be compatible to each other and should be from the same manufacturer.

2. The recommendation of the paint manufacturer regarding mixing, matching and application must be followed meticulously.

3. Technical representative of paint manufacturer should be available at site as and when required by **Engineer-in-Charge** for their expert advice as well as to ensure that the painting work is executed as per the instruction of paint manufactures.

c) Paints and primers shall be supplied at site in original container with factory seal otherwise such paints and primers shall not be allowed to be used. Mode of application i.e. by spray, brush or roller shall be strictly as per recommendation of paint manufacturer.

d) Painting materials must be used before the expiry date indicated on the containers.

e) Number of coats and DFT per coat must be strictly followed as indicated above. If the desired DFT is not achieved for primer, intermediate and finish paints in two coats (each), **CONTRACTOR** shall be required to apply extra coat (s) to achieve the desired DFT without any extra cost to **Engineer-in-Charge**.

f) Color shade for each coat of primer and finish paint must be different to identify the coats without any ambiguity.

g) Shade for the final finish coat shall be decided by **Engineer-in-Charge** at site.

h) All painting materials must be accompanied by manufacturers test certificates. However, Engineer-in-Charge has any doubt regarding quality of materials, he shall have the right to direct CONTRACTOR to get the doubtful material tested or and provided (by CONTRACTOR) testing agencies for which no extra payment shall be made to the CONTRACTOR and the charges shall deemed to be covered in the unit rates quoted for fabrication and erection of structural work.

i) DFT for paint shall be measured at least 20 points and mean DFT shall not vary by more than 10% than specified in DFT.

j) Reliable and calibrated Instrument for measurement of DFT shall be arranged and provided by **CONTRACTOR** at his cost.

k) Thickness of each coat shall also be checked regularly to ensure uniformity in DFT.

9.11.3 Abrasive blasting and painting works, being a specialized job must be carried out through the approved agencies only.

9.11.4 **PAINTING ON STEEL STRUCTURES**

SL.NO	DESCRIPTION	GENERIC COATING SYSTEM
1.	SURFACE PREPARATION	Blast clean to SA 2.5
2.	PRIMER	One coat of ethyl silicate zinc rich with solvent. Thickness 75 micron per coat
3.	INTERMEDIATE	Two coat of two pack high build aliphatic amine cured epoxy coating Thickness 100 micron per coat.
4.	FINISH COAT	One coat of two pack amine cured epoxy / Acrylic aliphatic polyurethane. Thickness 50 micron per coat
5.	Total DFT	325 Micron

10.0 STEEL / ALUMINIUM DOORS, WINDOWS AND VENTILATORS

10.1 The Steel doors, windows and ventilators shall be of the size and type as per IS-1361 and IS-1038. Fixing and glazing shall be done as per IS-1081 and as per manufacturer's instructions. The putty of approved make such as special gold size or equivalent conforming to IS-419 shall be used.

10.2 Aluminium doors, windows and ventilators shall be manufactured from wrought aluminium and aluminium alloy extruded round tube and / or hollow rectangular / square sections conforming to IS: 1285 & IS : 6477 or equivalent as approved by **Engineer-in-Charge**.

11.0 ROOFING & CLADDING

For roofing & cladding Non-asbestos high impact Polypropylene reinforced cement 6mm thick corrugated sheets (as per IS:14871) roofing up to any pitch and fixing with polymer coated J or L hooks, bolts and nuts 8mm dia. G.I. plain and bitumen washers or with self drilling fastener and EPDM washer.

12.0 FLOORING AND PAVING

12.1 Sub Base of floor

12.1.1 The area to be paved shall be divided into suitable panels. Form work shall be provided. The boarding / battens shall be fixed in position with their toe at proper level, giving slope where required. Alternatively base concrete may be deposited in the whole area at a stretch.

12.1.2 Before placing the base concrete the sub-base shall be properly wetted and rammed. The concrete of the specified mix shall then be deposited between the forms where provided, thoroughly tamped and the surface finished level with the top edge of the forms. The surface of base concrete shall be spreader uniformly. The surface shall be finished rough to provide adequate bond for the topping. Two or three hours after concrete has been laid the surface shall be brushed with wire brush to remove any scum or Latinate and swept clean so that coarse aggregate is exposed.

12.2 Cement Concrete Floor Finishes

12.2.1 The surface of base concrete shall be thoroughly cleaned by scrubbing with coir or steel wire brush. Before laying the toping, the surface shall be soaked with water at least for 12 hours and surplus water mopped up immediately before the toping is laid.

12.2.2 The forms shall be fixed over the base concrete dividing into suitable panels. Where glass dividing strips are provided, thickness of glass dividing strips shall be 4 or as indicated. Before placing the concrete toping, neat cement slurry at the rate of 2 kg/sq.m shall be then thoroughly brushed into the base concrete just ahead of the finish. The topping shall then be laid, thoroughly compacted by using screed board/plate vibrator. The surface floated with a wooden float to a fair and even surface shall be left for some time till moisture disappears from it. Junctions with skirting / dado or wall surfaces shall be rounded off using cement mortar 1:2 curing shall be carried out for a minimum of 7 days.

13.0 PLASTERING

13.1 Sand for plastering shall be 50% fine sand and 50% coarse sand from approved sources.

13.2 Preparation of surface shall be done as per CPWD specifications.

13.3 Cement mortar shall be of the mix as indicated in the items and shall be mixed as specified in the CPWD specifications.

13.4 Joints in walls etc. shall be raked to a depth of 12 mm, brushed clean with wire brushes dusted and thoroughly washed before starting the plaster work.

13.5 The surface shall be thoroughly washed with water cleaned and kept wet to saturation point before plastering is commenced.

13.6 Cement mortar as indicated, shall be firmly applied to the masonry walls in a uniform layer to the thickness specified and will be pressed into the joints. On concrete surfaces rendering shall be dashed to the roughened surface to ensure adequate bond. The surface shall be finished even and smooth. Hectoring wherever required shall be done as per directions of **Engineer-in-Charge.** Nothing extra shall be paid on this account.

13.7 All plaster work shall be cured for at least 7 days.

13.8 Integral water proofing compound shall be mixed with cement in the proportion recommended by the manufacturer. Care shall be taken to ensure that the water proofing material gets well and integrally mixed with cement. All other operations are the same as for general plaster work.

13.9 For sand face plaster undercoat of cement plaster 1:4 (1 cement : 4 sand) of thickness not less than 12 mm shall be applied similar to one coat plaster work. Before the under coat hardens the surface shall be scared to provide for the top coat. The top coat also of cement mortar 1:4 shall be applied to a thickness not less than 8 mm and brought to an even surface with a wooden float. The surface shall then be tapped gently with a wooden float lined with cork to retain a coarse surface texture, care being taken that the tapping is even and uniform.

14.0 EXTERIOR PAINTING

14.1 Exterior painting shall be Acrylic smooth exterior.

14.2 Where shown on drawings for external surfaces of sand faced plaster, or any other surface, two coats of cement paint shall be applied of tint and shade as approved by the **Engineer-in-Charge**.

14.3 The surfaces shall be prepared as specified for white washing. Before applying cement paint the surface shall be thoroughly wetted to control surface suction. The surface shall be moist but not dripping wet, when the paint is applied. Not less than 24 hours shall be allowed between the two coats. In hot weather the first coat shall be slightly moistened before applying the second coat.

14.4 On external plastered surfaces (one coat primer + minimum 3 coat of paints), sand faced or plain plastered and concrete surfaces, apex weather proof paint shall be vigorously scrubbed on to work the paint into the voids and provide a continuous paint film free from pin holes and other openings

15.0 GLAZING

15.1 Sheet glass glazing of doors, windows etc. shall be of selected quality glass conforming to IS: 2835. Toughened splinter proof industrial safety glass shall confirm to IS: 2553. No cracked chipped or disfigured glass shall be accepted Glass shall be in one piece for each pan.

15.2 Glazing shall be fixed with timber or steel / aluminium beading as called for. Glass shall be back puttied and fixed with beading for a water tight and rattle free installation. Sizes of timber/ steel / aluminium beading shall be as directed.

16. PROTECTIVE COATING AND LINING SYSTEM

16.1 EPOXY COATING

Characteristics of coated surfaces (after application)

- Compressive strength : min. 90 N/mm2
- Tensile strength : min. 10 N/mm2

- Abrasion resistance : as per Amsler 1.5 mm after 3000 revol.
- Bonding (joining) factor : 1
- Adhesion with concrete : min. 2.5 N/mm2
- Elongation : 15%

APPLICATION:

A) ON FLOOR

SL. NO	DESCRIPTION
1.	Surface preparation- in this case concrete columns, beams, sofitt slabs, floors & plastered brick masonry walls (for receiving IMPREGNATION, BOND COATS, COATINGS etc) with hand wire brushes or rotary wire brushes etc and removing all the dust , dirt etc complete.
2.	Impregnation with monomer (5 cps viscosity) to be applied by brush with a consumption of minimum 0.25 kg/m2
3.	Providing and applying structural grade Epoxy Bonding agent, (with bond strength of 3 N/mm2) over concrete prior to screed concrete. Bonding agent to be used as per application procedure of manufacturer.
4.	Self levelling cemetious screed avg. 25mm thick, using proportion 1:1:0.5 cement: sand : 8 mm down aggregates (by weight) with addition of suitable free flow and performance improving additives namely micro silica, shrinkage compensating admixtures, polymers, high range super plasticizers. W/C ratio not to exceed 0.4. Compressive strength of the screed to be 37.5 N/mm2 after 28 days over bonding agent.
5.	Providing and applying structural grade Epoxy Bonding agent, (with bond strength of 3 N/mm2) over screed concrete. Bonding agent to be used as per application procedure of manufacturer.
6.	Self levelling epoxy phenolic IPN (inter penetrating polymer network) screed (min 3mm thick, solvent free resin in proportion of 1 resin hardener mix : 2 sharp silica sand 600 micron down) on dry and clean surface of the self levelling cementitious screed done earlier, using special fork type leveller tool and allowing the scred to sure for 48 hours.

B) ON WALLS, SLAB, SOFFITS, BEAMS, COLUMN

SL. NO	DESCRIPTION
1.	Surface preparation- in this case concrete columns, beams, sofitt slabs, floors & plastered brick masonry walls (for receiving IMPREGNATION, BOND COATS, COATINGS etc) with hand wire brushes or rotary wire brushes etc and removing all the dust , dirt etc complete.
2.	Impregnation with monomer (5 cps viscosity) to be applied by brush with a consumption of minimum 0.25 kg/m2
3.	Impregnation of prepared concrete surface (internal walls, slab, soffits, beams, column and cut outs) with polymethyl methacrylate monomer (viscosity 5cps), brush applied @ 0.25kg/m². Three coat epoxy phenolic IPN solvent containing protective coating with one non pigmented primer coat and two subsequent colour coats with approved shades giving total dry film thickness of 225 +/- 10 microns over impregnated and cleaned surface.

16.2 **ACID PROOF TILES:**

MATERIAL

1) TILES

These tiles shall be made of clays, feldspar, quartz, talc and vitrified at high temperature in ceramic kilns and kept unglazed so as to prevent from slipperiness. Tiles shall not absorb more than 2% of their own dry weight when soaked in water. Compression strength: 700 Kg/cm2 Min. & Flexural strength: 200 Kg/cm2 Min. It shall not lose more than 1.5% of it weight when soaked in acid.

Chemical compositions of tiles:

- Al_2O_3 : 22-24%
- SiO_2 : 60-65%
- Fe_2O_3 : 1.0-2.0%
- Alkalise : 10-12%

2) K-BASED SILICATE MORTAR

Acid Proof cement KSC is a potassium silicate based corrosion cement. Acid tile linings carried out with KSC cement are not subject to crystal formation in the pores of cement. Besides Bitumastic surface is joint-less, hence there is no danger of Acids percolating through the surface.

Characteristics of K-based Silicate mortar:

- Colour : White
- Density (lbs/Cub. ft.) : 130
- Water Absorption : 2-5 %
- Tensile Strength (Psi) : 400
- Compressive strength (Psi) : 2800
- Bond Strength (Psi) : 180
- Coefficient of thermal expansion : 6.0×10^{-6}

3) BITUMASTIC MORTAR

It shall consist of an acid proof inorganic filler and blended bitumen. It shall be trowelled to concrete having total thickness of 10 mm.

Characteristics of Bituminous compounds:

- Density (Kg/m^3) : 2200
- Water content by mass percent (max) : 0.5
- Flash point °C ,min. : 35

Consistency

a) Before setting (test after 1 hr) min. : 100

b) After setting (test after 24 hr) min. : 80

Mastic shall be heated to 150-300°C and shall be applied in 5 mm layers after surface is cleaned and dried.

4) BITUMINOUS PAINT

This is generally of heavy grade bituminous corrosion resisting paint. 2 coats of the paint shall be given, and drying time between the 2 coats shall not be less than 5 hours. Also, its drying time after second coat shall not be more than 8 hours. Its finish shall be smooth, glossy and elastic.

The primer shall confirm to the following requirements:

- Viscosity by standard tar viscometer, 4mm orifice at 25°C: 4 to 24
- Penetration at 25°C, 100g, 5sec in 1/100 cm : 20 to 50
- Water content percent (max) : 0.2

APPLICATION

SL. NO.	DESCRIPTION	ITEM OR AREA
1.	Bituminous Paint (Primer)	Concrete surface
2.	10mm Bitumastic Laying in two layers each shall not be more than 5mm thick	Over Bituminous Paint
3.	One layer, 5mm Acid, K-based Silicate Type mortar	#
4.	10 mm thick Acid proof tiling	Over K-based Silicate

- Tiles should be fixed on bitumastic surface with the help of 5mm K-based silicate mortar.

16.3 ACID RESISTANT BRICK LINING

A. MATERIAL

These bricks are made of raw materials such as clay or shale of suitable composition with low lime and iron content, feldspar, flint or sand and vitrified at high temperature in ceramic kilns. Bricks shall not absorb more than 2% of their own wt. when soaked in water. Compression strength: > 700 Kg/cm^2. Bricks shall not lose more than 1.5% at their own weight when tested for acid resistance.

Chemical compositions of bricks are

a) Al_2O_3 22-24%

b) SiO_2 60-65%

c) $Fe_2 O_3$ 1.0-2.0%

d) Alkalies 10-12%

1) ~~K-BASED SILICATE MORTAR~~

Acid Proof cement KSC is a potassium silicate based corrosion cement. Acid brick linings carried out with KSC cement are not subject to crystal formation in the pores of cement. Besides Bitumastic surface is joint-less, hence there is no danger of Acids percolating through the surface.

Characteristics of K-based Silicate mortar:

Colour	: White
Density (lbs/Cub. ft.)	: 130
Water Absorption	: 2-5 %
Tensile Strength (Psi)	: 400
Compressive strength (Psi)	: 2800
Bond Strength (Psi)	: 180
Coefficient of thermal expansion	: 6.0×10^{-6}

2) BITUMASTIC MORTAR

It shall consist of an acid proof inorganic filler and blended bitumen. It shall be trowelled to concrete having total thickness of 10 mm.

Characteristics of Bituminous compounds:

Density (Kg/m^3)	: 2200
Water content by mass percent (max)	: 0.5
Flash point °C ,min.	: 35
Consistency	
c) Before setting (test after 1 hr) min.	: 100
d) After setting (test after 24 hr) min.	: 80

Mastic shall be heated to 150-300°C and shall be applied in 5 mm layers after surface is cleaned & dried.

3) BITUMINOUS PAINT(PRIMER)

This is generally of heavy grade bituminous corrosion resisting paint. 2 coats of the paint shall be given, and drying time between the 2 coats shall not be less than 5 hours. Also, its drying time after second coat shall not be more than 8 hours. Its finish shall be smooth, glossy and elastic.

The primer shall confirm to the following requirements:

Viscosity by standard tar viscometer, 4mm orifice at 25°C : 4 to 24

Penetration at 25°C, 100g, 5sec in 1/100 cm : 20 to 50

Water content percent (max) : 0.2

APPLICATION

SL. NO.	DESCRIPTION	ITEM OR AREA
.	Bituminous Paint (Primer)	Concrete surface
.	10mm Bitumastic Laying in two layers each shall not be more than 5 mm thick	Over Bituminous Paint
3.	One layer, 5mm Acid, K-based Silicate Type mortar	#
4.	One layer, 40mm Acid resistant Brick lining	Over K-based Silicate

#:- K-based Silicate mortar should be buttered on all sides of acid-resistant brick except the side facing the surface to be exposed to corrosives

17. POLYURETHANE WATERPROOFING

17.1 MATERIALS

The two component Solvent free Polyurethane coat shall have the following properties –

1. Solid content ASTM D 2369- ≥ 90%
2. Mixing ratio - 8:1
3. Elongation ASTM D 638 - 700-900%

4. Tensile strength ASTM D 638- 1-2 MPa

The coating shall be applied to a minimum thickness of 600 microns (300µX2) thickness with separate wearing course (as per ASTM C 898 & 836) over application of 2 component, solvent free Epoxy Primer of 200 microns with tensile of 20-30 MPa and elongation of 4-5% for smooth surface and act as primer coat at all elevations in vertical and horizontal surface

It shall be perfectly smooth, dust free and shall retain glossy finish at least up to 3 years It shall be resistant to acid, alkalis and have a very low water absorption rate of 0.5% maximum at ambient temperature after 7 days.

The packs shall not be older than 9 months after the date of manufacture and packing.

17.2 Workmanship

17.2.1 Preparation of surface

The roof surface shall be thoroughly cleaned with a wire brush and all foreign matter etc shall be removed. Well defined cracks on the surface shall be cut to "V" section, cleaned and filled up flush with a paste of 2 component polyurethane based crack filling compound and white cement in a ratio of 1:2.

17.2.2 Primer Coat

Primer coat shall be mixed in the ratio as per manufacturer's specification A single coat of this primer shall be applied by brush over the prepared bed as an adhesion coat.

The primer shall be allowed to dry for minimum of 8 hours before the successive finishing coats of Polyurethane are applied.

17.2.3 Finishing coats

The finishing coats shall consist of three successive pigmented seating coats each of

2 pack polyurethane, mixed in the ratio as per manufacturer's specifications. Application shall be with brush, to a smooth and even finish. The overall dry film thickness shall be

Ambient temperature at the time of application shall not be less than 5°C and not more than 40°C.

Each coat shall be allowed to dry for minimum 8 hours or as per manufacturer's specification before applying next coat. Care shall be taken for quick application after mixing the 2 pack primer in view of short pot life of the mix and shall be fully consumed within the stipulated period as per manufacturer's specification. (Maximum 60 minutes

at 30°C.

Polyurethane coating shall be continued up the parapets/ walls for a minimum of 150mm over the finished roof surface. It shall be continued into rain water pipes by at least 100mm.

Treated surface should be allowed to cure for minimum 72 hours.

17.2.4 Cement Screed

The final coat of polyurethane, when tacky shall be sprinkled with 300 micron layer of clean sand. Plain cement concrete (1:2:4) of 25mm minimum thickness with 24 SWG chicken wire mesh shall be then laid to slope in panels not exceeding 6 M2 area per panel The joints between panels shall be raked out neatly to a minimum 6mm x 6mm V-groove and filled up with an approved quality elastomeric compound sealant. Drain outlet shall be provided for all spouts/rain water pipes by suitable rounding, filling and skoping of PCC as per drawing. At the junction of the roof and parapet or any other vertical surface, a fillet of 75mm radius shall be formed in cement mortar 1 cement 4 coarse sand.

17.3 Guarantee

The agency for waterproofing shall furnish a guarantee, which shall be agreed upon in the Contract to ensure the successful performance of the Contract. The guarantee shall be for a period of 10 years Any work required to be carried out as a result of any defects in workmanship during the period of the guarantee shall be carried out by CONTRACTOR at his cost.

