



BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
TRANSMISSION BUSINESS GROUP
SEC - 142, NOIDA

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PROJECT	400/220/132 kV GIS SUBSTATION AT SHAMLI							
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	400/220/132 kV GIS SUBSTATION UPPTCL SHAMLI	Part No.	SECTION -1
	AIR CONDITIONING SYSTEM		SHEET 1 OF 6

SECTION-1

INTENT, SYSTEM REQUIREMENT AND SCOPE

1.0.0 INTENT OF SPECIFICATION

- 1.1.0 This specification covers the manufacturing, inspection/testing, dispatch and erection, testing & commissioning at site of **Air-Conditioning System** as mentioned in different sections of this specification for **400/220/132 KV Sub-station at Shamli** of Uttar Pradesh Power Transmission Corporation Limited (UPPTCL).
- 1.2.0 The requirements specified under '**SECTION 2, SECTION 3, SECTION 4 & SECTION 5**' of the specification shall be considered as part of this section. In case of variance between various sections, the requirements of **SECTION 1** shall prevail.
- 1.3.0 The Bidder shall be deemed to have understood completely all the tender drawings and documents and quoted accordingly.
- 1.4.0 The Contract shall be on unit rate basis for the quantities furnished by BHEL. During contract stage, quantities of various items of BOQ may vary to any extent and same rates will be applicable so far the resultant variation in total contract value is within $\pm 20\%$. Variations beyond $\pm 20\%$ shall be negotiated mutually.
- 1.5.0 It is recommended that Bidders have no deviation on technical requirement & scope. Bidder shall submit signed and stamped copy of "Certificate of No deviation" (Schedule 1 of Section 5) for 'NIL DEVIATION'.
- 1.6.0 The term **Customer** shall refer to **UPPTCL**, '**Purchaser**' shall refer to **BHEL** and the term '**Contractor**' shall refer to the **successful Bidder**
- 1.7.0 The system / equipment shall be capable of performing the required duties as per the specification requirements.

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SHEET 2 OF 6**2.0.0 AIR CONDITIONING REQUIREMENT FOR VARIOUS AREAS****Air Conditioning System for Control Room Building and GIS Building**

Air conditioning units for control room building shall be set to maintain the inside DBT at $24.4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and the air conditioning system for control and relay panel rooms shall be designed to maintain DBT inside control and relay panel rooms below 24°C .

Air conditioning shall be provided in the following areas of the switchyard Control room building and GIS building:

S.No.	Area to be protected
i)	Relay & Protection panels Rooms in respective GIS Building
ii)	SCADA Room at First floor
iii)	Conference Room at First floor
iv)	AE Maintenance Room at First Floor
v)	AE (T&C) Room at First floor
vi)	JE Room at First floor
vii)	Electrical Lab at Ground floor

Standard Control Room Building drawing is also enclosed as a part of the specification for Bidders reference.

3.0.0 ELECTRICAL SYSTEM REQUIREMENTS

Single-phase switch socket shall be provided by BHEL for each of the split units (2TR) at operating height in Control room building. Any MCB/TPN switch etc required to connect this power supply to AC units shall be supplied and installed by contractor. *All cabling between the indoor and outdoor unit shall be supplied & done by contractor.*

4.0.0 SCOPE OF SUPPLY & SERVICES

The scope of equipment to be furnished and services to be provided under the contract are outlined hereinafter and the same is to be read in conjunction with the provisions contained in other sections/ clauses. The scope of work under the contract shall be deemed to include all such items, which although are not specifically mentioned in the bid documents and / or in Bidder's proposal, but are required to make the equipment/ system complete for its safe, efficient, reliable and trouble free operation. **NO EXTRA COST** implication to BHEL shall be considered

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during contract stage on account of supply & installation of these unaccounted items. 4.1.0 SCOPE OF SUPPLY i) The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Special Conditions of Contract, Technical Specifications, and Drawings. ii) The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Purchaser and valued at the rates and prices bid in the priced Bill of Quantities. iii) A rate or price shall be entered against each item in the priced Bill of Quantities. The cost of Items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities. iv) The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the priced Bill of Quantities, and where no Items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work. v) General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Contract documentation shall be made before entering prices against each item in the priced Bill of Quantities. vi) Miscellaneous items like hardware, fixtures etc. shall be deemed to be included under the relevant BOQ items and bidders shall consider the same while quoting for BOQ items.			

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SHEET 4 OF 6**For GIS Panel Room (Relay & Protection Panel Room)**

Sl. No.	Item Description	Unit	Quantity
1.	High wall type split AC units of 2 T capacity of four star rating complete with indoor, outdoor units and required accessories, stabilizers etc. for: (as per equipment specification attached to section-2)		
1.1	400kV GIS - Relay & Protection panels Room	Nos.	12
1.2	220kV GIS - Relay & Protection panels Room	Nos.	9
1.3	132kV GIS - Relay & Protection panels Room	Nos.	9
2.	ECU / Control Panel for 400kV GIS - Relay & Protection panels Room (as per clause 4 of equipment specification attached to section-2)	Nos.	4
3.	ECU / Control Panel for 220kV GIS - Relay & Protection panels Room (as per clause 4 of equipment specification attached to section-2)	Nos.	3
4.	ECU / Control Panel for 132kV GIS - Relay & Protection panels Room (as per clause 4 of equipment specification attached to section-2)	Nos.	3

For Control Building

Sl. No.	Item Description	Unit	Quantity
1.	High wall type split AC units of 2 T capacity of four star rating complete with indoor, outdoor units and required accessories, stabilizers etc. for (as per equipment specification attached to section-2)		
1.1	SCADA Room	Nos.	3
1.2	Conference Room	Nos.	2
1.3	AE Maintenance Room	Nos.	1
1.4	AE (T&C) Room	Nos.	1
1.5	JE Room	Nos.	1
1.6	Electrical Lab Room	Nos.	1

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<i>Prices of following shall be deemed to be inclusive in unit's rates of above items:</i> - Copper refrigerant piping complete with insulation between the indoor and remote outdoor condensers as required. - PVC drain piping of suitable length from indoor units to the nearest drain point for each 2TR air conditioner. - One Lot of MS brackets and M.S. frame for indoor & outdoor units respectively and fixing hardware like anchor bolts, nuts, fittings etc. as would be necessary for installation of each unit. - One no. MCB/TPN switch and cable required to connect indoor & outdoor unit and one no. stabiliser of capacity 5KVA for each split AC. <i>Note: Bidder should take special care of following points while quoting:</i> <i>Cooling capacity of 2TR AC units shall not be less than 22000btu/hr. & shall have energy efficiency rating of 4star or above.</i> <i>The Split AC units shall be of Carrier, Voltas, Blue Star, Hitachi, Daikin, LG, National, O'General or Samsung make.</i>			
4.2.0 SERVICES TO BE PERFORMED BY CONTRACTOR			
4.2.1 <u>Erection, Testing & Commissioning (ETC) requirements</u>			
- The scope of ETC shall include erection, system testing and commissioning of the system (Unloading and storage of materials at site is excluded from contractor's scope) - Laying and termination of power and control cables for the equipment under the scope of this specification. - Bidder shall arrange all machinery tools & tackles and consumables required for erection of the system. - PVC drain piping for the condensate drain. - Refrigerant piping connections as required. - Bidder shall ensure that sufficient quantity of commissioning spares is made available for timely completion of commissioning of the system. These commissioning spare shall be in addition to mandatory spares. - Submission of following documents for approval.			

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1. Data sheet for 2TR split AC along with catalogue for the model being offered. 2. Drawing and detailed scheme of ECU with necessary provision of alarms as per cl no. 4 of customer's specification attached to Section-2 3. Layout showing distribution of split AC in the control room building, placement of indoor & outdoor units & routing of refrigerant piping. 4.2.2 <u>Civil Works</u> Following is covered under contractor's scope: 4.2.2.1 Wall openings at suitable locations for refrigerant and drain piping for installation of AC units. 4.2.2.2 Any other damage caused to civil works during ETC work of the equipment/system shall be made good to the original finish at no extra cost to the BHEL. 4.3.0 INTERFACING Provision shall be provided in ECU so that air conditioners in GIS Panel rooms can be controlled and monitored from substation automation system. 5.0.0 HANDING & TAKING OVER After successful commissioning, All the AC units will be put through a run test for a week as per the specification requirement. After successful completion, they will be handed over to customer. Any defect noted during this period shall be rectified by the contractor without any cost implication to BHEL/ Customer.			

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SECTION-2
EQUIPMENT SPECIFICATION

Customer’s specification is attached to this section. Kindly refer the applicable clauses for air conditioning system of relay panel rooms and control room building.

AIR CONDITIONING SYSTEM

AIR CONDITIONING SYSTEM

CONTENTS

Clause No.	Description
1.0	General
2.0	Scope
3.0	Specification for Split AC units
4.0	Environmental Control Units (ECU)
5.0	Air conditioners used in ECU

TECHNICAL SPECIFICATION OF AIR CONDITIONING SYSTEM

1.0 GENERAL

- 1.1 This specification covers supply, installation, testing and commissioning and handing over to UPPTCL of air conditioning system for the **control room building and control and relay panel rooms**.
- 1.2 Air conditioning units for control room building shall be set to maintain the inside DBT at $24.4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and the air conditioning system for control and relay panel rooms shall be designed to maintain DBT inside control and relay panel rooms below 24°C .

2.0 SCOPE

- 2.1 The scope of the equipment to be furnished and services to be provided under the contract are outlined hereinafter and the same is to be read in conjunction with the provision contained in other sections/ clauses. The scope of the work under the contract shall be deemed to include all such items, which although are not specifically mentioned in the bid documents and/or in Bidder's proposal, but are required to make the equipment/system complete for its safe, efficient, reliable and trouble free operation.
- 2.2 The following rooms shall be provided with **split Air-Conditioners**.
- i) Bay level units, bay mimic, relay and protection panels etc. for **400KV bays**.
 - ii) Bay level units, bay mimic, relay and protection panels etc. for **220KV bays**.
 - iii) Bay level units, bay mimic, relay and protection panels etc. for **132KV bays**.
 - iv) Control room
 - v) Battery room
 - vi) Electrical test lab.
- 2.3 The design of layout plan of **split AC** and their control panels shall be subject to Purchaser's approval and conform to the IS: 1391(part-2). The split AC shall be installed atleast **4 star rated system** as per the Bureau of Energy Efficiency (India). The AC rooms shall also be provided with fire alarm system with at least two detectors and it shall be wired to **SAS for monitoring**. The air conditioning system shall be provided with control and protection IEDs for performing sub-station automation and protection functions.

- 2.4 Air conditioning requirement of rooms indicated at clause no. 2.2 shall be met using split AC units. High wall type split AC units of 2TR capacity each complete with air cooled outdoor condensing unit having hermetically sealed compressor and high wall type indoor evaporator unit with cordless remote controller shall be provided.
- 2.5 Air conditioning system shall be provided in the control and relay panel rooms used for housing control and protection panels. These panel rooms will be located adjacent to **GIS Halls** and generally unmanned. Therefore, the air-conditioning system shall be rugged, reliable, maintenance free and designed for long life.
- 2.6 Copper refrigerant piping complete with insulation between the indoor and remote outdoor condensers as required.
- 2.7 PVC drain piping from the indoor units upto the nearest drain point.
- 2.8 Power and control cabling between the indoor unit and outdoor unit and earthing.
- 2.9 MS Brackets for outdoor condensing units, condensers as required.

