BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
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CUSTOMER	UP POWER TRANSMISSION CORPORATION LTD. (UPPTCL)						
PROJECT	400/220/132 kV GIS SUBSTATION AT RASRA, BALLIA						

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विषय-सूचि /CONTENTS

अनुभाग / Section	विवरण /Description	पृष्ट संख्या/ No of Pages
1	Intent, System Requirement and Scope	07
2	Equipment Specification	04
3	Project details and general specifications	28
4	List of Drawings & Documents	01
5	Enclosures to Specification	04

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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 **Ventilation System** as mentioned in different sections of this specification for **400/220/132 KV Sub-station at Ballia** of Uttar Pradesh Power Transmission Corporation Limited (UPPTCL).

1.2.0 The requirements specified under **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 & 2** 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 lump sum basis for the package. Within the scope of the contract no variation shall be admissible to the contractor so far the inputs remain unchanged. The Contractor shall be responsible for providing all material, equipment and services, specified or otherwise which are required to fulfill the intent of ensuring operability, maintainability and the reliability of the complete work covered under this specification. In case of change in the input after placement of order the additions / deletions to the scope shall be settled on the basis of mutually agreed rates.

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.

2.0.0 VENTILATION REQUIREMENT FOR VARIOUS AREAS

Ventilation System for GIS Building

The building shall have arrangement to maintain pressurised air in order to prevent the ingress of dust in the GIS Hall.

The GIS hall shall have an independent ventilation system. Each ventilation system shall consist of **two 100% capacity systems, one operating and one standby**.

To ensure that the air being supplied to the GIS hall is free from dust particles, a minimum **two stage dust filtration process** shall be supplied. This shall consist of at least the following:

1. Pre Filters: To remove dust particles down to **10 microns in size** with at least 95% efficiency.

2. Fine Filters: To remove dust particles down to **5 microns in size** with at least 99% efficiency.

All the filters shall be panel type. Easy access should be available to the filters for replacement/cleaning.

The ventilation of the GIS hall shall be of a positive pressure type with minimum **4 air changes per hour**. **The pressure inside the GIS hall shall be maintained 5 mm of Water above the atmospheric pressure**. Fresh outdoor air shall be filtered as per requirement before being blown into the GIS hall by the centrifugal air fans to avoid dust accumulation on components present in the GIS hall. **Each GIS hall shall be provided with motorized exhaust dampers with local control.**

Ventilation shall be provided in the following areas:

Sl. No.	Area
i)	400 kV GIS Hall
ii)	220 kV GIS Hall
iii)	132 kV GIS Hall

Note:

The layout for 400kV, 220kV and 132kV GIS building is enclosed for reference and tender purpose only. Bidder may refer dimensions of GIS Hall building from the architecture drawing attached to this specification. However final drawing shall be provided with exact dimensions during detailed engineering. Dimensions may vary +/-10% hence, bidder may choose the capacity of equipment with sufficient margin.

3.0.0 ELECTRICAL SYSTEM REQUIREMENTS

One (1) no. dedicated MCC panel in ventilation room of each GIS Hall shall be provided. This MCC shall extend power supplies to centrifugal fan in this room. Two nos. incomers of adequate capacity shall be provided from the main ACDB (in control room building) and the same will be terminated in ventilation system MCC (in AHU room of their respective GIS Hall) with a mechanical changeover switch. Lamps shall be provided for indicating the status of each fan etc. in the panel. All annunciations related to failure of equipment, tripping of equipment, source of failure/reason due to which the equipment is stopped/tripped, low & high limits of parameters such as level, temp., pressure drop etc. as applicable shall be provided for each fan in the panel. Fully wired, 20% spare annunciation windows shall be provided in the panel.

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 during contract stage on account of supply & installation of these unaccounted items.

4.1.0 SCOPE OF SUPPLY

Exact requirements shall be worked out during detailed engineering after award of contract. The scope of the work under the contract shall be deemed to include all such items, which although not specifically mentioned in the bid documents and/or in the bidder's proposal, but are required to make the equipment/system complete for its safe, efficient, reliable and trouble free operation, unless the same is specifically excluded from the Bidder's scope of work under clause 5.0 of this section.

4.1.1 Bidder shall also consider the following while quoting for the system:

i) Power & Control cables will be supplied on free issue basis to contractor. Contractor shall have to choose their cables from the available sizes only and necessary modifications in their equipment for termination of these cables shall be made by contractor.

ii) Since laying & termination of all cables is in contractor's scope, supply of cable accessories such as lugs, glands, cable tags & markers etc. shall be included by the bidders in their offers.

iii) Necessary cable trays will be supplied on free issue basis to the contractor, however necessary hardware for fixing the same on walls or elsewhere shall be included by the bidders in their offers.

iv) Earthing material viz. GS flat & wire will also be supplied on free issue basis to contractor; however, requirement shall be given by the bidders in their respective bids.

v) Bidder shall ensure that sufficient quantities of commissioning spares are made available for timely completion of commissioning of the system. The bidder shall furnish a list of Commissioning spares that will be brought by him. The unused commissioning spares shall be returnable to the bidder.

vi) Conducting performance guarantee tests as per approved procedure to the satisfaction of Owner / Purchaser and handing over an operational system to the owner. Procedure for performance guarantee test shall be submitted by contractor for customer review and approval.

vii) Contractor shall submit valid Type test report for approval by owner. Fresh type test of equipment is not envisaged. It is presumed that equipment offered is duly type tested.

In case the type test reports are found un-satisfactory, tests shall be carried out afresh by contractor without any additional cost implication to BHEL.

Bidder may read all clauses of technical specification and quote accordingly.

Final applicable make is subject to ultimate customer approval without any cost implication to BHEL. Ultimate client may ask for any make and the same shall be binding on the contractor without any commercial implication.

4.2.0 SCOPE OF SERVICES

A. **Erection, Testing & Commissioning (ETC) requirements**

i) The scope of ETC shall include receipt of material at site, unloading, safe storage of material, handling of equipment/ material at site, erection of equipment /material at site including fabrication, equipment and system testing, commissioning of the entire system, conducting performance guarantee tests to the satisfaction of Owner / Purchaser and final handing over to the owner of the entire system.

ii) Furnishing technical calculations in support of equipment selection or sizing as and when required.

B. **Electrical System**

i) Preparations of cable interconnection diagram for equipment supplied under this contract and accordingly offer guidance to the purchaser for laying necessary cables. Termination details shall also be furnished in the said interconnection table.

ii) Cables laying for incomers to the MCC panel shall be done by the purchaser while termination of the same to the MCC panel end supplied under this contract is in bidder's scope of works. The contractor has to lay and terminate all the other power and control cables supplied under the present scope.

iii) Laying & Termination of Power/ Control cables for the equipment under the scope of this specification. Bidders shall include all cable accessories like lugs, glands, cable tags, markers etc. in their respective bids.

iv) Earthing of all installations (to the nearest earth mat/ earthing pad) supplied under the scope of this specification wherever applicable shall be done by contractor. However earthing material shall be supplied by BHEL.

C. All machinery tools & tackles and consumables required for erection/testing/commissioning of the system shall be arranged by the Bidder.

D. Minor modifications, alterations in system installation as per customer's specific requirements shall be done without any extra cost to purchaser.

E. Painting of all the equipment shall be done to match the inside wall of GIS hall from aesthetic point of view.

F. After completion of erection and commissioning of the system, the bidder shall provide training

to site engineers of Purchaser/Owner so that they are fully conversant with both electrical and mechanical part of this package.

G. Bidders to ensure that sufficient quantity of spares are made available for timely completion of commissioning of the system. The bidder shall furnish a list of commissioning spares that will be brought by him. The unused commissioning spares shall be returnable to the bidder.

H. **Obtaining approval on documents & installations.**

i) Obtaining, "As Built" certification from purchaser or owner on applicable drawings. Completing documentation as per specification requirement.

ii) Obtaining customer's written acceptance of satisfactory completion of job. (Acceptance of PG + handing over of system and mandatory spares (if any)).

iii) Any other service not explicitly illustrated herein but which may be required to complete the system with its desired functionality or in the spirit of contract shall also deemed to be under the scope of bidder.

I. **Civil Works**

Major civil works such as room & foundations for various equipment shall be in purchaser's scope. However, following shall be in contractor scope of services:

a. Wall openings at suitable locations for ducts and fresh air etc., shall be made by the contractor. Associated civil works such as grouting, filling up crevices/cut outs etc. during installations of equipments shall also be in contractor's scope. Any other damage caused to civil works during ETC work of the equipment/system shall be made good to the original finish by the contractor at no extra cost to the purchaser.

b. Support Structure for all equipments of ventilation system including ducting etc. are in contractor's scope.

c. Providing necessary guidance to / coordination with civil contractor so that appropriate sized / correctly located cut outs are made (by civil contractor) in areas like AHU room and GIS hall pertaining to ventilation system for installation/erection of grilles/diffusers/ducts etc. Suitable wall openings for fresh air and supply & installation of grills shall be done by contractor.

However, in case wall openings / cut outs have not been provided for either duct laying, louver fixing, ventilation fan(s) the same shall have to be made by the Contractor.

Minor modifications, alterations in system installation as per customer's specific requirements shall be done without any extra cost to purchaser. The Bidder shall however supply foundation bolts & hardware and undertake minor civil works such as grouting, filling up of crevices/ cut outs etc. Any damage caused to civil works during ETC work of the equipment/system shall have to be made good to the original finish by the Contractor at no extra cost to the Purchaser.

5.0.0 EXCLUSIONS

a) **Supply of power & control cables are excluded. However, laying and termination of these cables shall be in contractor's scope.** The bidder shall furnish quantity and type of cables required for complete system in their respective bids. Laying & termination is in contractor scope.

b) **Supply of necessary cable trays for laying cables, however hardware for fixing the same on wall trenches or elsewhere shall be included by the bidder in his bid.**

c) **Supply of GI flat or any other for earthing of equipment.**

d) **Major civil works such as AHU rooms & foundations for various ventilation equipment.**

6.0.0 ENGINEERING DRAWINGS / DOCUMENTS

Engineering shall start immediately after the award of the contract.
Submission & approval of all drawings / Data sheet /documents– as per tender requirement. Bidder shall also submit 3 sets of each drawing documents in hard copy for approval

7.0.0 OPERATION & MAINTENANCE (O&M) MANUAL

Operation and Maintenance manuals shall be specifically compiled for the project by the bidders. The draft O&M manual shall be submitted along with the supply of the items. The O&M manual shall contain the following information:

a. Description of the system and equipment with design particulars.
b. Instruction for erection.
c. Instruction for operation, maintenance and repair.
d. Recommended inspection practices and inspection schedule.
e. Ordering information for all replaceable parts.
f. Recommendation for type of lubricants and frequency of lubrication.

8.0.0 HANDING & TAKING OVER

It is the responsibility of the contractor to maintain the Ventilation system for switchyard till PG test conducted successfully and it is handed over to customer. Any defect noted during the period shall be rectified by the contractor without any price implication to BHEL. Also suitable PG tests shall be conducted by the contractor to show the achievement of guaranteed parameters in line with the requirements of specification/ standards/ codes and to the satisfaction of Purchaser/ Owner.

9.0.0 INSPECTION & TESTING

All the equipment shall be inspected prior to dispatch in line with relevant IS, approved GTP/ drawing and technical specification, BHEL/ customer approved QAP. Being standard equipment, no shop tests have been envisaged for ventilation fans. Test certificates for all major equipment of ventilation system will be submitted to customer for verification and release of dispatch instruction.

After the installation is over, the system will be subjected to performance guaranteed test in the presence of customer.

"Performance Guarantee Test Procedure" will be submitted during detailed engineering for approval of customer.

10.0.0 VARIOUS HEADS TO BE QUOTED FOR

Based on the above input it is recommended that the bidders shall submit their LUMPSUM offers in the prescribed format only.

Sl. No.	Item Description	Unit	Qty.	Ex-works Rate	Total Ex-works	ETC rate	Total ETC price
1.0	Ventilation System (positive pressure type) with pre filters and fine filters for 100% capacity of GIS Hall (one operating + one standby for each Hall) alongwith all accessories and panel as per technical specification.						
1.1	400 kV GIS Hall	Lot	1				
1.2	220 kV GIS Hall	Lot	1				
1.3	132 kV GIS Hall	Lot	1				

It may be noted that BOQ furnished by the bidder against main heads as per above Table in Cl. 10.0.0 shall not be considered as limits to scope of supply and ETC. Being a lumpsum offer, any other item, which is not specifically mentioned in this specification 'OR' any item not considered by the bidder in his BOQ 'OR' additional quantity of any given item in Bidder's BOQ, which is required for satisfactory operation of the system shall be supplied and erected without any additional cost implication to BHEL.

SECTION-2

EQUIPMENT SPECIFICATION

1.0. STANDARDS AND CODES

IS:2062 - Steel for general structural purposes
IS:655 - Specification for Metal Air Duct
IS:277 - Specification for Galvanised Steel Sheets
IS-737 - Specification for Wrought Aluminium and Aluminium Sheet & Strip
IS-1079 - Hot rolled cast steel sheet & strip
BS-6540 Part-I - Air Filters used in Air Conditioning and General Ventilation
BS-3928 - Sodium Flame Test for Air Filters (Other than for Air Supply to I.C. Engines and Compressors)
US-PED-2098 - Method of cold DOP & hot DOP test
MIL-STD-282 - DOP smoke penetration method
ASHRAE-52 - Air cleaning device used in general ventilation for removing particle matter
IS:3069 - Glossary of Terms, Symbols and Units Relating to Thermal Insulation Materials.
IS:4671 - Expanded Polystyrene for Thermal Insulation Purposes
IS:8183 - Bonded Mineral Wool
IS:3346 - Evaluation of Thermal Conductivity properties by means of guarded hot plate method
ASTM-C-591-69 - Standard specification for rigid preformed cellular urethane thermal insulation
IS:4894 - Centrifugal Fans
BS:848 - Method of Performance Test for Centrifugal Fans
IS:325 - Induction motors, three-phase
IS:4722 - Rotating electrical machines
IS:1231 - Three phase foot mounted Induction motors
IS:2233 - Designations of types of construction and mounting arrangements of rotating electrical machines
IS:2254 - Vertical shaft motors for pumps
IS:7816 - Guide for testing insulation resistance of rotating machines
IS:4029 - Guide for testing three phase induction motors
IS:4729 - Rotating electrical machines, vibration of, Measurement and evaluation of
IS:4691 - Degree of protection provided by enclosures for rotating electrical machinery
IS:7572 - Guide for testing single-phase a.c. motors
IS:2148 - Flame proof enclosure for electrical apparatus
BS:4999 - Noise levels (Part-51)

2.0. Ventilation system for 400, 220 & 132 kV GIS Hall

Ventilation system shall be provided to maintain positive pressure inside GIS building.

The system shall comprise of supply air fan assemblies with Pre & Fine filters, motorized exhaust dampers, along with necessary ducting, grilles etc. This dry mechanical ventilation system shall be designed according to four air changes per hour.

Ventilation system for GIS hall shall operate on 100% fresh air and no recirculation is envisaged.

A) Plant shall mainly consist Supply air fans of DIDW type with pre and fine filters, Supply air ducting and grills. Two (2) nos. DIDW supply air centrifugal fans on 2x100 % (One working and one standby) basis shall be provided for the collective requirement of GIS Hall. Fans and accessories for this ventilation system shall be placed in separate ventilation room (AHU room) provided adjacent to the GIS Hall.

B) **Air Handling Unit (A complete factory made package enclosed unit consist of all fans, filters and other accessories)**

The air handling units shall be Double skin, draw through/ blow through type, modular construction and shall include filter section, fan section and mixing box (wherever required). The AHU shall be made of Double skin design with main structure made of suitable thickness powder coated/ extruded Aluminium frame work as per manufacturer standard. The panels shall be double skin sandwich type with minimum 24G GI powder coated external sheet and 24G GI powder coated internal sheet with 25mm thick insulation material in between. All sections shall be bolted to each other with neoprene rubber or its equivalent gasket. The fan shall be double inlet, double width type. The wheel & housing shall be fabricated from heavy gauge galvanised steel. The impeller & fan shaft shall be statically and dynamically balanced. Fan housing with motor shall be mounted on a common steel base mounted inside the air handling housing on anti- vibration springs mounts. The fan outlet shall be connected to casing with the help of fire retardant flexible canvass. The fan shall be complete with multi V belt drive, belt guard and adjustable motor mounting base. The inspection doors shall have double synthetic rubber seals doors and locking arrangements.

One of the above options (A or B) from these AHU units of suitable capacity (shall be finalised during detailed engineering) shall be installed inside a separate dedicated room called AHU/ventilation room adjacent to GIS Hall.

For fresh air suitable size of intake louvers with wire mesh, frame and bird protection screen shall be provided. Each system shall have washable pre-filter of 90% efficiency down to10 microns at the inlet of AHU and a micro-vee filter of 99% efficiency down to 5 microns at the inlet of AHU. These filters shall be arranged in a panel formation with filter module mounting frame on the downstream side. Easy access should be available to the filters for replacement/cleaning.

The vibration level of fans shall be within limits and vibration isolation shall be achieved by providing suitable spring type or pad type (or combination) vibration isolators for ventilation system equipment (centrifugal fans). Wall cut outs for mounting of intake louvers shall be made available in ventilation room.

There shall be 18 gauge G.I. common plenum chamber after centrifugal fans outlet provided with necessary maintenance windows, water tube manometer across air filter, one pressure switch and pilot light on panel to indicate dirty condition of filter.

Two Supply air duct shall be taken from plenum chamber which shall run on the both walls along the length of the GIS Hall with necessary grilles/ diffusers to make proper ventilation arrangement inside

the hall to facilitate proper mixing and avoid any hot spot. Fusible link / solenoid operated & CBRI certified Fire damper of fire rating 90 minutes shall be installed in supply air path. No exhaust duct or return air ducting is envisaged in this area.

There shall be a proper arrangement/provisions for supply and accommodation of NRD/URD in the supply air circuit near AHU duct to avoid any cross/reverse flow of air and inturn AHU fan of standby unit. The purpose of providing these damper is to isolate standby unit when working unit is under operation

Motorized Pressure Relief Dampers with frame & bird screen shall be provided of suitable size and quantities on both walls of GIS hall above supply air ducts to release hot air & excessive pressure inside the hall beyond design over pressure.

Ventilation duct running inside GIS Hall shall be suitably placed to avoid any fouling with GIS incoming/outgoing ducts and LCC panels, if any.

For fans and blowers, continuous motor rating (at 50 deg. C ambient) shall be at fifteen percent (15%) above the demand of the equipment at duty point or ten percent (10%) above maximum load demand of the equipment whichever is higher. For Belt drives, the belts shall be sized for 150% of the rated power and there shall be minimum of two belts per drive.

The pressure inside the GIS hall shall be maintained 5 mm of Water above the atmospheric pressure.

All ducts shall be made of galvanized steel sheets confirming to IS 277 with minimum grade of 180 GSM. Duct sizing and fabrication shall comply with requirements of IS 655.

Duct design criteria- Velocity shall be 12m/s (max.) for main duct, 9m/s (max.) for branch duct and 3.75m/s for the grills.

All the equipment of Ventilation system shall be designed for continuous duty for continuous operation of 24 hours a day.

✓ **Notes:**

Ventilation fan with suitable capacity driving motor calculation sheet for GIS Hall shall be submitted for customer/ Purchaser approval during detailed engineering stage. Pressure loss in ducting and accordingly static of fans and power capacity of motor shall be finalised during detailed engineering.

SECTION 3
PROJECT DETAILS & GENERAL SPECIFICATION

SITE INFORMATION

S. N.	Particular	Details
a)	Owner	UPPTCL
b)	Customer	UPPTCL
c)	Project Title	400/220/132 kV GIS at Rasra, Ballia
d)	Location	Uttar Pradesh
e)	Transport Facilities	Nearest rail head - Ballia
	SITE CONDITIONS	
a)	Max. Ambient air temp.	50°C
b)	Min. ambient air temp.	0°C
c)	Max. design ambient emp.	50°C
d)	Design reference temp.	50°C
e)	Average Humidity	Max. 100%
f)	Special corrosion conditions	No
g)	Solar Radiation	
h)	Atmospheric UV radiation	High
i)	Altitude above sea level	Less than 1000meter
j)	Pollution Severity	High Pollution level
k)	Seismic Zone	As per the seismic zone defined in the relevant BIS / **IEC-62271-300** but not less than 0.3g horrizontal
	WIND DATA	
	Wind load	195kg/sqm
	Average No. of thunderstorm days per annum	As per IS

1. GENERAL

This Chapter covers Technical Requirements and requirements of auxiliary items.

1.1 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.

1.2 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.