SCHEDULE OF RATES

FOR

CIVIL, RCC & STRUCTURAL WORKS FOR CONSTRUCTION POWER

0	21.01.26	21.01.26	Issued for Tender	AR	BK	RNS
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD

ESTIMATE FOR CIVIL, RCC STRUCTURAL WORKS FOR CONSTRUCTION POWER

ESTIMATE FOR CIVIL, RCC & STRUCTURAL WORKS FOR CONSTRUCTION POWER						
S.NO.	DESCRIPTION		UNIT	QUANTITY	RATE (Exclusive of GST)	AMOUNT (IN INR)
		EARTH WORK				
1	C-01	Earthwork in excavation in foundations of buildings, footings, columns, plinth beams, walls, machine/ equipment foundations, isolated pits, pavements, trenches for pipelines /cables, pipe sleepers, drains, etc., to the required levels and grades in both dry and wet conditions, including dressing of sides and ramming of bottoms, getting out excavated earth with lift upto 1.5 M and disposal of surplus excavated materials within plant boundary including stacking, levelling and dressing etc., complete as per direction of Engineer-in-Charge(E.I.C.) in all kinds of soils as defined in IS: 1200 including providing temporary supports to all service lines such as overhead and underground water, sewage and drain pipes, cables etc. and shoring and strutting wherever necessary, complete in all respects as per direction of Engineer-in-Charge.	Cu. M.	350		
2	C-02	Same as Item No. C-01, but lift from 1.5 M to 3.0 M. including in or under water and/or liquid mud, including pumping out water as required	Cu. M.	150		
3	C-03	Filling with available excavated good earth (excluding rocks / boulders), as approved and directed by Engineer-in-Charge, in trenches, plinth, under floors, sides of foundation etc., at all depths in layers not exceeding 20 cms. in thickness including consolidating and dressing each deposited layer by ramming and watering with lead upto plant boundary, complete in all respects (compaction under floor with mechanical vibrater / road roller including watering).	Cu. M.	250		
4	C-04	Supplying and filling with selected good earth brought from source approved by the Engineer -in-Charge in trenches, plinth, under floors, sides of foundation etc., at all depths in layers not exceeding 20 cms. in thickness including consolidating and dressing each deposited layer by ramming and watering (Rate shall include Royalty, Taxes, Octoroi, etc., levied by the local authorities, all transportation, loading and unloading, etc., and nothing extra will be paid on this account including compaction under floor with mechanical vibrater / road roller including watering).	Cu. M.	10		
5	C-05	Disposal of building rubbish / malba / similar unserviceable / surplus excavated earth, dismantled or waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge, beyond initial lead, for all leads including all lifts involved as per the direction of Engineer-in-Charge..	Cu. M.	250		
6	C-06	Supplying and filling in plinth with sand under floors, including watering, ramming, consolidating and dressing complete.	Cu. M.	50		

ESTIMATE FOR CIVIL, RCC STRUCTURAL WORKS FOR CONSTRUCTION POWER

		PLAIN CEMENT CONCRETE :				
7	C-07	Providing and laying plain cement concrete, machine mixed and mechanically vibrated in foundations, plinth, under floors, etc., including all necessary cost of centring and shuttering :				
		A) 1:4:8 (1 cement: 4 coarse sand: 8 graded stone aggregate 40 mm nominal size).	Cu. M.	30		
		B) 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 20 mm and below).	Cu. M.	5		
		REINFORCED CEMENT CONCRETE :				
		IN FOUNDATION AND PLINTH				
8	C-08	Providing and laying reinforced cement concrete of grade M-30(using 20 mm. nominal gauge graded stone aggregate) machine mixed and mechanically vibrated and finished to a fair face but excluding the cost of centring, shuttering and reinforcement in foundation and plinth, for rafts, footings, bases of columns, pedestals, beams, walls, columns, slabs, machine and equipment foundations, pile caps, box sections, pipe supports, etc., complete in all respects as per direction of Engineer-in- Charge.	Cu. M.	200		
9	C-09	Same as Item No. C- 01, but with concrete of grade M-25.	Cu. M.	50		
		IN SUPERSTRUCTURE				
10	C-10	Providing and laying reinforced cement concrete of grade M-25 (using 20 mm. nominal gauge graded stone aggregate), machine mixed, mechanically vibrated and finished to a fair face but excluding the cost of centring, shuttering and reinforcement in superstructure at all heights for columns, pillars, posts, attached pillasters, portals, struts, inclined posts, pedestals for equipments and similar vertical members, etc., complete in all respects as per direction of Engineer-in-Charge.	Cu. M.	10		
11	C-11	Same as Item No. C-03, but in walls of any thickness, shape or size including attached buttresses, pilasters and their caps and bases.	Cu. M.	5		
12	C-12	Same as Item No. C- 03, but in lintels, beams, portal beams, brackets, girders, cantilevers, suspended floors, roofs, staircase roofs and their supports, balconies, staircase waist and landing slabs and steps including preparation of top surface and	Cu. M.	5		
		REINFORCEMENT AND EMBEDMENTS :				
13	C-13	Supplying, cutting, cleaning, straightening, bending, hoisting and placing in position and binding with 18 SWG annealed wire, reinforcement bar of high yield strength Steel with Fe550D or more properties conforming to IS:1786 for all R.C.C. works including all necessary handling at all heights and depths complete in all respects and as per direction of Engineer-in-Charge..	Te.	27		
14	C-14	Supplying, fabricating and fixing in position M.S. anchor plates, hooks, insert plates, M.S. flats, M.S. angle inserts and the like including welding M.S. lugs, etc., and embedding in cement concrete /R.C.C. works as per approved drawings complete in all respects and as per direction of Engineer-in-Charge.	Kg.	100		
15	C-15	Supplying, fabricating and fixing in position M.S. holding down bolts assembly consisting of bolts, heads, nuts, washers etc., and the like including embedding in cement concrete/R.C.C. works as per approved drawings complete in all respects including one coat of approved quality anti-corrosive paint over a coat of approved quality primer.	Kg.	100		

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Prepared By

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Reviewed By

RNS
Approved By

ESTIMATE FOR CIVIL, RCC STRUCTURAL WORKS FOR CONSTRUCTION POWER

		SHUTTERING :				
16	C-16	Providing, fabricating, erecting and fixing in position with bolts and nuts, nails and ties, etc., centring and shuttering materials true to line and level, including strutting, propping, staging etc. with necessary bracing in all axes to give a stable assembly including chamfering the corners of columns and beams etc., wherever required including making joints in the shuttering fully leak-proof, i/c. Striking, dismantling and removing the aforesaid assembly after concreting is over, including all labour and materials complete in all respects and as per direction of Engineer-in Charge :				
		IN FOUNDATION AND PLINTH				
		Foundation and plinth in rafts, footings, columns, pedestals, beams, walls, slabs, machine and equipment foundations, pile caps and pipe support foundations, etc.	Sq. M.	300		
		IN SUPERSTRUCTURE				
		A) Columns, pillars, posts, struts, inclined posts, attached pillasters, portals and similar vertical members.	Sq. M.	50		
		B) Walls of any thickness, height and shape including attached buttresses, pillasters, and their caps and bases, etc.	Sq. M.	50		
		C) Lintels, beams, portal beams, brackets, girders, cantilever beams, suspended floors, roofs, staircase roofs and their supports, balconies, staircase waist and landing slabs and steps, etc.	Sq. M.	50		
		STRUCTURAL STEEL				
17	C-17	Supplying, transporting, de-rusting, fabricating, erecting, hoisting and fixing in position with necessary welding and/or bolting with MS bolts conforming to property class 4.6 of IS: 1367 at all heights as per approved fabrication drawings of all types of structural steel work in columns, portals, girders, lattice girders, beams, crane girders, M.S rails, monorails, bracings, trusses, purlins, rafters, side runners, sag rods, hand railings, staircase stringers and steps, walkway, toe-plates, floor grids, sag rods with M.S. rounds, side walling, conveyor gantries, trestle for pipe and cable racks, gusset plates, etc., either made of rolled steel joists, channels, angles, tees, flats, plates or built up from plates and/or rolled steel sections including necessary site and shop fasteners, complete in all respects as per approved fabrication drawings, standards and direction of Engineer-in-Charge :				
		A) With providing and applying primer coat, intermediate coats and finish coat after the preparation of surfaces on structural steel work complete in all respects as per technical specifications and direction of Engineer-in-Charge.	Te	3		

ESTIMATE FOR CIVIL, RCC STRUCTURAL WORKS FOR CONSTRUCTION POWER

		MISCELLANEOUS :				
18	C-18	Providing and laying "SHRINKKOMP- 10" or any other approved equivalent anti-shrinkage grouting in pockets, under base plates of light static equipments, structural steel columns, etc., and as specified in the drawing, complete in all respects as per direction of Engineer-in-Charge.	Cu. M.	0.5		
19	C-19	Providing and laying "SHRINKKOMP- 20" or any other approved equivalent anti -shrinkage grouting in pockets and base plates of light dynamic machines such as small pumps and compressors as per manufacturer's specifications, complete in all respects as per direction of Engineer-in-Charge.	Cu. M.	0.5		
20	C-20	Providing and laying "SHRINKKOMP- 30" or any other approved equivalent anti-shrinkage grouting in pockets and base plates of heavy dynamic machines such as heavy pumps and compressors as per manufacturer's specifications, complete in all respects as per direction of Engineer-in-Charge.	Cu. M.	2		
21	C-21	Supply and laying non-shrinking cementitious grout with a minimum crushing strength of 40 N/mm2 under base plates, base frames or other anchoring elements for structures and/or machines, including cleaning of surfaces, form-works, chamfering of edges, smoothing of exposed surfaces, providing all tools and labour necessary to complete the work as per drawings / specifications and as directed by Owner/EIC. The non shrink grout shall be laid as per approved vendor's specification	Cu. M.	0.5		
22	C-22	Providing and laying 75 mm thick compacted bed of dry brick aggregate of 40 mm thick nominal size including spreading, well ramming, consolidating and grouting with sand, including finishing smooth etc. complete as per direction of Engineer-in-charge	Sq. M.	50		
23	C-23	"Providing and fixing G.I. chain link fabric fencing of required width in mesh size 50x50 mm including strengthening with 2 mm dia wire or nuts, bolts and washers as required complete as per the direction of Engineer-in-charge				
		a) Made of G.I. wire of dia 4 mm	Sq. M.	500		
24	C-24	Supplying at site Angle iron post & strut of required size including bottom to be split and bent at right angle in opposite direction for 10 cm length and drilling holes upto 10 mm dia. etc. complete	Kg.	1150		
25	C-25	Providing & fixing UV stabilised fiberglass reinforced plastic sheet roofing up to any pitch, including fixing with polymer coated ‘J’ or ‘L’ hooks, bolts & nuts 8mm dia. G.I plain/bitumen washers complete but excluding the cost of purlins, rafters, trusses etc. The sheets shall be manufactured out of 2400 TEX panel rovigs incorporating minimum 0.3% ultra-violet stabiliser in resin system under approximately 2400 psi and hot cured. They shall be of uniform pigmentation and thickness without air pockets and shall conform to IS 10192 and IS 12866.The sheets shall be opaque or translucent, clear or pigmented, textured or smooth as specified.	Sq. M.	150		
26	C-26	Providing and fixing precoated galvanised steel sheet roofing accessories of total coated thickness 0.50mm (base metal of minimum 0.45mm thickness with total coating thickness of 0.05mm) with Zinc coating 120 grams per sqm as per IS: 277, in 240 mpa steel grade, 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns using self drilling/ self tapping screws complete				
		a) Ridges plain (500 - 600mm)	M	50		
		b) Gutter (600 mm over all girth)	M	20		
		c) Flashings/ Aprons.(Upto 600 mm)	M	10		
		d) Barge board (Upto 300 mm)	M	10		
27	C-27	Providing and fixing in position at all heights UPVC rain water pipes confirming to BIS :13592 Type A R.C.C. column using plugs and standard holder bat clamps comprising of two semi-circular halves of flat iron and cast iron base screwed on wooden plugs or using clamps welded to structural steel members or M.S. insert plates where pipes are to be fixed on R.C.C. members including all necessary fittings, such as tees, shoes, off-sets, branches, swan necks, elbows, bends, heads, etc. (plate inserts, if any, to be embedded in R.C.C shall be paid separately) :				
		a) 110 mm diameter	M	30		
SUB-TOTAL OF C (Rs.)						
SUB-TOTAL IN CRORES (Rs.)						

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Prepared By

BK
Reviewed By

RNS
Approved By

INDEX CIVIL ENGINEERING ITEMS

610201 : PILING

CODE	NAME
INDIA	
1 . P6007	AFCONS INFRASTRUCTURE LIMITED
2 . P6005	BRIDGE AND ROOF CO.(INDIA) LTD.
3 . P6006	GAMMON INDIA LTD.
4 . P6003	GANNON DUNKERLEY & CO. LIMITED
5 . P6009	HINDUSTAN CONSTRUCTION CO.
6 . P6008	INTEGRATED PILE FOUNDATION(MADRAS) PVT. LTD.
7 . P6001	LARSEN & TOUBRO LTD(ECC Division)
8 . P6004	SIMPLEX INFRASTRUCTURES LIMITED
9 . P6002	SKANSKA CEMENTATION INDIA LIMITED.

610202 : PRILLING TOWER(UREA) (using slip from technique)

CODE	NAME
INDIA	
1 . P6005	BRIDGE AND ROOF CO.(INDIA) LTD.
2 . P6006	GAMMON INDIA LTD.
3 . P6001	LARSEN & TOUBRO LTD(ECC Division)
4 . P6004	SIMPLEX INFRASTRUCTURES LIMITED

610203 : CHIMNEY(using slip form technique)

CODE	NAME
INDIA	
1 . P6011	BYGGING INDIA
2 . P6006	GAMMON INDIA LTD.
3 . P6003	GANNON DUNKERLEY & CO. LIMITED
4 . P6001	LARSEN & TOUBRO LTD(ECC Division)
5 . P6010	NILA BAUART ENGINEERING LTD.

610204 : SILO(parabolic or a type)

CODE	NAME
INDIA	
1 . P6005	BRIDGE AND ROOF CO.(INDIA) LTD.
2 . P6006	GAMMON INDIA LTD.
3 . P6003	GANNON DUNKERLEY & CO. LIMITED
4 . P6001	LARSEN & TOUBRO LTD(ECC Division)
5 . P6004	SIMPLEX INFRASTRUCTURES LIMITED

610205 : WORKS CIVIL &STRUCTURAL

CODE	NAME
INDIA	
1 . P6027	A.N.S. CONSTRUCTION (UPTO Rs.7.5 CRORE)
2 . P6013	BHAGEERATHA ENGINEERING LIMITED
3 . P6005	BRIDGE AND ROOF CO.(INDIA) LTD.
4 . P6031	BSBK LTD.
5 . P6034	C.P. SYSTEMS PVT, LTD. (UPTO Rs.3.0 CRORE)
6 . P6017	DUAL STRUCTURAL (P) LTD. (UPTO Rs.3.0 CRORE)
7 . P6015	ENGINEERING PROJECTS(I) LTD. (UPTO Rs.7.5 CRORE)
8 . P6006	GAMMON INDIA LTD.
9 . P6003	GANNON DUNKERLEY & CO. LIMITED
10 . P6030	GILLANDERS ARBUTHNOT & CO. LTD.,UNIT-MICCO (UPTO RS. 3.0 CRORE)
11 . P6029	GLOBE HI-FAB (UPTO Rs. 7.5 CRORE)
12 . P6022	HINDUSTAN STEEL WORKS CONSTRUCTION LTD. (UPTO Rs.7.5 CRORE)
13 . P6036	INDIAN COMMERCE & INDUSTRIES CO. PVT. LTD. (UPTO Rs.3.0 CRORE)
14 . P6025	J.M.C. PROJECTS (INDIA) LIMITED. (UPTO Rs.7.5 CRORE)
15 . P6020	JAIHIND PROJECTS LIMITED (UPTO Rs.3.0 CRORE)
16 . P6001	LARSEN & TOUBRO LTD(ECC Division)
17 . P6018	MSK PROJECTS (INDIA) LIMITED. (UPTO Rs. 7.5 CRORE)

610205 : WORKS CIVIL &STRUCTURAL

CODE	NAME
18 . P6019	NATIONAL BUILDERS (UPTO Rs. 7.5 CRORE)
19 . P6021	NATIONAL BUILDINGS CONST. CORPORATION LTD. (UPTO Rs.7.5 CRORE)
20 . P6010	NILA BAUART ENGINEERING LTD. (UPTO Rs. 7.5 CRORE)
21 . P6023	ORIENTAL CIVIL ENGINEERING CO. LTD. (UPTO Rs. 7.5 CRORE)
22 . P6012	PETRON CIVIL ENGINEERING LIMITED
23 . P6033	POWER MAX INDIA PVT. LTD. (UPOT Rs. 7.5 CRORE)
24 . P6028	RAMJI DAS DARSHAN KUMAR (UPTO Rs. 7.5 CRORE)
25 . P6024	RASTRIYA PARIYOJNA NIRMAN NIGAM LTD. (UPTO Rs. 7.5 CRORE)
26 . P6004	SIMPLEX INFRASTRUCTURES LIMITED
27 . P6002	SKANSKA CEMENTATION INDIA LIMITED.
28 . P6026	SKB BUILDERS (UPTO Rs.7.5 CRORE)
29 . P6016	SVC PROJECTS PRIVATE LIMITED (UPTO Rs.3.0 CRORE)
30 . P6014	TARAPORE & COMPANY
31 . P6035	TEKNOW CONSULTANTS & ENGINEERS PVT. LTD. (UPTO Rs.3.0 CRORE)
32 . P6032	UNITECH LTD. (UPTO RS. 7.5 CRORE)
33 . P6037	VASAVI ENGINEERING CORPORATION (UPTO Rs.3.0 CRORE)

610206 : UNDERGROUND PIPING WORKS (AS PART OF CIVIL WORK)

CODE	NAME
INDIA	
1 . P6013	BHAGEERATHA ENGINEERING LIMITED
2 . P6005	BRIDGE AND ROOF CO.(INDIA) LTD.
3 . P6006	GAMMON INDIA LTD.
4 . P6003	GANNON DUNKERLEY & CO. LIMITED
5 . P6001	LARSEN & TOUBRO LTD(ECC Division)
6 . P6004	SIMPLEX INFRASTRUCTURES LIMITED
7 . P6014	TARAPORE & COMPANY

610213 : PRILLING TOWER LINING (INSIDE)

CODE	NAME
INDIA	
1 . P6063	ARIEN NEW DELHI PRIVATE LIMITED
2 . P6139	BERGER PAINTS INDIA LIMITED
3 . P6059	M.PALLONJI & CO. PRIVATE LIMITED
4 . P6071	MAJOR GRAIND CORROSSION CONTROLLERS
5 . P6140	SYNORGANIC PAINTS PVT. LTD.
6 . P6060	WASPRABHA

610216 : COMPOSITE WORK

CODE	NAME
INDIA	
1 . P6005	BRIDGE AND ROOF CO.(INDIA) LTD.
2 . P6106	ESSAR STEEL INDIA LTD. (For H.R. Plates/ Sheets/Coils/CRCA Coils/Sheets)
3 . P6003	GANNON DUNKERLEY & CO. LIMITED
4 . P6001	LARSEN & TOUBRO LTD(ECC Division)
5 . P6051	MUKUND ENGINEERS LTD.
6 . P6012	PETRON CIVIL ENGINEERING LIMITED
7 . P6043	SPIC JEL ENGG. CONSTRUCTION LTD.
8 . P6045	STEWARTS & LLOYDS OF INDIA LTD.
9 . P6038	U.B.ENGINEERING LIMITED

610221 : ARCHITECTURAL SERVICES

CODE	NAME
INDIA	
1 . P6082	ALLIED ARCHITECTS PVT. LIMITED.
2 . P6081	GARG & ASSOCIATES
3 . P6085	KOTHARI ASSOCIATES PVT. LIMITED.
4 . P6084	R.K.ASSOCIATES
5 . P6083	S.K.INTEGRATED CONSULTANTS

610222 : GEOTECHNICAL WORKS

CODE	NAME
INDIA	
1 . P6087	CENGRS GEOTECHNICA PVT. LIMITED.
2 . P6086	GEOTECH CONSULTANTS PVT. LIMITED

610226 : SMALL MAINTENANCE WORKS

CODE	NAME
INDIA	
1 . P6088	SHIVA CONSTRUCTIONS

610228 : STRUCTURAL GRATINGS

CODE	NAME
1 . P6089	INDIANA GRATINGS PVT. LIMITED.
INDIA	
2 . P6111	ERCON COMPOSITES (FRP Gratings)
3 . P6123	FERROTECH STRUCTURALS (INDIA) PVT.LTD.
4 . P6136	INDIANA GRATINGS PRIVATE LIMITED
5 . P8089	KANADE ANAND UDYOG PVT. LTD.
6 . P6105	KEMROCK INDUSTRIES & EXPORTS LTD. (For FRP Gratings)
7 . P6108	PENTAX FERRO INCORPORATE (For Gratings/Floor Grill - MS, MS Hot Dipped Galvanized.)
8 . P6110	PINAX STEEL INDUSTRIES PRIVATE LIMITED (Electroforged Gratings)
9 . P6125	PINAX STEEL INDUSTRIES PRIVATE LIMITED
10 . P6109	SUTTATTI ENTERPRISES LTD.

610231 : WATER PROOFING AND ROOF TREATMENT

CODE	NAME
INDIA	
1 . P6139	BERGER PAINTS INDIA LIMITED
2 . P6130	IWL INDIA PRIVATE LIMITED
3 . P6101	PIDILITE INDUSTRIES LIMITED (Including all Chemicals & Accessories)
4 . P6128	STP LIMITED
5 . P6126	SUNANDA SPECIALITY COATINGS PVT.LTD.
6 . P6140	SYNORGANIC PAINTS PVT. LTD.
7 . P6131	TIKI TAR DANOSA INDIA PVT. LTD. (MATERIAL)
8 . P6100	TRISTAR INTECH PVT. LTD.

610232 : WATER SUPPLY AND SANITATION

CODE	NAME
INDIA	
1 . P6099	KAPILANSH DHATU UDYOG (P) LTD.

610233 : ANTI-CORROSIVE MATERIAL (MANUFACTURE & APPLICATOR)

CODE	NAME
INDIA	
1 . P1032	ARCOY INDUSTRIES (Cement / Morter / Rubber / Tile Lining Work)
2 . P6133	ARCOY INDUSTRIES (INDIA) PVT.LTD.
3 . P6139	BERGER PAINTS INDIA LIMITED
4 . P6135	DOOALL CORPRO INDIA PVT. LTD.
5 . P6130	IWL INDIA PRIVATE LIMITED
6 . P6128	STP LIMITED
7 . P6126	SUNANDA SPECIALITY COATINGS PVT.LTD.
8 . P6140	SYNORGANIC PAINTS PVT. LTD.
9 . P6131	TIKI TAR DANOSA INDIA PVT. LTD.

