



SPECIFICATION AND GUIDELINES FOR CONSTRUCTION & RECONSTRUCTION OF 11 kV SUBSTATIONS

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

TABLE OF CONTENTS

1	PURPOSE	2
2	SCOPE	2
3	ABBREVIATIONS:	3
4	NEW SUBSTATION DESIGN:.....	3
5	SUBSTATION CONSTRUCTION:.....	6
6	DOCUMENTATIONS (AGREEMENT):.....	12
7	APPENDIX:	13

TABLE OF FIGURES

Figure 1	CC type ventilator	11
Figure 2	Anti-Theft Door Detail.....	45
Figure 3:	Substation Branding Format	48

LIST OF TABLES

Table 1:	Checklist for Site selection for Substation location.....	5
Table 2:	Concrete cover requirements in coastal areas	9
Table 3	Check list at substation layout stage.....	46
Table 4	Checklist at foundation pouring stage	46
Table 5	Check list at first slab pouring stage.....	47
Table 6	Check list at substation roof slab stage.....	47

1 PURPOSE

This specification and guidelines are developed for the construction and reconstruction of 11 kV Substations across KE Distribution network.

2 SCOPE

- a. This covers the guideline(s) and specification(s) for the construction of 11 kV substations (Transformer room and/or Switchgear room)

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

- b. Substation space requirements for Cassette type VCBs, Fixed type Switches and Indoor RMUs are covered in this document.
- c. Requirements for the Substations in Multi story buildings
- d. Additional requirements for the construction of the substations in coastal areas.

3 ABBREVIATIONS:

CC – Cement Concrete
OPC – Ordinary Portland Cement
PMT– Pole Mounted Transformer
RMU – Ring Main Unit
SS – Substation
LT – Low Tension

4 NEW SUBSTATION DESIGN:

4.1 Substation types:

There shall be two types of substations within distribution network for New connection cases and their selection criteria is mentioned in subsequent section:

Type of Substation	No of rooms	*Size of Substation		
		HT Switches = 3	HT Switches = 4	HT Switches = 5
HT Switch Room / Bulk Supply Room	1 Room (Switchgear Room)	12'-10" W x 13'-6" D x 11'-0" H	15'-0" W x 13'-6" D x 11'-0" H	17'-2" W x 13'-6" D x 11'- 0" H
Distribution Substation with Transformer	2 Rooms (Transformer Room & Switchgear Room)	23'10" W x 16'-6" D x 11'-0" H	26'-0" W x 16'-6" D x 11'-0" H	28'-2" W x 16'-6" D x 11'- 0" H

**Height of above rooms is also reflected on section and elevation drawings.*

4.2 Single Room Substation - HT Switch Room or Bulk Supply Room:

This type of substation shall be constructed for the applicants requiring 11kV bulk supply connection or for switching purpose of 11 kV feeders.

Standard substation shall consist of 04 Nos. of HT Switches (VCBs or Extensible RMUs). Size of the substation, placement/orientation of equipment, floor requirement and clearances shall be as per the drawings in the **Annexure B**.

4.3 Number of HT switches/RMUs in HT Switch Room

If the required HT switches are more than 4 Nos., then the proposed HT room size should be increased accordingly as per the width of the HT switch (VCBs or Extensible RMUs), maintaining the necessary clearances as per the drawing.

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

In case of Bulk supply, if the required number of HT switches are less than 4, then the dimensions of the HT Bulk supply room shall be adjusted accordingly. Door width shall also be revised. The clearances shall remain the same as per the equipment layout in Annexure-B of the HT switch/bulk supply room.

4.4 Two Rooms Substation - Switchgear Room + Transformer Room:

It shall consist of 2 separate rooms with separate gates, one for the transformer (Transformer room) and the other for LT panel and HT switches (Switchgear room).

In case the number of transformers increases, then the applicant shall provide / construct additional room for transformer equal to the size of transformer room specified in the drawing. The additional room shall have a separate gate for Entry/Exit.

If the required HT switches are more than 4 Nos., then the proposed Switchgear room size shall be increased accordingly as per the width of the HT switch (VCB or RMU), maintaining the necessary clearances as per the drawing. The same will be performed for additional LT panels.

Size of the substation, placement/orientation of equipment, floor requirement and clearances shall be as per the drawings in the **Annexure B**

4.5 Site Selection for Substation Construction:

Applicant shall provide the Agreement as per attached format for ownership of Substation. (**Annexure - A**).

Following checklist to be followed for selection and finalization of the substation location.

S.No	Requirement
1	Access to the substation is clear with no lockable gate up to the substation, and 24/7 access is provided (in case of multi-story).
2	Sufficient width and height of access way is available to the substation for the movement of crane / loader / forklifter.
3	The substation area is free from the risk of sewerage/rain/flood and storm water damages.
4	The services such as drains, sewers, HVAC Ducts, piping, or wiring shall not be permitted to pass through the substation. (Minimum clearance of 3 ft to be maintained from the substation wall)
5	There shall be no underground tank beneath or above the proposed substation location and HT / LT Cable route.