2. SYSTEM PARTICULARS

	Rated System voltage	420 kV, 245kV, 145kV, 36kV
	System frequency	50 Hz, This may vary by ± 5%
	Number of phases	Three
	Neutral	Effectively Earthed
	Auxiliary power supply:-	
	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	2 wire ungrounded DC supplies (i) 400 kV S/S : 220V DC (ii) 220/132kV S/S : 110V DC (iii) Communication : 48 V DC 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 ± 10%. Frequency by ± 5% Combined Voltage & frequency by ±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

3. System parameters

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	40 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 system & 92kV rms for 132kV system	1000 microvolt	1000 microvolt	500 microvolt	-
10	Minimum total creepage	25mm/kV	25mm/kV	25mm/kV	25mm/kV
		(10500 mm)	(6125 mm)	(3625 mm)	(1300 mm)
11	Min. clearances				
	i. Phase to phase	4000mm (for Conductor-conductor)	2100 mm	1300 mm	320 mm
		4200mm (for rod - Conductor)			
	ii. Phase to earth	3500 mm	2100 mm	1300 mm	320 mm
	iii) Sectional clearances	6500 mm	5000 mm	4000 mm	3000 mm

12.	System neutral earthing	Effectively Earthed

4. SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED

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

4.2 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.

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

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

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

5. SUPPORT STRUCTURES (If in the scope of Bidder)

The base design of all the equipments, to be installed on auxiliary structures, shall conform to the standard auxiliary structure designs presently being used in UPPTCL at 400/220/132/33kV Substations.

All equipment support structures shall be supplied along with brackets, angles, stools etc. for attaching the operating mechanism, control cabinets and marshalling box (wherever applicable) etc. The support structures should be hot dip galvanised with minimum 610 gram/sq.m net of zinc.

6. STANDARDS

6.1 **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.

6.2 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.

6.3 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.

6.4 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.

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

6.6 REFERENCE OF STANDARS

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

7. ENGINEERING DATA AND DRAWINGS

7.1 SUBMISSION AND APPROVAL OF DRAWINGS/ DOCUMENTS

7.1.1 The Bidder shall follow a well-defined coding system for proper and quick identification of all systems/ sub-systems/ equipments/ assemblies/ sub-assemblies/ accessories/ other plant material/ spare parts/ special tools and plants and drawings for the execution of the plant and later for its operation and maintenance.

Copies of coding documents defining the above shall be supplied along with drawings to understand the system.

7.1.2 All drawings submitted by the Bidder shall be in sufficient details to indicate the type, size arrangement, weight of each component, details for packing and shipment, the external connections, fixing arrangements, dimensions required for installation arrangement, dimensions required for installation and interconnections with other equipment and other information specifically, as called for in the drawing schedules. All the equipments tapping points etc. shall be numbered according to pre-determined scheme/ system which shall be subject to approval of Purchaser.

7.1.3 Each drawing shall be clearly marked with the name of the Purchaser, unit designation, UPPTCL's Contract No. and the name of the project. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawings shall be in English. All the dimensions should be in metric units.

7.1.4 If any dimension figures on a drawing or a plan differs from those obtained by scaling the drawing or plan, the dimensions as mentioned in figures on the drawing or plan shall be taken as correct.

7.2 Submission and distribution of drawings/ documents

All the drawings which do not require approval shall be submitted along with reproducible in required number and those requiring approval shall be initially submitted for comments/ approval before submitting along with reproducible as per "Document Distribution Schedule".

7.3 APPROVAL OF DRAWINGS

7.3.1 The Purchaser shall return to the Bidder one set of drawings, plans and technical data requiring approval after marking them with their comments/ corrections, if any, either (a) marked 'Approved' or (b) marked 'Approved subject to incorporation of comments" or (c) marked 'Not Approved' with comments requiring resubmission of drawings etc. in 14 days or (d) marked 'Approval not required', where drawing is for information only. In case of (a) no further revision of drawings will be required. In case of (b) Bidder can proceed with the work but will resubmit the drawings incorporating the corrections as per comments only within fourteen (14) days. In case of (c) Bidder can proceed with the work only after resubmitting the

drawings within fourteen (14) days and getting approval under (a) or (b) categories above. In case of (d) the Bidder drawing is deemed to have been received only for information purpose.

7.3.2 The Purchaser shall have the right to ask the Bidder to make any change in the design/ drawing which may be necessary to make equipment conform to the provisions and intent of the contract, without any extra cost to the Purchaser.

The drawings submitted shall be re-viewed by the Purchaser and shall be modified by the Bidder as required. The Bidder shall incorporate such modifications and/or corrections and submit the final drawings for approval/ reference.

7.3.3 No deviation from the approved drawings shall be permitted without the written approval of the Engineer.

7.3.4 The review of drawings/ data by the Purchaser will cover only general conformance of the data of the specifications and document, interfaces with the equipment provided under the specifications, external connections and the dimensions which might effect substation layout.

This review by the Purchaser may not indicate thorough review of all dimensions, quantities and details of the equipment, wiring, materials, any devices or items indicated or the accuracy of the information submitted. This review and/ or approval by the purchaser shall not be considered by the Bidder, as limiting any of his responsibilities specified under these specifications and documents.

Approval/ comments conveyed as above shall neither relieve the Bidder of his contractual obligations and his responsibilities for correctness of dimensions, material of construction, quantities, design details, assembly fits, performance particulars, guarantees and conformity of the supplies with the specifications, schemes, systems and statutory laws, nor does it limit the Purchasers right under the contract.

7.3.5 Should any minor revision be made after 'approval', at the time of erection/ commissioning the Bidder shall redistribute prints and reproducible, clearly certifying the changes incorporated in the drawing and marking it in a block. Every revision shall be marked by a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

7.3.6 The Bidder shall be responsible for and shall pay for any alterations of the work due to any discrepancies, errors and omissions in the drawings or other particulars supplied by him, whether such drawings or particulars have been approved by Engineer or not.

No extension of delivery periods shall be granted on this account.

7.3.7 As- build drawings

Drawings of all equipments as detailed in technical specifications of respective equipments necessarily including schematic drawings and terminal block drawings wherever applicable whether mentioned in respective technical specifications or not.

8. NAME PLATE, MARKING OF PARTS, LABELS

8.1 All equipment shall have metal name plates fixed in suitable position with full particulars engraved legibly thereon and not painted.

8.2 Each main and auxiliary item of plant is to have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which is to be engraved identifying manufacturer's name, equipment type or serial number, rating together with details of the loading/ operating conditions under which the item or plant in question has been designed to operate and such diagram plates as may be required by the Engineer.

8.3 Each item of plant is to be provided with a name plate or label designating the service of the particular equipment. These inscriptions are to be approved by the Engineer or as detailed in the appropriate sections of the technical specifications.

8.4 Such name plates or labels are to be white non hygroscopic material with engraved block lettering or, alternatively, in the case of indoor equipments of transparent plastic material with suitably colored lettering engraved on the back

8.5 Each bay module in GIS room will have a clear marking showing the name of bay, identification, name and rating plate marking for each individual equipment like circuit breaker, disconnectors grounding switches, current transformer, voltage transformers and bushings etc. as per relevant IEC to facilitate identification during routine operation/ maintenance.

8.6 All such name plates, instruction plates, lubrication charts etc. shall be bilingual with Hindi inscription first followed by English. Provisions shall be made to fit in name plates, lubrication/ connection diagram plates etc.

8.7 In order to facilitate identification, the parts of the equipment shall be suitably marked.

9. INSTRUCTION MANUALS

9.1 The Bidder shall submit to the Engineer 'Descriptive Manuals', i.e. system design concept, detailed catalogues of equipment and typical equipment instructions for this project, for all major systems and equipment, covered under this contract along with dispatch of equipment. These initial copies of descriptive manuals shall be in sufficient details, bringing out detailed internal construction, characteristics, performance parameters, principles of operation, maintenance requirements, replacement and renewals needed, erection and overhauling procedure, testing and operation procedure etc. for various equipment.

9.2 The integrated instruction manuals, fully defining the interfaces between various systems and

complete in all respects shall be submitted by the Bidder one month before scheduled date of commissioning. The instruction manuals shall contain full details of designation and drawings of all the equipment furnished, the erection procedure, testing procedure, operation and maintenance procedure of the equipment, single line diagrams, and schematics. After the commissioning and initial operation of the plant, modifications/ additions/ changes, wherever required shall be incorporated in the instruction manuals and drawings shall be submitted by the Bidder to the Purchaser.

9.3 The manuals shall be specific to the equipment supplied and not of general nature.

10. DOCUMENTS AND ERECTION DRAWINGS

The Bidder shall submit within a reasonable time but at least four (4) weeks before dispatch of equipment (as per distribution schedule) the following drawings/ documents and instruction manuals etc. to the consignee and the Engineer.

I. List of item-wise equipment as proposed to be dispatched by the Bidder.
II. Erection drawings along with reproducible prints of each drawings.
III. Instruction books for proper handling/ checking of material on receipt at site/storage, erection and assembly of all equipment and necessary instruction for checking and recording proper assembly of the plant.
IV. Instruction sheets for proper balancing, alignment, adjustment, checking and calibrations as may be necessary.
V. Descriptive literature and drawings to illustrate the working principals, methods of Assembly and dismantling of plants and equipment.
VI. Testing/commissioning format for recording data during erection/testing/ commissioning and trial run. These formats/data sheets shall clearly indicate the results obtained during shop tests and permissible deviations.

11. QUALITY CONTROL PROGRAMME

To ensure that the equipment construction work and the services covered under this job are in accordance with the specifications and conform to the high standard of workmanship. It is obligatory on the part of the Bidder to adopt a suitable quality control program. Such a program shall include suitable hold point for check for major equipments during manufacture at supplier's work, during erection at site and during the construction stage such that material checks for attaining proper strength and dimensional checks for attaining close tolerances required for equipment installation can be obtained.

In order to attain the above objectives, the Bidder shall draw out a plan listing all quality control checks in detail, including all hold points at which the quality checks shall be applied, also specifically mentioning those hold points where the Purchaser shall also participate in the quality check to assure him of the quality of the products supplied. Such a program shall be outlined by the Bidder for the acceptance by the Purchaser. The Bidder shall furnish detailed

information regarding his quality control program and its strict implementation. Following information shall be included in the proposal along with others regarding quality control program:

I. The quality control organizations and the proposal of its implementation.
II. The system for controlling drawings and documents for correctness.
III. The system of quality control for raw materials, process control and maintaining tolerances during manufacturing, assembly and fabrication.
IV. Quality control during purchase of components, sub-systems and assemblies.
V. Methods for ensuring selection of proper vendors/ sub-vendors.
VI. Inspection of testing at shop after assembly.
VII. Control of accuracy during calibration of measuring and testing equipments.
VIII. Preservation and quality control during the transit.
IX. Procedure for inspection before erection and quality control during erection.
X. System for storage and delivery.

Bidder shall be wholly responsible for the quality control and quality assurance for the manufacture, supply, erection, testing and commissioning etc.

During inspection, destructive testing and non- destructive test evaluation shall be done wherever applicable, in presence of Purchaser's representative in accordance with established norms. Directions of Purchaser shall be rigorously followed.

12. INSPECTION & TESTING

12.1 The Purchaser reserves the right to inspect any machinery and material to ensure that approved Q.A.P. is being strictly implemented by the Bidder or his Sub Bidder/ Supplier under this contract and to reject any item found defective in workmanship or design or otherwise unsuitable for the use and purpose intended or which is not in accordance with the intent of this contract. The Bidder should on demand by the Purchaser, rectify or replace such defective or unsuitable equipment, or the Purchaser may at the Bidder's expense, rectify or replace such defective or unsuitable equipment whether before or after supply.

12.2 That Bidder shall, for purpose of clause 15 of the annexed conditions of contract Form-A inform to the Purchaser places of manufacture, testing and inspection of various equipment offered by him. Unless specifically provided otherwise, all tests shall be carried out at the Bidder's work or for bought out items at sub-vendors works before dispatch.

12.3 The Bidder shall advise the Purchaser at least 4 weeks in advance as to when the equipment will be ready for stage/ final inspection at the Bidder's works or at his Sub-Bidder’s works.

PENAL CHARGES

In case the equipment is not available for inspection at the time of arrival of inspection

officers, the Bidder shall pay to UPPTCL towards futile journey a sum decided by Chief Engineer (765 KV DU), UPPTCL and demanded by "Engineer of Contract". This amount shall be paid within 10 days from the date of demand. Further action for inspection of the material shall be taken only after the said amount is deposited.

12.4 During inspection, the Purchaser's Inspecting Engineers at all times have access to all part of shops where the equipment is being manufactured and also shall be provided with all reasonable inspection facilities by the Bidder and/ or sub-Bidders.
Even without scheduled inspection, the Engineer and/or his duly authorized representative shall have at all reasonable times access to the Bidder's premises, works or site and shall have the power to inspect and examine the materials and workmanship of the works during its manufacture or erection.

12.5 All plants equipment/ parts, sub-assemblies/ assemblies shall comply with the requirement of type tests and shall be subjected to the routine/ acceptance tests specified in the set of standards adopted and to such other tests as are stipulated in the respective technical specifications.

The Purchaser reserves to himself the right of having at his own expense any inspection or special test of a reasonable nature at Bidder's premises or at site, in addition to those prescribed in applicable standards and the enclosed technical specifications.

12.6 The Engineer shall either depute his representative to witness the tests as applicable and inspect the material or shall waive the inspection. In case of waiver the Bidder or his sub-Bidder shall carryout the all applicable tests in absence of Purchaser’s representative. In both the cases i.e. either inspection or waiver the test certificates shall be submitted to Engineer of Contract for approval and issue of dispatch authorization. In case of inspection the test certificates must bear signatures of the Purchaser’s inspecting officer.

The Engineer of Contract, within 10 days of receipt of test certificates, shall issue approval/ dispatch authorization, if test certificates are found satisfactory.

In case test certificates are not found satisfactory the Engineer of Contract, within 10 days of receipt of test certificates, shall communicate his objections and actions required to be taken in writing to the Bidder. The Bidder shall take remedial action and shall re-submit the test certificates or re-offer the material for inspection as asked for by the Engineer. Subsequent actions shall follow as in case of fresh offer for inspection. No extension of delivery/ completion period shall be granted on this account.

12.7 REJECTON

Purchaser reserves the right to reject any equipment if during the tests at works or site, the test value achieved do not comply with the respective standard/ specifications and exceeds

that tolerable limits. Rejection of any equipment will not be held as a valid reason for delay in timely completion of the work.

12.8 No equipment to be furnished or used in connection with this contract shall be dispatched, until factory inspection and acceptance test have been carried out satisfactorily and dispatch authorization issued by Engineer of Contract. Such factory inspection of the equipment or approval of acceptance tests shall not however, relieve the Bidder from full responsibility for supplying equipment conforming to the requirements of this contract, nor prejudice any claim, right or privilege which the Purchaser may have because of the use of defective or unsatisfactory equipment. Should Purchaser waive the right to inspect any equipment, such waiver shall not relieve the Bidder in any way from his obligations under this contract. The inspection/waiver by Engineer and/ or approval of test certificates shall in no way limit the liabilities and responsibilities of the Bidder in respect of the agreed quality assurance program, and the desired performance of the equipment.

12.9 In all cases where the contract provides for tests whether at the premises or works of the Bidder or of any Sub-Bidder, the Bidder shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably required to carry out effectively, such tests on the equipment in accordance with the contract and shall give facilities to the Engineer or to his authorized representative to accomplish inspection.
All the expenses incurred for testing including material consumed in testing shall be to the Bidder's account.

12.10 Purchaser will not entertain any request for waiver of inspection on the ground that sub-vendors are not agreeing for the Purchaser's inspection. It is the responsibility of the Bidder to ensure that all the requirements of the Purchaser as envisaged in the technical specifications are incorporated.

12.11 The Bidder is required to record the following certificates on the invoices and challans of each and every consignment:
"Certified that material being dispatched against the above invoices and challan has been inspected and tested by the representative of Engineer of the contract on (date) and all the test results were satisfactory, as per approved test certificate enclosed."

Or

Certified that inspection of material being dispatched against the above invoice and challan has been waived off by Engineer of Contract vide letter No.....Dt..... (Copy enclosed) and all the acceptance and routine tests as per relevant standards and those provided in Contract, have been conducted and all the test results were found satisfactory as per test certificates enclosed."

12.12 In case the inspection or testing of the material is to be carried out outside India, all the

expenditure including boarding and lodging etc. of the inspecting officer/ officers shall be borne by the contractor and information regarding inspection has to given at least 8 weeks in advance.

13. PACKING

13.1 All equipment 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. While packing all the materials, the limitations from the point of view of availability of transportation facilities in India should be taken into account. The Bidder shall be responsible for any loss or damage during transportation, handling and storage.

13.2 The Bidder shall include and provide for security protection and packing the plant so as to avoid loss or damage during transport by any mode.

13.3 All packing shall allow for easy removal and checking at site. Wherever necessary, proper arrangement for attaching slings for lifting shall be provided. All packages shall be clearly marked for with signs showing 'UP' and 'DOWN' side of boxes, and handling and unpacking instructions as considered necessary. Special precautions shall be taken to prevent rusting of steel and iron parts during transit and storage. Gas seals or other methods proposed to be adopted for protection against moisture during transit shall be to the satisfaction of the engineer.

13.4 The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols i.e. FRAGILE, HANDLE WITH CARE, USE NO HOOKS etc.

13.5 Each package delivered under the contract shall be marked by the Bidder at his expense and such marking must be distinct (all previous irrelevant marking being carefully obliterated). Such marking shall show the description and quantity of contents, the name of consignee and address, the gross and net weights of the package, the name of Bidder with a distinctive number of mark sufficient for purpose of identification. All markings shall be carried out with such materials as to ensure quickness of drying, fastness and legibility.

13.6 Each Package shall contain a note quoting specifically the name of the Bidder, the number and date of contract or order and the name of office placing the contract, nomenclature of the stores and include a schedule of parts for each complete equipment giving the parts number with reference to the General Arrangement/ Assembly drawing and the quantity of each part, drawing number and tag numbers.

13.7 All equipment/ material shall be suitably packed for transport, carriage at site and outdoor storage during transit. The Bidder shall be responsible for any damage to the equipment during transit. The contents of each package shall bear marking that can be readily identified

from the package list and packing shall provide complete protection from moisture, termites and mechanical shocks etc.

13.8 Any material found short inside the packing cases shall be supplied by the Bidder without any extra cost.

13.9 Notwithstanding anything stated in this clause the Bidder shall be entirely responsible for any loss, damage or depreciation to the stores.

14. DESPATCH OF EQUIPMENT

14.1 Detailed dispatch instructions will be intimated to the Bidder. All materials shall be dispatched by road.

14.2 The Bidder shall intimate, at least thirty (30) days in advance to the consignee as well as the concerned Superintending Engineer at site, the probable date when the equipment will be ready for dispatch from the works. Notification of delivery or dispatch in regard to each and every consignment shall be made to the Purchaser immediately after dispatch or delivery. The supplier shall further supply to the consignee a priced invoice and packing account of all stores delivered or dispatched by him. All packages, containers, bundles and loose materials forming parts of each and every consignment shall be described fully in the packing account, and full details of the contents of packages and quantity of material shall be given to enable the consignee to check the stores on arrival at destination.

14.3 A list in duplicate containing details of equipment for verification at site shall also be placed inside each package and shall correspond with the advice note. One additional copy of each of the package lists shall also be sent to the consignee.

15. TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE

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 10(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.

15.1 Pre-commissioning Tests

On completion of erection of the equipment and before charging, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Purchaser and the Contractor for correctness and completeness of installation and acceptability for charging, leading to initial pre-commissioning tests at Site. The list of pre-commissioning tests to be performed are given in respective chapters and shall be included in the Contractor's quality assurance programme.

15.2 Commissioning Tests

15.2.1 The available instrumentation and control equipment will to be used during such tests and the Purchaser will calibrate, all such measuring equipment and devices as far as practicable.

15.2.2 Any special equipment, tools and tackles required for the successful completion of the Commissioning Tests shall be provided by the Contractor, free of cost.

15.2.3 The specific tests requirement on equipment have been brought out in the respective chapters of the technical specification.

15.2.4 The Contractor shall be responsible for obtaining statutory clearances from the concerned authorities for commissioning the equipment and the switchyard. However necessary fee shall be reimbursed by POWERGRID on production of requisite documents.

16. MATERIAL WORKMANSHIP

16.1 General Requirement

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

fulfil 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 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 in 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, of so required.

16.2 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.

16.3 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 centred 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 sherns or that of insulator wire or other component in the compartments.

16.4 FUNGI STATIC VARNISH

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.

16.5 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.

16.6 Degree of Protection

The enclosures of the Control Cabinets, Junction boxes and Marshalling Boxes, panels etc. to be installed shall provide 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 IS: 13947 (Part-I) / IEC-60947(Part-I) / IS 12063 / IEC-60529. Type test report for degree of protection test, shall be submitted for approval.

16.7 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 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.

16.8 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.

17. 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 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.

18. 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 electrogalvanized.

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.

19. PAINTING

19.1 All sheet steel work shall be degreased, pickled, phosphated in accordance with the IS-6005 “Code of practice for phosphating iron and sheet”. All surfaces, which will not be easily accessible after shop assembly, shall beforehand be treated and protected for the life of the equipment. The surfaces, which are to be finished painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer. Oil, grease, dirt and swaf shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

19.2 After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying. The phosphate coating shall be sealed with application of two coats of ready mixed, stoving type zinc chromate primer. The first coat may be “flash dried” while the second coat shall be stoved.