610234 : REHABILITATION WORKS

CODE	NAME
INDIA	
1 . P6107	STANDARD REHABILITATORS PVT. LTD. (For Civil Structure with Painting)
2 . P6140	SYNORGANIC PAINTS PVT. LTD.

610235 : TMT RE-BAR

CODE	NAME
INDIA	
1 . P6119	Jindal Steel & Power Limited
2 . P6114	M/S ELECTROSTEEL STEELS LTD. (V-XEGA)
3 . P6137	MS AGARWAL FOUNDRIES PVT. LTD.
4 . P6129	RASHMI METALIKS LIMITED
5 . P6134	REAL ISPAT AND POWER LIMITED
6 . P6121	SHRI BAJRANG POWER & ISPAT LTD. (GOEL TMT)
7 . P6115	SHRI RATHI STEEL LTD.
8 . P6127	SHYAM METALICS AND ENERGY LTD.
9 . P6112	SHYAM STEEL INDUSTRIES LIMITED
10 . P6122	SPS STEELS ROLLING MILLS LIMITED
11 . P6116	SRMB SRIJAN PRIVATE LIMITED

610236 : STRUCTURAL STEEL

CODE	NAME
INDIA	
1 . P6113	JINDAL STEEL & POWER LIMITED
2 . P6138	RR ISPAT (A UNIT OF GODAWARI POWER AND ISPAT LTD.) (a. Angle : Upto 200 x 200 x 20MM, b. Channel : Upto 200 x 75MM, c. H-Beam : Upto 152 x 152MM (37.1Kg) & d. Flat)
3 . P6127	SHYAM METALICS AND ENERGY LTD.

610237 : FRP, POLYCARBONATE AND METAL SHEET PRODUCTS

CODE	NAME
INDIA	
1 . P6124	ROOFCLAD INFRA PVT.LTD.
2 . P6117	SHIV SHAKTI FIBER UDYOG

610238 : CONST. CHEMICALS (ADMIXT, WATERPROOFING, FLOORING & COATING, REPAIR & RESTORE, GROUT & ANCHOR,BUILDINGS & JOIN

CODE	NAME
INDIA	
1 . P6139	BERGER PAINTS INDIA LIMITED (Admixture, Waterproofing, Grout & Joint sealant)
2 . P6130	IWL INDIA PRIVATE LIMITED
3 . P6120	Jay Chemical Industries Pvt. Ltd. (K2)
4 . P6118	MYK ARMENT PRIVATE LIMITED
5 . P6128	STP LIMITED
6 . P6126	SUNANDA SPECIALITY COATINGS PVT.LTD.
7 . P6140	SYNORGANIC PAINTS PVT. LTD.
8 . P6131	TIKI TAR DANOSA INDIA PVT. LTD.

610239 : PRE FABRICATED STRUCTURE

CODE	NAME
INDIA	
1 . P6132	PINAX STEEL INDUSTRIES PRIVATE LIMITED

610240 : PORTLAND SLAG CEMENT (IS:455, 2015)

CODE	NAME
INDIA	
1 . P6141	DALMIA CEMENT (BHARAT) LTD

610241 : COMPOSITE CEMENT (IS:16415, 2015)

CODE	NAME
INDIA	
1 .P6141	DALMIA CEMENT (BHARAT) LTD

610242 : PORTLAND POZZOLANA CEMENT (IS:1489, PART-1, 2015)

CODE	NAME
INDIA	
1 .P6141	DALMIA CEMENT (BHARAT) LTD

SECTION-3

SCHEDULE OF RATES

CONSTRUCTION POWER SYSTEM AND ASSOCIATED ELECTRICAL FACILITIES

FOR

2000 TPD COAL TO AMMONIUM NITRATE PROJECT

BCGCL, LAKHANPUR (ODISHA)

पी डी आई एल PDIL	SCHEDULE OF RATES FOR ELECRTICAL WORKS (SUPPLY CUM ERECTION) AT BCGCL LAKHANPUR (ODISHA)	PC298-7411-0990	2	06.02.2026	06.02.2026	SS/RKP	SKB	RKV
		DOCUMENT NO.	REV.	REV. DT.	EFF. DT.	PREPD.	RVWD.	APPD.

1	The schedule of rates is to be read in conjunction with Technical Specification of Construction Power System & Associated Electrical facilities and other relevant sections / sub sections.
2	The price indicated shall be applicable to all heights.
3	Owner/Consultant reserves the right to interpolate or extrapolate the rate for any item from the rates available for similar work in the Schedule of Rates.
4	Whenever it is mentioned in the specifications that the bidder shall perform certain work or provide certain facilities/materials or certain item or activity is in bidder's scope of services it is understood that the bidder shall do so at his own cost within the item rates unless expressly stated otherwise.
5	Unit rates shall include the cost of labour, supervision and consumables, cost towards providing necessary tools and tackles, and providing all the required facilities for execution and inspection, testing, guarantees etc. as per scope of work and Technical specification and other relevant sections / sub sections etc. listed in ITB. Minor repair and touch painting work towards providing all required facilities for execution shall be in bidder's scope.
6	All supply items shall be of superior quality. These shall conform to relevant IS and shall be of approved make.
7	Quantities mentioned in SOR are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site.
8	Any item specifically not indicated but considered necessary for completion of job shall also be quoted by the bidder under separate sheet. Work shall also include any other item of work required to complete the work in all respect as per the specifications, drawings and instructions of the Engineer-in-charge whether specifically mentioned or not in the tender document.
9	Work shall involve, at every stage, correct identification of all equipment including loose equipment from stores, identifying spare items / excess items, listing the same and carefully storing them under the custody of the contractor. Information to this extent shall be passed on to the concerned Engineer-in-charge / owner. Certification of balance items after erection and return to the Engineer in-charge / Owner so assigned.
10	The quantities indicated in SOR are estimated quantities and may change during detailed engineering as per site condition. Quantity of some or all the items may increase or decrease up to any extent at the time of actual execution, however the total contract value shall be limited to total increase or decrease of 25% only. Successful bidder shall supply the equipments at the same rate as per these change quantities, irrespective of the changes in quantity of individual items. Payment shall be made as per actual quantities executed.
11	All equipment shall be deemed to have clear tags, descriptive letter writing indicating locations / sources (from - to), cable sizes, circuit no., unit no., and any other writing required to make installation completely informative. All costs in view of above shall be deemed to have been included in installation / commissioning.
12	Work shall involve, at every stage, correct identification of all equipment including loose equipment from stores, identifying spare items / excess items, listing the same and carefully storing them under the custody of the contractor. Information to this extent shall be passed on to the concerned Engineer-in-charge / owner. Certification of balance items after erection and return to the Engineer in-charge / Owner so assigned.
11	All primary & secondary injection tests & testing of relays and other equipment as per relevant IS, code of practice for testing and commissioning shall be deemed to have been included for testing & commissioning. No extra charges shall be provided for the same.
12	The Contractor must visit BCGCL sites to assess the quantum and nature of work before quoting. However, the Contractor shall inform PDIL / BCGCL, 1 week prior to their visit to the site.
13	Owner reserve their right to execute any additional works / extra works, during the execution of work, either by themselves or by appointing any other agency, even though such works are incidental to and necessary for the completion of works awarded to the Contractor. In the event of such decisions taken by Owner, Contractor is required to extend necessary cooperation, and act as per the instructions of Engineer-in-Charge.
14	Before procurement of any equipment / material, the Contractor shall submit drawing / document, Compliance Statement supported by Product Catalogue for review / approval. PDIL / BCGCL shall indicate the quantity of equipment / material to be procured during approval of respective equipment Document.
15	Transformers, LV Switch board, shall be designed, manufactured and supplied by OEM (Original Equipment Manufacturer). Supply of these equipments from channel partner, franchise or sub vendors of the OEM/Contractor shall not be acceptable in any case.
16	Bidder to submit drawings & documents of HT switchboard, Transformers, within 15 days of issue of issue of LOI/LOA whichever is earlier for owner's approval before manufacturing of equipment.

ITEM NO.	DESCRIPTION	UNIT	Qty	UNIT RATE WEIGHT (UPTO 10 DECIMAL POINT)	DERIVED QUOTED UNIT RATE in INR (TOTAL QUOTED PRICE *UNIT RATE WEIGHT)	DERIVED TOTAL QUOTED AMOUNTin INR (QUANTITY*DERIVED QUOTED UNIT RATE)
PART-A	**SUPPLY OF ELECTRICAL ITEMS**					
1	**Four Pole Structure with Accessories**					
	Design,Supply of 6.6 kV, 1250 A 25 kA for 1 sec,50 Hz ± 5%, 4 pole structure with one sets of incomer and two set of outgoing along with required bracing,cross arm etc for supporting the pin/strain type insulators,Guy wires as required, GOD, DO fuses (3No) with necessary 10KA lightening arresters,earth switch,CT,PT,Insulators,Jumpers,Anti climbing device,Danger board etc suitable for receiving power from MCL/SEB as per enclosed specifications, SLD, SEB guidelines etc including this shall also includes supply of chain link fencing of 2.5 mtr height around HT Yard comprising of 100x50x6 mm MS channels at every 1.8 mtr centres, 65x65x6mm angles, 8 swg GI mesh of 50x50 mm opening, washers, nuts, bolts, locknuts etc & Supply of well graded crushed stone aggregate varying in size from 20mm to 50mm mixed with clean sand in the ratio 2.5 part of stone aggrgate to 1 part of clean sand having less than 75 micron size as per enclosed specifications, SLD,SEB guidelines etc	Set	2	0.0012552155		
2	**6.6KV RMU (OUTDOOR TYPE WITH KIOSK)**					
	Supply of SF6 insulated, 6.6KV, 630A RMU with all accessories such as 6 nos. VCB, Line PT and auxiliary transformer with metering, protection and power pack with self sustained battery bank for duration of 1 hours etc. as specified in Technical specification Doc. No. PC298-TS-0801.	Set	2	0.0232674598		
3	**6.6KV CSS (Compact Sub Station)**					
	Design, engineering, manufacture, assembly, inspection and testing of equipment at manufacturer's works, painting, packing and forwarding, reinforcement for shipping (if required), securing and loading on sea vessel (if required), documentation, supply of Compact sub station with all the accessories in accordance with the requirements stated in technical specifications and other attached/referred Annexures & Attachments. including supply of chain link fencing of 2.5 mtr height around CSS comprising of 100x50x6 mm MS channels at every 1.8 mtr centres, 65x65x6mm angles, 8 swg GI mesh of 50x50 mm opening, washers, nuts, bolts, locknuts etc, Compact Substation shall comply with the requirements of latest revision of codes & standards attached or referred with the specifications. Please refer Technical specification of CSS (Doc no PC298-7411-0814 & PC298-TS-0801) of Compact Sub-station suitable for 6.6kV(UE)/0.433kV voltage.The CSS shall be designed for outdoor application and comply with relevant IEC/IS standards.	Set	4	0.0562510017		
4	**INTER LOCKED TYPE Switch SOCKET & PLUG**					
4.1	Supply of Heavy duty Weather proof interlocking Switch Socket having enclosure with IP–65 degree of protection with matching Plug of following type as specified in Technical Specification Doc. No. PC298-TS-0801.					
i	63A, 5-pin, 415V	No.	2	0.0003291195		
ii	5/25A, 3 pin, 240V	No.	2	0.0000741490		
5	**HT & LT CABLES**					
5.1	Supply of 6.6 KV (UE) Grade, XLPE Insulated, PVC inner sheathed FRLS PVC outer sheathed cables as specified in Technical Specification Doc. No. PC298-TS-0801.					
i.	3C x 300 sq. mm (Al)	Mtrs.	6100	0.0000352234		
5.2	Supply of 1.1 KV Grade, XLPE Insulated, PVC inner Sheath, FRLS PVC outer sheathed cables as specified in Technical Specification Doc. No. PC298-TS-0801.					
i	3.5C x 400 sq. mm (Al)	Mtrs.	50	0.0000362052		
ii	3.5C x 300 sq. mm (Al)	Mtrs.	500	0.0000278800		
iii	3.5C x 120 sq. mm (Al)	Mtrs.	3700	0.0000121093		
iv	3.5C x 70 sq. mm (Al)	Mtrs.	500	0.0000082740		
v	4CX16 sq. mm (Al)	Mtrs.	500	0.0000025569		
vi	3C x 2.5 sq. mm (Cu)	Mtrs.	1,000	0.0000026898		
6	**CABLE GLANDS**					
6.1	Supply of heavy duty Industrial double compression rolled Aluminum cable glands suitable for the following sizes of cables as specified in Technical Specification Doc. No. PC298-TS-0801.					
A	6.6 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, Armoured, FRLS PVC outer sheathed cables.					
i	3C X 300 sq. mm (Al)	Nos.	34	0.0000592886		
B	1.1 KV Grade, XLPE Insulated, PVC inner Sheath, FRLS PVC outer sheathed cables.					
i	3C x 2.5 sq. mm (Cu)	Nos.	60	0.0000034569		
ii	3.5C x 400 sq. mm (Al)	Nos.	2	0.0000355711		
iii	3.5C x 300 sq. mm (Al)	Nos.	4	0.0000325949		
iv	3.5C x 120 sq. mm (Al)	Nos.	16	0.0000147275		
v	3.5C x 70 sq. mm (Al)	Nos.	10	0.0000103706		
vi	4CX16 sq. mm (Al)	Nos.	30	0.0000074149		
7	**CABLE LUGS**					
7.1	Supply of Tinned Copper / Aluminum crimping type lugs of following sizes for termination of cables.					
i	300 sq. mm (Al/Bimetallic),6.6KV	Nos.	102	0.0000063206		
ii	2.5 sq. mm (Cu), 1.1KV	Nos.	180	0.0000001023		
iii	16 sq. mm (Al), 1.1KV	Nos.	120	0.0000001432		
iv	35 sq. mm (Al), 1.1KV	Nos.	5	0.0000002761		
v	70 sq. mm (Al), 1.1KV	Nos.	28	0.0000006341		
vi	120 sq. mm (Al), 1.1KV	Nos.	48	0.0000019637		
vii	150 sq. mm (Al), 1.1KV	Nos.	2	0.0000026182		
viii	240 sq. mm (Al), 1.1KV	Nos.	2	0.0000049092		
ix	300 sq. mm (Al), 1.1KV	Nos.	108	0.0000060035		
x	400 sq. mm (Al), 1.1KV	Nos.	8	0.0000087752		
8	**CABLE TERMINATION / JOINTING KITS**					
8.1	Supply of following types of cable termination / jointing kits:					
A	Indoor type Heat shrinkable end termination kit of Raychem make suitable for 6.6 KV grade XLPE-A-FRLSPVC insulated armoured cables of following sizes					
i	6.6 kV (UE), 3C x 300 sq. mm (Al) XLPE armoured cables	Nos.	22	0.0001957535		
B	Outdoor type Heat shrinkable end termination kit of Raychem make suitable for 6.6 KV grade XLPE-A-FRLSPVC insulated armoured cables of following sizes					

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i	6.6 kV (UE), 3 x 300 sq. mm (Al) XLPE armoured cables	Nos.	5	0.0002349246		
C	Heat Shrinkable Raychem make straight through jointing kit suitable for 6.6/1.1 KV grade XLPE-A-FRLSPVC insulated armoured cables of following sizes					
i	3C x 300 sq. mm (Al, 6.6 KV)	Nos.	5	0.0003575518		
ii	3.5C x 300 sq. mm (Al, 1.1KV)	Nos.	1	0.0001681700		
iii	3.5C x 120 sq. mm (Al, 1.1KV)	Nos.	1	0.0001309114		
iv	3.5C x 70 sq. mm (Al, 1.1KV)	Nos.	1	0.0000909834		
9	**CABLE RACK (GI LADDER TYPE CABLE TRAYS) & ACCESSORIES**					
9.1	Supply of prefabricated ladder GI cable trays and their accessories i.e. supply of all hardware required i.e. J-hooks, GI Nut, Bolt, Washers, coupling plate etc. of width 150 mm, 300 mm, 450 mm & 600 mm as per site requirement for laying of cables with standard rung spacing. Load for support span of 2.5 meter as 30, 60, 75 & 90 (in Kg/Mtr.) respectively with concentric static load as 70 Kg at the centre, as per drawings, specification and directions of Site Engineer / Engineer-in-Charge.					
A.	Straight Run Cable Trays					
i.	150mm wide	Mtrs.	50	0.0000084888		
ii.	50mm wide	Mtrs.	50	0.0000064433		
B	Horizontal Bends/Tees/Reducer					
i.	150 mm wide	No	3	0.0000084888		
ii.	50 mm wide	No	3	0.0000064433		
10	**FEEDER PILLAR**					
10.1	Supply of following Distribution Boards as specified in Technical Specification Doc. No. PC298-TS-0801.					
i.	415 V, 3 Ph & N,50KA for 1 sec floor mounted sheet steel enclosed Outdoor Type Feeder Pillar Board as per Technical Specification PC298-TS-0801. It shall consist of 1 no. incoming 400 A 4 P MCCB incomer with 6 Nos. 63A TPN MCCB and 4 Nos. 125A TPN MCCB as outgoing Feeders. All Outgoing Feeders shall have CTs and MFM.	No.	1	0.0109945140		
ii.	Supply of 415 V, 3 Ph & N, IP55, wall/structure mounted sheet steel enclosed Feeder pillar box consisting of 1 nos. incoming 125A TPN MCCB incomer with RYB indications and 4 nos. 63A TPN MCCB outgoing feeders as for feeder pillar box as per enclosed Technical specification	Nos.	1	0.0030682365		
10	**LIGHTING fixtures & accessories AND Junction Boxes**					
10.1	Supply of Lighting Fixtures & Accessories					
A	240V AC,1-Ph, hose and weather proof Lighting fixtures including lamp with integral control gear box, suitable for use in safe area having IP-65 degree of protection complete with all accessories and all hardware for fixing the lighting fittings with ceiling / wall / pole / frame of following types as specified in Technical Specification Doc. No. PC298-TS-0801.					
i.	70 W LED Street Lighting Fixtures	Nos.	20	0.0000767059		
ii.	2X18 W 4ft LED Tube Light fixture	Nos.	2	0.0000409098		
ii.	120 W LED Street Lighting Fixtures	Nos.	10	0.0001214510		
10.2	Supply of 63A, 415V, 3Ph & N hose proof & weatherproof junction boxes in cast aluminium (LM-6) enclosure with IP–65 degree of protection and suitable for 2 Nos. 4C x 16 Sq. mm (Al)cable & 1 nos. of 3Cx2.5 sq.mm(Cu) cable with terminal blocks of suitable size for easy termination of cables and as specified in Technical specification Doc. No. PC298-TS-0801	Nos.	10	0.0000711831		
10.3	Supply of 25A, 230V, 1 Ph. & N, 4 way hoseproof & weather proof junction boxes in cast aluminium (LM6) enclosure complete with terminal block, rolled aluminium cable glands suitable for 3 x 2.5mm2 cable and threaded plug.	Nos.	10	0.0000255686		
10.4	Supply of Indoor Type, wall/structural, weatherproof (IP 55) Lighting Distribution board Type DB with Bus bar - 63 A , 415 V TPN, Incomer - 1 no. 63 A 4P MCB, 3 nos. feeder circuit of 63A DP MCB & Outgoing - 9 nos. 16 A DP, MCB as indicated in attached SLD for LSDB enclosed with Technical specification	Nos.	1	0.0007159218		
11	**HIGH MAST**					
	Supply of 30M high mast shaft in three sections suitable for wind speed as Per IS-875, with raising lowering system comprising, head frame, luminaries carriage suitable to install 24 nos luminaries of 350W LED of approved make in symmetrical arrangement, double drum winch, 6mm diameter SS wire rope, trailing cable, connector, integral power tool motor, manual handle, junction box, lightening finial, including 1 set foundation bolts manufactured from special steel along with nuts, washers, anchor plates and templates. This includes Supply of 24 nos. Integral LED Flood Light Luminaries with complete set of lamp & drivers as per technical specification the following components: Aluminum Cast luminary body, Electronic Circuit & LED drivers, Weather proof Transparent Cover, Luminary Mounting Clamps, LED Assembly.1 set Within Luminary Interconnection. Supply of 2 nos. LED type single dome aviation obstruction light (Make:Binay Opto) is also required with one high mast. This also includes Supply and installation of 1 no. outdoor stand mounted feeder pillar with 63A, 4-pole MCCB incomer, astro timer switch, 45A TP contactor for the automatic switching of luminaries, power tool control with 2 no 9A contactors and raise lower push button, Incoming and outgoing terminals suitable for required cable size(cable size shall be indicated during detail engg).. The Control Panel shall be of weather proof .Construction of shallow foundation with M25 grade concrete for the high mast considering the safe soil bearing capacity at site as 10 T/sqmtr at 2 metre depth with all materials Lightning Finial shall be insulated from body and head frame of High Mast and a separate down conductor (1Rx1Cx35 sq mm Aluminium Flexible Cable) shall run from the lightning finial to an earthing bolt independent of the high Mast structure. Electrical accessories like plug & socket, power tool motor etc at the bottom of high mast shall be weather proof.	Nos.	7	0.0146700567		
12	**PLANT LIGHTING POLES**					
12.1	Supply of hot dip galvanized MS tubular swaged lighting poles of following types suitable for wind velocity of 170 Km/Hr and along with suitable pole junction box.					
i.	9M high ground mounted poles	Nos.	10	0.0003394492		
ii.	7M high ground mounted poles	Nos.	20	0.0002704139		
13	**EARTHING & LIGHTNING**					
13.1	Supply of maintenance free type chemical earth pit, having Enhanced high quality UL certified 17.2 mm copper bonded (250 micron) earthing electrode/ rod along with 22.6 KG graphite based (non-bentonite) as a ground enhancing material with stainless steel clamp for connecting copper bonded rod with horizontal flat strip , Backfill shall be permanent and maintenance free. (No re- charging with salts or any other chemicals) and shall maintain its earth resistance with time. Backfill shall confirm IEEE 80-2000Clause No.14.5 (d). Backfill in its set form shall have a resistivity of not more than 0.12 ohm-m. Backfill shall comply the requirements and all applicable tests as per part-7 of IEC62561.	Nos.	38	0.0000818196		
13.2	Supply of G.I. Earth Bus (50mm x 12mm x 390mm), with 10 nos. earthing holes and as per PDS: E 615 enclosed.	Nos.	10	0.0000167730		
13.3	Supply of hot dip galvanized (minimum Zinc coating of 800 gms. / sq. mtr. as per IS-2629) Earthing strip / earth wire / GI Rope of the following sizes :					
i.	75mm X10mm	Mtrs.	260	0.0000080797		
ii.	50mm X 6mm	Mtrs.	200	0.0000032728		
iii.	25mm X 6mm	Mtrs.	100	0.0000020455		
iv.	10 sq mm GI Rope	Mtrs.	200	0.0000006136		
14	**MS Structure / Aluminium Sheet**					
14.1	Supply of MS structural in channels, angles, flats, plates, rods etc. conforming to IS: 226.	Te	0.5	0.0017018485		
14.2	Supply of 2 mm thick Aluminium sheet for fabrication of Rain protective hood	m^2	10	0.0000310915		
14.3	Supply of 8 mm thick MS Chequered plates.	Te	0.4	0.0014891174		
15	**G.I. / HDPE PIPES**					
15.1	Supply of G. I. pipes; Medium Class as per IS 1239 (part-1) of following sizes :					
i.	50 mm NB	Mtrs.	50	0.0000066478		
ii.	150 mm NB	Mtrs.	100	0.0000204549		
iii.	200 mm NB	Mtrs.	100	0.0000255686		
16	**CABLE TRENCH MATERIAL & ACCESSORIES**					
16.1	Supply of approved first class bricks of 4 inch thickness in cable trenches for cable protection including all labour and materials to make installation complete in all respect.	Nos.	115000	0.0000001023		