Table 1: Checklist for Site selection for Substation location

4.6 Substation Structure

The substation shall be constructed with a raised floor, casted as a slab with hollow space below for cable laying. (**Refer drawing in Annexure B**). The finish floor level of the substation shall be at least 5'-6" from the road level/Ground level (whichever is higher).

The floor of the lower level of the substation shall not be concreted and will be levelled and compacted using natural earth.

Separate entry shall be provided in the lower level of substation with Steel gate and anti-theft lock as per the details mentioned in the drawing.

In case of multistory buildings, where the substation is a part of the overall building structure, the substation may be constructed as either hollow type (raised design), or with trenches (solid design). The Finish floor level of the substation in case of multistory building (solid design) shall be at least 4'-0" from the road level/Ground level (As per site situation). Switch room/Bulk supply can also be constructed in a multistory.

4.7 Substation super structure (above plinth level)

The super structure of the substation can be constructed as either RCC type, or Prefabricated type.

The applicant can select either of the construction types for the super structure.

The details of these 2 types of construction are as follows:

4.7.1 RCC Slab with Block masonry walls:

- i. Structural details are attached in **Annexure-B** of the document.

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

4.7.2 Prefabricated walls and roof:

- i. The super structure of the substation can also be constructed as “Prefabricated type”.
- ii. The requirements specified in the specifications shall be followed for the construction of prefabricated substations.

5 SUBSTATION CONSTRUCTION:

5.1 Substation Drawing / Layout:

The Applicant shall be given an Approved Schematic layout (as per clause 7.1.4) for every new connection case as well as detailed structural drawings of the substation prior to start of construction works by KE. The Schematic layout shall be vetted from the KE before the issuance of estimate. This Schematic layout shall be prepared/shared by KE showing the placement of the different equipment along with cable entry/ exit. Schematic layout shall be signed off/approved by KE.

Detailed drawings of substation are attached in **Annexure-B** of this document.

Various arrangements for the substation and switch room are shown in **Annexure-B**, including VCBs (Withdrawable type), Fixed type switches and Extensible type RMUs.

The Schematic layout shall contain all the necessary information regarding the size/orientation and equipment placement, including but not limited to the following (for reference please see Annexure -B1 and B2)

- a) Exact size of the substation along with clear height and floor level from ground/road.
- b) Equipment placement along with clearances (between equipment and walls).
- c) Location and dimensions of trenches (if present).
- d) Cable entry and exit points (Sealing arrangements)
- e) Gates location & size
- f) Position and size of Ventilators, exhaust fans (if required)
- g) Fire extinguisher placement
- h) Lighting arrangements etc.

5.2 Construction Activity:

The applicant shall start the construction work after the approved drawing is issued to them by KE.

The applicant is required to notify the KE on different stages of the construction of Substation. The KE team will visit and check the Construction as per the Checklists (attached in **Annexure-C**), after the go ahead the applicant may continue the construction till the next inspection stage.

In case of non-compliance at any stage from applicant, the same shall be rectified before moving on to the next stage.

The energization of the scheme may be halted in case of failure in rectification of the non-compliances.

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

Applicant is also required to document the construction activities, in the form of pictures and videos, and shall provide the same to KE on inspection stages.

Applicant shall have the substation constructed only through KE prequalified contractors (**Annexure-E**). List to be shared with the applicant by KE.

5.3 Construction Requirements:

Substation to be constructed by the applicant following all the construction requirements defined in this document. All the construction work to be done as per the structural and dimensional drawings issued.

Materials to be used for the substation construction should be of the best quality available.

Concrete to be used for all structural members and shall be of 3000 PSI minimum strength.

Steel reinforcement shall have a minimum tensile strength of 60 KSI, and shall be free from any visible rust marks.

Test report for both steel and concrete to be submitted at the time of completion.

Proper curing to be done for all structural concrete members as per the required curing times.

The applicant shall supply and install the light & power distribution board and the necessary light fittings and power outlets in the substation including all wiring. KE will connect the distribution board to the supply point on the low voltage board.

5.3.1 Foundation of Substation

- i. Excavation to be done as per the footing sizes.
- ii. Stone soling to be provided and compacted properly, minimum thickness of 6" to be provided. It is recommended to use 3 inch and 4 inch down stones for 6 inches and 8 inches thickness of stone soling respectively. The stones should be laid in two layers and proper compaction should be done.
- iii. Lean concrete with ratio 1:4:8 to be done for foundation, thickness to be maintained as per the drawing.
- iv. Proper concrete spacers to be used for maintaining concrete cover as per the ACI (American Concrete Institute). The compressive strength of the spacers shall be same or greater than the concrete.
- v. All the concrete up to Plinth level to be done using Modified OPC cement to prevent the risk of sulfate and chloride attack, modified OPC to be used as per the following criteria:
 - vi. *C3A should be more than 5% and should be less than 8%.*
 - vii. *C4AF + 2C3A should be less than 25%.*
 - viii. *AL2O3 should be less than or equal to 6%.*
- ix. Ordinary Portland Cement (OPC) meeting the above chemical composition can be used in lieu of modified cement and above plinth level OPC should be used.
- x. The substation shall be constructed using approved water proofing materials. All sub-structure to be applied with waterproofing to avoid contact with sub soil water. Example are any bituminous waterproofing membranes etc.