3.0 SPECIFICATION FOR SPLIT AC UNITS

- 3.1 The split AC units will be complete with indoor evaporator unit, outdoor condensing units and **cordless remote control units**.
- 3.2 Outdoor unit shall comprise of hermetically sealed **reciprocating/ rotary compressors** mounted on vibration isolators, propeller type axial flow fans and **copper tube aluminium finned coils** all assembled in a sheet metal casing. The casing and the total unit shall be properly treated and shall be weatherproof type. They shall be compact in size and shall have horizontal discharge of air. The compressor shall be very reliable, trouble free and require less maintenance.
- 3.3 The indoor units shall be high wall type. The indoor unit shall be compact and shall have elegant appearance. They shall have low noise centrifugal blowers driven by special motors and copper tube aluminium finned cooling coils. Removable and washable **polypropylene filters** shall be provided. They shall be complete with multi function cordless remote control unit with special features like programmable timer, sleep mode and soft dry mode etc.
- 3.4 The Split AC units shall be of **Carrier, Voltas, Blue Star, Hitachi, Daikin, LG, National, O'General or Samsung make**.

4.0 ENVIRONMENTAL CONTROL UNITS (ECU)

- 4.1 Air conditioning system is required for critical application i.e.for maintaining the temperature for critical sub-station control and protection equipments. To provide redundancy for such critical applications, each split AC shall be installed with adequate number of Environmental Control Units (ECU) to maintain the temperature below 24°C. The system shall be designed for 24 Hours, 365 Days of

the year operation to maintain the control and relay panel rooms temperature for proper operation of the critical equipment.

- 4.2 Each Environmental control unit (ECU) shall comprise of **three nos. of air conditioners (2 main + 1 standby)**, working in conjunction through a micro processor based controller for desired operation. Two of the air-conditioners shall be running at a time and shall maintain the required temperature. On failure of the running of anyone of air-conditioner or as described hereunder, the other air-conditioner shall start automatically. To ensure longer life of the system, the redundant airconditioner shall also be running in cyclic operation through the controller. However, during running of air-conditioners, if inside temperature of the room reaches 35°C due to any emergency condition, the other standby air-conditioner shall start running to maintain the temperature less than 24°C and gives alarm for such situation. After achieving this temperature, the other unit shall again shut off. The ECU shall be switched off if the temperature falls below 20°C. No heating or humidification is envisaged for the air conditioning system inside the control and relay panel rooms.

5.0 AIR CONDITIONERS USED IN ECU

5.1 CONSTRUCTION

The air conditioner shall be completely self-contained. All components of the units shall be enclosed in a powder coated cabinet. The unit shall be assembled, wired, piped, charged with refrigerant and fully factory tested as a system to ensure trouble free installation and start up. Suitable isolation or other by-passing arrangement shall be provided such that any unit/component could be maintained/ repaired without affecting the running standby unit. The maintenance of unit shall be possible from outside the control and relay panel room.

5.2 SEQUENCE OF OPERATION

Suitable arrangement shall be made to operate the unit in the following order. However, the actual operation arrangement shall be finalised during detailed engineering.

1. Evaporator Fan
2. Condenser Fan
3. Compressor

5.3 REQUIRED FEATURES OF VARIOUS COMPONENTS

The compressor shall be very reliable, trouble free and long life i.e. hermetically sealed Scroll type of reputed make suitable for continuous operation. Compressor should be installed on vibration isolated mountings or manufacturer's recommended approved mounting. Valve shall be provided for charging/topping

up of refrigerant. The bidder shall furnish details of their compressor indicating the MTBF, life of compressor and continuous run time of compressor without failure. The contractor shall also furnish details of all accessories i.e. refrigeration system, evaporator coil, condenser coil, evaporator blower filter, cabinet, indoor supply and return grill etc. during detailed engineering.

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SHEET 1 OF 15**SECTION-3****GENERAL TECHNICAL REQUIREMENTS OF SPECIFICATIONS (GTR)****1.0 GENERAL**

This section stipulates the General Technical Requirements (GTR) under the Contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipments and services covered under respective equipment sections and are not exclusive. However in case of conflict between the requirement specified in this section and requirements specified under respective equipment sections, the requirements specified under respective sections shall hold good.

Every effort will be made to supply all equipment as per the technical details furnished in the specification. However, due to the standard manufacturing practice of various equipment suppliers and depending on the selected vendor, there may be slight variations from indicated values at the contract stage. Such variations should not affect the quality and performance of the equipment.

It is not the intent to specify completely in technical specifications of equipments/ materials all details of the design and construction of equipment. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation. The Purchaser will interpret the meaning of drawing and specification and shall have the power to reject any work or material which in his judgement is not in accordance therewith. The equipment offered shall be complete with all components necessary for its effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply, irrespective of whether these are specifically brought out in this specification and/or commercial order or not.

2.0 COMPLETENESS OF EQUIPMENTS

2.1 Equipments furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories specified &/or normally provided with such equipment and/ or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the Technical Specifications. Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the substation unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost All similar standard components/ parts of similar standard equipment provided, shall be inter-changeable with one another.

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- 2.2** The Bidder shall supply type tested (including special test as per technical specification) equipments and materials. The test reports/details shall be furnished by the Bidder in the bid. In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes or due to non-compliance with the requirement stipulated in the Technical Specification and/or IEC/ IS, same, shall be carried out without any additional cost implication to the Purchaser. The Purchaser reserves the right to get any or all type tests conducted/ repeated.

The reports for all type tests and additional type tests as per technical specification furnished by the Bidder shall be of the tests conducted within last 05(five) years prior to the date of bid opening. The type tests conducted should have either been conducted in accredited laboratory (accredited based on ISO/ IEC Guide 25/ 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by UPPTCL or representative authorized by UPPTCL or Utility or representative of accredited test lab or reputed consultant.

3.0 STANDARDS

- 3.1** Except as modified by this Bid specification, all material and equipment shall conform to the requirement of the latest editions of relevant ISS/ IEC and other applicable standards. The equipments/ works shall be designed, engineered, manufactured, built, tested and commissioned shall be carried out in accordance with the Acts, Rules, Laws and Regulations in force in India.
- 3.2** In addition to meeting the specific requirements called for in the respective sections of the Technical Specification, the equipment shall also conform to the general requirement of the relevant standards which shall form an integral part of the specification. When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.
- 3.3** In the event of the Bidder offering equipment conforming to standards other than ISS/IES standards, which ensure equivalent or better performance than that specified in the standards, the salient point of comparison between the standards adopted and relevant ISS/ IEC standards shall be indicated clearly in the proposal, along with English language version of such standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's approval.
- 3.4** The standards mentioned in the respective equipment specifications are not mutually exclusive or complete in themselves. The equipment &/or work shall also conform to any other applicable standard, even if not specifically mentioned in these specifications.
- 3.5** Should the Bidder wish to depart from the provisions of the specifications, either on accounts of manufacturing practices or for any other reason, he shall clearly mention the departure and submit complete justification supported by information, drawings etc. as will enable to assess the suitability of equipment(s) offered. In the event of the Bidder's specifications, drawings, forms and tables etc. being found to disagree with the requirement of the Bid specifications at

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any stage, Bid specifications shall be binding, unless the departures have been duly approved in writing by the Purchaser.

3.6**REFERENCE OF STANDARDS**

Reference	Abbreviation	Name and Address
IEC/ CISPR	International Electro technical Commission	Bureau Central de la Commission, Electro Technique International, 1 Rue de verembe Geneva, Switzerland
IS	Indian Standards,	Bureau of Indian Standard, Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi-110 002, INDIA

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BS	British Standards,	British Standards Institution, 101, Pentonville Road, N-19-ND UK
ISO	International Organization For Standardization,	Danish Board of Standardization Danish Standardising Sraat, Aurehoegvej-12, DK-2900, Heelstrup, DENMARK
NEMA	National Electric Manufacture Associate	115, East 44th Street, New York NY 10017 U.S.A

4.0 PROJECT DATA

- | | | |
|------|--|---------------------------|
| i. | Location | UTTAR PRADESH |
| ii. | Altitude | not exceeding 1000 Meters |
| iii. | Climatic Conditions | |
| (a) | Design maximum ambient Air Temperature | 50 ⁰ C |
| (b) | Minimum ambient air temperature in shade | 0 ⁰ C |
| (c) | Relative Humidity | 100%Max. |
| (d) | Wind Load | 195 Kg./ Sq.m. |
| (e) | Seismic Level | 0.3 g |
| (f) | Isoceraunic Level | 50days/ year |
| (g) | Average annual rain fall | 1200 mm |
| (h) | Hot and humid tropical Climate conducive to rust and fungus growth | |

5.0 SYSTEM PARTICULARS

- | | | |
|-------|--------------------------|-----------------------------------|
| (i) | Rated System voltage | 420 kV, 245kV, 145kV, 36kV |
| (ii) | System frequency | 50 Hz, This may vary by $\pm 5\%$ |
| (iii) | Number of phases | Three |
| (iv) | Neutral | Effectively Earthed |
| (v) | Auxiliary power supply:- | |

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Auxiliary electrical equipment shall be suitable for operation on the following supply system:

- | | | |
|-----|--|---|
| (a) | Power device (Like drive motors) | 400V, 3Phase, 4Wire 50Hz
Effectively earthed AC system. |
| (b) | Lighting fixtures, space heaters,
fractional Horse Power motors and
control devices. | 250V, 2wire, 50Hz,
AC supply with one
point grounded. |
| (c) | DC alarm, Control and Protective
Devices from sub station batteries as under | 2wire ungrounded DC supplies |
- (i) 400 kV S/S : 220V DC (ii)
220/132kV S/S : 110V DC (iii)
Communication : 48 V DC
equipment

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The above supply voltage is subject to variation as follows:

All devices must be suitable for a continuous operation over the entire range of voltage variations :

- (i) AC
- Voltage may vary by $\pm 10\%$.
Frequency by $\pm 5\%$
Combined Voltage & frequency by $\pm 10\%$.
- (ii) DC
- a) 220 V may vary between 187 & 242 V
b) 110 V may vary between 93 & 121 V
c) 48 V may vary between 41 & 53 V

6.0 SYSTEM PARAMETERS

The following system parameters shall prevail:

Sl. No.	Description of Parameters	400 kV System	220 kV System	132 kV System	33 kV System
1.	Nominal system voltage	400kV	220kV	132kV	33kV
2.	Maximum operating voltage of the system(rms)	420kV	245kV	145kV	36kV
3.	Rated frequency	50Hz	50Hz	50Hz	50Hz
4.	No. of phase	3	3	3	3
5.	Rated short time current	50 kA for 3 Sec.	40 kA for 3 sec	31.5 kA for 3 sec	25 kA for 3 sec
6.	Dry and wet one minute power frequency withstand voltage	680 kV	460 kV	275 kV	95 kV
7.	Dry and wet impulse withstand voltage positive and negative	1550 kVp	1050 kVp	650 kVp	250 kVp
8.	Corona extinction voltage	320 kV	156 kV	105 kV	-
9.	Max. Radio interference voltage for frequency between 0.5 MHz and 2 MHz at 508 kV rms for 765kV, 320kV rms for 400kV system and 156kV rms for 220kV system & 92kV rms for 132kV system	1000 microvolt	1000 microvolt	500 microvolt	-
10.	Minimum total creepage	25mm/ kV (10500 mm)	25mm/ kV (6125 mm)	25mm /kV (3625 mm)	25mm/kV (1300 mm)
11.	Min. clearances				

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i. Phase to phase

4000mm (for
Conductor-
conductor)
4200mm
(for rod -
Conductor)

2100 mm

1300 mm

320 mm

ii. Phase to earth

3500 mm

2100 mm

1300 mm

320 mm

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12.	iii) Sectional clearances	6500 mm	5000 mm	4000 mm	3000 mm
	System neutral earthing	Effectively Earthed	Effectively Earthed	Effectively Earthed	Effectively Earthed

Major technical parameters of bushings/ hollow column/ support insulators are given below:

Sl. No	Parameters	400 kV System	220 kV System	132 kV System	33 kV System
(a)	Max. System voltage Um (kV)	420	245	145	36
(b)	Impulse withstand voltage (dry & wet) (kVp)	± 1425	± 1050	± 650	±170
(c)	Switching surge withstand voltage (dry & wet) (kVp)	1050	-	-	-
(d)	Power frequency withstand voltage (dry and wet) (kV rms)	650	460	275	75
(e)	Total creepage distance(min) (mm)	10500	6125	3625	900

Insulator shall also meet requirement of IEC- 815 for 420kV, 245kV, 145kV and 36kV systems, as applicable having alternate long and short sheds.

7.0 SERVICES TO BE PERFORMED BY THE EQUIPMENT

All equipments shall perform satisfactorily under various electrical, electromechanical and meteorological conditions of the installation site.

All equipment shall be able to withstand all external and internal mechanical thermal and electromechanical forces due to various factors like wind load temperature variation, ice & snow (wherever applicable) short circuit etc for the equipment.

The Bidder shall design the various forces which the terminal connectors of the equipment are required to withstand.

All outdoor EHV equipments except marshalling kiosks shall be suitable for hot line washing.

To facilitate erection of equipment, all items to be assembled at site shall be "match marked".

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Where the specification does not contain references to workmanship, equipment, materials and components of the covered equipment, it is understood that the same must be new, of highest grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended.

The design of the works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the Purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be considered as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances, instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacturer's limits. Suitable guards shall be provided for the protection of personnel on all exposed rotating and/or moving machine parts and shall be designed for easy installation and removal for maintenance purposes. The spare equipment(s) shall be installed at designated locations and tested for healthiness.

The Bidder shall apply oil and grease of the proper specification to suit the machinery, as is

necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for

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applying the lubricant required for operation. The Bidder shall apply all operational lubricants to the equipment installed by him.

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Bidder has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help Purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

A cast iron or welded steel base plate shall be provided for all rotating equipment which are to be installed on a concrete base unless otherwise agreed to by the Purchaser. Each base plate shall support the unit and its drive assembly, shall be of design with pads for anchoring the units and shall have a raised up all around and shall have threaded in air connections, if so required.

8.2 PROVISIONS FOR EXPOSURE TO HOT AND HUMID CLIMATE

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

9.0 SPACE HEATERS

The heaters shall be suitable for continuous operation at 240V AC supply. On-off switch and fuse shall be provided for the heater.

One or more adequately rated thermostatically connected heaters shall be supplied to prevent condensation in any compartment. The heaters shall be installed in the lower portion of the compartment and electrical connections shall be made sufficiently away from below the heaters to minimize deterioration of supply wire insulation. The heaters shall be suitable to maintain the compartment temperature to prevent condensation.

The heaters shall be suitably designed to prevent any contact between the heater wire and the air and shall consist of coiled resistance wire centered in a metal sheath and completely encased in a highly compacted powder of magnesium oxide or other material having equal heat conduction and electrical insulation properties, or they shall consist of resistance wire wound on a ceramic and completely covered with a ceramic material to prevent any contact between the wire and the air. Alternatively, they shall consist of a resistance wire mounted into a tubular ceramic body built into an envelope of stainless steel or the resistance wire is wound on a tubular ceramic body and embedded in glaze. The surface temperature of the heaters shall be restricted to a value which will not shorten the life of the heater sheaths or that of insulator wire or other component in the compartments.

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Besides the space heaters, special moisture and fungus resistant varnish shall be applied on parts which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where

the treatment will interface with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application of the varnish.

11.0 VENTILATION OPENING

In order to ensure adequate ventilation, compartments shall have ventilation openings provided with fine wire mesh of brass to prevent the entry of insects and to reduce to a minimum the entry of dirt and dust. Outdoor compartment openings shall be provided with shutter type blinds and suitable provision shall be made so as to avoid any communication of air/ dust with any part in the enclosures of the Control Cabinets, Junction boxes and Marshalling Boxes, panels etc.

12.0 DEGREE OF PROTECTION

The enclosures of the Control Cabinets, junction boxes and Marshalling Boxes, panels etc. to be installed shall be provided with degree of protection as detailed here under:

- a) Installed out door : IP-55
- b) Installed indoor in air conditioned area : IP-31
- c) Installed in covered area : IP -52
- d) Installed indoor in non air-conditioned area where possibility of entry of water is limited: IP-41
- e) For LT Switchgear (AC & DC distribution Boards): IP-52

The degree of protection shall be in accordance with :13947 (Part-I)/ IEC-60947 (Part-I)/ IS

12063 / IEC-60529. Type test report for degree of protection test, on each type of the box shall be submitted for approval.

13.0 RATING PLATES, NAME PLATES AND LABELS

Each main and auxiliary item of substation is to have permanently attached to it in a conspicuous position a rating plate of non-corrosive material upon which is to be engraved manufacturer's name, year of manufacture, equipment name, type or serial number together with details of the loading conditions under which the item of

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substation in question has been designed to operate, and such diagram plates as may be required by the Purchaser. The rating plate of each equipment shall be according to IEC requirement.

All such nameplates, instructions plates, rating plates CB, CT, VT, SA, Isolators and Relay & Protection panels equipments shall be bilingual with Hindi inscription first followed by English. Alternatively two separate plates one with Hindi and the other with English inscriptions may be provided.

14.0 FIRST FILL OF CONSUMABLES, OIL AND LUBRICANTS

All the first fill of consumables such as oils, lubricants, filling compounds, touch up paints, soldering/brazing material for all copper piping of circuit breakers and essential chemicals etc. which will be required to put the equipment, covered under the scope of the specifications, into successful operation, shall be furnished by the Bidder unless specifically excluded under the exclusions in these specifications and documents.

15.0 PACKAGING AND PROTECTION

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. The Bidder shall also submit packing details/associated drawing for any equipment/material, to facilitate the Purchaser to repack any equipment/material at a later date. The Bidder shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Bidder.

All coated surfaces shall be protected against abrasion, impact, discolouration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protectin device. All ends of all valves and pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner.

16.0 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished

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or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling.

All external painting shall be as per shade No. 631 of IS: 5.

17.0 HOT DIP GALVANISING

All ferrous parts including all sizes of nuts, bolts, plain and spring washers, support channels, structures, shall be hot dip galvanized conforming to latest version of IS: 2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro- galvanized. Minimum weight of zinc coating shall be 610 gm/ sq.mm and minimum thickness of coating shall be 85 microns for all items thicker than 6 mm. For items lower than 6mm thickness, requirement of coating shall be as per relevant ASTM. For surface which shall be embedded in concrete, the zinc coating shall be 610 gm/sq. m minimum.

The galvanized surfaces shall have a continuous and uniform thick coating of zinc, firmly adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surface, flaking or peeling off,

etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

After galvanizing, no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

Galvanised material must be transported properly to ensure that galvanised surfaces are not damaged during transit. Application of zinc rich paint at site shall not be allowed.

18.0 PROTECTIVE GUARDS

Suitable guards shall be provided for protection of personnel on all exposed rotation and/of moving machine parts. All such guards with necessary spares and accessories shall be designed for easy installation and removal for maintenance purpose.

19.0 TOOLS AND TACKLES

The Bidder shall supply with the equipment one complete set of all special tools and tackles for the erection, assembly, dis-assembly and maintenance of the equipment.

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However, these tools and tackles shall be separately packed and brought on to site.

**20.0 CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES AND MARSHALLING
BOXES FOR OUTDOOR EQUIPMENT**

- 20.1 All types of boxes, cabinets etc. shall generally conform to and be tested in accordance with IS-5039/ IS-8623, IEC-60439, as applicable, and the clauses given below.
- 20.2 Control cabinets, junction boxes, marshalling boxes and terminal boxes shall be made of sheet steel or aluminum enclosure and shall be dust, water and vermin proof. Sheet steel used shall be at least 2.0 mm thick cold rolled or 2.5 mm hot rolled. The box shall be properly braced to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. In case of aluminum enclosed box, the thickness of aluminum shall be such that it provides adequate rigidity and long life as comparable with sheet steel of specified thickness.
- 20.3 Cabinet/boxes shall be free standing floor mounting type, wall mounting type or pedestal mounting type as per requirements. A canopy and sealing arrangements for operating rods shall be provided in marshalling boxes/ Control cabinets to prevent ingress of rain water.
- 20.4 Cabinet/boxes shall be provided with double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. The quality of the gasket shall be such that it does not get damaged/cracked during the operation of the equipment.
- 20.5 All doors, removable covers and plates shall be provided gasket all around with suitably profiled EPDM/Neoprene gaskets. The gasket shall be tested in accordance with approved quality plan, IS:11149 and IS:3400. The quality of gasket shall be such that it does not get damaged/cracked during 10(ten) years of operation of the equipment or its major overhaul whichever is earlier. All gasketed surfaces shall be smooth straight and reinforced if necessary to minimize distortion and to make a tight seal. Ventilating Louvers, if provided, shall have screen and filters, the screen shall be fine wire mesh made of brass.
- 20.6 All boxes/ cabinets shall be designed for the entry of cables from bottom by means of weather proof and dust-proof connections. Boxes and cabinets shall be designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet. Suitable cable gland plate projecting at least 150 mm above the base of the marshalling kiosk/box shall be provided for this purpose along with the proper blanking plates. Necessary number of cable glands shall be supplied and fitted on this gland plate. Gland plate shall have provision for some future glands to be provided later, if required.
- 20.7 A 240V, single phase, 50 Hz, 15 amp AC plug and socket shall be provided in the

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cabinet with ON-OFF switch for connection of hand lamps. Plug and socket shall be of industrial grade.

- 20.8** For illumination, a 20 Watts fluorescent tube or 15 watts CFL/LED bulb shall be provided. The switching of the fittings shall be controlled by the door switch.