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16.2	Supply of fine river sand for Cable trench	M3	900	0.0000195344		
17	**CABLE ROUTE MARKER**					
17.1	Supply of Cable route markers of Round shape made of MS of dia 200mm with suitable engraving as of HT / LT / Control / Data Cable jointed with angle of 30X30X5 mm grouted in concrete of size 150mm x150mm x 500mm.	Nos.	200	0.0000248527		
18	**MISCELLANEOUS ITEMS**					
18.1	Supply of Caution boards / dangers boards written in ENGLISH & HINDI of the following voltages as per IS 2551 :					
i.	6.6 KV	Nos.	2	0.0000069547		
ii.	415 Volts	Nos.	5	0.0000069547		
18.2	Supply of rubber hand gloves with IS mark suitable for the following voltages as per relevant IS :					
i.	6.6 KV	Set	1	0.0000310915		
ii.	415 Volts	Set	1	0.0000310915		
18.3	Supply of Shock treatment chart conforming to Indian Electricity Rules in Aluminum frame with glass.	Nos.	2	0.0000279210		
18.4	Supply of Do & Don't chart as per Indian Electricity Rules in Aluminum frame with glass.	Nos.	2	0.0000279210		
18.5	Supply S/S Single Line Diagram in Aluminum frame with glass.	No.	1	0.0001439003		
18.6	Supply of portable CO2 type fire extinguisher (4.5 liter capacity).	Nos.	4	0.0000838651		
18.7	Supply of Sand buckets with stand (each with at least 3 sand buckets).	Nos.	4	0.0000500123		
18.8	SupplyCPR (CARDIO PULMONARY RESUSCITATION) Charts.	Nos.	2	0.0000279210		
18.9	Supply of Exit Route / Emergency Exit Route Signage.	Nos.	2	0.0000209663		
18.10	Supply of First aid boxes.	Nos.	2	0.0000544101		
18.11	Supply of following Testing Items					
i.	Discharge Rod	Nos.	1	0.0000495009		
ii.	HT megger	No.	1	0.0007031375		
iii.	LT megger	No.	1	0.0001917648		
iv.	Earth megger	Nos.	2	0.0002301177		
v	Multi-meter	Nos.	2	0.0001278432		
vi	Tong Tester	Nos.	2	0.0000434667		
19	**Hume Pipes**					
19.1	Supply of Hume Pipes NP3 of following sizes with socket at one end:					
i.	200 mm DIA	Mtrs.	200	0.0000192276		
20	**Mandatory Spares**					
	Supply of following Mandatory spares					
A.	**TRANSFORMERS**					
i)	HV Bushings complete with accessories for all 3 phase for 6.6KV/0.433kV Transformer.	Set	1	0.0008949023		
iv)	LV Bushings complete with accessories for all 3 phase & neutral for 6.6KV/0.433kV Transformer.	Set	1	0.0004602355		
v)	Complete set of gaskets	No.	1	0.0000818196		
vi)	Dial type thermometer (6" WTI)	Set	1	0.0000511373		
B.	**6.6KV RMU/SWITCHBOARD**					
i)	BREAKERS (OF EACH RATING)					
a.	Trip bar spring and any other spring used in the circuit breaker mechanism	Set	1	0.0003774954		
b.	Shunt trip coil	Set	1	0.0001006382		
c.	Closing coil	Set	1	0.0001006382		
d.	Micro Switch for Spring Charging	Set	1	0.0000830469		
e.	Micro Switch for Service/Test position	Set	1	0.0000716945		
ii)	CONTROL SWITCHES					
a.	Trip-Neutral-Close Control Switch	No.	1	0.0000081820		
b.	Local-Remote or Auto-Manual Selector Switch	No.	1	0.0000081820		
c.	Indication Lamps (Red, Yellow, White, Blue & Amber)	Nos.	5	0.0000051137		
iii)	MINIATURE CIRCUIT BREAKER (OF EACH RATING)	No.	1	0.0000491941		
iv)	RELAYS (OF EACH TYPE)					
a.	Relays of each type	No.	1	0.0035441199		
v)	METERS					
a.	Ammeter of each type	No.	1	0.0000403984		
b.	Voltmeter	No.	1	0.0000403984		
C.	**LV SWITCHBOARDS**					
i)	BREAKERS (OF EACH RATING)					
a.	Trip bar spring and any other spring used in the circuit breaker mechanism	Set	1	0.0001543323		
d.	Shunt trip Coil	Set	1	0.0000559442		
e.	Closing Coil	Set	1	0.0000491941		
g.	Secondary Isolating Contact Blocks	Set	1	0.0000767059		

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h.	Shutter Assembly	Set	1	0.0000511373		
ii)	SWITCHES (OF EACH RATING)					
a.	Trip-Neutral-Close Control Switch	No.	1	0.0000081820		
v)	RELAYS					
a.	Relays of each type	No.	1	0.0025568637		
vi)	MCB (OF EACH RATING)	No.	1	0.0000192276		
B.	**FPB**					
i.	400A 4P MCCB	No.	1	0.0008468333		
ii	400 A TPN MCCB	No.	1	0.0005727375		
iii	250 A TPN MCCB	No.	1	0.0004909178		
iv	125 A TPN MCCB	Nos.	1	0.0003886433		
v	63 A TPN MCCB	No.	1	0.0002556864		
PART-B	**ERECTION OF ELECTRICAL ITEMS**					
1	**Four Pole Structure with Accessories**					
	Installation, erection, testing and commissioning of 6.6 kV,1250 A, 25 kA for 1 sec,50 Hz + 5%,4 pole structure with two sets of incomer and one set of outgoing along with required bracing,cross arm etc for supporting the pin/ strain type insulators,Guy wires as required, GOD, DO fuses (3No) with necessary 10KA lightening arresters, earth switch, CT, PT, Insulators, Jumpers, Anti climbing device, Danger board etc suitable for receiving power from SEB as per enclosed specifications, SLD, JSEB guidelines etc including excavation and groutinng/coping of poles, painting with primer, paint, earting as per IE rule, & IS 3043 etc this shall also includes installation of chain link fencing of 2.5 mtr height around HT Yard comprising of 100x50x6 mm MS channels at every 1.8 mtr centres, 65x65x6mm angles, 8 swg GI mesh of 50x50 mm opening, washers, nuts, bolts, locknuts etc & filling the HT yard with well graded crushed stone aggregate varying in size from 20mm to 50mm mixed with clean sand in the ratio 2.5 part of stone aggrgate to 1 part of clean sand having less than 75 micron size, compacting in 30 mm thick layers using vibratory rollers to achieve a unit weight of at least 2.2T/cu.m (IS 10028) as per enclosed specifications, SLD,JSEB guidelines etc.	Set	2	0.0004602355		
2	**6.6KV RMU (OUTDOOR TYPE WITH KIOSK)**					
	Installation, testing and commissioning of SF6 insulated, 6.6KV, 630A RMU, free standing, floor mounting, cubicle type, including transportation from the owner's store to the site of erection, assembly, mounting, fixing and wiring of loose components like relays/meters, interconnection of shipping sections and inter panel wiring as necessary, inter bus bar jointing and earthing, operational and functional checking, installation on foundation including levelling and aligning, supply of foundation nuts and bolts, drilling of gland plates with requisite holes, fixing of cable glands supplied loose, plugging of all unused cable entries and other holes found in switch boards for making the same dust and vermin proof with all labour and materials to make the installation complete as per approved drawings, technical specifications and direction of engineer-in-charge, but excluding termination of incoming & outgoing cables. Job shall include rigidly fixing the frame including grouting, if necessary	Set	2	0.0005113727		
3	**6.6KV CSS (Compact Sub Station)**					
	Installation, Erection,Testing & Commissioning ,Site Acceptance testing, proving performance guarantee of Compact Sub station with all the accessories in accordance with the requirements mentioned in specification and other attached/referred Annexures & Attachments. Compact Substation shall comply with the requirements of latest revision of codes & standards attached or referred with the specification. this shall also includes installation of chain link fencing of 2.5 mtr height around Compact Subsation comprising of 100x50x6 mm MS channels at every 1.8 mtr centres, 65x65x6mm angles, 8 swg GI mesh of 50x50 mm opening, washers, nuts, bolts, locknuts etc as per specification, standards & direction of Engineer-in-charge, Please refer Technical specification of (Doc no PC298-7411-0814 & PC298-TS-0801)	Set	4	0.0006136473		
4	**INTER LOCKED TYPE Switch SOCKET & PLUG**					
4.1	Erection, installation, testing and commissioning of weatherproof switch cum socket/welding receptacle having IP65 protection of approved makes to be installed on walls, columns, structures, including handling, storage, transportation from store to site of installation, supply & installation of double compression cable glands, suitable lugs & WP/flame proof plugs for sealing all spare entries etc., including connection and termination of all power cables, earthing wire and conduits, etc. complete as per drawings, specifications and direction of the Site Engineer, including the cost of all labour, tools, consumable materials etc. complete in all respect.					
i	63A, 5-pin, 415V (Weather Proof)	No.	2	0.0000350802		
ii	25A, 3-pin, 240V (Weather Proof)	No.	2	0.0000078751		
5	**HT & LT CABLES**					
5.1	Horizontal and vertical laying, testing (before and after laying) and commissioning of following HV (6.6KV) / LV Power & Control cables in trenches, on pre-fabricated cable trays / racks, on already installed risers, support hangers, saddles / directly buried up to 1000mm depth etc. pulling through pipes on walls / columns, steel structures including transportation of cable drums from storage yard to the site, unrolling the drum, laying the required length of cables including supply and fixing of necessary saddles, saddle bars, cable tags, Al clamps for cables laid vertical on walls / columns / structures, risers with all labour, consumable materials and necessary hardware to make installation complete in all respect as per approved standard drawings and direction of engineer-in-charge.					
A	6.6 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, FRLS PVC outer sheathed cables.					
i	3C x 300 sq. mm (Al)	Mtrs.	6100	0.0000033853		
B	1.1 KV Grade, XLPE Insulated, PVC inner Sheath, FRLS PVC outer sheathed cables.					
i	3.5C x 400 sq. mm (Al)	Mtrs.	50	0.0000020864		
ii	3.5C x 300 sq. mm (Al)	Mtrs.	500	0.0000016671		
iii	3.5C x 120 sq. mm (Al)	Mtrs.	3700	0.0000014114		
iv	3.5C x 70 sq. mm (Al)	Mtrs.	500	0.0000014114		
v	4CX16 sq. mm (Al)	Mtrs.	500	0.0000010227		
vi	3C x 2.5 sq. mm (Cu)	Mtrs.	1,000	0.0000006443		
6	**TERMINATION OF CABLES**					
6.1	End termination (Indoor / Outdoor) and subsequent testing of XLPE/PVC insulated single core / multi core armoured Cables of 6.6/1.1 KV grade, Al / Cu cable using suitable Heat Shrink Termination Kit , excluding supply of glands & lugs but including Glanding, all labour and consumable materials to make installation complete in all respect. The rate shall include drilling, taping of cable insulation, crimping of lugs to the conductor, connection of the lugs to equipment terminal, supply and fixing of G.I. nuts, screws, bolts, washers and other necessary hardware, PVC tape of required grade for taping, making cable entries dust and vermin proof, earthing etc. as per instruction of manufacturer, approved drawings, specifications and directions of engineer-in-charge.					
A	6.6 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, Armoured, FRLS PVC outer sheathed cables.					
i	3 X 300 sq. mm (Al)	Nos.	34	0.0000480179		
B	1.1 KV Grade, XLPE Insulated, PVC inner Sheath, FRLS PVC outer sheathed cables.					
i	3C x 2.5 sq. mm (Cu)	Nos.	60	0.0000014318		
C	3.5C x 400 sq. mm (Al)	Nos.	2	0.0000214265		
i	3.5C x 300 sq. mm (Al)	Nos.	2	0.0000212731		
ii	3.5C x 120 sq. mm (Al)	Nos.	16	0.0000163639		
iii	3.5C x 70 sq. mm (Al)	Nos.	10	0.0000086933		
iv	4CX16 sq. mm (Al)	Nos.	30	0.0000049092		
7	**STRAIGHT THROUGH JOINTS**					
7.1	Straight through jointing of HT& LT armoured cables of following sizes excluding supply of straight through jointing kit including all labour and materials complete as per Technical Specification and direction of engineer-in-charge.					
ii.	3C x 300 sq. mm (Al, 6.6 KV)	Nos.	5	0.0000482736		
iii.	3.5C x 300 sq. mm (Al, 1.1KV)	Nos.	1	0.0000212731		
iv.	3.5C x 120 sq. mm (Al, 1.1KV)	Nos.	1	0.0000163639		
v.	3.5C x 70 sq. mm (Al, 1.1KV)	Nos.	1	0.0000086933		
8	**CABLE RACK (ALUMINIUM PERFORATED TYPE CABLE TRAYS) & ACCESSORIES**					
8.1	Installation & fixing of prefabricated ladder GI cable trays and their accessories including all hardware required i.e. J-hooks, GI Nut, Bolt, Washers, coupling plate etc. of width 150 mm, 300 mm, 450 mm & 600 mm as per site requirement for laying of cables with standard rung spacing. Load for support span of 2.5 meter as 30, 60, 75 & 90 (in Kg/Mtr.) respectively with concentric static load as 70 Kg at the centre, with materials, labour, tools and tackles, consumables etc. as per drawings, specification and directions of Site Engineer / Engineer-in-Charge. The rates shall be valid for all mounting heights.					
A.	Straight Run Cable Trays					