19.3 After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. The second finishing coat shall be applied after inspection of first coat of painting.

19.4 The exterior and interior colour of the paint in case of new substations shall preferably be RAL 7032 for all equipment, marshalling boxes, junction boxes, control cabinets, panels etc. unless specifically mentioned under respective sections of the equipments. Glossy white colour inside the equipments /boards/panels/junction boxes is also acceptable. The exterior colour for panels shall bematching with the existing panels in case of extension of a substation. Each coatof primer and finishing paint shall be of slightly different shade to enable inspection of the painting. A small quantity of finishing paint shall be supplied for minor touching up required at site after installation of the equipments.

19.5 COLOUR SCHEME AND CODES FOR PIPE SERVICE

The Bidder shall propose a colour scheme for the those equipments/ items for which the colour scheme has not been specified in the specification. For the approval of purchaser. The decision of Purchaser shall be final. The scheme shall include.

- Finishing colour of Indoor equipment.
- Finishing colour of Outdoor equipment.
- Finish colour of all cubicles.
- Finishing colour of various auxiliary system equipment including piping
- Finishing colour of various building items.

- All steel structures, plates etc. shall be painted with non-corrosive paint with a suitable primer.

It may be noted that normally all electrical equipments in switchyard are painted with shade 631 of IS-5. The indoor cubicles, GIS enclosures and other miscellaneous items, the colour scheme shall be approved by the Purchaser during detailed engineering.

For aluminium casted surfaces, the surface shall be with smooth finish. Further, in case of aluminium enclosures the surface shall be coated with powder (coating thickness of 60 microns) after surface preparation for painting.

20. TOOLS AND TACKLES

The Contractor 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. However, these tools and tackles shall be separately, packed and brought on to Site.

21. CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES & MARSHALLING BOXES FOR OUTDOOR EQUIPMENT

21.1 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.

21.2 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 braces 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.

21.3 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.

21.4 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.

21.5 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.

21.6 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.

21.7 A 240V, single phase, 50 Hz, 15 amp AC plug and socket shall be provided in the cabinet with ON-OFF switch for connection of hand lamps. Plug and socket shall be of industrial grade.

21.8 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.

21.9 All control switches shall be of rotary type. Toggle piano switches shall not be accepted.

21.10 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.

21.11 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.

21.12 The following routine tests alongwith the routine tests as per IS: 5039 shall also be conducted:
Check for wiring
Visual and dimension check

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.

21.13 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 on contacts.
d) IR/HV test etc.

22. TERMINAL BLOCKS AND WIRING

22.1 Control and instrument leads form the switchboards or from other equipment will be brought to terminal boxes or control cabinets in conduits. All interphase and external connections to equipment or to control cubicles will be made through terminal blocks.

22.2 Terminal blocks shall be 1100 V grade and have continuous rating to carry the maximum expected current on the terminals. These shall be of moulded piece, complete with insulated/barriers stud type terminals, washers, nuts and lock nuts. Screw clamp, overall insulated, insertion type, rail mounted terminals can be used in place of stud type terminals.

22.3 But preferably the terminal blocks shall be non-disconnecting stud type of Elmex type CATM4, phoenix cage clamp type or equivalent. The insulating material of terminal block shall be nylon which shall be free of halogens, fluorocarbons etc.

22.4 Terminal blocks for current transformer and voltage transformer secondary leads shall be provided with test links and isolating facilities. The current transformer secondary leads shall also be provided with short circuiting and earthing facilities.

22.5 The terminals shall be such that maximum contact area is achieved when a cable is terminated. The terminal shall have a locking characteristic to prevent cable form escaping form the terminal clamp unless it is done intentionally.

22.6 The conducting part in contact with cable shall preferably be tinned or silver plated, however Nickel plated copper or zinc plated steel shall also be acceptable.

22.7 The terminal blocks shall be of extensible design.

22.8 The terminal blocks shall have locking arrangement to prevent its escape from the mounting rails.

22.9 The terminal blocks shall be fully enclosed with removable covers of transparent, non-deterioration type plastic material. Insulating barriers shall be provided between the terminal blocks. These barriers shall not hinder the operator form carrying out the wiring without removing the barriers.

22.10 Unless otherwise specified terminal blocks shall be suitable for connecting the following conductors on each side.

a) All circuits except CT circuits - Minimum of 2 nos. of 2.5 sq. mm copper flexible
b) All CT circuits - Minimum of 4 nos. of 2.5 sq.mm copper flexible

22.11 The arrangements shall be in such a manner so that it is possible to safely connect or disconnect terminals on live circuits and replace fuse links when the cabinet is live.

22.12 At least 20% spare terminals shall be provided on each panel/cubicle/box and these spare terminals shall be uniformly distributed on all terminal rows.

22.13 There shall be minimum clearance of 250 mm between the first bottom row of terminal block and the associated cable gland plate. Also the clearance between two rows of terminal blocks shall be a minimum of 150 mm.

22.14 The Bidder shall furnish all wire, conduits and terminals for the necessary interphase electrical connections (where applicable) as well as between phases and common terminal boxes or control cabinets.

22.15 All input and output terminals of each control cubicle shall be tested for surge withstand capability in accordance with the relevant IEC Publications, in both longitudinal and transverse modes. The Bidder shall also provide necessary filtering, surge protection, interface relays and any other measures necessary to achieve an impulse withstand level at the cable interfaces of the equipment.

23. LAMPS & SOCKETS

23.1 Lamps

All incandescent lamps shall use a socket base as per IS-1258, except in the case of signal lamps.

23.2 Sockets

All sockets (convenience outlets) shall be suitable to accept both 5 Amp & 15 Amp pin round Standard Indian plugs. They shall be switched sockets with shutters.

23.3 Hand Lamp

A 240 Volts, single Phase, 50 Hz AC plug point shall be provided in the interior of each cubicle with ON- OFF Switch for connection of hand lamps.

23.4 Switches and Fuses

Each panel shall be provided with necessary arrangements for receiving, distributing, isolating and fusing of DC and AC supplies for various control, signalling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with miniature circuit breaker/ switchfuse units. Selection of the main and Sub-circuit fuse ratings shall be such as to ensure selective clearance of sub-circuit faults. Potential circuits for relaying and metering shall be protected by HRC fuses.

All fuses shall be of HRC cartridge type conforming to IS-9228 mounted on plug-in type fuse bases. Miniature circuit breakers with thermal protection and alarm contacts will also be accepted. All accessible live connection to fuse bases shall be adequately shrouded. Fuses shall have operation indicators for indicating blown fuse condition. Fuse carrier base shall have imprints to the fuse rating and voltage. All control switches shall be of rotary type. Toggle piano switches shall not be accepted.

24. Bushings, Hollow Column Insulators, Support Insulators:

24.1 Bushings shall be manufactured and tested in accordance with IS:2099 & IEC- 60137 while hollow column insulators shall be manufactured and tested in accordance with IEC-62155/IS:5621. The support insulators shall be manufactured and tested as per IS:2544/IEC-60168 and IEC-60273. The insulators shall also conform to IEC-60815 as applicable. The bidder may also offer composite hollow insulators, conforming to IEC-61462.

24.2 Support insulators, bushings and hollow column insulators shall be manufactured from high quality porcelain Porcelain used shall be homogeneous, free from laminations cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified tough and impervious to moisture.

24.3 Glazing of the porcelain shall be uniform brown in colour, free from blisters, burrs and similar other defects.

24.4 Support insulators/bushings/hollow column insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used.

24.5 When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action. No radio

interference shall be caused by the insulators/bushings when operating at the normal rated voltage.

24.6 Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service. The design and location of clamps and the shape and the strength of the porcelain flange securing the bushing to the tank shall be such that there is no risk of fracture. All portions of the assembled porcelain enclosures and supports other than gaskets, which may in any way be exposed to the atmosphere shall be composed of completely non hygroscopic material such as metal or glazed porcelain.

24.7 All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued up porcelain parts by grinding and metal parts by machining. Insulator/bushing design shall be such as to ensure a uniform compressive pressure on the joints.

24.8 Tests

In bushing, hollow column insulators and support insulators shall conform to type tests and shall be subjected to routine tests in accordance with IS: 2099 & IS:2544 & IS : 5621.

25. MOTORS

Motors shall be "Squirrel Cage" three phase induction motors of sufficient size capable of satisfactory operation for the application and duty as required for the driven equipment and shall be subjected to routine tests as per applicable standards. The motors shall be of approved make.

25.1 Enclosures

a) Motors to be installed outdoor without enclosure shall have hose proof enclosure equivalent to IP-55 as per IS: 4691. For motors to be installed indoor i.e. inside a box, the motor enclosure, shall be dust proof equivalent to IP-44 as per IS: 4691.
b) Two independent earthing points shall be provided on opposite sides of the motor for bolted connection of earthing conductor.
c) Motors shall have drain plugs so located that they will drain water resulting from condensation or other causes from all pockets in the motor casing.
d) Motors weighing more than 25 Kg. shall be provided with eyebolts, lugs or other means to facilitate lifting.

25.2 Operational Features

a) Continuous motor rating (name plate rating) shall be at least ten (10) percent above the

maximum load demand of the driven equipment at design duty point and the motor shall not be over loaded at any operating point of driven equipment that will rise in service.

b) Motor shall be capable at giving rated output without reduction in the expected life span when operated continuously in the system having the particulars as given in Clause 15.0 of this Section.

25.3 Starting Requirements:

a) All induction motors shall be suitable for full voltage direct-on-line starting. These shall be capable of starting and accelerating to the rated speed alongwith the driven equipment without exceeding the acceptable winding temperature even when the supply voltage drops down to 80% of the rated voltage.

b) Motors shall be capable of withstanding the electrodynamic stresses and heating imposed if it is started at a voltage of 110% of the rated value.

c) The locked rotor current shall not exceed six (6) times the rated full load current for all motors, subject to tolerance as given in IS:325.

d) Motors when started with the driven equipment imposing full starting torque under the supply voltage conditions specified under Clause 15.0 shall be capable of withstanding atleast two successive starts from cold condition at room temperature and one start from hot condition without injurious heating of winding. The motors shall also be suitable for three equally spread starts per hour under the above referred supply condition.

e) The locked rotor withstand time under hot condition at 110% of rated voltage shall be more than starting time with the driven equipment of minimum permissible voltage by at least two seconds or 15% of the accelerating time whichever is greater. In case it is not possible to meet the above requirement, the Bidder shall offer centrifugal type speed switch mounted on the motor shaft which shall remain closed for speed lower than 20% and open for speeds above 20% of the rated speed. The speed switch shall be capable of withstanding 120% of the rated speed in either direction of rotation.

25.4 Running Requirements:

a) The maximum permissible temperature rise over the ambient temperature of 50 degree C shall be within the limits specified in IS:325 (for 3 - phase induction motors) after adjustment due to increased ambient temperature specified.

b) The double amplitude of motor vibration shall be within the limits specified in IS: 4729. Vibration shall also be within the limits specified by the relevant standard for the driven equipment when measured at the motor bearings.

c) All the induction motors shall be capable of running at 80% of rated voltage for a period of 5 minutes with rated load commencing from hot condition.

25.5 TESTING AND COMMISSIONING

An indicative list of tests is given below. Contractor shall perform any additional test based on specialities of the items as per the field Q.P./Instructions of the equipment Contractor or Purchaser without any extra cost to the Purchaser. The Contractor shall arrange all instruments required for conducting these tests alongwith calibration certificates and shall furnish the list of instruments to the Purchaser for approval.

(a) Insulation resistance.

(b) Phase sequence and proper direction of rotation.

(c) Any motor operating incorrectly shall be checked to determine the cause and the conditions corrected.

SECTION-4

LIST OF DRAWINGS & DOCUMENTS

Bidder shall submit the drawings & data sheets as per the following list:

DRAWING NOS.	DRAWING NAME
TB-DG-404-553-001	Ventilation equipment & Ducting layout for GIS hall building (400, 220 & 132 kV)
TB-DG-404-553-002	Schematic, GA & SLD of PDB/MCC for Ventilation fan in GIS hall building (400, 220 & 132 kV)
DATA SHEETS	**DATA SHEETS NAME**
TB-DS-404-553-01	TDS For GI Sheet for Ducts
TB-DS-404-553-02	TDS For Insulation
TB-DS-404-553-03	TDS For Fire Damper
TB-DS-404-553-04	TDS For Pre-filter & Fine filter
TB-DS-404-553-05	TDS For Instruments
TB-DS-404-553-06	TDS for Centrifugal fans and motor
TB-DS-404-553-07	Ventilation Fans Calculation
TB-DS-404-553-08	BOQ - VENTILATION SYSTEM

SECTION-5

ENCLOSURES TO SPECIFICATION

SCHEDULES TO BE FILLED BY THE BIDDER

Schedule 1 **Certificate of No deviation**

Schedule 3 **Details of contact persons (technical and commercial)**

Schedule 4 **Enclosures to Specification**

Drawings

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 :

Company Seal

SCHEDULE-2

DETAILS OF CONTACT PERSON (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.

SCHEDULE-3

DRAWINGS

1. Architecture drawing-400 kV GIS Building
   DRG. NO. TB-1-404-607-661-1 REV.00

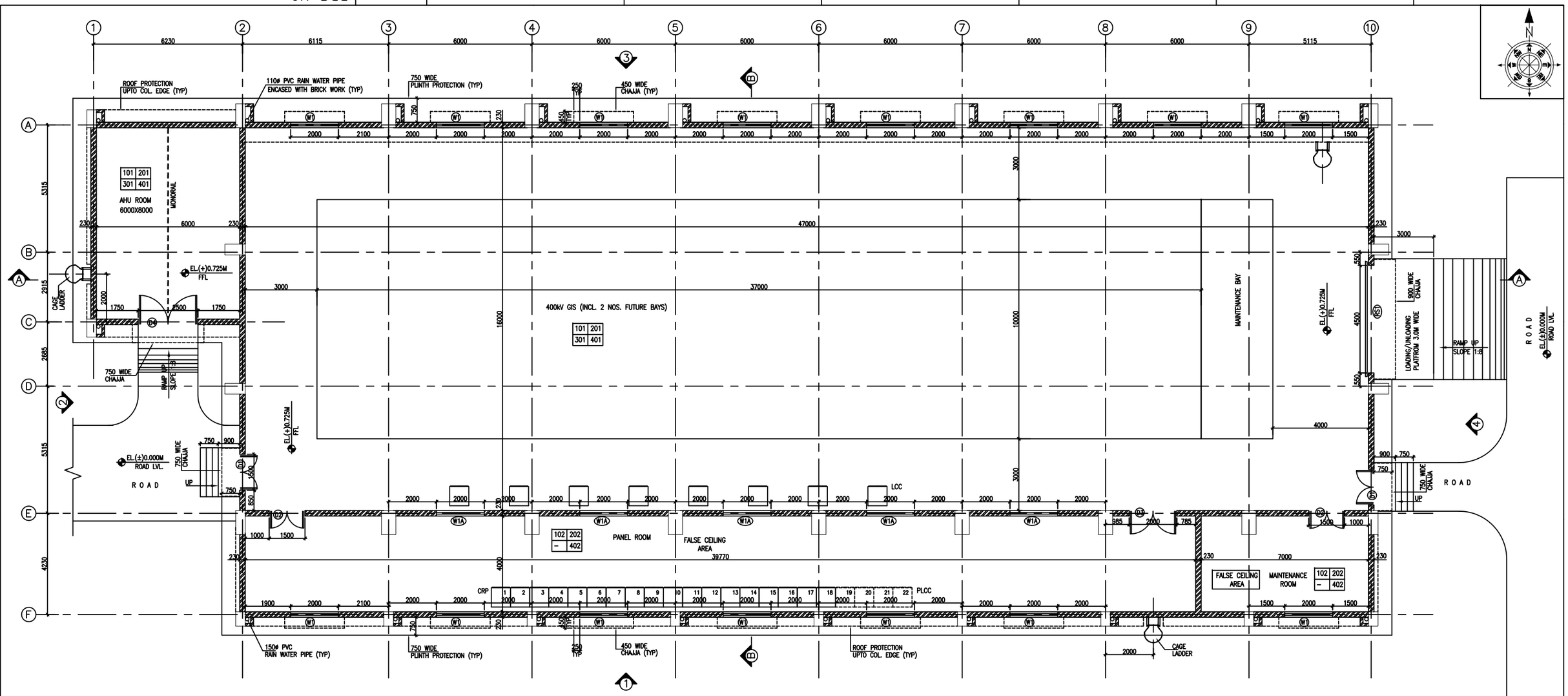
2. Architecture drawing-220 kV GIS Building
   DRG. NO. TB-1-404-607-671-1 REV.00

3. Architecture drawing-132 kV GIS Building
   DRG. NO. TB-1-404-607-681-1 REV.00

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



GROUND FLOOR PLAN

ILLUSTRATION OF FINISHES.	
WALL SERIES 100	FLOORING SERIES 200
CEILING SERIES 300	SKIRTING/ DADO SERIES 400

FINISHES OF SCHEDULE

WALL FINISHES–

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	2.	202	VITRIFIED TILES
CEILING FINISHES					
1.	301	ARYLIC DISTEMPER			
2.	302	ARYLIC EMULSION PAINT			

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)

LEGEND:–

SIDE HUNG OPENABLE PANEL

FIXED GLASS PANEL

FFL. = FINISH FLOOR LEVEL
FGL. = FINISH GRADE LEVEL
H.P. = HIGH POINT
L.P. = LOWER POINT
TOC = TOP OF CONCRETE
FFL = FINISH FLOOR LEVEL
FGL = FINISH GROUND LEVEL

REFFRENCE DRAWING:–

1 OVERALL GENERAL ARRANGEMENT DRAWING – TB–0–375–316–002
1 CONCEPTUAL DRAWING FOR 400kV GIS BUILDING – TB–3–404–316–004

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2 ALL WINDOWS AND VENTILATORS ON GROUND FLOOR OF ALL BUILDINGS SHALL BE PROVIDED WITH SUITABLE MS GRILL.
3. ALL DOOR–WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.
4. EL(±)0.00M CORRESPONDS TO TOP LEVEL OF ROAD.
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 RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:–
RDA CIVIL ENGINEERING SYSTEM PVT. LTD.
N–43, SRINIWASPURI NEW DELHI –65
☎ PH. 011 26845128, FAX 011 26313478

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		15.01.19	N.A.
CHD.	AKHLESH		15.01.19	
APPD.	DKU		15.01.19	

DEPT. TBG	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.
CODE							

TITLE: 400KV GIS BUILDING ARCHITECTURAL GROUND FLOOR PLAN & FINISHES SCHEDULE

CARD CODE: NA

DRG.NO. TB–1–404–607–661–1

REV. 00

SHT. No 01 NO. OF SHT. 03

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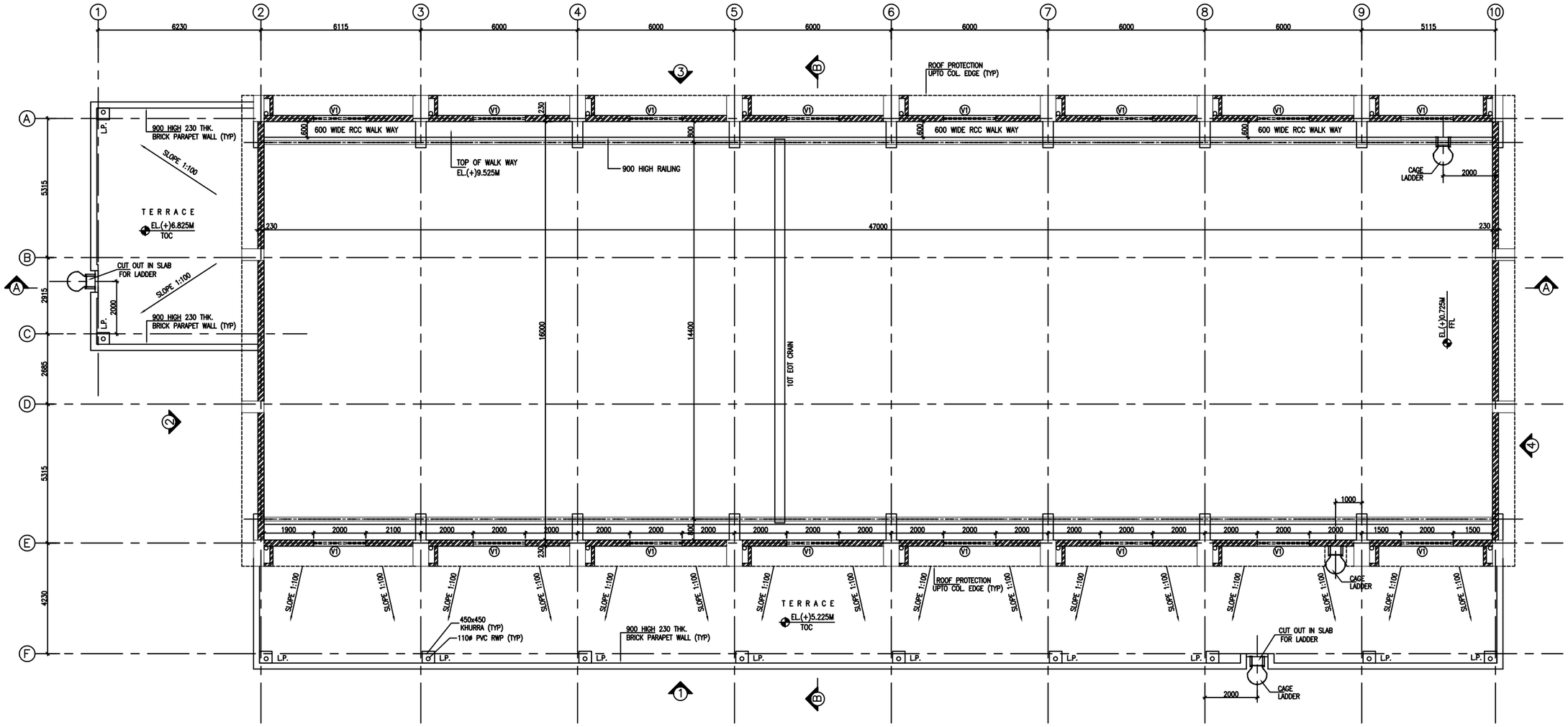
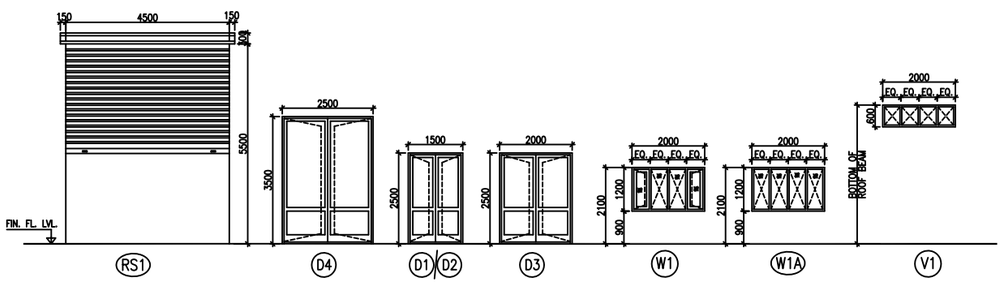
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