- xi. A buried earthing/ grounding system is necessary for substation and installed equipment, the earthing system shall be provided as per KE's design/specification (Earthing of HT/LT Equipment).

5.3.2 Substation floor slab

- i. The plinth/finish floor level of substation shall be at least 5.5 feet above the road level/Ground level.
- ii. RCC floor slab to be provided as per the structural drawing with enough strength to bear the weight (4 tonnes for single room and 10 tonnes for 2 room) and the normal wear and tear during placement and shifting of equipment.
- iii. PCC SITU/Block Masonry wall to be provided below the plinth beam. As per the details shown in the drawing.
- iv. Floor openings for cables, to be provided as per the approved drawing handed over by KE. Details regarding the construction of the openings in floor, to be followed as per the structural drawing and the typical section provided.
- v. Opening in floor will be made as per the Equipment placement in the form of a slit at the time of floor concreting.
- vi. Platform to be provided for unloading of the equipment.
- vii. The platform and the stairs to be constructed as RCC type, and to be casted along with substation floor. The location of the stairs can be adjusted as per the site conditions.
- viii. The floor must have a level steel troweled finish.
- ix. The floor of the substation shall be perfectly levelled and cured before handing over.

5.3.3 Substation walls

- i. Machine made blocks of best quality to be used for construction, with the compressive strength of minimum 600 psi. Blocks shall be non-load bearing type and shall conform to ASTM C129.
- ii. Block masonry to be at least 6 inches thick for all wall construction.
- iii. Internal walls plaster to be ½" and the external walls plaster to be ¾" thick. Exterior walls to be painted as per KE's branding theme (refer Annexure – D).
- iv. The finish of internal wall and ceiling must be clean, smooth and must be painted.
- v. Substation requires special attention to ventilation in order to dissipate heat from electrical equipment, wherever possible natural air flow to the outside of the building will be used.
- vi. Forced ventilation should be used where natural ventilation is not practicable. Forced ventilation by mean of industrial fan (s) with timer switch must be designed, supplied and installed by the owner/applicant as per KE's requirements, 2 number exhaust fans of 18 inch dia per room along with shutter. (The power supply to meter shall be on account of KE).

5.3.4 Substation Roof slab

- i. The ceiling shall be of RCC construction as per the drawing.
- ii. Slope to be given in the RCC roof slab as per the drawing, for avoiding rainwater ingress inside structure.
- iii. Water proofing shall be done on top of substation roof using industry standard water proofing materials. For example, 3-inch screed with water proofing agent.
- iv. Slab projection to be provided on all four sides, of at least 2 ft.
- v. Drip course shall be provided all over the projection (Chajja).

5.4 Additional Requirements for Substations in Coastal Areas:

All the substations that are on the shoreline or within 02 km from the shoreline shall be constructed according to the additional requirements defined below, to protect the substation against the adverse effects of the coastal environment. These requirements to be communicated by KE at the time of design stage.

5.4.1 Concrete cover:

- i. The concrete cover for structural members in coastal area should be greater as compared to the normal construction so as the protect the reinforcement from the corrosion. ACI (American Concrete Institute) defines the minimum concrete covers for the different structural members in a building.
- ii. Following should be followed for minimum cover requirements in the substation structure.

Type of structure	Concrete over
Concrete cast against and permanently in contact with ground	75mm or 3 in
Concrete in contact with ground or water	
No. 19 through No. 57 bars (#6 through #18)	50mm or 2 in
No. 16 bar and smaller (#5 and smaller)	40 mm or 1.5 in
Concrete not exposed to weather or in contact with ground	
Slabs, walls, joists	
No. 43 and No. 57 bars (#14 and #18)	40 mm or 1.5 in
No. 36 bar and smaller (#11 and smaller)	20 mm or 3/4 in
Beams, columns	
Primary reinforcement, ties, stirrups, spirals	40 mm or 1.5 in

Table 2: Concrete cover requirements in coastal areas

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

5.4.2 **Water/cement ratio:**

- i. Water/cement ratio is the ratio of the mass of water to the mass of cement added to concrete. The water cement ratio formula directly affects the strength & durability of the concrete.
- ii. For coastal areas, a dense/compacted concrete with lower water cement ratio to be used for all structural works. Water/cement ratio not to exceed 0.5

5.5 **Requirements for Anti-Theft type door:**

- 5.5.1. The doors for the substation shall be Antitheft type along with louvers as per the enclosed Drawing.
- 5.5.2. The door to be painted with EPOXY paint, with a minimum thickness of 200 Microns, including epoxy primer.
- 5.5.3. Steel surface of the door to be cleaned properly before applying primer.
- 5.5.4. Gate delivered at site shall be painted at least with a coat of primer. (unpainted/bare steel gate shall not be allowed at site).
- 5.5.5. Small gate of same specifications to be fixed at lower level of the substation, and to be fixed with Antitheft type lock. Size of the gate to be 5'x 3'.
- 5.5.6. All the gates of the substation shall be grounded and connected to the earthing system of the substation.
- 5.5.7. CC floor of 6 inches thickness to be provided below the gate of the lower level, to prevent ingress of rodents etc.