ITEM NO.	DESCRIPTION	UNIT	Qty	UNIT RATE WEIGHT (UPTO 10 DECIMAL POINT)	DERIVED QUOTED UNIT RATE in INR (TOTAL QUOTED PRICE *UNIT RATE WEIGHT)	DERIVED TOTAL QUOTED AMOUNTin INR (QUANTITY*DERIVED QUOTED UNIT RATE)
i.	150mm wide	Mtrs.	50	0.0000025569		
ii.	50mm wide	Mtrs.	50	0.0000015341		
B.	Horizontal Bends					
i.	150 mm wide, 700 mm radius	Mtrs.	3	0.0000025569		
ii.	50 mm wide, 700 mm radius	Mtrs.	3	0.0000015341		
9	**FEEDER PILLAR**					
9.1	Installation, testing and commissioning of following floor / wall mounted Distribution Boards, including supply and fabrication of epoxy painted MS frame, operational and functional checking, drilling of gland plates with requisite holes, fixing of cable glands, plugging of all unused cable entries and other holes found in the boards to make the same dust and vermin proof with all labour and consumable materials to make installation complete as per approved drawings, specifications and directions of engineer-in-charge.					
i.	415 V, 3 Ph & N,50KA for 1 sec, floor mounted sheet steel enclosed Outdoor Type Feeder Pillar Board as per Technical Specification 5003-TS-0801. It shall consist of 1 no. incoming 630 A MCCB incomer with 6 Nos. 63A TPN MCCB and 4 Nos. 125 A TPN MCCB as outgoing Feeders. All Outgoing Feeders shall have CT & MFM.	No.	1	0.0006136473		
ii.	415 V, 3 Ph & N, IP55, wall/structure mounted sheet steel enclosed Feeder pillar box consisting of 1 nos. incoming 125A TPN MCCB incomer with RYB indications and 4 nos. 63A TPN MCCB outgoing feeders as for feeder pillar box as per enclosed Technical specification	No.	1	0.0005113727		
10	**LIGHTING fixtures & accessories AND JUNCTION BOXES**					
10.1	Installation, connection, testing and commissioning of pre-wired fluorescent / LED fixtures along with integral / non-integral control gears, lamps, tubes, chokes, starters, condensers, mounting accessories, including cable glanding, crimping of lugs on cable conductor & connecting cables at fixtures, earthing, junction boxes, etc. including supply of all connecting materials like clamps, supports, conduits, down rods etc. as required as well as transportation from store to site of erection with all labour and material to make installation complete in all respect as per approved drawings, specifications and directions of engineer-in-charge. The rates shall be valid for all mounting heights.					
i.	70 W LED Hose proof & weather proof Street Lighting Fixture complete with weatherproof cable glands, plug suitable for 3 X 2.5 mm^2 XLPE-A-PVC cable and stopping plug.and installation of suspension rod and other mounting accessories	Nos.	20	0.0000051137		
ii.	120 W LED Hose proof & weather proof Street Lighting Fixture complete with weatherproof cable glands, plug suitable for 3 X 2.5mm^2 XLPE-A-PVC cable and stopping plug.and installation of suspension rod and other mounting accessories	Nos.	10	0.0000102275		
iii	2X18 W 4ft LED Tube Light fixture LED Tube light fitting industrial type of approved make suspension mounting suitable for 240V AC as per Technical specification complete with 2x20 W T8 fixture with all accessories such as LED lamp/chip, electronic driver, Refelector, Terminal block etc.The fittings shall be provided with suspension accessory / wall mounting bracket depending upon directions by EIC / Site Engineer.	Nos.	2	0.0000051137		
10.2	Installation, connection, testing and commissioning of Junction Boxes, including cable glanding, crimping of lugs on cable conductor & connecting cables, earthing etc. including supply of all connecting materials like clamps, supports etc. as required as well as transportation from store to site of erection with all labour and material to make installation complete in all respect as per approved drawings, specifications and directions of engineer-in-charge. The rates shall be valid for all mounting heights.					
i.	63A, 415V, 3 Ph. & N, 4 way hoseproof & weather proof junction boxes in cast aluminium (LM6) enclosure complete with terminal block, rolled aluminium cable glands suitable for 2Nos. 4C x 16 Sq. mm (Al) & 1 no. 3 x 2.5mm^2 cable and threaded plug.	Nos.	10	0.0000051137		
ii.	25A, 230V, 1 Ph. & N, 4 way hoseproof & weather proof junction boxes in cast aluminium (LM6) enclosure complete with terminal block, rolled aluminium cable glands suitable for 3 x 2.5mm2 cable and threaded plug.	Nos.	10	0.0000040910		
10.3	Indoor Type, wall/structural, weatherproof (IP 55) Lighting Distribution board Type DB with Bus bar - 63 A , 415 V TPN, Incomer - 1 no. 63 A 4P MCB, 3 nos. feeder circuit of 63A DP MCB & Outgoing - 9 nos. 16 A DP, MCB as indicated in attached SLD for LSDB enclosed with Technical specification	Nos.	1	0.0000511373		
11	**HIGH MAST**					
	Unloading, storage, handling, transportation within site from store to site of installation, erection, installation and testing & Commissioning of 30M high mast shaft in three sections suitable for wind speed as Per IS-875, with raising lowering system comprising, head frame, luminaries carriage suitable to install 24 nos luminaries of 350W LED of approved make in symmetrical arrangement, double drum winch, 6mm diameter SS wire rope, trailing cable, connector, integral power tool motor, manual handle, junction box, lightening finial, including 1 set foundation bolts manufactured from special steel along with nuts, washers, anchor plates and templates.	Nos.	7	0.0016300518		
12	**PLANT LIGHTING POLES**					
12.1	Erection and commissioning of following hot dipped galvanized mild steel tubular swaged lighting poles including transportation of required items from owner's issue point to site and installation of poles, junction box, supply of requisite cable glands and tinned copper lugs, cable termination, necessary hardware required for excavation, providing concrete foundation (ratio of cement : sand : stone chips = 1:2:4) for ground installation, disposal of surplus earth within 30 m lead, earthing and painting with all labour to make installation complete in all respect as per instruction and directions of engineer-in-charge.					
i.	9M high ground mounted poles	Nos.	10	0.0000377393		
ii.	7M high ground mounted poles	Nos.	20	0.0000300687		
13	**EARTHING & LIGHTNING**					
13.1	Installation, testing and commissioning of maintenance free type chemical earth pit, shall have Enhanced high quality UL certified 17.2 mm copper bonded (250 micron) earthing electrode/ rod along with 22.6 KG graphite based (non-bentonite) as a ground enhancing material with stainless steel clamp for connecting copper bonded rod with horizontal flat strip ,Backfill etc.	Nos.	38	0.0000306824		
13.2	Installation and commissioning of hot dip galvanized earth bus bar of size 50mm x 12mm x 390 mm with 10 holes of 14 mm dia. including all labour and materials to complete installation in all respect as per approved drawings, specifications and directions of engineer-in-charge.	Nos.	10	0.0000018409		
13.3	Installation, testing and commissioning of Hot dip galvanized G.I. earthing strip / GI Rope running on O.H. cable trays / cable trays in underground cable trenches / buried under soil in already excavated cable trenches of depth 600mm or supported by G.I. saddles & saddle bars as mentioned below including interconnection between different earth pits, strip / cable for connection to various equipments & system neutral, necessary hardware for connection and interconnection between earth bus bars including all labour and miscellaneous materials to make installations complete in all respect as per approved drawings, specifications, instructions and directions of engineer-in-charge.					
i.	75mm X10mm	Mtrs.	260	0.0000015341		
ii.	50mm X 6mm	Mtrs.	200	0.0000012273		
iii.	25mm X 6mm	Mtrs.	100	0.0000010227		
iv.	10 sq mm GI Rope	Mtrs.	200	0.0000002045		
14	**FABRICATION OF STEEL STRUCTURE**					
14.1	Fabrication and installation of MS frame supports and brackets for various equipment base frame, miscellaneous electrical equipment support, made of channels, angles, flats etc. of different sections including bolting, welding, riveting, supply of necessary anchor bolts and grouting etc. including 2 coats of zinc rich anti-rust epoxy primer and 2 finished coats of epoxy paint including breaking wall, floor etc. and making good the same with all labour and consumable materials to complete installation in all respect as per approved drawings, specifications and directions of engineer-in-charge	Te	0.5	0.0004254621		
14.2	Fabrication & installation of 2 mm thick Al sheet for rain protective hood for outdoor equipment e.g. motors, switch sockets, junction boxes etc.	m^2	10	0.0000077729		
14.3	Fabrication and Installation of 8mm thick chequered plate in flooring, steps, covers over cable trenches in switch board room, painting with one coats of bitumen paint in the 50% thinner with two coats of black bitumen paints including supply of all consumables and paints.	Te	0.4	0.0003722794		
15	**G.I. / HDPE PIPES**					
15.1	Installation of G.I. pipes of following sizes for cable protection, floor sleeves etc. fixed on a steel structure, concrete, laid in trenches including concrete cutting, bending, threading etc. to a clamp, nuts, bolts sockets, reducers, spacers, plug, bushing, chipping of concrete floor, breaking of concrete cable trench, walls and complete with all labour and material as per directions of engineer-in-charge.					
i.	50 mm NB	Mtrs.	50	0.0000016364		
ii.	150 mm NB	Mtrs.	100	0.0000030682		
iii.	200 mm NB	Mtrs.	100	0.0000051137		
15.2	**WBM ROAD / CONCRETE BREAKING :** WBM Road/concrete breaking for cable trenches including required shoring strutting etc., and repairing of the road/dyke to original condition and disposing off excess materials (within the work site) job complete in all respects including the cost of labour, tools, materials, load, lift hire charges of equipments, if any, complete as per drawings, specification and directions of Site Engineer / Engineer-in-Charge.	m^3	250	0.0000294551		
15.3	Drilling of hole under Road for laying of Pipe for Cable pulling					
i.	200 NB Dia.	Mtrs.	100	0.0000515464		
ii.	150 NB Dia.	Mtrs.	100	0.0000368188		
iii.	50 NB dia	Mtrs.	50	0.0000245459		
16	**CABLE TRENCH MATERIAL & ACCESSORIES**					
16.1	Spreading of approved fine river sand in cable trenches including all labour and materials to make the installation complete in all respect as per approved drawings, specifications and directions of engineer-in-charge.	M3	900	0.0000083865		
16.2	Spreading of approved first class bricks of 4 inch thickness in cable trenches for cable protection including all labour and materials to make installation complete in all respect.	Nos.	115000	0.0000000511		
16.3	Excavation for laying of cables including disposal of excavated earth, lead up to 100 mtrs. and lift up to 1.5 mtrs., disposed earth to be levelled and neatly dressed	M^3	2000	0.0000077729		
16.4	Back filling with excavated earth in trench including consolidating each deposited layer by ramming, dressing etc.	M^3	700	0.0000031091		

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17	**CABLE ROUTE MARKER**					
	Grouting, Erection & installation of cable route markers for underground cable runs, including excavation, installation of the markers, cement concrete grouting, backfilling, materials, labour, tools and tackles, consumables etc., as per drawings, specification and directions of Site Engineer / Engineer-in-Charge	Nos.	200	0.0000062387		
18	**MISCELLANEOUS ITEMS**					
18.1	Fixing of Caution boards / dangers boards written in ENGLISH, HINDI & Local language of the following voltages.					
i.	6.6 KV	Nos.	2	0.0000008182		
ii.	415 Volts	Nos.	5	0.0000008182		
18.2	Fixing of shock treatment chart written in English and Local language duly framed and approved by engineer-in-charge.	Nos.	2	0.0000030682		
18.3	Fixing of Do & Don't chart as per Indian Electricity Rules in Aluminum frame with glass	Nos.	2	0.0000030682		
18.4	Fixing of S/S Single Line Diagram in Aluminum frame with glass.	No.	1	0.0000159548		
18.5	Installation of portable CO_2 type fire extinguisher (4.5 liter capacity).	Nos.	4	0.0000093070		
18.6	Installation of Sand buckets with stand (each with at least 3 sand buckets).	Nos.	4	0.0000055228		
18.7	Fixing of CPR (CARDIO PULMONARY RESUSCITATION) Charts.	Nos.	2	0.0000030682		
18.8	Fixing of High Voltage danger signage (Skull & bones).	Nos.	5	0.0000051137		
18.9	Fixing of Exit Route / Emergency Exit Route Signage.	Nos.	2	0.0000023523		
19	**Hume Pipes**					
19.1	Laying of reinforced cement concrete light duty hume pipe, non pressure type (NP3), centrifugally cast conforming to I.S.458 with 1:3:6 concrete casing at joints as required with necessary slope including excavation, backfilling, supply of collars, jointing of pipes with stiff mixture of cement mortar in the proportion of 1:2 (1 cement: 2 fine sand), testing of joints, complete in all respects as per specifications, drawing and the direction of the EIC/Site Engineer.					
i.	200 mm Dia.	Mtr.	200	0.0000030682		
PART-C	**CIVIL & STRUCTURAL WORKS**					
	EARTH WORK					
C-01	Earthwork in excavation in foundations of buildings, footings, columns, plinth beams, walls, machine/ equipment foundations, isolated pits, pavements, trenches for pipelines /cables, pipe sleepers, drains, etc., to the required levels and grades in both dry and wet conditions, including dressing of sides and ramming of bottoms, getting out excavated earth with lift upto 1.5 M and disposal of surplus excavated materials within plant boundary including stacking, levelling and dressing etc., complete as per direction of Engineer-in-Charge(E.I.C.) in all kinds of soils as defined in IS: 1200 including providing temporary supports to all service lines such as overhead and underground water, sewage and drain pipes, cables etc. and shoring and strutting wherever necessary, complete in all respects as per direction of Engineer-in-Charge	Cu. M.	350.00	0.0000010534		
C-02	Same as Item No. C-01, but lift from 1.5 M to 3.0 M. including in or under water and/or liquid mud, including pumping out water as required	Cu. M.	150.00	0.0000013193		
C-03	Filling with available excavated good earth (excluding rocks / boulders), as approved and directed by Engineer-in-Charge, in trenches, plinth, under floors, sides of foundation etc., at all depths in layers not exceeding 20 cms. in thickness including consolidating and dressing each deposited layer by ramming and watering with lead upto plant boundary, complete in all respects (compaction under floor with mechanical vibrater / road roller including watering).	Cu. M.	250.00	0.0000010943		
C-04	Supplying and filling with selected good earth brought from source approved by the Engineer -in-Charge in trenches, plinth, under floors, sides of foundation etc., at all depths in layers not exceeding 20 cms. in thickness including consolidating and dressing each deposited layer by ramming and watering (Rate shall include Royalty, Taxes, Octoroi, etc., levied by the local authorities, all transportation, loading and unloading, etc., and nothing extra will be paid on this account including compaction under floor with mechanical vibrater / road roller including watering).	Cu. M.	10.00	0.0000041114		
C-05	Disposal of building rubbish / malba / similar unserviceable / surplus excavated earth, dismantled or waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge, beyond initial lead, for all leads including all lifts involved as per the direction of Engineer-in-Charge..	Cu. M.	250.00	0.0000022877		
C-06	Supplying and filling in plinth with sand under floors, including watering, ramming, consolidating and dressing complete.	Cu. M.	50.00	0.0000184073		
	PLAIN CEMENT CONCRETE :					
C-07	Providing and laying plain cement concrete, machine mixed and mechanically vibrated in foundations, plinth, under floors, etc., including all necessary cost of centring and shuttering :					
	A) 1:4:8 (1 cement: 4 coarse sand: 8 graded stone aggregate 40 mm nominal size).	Cu. M.	30.00	0.0000515157		
	B) 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 20 mm and below).	Cu. M.	5.00	0.0000551771		
	REINFORCED CEMENT CONCRETE :					
	IN FOUNDATION AND PLINTH					
C-08	Providing and laying reinforced cement concrete of grade M-30(using 20 mm. nominal gauge graded stone aggregate) machine mixed and mechanically vibrated and finished to a fair face but excluding the cost of centring, shuttering and reinforcement in foundation and plinth, for rafts, footings, bases of columns, pedestals, beams, walls, columns, slabs, machine and equipment foundations, pile caps, box sections, pipe supports, etc., complete in all respects as per direction of Engineer-in-Charge.	Cu. M.	200.00	0.0000732797		
C-09	Same as Item No. C- 01, but with concrete of grade M-25.	Cu. M.	50.00	0.0000711933		
	IN SUPERSTRUCTURE					
C-10	Providing and laying reinforced cement concrete of grade M-25 (using 20 mm. nominal gauge graded stone aggregate), machine mixed, mechanically vibrated and finished to a fair face but excluding the cost of centring, shuttering and reinforcement in superstructure at all heights for columns, pillars, posts, attached pillasters, portals, struts, inclined posts, pedestals for equipments and similar vertical members, etc., complete in all respects as per direction of Engineer-in-Charge.	Cu. M.	10.00	0.0000724717		
C-11	Same as Item No. C-03, but in walls of any thickness, shape or size including attached buttresses, pilasters and their caps and bases.	Cu. M.	5.00	0.0000724717		
C-12	Same as Item No. C- 03, but in lintels, beams, portal beams, brackets, girders, cantilevers, suspended floors, roofs, staircase roofs and their supports, balconies, staircase waist and landing slabs and steps including preparation of top surface and finishing, nosing, etc.	Cu. M.	5.00	0.0000724717		
	REINFORCEMENT AND EMBEDMENTS :					
C-13	Supplying, cutting, cleaning, straightening, bending, hoisting and placing in position and binding with 18 SWG annealed wire, reinforcement bar of high yield strength Steel with Fe550D or more properties conforming to IS:1786 for all R.C.C. works including all necessary handling at all heights and depths complete in all respects and as per direction of Engineer-in-Charge..	Te.	27.00	0.0008867306		
C-14	Supplying, fabricating and fixing in position M.S. anchor plates, hooks, insert plates, M.S. flats, M.S. angle inserts and the like including welding M.S. lugs, etc., and embedding in cement concrete /R.C.C. works as per approved drawings complete in all respects and as per direction of Engineer-in-Charge.	Kg.	100.00	0.0000011233		
C-15	Supplying, fabricating and fixing in position M.S. holding down bolts assembly consisting of bolts, heads, nuts, washers etc., and the like including embedding in cement concrete/R.C.C. works as per approved drawings complete in all respects including one coat of approved quality anti-corrosive paint over a coat of approved quality primer.	Kg.	100.00	0.0000013948		
	SHUTTERING :					
C-16	Providing, fabricating, erecting and fixing in position with bolts and nuts, nails and ties, etc., centring and shuttering materials true to line and level, including strutting, propping, staging etc. with necessary bracing in all axes to give a stable assembly including chamfering the corners of columns and beams etc., wherever required including making joints in the shuttering fully leak-proof, i/c. Striking, dismantling and removing the aforesaid assembly after concreting is over, including all labour and materials complete in all respects and as per direction of Engineer-in-Charge :					
	IN FOUNDATION AND PLINTH					
	Foundation and plinth in rafts, footings, columns, pedestals, beams, walls, slabs, machine and equipment foundations, pile caps and pipe support foundations, etc.	Sq. M.	300.00	0.0000072001		
	IN SUPERSTRUCTURE					
	A) Columns, pillars, posts, struts, inclined posts, attached pillasters, portals and similar vertical members.	Sq. M.	50.00	0.0000086422		
	B) Walls of any thickness, height and shape including attached buttresses, pillasters, and their caps and bases, etc.	Sq. M.	50.00	0.0000086422		
	C) Lintels, beams, portal beams, brackets, girders, cantilever beams, suspended floors, roofs, staircase roofs and their supports, balconies, staircase waist and landing slabs and steps, etc.	Sq. M.	50.00	0.0000086422		
	STRUCTURAL STEEL					

ITEM NO.	DESCRIPTION	UNIT	Qty	UNIT RATE WEIGHT (UPTO 10 DECIMAL POINT)	DERIVED QUOTED UNIT RATE in INR (TOTAL QUOTED PRICE *UNIT RATE WEIGHT)	DERIVED TOTAL QUOTED AMOUNTin INR (QUANTITY*DERIVED QUOTED UNIT RATE)
C-17	Supplying, transporting, de-rusting, fabricating, erecting, hoisting and fixing in position with necessary welding and/or bolting with MS bolts conforming to property class 4.6 of IS: 1367 at all heights as per approved fabrication drawings of all types of structural steel work in columns, portals, girders, lattice girders, beams, crane girders, M.S rails, monorails, bracings, trusses, purlins, rafters, side runners, sag rods, hand railings, staircase stringers and steps, walkway, toe-plates, floor grids, sag rods with M.S. rounds, side walling, conveyor gantries, trestle for pipe and cable racks, gusset plates, etc., either made of rolled steel joists, channels, angles, tees, flats, plates or built up from plates and/or rolled steel sections including necessary site and shop fasteners, complete in all respects as per approved fabrication drawings, standards and direction of Engineer-in-Charge :					
	A) With providing and applying primer coat, intermediate coats and finish coat after the preparation of surfaces on structural steel work complete in all respects as per technical specifications and direction of Engineer-in-Charge.	Te	3.00	0.0012598895		
	MISCELLANEOUS :					
C-18	Providing and laying "SHRINKKOMP- 10" or any other approved equivalent anti-shrinkage grouting in pockets, under base plates of light static equipments, structural steel columns, etc., and as specified in the drawing, complete in all respects as per direction of Engineer-in-Charge.	Cu. M.	0.50	0.0005086113		
C-19	Providing and laying "SHRINKKOMP- 20" or any other approved equivalent anti -shrinkage grouting in pockets and base plates of light dynamic machines such as small pumps and compressors as per manufacturer's specifications, complete in all respects as per direction of Engineer-in-Charge.	Cu. M.	0.50	0.0005086113		
C-20	Providing and laying "SHRINKKOMP- 30" or any other approved equivalent anti-shrinkage grouting in pockets and base plates of heavy dynamic machines such as heavy pumps and compressors as per manufacturer's specifications, complete in all respects as per direction of Engineer-in-Charge.	Cu. M.	2.00	0.0005086113		
C-21	Supply and laying non-shrinking cementitious grout with a minimum crushing strength of 40 N/mm2 under base plates, base frames or other anchoring elements for structures and/or machines, including cleaning of surfaces, form-works, chamfering of edges, smoothing of exposed surfaces, providing all tools and labour necessary to complete the work as per drawings / specifications and as directed by Owner/EIC. The non shrink grout shall be laid as per approved vendor's specification	Cu. M.	0.50	0.0005086113		
C-22	Providing and laying 75 mm thick compacted bed of dry brick aggregate of 40 mm thick nominal size including spreading, well ramming, consolidating and grouting with sand, including finishing smooth etc. complete as per direction of Engineer-in-charge	Sq. M.	50.00	0.0000017278		
C-23	"Providing and fixing G.I. chain link fabric fencing of required width in mesh size 50x50 mm including strengthening with 2 mm dia wire or nuts, bolts and washers as required complete as per the direction of Engineer-in-charge					
	a) Made of G.I. wire of dia 4 mm	Sq. M.	500.00	0.0000088216		
C-24	Supplying at site Angle iron post & strut of required size including bottom to be split and bent at right angle in opposite direction for 10 cm length and drilling holes upto 10 mm dia. etc. complete	Kg.	1150.00	0.0000010899		
C-25	Providing & fixing UV stabilised fiberglass reinforced plastic sheet roofing up to any pitch, including fixing with polymer coated 'J' or 'L' hooks, bolts & nuts 8mm dia. G.I plain/bitumen washers complete but excluding the cost of purlins, rafters, trusses etc. The sheets shall be manufactured out of 2400 TEX panel rovigs incorporating minimum 0.3% ultra-violet stabiliser in resin system under approximately 2400 psi and hot cured. They shall be of uniform pigmentation and thickness without air pockets and shall conform to IS 10192 and IS 12866.The sheets shall be opaque or translucent, clear or pigmented, textured or smooth as specified.	Sq. M.	150.00	0.0000121460		
C-26	Providing and fixing precoated galvanised steel sheet roofing accessories of total coated thickness 0.50mm (base metal of minimum 0.45mm thickness with total coating thickness of 0.05mm) with Zinc coating 120 grams per sqm as per IS: 277, in 240 mpa steel grade, 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns using self drilling/ self tapping screws complete					
	a) Ridges plain (500 - 600mm)	M	50.00	0.0000046140		
	b) Gutter (600 mm over all girth)	M	20.00	0.0000113862		
	c) Flashings/ Aprons.(Upto 600 mm)	M	10.00	0.0000042089		
	d) Barge board (Upto 300 mm)	M	10.00	0.0000039133		
C-27	Providing and fixing in position at all heights UPVC rain water pipes confirming to BIS :13592 Type A R.C.C. column using plugs and standard holder bat clamps comprising of two semi-circular halves of flat iron and cast iron base screwed on wooden plugs or using clamps welded to structural steel members or M.S. insert plates where pipes are to be fixed on R.C.C. members including all necessary fittings, such as tees, shoes, off-sets, branches, swan necks, elbows, bends, heads, etc. (plate inserts, if any, to be embedded in R.C.C shall be paid separately) :					
	a) 110 mm diameter	M	30.00	0.0000032710		
PART-D	**OPERATION AND MAINTENANCE**					
1.	**DEPLOYMENT OF ELECTRICIANS / RELIEVER**					
	Deployment of Electricians/Reliever (skilled) as per requirement indicated in technical specification (Doc. No. PC298-TS-0801) for carrying out various activity associated to Operation and Maintenance of Electrical system along as per direction of engineer in-charge. as per direction of engineer in-charge. (2 person x 36 months)	Man month	72	0.0004418260		
2.	**DEPLOYMENT OF HELPERS**					
	Deployment of Helper (semi-skilled) as per requirement indicated in technical specification (Doc. No. PC298-TS-0801) for carrying out various activity associated to Operation and Maintenance of Electrical System as per direction of engineer in-charge. (2 person x 36 months)	Man month	72	0.0002945507		
3.	**CONTRACTOR'S SERVICE CHARGES**					
	Contractor's Service Charges per Month (including all miscellaneous charges envisaged by the contractor).	Man month	36	0.0003068236		

PART-II: TECHNICAL

SECTION-4.0

HEALTH, SAFETY & ENVIRONMENT

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 The purpose of the present document is to outline the minimum safety requirements applicable to personnel, equipment and facilities during erection, pre-commissioning and commissioning activities of OWNER / CONSULTANT Construction Sites. Constructing safe structure and providing safe working environment to the personnel is a vital factor in successful construction business. Safety and health are as much as part of effective project planning and control as the cost, schedules, procurement and quality. Indeed they are all closely interrelated. Productivity, safety and quality can move forward in close proximity.