PLAN AT CRAIN GIRDER LEVEL@ EL(+)9.525M



SCHEDULE OF DOORS & WINDOWS

TYPE	OPENING SIZE	FRAME SIZE	CILL LEVEL	LINTEL LEVEL	NOS.	DESCRIPTION
RS1	4500x5500	4500x5500	–	5500	1	STEEL ROLLING SHUTTER
D1	1500x2500	1480x2490	–	2500	2	DOUBLE SHUTTER STEEL DOOR
D2	1500x2500	1480x2490	–	2500	2	DOUBLE SHUTTER ALUMINIUM DOOR
D3	2000x2500	1980x2490	–	2500	1	DOUBLE SHUTTER ALUMINIUM DOOR
D4	2500x3500	2480x3490	–	3500	1	DOUBLE SHUTTER STEEL DOOR
W1	2000x1200	1980x1180	900	2100	15	ALUMINIUM WINDOW FULLY GLAZED
W1A	2000x1200	1980x1180	900	2100	5	ALUMINIUM FIXED WINDOW FULLY GLAZED
V1	2000x600	1980x580	–	SOFFIT OF ROOF BEAM	16	FIXED ALUMINIUM VENTILATOR

LEGEND:–

- SIDE HUNG OPENABLE PANEL
- FIXED GLASS PANEL
- FFL = FINISH FLOOR LEVEL
- FGL = FINISH GRADE LEVEL
- H.P. = HIGH POINT
- L.P. = LOWER POINT
- TOC = TOP OF CONCRETE
- FFL = FINISH FLOOR LEVEL
- FGL = FINISH GROUND LEVEL

NOTES:–

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3. ALL DOOR-WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.
4. EL(±)0.00M CORRESPONDS TO TOP LEVEL OF ROAD.
5. FINAL LOCATION OF CABLE TRENCHES REFER APPROVED ELECTRICAL DRAWINGS.

REV	DATE	ALTERED	CHD/APPD

ZONE

PROJECT: 400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER: UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:–
RDA CIVIL ENGINEERING SYSTEM PVT. LTD.
N-43, SRINIWASPURI NEW DELHI -65
PH. 011 26845128, FAX 011 26313478

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		15.01.19	N.A.
CHD.	AKHLESH		15.01.19	
APPD.	DKU		15.01.19	

DEPT. TBG	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE	g/m/f		N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: 400KV GIS BUILDING
PLAN AT CRAIN GIRDER LEVEL@ EL(+)9.00M &

CARD CODE: NA

DRG.NO. TB-1-404-607-661-1

REV. 00

SHT. No 02 NO. OF SHT. 03

SIZE-A1

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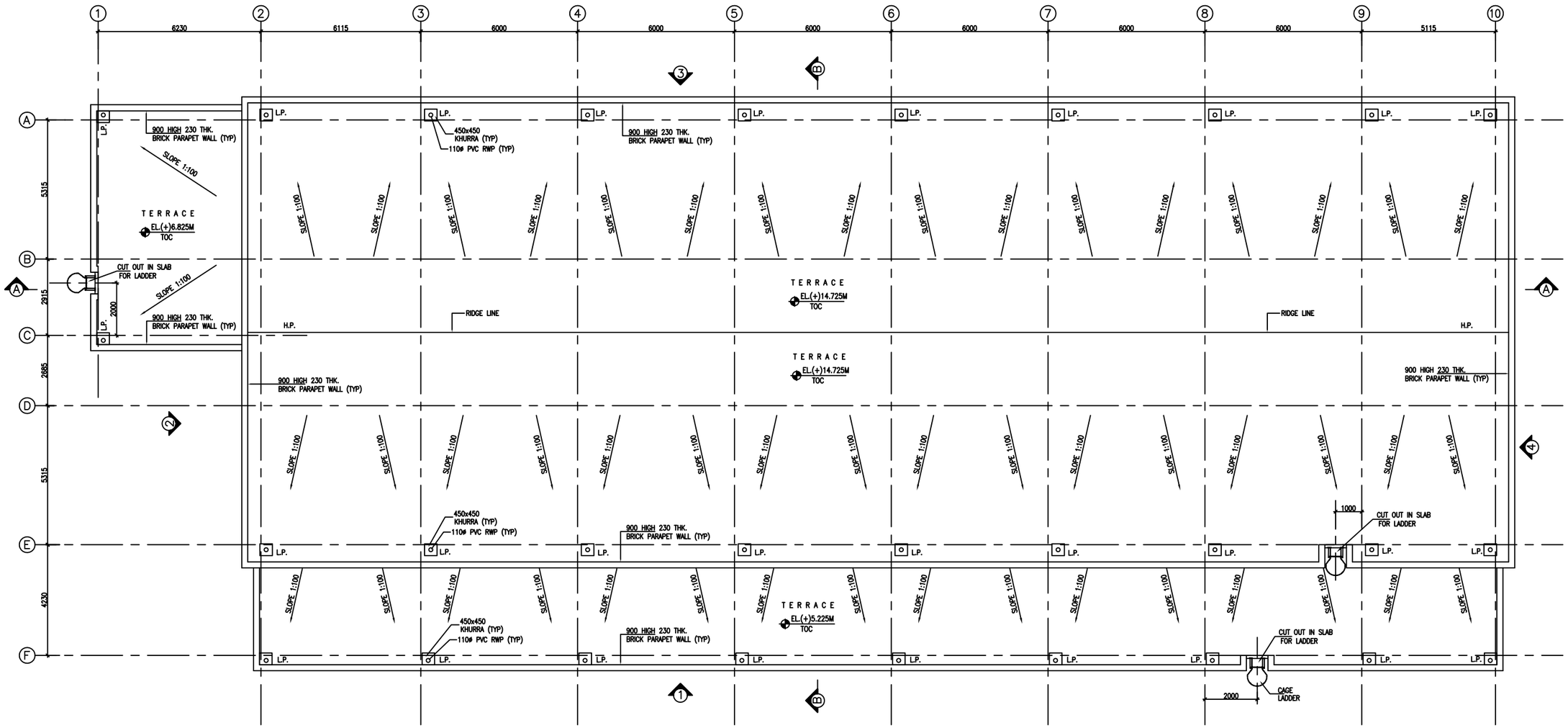
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



TERRACE PLAN

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NOTES:-

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3. ALL DOOR-WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.
4. EL(±)0.00M CORRESPONDS TO TOP LEVEL OF ROAD.
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 RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
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APPD.	DKU		15.01.19	

DEPT. TBG	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE	g/M/f		N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: 400KV GIS BUILDING ARCHITECTURAL TERRACE PLAN

CARD CODE: NA

DRG.NO. TB-1-404-607-663

REV. 00

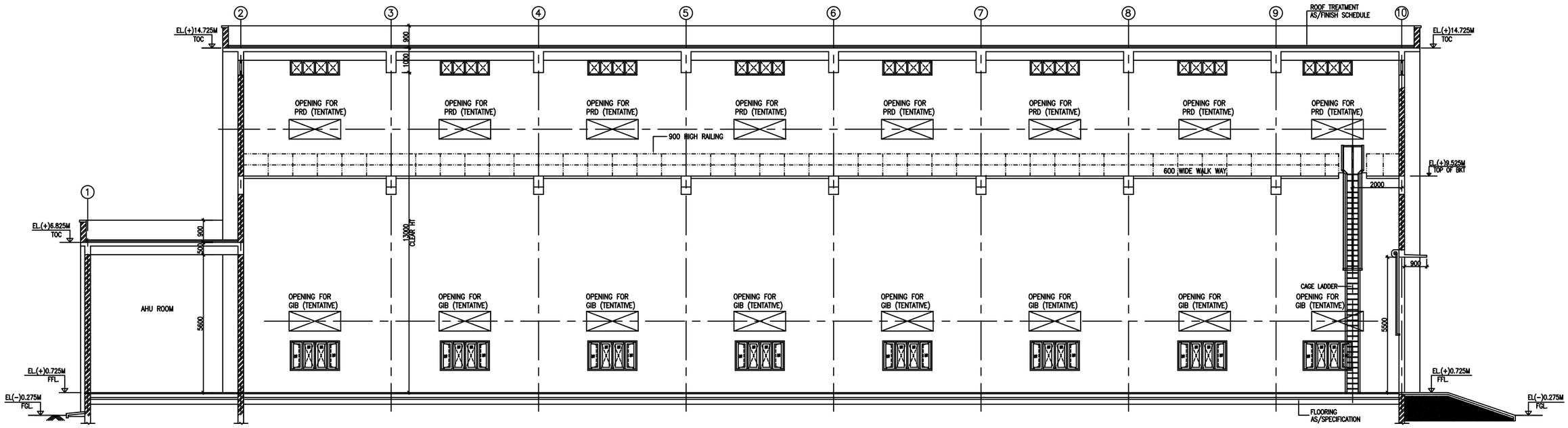
SHT. No 03 NO. OF SHT. 03

SIZE-A1

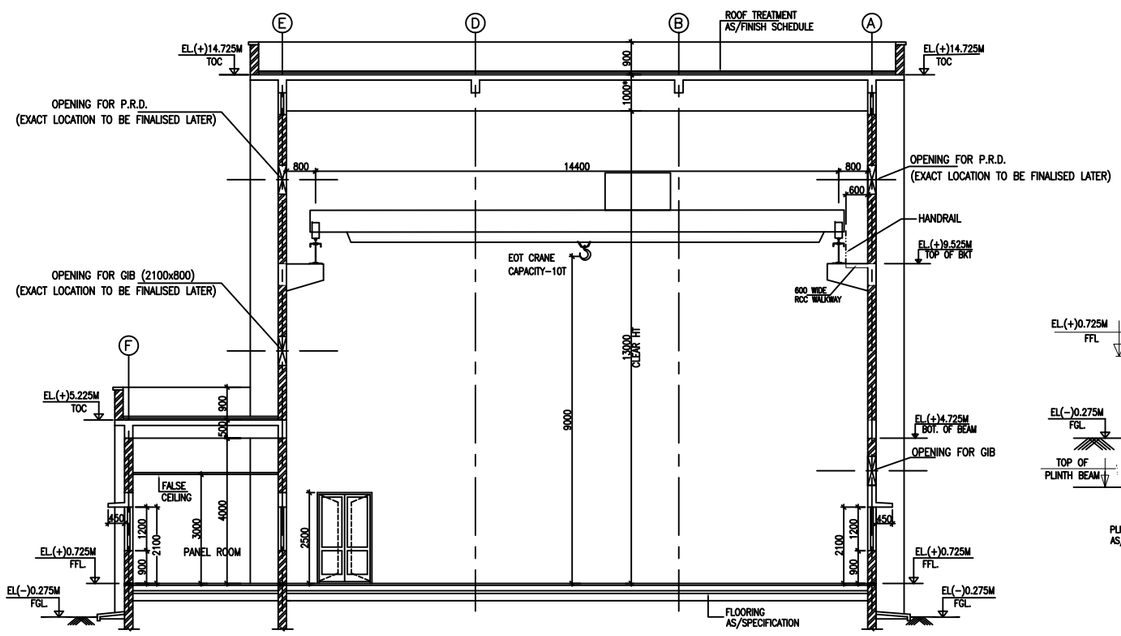
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

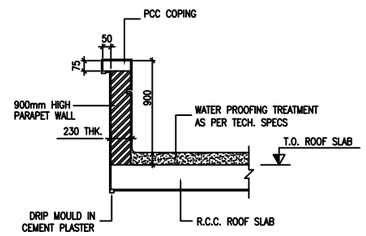
DRG. NO.



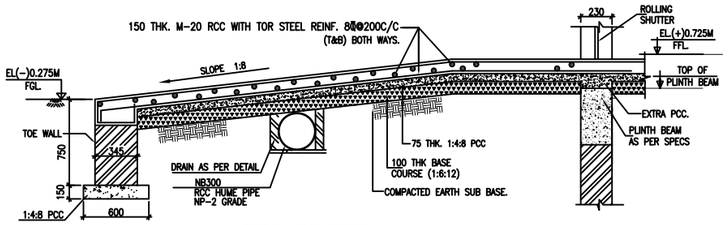
SECTION A-A



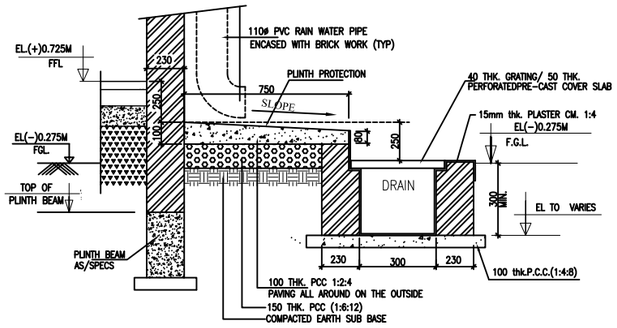
SECTION B-B



TYP. DETAIL OF PARAPET



DETAIL OF RAMP



PLINTH PROTECTION ALONG BUILDING WITH DRAIN-TYPICAL

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5. FINAL LOCATION OF CABLE TRENCHES REFER APPROVED ELECTRICAL DRAWINGS.

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

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:-
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N-43, SRINIWASPURI NEW DELHI -65
☎PH. 011 26845128, FAX 011 26313478

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		15.01.19	N.A.
CHD.	AKHLESH		15.01.19	
APPD.	DKU		15.01.19	

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: 400KV GIS BUILDING ARCHITECTURAL SECTIONS

CARD CODE: NA

DRG.NO. TB-1-404-607-661-2

REV. 00

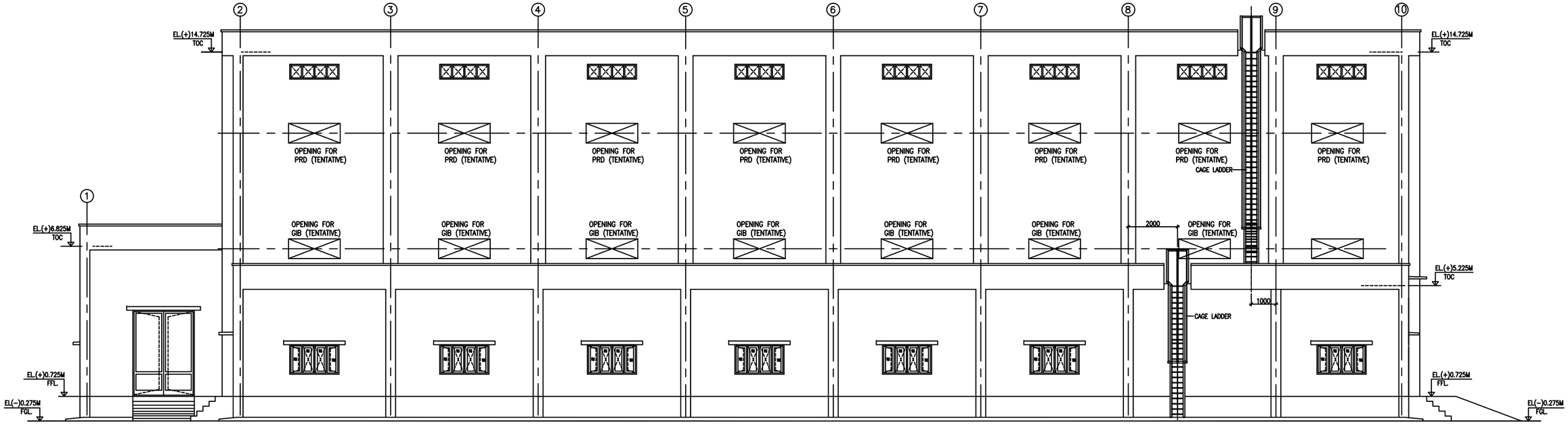
SHT. No 01 NO. OF SHT. 01

SIZE-A1

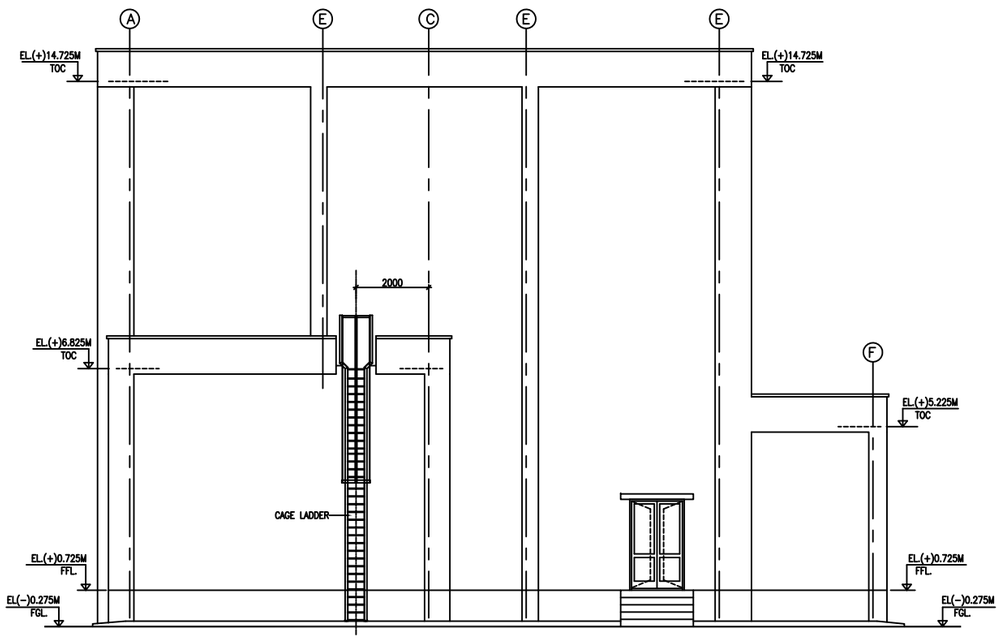
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



ELEVATION–1



ELEVATION–2

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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		

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
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CHD.	AKHLESH		15.01.19	
APPD.	DKU		15.01.19	

DEPT. TBG	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE	g/M/f	N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: 400KV GIS BUILDING ARCHITECTURAL ELEVATIONS