For junction boxes of smaller sizes such as lighting junction box, manual operated earth switch mechanism box etc., plug socket, heater and illumination is not required to be provided.

- 20.9** All control switches shall be of rotary type. Toggle piano switches shall not be accepted.

- 20.10** Positive earthing of the cabinet shall be ensured by providing two separate earthing pads. The earth wire/ strip shall be terminated on to the earthing pad and secured by the use of self etching washer. Earthing of hinged door shall be done by using a separate earth wire.

- 20.11** The bay marshalling kiosks shall be provided with danger plate and a diagram showing the numbering/connection/feruling by pasting the same on the inside of the door.

- 20.12** a) The following routine tests alongwith the routine tests as per IS: 5039 shall also be conducted.

Check for wiring
Visual and dimension check

- b) The enclosure of bay marshalling kiosk, junction box, terminal box shall be type tested for IP-55 as per IS: 13947. After IP-55 test, 2.5 kVrms for 1 (one) minute, insulation resistance and functional test should be conducted.

20.13 Auxiliary Switches

All the auxiliary switches shall be fully type tested as per relevant IS.

The following type test reports on auxiliary switches shall be submitted:

- (a) Electrical endurance test - A minimum of 2000 operation for 2A D. C. with a time constant greater than or equal to 20 millisecond with a subsequent examination of mV drop/visual defects/temperature rise test.
- (b) Mechanical endurance test. A minimum of 1, 00,000 operations with a subsequent checking of contact pressure test/visual examination.
- (c) Heat run test

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SECTION -4

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SHEET 1 OF 2**SECTION-4****GUARANTEED TECHNICAL PARTICULARS****To be submitted by the bidder at the time of the bid**

1	Make	
2.	Model No. a. Indoor Unit b. Outdoor Unit	
3.	Tonnage Capacity and star rating	2 TR / 4 star or above
4	Cooling Capacity	22000btu/hr (Minimum)
5	Type of AC	High Wall Type Split AC
6	Power Supply	Single Phase, 230 V
7	Evaporator unit	High Wall type indoor with cordless remote controller
8	Compressor	Hermetically Sealed, Reciprocating / rotary
9	Refrigerant Piping	Material -Copper Thermally insulated between the indoor unit (evaporator) and outdoor unit (condenser)
10	Filters	Removable and washable polypropylene
11	Programmable timer	Yes
12	Sleep Mode	Yes
13	Dry mode	Yes

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14	Dimension a. Indoor Unit b. Outdoor Unit	
15	Weight a. Indoor Unit b. Outdoor Unit	
16	ECU for GIS Relay Panel Room	Yes

Signature of the authorized representative of Bidder

Name _____

Designation_____

Place_____

Date _____

Company Seal

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SECTION-5
SCHEDULES TO BE FILLED BY THE BIDDER

- Schedule 1 Certificate of No deviation
- Schedule 2 Schedule of unpriced quote
- Schedule 3 Details of contact person both technical and commercial
- Schedule 4 Enclosures to Specification
- Drawings

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SECTION -5**SHEET 2 OF 6****SCHEDULE-1****CERTIFICATE OF NO DEVIATION**

We confirm that there are no deviations whatsoever and our offer is in full compliance with the specification. We also confirm that there are no deviations in any other form such as comments, variations/ GTP and/ or exceptions.

Signature of the authorized representative of Bidder

Name : _____

Designation : _____

Place : _____

Date : _____

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SECTION -5**SHEET 3 OF 6****SCHEDULE-2**Bidders shall attach signed and stamped **unpriced** copy of this BoQ with their technical offer:

Sl. No.	Item Description	Unit	Qty	Whether Unit Rates have been furnished in priced bid?	
				Supply	ETC
1	High wall type split AC units of 2 T capacity of four star rating complete with indoor, outdoor units and required accessories, stabilizers etc. for 400kV GIS - Relay & Protection panels Room	Nos.	12	YES	YES
2	High wall type split AC units of 2 T capacity of four star rating complete with indoor, outdoor units and required accessories, stabilizers etc. for 220kV GIS - Relay & Protection panels Room	Nos.	9		
3	High wall type split AC units of 2 T capacity of four star rating complete with indoor, outdoor units and required accessories, stabilizers etc. for 132kV GIS - Relay & Protection panels Room	Nos.	9		
4	ECU / Control Panel for 400kV GIS - Relay & Protection panels Room	Nos.	4		
5	ECU / Control Panel for 220kV GIS - Relay & Protection panels Room	Nos.	3		
6	ECU / Control Panel for 132kV GIS - Relay & Protection panels Room	Nos.	3		
7	High wall type split AC units of 2 T capacity of four star rating complete with indoor, outdoor units and required accessories, stabilizers etc. for:				
7.1	SCADA Room	Nos.	3		
7.2	Conference Room	Nos.	2		
7.3	AE Maintenance Room	Nos.	1		
7.4	AE (T&C) Room	Nos.	1		

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7.5	JE Room	Nos.	1		
7.6	Electrical Lab Room	Nos.	1		

Signature of the authorized representative of Bidder

Name :

Designation :

Place :

Date :

Company Seal

SCHEDULE-3

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SECTION -5**SHEET 5 OF 6****DETAILS OF CONTACT PERSON BOTH TECHNICAL AND COMMERCIAL**

Name

Address for correspondence

Phone No.

Fax No.

Email

Place

Date

Signature of the authorized representative of Bidder

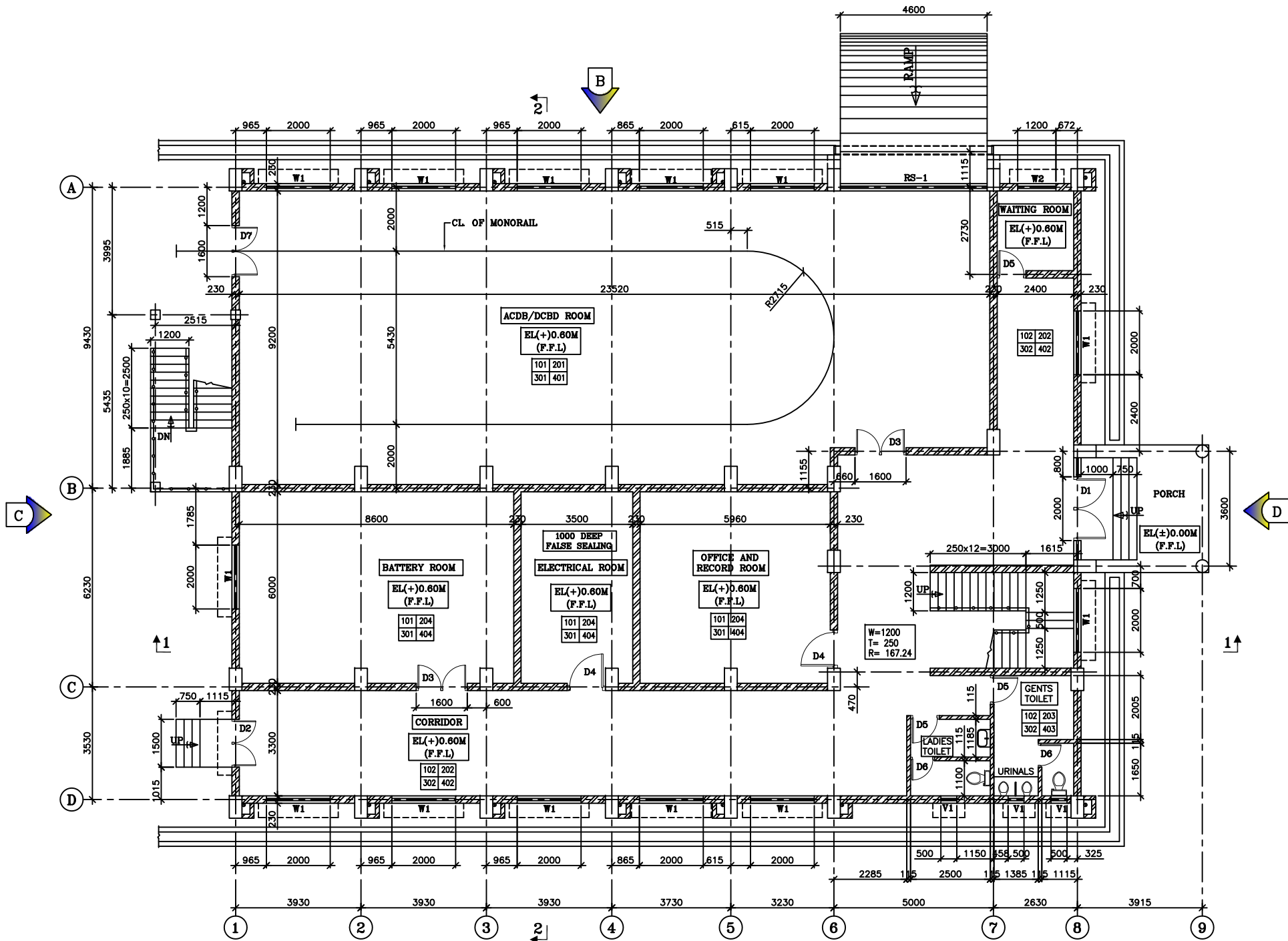
Name-----

Designation-----

Company seal -----

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

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SCHEDULE-4 DRAWINGS CONTROL ROOM BUILDING ARCHITECTURAL DRAWING <i>DRG. NO. TB-1-406-607-620-1, REV-00</i>			



GROUND FLOOR PLAN
(SCALE- 1:75)

PLASTER:

INTERNAL:
12mm THK. PLASTER (1:6 CEMENT : SAND)
EXTERNAL:
18mm THK. PLAIN PLASTER (1:6 CEMENT : SAND)
12mm 1ST LAYER 1:6 C&S, 6MM 2ND LAYER 1:4 C&S
CEILING EXCEPT FOR WHERE FALSE CEILING WILL BE PROVIDED.
6mm THK. PLAIN PLASTER (1:4 CEMENT : SAND)