1.2 **OBJECTIVES**

OWNER/CONSULTANT Site Management has following main objectives regarding safety at site.

a) No Accident
b) To make the environment safe
c) No harm to people
d) Safety is everyone's responsibility
e) To make the job safe

2.0 GENERAL

2.1 These rules do not exempt the Contractor from statutory Health, Safety and Environmental duties but are intended to assist in attaining a high standard of compliance with those duties, in order to provide a safe and healthy working environment.

2.2 OWNER/CONSULTANT will assist Contractors in any practical way to facilitate safe working, and requires full co-operation in observing these rules.

2.3 The rules for Health and Safety specified herein are in no way intended to relieve the Contractor from any obligation or liability under the Contract, nor is it intended to relieve the Contractor of any of his legal obligations for the avoidance of accidents.

2.4 In all matters arising in the performance of the Contract, the Contractor shall conform with all Statutory Regulations and By-Laws made with statutory authority by Government Departments or by Local or other Authorities that shall be applicable to the Works.

2.5 The Contractor, in the performance of the Contract, shall not endanger the safety or unlawfully interfere with the convenience of the public in any manner.

2.6 The Contractor's representative on Site shall communicate details of these rules for Health, Safety and Environment to all Contractors' employees and to all Subcontractors and Subcontractors' employees employed on the Site.

2.7 The requirements of the Client/Owner's existing Site Rules/Regulations form part of the Contract and in the case of conflict between the OWNER/CONSULTANT'S rules, the highest standard shall be applied.

2.8 At the tender stage OWNER/CONSULTANT will require to see a copy of the Contractor's policy, organization and arrangements for the Health and Safety at Work. The Contractor shall submitted complete documents Health and Safety Questionnaire. Contractor shall deploy safety officer of adequate experience at each work site or during each shift including Sunday/holiday with approval of EIC/Owner.

3.0 SITE HEALTH, SAFETY AND ENVIRONMENT INDUCTION

3.1 All personnel shall receive OWNER/CONSULTANT and Contractors' site Health, Safety and Environment induction before they commence work on site. The induction shall comprise information on the various hazards which they may come into contact with, instructions on the site emergency procedures, warning and alarm systems, and permit to work system, first aid locations, welfare facilities, access routes and project specific rules.

3.2 It is the responsibility of the Contractor to familiarize all new personnel to the Project on the actual location of muster points, fire alarm points, first aid stations and the like.

4.0 DEMARCATION

4.1 Construction personnel are restricted to the construction areas shown on the Contract Drawings. Any personnel found on/in or interfering with the existing works/plant, without permission, will be dismissed from site. Any work outside of these areas may only be carried out with the written agreement of OWNER/CONSULTANT.

Before any work is started on the site, the Contractor's representative shall report to OWNER/CONSULTANT, who will confirm to the Contractor's representative, the limits of the working area(s) and shall be informed of any special requirements appertaining thereto.

5.0 ACCESS TO THE CLIENT'S FACILITIES/BUILDINGS

5.1 The Client's Facilities, including the canteen/cafeteria and toilets shall not be used by Construction Personnel.

5.2 Construction Personnel shall not enter any of the Owner's building unless escorted by a member of the OWNER/CONSULTANT'S staff (or working with prior agreement to Owner's Permit to Work System).

6.0 BEHAVIOR ON SITE

6.1 All Contractors' personnel shall treat everyone with respect and will refrain from any sexually suggestive or abusive comments or behavior.

7.0 SMOKING, EATING AND DRINKING

7.1 Smoking, eating and drinking is allowed in designated areas.

8.0 DRUGS AND ALCOHOL

8.1 The possession or use of illicit drugs and alcohol at site is not permitted. Anyone who is found, or suspected to be, under the influence of either will be removed from site (subject to the Contractors' disciplinary procedure).

8.2 Anyone taking prescriptive drugs shall advise their employer, in particular those drugs that may impair their performance. Their employer may make arrangements to assign them to more suitable work, but shall ensure that the OWNER/CONSULTANT Construction manager is informed without delay.

9.0 PERMIT TO WORK SYSTEM

9.1 All construction works will be carried out under a permit to work system. It is designed to protect personnel and plant and consists of an organized and predefined safety procedure. It forms a clear record of all foreseeable hazards which have been considered in advance of construction operations.

9.2 The identities of the permit "Issuing Authority" will be OWNER and the "Permit Acceptor" will be the Contractor.

9.3 The following types of permits will be issued:

- Clearance Certificate - all other permits are invalid without this Certificate, (this certificate can be used for general work).
- Hot Job Work Permit.
- Electrical Work Permit.
- Confined Spaces Work Permit.
- Excavations Work Permit.
- Working at Height work Permit.
- Radiography Work Permit.
- Cold Job Work Permit.
- Road Closure Work Permit.

9.4 Written requests for permits must be submitted to Owner at least twenty-four hours in advance and the permits will be issued daily. Permits shall be given to Safety Officers of the contractor, by representatives authorized by Owner in approved formats.

10.0 ACCESS, SITE PASSES AND SECURITY

10. 1 Passes

All personnel and vehicles shall enter and leave the site via the entrance authorized for construction personnel and traffic. Contractors' employees shall not enter any part of the site other than for the purpose of carrying out the Works.

All personnel shall be issued with a site pass. The site pass must be carried (or displayed on the pass holder's lapel) at all times. Details of all personnel requiring site passes shall be submitted to OWNER/CONSULTANT at least seven working days in advance of the planned start-on-site date. Site passes shall be submitted for inspection on entering or leaving the site, or when requested for inspection by OWNER/CONSULTANT or Security.

Loss of site passes must be reported immediately to Owner/Consultant. Lack of a site pass may mean delay at the site entrance. Owner/Consultant shall not accept any responsibility for lost time or costs incurred.

On completion of their assignment, or termination or their employment, all personnel will return their site pass to Owner or Owner representative/ Owner authorized personal.

10.2 **Security**

The security of Contractor's plant, tools, equipment, materials (including free issue materials properly handed-over by Owner/Consultant) are the responsibility of the Contractor. It is the Contractor's responsibility to satisfy themselves that the security arrangements in existence on the site are adequate. The Contractor shall provide any other security measure that he deems necessary for the control and security of Contractor owned equipment and plant, including for free-issue plant and materials, both within the site establishment area and the working areas on the site.

Owner accepts no liability for any loss, damage or deterioration to the Contractor's plant tools equipment and materials.

Owner reserves the right to search at random all personnel, any Contractor's employee, or employees of its servants, agents, Contractors or any vehicle entering or leaving the site. Any package or container being taken into or out of the site may be opened and inspected by security staff or any other persons authorized by Owner/Consultant to make such a search or inspection.

It is the Contractor's obligation and responsibility to ensure that OWNER / CONSULTANT right to search and inspect persons and property, extends to and is brought to the attention of all his personnel.

Personnel shall give all possible assistance and make available any facilities required to assist OWNER/CONSULTANT and the Police in pursuance of the prosecution of any person(s) responsible for alleged malicious damage or loss to the Works or existing installations.

Owner shall not accept any responsibility for the loss or damage of personal effects. The security and safekeeping of personal effects is the responsibility of each individual.

10.3 Construction personnel will not be admitted to the Construction Areas unless they have undergone Owner/ Consultant’s induction, and received a security pass.

No Induction, No Pass, No Access to the Site

10.4 OWNER/CONSULTANT reserves the right to deny access to the Construction Site/Areas and/or the Construction Car parks to any person, or vehicle.

10.5 Individuals may be excluded from and refused future entry to the Site and/or Construction Areas for any breach of Safety or Security Rules, or exceeding the speed limit (20 mph on roads leading to the site off the public highway and 5 mph in the construction area).

10.6 No plant/skips waste or materials may leave the Construction Area without the clearance of OWNER/CONSULTANT.

10.7 The taking of photographs on the site is prohibited.

10.8 Vehicles with children under the age of 16 years or animals onboard will not be allowed access.

10.9 Visitors will only be allowed by appointment (two days' notice to OWNER/CONSULTANT is required). Visitors shall be accompanied by a member of the Contractor's team (who has received Health, Safety and Environment Induction) at all times. The visitor will have to obtain a visitor's pass, and be collected from and returned to the main gate.

10.10 Each Contractor will keep a daily register of who is on site. The register will record name, pass number, time-in and time-out (records on time-clocks will not be permitted). This information shall be used to check personnel (role call) in the event of an emergency

11.0 PARKING, DELIVERIES AND VEHICLE PASSES

11.1 Contractors' personnel shall not be allowed to park any vehicle on the main car park or site. All contractors shall park in the Contractors' Temporary Car Park.

11.2 The Contractor shall arrange transport between the parking area(s), the main site gate and the Contractor's establishment and working areas if judged to be necessary.

11.3 Vehicles used solely for transporting of tools and equipment may be allowed access to the working area(s) for unloading/loading only.

11.4 Owners of vehicles parked illegally will have their car pass taken off them and told to remove the vehicle from site. They may have their site pass withdrawn and be refused further access to the Construction Site.

11.5 The Construction Areas will be restricted to construction plant and delivery vehicles.

11.6 The speed limit on site is 10 mph on the approach roads leading to the site off the public highway and 5 mph on the construction areas

12.0 SITE OPENING AND CLOSING TIMES

12.1 The site will be open from 7:30 Hrs. to 16.00 Hrs from Sunday to Thursday. Work outside the agreed normal working hours will be by agreement with Owner (subject to two working days' notice). All applications for out of hour working will identify the scope of work, supervision arrangements and a list of personnel.

13.0 SITE SUPERVISION

13.1 The Contractor must ensure that an employee of suitable seniority and authority, with responsibility for Health and Safety, is always present on site during the course of the works, to supervise and direct the Works and to receive and implement instructions from OWNER/CONSULTANT. Seven days before commencing works on site, the Contractor must notify OWNER/CONSULTANT of the name of that employee.

13.2 All supervisory staff shall be made aware of their responsibilities for safety.

14.0 TRAINING, COMPETENCE OF EMPLOYEES AND NOTIFICATION OF HAZARDS

14.1 Each Contractor must ensure that all his supervision and employees have had adequate safety training and are experienced to carry out their work safely, prior to starting on site. Training should be continuous throughout a project and should include regular toolbox discussions, (on site briefings at the start of each working day/shift).

To this end, the Contractor must also ensure that specific hazards likely to be experienced on the Site, whether notified to them or discovered by them, are notified to their workforce together with any precautions to be taken and local rules to be observed. Similarly, such hazards should be notified to their Subcontractors and, where discovered by them, to OWNER/CONSULTANT.

14.2 Where particularly severe or unusual hazards may arise on site, OWNER/CONSULTANT reserves the right at no additional cost to request Contractors' employees to attend special safety training and instruction sessions, whether carried out on site or externally. OWNER/CONSULTANT also requires Contractors' employees to undergo specified induction safety training. These aspects should be checked prior to submission of Tenders or execution of the works.

15.0 METHOD STATEMENTS

15.1 Contractors shall submit Safety Method Statements and JSA for all work activities, for example:

- Piling Operations.
- Excavation works.
- Lifting operations, as specified.
- Steel erection.
- Hot work operations.
- Radiography/NDT.
- Entry into confined spaces.
- Pressure testing.
- Working at height.
- Shot fired tools.
- Installation of pre-cast concrete planks.
- Pre-cast concrete structure.
- The erection of safety nets and fall arrest equipment.

Safety method statements must also be submitted for activities which have been identified as being of significant risk during the risk assessment process and activities selected by OWNER/CONSULTANT.

15.2 All Safety method statements must be submitted to OWNER/CONSULTANT at least seven days before planned commencement of the works.

15.3 The Safety method statement shall detail:

- The job to be undertaken.

- The individual activities required to complete the job.
- The individual trades/disciplines involved in each activity.
- Plant, equipment and tools be used in each activity.
- Any substances/chemicals to be used and where, and during which activity they will be used (together with a COSHH assessment).
- The Name(s) of the Supervisor(s) for each activity.
- The Name of the person in overall charge of the job.
- A detailed description of how the work will be done including control measures and procedures to complete each activity and the overall job safety.
- All hot work.

15.4 Compliance with the contents of the safety method statement shall be monitored on a daily basis and addressed during Contractors' safety management meetings.

15.5 The Contractor must ensure that employees executing the works are fully briefed and are made aware of the details within the approved Safety Method Statements, prior to starting the task, this includes highlighting hazards associated, associated risk assessments and reduction measures.

16.0 RISK ASSESSMENTS

16.1 Contractors will be required to produce risk assessments for all works under their control. The risk assessment shall be submitted as part of the Safety Method Statement to OWNER/CONSULTANT at least seven days before the job commences, and include the following information:

- Identification of all hazards applicable to significant risk activities.
- Details of measures in place to control the risk.
- Justification that the existing control measures are adequate or if not, a detailed action plan on how the risk(s) shall be controlled.

16.2 The use of Generic Risk Assessments is only acceptable if they follow the logical progression of the method statement and that specific operation, otherwise, task specific risk assessments will be required.

16.3 All risk assessments must be communicated to the workforce who will be responsible for undertaking the work.

17.0 COMPLIANCE WITH STATUTORY REGULATIONS

17.1 Contractors shall carry out their work in accordance with statutory legislation.
It is the duty of the Contractor to have knowledge of all relevant legislation and take account of it in the planning and execution of the work on OWNER/CONSULTANT' Sites.

18.0 INFORMATION TO BE PROVIDED AND POSTED

18.1 Contractors shall have in place, and issue to OWNER/CONSULTANT the following documents or information prior to commencement of their work, (where detailed within these rules):

18.1.1 Safety, Health and Environmental Policy.
18.1.2 Employer's Liability Insurance Certificate.

18.1.3 A detailed Health, Safety and Environment Plan, compliant with the project plan developed by the Planning Supervisor and/or Principal Contractor.
18.1.4 Work Method Statement Lifting Studies.
18.1.5 COSHH Procedures and Assessments.
18.1.6 Noise Procedures and Assessments.
18.1.7 Name of the individual appointed as the Site Safety Supervisor/Advisor.
18.1.8 Test certificates and examination for lifting gear, plant and appliances to be used on site. (Duplicates to be provided for OWNER/CONSULTANT's records.)
18.1.9 Drawings and calculations relating to false work, designed scaffolds, ground works and supporting temporary works.
18.1.10 Details of young persons to be employed on site.
18.1.11 Information relating to hazards associated with plant, operation and materials used in the works.
18.1.12 Proof of training for all personnel engaged in the works.
18.1.13 Daily Labour Returns.
18.1.14 Monthly Return of Accident Statistics to submitted OWNER/CONSULTANT format (Nil returns required).
18.1.15 Personal Injury Report to submitted to OWNER/CONSULTANT format (all injuries, however minor, to be reported). OWNER/CONSULTANT may request a detailed investigation into an accident. OWNER/CONSULTANT' decision on which incidents require detailed investigation is final.
18.1.16 Dangerous Occurrences, Incidents, Damage to Equipment and/or Property report to be submitted to OWNER/CONSULTANT format.
18.1.17 All entries/records of accidents entered into the Contractor's Accident Book shall also be copied into OWNER/CONSULTANT' Accident Book by the Contractor.
18.1.18 Copies of all Statutory Registers to be submitted weekly to OWNER/CONSULTANT.
18.1.19 Copies of the Contractor's Safety Officer/Advisor's reports of their findings on site visits/inspections.

18.2 Accidents, Incidents, Dangerous Occurrences and Notifiable Diseases

18.2.1 Accidents/Incidents/ Dangerous Occurrences/Near Misses

All accidents/incidents/dangerous occurrences/near misses must be notified to OWNER/CONSULTANT immediately, and a report prepared.

For reportable incidents, a copy the report to the Authority must be submitted to OWNER/CONSULTANT on completion but no later than two calendar days after the accident.

18.2.2 OWNER/CONSULTANT reserves the right to decide which accident, incidents or minor injuries shall be Investigated, and to what extent/format/contents of any investigation.

Note: All such notification or reports to OWNER/CONSULTANT do not release the Contractor of his statutory duties to report such matters to the Authorities by the quickest possible means (viz, telephone, fax and e-mail) immediately following the incident/accident.

19.0 PERSONAL PROTECTIVE EQUIPMENT/CLOTHING

19.1 All personnel on OWNER/CONSULTANT' site must wear as a minimum safety helmet, hi-vis vest, safety glasses and protective footwear. Additional personal protective equipment may be required dependent on the tasks being undertaken or as dictated by the risk assessment.

19.2 Contractors shall provide all necessary personal protective clothing and equipment for their employees and renew as necessary. Records of the issue of such equipment must be maintained for inspection by OWNER/CONSULTANT.

19.3 The Contractor shall:

- Provide personal protective equipment which is comfortable and fit for purpose.
- Maintain and clean personal protective equipment.
- Replace free of charge defective, broken or lost personal protective equipment.
- Provide storage for personal protective equipment when not being used.
- Ensure that personal protective equipment is properly used.
- Give training, information and instruction on its use to employees.
- Ensure that all personnel wear suitable clothing at all times **(no shorts, no sports shirts and no colours that may invite aggression - HSE "Keep Your Tops On" is enforced).**
- OWNER/CONSULTANT reserves the right to direct the contractor to change/replace personal protective equipment if they determine that it is unsuitable or inadequate for its proposed use.

20.0 SUBSTANCES (Control of Substances Hazardous to Health – COSHH)

20.1 Substances hazardous to health must be identified prior to taking them onto site and, if they cannot be substituted or eliminated, assessments stating how the substances will be controlled and what precautions will be introduced must be carried out and recorded in writing by a competent person. This assessment must be communicated to, and understood by, the members of the workforce who are likely to come into contact with the substance(s). A copy of all assessments should be submitted to OWNER/CONSULTANT.

20.2 Hazardous substances may only be brought to site with OWNER/CONSULTANT' permission. They shall be kept to a minimum and must be stored in secure, appropriate containers with the contents clearly labelled. The containers must be stored in a secure area, preferably quarantined from the main stores areas, with suitable warning notices and signage posted.

20.3 Hazardous materials must not be allowed to discharge into natural watercourses or drainage systems.

20.4 All hazardous material waste must be kept separate from normal waste and be disposed of in a specialist disposal facility.

21.0 NOISE

21.1 When any operation of a Contractor is likely to expose any employee on site to an average noise level of 85 dB(A) and above, an assessment shall be carried out, by the Contractor, and records maintained for OWNER/CONSULTANT' inspection. In such circumstances, the Contractor must keep stocks of adequate ear defenders or other suitable hearing protection.

21.2 In addition to the foregoing, noise must be kept to a minimum at all times and must not exceed acceptable and/or locally specified rules and conditions relating to noise imposed by the Contract. Due regard must always be given to noise levels, and their effects on the local community and persons not involved in the operations. Permissible times for noisy work operations, and other restrictions, may be imposed by the Local Authority. Contractors receiving Notices or Prohibition Notices under the related legislation must notify OWNER/CONSULTANT of such Notices.

22.0 FIRST AID

22.1 All Contractors shall provide or ensure that they are provided with, such equipment and facilities as are adequate and appropriate in the circumstances for enabling first-aid to be rendered to any of their employees if they are injured or become ill at work.

22.2 No work shall commence on site until Contractors have trained first aid personnel on site. Contractor at all times during execution, shall station at site an emergency vehicle without any extra cost or claim.

23.0 TOOL BOX TALKS

23.1 Tool Box Talks will be implemented by all Contractors. The agenda for these talks will be agreed with OWNER/CONSULTANT prior to the commencing of work.

24.0 HEALTH, SAFETY AND ENVIRONMENT INSPECTIONS/HEALTH, SAFETY AND ENVIRONMENT ADVISORS

24.1 The OWNER/CONSULTANT' Health, Safety and Environment Engineer/Advisor will visit the sites and carry out Site Safety Inspections. Contractors must co-operate in these inspections. Whenever Contractors' own Health, Safety and Environment Advisors visit site they must report their arrival and departure to the OWNER/CONSULTANT' Senior Representative, and provide a report of their findings and any necessary corrective action to be undertaken.

24.2 Contractors on the project must provide a full-time site based Health, Safety and Environment Advisor, when the intensity of the work requires or at the request of the OWNER/CONSULTANT.

24.3 Contractors who do not have full-time site based Health, Safety and Environment Advisors, shall ensure that their Health, Safety and Environment Advisor visits site once per week as a minimum.

24.4 **Appointment of Health, Safety and Environment Supervision**

The Contractor shall appoint safety supervision. The name of each appointee, together with evidence of his or her competence to carry out the requirements of the role, shall be submitted to OWNER/CONSULTANT for their approval.