CARD CODE: NA

DRG.NO. TB–1–404–607–661–3

REV. 00

SHT. No 01 NO. OF SHT. 02

SIZE–A1

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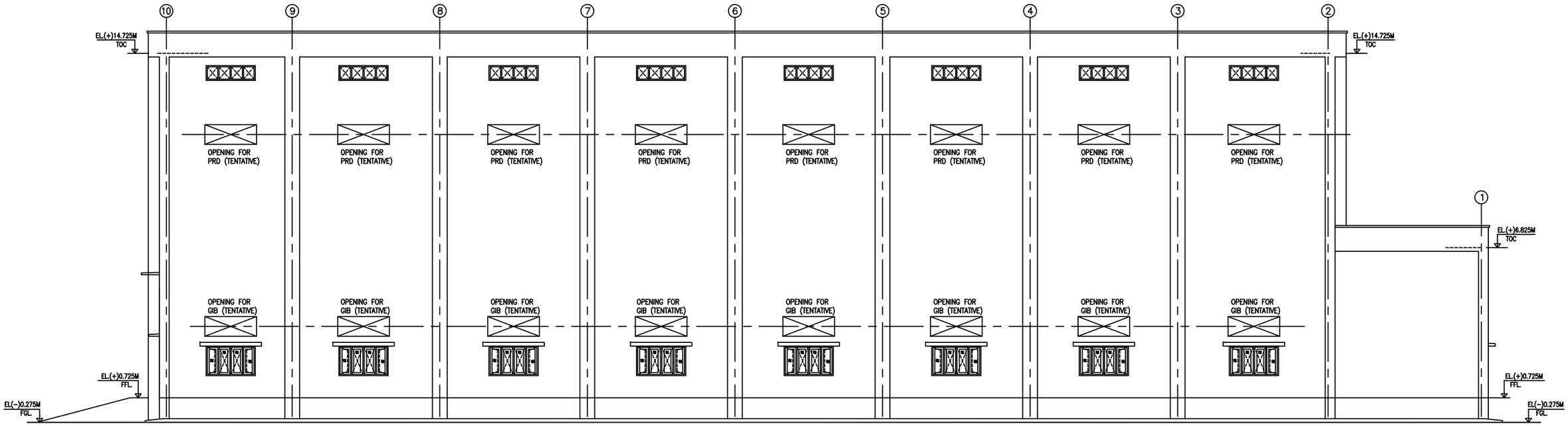
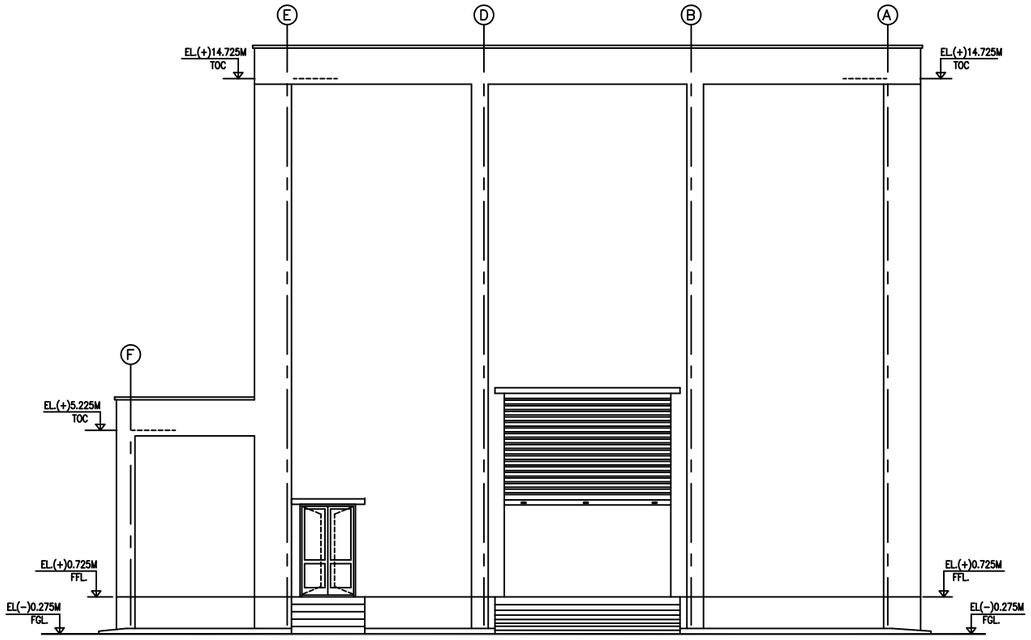
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



ELEVATION–3



ELEVATION–4

NOTES:–

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

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:–
RDA CIVIL ENGINEERING SYSTEM PVT. LTD.
N–43, SRINIWASPURI NEW DELHI –65
☎PH. 011 26845128, FAX 011 26313478

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		15.01.19	N.A.
CHD.	AKHLESH		15.01.19	
APPD.	DKU		15.01.19	

DEPT. TBG / CODE	UNTOL. DIMS. GR. g/M/f	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
		N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: 400KV GIS BUILDING ARCHITECTURAL ELEVATIONS

CARD CODE: NA

DRG.NO. TB–1–404–607–661–3

REV. 00

SHT. No 02 NO. OF SHT. 02

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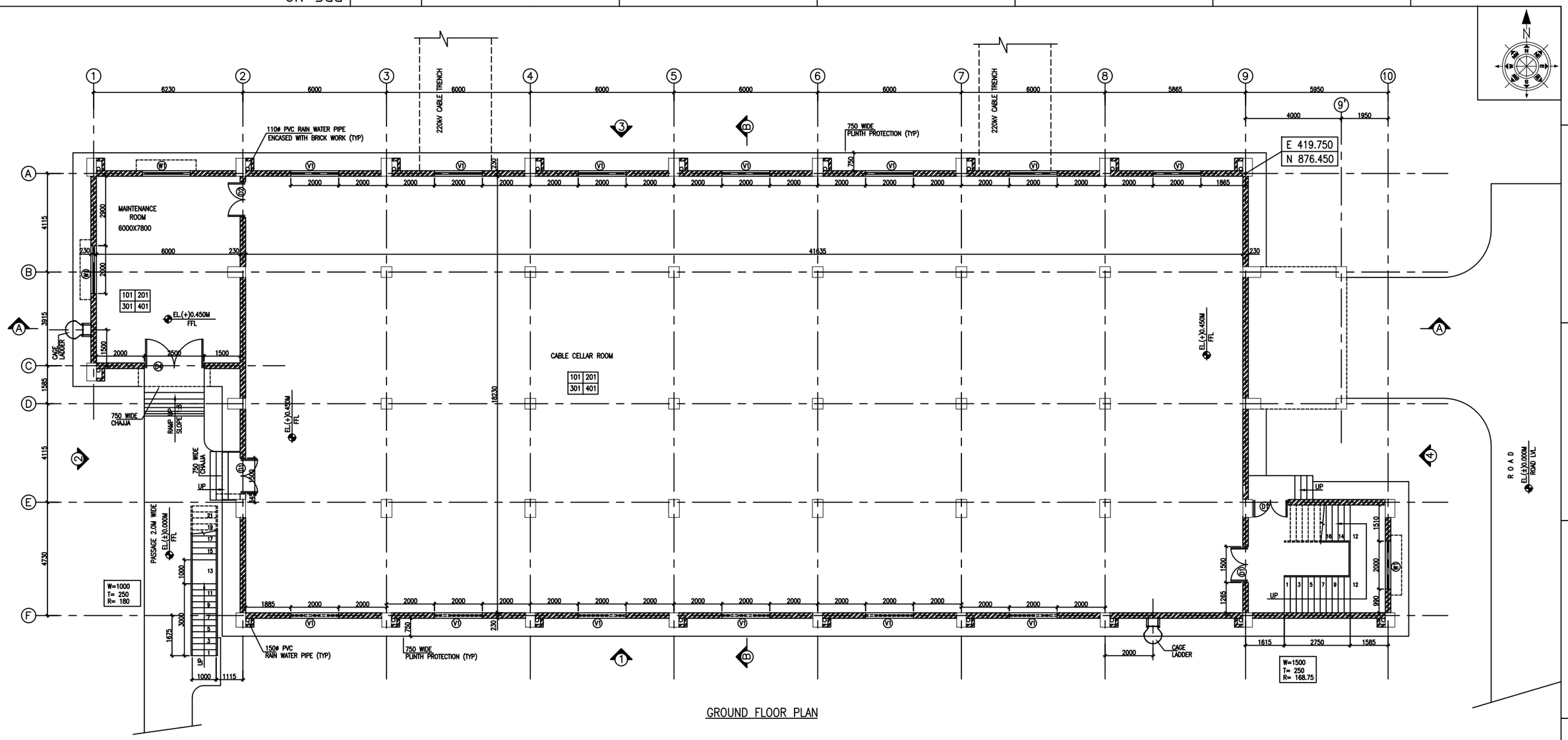
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



GROUND FLOOR PLAN

ILLUSTRATION OF FINISHES.			FINISHES OF SCHEDULE		
WALL SERIES 100	FLOORING SERIES 200		WALL FINISHES–		
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	2.	202	VITRIFIED TILES
CEILING FINISHES					
1.	301	ARYLIC DISTEMPER			
2.	302	ARYLIC EMULSION PAINT			

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)

LEGEND:–

- SIDE HUNG OPENABLE PANEL
- FIXED GLASS PANEL
- FFL. = FINISH FLOOR LEVEL
- FGL. = FINISH GRADE LEVEL
- H.P. = HIGH POINT
- L.P. = LOWER POINT
- TOC = TOP OF CONCRETE
- FFL = FINISH FLOOR LEVEL
- FGL = FINISH GROUND LEVEL

REFFRENCE DRAWING:–

1 OVERALL GENERAL ARRANGEMENT DRAWING – TB–0–375–316–002
2 CONCEPTUAL DRAWING FOR 220kV GIS BUILDING – TB–3–404–316–005
3 GIS LAYOUT FOR 220kV GIS BUILDING – G71770–AD309–V023

NOTES:–

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ZONE			ZONE			ZONE			ZONE		

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
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DRN.	TKR		12.09.19	N.A.
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APPD.	DKU		12.09.19	

DEPT. TBG	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE	g/m/f		N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: 220KV GIS BUILDING
ARCHITECTURAL GROUND FLOOR PLAN & FINISHES SCHEDULE

CARD CODE: NA

DRG.NO. TB–1–404–607–671–1

REV. 00

SHT. No 01 NO. OF SHT. 04

SIZE–A1

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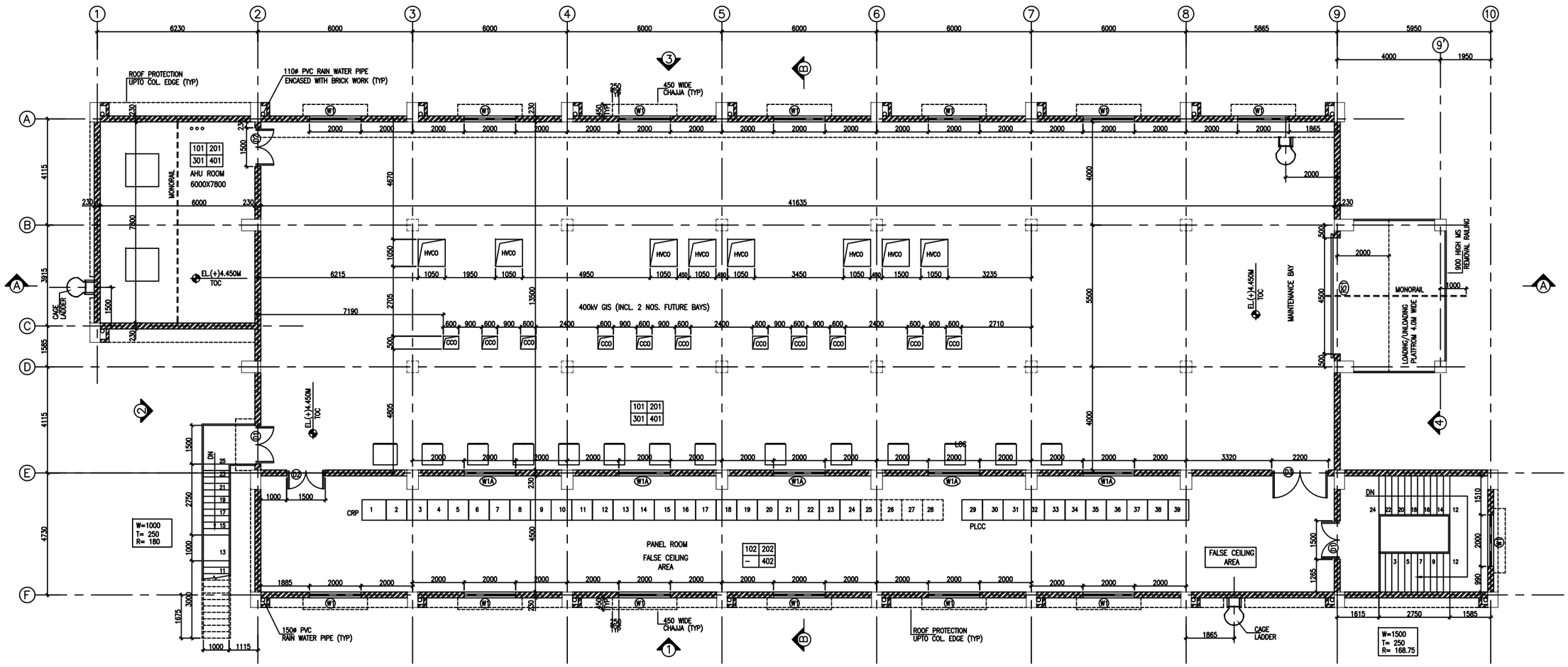
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



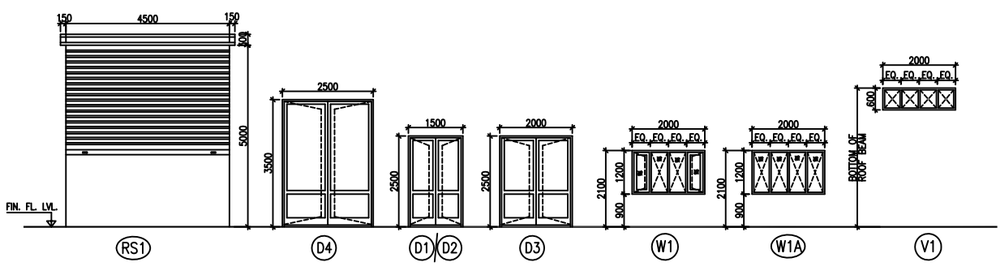
FIRST FLOOR PLAN

LEGEND:–

SIDE HUNG OPENABLE PANEL

FIXED GLASS PANEL

FFL. = FINISH FLOOR LEVEL
FGL. = FINISH GRADE LEVEL
H.P. = HIGH POINT
L.P. = LOWER POINT
TOC = TOP OF CONCRETE
FFL = FINISH FLOOR LEVEL
FGL = FINISH GROUND LEVEL



SCHEDULE OF DOORS & WINDOWS

TYPE	OPENING SIZE	FRAME SIZE	CILL LEVEL	LINTEL LEVEL	NOS.	DESCRIPTION
RS1	4500x5000	4500x5000	–	5000	1	STEEL ROLLING SHUTTER
D1	1500x2500	1480x2490	–	2500	5	DOUBLE SHUTTER STEEL DOOR
D2	1500x2500	1480x2490	–	2500	3	DOUBLE SHUTTER ALUMINIUM DOOR
D3	2200x2500	2180x2490	–	2500	1	DOUBLE SHUTTER ALUMINIUM DOOR
D4	2500x3000	2480x2990	–	3000	1	DOUBLE SHUTTER STEEL DOOR
W1	2000x1200	1980x1180	900	2100	16	ALUMINIUM WINDOW FULLY GLAZED
W1A	2000x1200	1980x1180	900	2100	5	ALUMINIUM FIXED WINDOW FULLY GLAZED
V1	2000x600	1980x580	–	SOFFIT OF ROOF BEAM	27	FIXED ALUMINIUM VENTILATOR

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ZONE			ZONE			ZONE			ZONE		

PROJECT: 400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER: UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

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CODE	G/M/F	N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: 220KV GIS BUILDING ARCHITECTURAL FIRST FLOOR PLAN & SCHEDULE OF DOORS & WINDOWS

CARD CODE: NA

DRG.NO. TB-1-404-607-671-1

REV. 00

SHT. No 02 NO. OF SHT. 04

SIZE-A1

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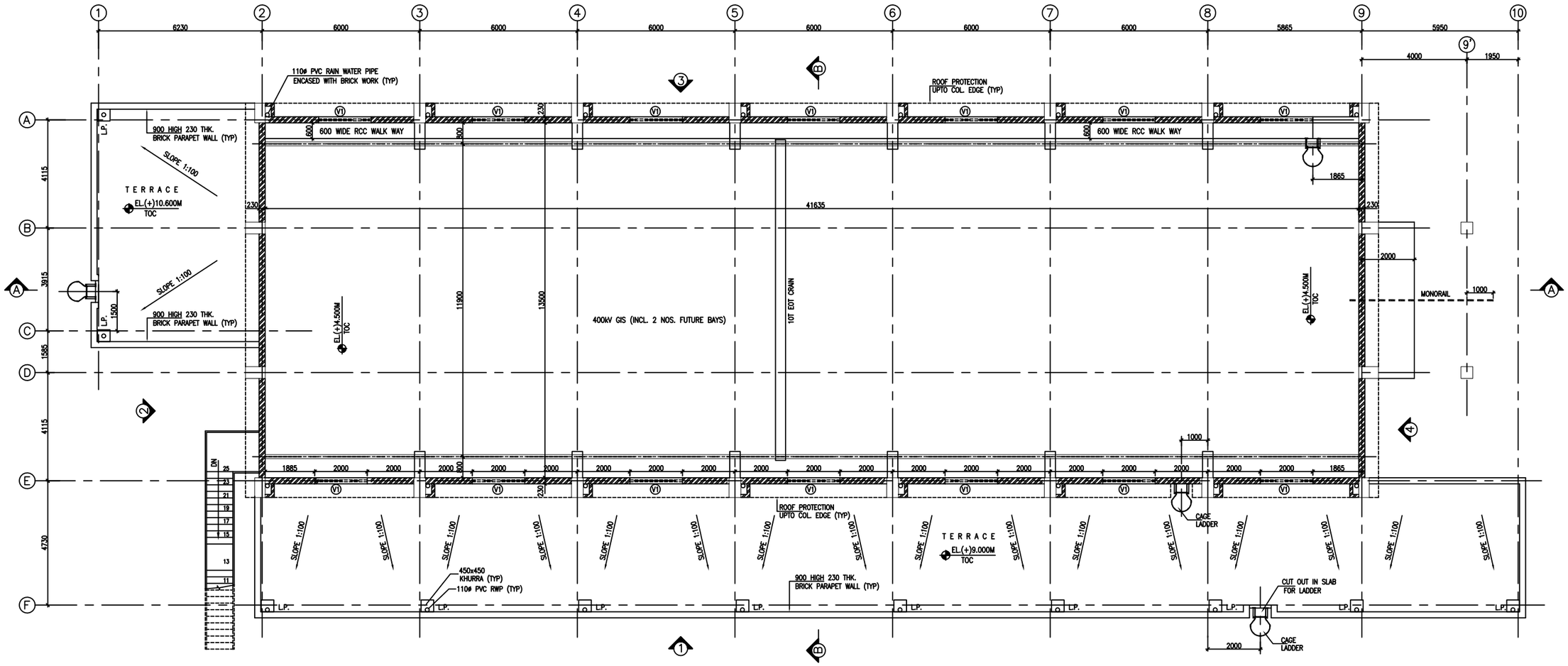
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



PLAN AT CRAIN GIRDER LEVEL@ EL(+)11.800M

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NOTES:–

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3. ALL DOOR–WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.
4. EL(±)0.00M CORRESPONDS TO TOP LEVEL OF ROAD.
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 RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:–
RDA CIVIL ENGINEERING SYSTEM PVT. LTD.
N–43, SRINIWASPURI NEW DELHI –65
☎ PH. 011 26845128, FAX 011 26313478

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		12.09.19	N.A.
CHD.	AKHLESH		12.09.19	
APPD.	DKU		12.09.19	

DEPT. TBG	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE	g/m/f	N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE
220KV GIS BUILDING
PLAN AT CRAIN GIRDER LEVEL@ EL(+)11.850M
FINISHES SCHEDULE