WATER PROOFING ON ROOF

PROVIDING AND LAYING INTEGRAL CEMENT BASED WATER PROOFING TREATMENT INCLUDING PREPARATION OF SURFACE AS REQUIRED FOR TREATMENT OF ROOFS, BALCONIES, TERRACES ETC CONSISTING OF FOLLOWING OPERATIONS: (A) APPLYING A SLURRY COAT OF NEAT CEMENT USING 2.75 KG/SQM OF CEMENT ADMIXED WITH WATER PROOFING COMPOUND CONFORMING TO THE RCC SLAB INCLUDING ADJOINING WALLS UPTO 300 MM HT. INCLUDING CLEANING THE SURFACE BEFORE TREATMENT (B) LAYING BRICK BATS WITH MORTAR USING BROKEN BRICKS/BRICK BATS 25 MM TO 115 MM SIZE WITH 50% OF CEMENT MORTAR 1:5 (1 CEMENT : 5 COARSE SAND) ADMIXED WITH WATER PROOFING COMPOUND CONFORMING OVER 20 MM THICK LAYER OF CEMENT MORTAR OF MIX 1:5 ADMIXED WITH WATER PROOFING COMPOUND TO REQUIRED SLOPE AND TREATING SIMILARLY THE ADJOINING WALLS UPTO 300 MM HEIGHT INCLUDING ROUNDING OF JUNCTIONS OF WALLS AND SLABS. (C) AFTER TWO DAYS OF PROPER CURING APPLYING A SECOND COAT OF CEMENT SLURRY USING 2.75 KG/ SQM OF CEMENT ADMIXED WITH WATER PROOFING COMPOUND (D) FINISHING THE SURFACE WITH 20 MM THICK JOINTLESS CEMENT MORTAR OF MIX 1:4 WITH WATER PROOFING INCLUDING LAYING GLASS FIBRE CLOTH OF APPROVED QUALITY IN TOP LAYER OF PLASTER AND FINALLY FINISHING THE SURFACE WITH TROWEL WITH NEAT CEMENT SLURRY AND MAKING PATTERN OF 300X300 MM SQUARE 3 MM DEEP. (E) THE WHOLE TERRACE SO FINISHED SHALL BE FLOODED WITH WATER FOR A MINIMUM PERIOD OF TWO WEEKS FOR CURING AND FOR FINAL TEST. ALL ABOVE OPERATIONS TO BE DONE IN ORDER AND AS DIRECTED WITH AVERAGE THICKNESS OF 120 MM AND MINIMUM THICKNESS AT KHURRA AS 65 MM. (CSI NO. 28.30)

NOTES:-

- 1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
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4. EL(+).0.00M CORRESPONDS TO TOP LEVEL OF ROAD WHICH IS +100.0M ABSOLUTE ELEVATION.
5. FINAL LOCATION OF CABLE TRENCHES REFER APPROVED ELECTRICAL DRAWINGS.

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE			ZONE		

PROJECT: 400/220/132kV GIS SUBSTATION AT SHAMLI (U.P.)											
CUSTOMER: UTTAR PRADESH POWER TRANSMISSION CORPORATION LIMITED											
BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION BUSINESS GROUP NOIDA											
STRUCTURAL CONSULTANTS:- STRUCMECH ENGINEERS PVT. LTD. 93, MAYA BHAWAN, OLD A.G. COLONY, KADRU, RANCHI PH. 0651 2340631, FAX 0651 2340631								NAME	SIGN.	DATE	NO.OF VAR.
SME								DRN.	Subrata	26.03.19	N.A.
								CHD.	Madhush	26.03.19	N.A.
								APPD.	Madhush	26.03.19	N.A.
DEPT. TBG CODE	UNTOL. DIMS. GR. 2/M/F	SCALE N.T.S	WEIGHT (KG) N.A.	REF. TO ASSY. DRG. N.A.	ITEM NO. N.A.	NO.OF ITEMS N.A.					
TITLE CONTROL ROOM BUILDING ARCHITECTURAL GROUND FLOOR PLAN				CARD CODE NA	DRG.NO. TB-1-406-607-620-1	REV. 00					
				SHT. No 01	NO. OF SHT. 03						

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D

C

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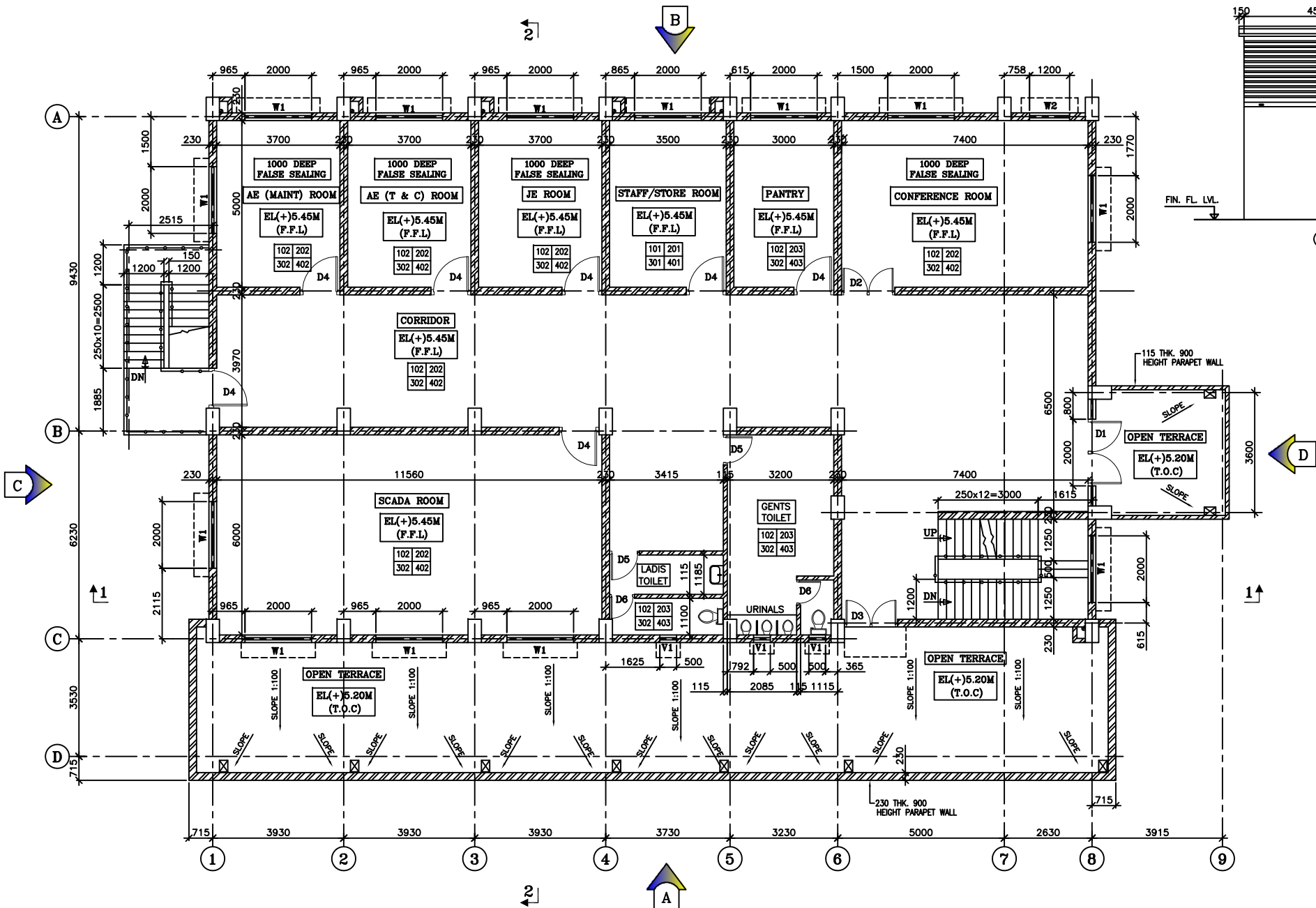
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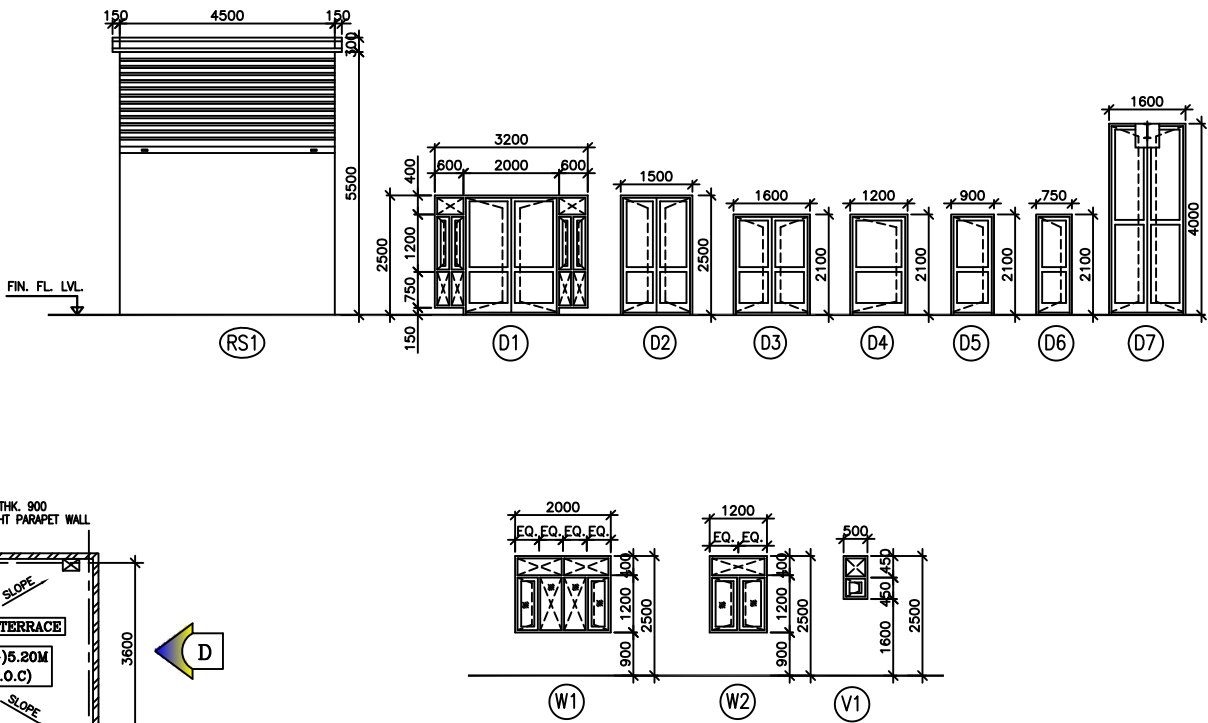
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FIRST FLOOR PLAN
(SCALE- 1:75)



SCHEDULE OF DOORS & WINDOWS

TYPE	OPENING SIZE	FRAME SIZE	CILL LEVEL	LINTEL LEVEL	NOS.	DESCRIPTION
RS-1	4500x5500	4500x5500	-	6100	1	STEEL ROLLING SHUTTER
D1	2000x2500	1980x2490	-	3100	2	DOUBLE SHUTTER ALUMINIUM DOOR
D2	1500x2500	1480x2490	-	3100	2	DOUBLE SHUTTER STEEL DOOR
D3	1600x2100	1580x2090	-	2600	4	DOUBLE SHUTTER ALUMINIUM DOOR
D4	1200x2100	1180x2080	-	2600	10	SINGLE SHUTTER STEEL DOOR
D5	900x2100	880x2080	-	2600	4	SINGLE SHUTTER PVC DOOR
D6	750x2100	730x2080	-	2600	4	SINGLE SHUTTER PVC DOOR
D7	1600x4000	1580x3980	-	-	1	DOUBLE SHUTTER ALUMINIUM DOOR
W1	2000x1200	1980x1180	1500	2600	24	ALUMINIUM WINDOW FULLY GLAZED
W2	1200x1200	1180x1180	1500	2600	1	ALUMINIUM WINDOW FULLY GLAZED
V1	2000x600	1980x580	2200	2600	6	FIXED ALUMINIUM VENTILATOR