5.6 **Check Meter Installation:**

KE provided check meter to monitor losses of local transformer shall be installed in LT panel (LT panel, MS 4&8 Way LT Panel).

5.7 **Material / Equipment:**

All equipment such as HT Switches / Transformer / LT panels / HT and LT cables and hardware material used in substation shall be confirming to relevant (Latest) KE Standard Specifications.

Proper tagging on HT- switches, as well as route and destination of in-comings, out-goings & local transformer cables plus LT circuit destination should be clearly mentioned.

- 5.7.1 For HT cables, the entry and exit into the substation shall be from the front side of the substation (for solid trench type structure). However, in case of 11 kV bulk supply connection, the outgoing HT cable route to be approved from the KE before laying.
- 5.7.2 For LT outgoing cables, the route to be decided as per the scheme design and metering point location.

5.8 **Ventilation Requirement:**

Proper ventilation shall be provided in substation to dissipate heat from the electrical equipment.

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

Only CC (cement concrete) type ventilators to be installed, with maximum width of 1 ft. (refer Picture). No metallic ventilators to be used as these are prone to corrosion and can be a reason of theft.



Figure 1 CC type ventilator

The openings (slits) of the CC ventilators shall not be more than 1 inch in width.

All the ventilators to be placed on the top portion of walls (below roof beam) as per the drawing.

Natural air ventilation to be provided in transformer room as per the criteria. This shall be at least 3 sq-in per kVA of transformer rating. E.g. 1000 kVA to have at least 3000 sq.in. (approx. 21 sq.ft.) ventilation in transformer room.

Natural airflow directly from outside of the building is preferred. Position of ventilator should be such as to provide cross ventilation.

5.9 Earthing Requirement:

Earthing shall be done as per KE Standard (Earthing for HT/LT Equipment and Poles) for Grounding (Latest Applicable).

5.10 After completion of civil works & installation of equipment, the substation shall be handed over to KE. (Agreement/ Taking over of Substation)

5.11 Provision of Fire Extinguisher:

For each room of Sub Station, 2 units of the fire extinguisher shall be provided/ installed by the applicant as per below specification. This unit shall be used only for minor fire especially during and switching & preventive maintenance, and to be mounted on ceiling with Hooks in fan box.

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

Capacity:	6 kg
Make:	Imported
Extinguishing Agent:	ABC Dry Chemical Powder
Propellent:	Nitrogen
Area of Coverage:	Approx. 130 sq. ft
Duration of discharge:	14-16 seconds
Installation:	Ceiling mounted above fire risk
Operating Mechanism:	Automatic Sprinkler Head
Operating Temperature:	68 C
Shelf life:	06 years



5.12 Marking:

Branding to be done on the front side of the substation, as per attached scheme in Annexure-D

The following permanent marking to be provided:

- 5.12.1. SLD (laminated) to be displayed in Switchgear room.
- 5.12.2. Name with Logo & code/ID in front /elevation side of Substation
- 5.12.3. 11kV/.4kV & Danger sign on HT/LT Room of Substation
- 5.12.4. Year of Construction of Substation to be written inside the substation.
- 5.12.5. Destination of HT/LT incoming & outgoing cables should be marked/ paint on HT/LT panel.
- 5.12.6. Marking to be done on HT Switches using stencil.
- 5.12.7. Emergency Contact Numbers to be displayed outside the substation
- 5.12.8. Danger Signs to be pasted outside the substation.

6 DOCUMENTATIONS (AGREEMENT):

6.1 Documentation Requirement:

The agreement shall draft as per **Annexure "A"** (appended below) on Rs. 1000 E-Stamp Paper and will be duly signed & stamped by concerned KE person & 2nd Party (Applicant).

The Original Stamp paper (duly filled & stamped as per above) will be forwarded to KE to be kept in safe custody. A copy may also be provided to applicant, if required.