25.0 HEALTH, SAFETY AND ENVIRONMENT MEETINGS

25.1 Health, Safety and Environment will form part of the agenda at all Site Progress Meetings. The Contractor's Safety Advisor may be asked to attend these progress meetings.

25.2 Once per month OWNER/CONSULTANT' Resident Construction Manager shall convene a Health Safety and Environment Meeting of all Contractors. Attendees at the meeting shall be all Contractors' Safety Advisors and Site Managers.

26.0 HEALTH, SAFETY AND ENVIRONMENT COMMITTEES AND SAFETY REPRESENTATIVES

26.1 OWNER/CONSULTANT encourages the workforce to nominate Safety Representatives as a way of improving communication on Health, Safety and Environment issues. Wherever Contractors' Safety Representatives have been appointed, OWNER/CONSULTANT must be informed of their appointment in writing.

27.0 HOUSEKEEPING

27.1 Contractors are expected to carry out their work in a clean, safe and orderly manner.

27.2 Dust shall be kept to acceptable levels for the work being carried out. Waste materials and rubbish shall be cleared up as the work progresses and not left to introduce a safety hazard for other personnel engaged on the works.

27.3 Construction waste should never obstruct emergency exit routes, Firefighting equipment, emergency alarm call points or other emergency facilities.

27.4 From time to time as judged necessary, at the expiration of the contract, or when instructed to do so by OWNER/CONSULTANT, the Contractor shall undertake to clean and tidy his areas of occupation and work to the satisfaction of OWNER/CONSULTANT. Should the Contractor fail to do this, OWNER/CONSULTANT reserves the right to remove all offending materials and debris and to deduct the cost of this operation from the Contract Price. OWNER/CONSULTANT accepts no responsibility for any materials and/or tools which may be removed during this operation.

27.5 The Contractor must ensure that the following requirements are strictly enforced:

- Ample provision of refuse bins for all rubbish including organic waste such as food scraps, etc.
- Daily clearance of all such bins to the area designated for this discharge.
- No discharge of deleterious matter such as oils or other industrial waste.

27.6 All site offices, toilets, eating facilities, changing rooms, drying areas, stores, etc, which are the responsibility of the Contractor, shall be cleaned daily as a minimum by the Contractor. These facilities shall be checked for vermin on a two weekly rota.

28.0 FIRE PREVENTION

28.1 Before welding, flame or arc cutting of metals, or other processes involving heat or naked lights are permitted, a fire risk assessment shall be carried out by the contractor and arrangements agreed with OWNER/CONSULTANT who will issue a Permit to Work.

28.2 Contractors shall familiarize both themselves and their employees with the fire safety arrangements, fire alarms, means of escape and emergency evacuation procedures.

28.3 Before leaving the premises and site, contractors shall ensure that naked lights and other ignition sources have been extinguished and electrical apparatus, where practicable, switched off and/or disconnected.

28.4 Contractors shall store Highly Flammable Liquids and Liquefied Petroleum Gases in a manner approved by OWNER/CONSULTANT.

28.5 OWNER/CONSULTANT' fire protection equipment shall only be used in an Emergency. Fire extinguishers/fire blankets for use when carrying out hot work shall be provided by the Contractor.

29.0 REMOVAL OF WASTE FROM CONSTRUCTION SITES

29.1 The removal of waste shall only be undertaken by Licensed Waste Carriers.

29.2 Where there is any doubt of the composition of excavation spoil, it must be analyzed before it is removed from site.

29.3 Evidence of compliance shall be submitted to OWNER/CONSULTANT prior to the removal of any waste from site.

29.4 Controlled waste is any kind of household, industrial or commercial waste. This includes, for example:

- Scrap metal.
- Building, construction, demolition and excavation waste, including waste from any repair or renovation.
- Clinical waste.
- Anything which is unwanted because it is surplus, broken, worn out, contaminated or spoiled in some other way.

Controlled waste disposal must be managed via a chain of transfer notes, maintained by the contractor and readily retrievable for OWNER/CONSULTANT' inspection.

30.0 EXCAVATIONS AND OPENINGS

30.1 No excavation work shall be commenced by the Contractor unless a valid excavation permit has been issued. The Contractor shall have on site at all times while excavation work is being carried out, detection equipment which meets the latest technology.

30.2 Prior to the start of any excavation, OWNER/CONSULTANT shall be consulted and the presence of overhead and buried service records shall be checked. Where "live" services are present, hand excavation must be carried out until the location of the service has been identified, recorded and made safe.

30.3 The Contractor must erect suitable solid edge protection (i.e., double handrails) around excavations or openings. During the hours of darkness any excavations, openings or obstructions near or on roadways and walkways must be indicated by a sufficient number of warning lamps.

30.4 The sides of all excavations should be properly shored, battered or stepped to prevent collapse. No excavation work shall commence unless there are adequate resources present to ensure the stability of the excavation. Excavations shall be inspected prior to, or re-commencement of the work to ensure the excavation is still in a safe condition.

30.5 All excavations shall have a proper ladder access point provided.

30.6 Spoil from excavations must be piled at least 1m from the edge of the hole.

30.7 Vehicular traffic shall be restricted from the edges of excavations, to prevent possible collapse.

31.0 ELECTRICITY

31.1 All Contractors must provide their own electrical power supplies or as per Technical ITB.

31.2 Contractors must not interfere with, or work on any of, the Client's electrical installations or equipment without written consent.

31.3 Where Contractors have to work in the vicinity of electrical equipment they must carry out a risk assessment prior to commencement of any works.

ALL EQUIPMENT MUST BE TREATED AS "LIVE" UNLESS ISOLATED/LOCKED OFF AND TAGGED.

31.4 Repair or installation of any electrical equipment must only be carried out by a competent qualified electrician.

31.5 The electrical supply to powered hand tools must not exceed permissible volts, centre tapped giving appropriate volts to earth. Where this is not possible, due to the type of tool being used, the approval of OWNER/CONSULTANT must be sought in writing.

Electrical lighting for use in confined spaces must not exceed 24 volts (and be explosion proof where applicable). Powered hand tools used in confined spaces should, where possible, be air operated.

31.6 Contractors requiring to install temporary electrical supply equipment shall submit a temporary electrical supply procedure to OWNER/CONSULTANT for approval. The procedure shall, where necessary, cover installation of 380/440 volt system, installation of 110 volt system, lighting system, welding equipment installation, inspection testing operation and maintenance of temporary electrical systems.

31.6.1 **Distribution Boards** - Semi-permanent or Long Term

These should be accommodated in weatherproofed locations and be so arranged, if possible, that they will not need to be moved during the Contract. They should be proofed against interference or unauthorized operation and they should be large enough to accommodate all the necessary apparatus required. Each circuit should be clearly labeled and a circuit diagram should be located at each board.

31.6.2 **Distribution Boards** – Temporary

These are usually small portable panels or boards containing two or three socket outlets. They must be of robust construction, preferably all-insulated and should be supplied by heavy duty flexible cables, these cables shall not be spliced. Socket outlets, plug connectors and cable couplers should comply with High Standards or equivalent industry standard.

31.6.3 **Distribution Cables**

These cables run from the main distribution boards to the local distribution boards throughout the site.

The cables will normally be multi-strand multi-core armored PVC cables but, in certain cases, may take the form of Mineral Insulated Copper Clad (MICC) cables. The latter type should be sheathed with PVC.

The installation must be so arranged as to prevent the need for long trailing cables. Socket outlets should be located as near the working point as possible.

Power and lighting circuits should be kept separate.

A full record should be made of all parts of the installation and should be kept up to date when alterations or extensions are made.

31.6.4 **Underground Cables**

Cables may be provided by the Contractor and laid underground or overhead to connect the supply or metering point to the semi-permanent site distribution boards.

The cables must be suitable for the duty and loading expected, e.g., armored PVC cables.

The cables should be buried at a safe depth or taken from a height so as not to obstruct the movement of persons and vehicles and their routes clearly marked both on the site and on the site plans.

The cables should be properly terminated and be provided with efficient circuit protection.

Cable routes should be so arranged that the minimum of obstruction is caused. The cables should be treated with care and given the same supervision and protection as other cables.

31.7 No temporary electrical supply shall be installed or modified without the agreement and approval of OWNER/CONSULTANT.

31.8 Any tool, plant or equipment exceeding 110 volts (55v to earth) shall be connected to an earth leakage circuit breaker (ELCB).

32.0 WORK IN CONFINED SPACES

32.1 All work in confined spaces must be covered by a safety method statement.
Safety method statements for work in confined spaces should include arrangements for the following as a minimum:

- Issue of a permit to work

- Work scope and method.
- Nominated Supervisor.
- Tally man.
- Rescue procedures and equipment.
- Training.
- Tools and equipment to be used, including low voltage or pneumatic.
- Lighting requirements, including standby/emergency.
- Explosion proof fittings.
- Low voltage or pneumatic tools.
- Ventilation.
- Access.
- Bonding to prevent both electrical shock and static discharge.
- Work cycles, to reduce risk of heat exhaustion.
- Fire safety and extinguisher requirements.

32.2 Contractors shall not enter or commence work in any excavation, tank, vessel, pipe or chamber or other enclosed space, until a valid permit to work has been issued. Where Contractor's operations result in a dangerous atmosphere arising during the monitoring of the work activity, the permit to work issuing authority must be informed and all personnel removed from the area.

No new activity shall be introduced into a confined space without the permission and signed approval of the permit to work issuing authority.

Whilst work is ongoing within a confined space, the Contractor will be required to provide a trained standby/tally man.

32.4 All personnel who have to enter confined spaces must have undertaken the training appropriate to this task.

33.0 MOBILE CRANES

33.1 All cranes (including piling rigs, fork lift trucks, mobile elevated work platforms, hand lorries and similar equipment), whether owned by the Contractor or hired, must carry relevant test certificates and thorough examination reports, together with the manufacturer's handbook. Copies of this documentation must be submitted to Owner/Consultant prior to commencing work.

33.2 Only persons who are certificated as competent and authorized shall be allowed to operate cranes. The Contractor must be able to prove the competence of their employees to operate such equipment prior to its use.

33.3 Crane operators or other competent persons must carry out daily inspections and enter these in the crane register. Failure to maintain the register properly may lead to suspension of operations. This obligation is the responsibility of the crane hirer when he is supplying the crane and the operator. In addition, the Contractor will implement a regular inspection and maintenance programme to ensure that all components of the lifting device are in good condition.

33.4 Travel routes for cranes and crane standing must be agreed with OWNER/CONSULTANT in order to avoid such things as overhead lines and other structures, underground services, excavations, made up ground, etc. Load spreader pads of sufficient size and thickness area, and of suitable material, e.g., metal plates, timber, etc, are to be placed under each outrigger foot, before all crane lifting operations are allowed to commence.

33.5 Crane duty charts (Load Radius Tables) must be displayed on or be available in the crane for easy reference. In addition, crane manufacturers' rigging/de-rigging instructions must be available on site. During rigging/de-rigging of jibs/booms, provision must be made to support sections/either side of rigging points, from below, utilizing tightly packed blocks.

33.6 All cranes shall be fitted with:

- A reverse warning audible alarm.
- Load radius indicator.
- Automatic safe load indication.
- Crane hooks with safety catches.

All of which must be serviceable.

33.7 All lifting equipment accompanying the crane shall comply with the requirements of lifting regulations.

33.8 The assembly, rigging and de-rigging of any crane components, including fly jibs, shall only be done under the supervision of a competent lifting supervisor. An approved risk assessment, together with the manufacturers' rigging/de-rigging instructions must be in place covering rigging activities for the equipment.

33.9 Every Contractor involved in lifting operations with a crane (including a piling rig) or mobile crane shall appoint, in writing, a lifting supervisor to oversee all lifting operations.

33.10 No crane shall travel with a suspended load.

33.11 Outriggers, when installed, must always be used.

34.0 LIFTING OPERATIONS

34.1 A Lifting Study and Safety Method Statement must be prepared for all heavy lifts exceeding 10 tons, or of a complex nature, e.g., tandem lifts or as specified by the Construction Manager (or the Rigging and Lifting Supervisor) and submitted to OWNER/CONSULTANT for review.

34.2 Every lifting operation must be properly planned by a nominated, competent person.

34.3 Every lifting operation shall be appropriately supervised.

34.4 All slinging and rigging of loads must be carried out by competent personnel.

34.5 Clear communications between the crane operator and the person responsible for controlling the lift must be established.

All statutory Inspection Reports/Certification/Documentation and proof of the driver's training shall be photocopied and handed to OWNER/CONSULTANT prior to the setting up of the crane. Certification for lifting equipment to be used in the lift shall be identified and cross checked with the item of plant

35.0 STEEL ERECTION

35.1 The weight of each component in excess of 500 kg shall be clearly marked upon it.

35.2 Erectors must be fully informed of the correct erection sequence, by their supervisor, prior to each stage of work commencing.

35.3 Vertical access provision should, whenever possible, be fixed to the steel before it is lifted into position. Where this is not possible permanent access, ie, stairways or permanent metal ladders, shall be installed as early as possible.

35.4 Where horizontal access along structural members is required, as much work as possible must be completed before the steel is lifted into position. This includes:

Fixing of handrails or posts for securing steel wire ropes to be used in conjunction with safety harnesses or inertia reels.

The fixing of scaffold tubes (needles) to the lower flange of an I-beam to allow a working platform to be erected.

Where scaffold tubes (needles) are used they shall not support a working platform wider than three boards, or one lightweight staging without being “picked up”.

Where no ladder access, permanent stairway, etc, leads onto working platforms, as described above, employees must use man riding baskets or mobile elevated work platforms as far as reasonably practicable to access working areas.

36.0 SCAFFOLDING

36.1 All scaffolding must be of good quality, be erected in compliance Good Practices for Access and Working Scaffolds, and special scaffold structures in steel. In addition to the main guard rail, an additional guardrail is required such that the gap between the toe-board and main guardrail does not exceed 470mm and all boards must be secured, without causing a tripping hazard.

36.2 All scaffolding shall be erected, modified and inspected by qualified competent scaffolders.

36.3 Where materials are to be positioned on scaffolding the Contractor’s supervision must ensure that the scaffolding is not overloaded.

36.4 Before use, scaffolding shall be inspected by an authorized Scaffold Inspector who shall complete a “scaffold tag” and secure it in a prominent position at the base of all ladder access points. The scaffolding tag will clearly show the following information as a minimum:

- Location.
- Reference number.
- Requested by.
- Access Scaffold Classification.
- Maximum distributed load/working lift.
- Maximum number of working lifts to be used simultaneously.
- Date erected.

- Erected by.
- Inspected by.

36.5 Scaffolds shall be inspected at weekly intervals or after storms by the authorised Scaffold Inspector who shall sign and date the "Scaffold Tag" after each inspection. Scaffolding not considered safe shall have the Scaffold Tag withdrawn and a prominent "DO NOT USE" sign displayed.

36.6 A scaffold register shall be maintained by the authorized Scaffold Inspector. This shall contain:

- Date of first and subsequent weekly inspections.
- Individual identifications of all scaffolds which shall be cross-referenced to the Scaffold Tag identity number.
- Clear name and signature of the authorized Scaffold Inspector against each separate scaffold inspected.

36.7 No scaffold may be erected which impedes normal access or can be accidentally struck by moving plant without prior consultation with OWNER/CONSULTANT to ensure that a safe system of work is in place.

36.8 Contractors are not permitted to erect or carry scaffolding near live overhead electrical cables, or equipment because of the danger of tubes making accidental contact with electrically charged apparatus.

36.9 If there is any doubt about the security of any anchorage, suspension points or ties for a scaffold, e.g., strength of existing buildings/structures, or those under construction, OWNER/CONSULTANT must be consulted before proceeding with erection.

36.10 All scaffolds must be provided with suitable access. Where ladders are used for this purpose they must be of adequate length and properly secured by lashing or fixing to prevent displacement.

36.11 Action shall be taken to warn personnel against using partly erected or dismantled scaffolds. A prominent "DO NOT USE" sign shall be clearly displayed.

36.12 OWNER/CONSULTANT shall approve the sitting of the scaffold material racks/compounds.

36.13 Mobile tower scaffolds shall not be constructed with a height greater than 3 times the minimum base width and shall only be used on level ground. Towers shall only be erected by trained personnel.

36.14 In addition to weekly inspections, wooden scaffold boards shall be subject to a monthly inspection to ensure wood has not rotted or been subject to insect damage

36.15 The Contractor shall ensure that the system of work employed for the erection and dismantling of scaffolding shall not expose the Scaffolders to any risk.

36.16 All scaffolding must be erected and dismantled to the requirements laid down in the current regulations and guidance notes and to the requirements of OWNER/CONSULTANT.

37.0 LADDERS/STEPS

37.1 Ladders must be in good condition and free from defects, i.e., broken rungs, split stiles.

37.2 Ladders must not be painted.

37.3 Ladders must:

- Be securely fastened at the top.
- Be properly positioned at the base.
- Extend at least 1m (5 rungs) above the working platform.
- Be at an angle of 300mm out for every 1.2m vertical drop.

37.4 **All steps used on the project Site**.

37.5 Only one person must be allowed on a set of steps at any one time.

37.6 Persons must work with a set of steps of the appropriate height for the task.

37.7 The top rung of the steps must be kept at waist height, no work to be carried out above this height on steps.

37.8 Ladders are to be used as a means of access not as a working platform except for light, minor or one off activities. Then the person must wear a harness and tie-off to a suitable anchorage whilst carrying out the minor task.

38.0 FALL PROTECTION

38.1 Depending on the task and the risks, harnesses and appropriate anchorages/running lines will be used for activities carried out above a height of 2 meters.

38.2 Fall protection equipment shall be subject to regular inspection by a competent person, and a register maintained for OWNER/CONSULTANT' inspection.

38.3 During the execution of work at height, where it is not practicable to work from within a standard working platform with double handrail and toe boards (for example erection of structural steelwork, installation of roof components, etc), safety netting capable of catching a falling person must be installed as far as reasonably practicable.

38.4 The provision of safety netting does not relieve individuals from utilizing fall protection devices during the execution of the works.

38.5 The safety nets should be manufactured to Indian Standard and erected in accordance with good practices by a competent person.

38.6 The safety nets must bear a label stating the normal size of the net; the date of manufacture, the deflection at the centre of the net during the prescribed test and the maximum distance below the working height for which the net is designed to be used.

38.7 Test certificates must be provided for all safety nets, which will state the breaking strength of the net and provide details of the drop test carried out.

38.8 All safety nets must be periodically tested at intervals not exceeding three months – and records of these tests must be retained.

38.9 A formal inspection of safety nets must be carried out weekly to check for damage, loose ties, changes in anchorage points, etc. Records of these inspections must also be retained.

39.0 MOBILE ELEVATED WORK PLATFORMS

39.1 The term Mobile Elevated Work Platform (MEWP) covers the following types of equipment:

- Scissor lifts.
- Telescopic booms or jibs.
- Articulating and telescopic booms.

39.2 Anyone who is to operate a MEWP must be competent and have received formal training accredited by manufacturer.

39.3 Prior to any MEWP being used on site, a formal risk assessment must be carried out to identify any potential hazards which may exist as a consequence.

39.4 Whilst working within the platform of a MEWP, all personnel must wear a safety harness which is attached to a secure anchorage point within the platform.

39.5 Before commencing work from a MEWP, the surrounding area should be cordoned-off to prevent personnel straying into a potentially hazardous area.

39.6 The Safe Working Load specified on the MEWP must not be exceeded.

39.7 If the MEWP has been manufactured with outriggers or stabilizers, they must always be deployed.

39.8 Prior to commencing work, ground conditions must be checked to ensure that the ground bearing capacity will not be exceeded by the loading from the MEWP. Where required, spreader plates shall be used to distribute the loading.

39.9 The MEWP shall only be permitted to travel with the platform occupied and/or the boom extended if it is within the machine’s specified operational capabilities.

39.10 MEWP shall not be used as a jack, prop or support.

39.11 MEWP shall not be used as a crane or lifting device.

39.12 MEWP shall not be used primarily for the transport of goods or materials.

39.13 MEWP shall not be used in wind speed exceeding 30 mph (12.5 m/s).

39.14 All MEWPs must be subjected to a regular maintenance and inspection regime, which as a minimum will require weekly inspections by a competent person and a thorough examination every six months.

40.0 CONTRACTORS' TOOLS AND EQUIPMENT

40.1 All Contractors' tools and equipment must be fit for purpose. Tools should be CE marked.

40.2 Guards and electrical trip switches must work effectively and must not be removed or by-passed.

40.3 All tools shall be of good quality and maintained in a safe working condition. Home made tools are not permitted.

40.4 The Contractor shall provide suitable storage with suitable racks and bins for storing tools and equipment.

40.5 All temporary construction leads, lighting and portable electric tools shall be of appropriate volts.

40.6 The Contractor shall nominate or employ the services of a competent qualified person to inspect and tag electrical power hand tools, transformers, distribution boards, extension cables, etc, on an at least a three monthly basis (PAT testing). The tag shall display name, signature of the individual inspecting the tool and date of inspection.

40.7 The Contractor shall keep, on site, a register of all electrical power hand tools in use. The register shall detail:

- Individual identity number of the tool.
- Name, signature and company of the qualified electrician carrying out the inspection.
- Date of inspection.
- Maintenance and Inspection schedule.
- Remarks on condition of tool and whether repaired or withdrawn from use.