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ZONE			ZONE			ZONE			ZONE		

PROJECT:
400/220/132kV GIS SUBSTATION AT SHAMLI (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LIMITED

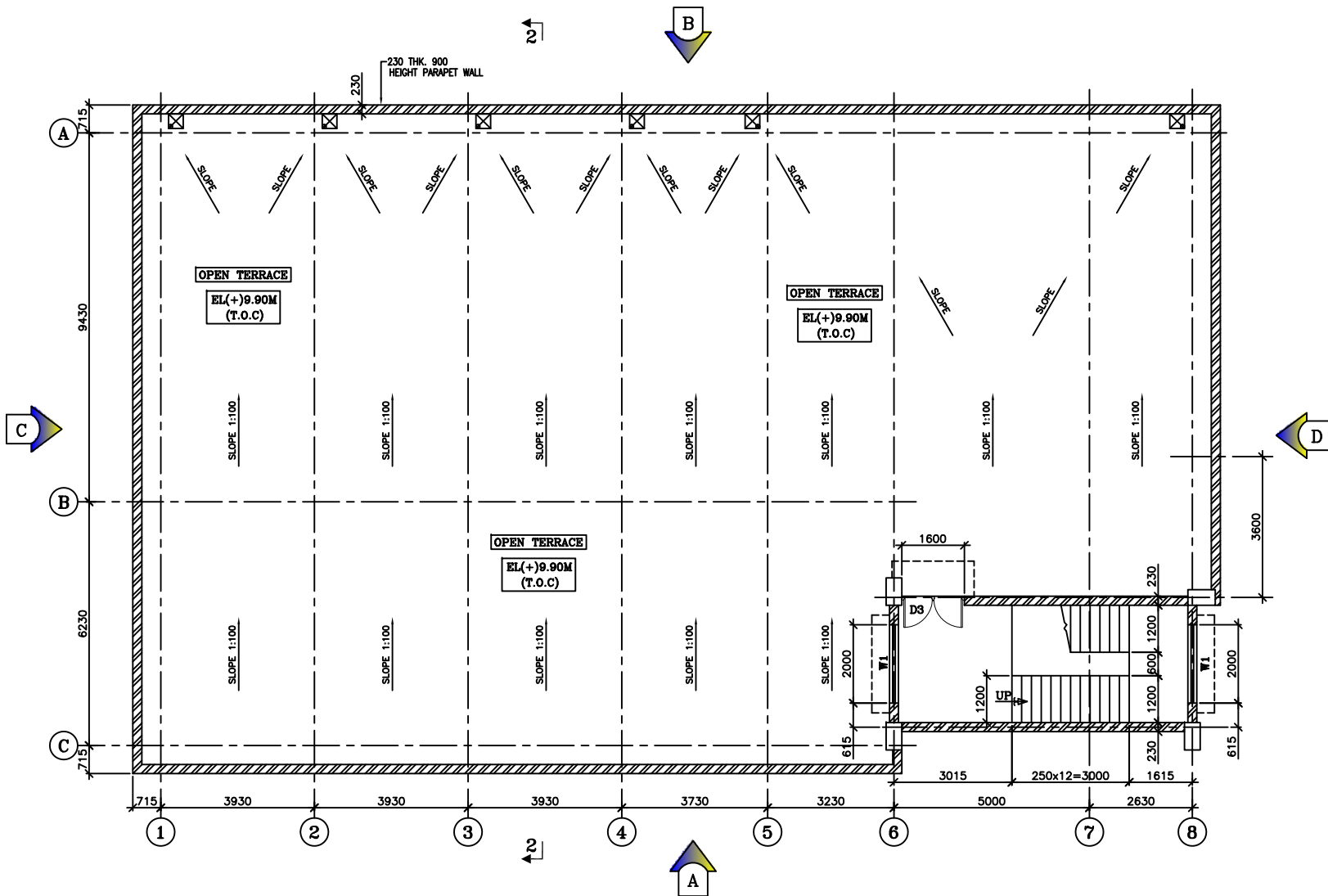
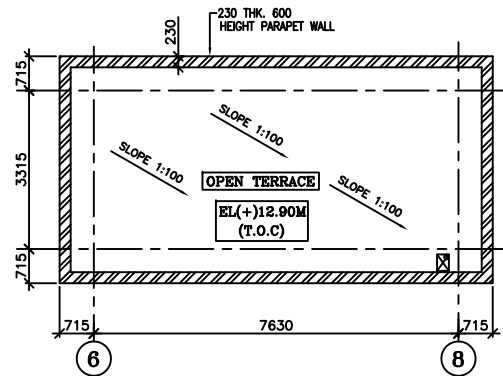


BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA



STRUCTURAL CONSULTANTS:-
STRUCMECH ENGINEERS PVT. LTD.
93, MAYA BHAWAN, OLD A.G. COLONY, KADRU, RANCHI
PH. 0651 2340631, FAX 0651 2340631

 SME	STRUCTURAL CONSULTANTS:- STRUCMECH ENGINEERS PVT. LTD. 93, MAYA BRAHAN, OLD A.G. COLONY, KADURU, RANCHI ☎ PH. 0651 2340631, FAX 0651 2340631				NAME	SIGN.	DATE	NO.OF VAR.
				DRN.	Subrata		26.03.19	
				CHD.	Madush		26.03.19	N.A.
				APPD.	Madush		26.03.19	
DEPT. TBG CODE	UNTOL. DIMS. GR. g/M/F		SCALE N.T.S	WEIGHT (KG) N.A.	REF. TO ASSY. DRG. N.A.		ITEM NO. N.A.	NO.OF ITEMS N.A.
TITLE CONTROL ROOM BUILDING ARCHITECTURAL FIRST FLOOR & DETAILS OF DOOR AND WINDOWS.					CARD CODE	DRG.NO. TB-1-406-607-620-1		REV. 00
					NA	SHT. No 02		NO. OF SHT. 03

TERRACE FLOOR PLAN
(SCALE- 1:75)MUMTY ROOF FLOOR PLAN
(SCALE- 1:75)

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REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE			ZONE		

ILLUSTRATION OF FINISHES.				FINISHES OF SCHEDULE					
<table border="1"><tr><td>WALL SERIES 100</td><td>FLOORING SERIES 200</td></tr><tr><td>CEILING SERIES 300</td><td>SKIRTING/ DADO SERIES 400</td></tr></table>	WALL SERIES 100	FLOORING SERIES 200	CEILING SERIES 300	SKIRTING/ DADO SERIES 400	WALL FINISHES--				
	WALL SERIES 100	FLOORING SERIES 200							
	CEILING SERIES 300	SKIRTING/ DADO SERIES 400							
	SR.NO.	CODE NO.	DESCRIPTION						
	1.	101	ARYLIC DISTEMPER						
2.	102	ARYLIC EMULSION PAINT							
SKIRTING/DADO FINISHES				FLOORING FINISHES					
1.	401	CEMENT PLASTER SKIRTING 150 MM HIGH		1.	201	CEMENT CONCRETE FLOORING			
2.	402	VITRIFIED TILES SKIRTING 150 MM HIGH		2.	202	VITRIFIED TILES			
3.	403	GLAZED TILE UPTO 1200 MM HIGH		3.	203	GLAZED TILES			
4.	404	ACID RESISTANT TILES UPTO 1200 MM HIGH		4.	204	ACID RESISTANT TILES			
CEILING FINISHES									
1.	301	ARYLIC DISTEMPER							
2.	302	ARYLIC EMULSION PAINT							

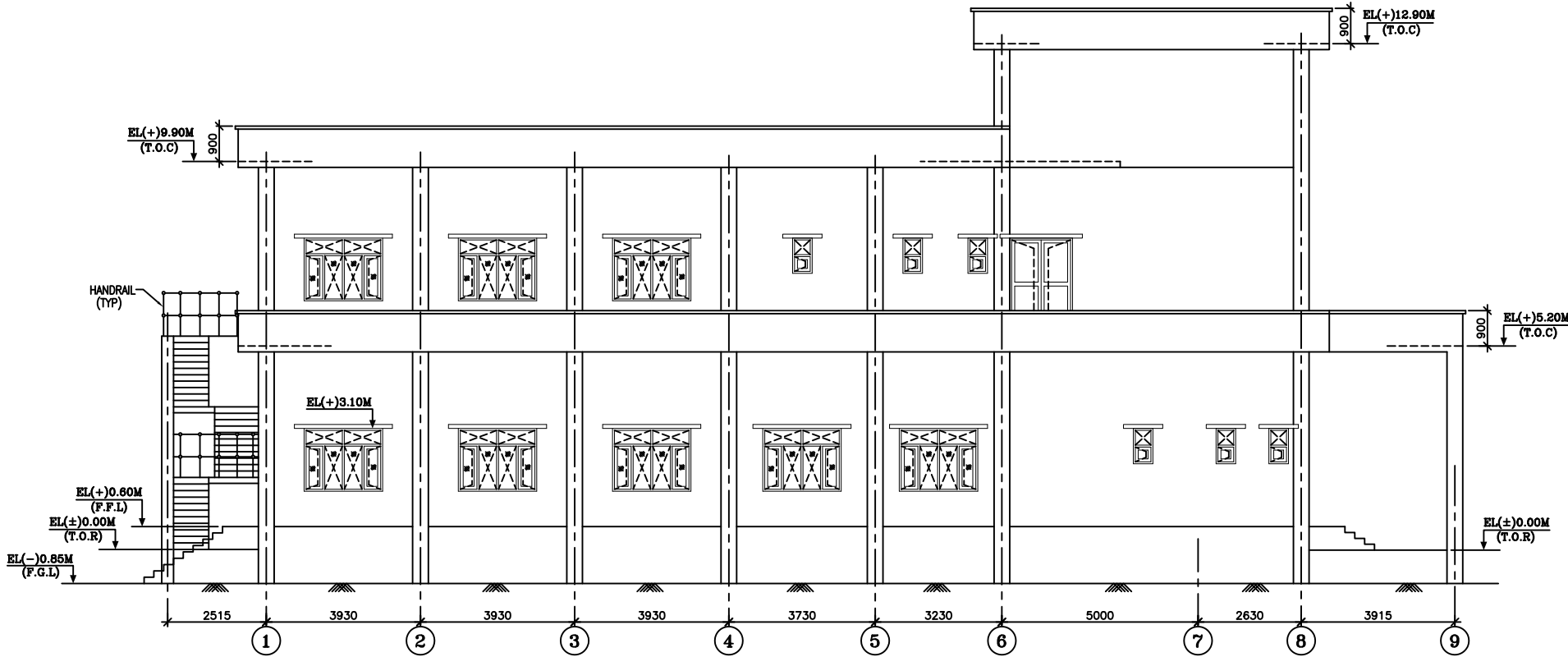
PROJECT:

400/220/132kV GIS SUBSTATION AT SHAMLI (U.P.)