7 APPENDIX:

- Annexure-A (Agreement/Undertaking)
- Annexure-B (Drawings)
- Annexure-C (Checklists)
- Annexure-D (Substation branding)
- Annexure – E (Prequalified Vendors List)

Annexure-A (Agreement E-Stamp paper Rs 1000)

This Handing/Taking Over Agreement (“Agreement”) of Sub-Station
Situated at Plot No.....is made on this day of ,
2022. Under Section 5(2) and Sections 6(1) and 6(2) of the Consumer
Eligibility Criteria (Distribution Licensees), 2022

“**K-ELECTRIC LIMITED**”, being a public company duly incorporated and existing under the laws of Pakistan, and having its registered office at KE House, 39-B, Sunset Boulevard, Phase-II, Defense Housing Authority, Karachi, Pakistan (hereinafter referred to as “**KE**”, which expression shall, wherever the context so permits, mean and include its successors-in-interest and assigns) of the ONE PART;

AND

Mr./Ms. _____ or M/s _____ through its authorized officer Mr./Ms,resident of/at.....Karachi and running his/her/their/its business in the name and style of, having its registered office at.....Karachi hereinafter referred to as ***(“Applicant”)*** which expression shall whenever the context so permits, means and include his/her legal heirs, executors, legal representatives, successors-in-interest and assigns of the other part;

(KE and the Applicant are hereinafter individually referred to as a “**Party**” and collectively as the “**Parties**”);

RECITALS:

WHEREAS KE is a privately managed and controlled vertically integrated utility company which generates, transmits and distributes electricity in Karachi and its adjoining areas in Sindh and Balochistan and has an exclusive distribution license granted by NEPRA (“**Distribution License**”) for the said service territory clearly delineated in its Distribution License.

AND WHEREAS the Applicant is desirous of obtaining supply of energy/power at its premises/society/multi-storied building/ housing scheme/factory/project etc. and has further agreed to pay KE for the installation, erection and laying of electricity supply lines underground cable on full paid basis scheme of KE within the area of the premises/society/multi-storied building/housing scheme/factory/project etc. for its/their self-usage or its occupants/users, by providing the completed sub-station where size and location of the substation is as per KE standards and part of duly approved site plan from the competent authority hereinafter referred as (“**Substation**”).

AND WHEREAS on the request of the Applicant, the Substation is being handed over to KE for operations and maintenance in accordance with the provision envisaged in this Agreement

NOW THEREFORE, THIS AGREEMENT WITNESSETH AND IT IS HEREBY MUTUALLY AGREED BY AND BETWEEN THE PARTIES AS UNDER:

1. That Applicant under this Agreement is handing over the duly constructed single/double room Sub-Station for 11 KV bulk supply or for switching purpose of 11 KV feeders/network within the project/scheme/premises as per requirements of KE. Applicant shall ensure the construction of the Substation is approved by the competent authority and reflected in the site plan indicating the actual size and location of the Substation, within a period of sixty (60) days from the date of execution of this Agreement and shall provide a certified copy of the approved site plan to KE.
2. The Applicant shall ensure that the Substation is type “A” or type “B” accordingly as specified in the prevailing specifications of KE.

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

3. Applicant agrees to duly hand over the possession of the Substation consisting upon one/two rooms and the size of the area is/are.....feet for.....(.....) KW to.....(.....)KW through this Agreement.
4. In case, the load of the Applicant increases from (_____)KW due to structural changes such as construction of additional units at the premises after the submission of initially approved layout plan (LOP) at the time of application of New Connection, then the Applicant shall provide a newly constructed additional room at the Substation for transformer equal to the above specified size of transformer room within a period of thirty (30) days from the date of such demand being raised by KE in writing and same principles to apply as enumerated in Clause 1 & 2 above.
5. The Applicant shall handover and KE shall duly take over the possession of the Sub-Station on the request of the Applicant for its conversion into a Common Distribution System (CDS) as per Section 5(2) and Sections 6(1) and 6(2) of Consumer Eligibility Criteria (Distribution Licensees) Regulation, 2022 (“CEC”) for the purposes of the operation and maintenance of the Substation on below-noted conditions.
 - i. Applicant undertakes that it is the rightful owner/occupant of the land/property on which the Substation is constructed which for all purposes is in line with the existing new connection policy of KE.
 - ii. Substation has been constructed as per KE specification / drawing by the Applicant at its own cost, according to the prevailing new connection policy of KE.
 - iii. The Substation is situated in such a way that there is no ramp, underground/overhead water tanks and pillars etc. in the way of Substation with provision of free movement of inter alia cranes and lifter for handling of the heavy equipment/materials placed inside the Substation and KE personnel/representatives will have easy and unrestricted access to Substation at all times.
 - iv. The Substation is free from the risk of sewerage / rain / flood and storm water damages. The drain provided is in working order.
 - v. Applicant shall protect the Substation from equipment being exposed to inter alia dampness / water / fire throughout its life vide proper site drainage water proofing.
 - vi. The Substation is fully equipped with all infrastructures as per requirement of KE under the existing new connection policy of KE and as prescribed under the applicable NEPRA standards, laws, rules and regulations and CEC.
 - vii. The Substation, for all purposes and intents stands converted into a CDS for the purposes of operation and maintenance in accordance with Sections 6(1) and 6(2) of the CEC
 - viii. That this Agreement is being executed by the Applicant for the usage of the Substation by KE under Section 12(2) of the Electricity Act, 1910, Section 5(2) and Sections 6(1) and 6(2) of the CEC for all purposes and intents.
 - ix. At any time before the handing & taking over of the substation, if any deviation is found pertaining to the construction of the Substation or if the Substation is not in conformance with the KE requirement and policies, then the Applicant shall make necessary alteration at its own cost including any construction (wholly or partially) of the Substation according to the proposed drawing and sketch vide refence no. _____ dated _____ as per prevailing policy of the New Connection.
6. That in case of shifting/relocation of Substation due to unavoidable reason or any court order by the mutual understanding of the Parties, the Applicant shall provide new space for the substation within the

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

same area/surrounding of premises/society/multi-storied building/ housing scheme/factory/project etc., and the Applicant shall bear the whole cost/expenses as per prevailing new connection policy of KE.