CARD CODE: NA

DRG.NO. TB–1–404–607–671–1

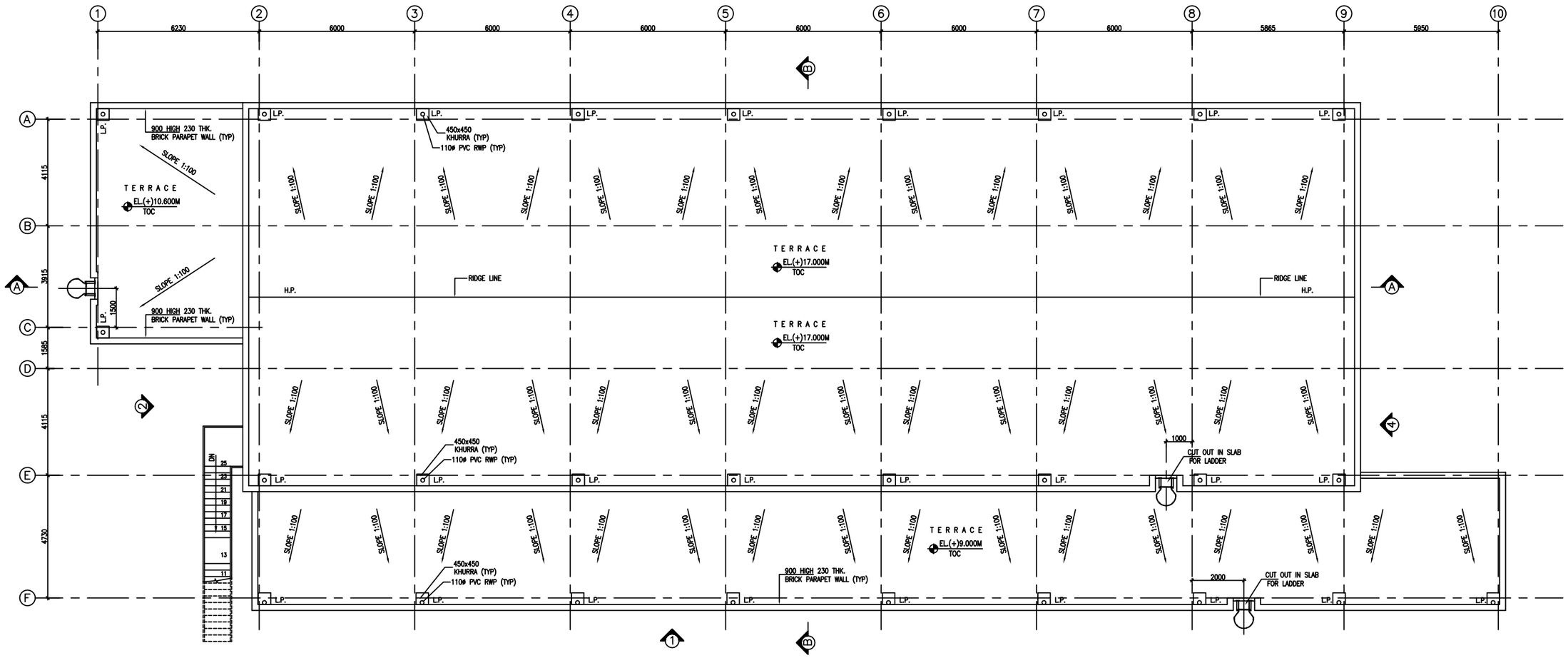
REV. 00

SHT. No 03 NO. OF SHT. 04

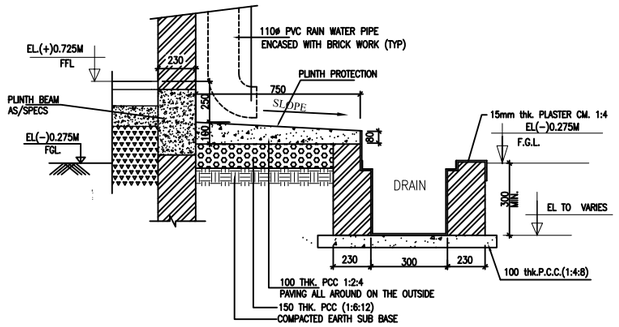
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

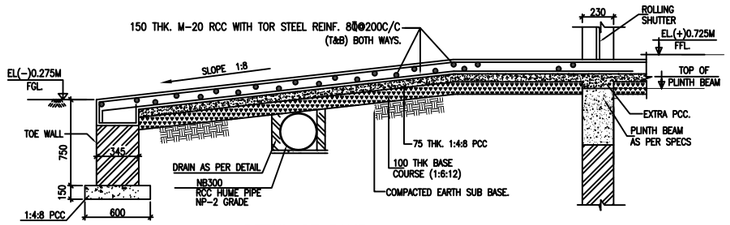
DRG. NO.



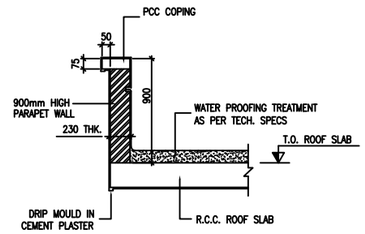
TERRACE PLAN



PLINTH PROTECTION ALONG BUILDING WITH DRAIN-TYPICAL



DETAIL OF RAMP



TYP. DETAIL OF PARAPET

NOTES:-

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ZONE			ZONE			ZONE			ZONE		

PROJECT: 400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER: UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:-
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DRN.	TKR		12.09.19	N.A.
CHD.	AKHLESH		12.09.19	
APPD.	DKU		12.09.19	

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: 220KV GIS BUILDING ARCHITECTURAL TERRACE PLAN

CARD CODE: NA

DRG.NO. TB-1-404-607-671-1

REV. 00

SHT. No 04 NO. OF SHT. 04

SIZE-A1

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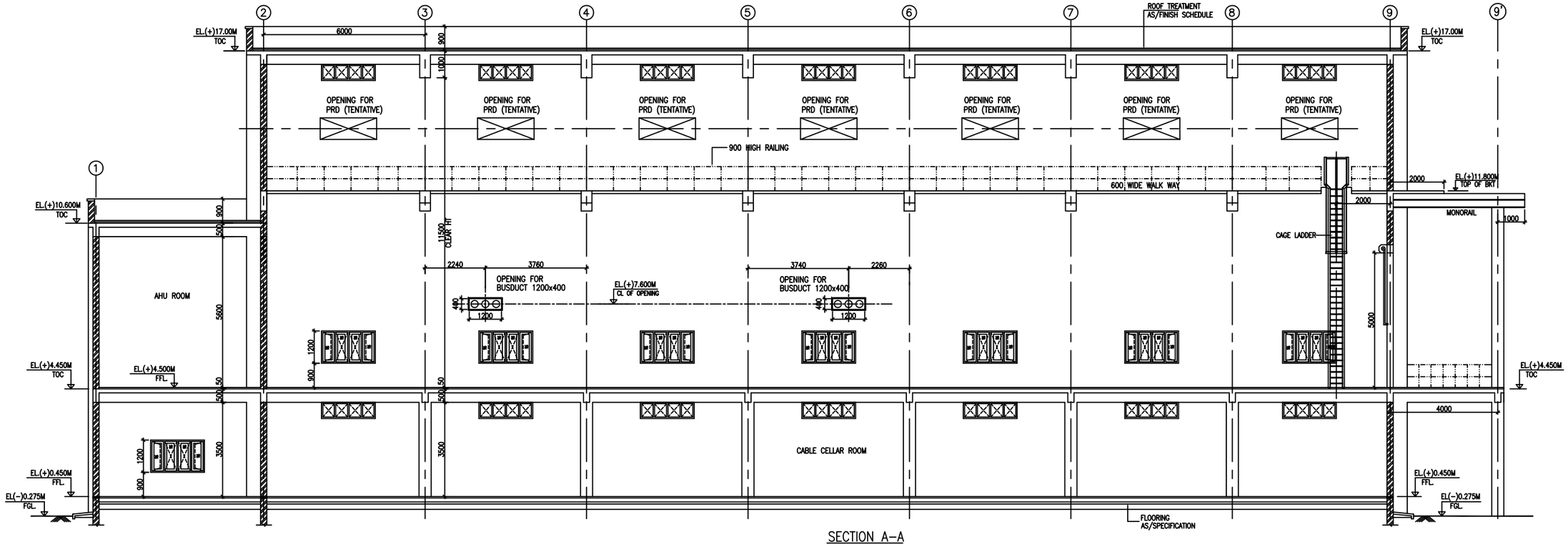
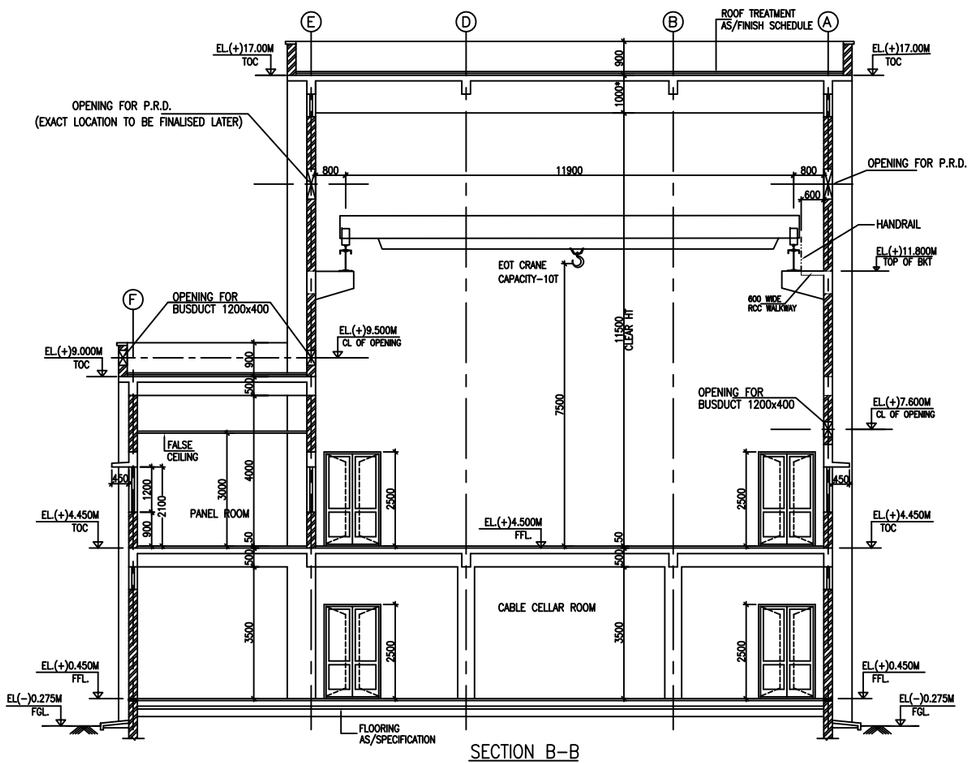


SECTION A–A



SECTION B–B

NOTES:–

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		CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE			ZONE		

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
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DRN.	TKR		12.09.19	N.A.
CHD.	AKHLESH		12.09.19	
APPD.	DKU		12.09.19	

DEPT. TBG	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE	g/M/F	N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: 220KV GIS BUILDING ARCHITECTURAL SECTIONS

CARD CODE: NA

DRG.NO. TB–1–404–607–671–3

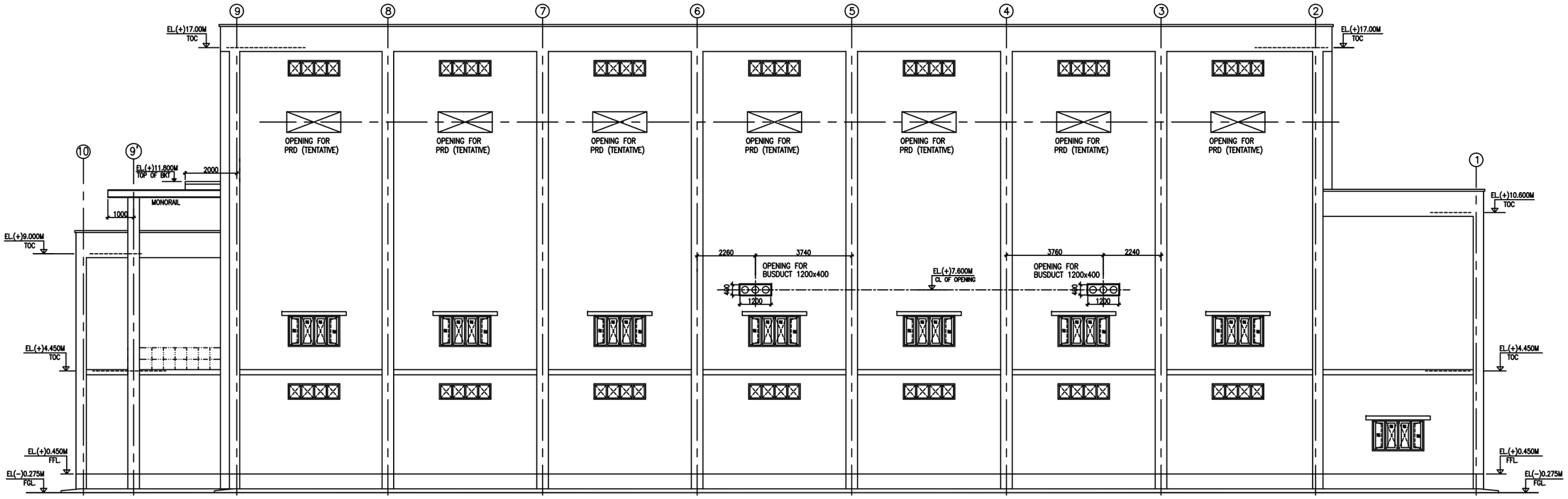
REV. 00

SHT. No 01 NO. OF SHT. 01

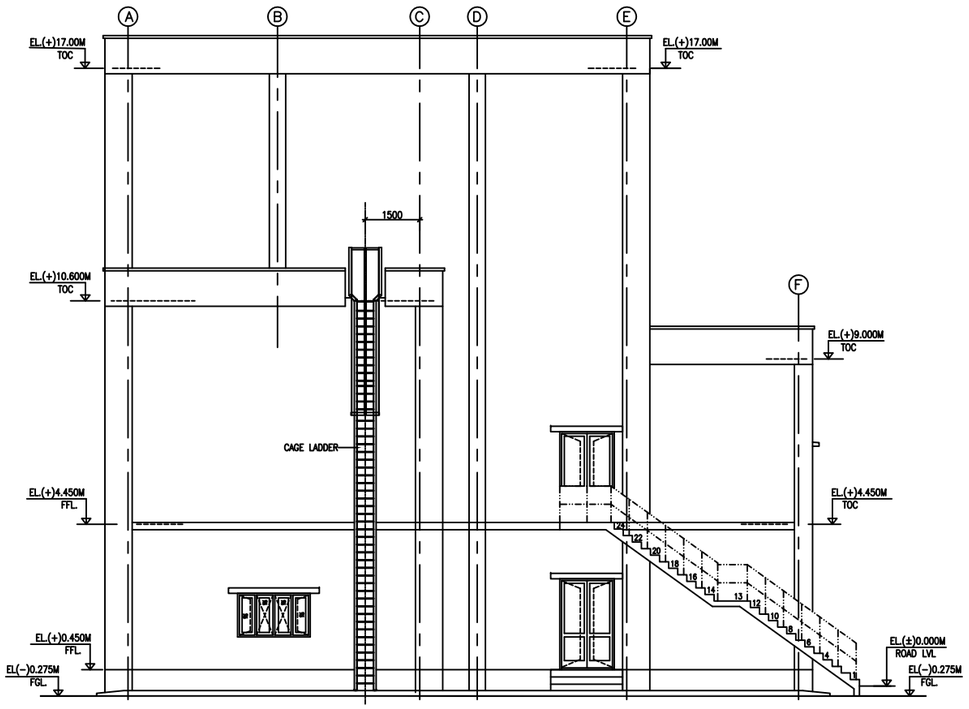
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



ELEVATION-3



ELEVATION-2

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

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:-
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☎PH. 011 26845128, FAX 011 26313476

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		12.09.19	N.A.
CHD.	AKHLESH		12.09.19	
APPD.	DKU		12.09.19	

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
220KV GIS BUILDING
ARCHITECTURAL ELEVATIONS

CARD CODE NA

DRG.NO. TB-1-404-607-671-2

REV. 00

SHT. No 01 NO. OF SHT. 02

SIZE-A1

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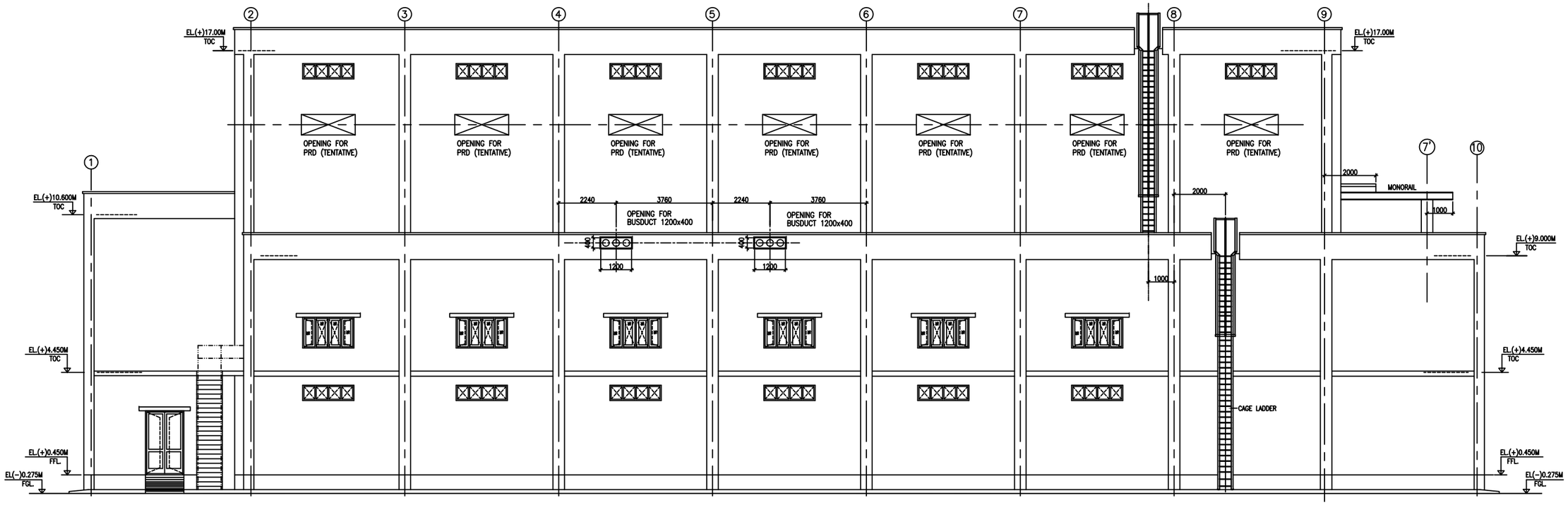
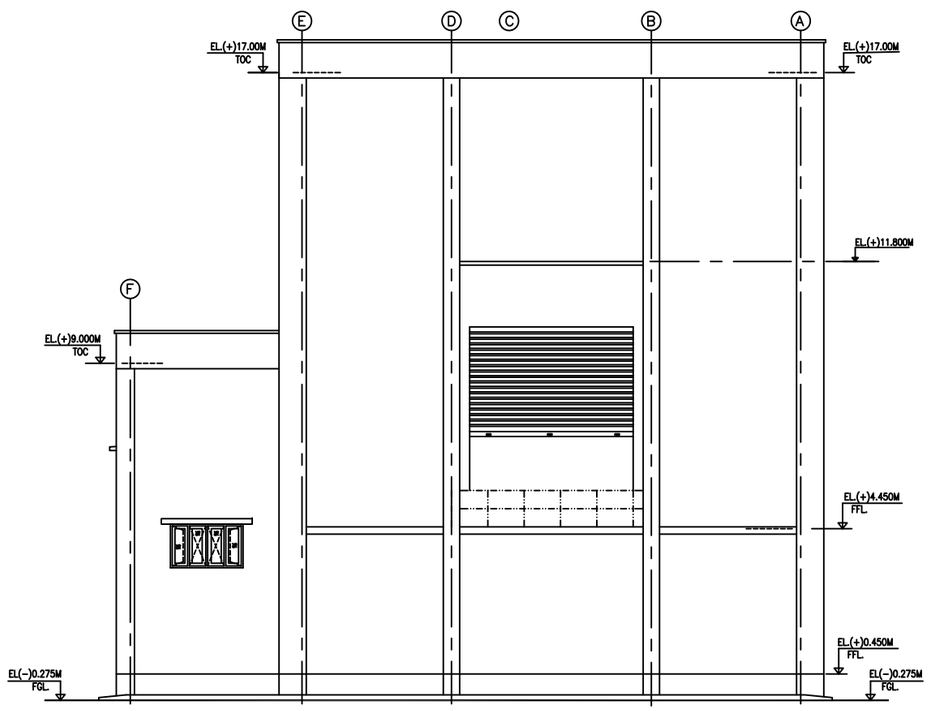
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



ELEVATION−1



ELEVATION−4

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ZONE			ZONE			ZONE			ZONE		

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:−
RDA CIVIL ENGINEERING SYSTEM PVT. LTD.
N−43, SRINIWASPURI NEW DELHI −65
☎PH. 011 26845128, FAX 011 26313476

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		12.09.19	N.A.
CHD.	AKHLESH		12.09.19	
APPD.	DKU		12.09.19	

DEPT. TBG CODE	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
	9/M/F	N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE
220KV GIS BUILDING
ARCHITECTURAL ELEVATIONS