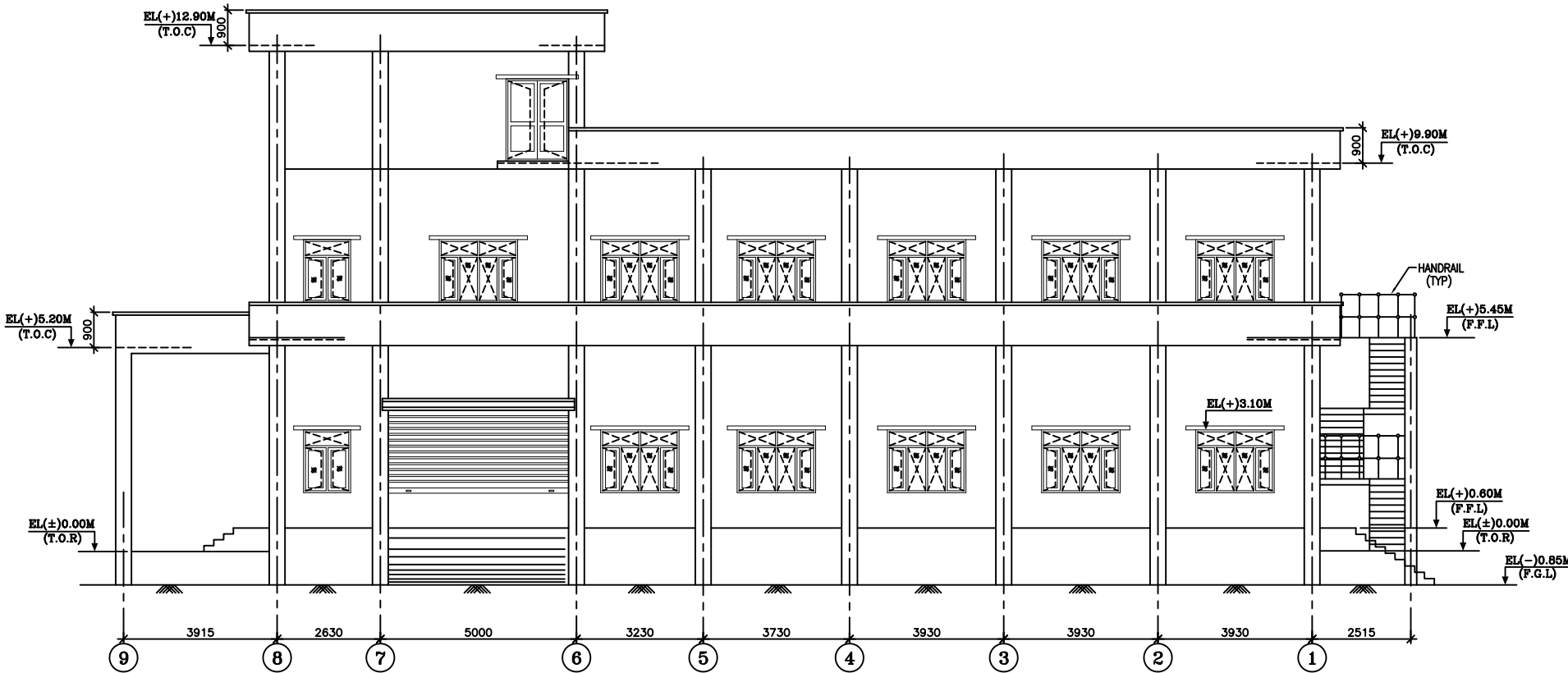
CUSTOMER:

UTTAR PRADESH POWER TRANSMISSION CORPORATION LIMITED

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDASTRUCTURAL CONSULTANTS:-
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93, MAYA BHAWAN, OLD A.G. COLONY, KADRU, RANCHI
☎ PH. 0651 2340631, FAX 0651 2340631DEPT.
TBG
CODEUNTOI. DIMS.
GR.
g/m/fSCALE
N.T.SWEIGHT (KG)
N.A.REF. TO ASSY. DRG.
N.A.ITEM NO.
N.A.NO.OF
ITEMS
N.A.TITLE
ARCHITECTURAL TERRACE PLAN & FINISHING SCHEDULECONTROL ROOM BUILDING
TB-1-406-607-620-2CARD
CODE
NADRG.NO.
TB-1-406-607-620-2
SHT. No 03REV.
00
NO. OF SHT. 03



ELEVATION-A



ELEVATION-B

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PROJECT:

400/220/132kV GIS SUBSTATION AT SHAMLI (U.P.)

CUSTOMER:

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	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	Subrata		26.03.19	
CHD.	Mishra		26.03.19	N.A.
APPD.	Mishra		26.03.19	

DEPT. TBG CODE	UNTOL DIMS. GR. 2/M/F		SCALE N.T.S.	WEIGHT (KG) N.A.	REF. TO ASSY. DRG. N.A.	ITEM NO. N.A.	NO.OF ITEMS N.A.
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TITLE
CONTROL ROOM BUILDING
ARCHITECTURAL ELEVATIONS

CARD CODE NA	DRG.NO. TB-1-406-607-620-2	REV. 00
SHT. No 01		NO. OF SHT. 02

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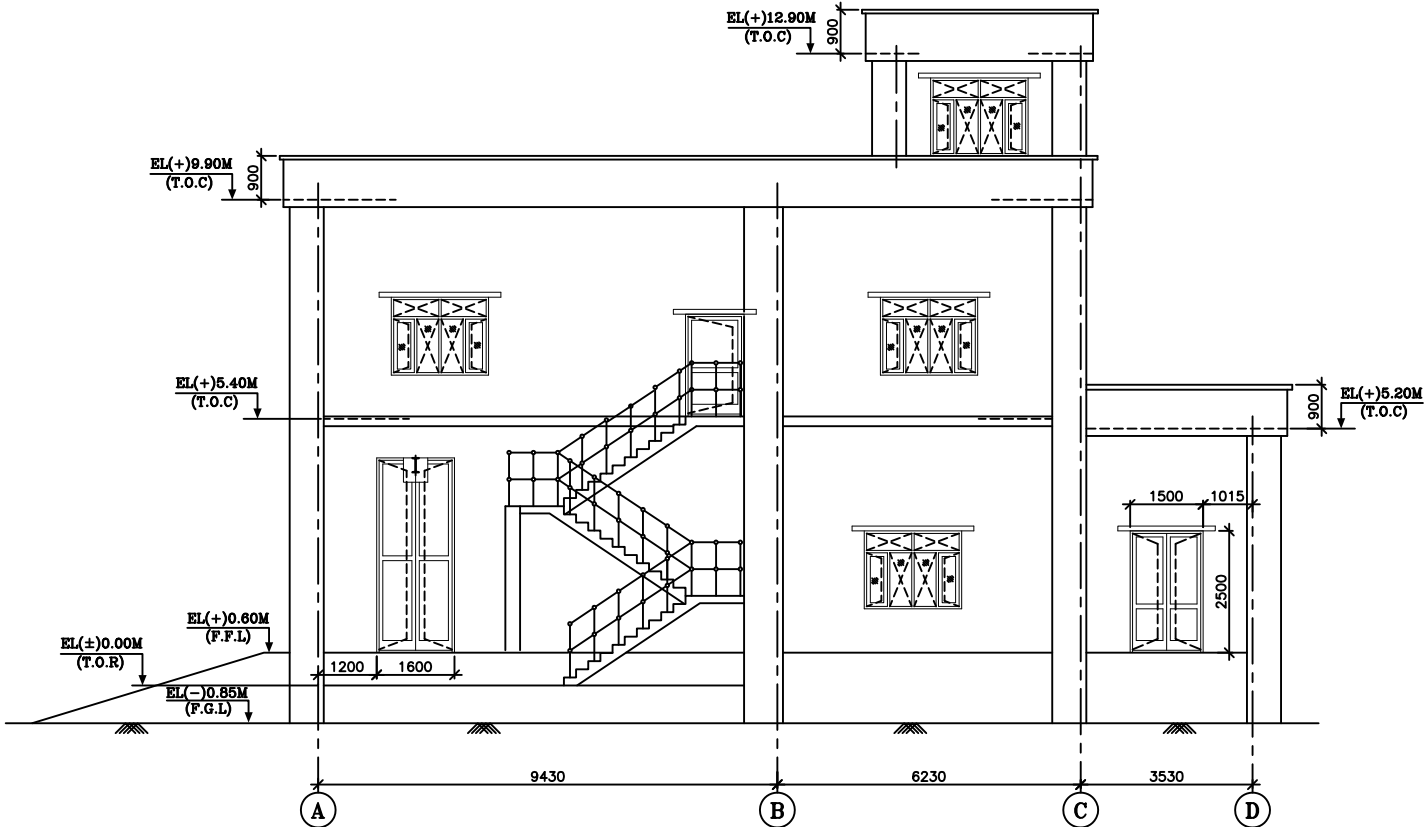
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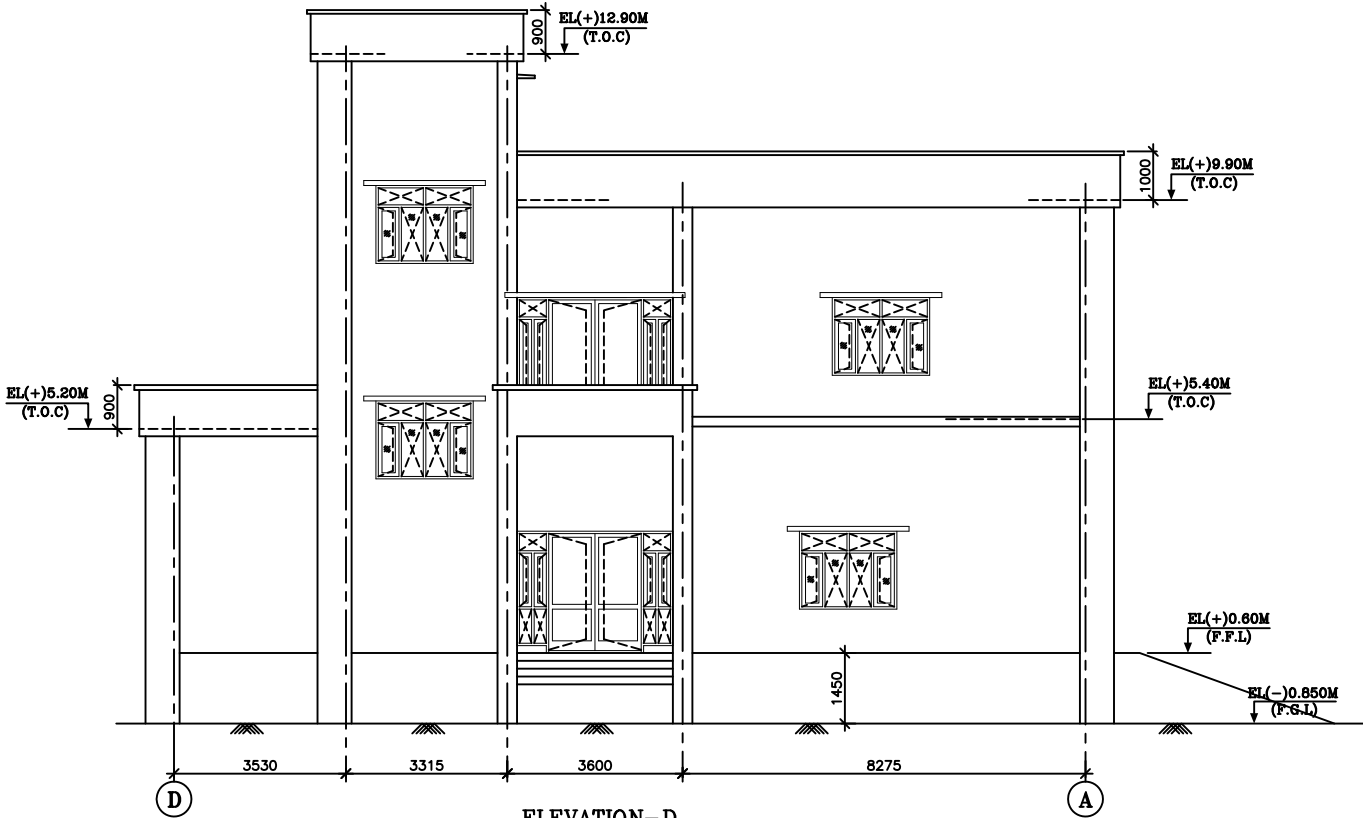
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ELEVATION-C