7. If the Applicant with or without any written intimation to KE has sold/leased the property/premises/land on which the Substation is built and operating, then the terms and conditions of this Agreement shall stand assigned to the new owner and shall automatically become lawfully binding on the new owner without requiring to change this Agreement or enter into any new agreement. Further, it shall be the responsibility of the Applicant to ensure the terms and conditions of the Agreement are complied with by any new owner/occupant of the property/premises/land.
8. Any increase or decrease of load shall be subject to applicable KE policies, the Agreement shall not be amended and the change of load shall be agreed through separate written agreement between the Parties, which shall be deemed to form an integral part of this Agreement.
9. The Applicant agrees and acknowledges that KE has the right to extend high transmission (HT) and low transmission (LT) lines, modify and/or alter any equipment installed from Substation without the Applicant's approval for distribution/supply of electricity.
10. The Applicant agrees not to hold KE responsible and indemnify KE and will keep KE indemnified (including third party claims), at all times from and against any and all loss (including any direct, indirect or consequential loss and loss of profit), loss of reputation and all interest, penalties, damage or liability (whether criminal or civil) suffered, legal fees (calculated on a full indemnity basis) and all other costs and expenses incurred by KE (whether directly or indirectly) as a result of KE's reliance on this Agreement.
11. This Agreement is in addition to and not in derogation or substitution of any other rights or remedies that KE may be entitled to under the law, rules and regulations.
12. The Applicant agrees that this Agreement is purely voluntary in nature and the Applicant have not received any inducements, threats or coercive demands of whatsoever nature in relation to the execution and/or implementation of this Agreement and neither would be entitled to any compensation against the usage of the Substation by KE being handed over by the Applicant under this Agreement.

IN WITNESS WHEREOF the parties above named set and subscribed their hands at Karachi, the day.....month.....and the year.....first above written.

.....

K-ELECTRIC

Witnesses of K-ELECTRIC:

1.

2.

.....

Applicant(s)/consumer(s)

Witnesses of Applicant:

1.

2.