CARD CODE: NA

DRG.NO. TB−1−404−607−671−2

REV. 00

SHT. No 02 NO. OF SHT. 02

SIZE−A1

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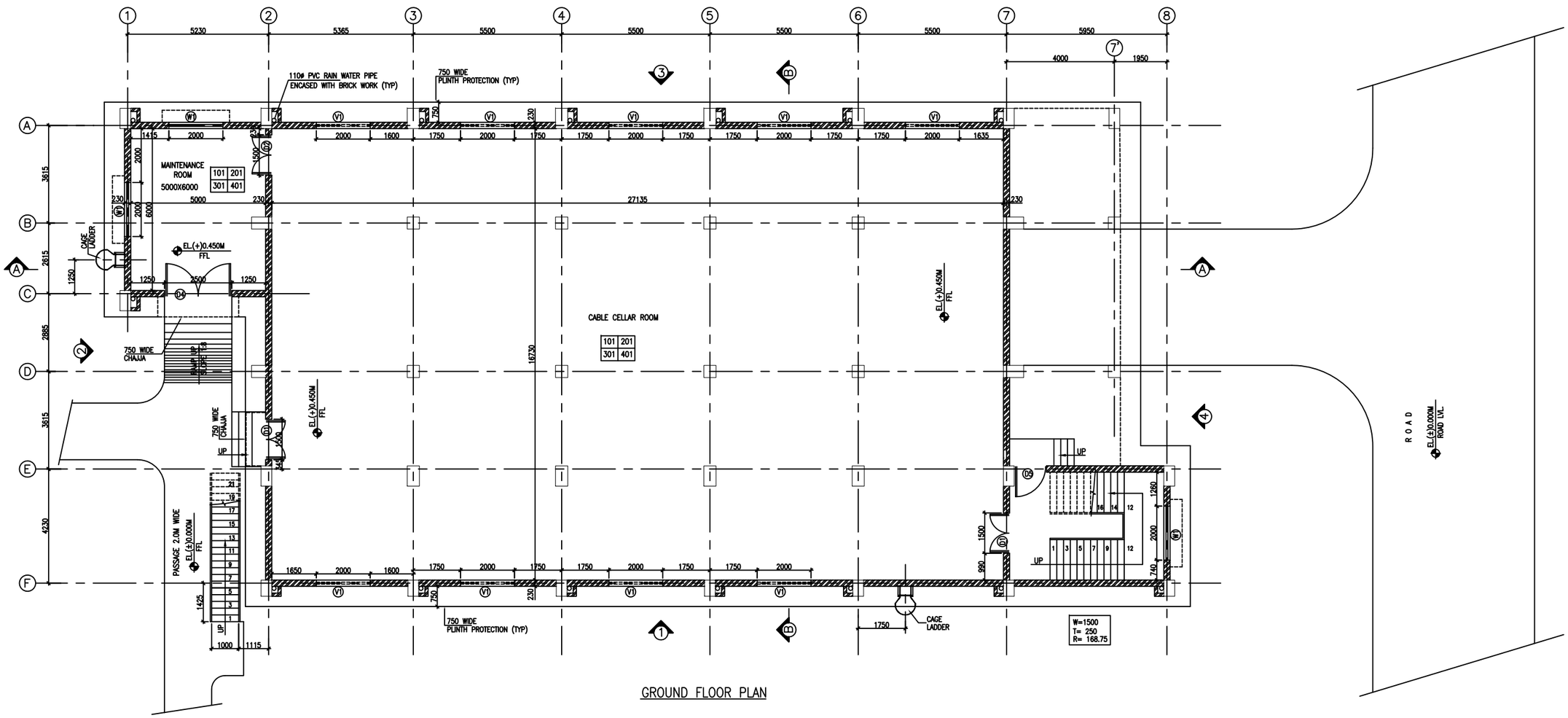
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



GROUND FLOOR PLAN

ILLUSTRATION OF FINISHES.	
WALL SERIES 100	FLOORING SERIES 200
CEILING SERIES 300	SKIRTING/ DADO SERIES 400

FINISHES OF SCHEDULE

WALL FINISHES–

SR.NO.	CODE NO.	DESCRIPTION
1.	101	ARYLIC DISTEMPER
2.	102	ARYLIC EMULSION PAINT

SKIRTING/DADO FINISHES		
1.	401	CEMENT PLASTER SKIRTING 150 MM HIGH
2.	402	VITRIFIED TILES

FLOORING FINISHES		
1.	201	CEMENT CONCRETE FLOORING
2.	202	VITRIFIED TILES

CEILING FINISHES		
1.	301	ARYLIC DISTEMPER
2.	302	ARYLIC EMULSION PAINT

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)

LEGEND:–

SIDE HUNG OPENABLE PANEL
FIXED GLASS PANEL
FFL. = FINISH FLOOR LEVEL
FGL. = FINISH GRADE LEVEL
H.P. = HIGH POINT
L.P. = LOWER POINT
TOC = TOP OF CONCRETE
FFL = FINISH FLOOR LEVEL
FGL = FINISH GROUND LEVEL

REFFRENCE DRAWING:–

1 OVERALL GENERAL ARRANGEMENT DRAWING – TB–0–375–316–002
2 CONCEPTUAL DRAWING FOR 132kV GIS BUILDING – TB–3–404–316–006
3 145kV GIS FOUNDATION & GROUNDING PROCEDURE/PHILOSOPHY – TB–DG–404–316–262/263

NOTES:–

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ZONE			ZONE			ZONE			ZONE		

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
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APPD.	DKU		09.09.19	

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
132KV GIS BUILDING
ARCHITECTURAL GROUND FLOOR PLAN & FINISHES SCHEDULE

CARD CODE NA

DRG.NO. TB–1–404–607–681–1

REV. 00

SHT. No 01 NO. OF SHT. 04

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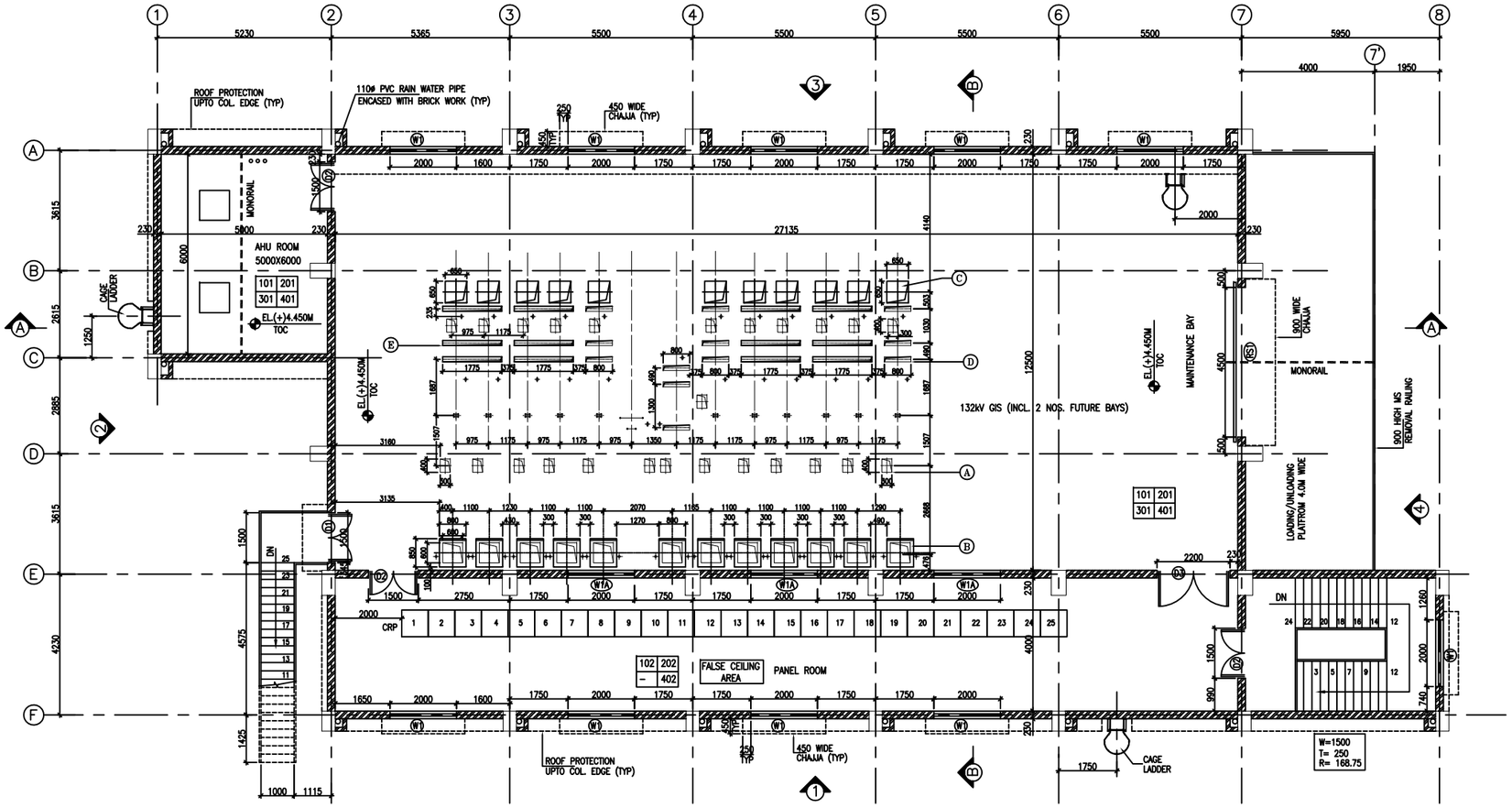
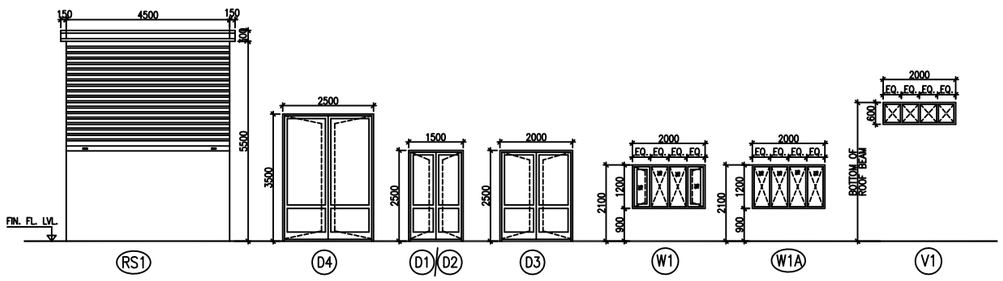
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



FIRST FLOOR PLAN



LEGEND:–

SIDE HUNG OPENABLE PANEL

FIXED GLASS PANEL

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FGL = FINISH GRADE LEVEL
H.P. = HIGH POINT
L.P. = LOWER POINT
TOC = TOP OF CONCRETE
FFL = FINISH FLOOR LEVEL
FGL = FINISH GROUND LEVEL

SCHEDULE OF DOORS & WINDOWS

TYPE	OPENING SIZE	FRAME SIZE	CILL LEVEL	LINTEL LEVEL	NOS.	DESCRIPTION
RS1	4500x5500	4500x5500	–	5500	1	STEEL ROLLING SHUTTER
D1	1500x2500	1480x2490	–	2500	3	DOUBLE SHUTTER STEEL DOOR
D2	1500x2500	1480x2490	–	2500	4	DOUBLE SHUTTER ALUMINIUM DOOR
D3	2200x2500	2180x2490	–	2500	1	DOUBLE SHUTTER ALUMINIUM DOOR
D4	2500x3000	2480x2990	–	3000	1	DOUBLE SHUTTER STEEL DOOR
D5	1200x2500	1180x2490	–	2500	1	SINGLE SHUTTER STEEL DOOR
W1	2000x1200	1980x1180	900	2100	12	ALUMINIUM WINDOW FULLY GLAZED
W1A	2000x1200	1980x1180	900	2100	3	ALUMINIUM FIXED WINDOW FULLY GLAZED
V1	2000x600	1980x580	–	SOFFIT OF ROOF BEAM	19	FIXED ALUMINIUM VENTILATOR

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ZONE			ZONE			ZONE			ZONE		

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

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RDA CIVIL ENGINEERING SYSTEM PVT. LTD.
N-43, SRINIWASPURI NEW DELHI -65
☎PH. 011 26845128, FAX 011 26313478

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		09.09.19	N.A.
CHD.	AKHLESH		09.09.19	
APPD.	DKU		09.09.19	

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: 132KV GIS BUILDING ARCHITECTURAL FIRST FLOOR PLAN & SCHEDULE OF DOORS & WINDOWS

CARD CODE: NA

DRG.NO. TB-1-404-607-681-1

REV. 00

SHT. No 02 NO. OF SHT. 04

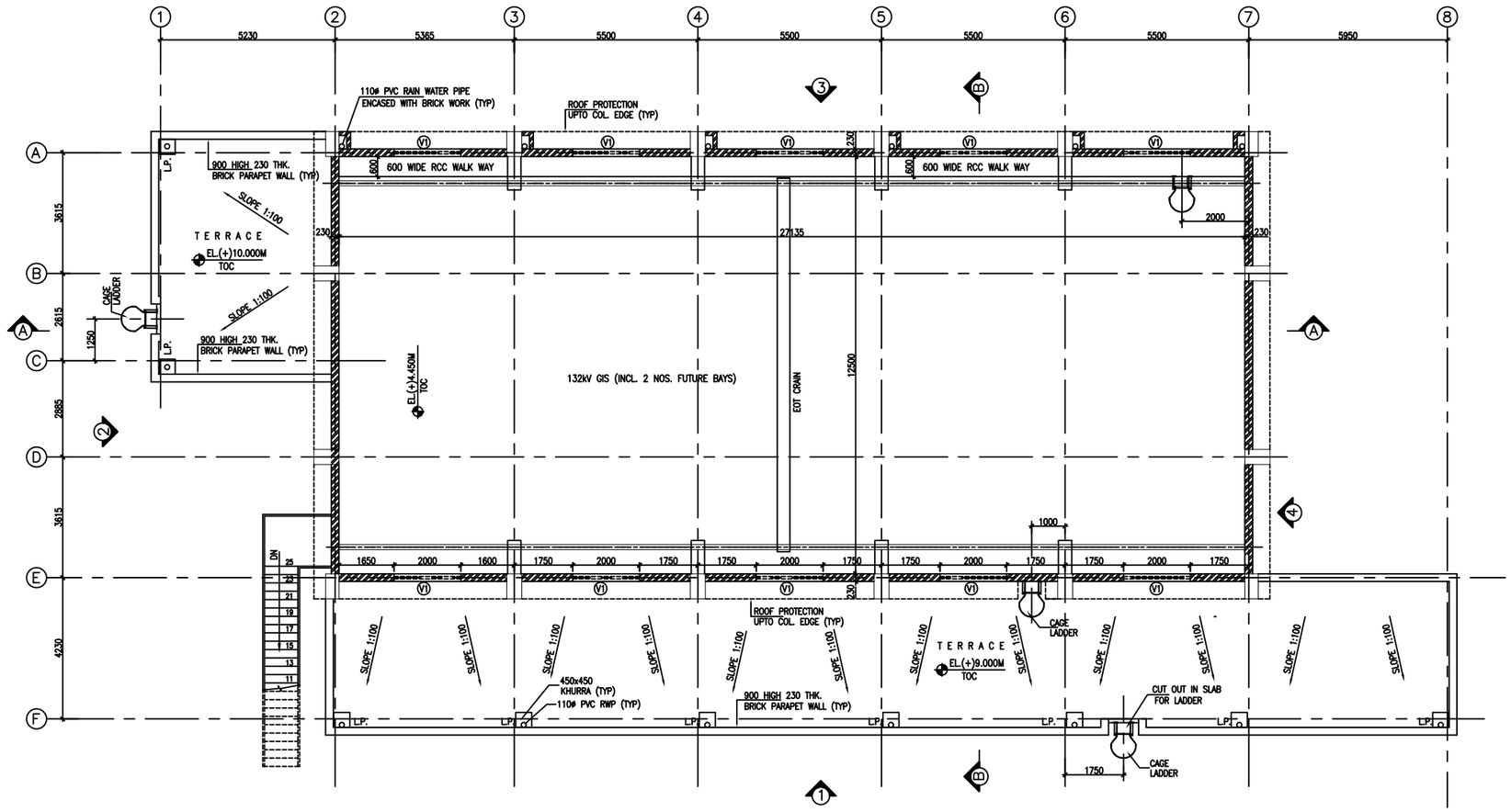
SIZE-A1

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



PLAN AT CRAIN GIRDER LEVEL@ EL(+)*.***M

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2 ALL WINDOWS AND VENTILATORS ON GROUND FLOOR OF ALL BUILDINGS SHALL BE PROVIDED WITH SUITABLE MS GRILL.
3. ALL DOOR-WINDOW, ETC. HEIGHT SHALL BE CONSIDERED FROM FINISH FLOOR LEVEL.
4. EL(±)0.00M CORRESPONDS TO TOP LEVEL OF ROAD.
5. FINAL LOCATION OF CABLE TRENCHES REFER APPROVED ELECTRICAL DRAWINGS.

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

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:–
RDA CIVIL ENGINEERING SYSTEM PVT. LTD.
N-43, SRINIWASPURI NEW DELHI -65
☎PH. 011 26845128, FAX 011 26313476

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		09.09.19	N.A.
CHD.	AKHLESH		09.09.19	
APPD.	DKU		09.09.19	

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
132KV GIS BUILDING
PLAN AT CRAIN GIRDER LEVEL@ EL(+)11.850M

CARD CODE NA

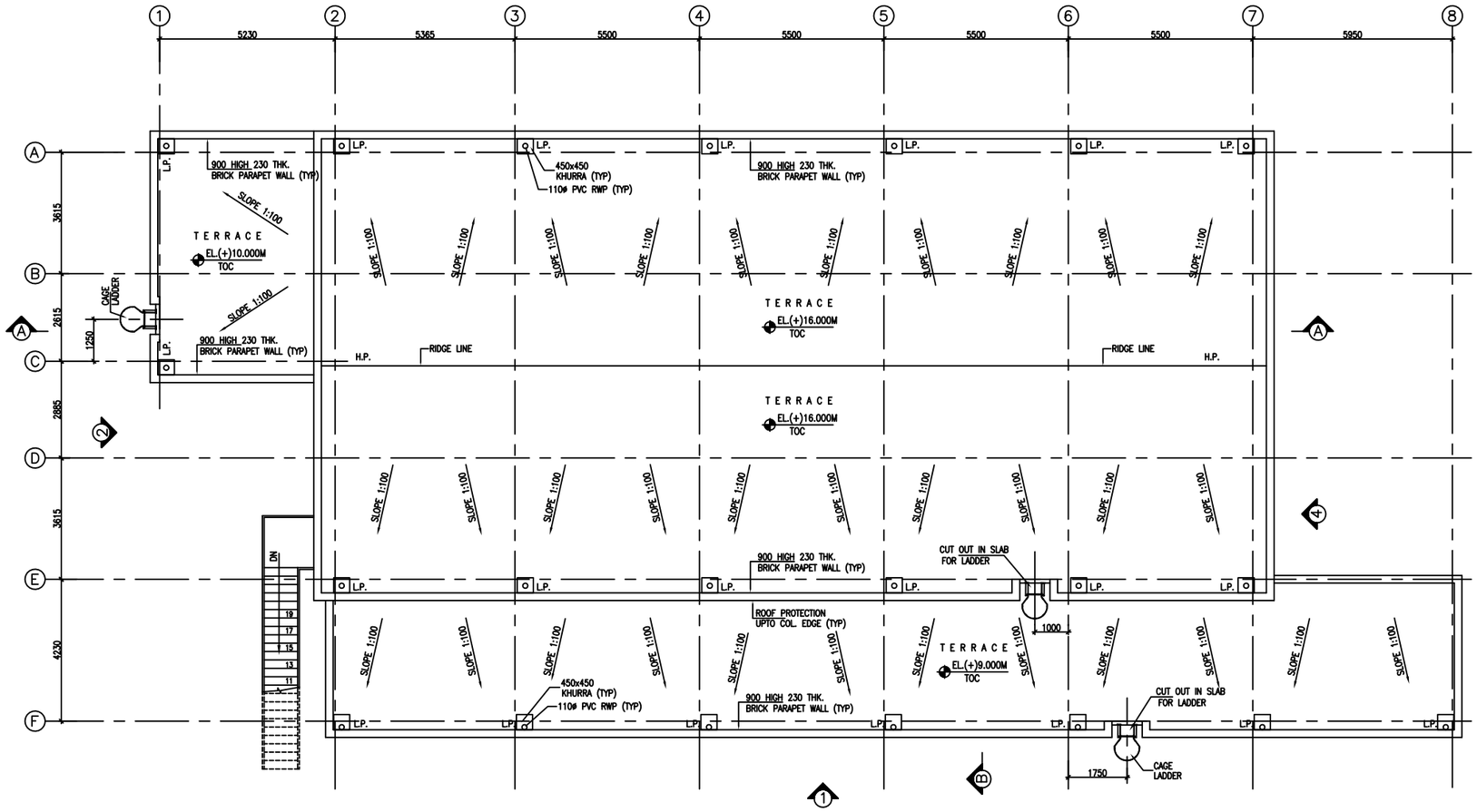
DRG.NO. TB-1-404-607-681-1

REV. 00

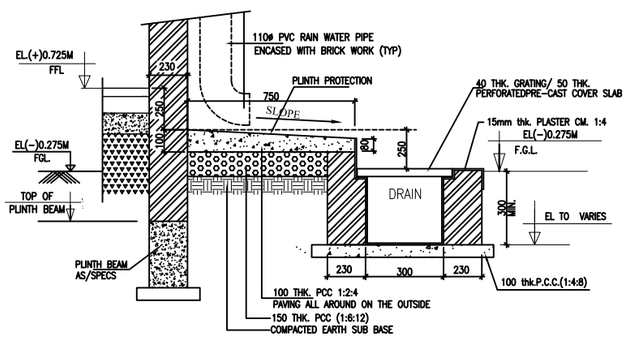
SHT. No 03 NO. OF SHT. 04

SIZE-A1

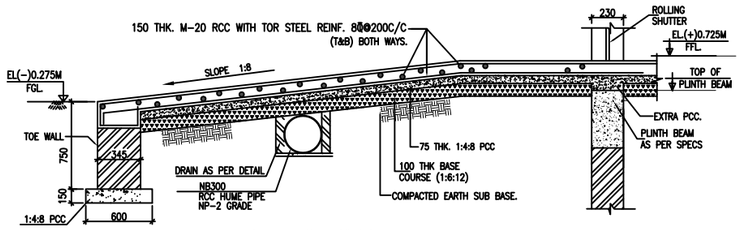
THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY



TERRACE PLAN



PLINTH PROTECTION ALONG BUILDING WITH DRAIN-TYPICAL



DETAIL OF RAMP

NOTES:-

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2 ALL WINDOWS AND VENTILATORS ON GROUND FLOOR OF ALL BUILDINGS SHALL BE PROVIDED WITH SUITABLE MS GRILL.
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4. EL(±)0.00M CORRESPONDS TO TOP LEVEL OF ROAD.
5. FINAL LOCATION OF CABLE TRENCHES REFER APPROVED ELECTRICAL DRAWINGS.