40.8 No electrical powered hand tool shall be used unless it is tagged with a current "INSPECTION" tag.

40.9 All electrical leads must be connected to the power source through standard industrial waterproofed plugs and sockets, which shall be in good condition.

41.0 MECHANICAL PLANT AND EQUIPMENT

41.1 Mechanical plant and equipment is defined as:

- Earthmoving plant.
- Road making plant and equipment.
- Concrete batching plant and mixers.
- Forklift trucks.
- Miscellaneous plant, including generators and compressors.
- Mobile elevating work platforms (e.g., star- lift, cherry picker, etc).

41.2 All items of mechanical plant transported to the project shall be in a safe and sound condition and shall be properly maintained. Emissions shall be to acceptable limits and no smoke shall be discharged.

41.3 A programme of regular, preventative maintenance shall be established by the Contractor, as per the manufacturer's handbook, to ensure that all plant equipment is systematically inspected, maintained and repaired as necessary.

41.4 The preventative maintenance programme and the Contractor's employee responsible for taking the action shall be clearly detailed, identified and given to OWNER/CONSULTANT.

41.5 A safe system of work must exist during all maintenance and repair operations to ensure that no part of the machinery is set in motion while work is being carried out.

41.6 Plant maintenance must not be carried out within the main construction site.

41.7 Where refueling is required, facilities provided shall be adequately covered by fire extinguishers, earthing, warning signs, bonding and proper fuel dispensers. Refueling areas shall be curbed to avoid spills.

41.8 Waste oil removed from vehicles after servicing shall be sent to the appropriate off-site waste disposal facility and this is the responsibility of the Contractor.

41.9 The OWNER/CONSULTANT'S tools, plant and equipment may not be used by Contractors without their express permission.

42.0 COMPETENCY/PLANT EQUIPMENT

42.1 All drivers and operators of mobile plant (mechanically propelled vehicles) shall be in possession of the appropriate license for the class of vehicle.

42.2 It is the responsibility of the contractor to ensure that all drivers, operators and banks men of mobile plant (mechanically propelled vehicles) are certificated as competent.

42.3 **General**

42.3.1 Every dangerous part of machinery shall be securely guarded.

42.3.2 Any guards removed for maintenance or repair purposes must be replaced before the machine is set in motion.

42.3.3 No mobile plant (mechanically propelled vehicles) shall carry passengers unless a proper fixed seat is provided, except when the equipment is specifically designed for standing personnel.

42.3.4 Mobile plant (mechanically propelled vehicles) must be parked on firm level ground when unattended, the engine stopped, brakes on and any load or attachment lowered to the ground and the keys left in the ignition.

42.3.5 No mechanical plant or equipment shall be sited on or operated on any area of the project without express the permission of OWNER/CONSULTANT.

42.3.6 All items of mobile plant (mechanically propelled vehicles) shall be fitted with a reverse warning audible alarm.

42.3.7 All drivers/operators of mobile plant (mechanically propelled vehicles) shall strictly obey the instructions of the site security, traffic regulations and speed limits. A banks man shall be in attendance during all reversing procedures.

42.4 **Inspection**

All mobile equipment (mechanically propelled vehicles) shall be inspected by a competent person appointed by the Contractor prior to use on site. Equipment considered to be unsafe, by OWNER/CONSULTANT, shall not be allowed access to the site.

42.5 Flame Arrestors

42.6 All mobile plant for use in Petro Chemical Live Plant Areas, or during the Start-up and Commissioning Phase of the project, must be fitted with Exhaust Flame Arrestors and Chalwyn Valves where there is a risk of flammable gas releases.

43.0 MACHINERY GUARDING

43.1 Unauthorized personnel must not operate, interfere or tamper with plant or equipment.

43.2 Persons authorized to use machines must first check that guards are in position and that any other safety devices, e.g., emergency stops, are in working order.

43.3 All plant or equipment brought onto the site must be properly guarded to prevent injury and be CE marked.

NO GUARD OR FENCE MAY BE REMOVED FROM MACHINERY.

44.0 WELDING

44.1 Welding sets shall be in good condition, properly maintained and earthed.

44.2 Isolation switches on welding sets shall be readily accessible.

44.3 Terminals and live components shall be adequately protected.

44.4 Cables shall be frequently inspected to ensure the insulation is intact.

44.5 Damaged cables or electrical holders shall be properly repaired or replaced.

44.6 The welding return cable shall be secured onto the work piece. If this is not practical it shall be as near as possible.

44.7 Proper cable connectors shall be used when connecting runs of cables.

44.8 Welders shall wear:

- Face and eye protection with correct grade of filter.
- Welder's gauntlets.
- Long sleeved flame retardant overalls.

Welders shall wear safety helmets at all times, except whilst welding, when it is agreed as impractical and written permission is granted by OWNER/CONSULTANT, subject to mitigation of hazard, i.e., no work overhead, or shielded from falling objects.

44.9 Welding areas should whenever possible be screened off using flame retardant blanket or other suitable material. All combustible materials must be cleared from the vicinity of all welding operations.

44.10 Asbestos material shall not be used on the project.

44.11 Electric Arc Welding equipment and accessories shall conform to Latest Engineering Standards.

44.12 Fire extinguishers must be provided and kept adjacent to any welding or cutting activity.

45.0 ABRASIVE WHEELS

45.1 Contractors must ensure that any of their employees authorized to change Abrasive Wheels have attended an approved course of training and have been appointed in writing.

45.2 Details of each employee trained must be entered in the training register kept on site. Contractors must produce certificates and registers on request.

45.3 Machines used to drive Abrasive Wheels must be in good condition and properly guarded.

45.4 Pedestal or bench mounted grinders must have an emergency stop button and be fitted with a properly adjusted tool rest and guard.

45.5 All hand held grinders shall have a “Dead Man” switch and appropriate guards fitted.

45.6 The use of hand held angle grinders over 115mm shall only be permitted for specific tasks, subject to Owner’s / Consultant’s approval.

46.0 USE OF GAS AND OXYGEN EQUIPMENT

46.1 Compressed gas cylinders shall:

- Be in good condition and not suffering from corrosion.
- Be properly colour coded (reference should be made to National Standards).
- Be individually identified.

Hoses shall be properly colour coded to the internationally recognized standard for the gas being used, in good condition and fitted with hose connectors attached by permanent clips.

Check valves and flashback arrestors must be used on both hoses at all times.

46.2 Users shall check the equipment for perished, damaged hoses, regulators, and pressure gauges, etc. Defects must be reported to their supervisors and faulty equipment must be replaced.

46.3 When on site, cylinders must be in trolleys or secured in an upright position at all times. A bottle key shall be kept with cylinders in use.

46.4 Stored oxygen and fuel gas cylinders shall be kept separate with minimum separation distance of 5m. Cylinders must never be stored or used in a horizontal position cylinders must be secured in an upright position. Empty cylinders must also be separated from full cylinders. Cylinders shall be stored in lockable open mesh bottle cages.

46.5 All gas cylinders must be handled with care and they must not be misused or abused. They must be properly shut off when not in use and safety caps must be fitted when being moved.

46.6 Great care must be taken to ensure that gas equipment, including hoses, are not allowed to cause obstruction of roadways, walkways, manholes, ladders or other means of access where they can cause hazards or be damaged. Hoses not in use should be coiled up and put in a safe place. Hoses should whenever possible be supported off the ground.

46.7 Where any operation involves the use of gas and oxygen equipment in enclosed or semi-enclosed spaces, Contractors' supervision must carry out frequent checks to ensure these procedures are complied with.

46.8 During meal breaks and at stopping times, hoses and equipment must be removed from confined spaces or excavations. Oxygen or gas cylinders must not be taken into confined spaces for use or storage.

46.9 No modification to tanks or drums which have contained flammable liquid shall be undertaken at the site.

47.0 ABRASIVE AIR BLAST CLEANIN

47.1 Blast cleaning shall be carried out in an enclosed designated area.

Provision shall be made to prevent the spread of grit and dust out of the blast area and to collect and dispose of the spoil to an approved location.

47.2 The blast cleaning area shall be indicated by prominent warning signs.

47.3 Only approved abrasives having no free silica shall be used.

47.4 Personnel involved in the actual blasting of material shall be protected by a positive pressure, blast hood, meeting approved standards and providing both respiratory and eye protection, with breathing air supplied via a suitable filter.

47.5 The nozzle shall be fitted with a properly functioning dead man's handle, and anti-static abrasive blast hoses. It is required that all equipment be grounded and checked for ground potential

47.6 A standby man shall stay by the blast pot.

48.0 COMPRESSED AIR

48.1 All air receivers and compressors shall be in good condition and properly maintained.

48.2 Air receivers shall be individually identified and marked with their safe working pressure.

48.3 Air receivers shall be accompanied by a valid test certificate which shall be kept on site by the Contractor and shown to OWNER/CONSULTANT before bringing the vessel onto site.

48.4 All air receivers must be fitted with a properly set pressure relief valve.

48.5 Air receivers shall be examined and the pressure relief valve tested by an independent examiner at yearly intervals.

48.6 There shall be a register of all air receivers containing:
- Individual identification numbers.
- Dates of independent inspections.
- Name and signature of independent examiner.
- Rates safe working pressure.
- Pressure at which pressure relief valve lifted shall be kept on site by the Contractor along with all current certification.

48.7 The requirements inclusive also apply to compressor mounted air receivers.

48.8 All compressed air fittings shall be wired and/or restrained to prevent them from whipping should the coupling separate.

48.9 Only hose clamps designed for compressed air service shall be used. Worm drive (Jubilee) clips are not acceptable.

COMPRESSED AIR MUST NEVER BE USED FOR CLEANING CLOTHES.

48.10 Nozzles used for air blowing must be fitted with a “Dead Man” valve.

49.0 MOBILE PHONES AND PAGERS

49.1 Radios, personal CD and tape players are not allowed in the construction areas.

49.2 Mobile phones and pagers are prohibited in the designated construction areas by any hands-on personnel. External to the designated construction areas, providing it does not detract the user from any safety requirements and the user is stationary, then mobile phones and pagers may be used. **Other uses of this equipment will be at the discretion of OWNER/CONSULTANT.**

50.0 RADIOGRAPHY/NDT

50.1 Contractors who carry out radiography/NDT on the site must comply with safe systems of work. In particular, they MUST ensure that:
- Radiography areas are clearly marked using barrier tapes, notices and flashing lights.
- Audible warning (horns) must be sounded before a source is exposed.
- Only Classified Workers are engaged in radiography work.
- All other personnel are clear of the area before radiography takes place.

- Radiography work is supervised by a Qualified Radiological Protection Supervisor. Such supervisors must be nominated in writing and notified to OWNER/CONSULTANT.
- Any incident which may have resulted in over-exposure of any personnel is brought to the attention of OWNER/CONSULTANT for investigation.
- They have a written emergency procedure to be followed in the event of loss of an isotope or damage or malfunction of associated equipment. This procedure must be submitted to OWNER/CONSULTANT for approval before commencement.
- A certified meter is available on site.
- Radiography is carried out at the times agreed with OWNER/CONSULTANT normally this will only be during silent hours. OWNER/CONSULTANT requires twenty-four hours notice of such planned work.

50.2 Contractors who are not involved in radiography work must ensure that their employees observe warning notices, alarms and barriers in use where such work is being carried out.

50.3 Contractors must ensure that statutory notification is made to the authorities of radiography works.

50.4 Disposal of spent radioactive sources shall be agreed with OWNER/CONSULTANT.

51.0 WORKING OVER WATER/DIVING OPERATIONS

51.1 The Contractor shall provide a buoyancy aid to any employee working over (or near) water where there is a likelihood of falling in.

The Contractor shall also supply a sufficient number of life buoys to be permanently located at the point(s) of danger. The life buoys shall be attached to a throwing line.

Where rescue of a person falling into the water may be difficult, OWNER/CONSULTANT may require the Contractor to supply a standby boat, crewed by a competent boatman trained in rescue and resuscitation techniques.

51.2Diving operations may only be carried out using approved specialist diving contractors, employing certified commercial divers, and upon acceptance by OWNER/CONSULTANT of their Health, Safety and Environment plan and method statements (Diving Rules).

52.0 ASBESTOS

52.1 Only certified Contractors are allowed to handle asbestos.

53.0 IMPROVEMENT AND PROHIBITION NOTICES

53.1 In the event of an Improvement or Prohibition Notice being served by an Inspector, the OWNER/CONSULTANT Senior Representative must be notified immediately and the Contractor shall comply with the terms of such Notice immediately.

54.0 CARTRIDGE OPERATED FIXING TOOLS

The use of Cartridge Operated tools shall only be permitted with the express permission of OWNER/CONSULTANT, subject to an approved method statement and risk assessment, and use only by competent, trained operators).

55.0 SITE ESTABLISHMENT AND AMENITIES

55.1 Details of temporary services to be provided by Contractor or as Per Technical portion of ITB.

56.0 ACCOMMODATION

56.1 An area will be allocated for temporary site establishment facilities/services.

56.2 When required by the Contract, the Contractor shall provide and maintain (including de-watering when necessary) a suitable level and hardcore surface in the area allocated for temporary buildings such as offices, stores, workshops, mess huts and a stores compound.

56.3 When required by the Contract, the Contractor shall provide all site offices, stores facilities, workshops and mess huts for the accommodation of staff/site personnel. Proposals for the Contractor's temporary buildings shall be submitted to OWNER/CONSULTANT for approval with their tender.

56.4 **Storage in Permanent Buildings**

No Plant, Contractor's Equipment or Construction Aids shall be stored in any permanent building without first obtaining the written permission of OWNER/CONSULTANT. Such permission will not relieve the Contractor of the obligation to protect the building from damage whilst used as a store. If permission to use the building is refused by OWNER/CONSULTANT, the Contractor shall provide alternative storage facilities at no additional cost to OWNER/CONSULTANT.

56.5 **Sanitary Facilities**

All toilets and washing facilities shall be provided by the Contractor.
The supply and installation of necessary water sewage/drainage pipe work, pits, etc, for the facilities and the regular emptying and servicing are the responsibility of the Contractor.

56.6 **Canteen**

The Contractor must provide mess-huts for his employees and arrange any canteen facilities required for his employees and those of any others employed by him in connection with the Work.

57.0 TEMPORARY SERVICES

57.1 **Telephone, Facsimile, etc**

Arrangements for the provision of telephones, computer modems and/or facsimile facilities shall be made directly with providers of such facilities by the Contractor.

57.2 **Electricity**

If under the contract the Contractor is responsible for providing electricity for the site establishment amenities and working area(s), the Contractor shall ascertain the type, location and available spare capacity of the electrical point(s) of supply and provide cable, connections, isolating switches and earth leakage protection of approved specification.

If the Contractor's requirements for temporary electrical supplies exceed those agreed and render the available service inadequate, the Contractor shall provide the additional requirements at no extra cost to OWNER/CONSULTANT.

Electrical installations including all cables, temporary connections, wandering leads and all electrical facilities and/or equipment required for the execution of the Works shall be properly installed and maintained by the Contractor.

Temporary electrical installations must comply with all appropriate statutory requirements, the latest edition of the Institution of Electrical Engineers Regulations, COP for Distribution of Electricity on Construction and Building Sites and Electrical Safety on Construction Sites.

Electrical equipment and installation shall at all times be subject to inspection and approval by OWNER/CONSULTANT but this shall not relieve the Installer/User of their responsibilities for the safety of the system.

Electrical equipment or cables forming part of the permanent installation shall not be used by the Contractor for temporary services.

Temporary buildings shall have an external isolating switch.

The Contractor shall supply, install and maintain any temporary workface lighting.

57.3 **Water**

Supply of potable water for drinking and raw water for washing/toilet facilities, mixing concrete, hydrostatic testing and other construction purposes shall be in Contractor’s scope. The Contractor shall ascertain the location of the supply point and shall provide and install any temporary pipe work necessary for the provision, use and disposal of such water.

58.0 DISCHARGES INTO THE INTERNAL AND EXTERNAL DRAINAGE SYSTEMS, LAND AND CONSTRUCTION AREAS

58.1 All proposed controlled discharges into the site drainage systems shall be agreed with OWNER/CONSULTANT.

58.2 Any water discharged on existing roads, hard shoulders or drainage systems shall first pass through a filtering interceptor (which must be regularly cleaned) to prevent the discharge of sludge or solids.

58.3 Any damage to the Works caused by prolonged or excessive pumping and any damage or nuisance arising out of pumping operations shall be the liability of the Contractor.

58.4 Subsequent to filling with water and testing of any part of the Works for hydraulic testing, the Contractor shall be responsible for safe disposal of the water, and shall ensure that the rate of discharge is controlled and kept within the capabilities of any drainage system utilized.

58.5 The Contractor shall provide all requisite equipment and materials to ensure that all drains, rivers, streams or waterways are safeguarded against pollution.

59.0 MAINTENANCE OF ROADS AND DRAINS

59.1 Existing roads, road gullies and drains shall be inspected by OWNER/CONSULTANT and the Contractor prior to work commencing. A record of this inspection shall be compiled and on the completion of the Works, a further inspection will be carried out and any necessary repairs to road surfaces or cleaning of drains shall be to the Contractor's cost.

59.2 The Contractor shall provide temporary protection to any existing roads to prevent all possibility of damage whatsoever arising from the Works.

59.3 The Contractor shall at all times in the execution of the work maintain all public and site roads in a clean condition to the satisfaction of OWNER/CONSULTANT.

59.4 The Contractor shall immediately remove all mud, earth and debris from road surfaces.

59.5 Track-laying cranes and similar vehicles must not travel on finished roads without written authority from OWNER/CONSULTANT and then only with the use of timber mats or approved precautions to prevent damage to the roads. Timber mats or other approved precautions shall be supplied by the Contractor.

60.0 MATERIALS – STORAGE AND CONTROL

60.1 The Contractor must give a minimum of twenty-four hours notice of the intention to uplift and transport materials/equipment supplied free-issue from OWNER/CONSULTANT/Client' storage facilities to the point of erection or Contractor's storage facility.

60.2 Free-issue materials/equipment furnished by OWNER/CONSULTANT shall be accepted by the Contractor and become the responsibility of the Contractor until acceptance of the Works. Any damage caused to free-issue materials after acceptance shall be repaired or replaced by the Contractor to OWNER/CONSULTANT' satisfaction.

60.3 **Storage of Petrol, Fuels, Lubricants etc**

All fuel and construction materials which may contaminate the site drains, land or watercourses shall be stored in bounded areas. Refueling of plant shall be via bounded bowers. All construction plant in static locations shall have drip trays which shall be cleared daily.

60.4 **Environmental Impacts**

The Contractor shall, prior to commencement of the work, present to OWNER/CONSULTANT for their approval a register of environmental impacts that necessarily arise from their works.

Each identified environmental impact shall be accompanied by an individual Risk Assessment, clearly showing the reduction measures put in place to ensure mitigation of residual risk.

61.0 PENALTY

The Contractor shall adhere consistently to all provisions of HSE requirements. In case of noncompliance's and also for repeated failure in implementation of any of the HSE provisions, Consultant/Owner may impose stoppage of work without any cost & time implication to the Owner and/or impose a suitable penalty.

The amount of penalty shall be limited to 0.5 % (Zero decimal five percent) of the contract value.

Gate pass issued by CISF will bear "Medically Fit" stamp based on the E-I-C's recommendation. Accordingly, this shall be treated as part of the tender.

MEDICAL CERTIFICATE

Affix latest PHOTO impression of the workmen half covering the photo.

Form for Medical Check Up for the Workman engaged by the Contractor

Certified that I, ___________________ have examined Shri ____________________Age _________

who has signed / thumb impression above on the photo in my presence. The details of his examination
as required are given in the enclosed medical examination report. I certify that all clinical and pathological tests were done in my hospital/dispensary under my instructions. General and physical examinations of Shri ________________ do not reveal any abnormality. He does not suffer from any
acute / chronic disease or any contagious or infectious disease. He is medically fit to work inside plant. He is free from Vertigo, Epilepsy or Fits, general giddiness and height related disease. His B.P.Pulse, Eyesight etc. are normal.

In my opinion, Shri ____________________ is physically and mentally fit for undertaking physical labour inside the plant.

Sign_______________________
Date: _________________

Signature and Rubber stamp of medical practitioner with name

Note: This certificate is to be given on the letterhead of the registered medical practitioner who is possessing MBBS qualification as recognized by the Indian medical council. Below the signature, the
rubber stamp of the medical practitioner should be affixed. The letterhead normally should contain the following:

1) Name of the Medical practitioner:
2) Qualifications:
3) Registration Number:
4) Designation:
5) Address:

62.0 ADDITIONAL SAFETY REQUIREMENT

A. Strict implementation of IS marked safety helmets & IS/CE marked safety shoes for contract personnel

All the contractors working inside the plant shall ensure that their supervisors/labourers compulsorily wear IS marked safety helmets & IS/CE marked safety shoes while entering plant premises. No contract personnel shall be allowed inside battery area without wearing IS marked safety helmets & IS/CE marked safety shoes. All EIC's/site engineers and F&S department shall sensitize and spread awareness among the contract personnel.

Name of Tenderer: …..………………………..

Signature & Seal of Tenderer: ……………………………