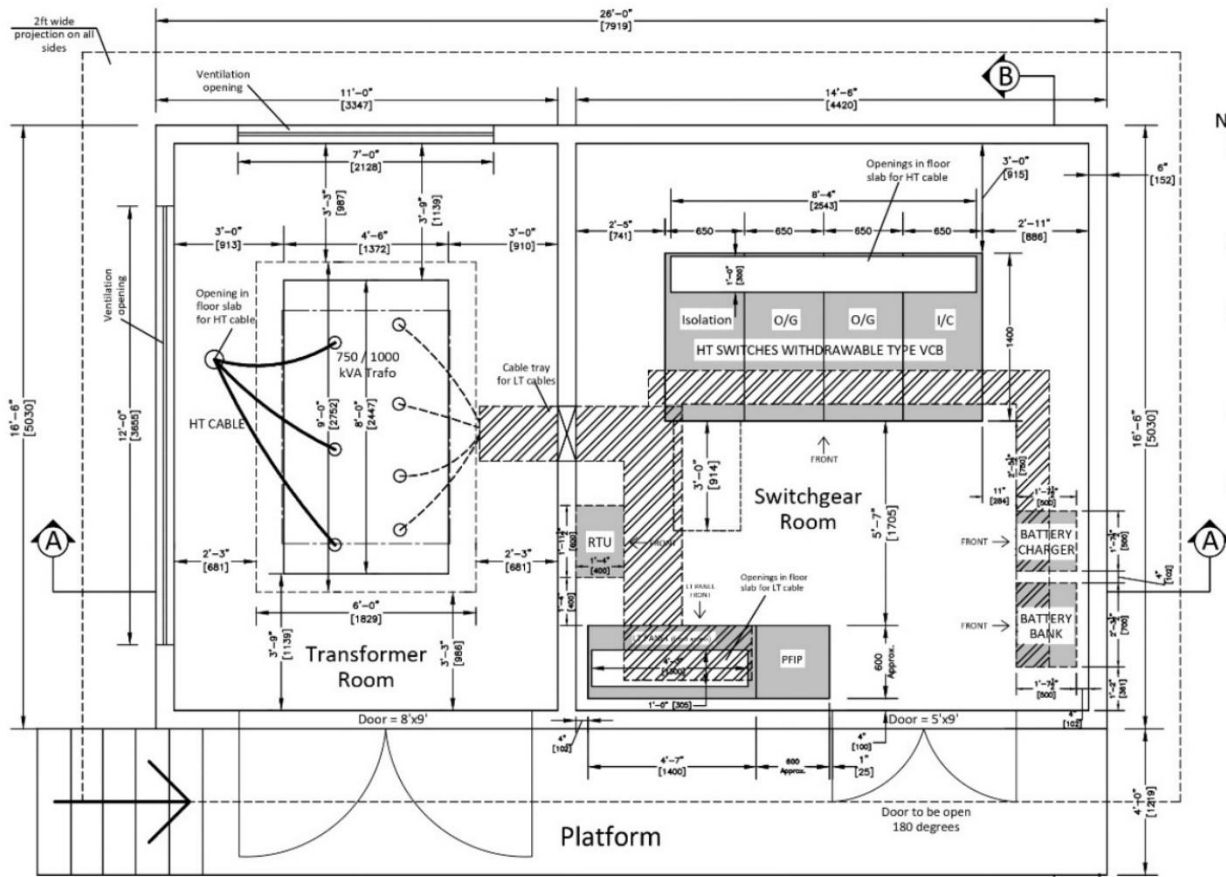
NOTARIZE BY NOTARY PUBLIC

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

Annexure – B1

Drawings showing Equipment layout, sizes and structural details are appended in the following pages:

Raised Hollow Design (Distribution Substation with Transformer)



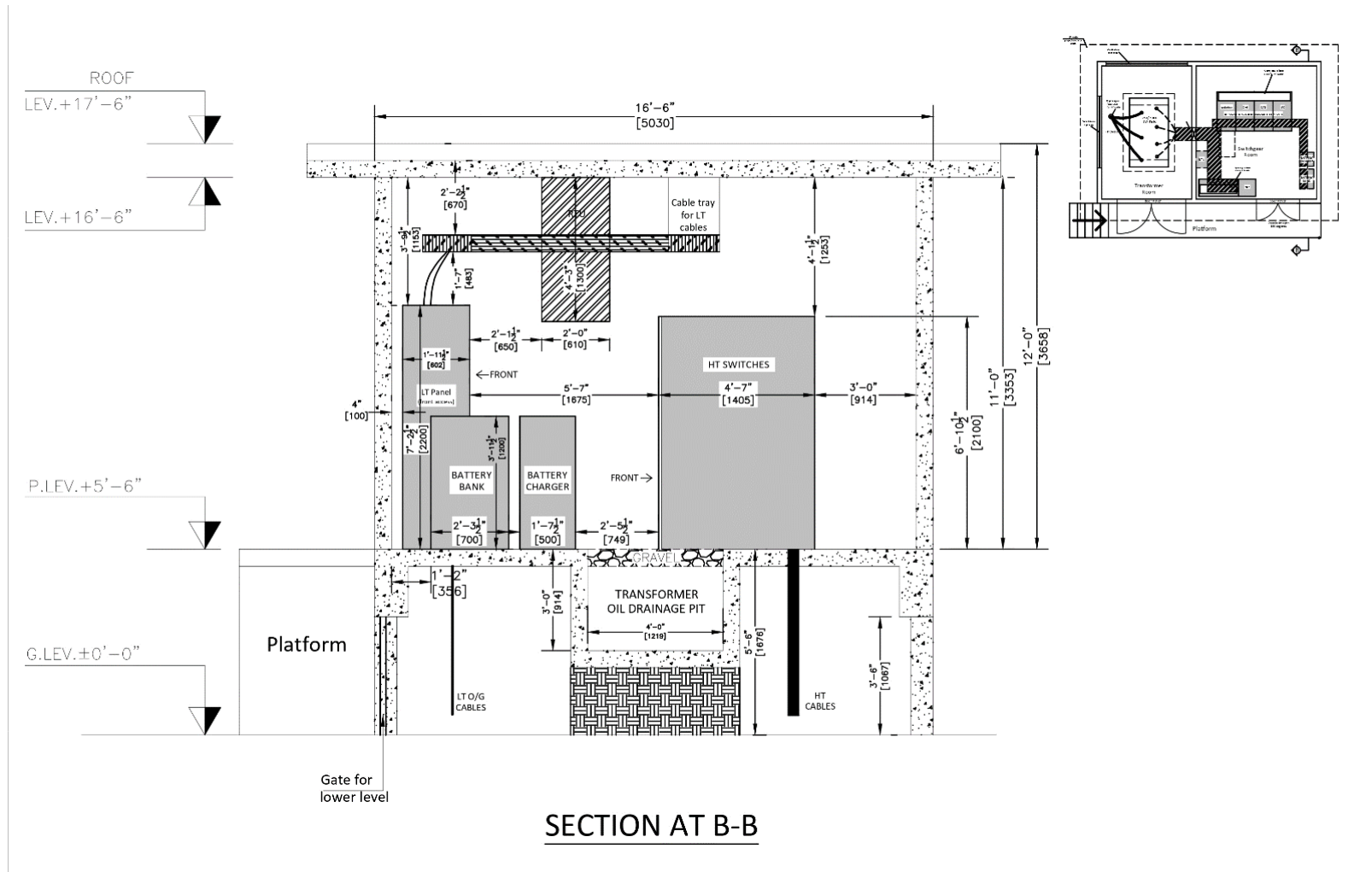
SUBSTATION LAYOUT WITH WITHDRAWABLE TYPE VCB