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

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:-
RDA CIVIL ENGINEERING SYSTEM PVT. LTD.
N-43, SRINIWASPURI NEW DELHI -65
☎PH. 011 26845128, FAX 011 26313478

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		09.09.19	N.A.
CHD.	AKHLESH		09.09.19	
APPD.	DKU		09.09.19	

DEPT. TBG	UNTOL. DIMS. GR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE	¢/M/¢	N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: 132KV GIS BUILDING ARCHITECTURAL TERRACE PLAN

CARD CODE: NA

DRG.NO. TB-1-404-607-681-1

REV. 00

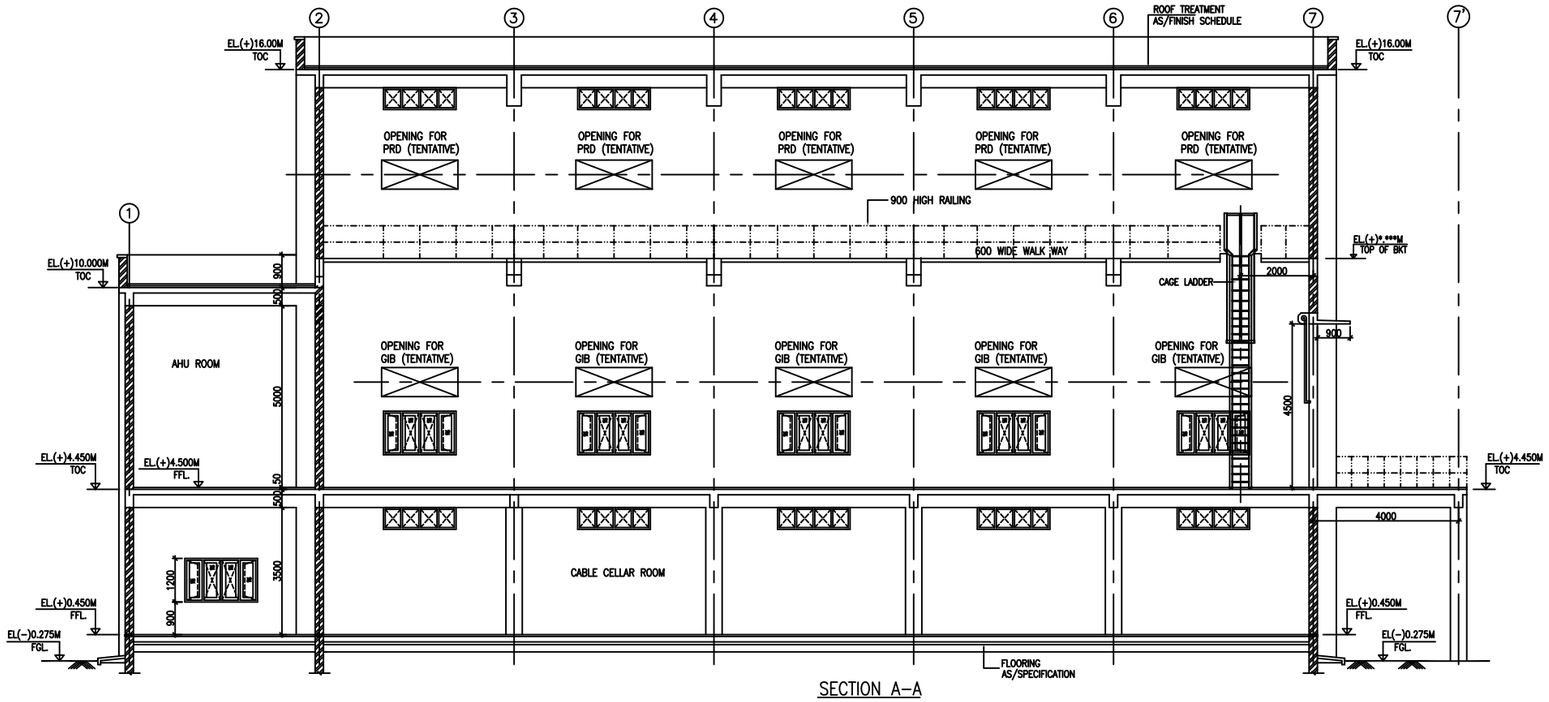
SHT. No 04 NO. OF SHT. 04

SIZE-A1

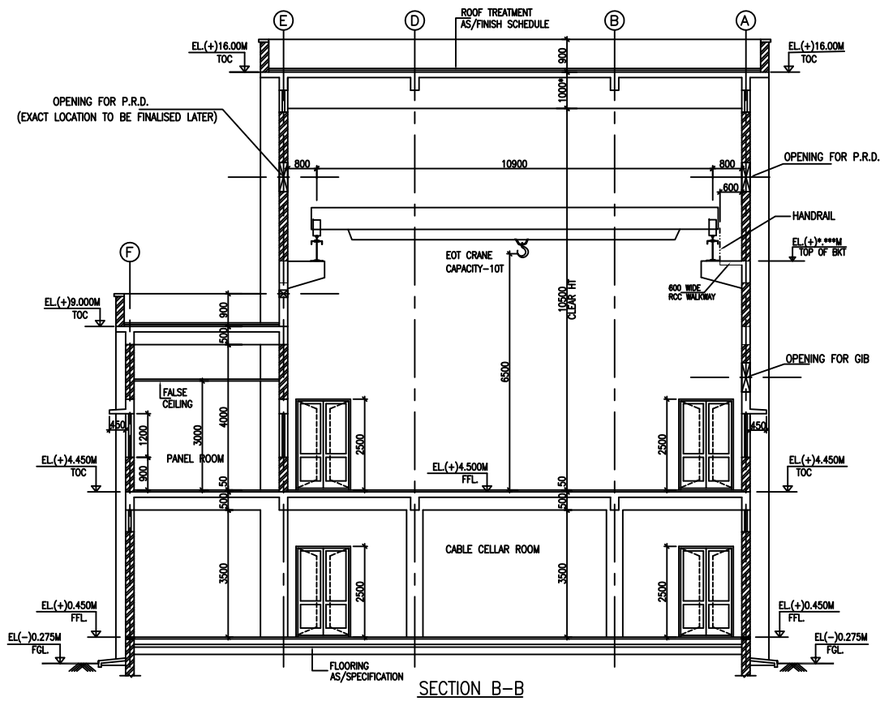
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

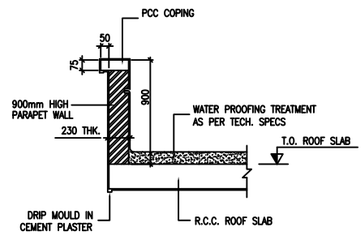
DRG. NO.



SECTION A–A



SECTION B–B



TYP. DETAIL OF PARAPET

NOTES:–

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. ALL WINDOWS AND VENTILATORS ON GROUND FLOOR OF ALL BUILDINGS SHALL BE PROVIDED WITH SUITABLE MS GRILL.
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4. EL(±)0.00M CORRESPONDS TO TOP LEVEL OF ROAD.
5. FINAL LOCATION OF CABLE TRENCHES REFER APPROVED ELECTRICAL DRAWINGS.

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

PROJECT: 400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER: UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:–
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N-43, SRINIWASPURI NEW DELHI -65
☎PH. 011 26845128, FAX 011 26313478

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		09.09.19	N.A.
CHD.	AKHLESH		09.09.19	
APPD.	DKU		09.09.19	

DEPT. TBG CODE	UNTOL. DIMS. GR. g/M/f	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
		N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: 132KV GIS BUILDING ARCHITECTURAL SECTIONS

CARD CODE: NA

DRG.NO. TB-1-404-607-681-3

REV. 00

SHT. No 01 NO. OF SHT. 01

SIZE-A1

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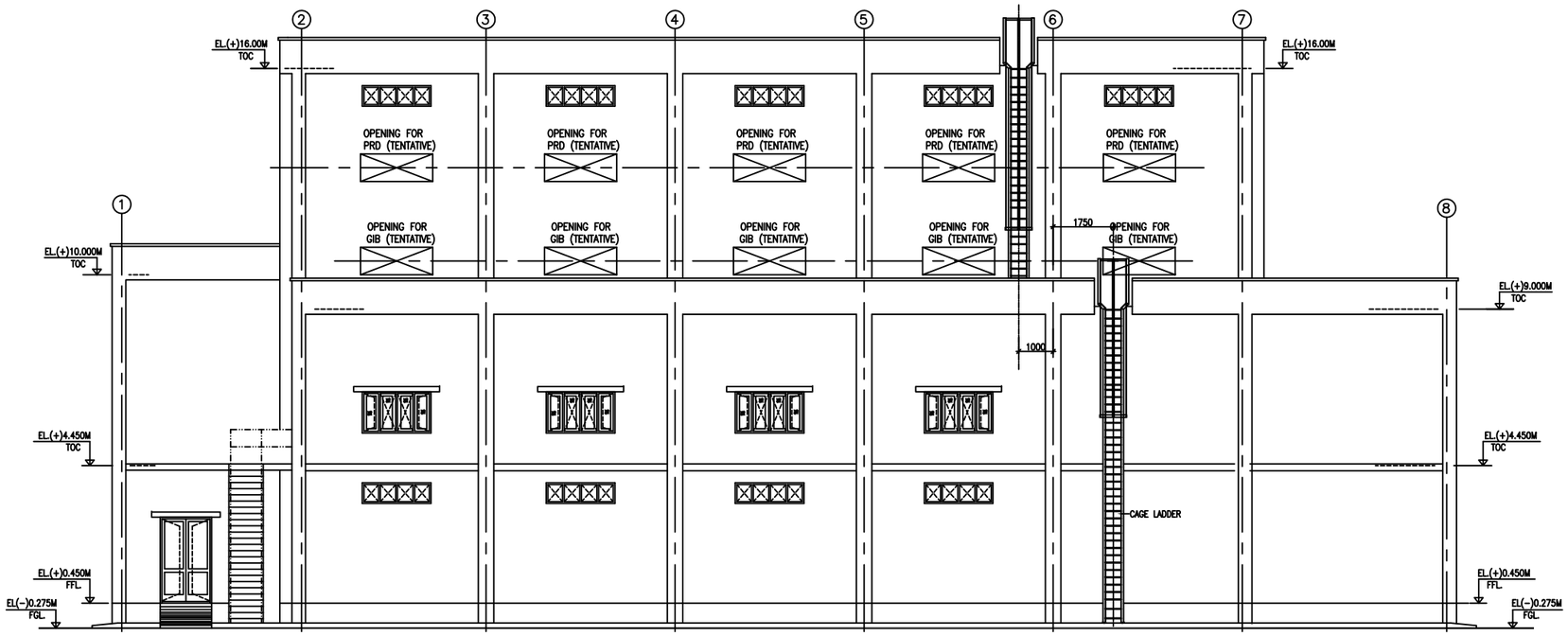
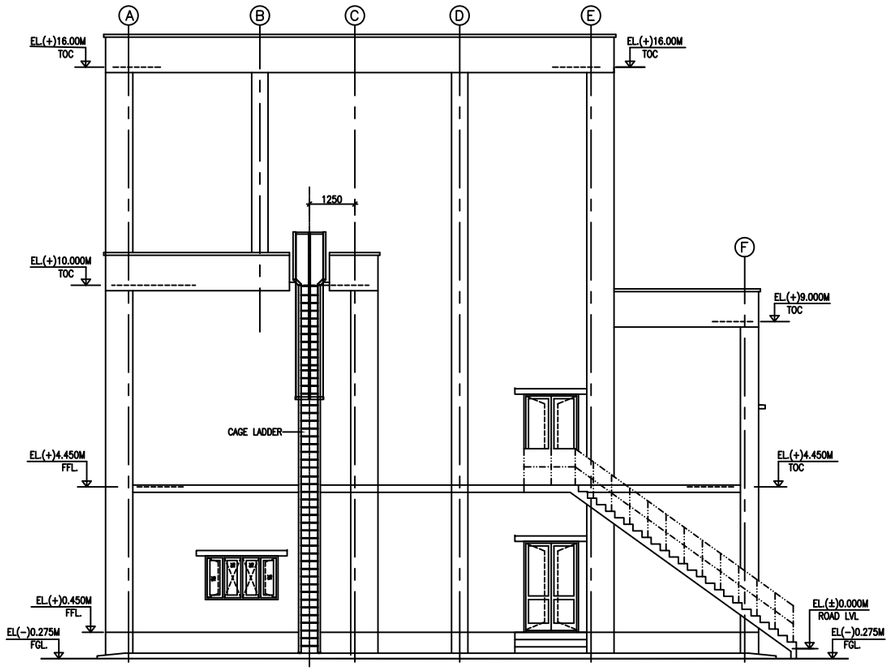
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



ELEVATION–1



ELEVATION–2

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
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REV	DATE	ALTERED / CHD/APPD	REV.	DATE	ALTERED / CHD/APPD	REV.	DATE	ALTERED / CHD/APPD	REV.	DATE	ALTERED / CHD/APPD
ZONE			ZONE			ZONE			ZONE		

PROJECT:
400/220/132kV GIS SUBSTATION AT RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:–
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N–43, SRINIWASPURI NEW DELHI –65
☎PH. 011 26845128, FAX 011 26313476

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		09.09.19	N.A.
CHD.	AKHLESH		09.09.19	
APPD.	DKU		09.09.19	

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: 132KV GIS BUILDING ARCHITECTURAL ELEVATIONS

CARD CODE: NA

DRG.NO. TB–1–404–607–681–2

REV. 00

SHT. No 01 NO. OF SHT. 02

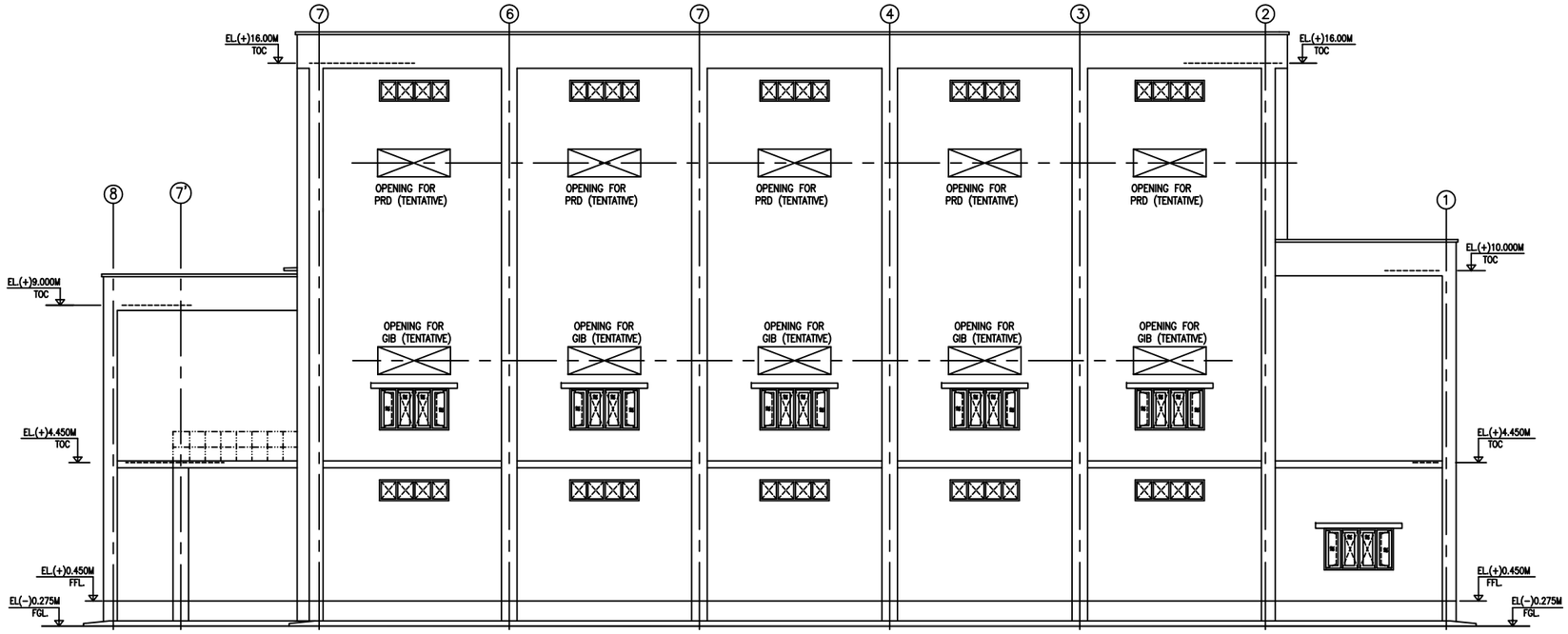
SIZE–A1

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

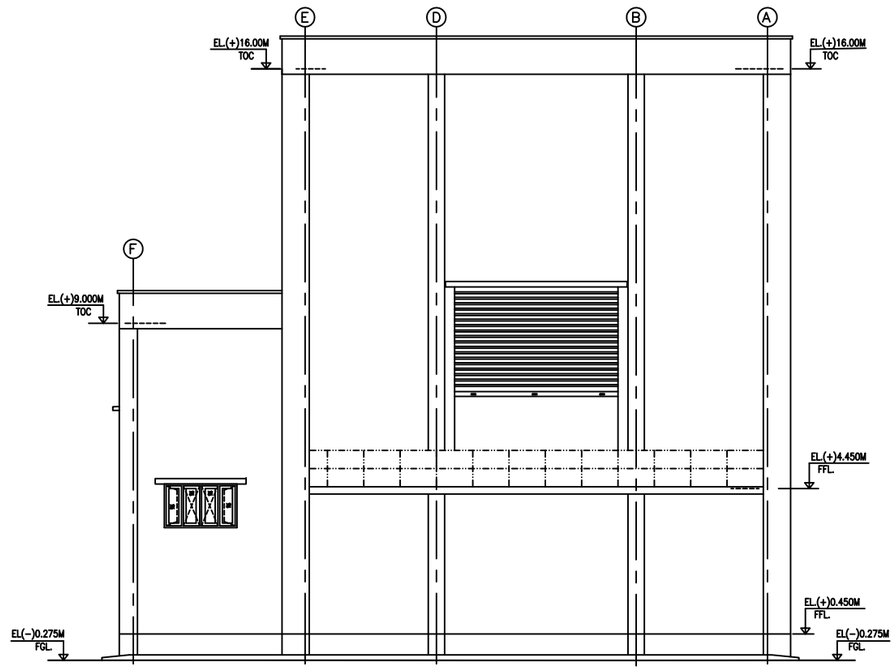
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO.



ELEVATION–3



ELEVATION–4

NOTES:–

1 ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
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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 RASARA, BALLIA (U.P.)

CUSTOMER:
UTTAR PRADESH POWER TRANSMISSION CORPORATION LTD.

BHARAT HEAVY ELECTRICALS LTD.
TRANSMISSION BUSINESS GROUP
NOIDA

STRUCTURAL CONSULTANTS:–
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N–43, SRINIWASPURI NEW DELHI –65
☎PH. 011 26845128, FAX 011 26313478

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	TKR		09.09.19	N.A.
CHD.	AKHLESH		09.09.19	
APPD.	DKU		09.09.19	

DEPT. TBG	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE	g/M/f		N.T.S	N.A.	N.A.	N.A.	N.A.

TITLE: 132KV GIS BUILDING ARCHITECTURAL ELEVATIONS

CARD CODE: NA

DRG.NO. TB–1–404–607–681–2

REV. 00

SHT. No 02 NO. OF SHT. 02

SIZE–A1

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