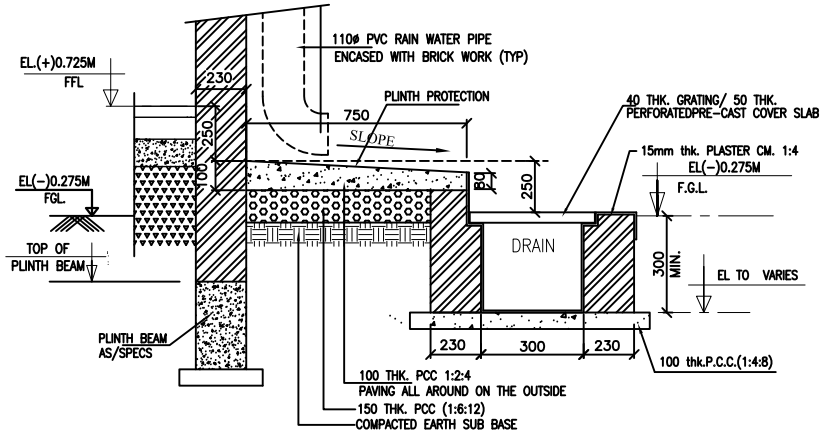


ELEVATION-D

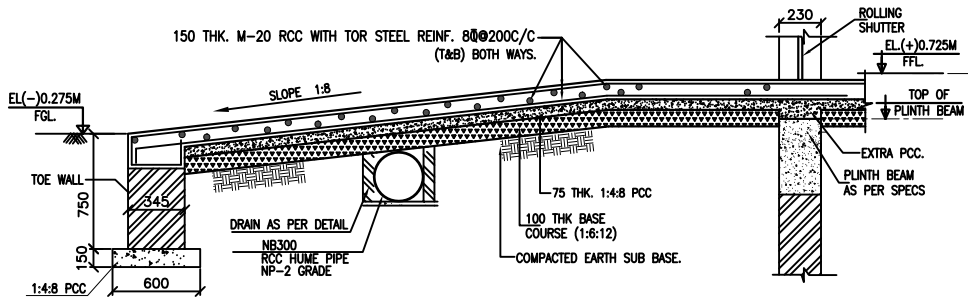
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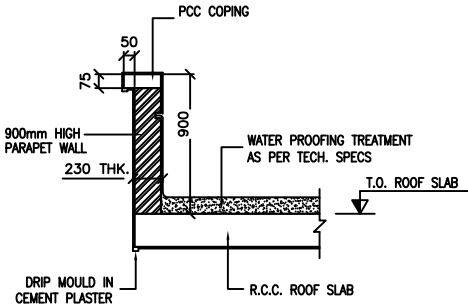
REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE			ZONE		



PLINTH PROTECTION ALONG BUILDING
WITH DRAIN-TYPICAL



DETAIL OF RAMP



TYP. DETAIL OF PARAPET

PROJECT:

400/220/132kV GIS SUBSTATION AT SHAMLI (U.P.)

CUSTOMER:

UTTAR PRADESH POWER TRANSMISSION CORPORATION LIMITED



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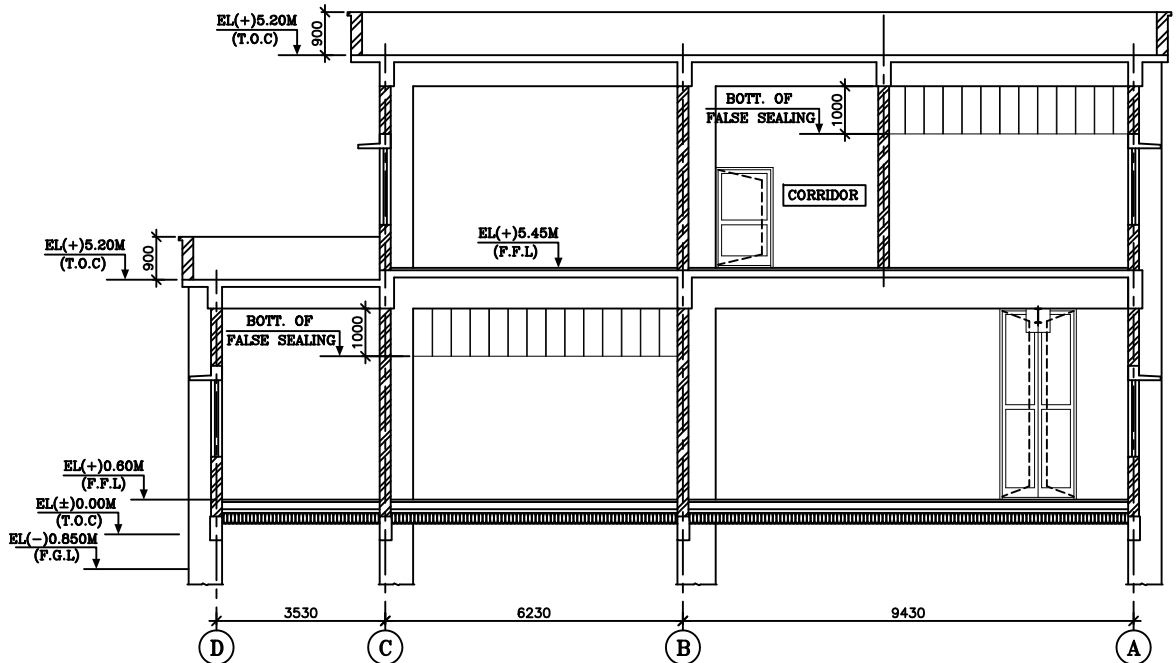
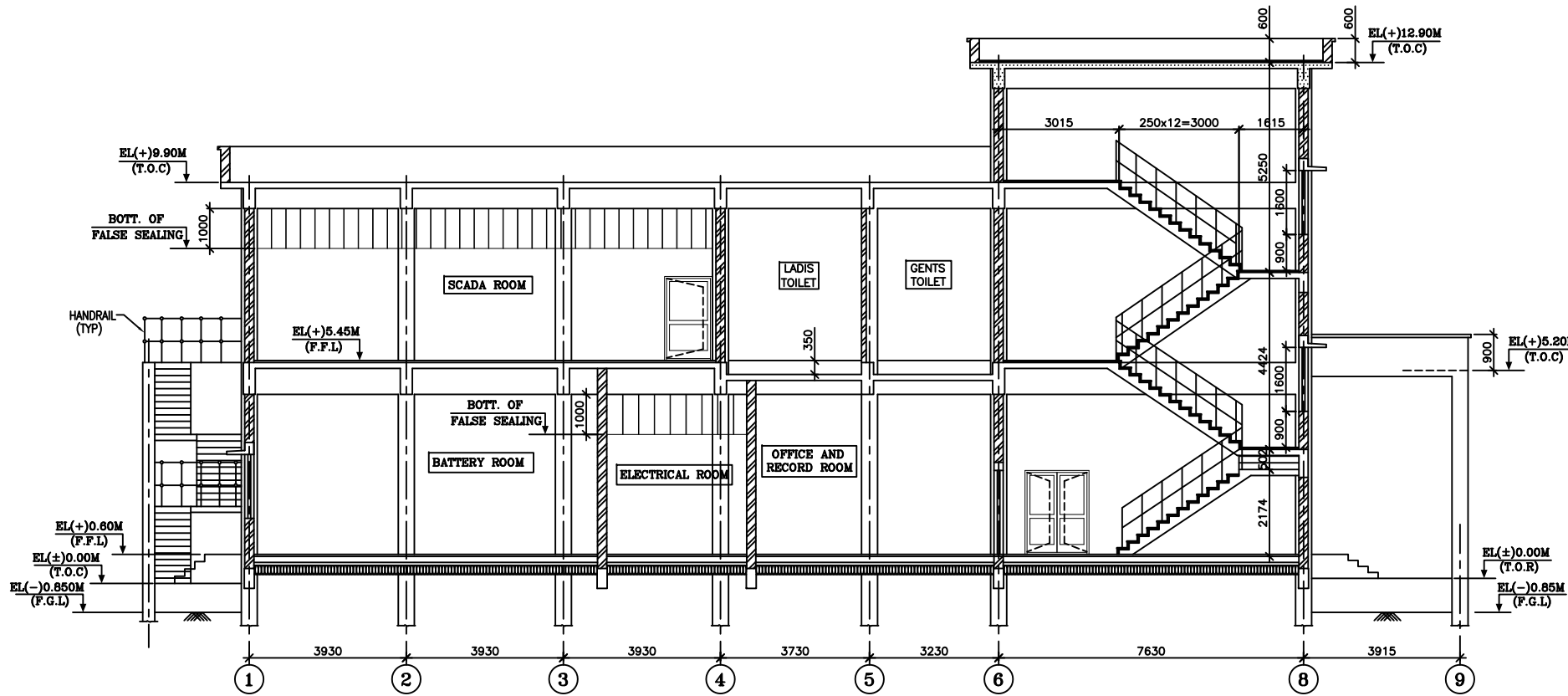
NAME	SIGN.	DATE	NO.OF VAR.
DRN. Subrata		26.03.19	
CHD. Mishra		26.03.19	N.A.
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DEPT. TBG CODE	UNTOL. DIMS. GR. Ø/M/Y		SCALE N.T.S	WEIGHT (KG) N.A.	REF. TO ASSY. DRG. N.A.	ITEM NO. N.A.	NO.OF ITEMS N.A.
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TITLE

CONTROL ROOM BUILDING
ARCHITECTURAL ELEVATIONS

CARD CODE NA	DRG.NO. TB-1-406-607-620-2	REV. 00
SHT. No 02		NO. OF SHT. 02



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PROJECT:

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TITLE

CONTROL ROOM BUILDING
ARCHITECTURAL SECTIONS

CARD CODE NA	DRG.NO. TB-1-406-607-620-3	REV. 00
SHT. No 01	NO. OF SHT. 01	