- NOTE:**
- 1) All the equipments to be fixed in the floor by anchor bolts, as per manufacturer's recommendations.
 - 2) Clearances to be maintained as per the drawing.
 - 3) Any change in the substation layout, to be approved from Network Engineering department.
 - 4) Earthing to be done as per earthing SOP.
 - 5) Opening to be covered.

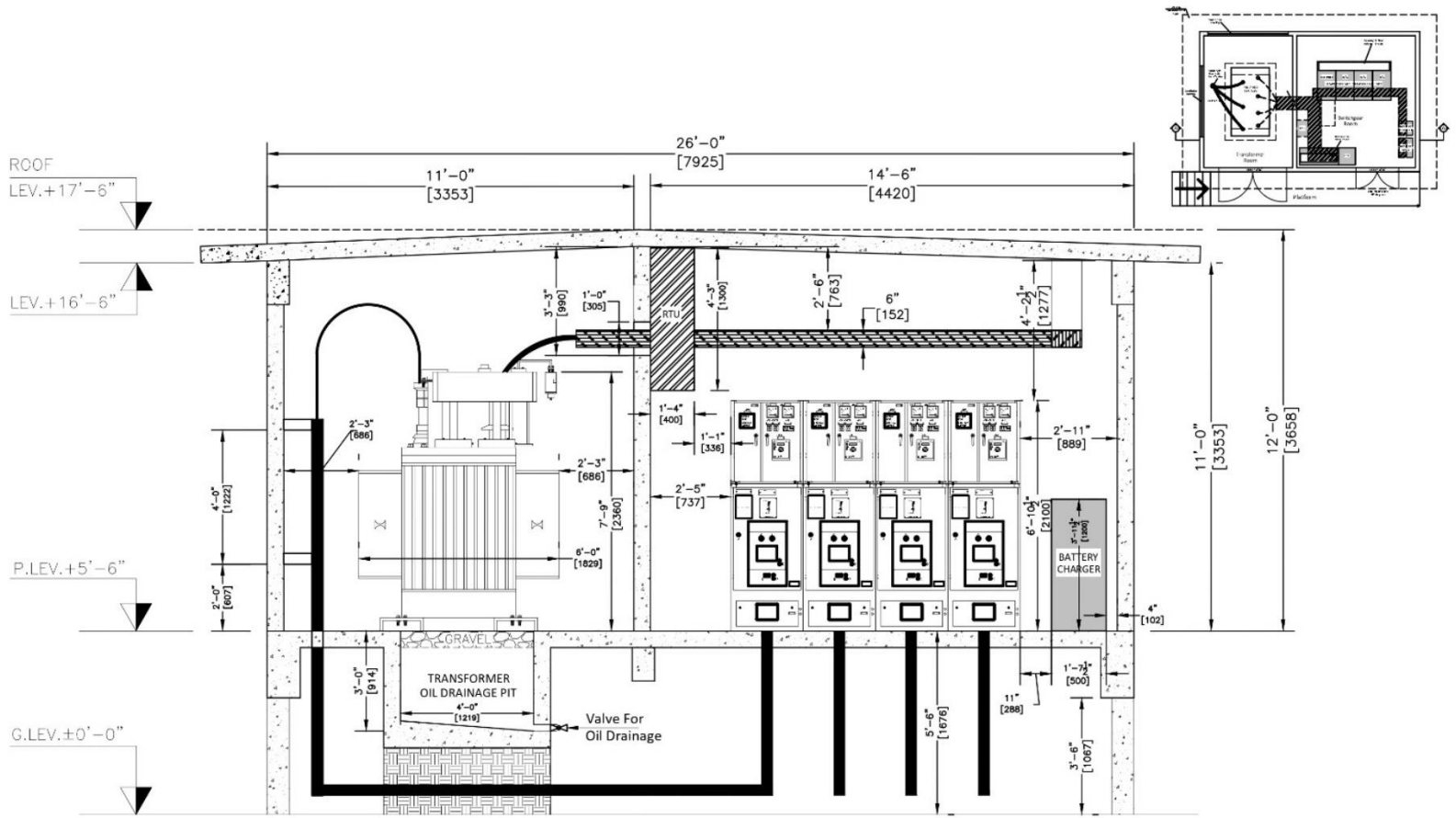
Legends:

	Conventional Tubular Trafo
	Corrugated Tank Trafo
	Dry Type Trafo

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

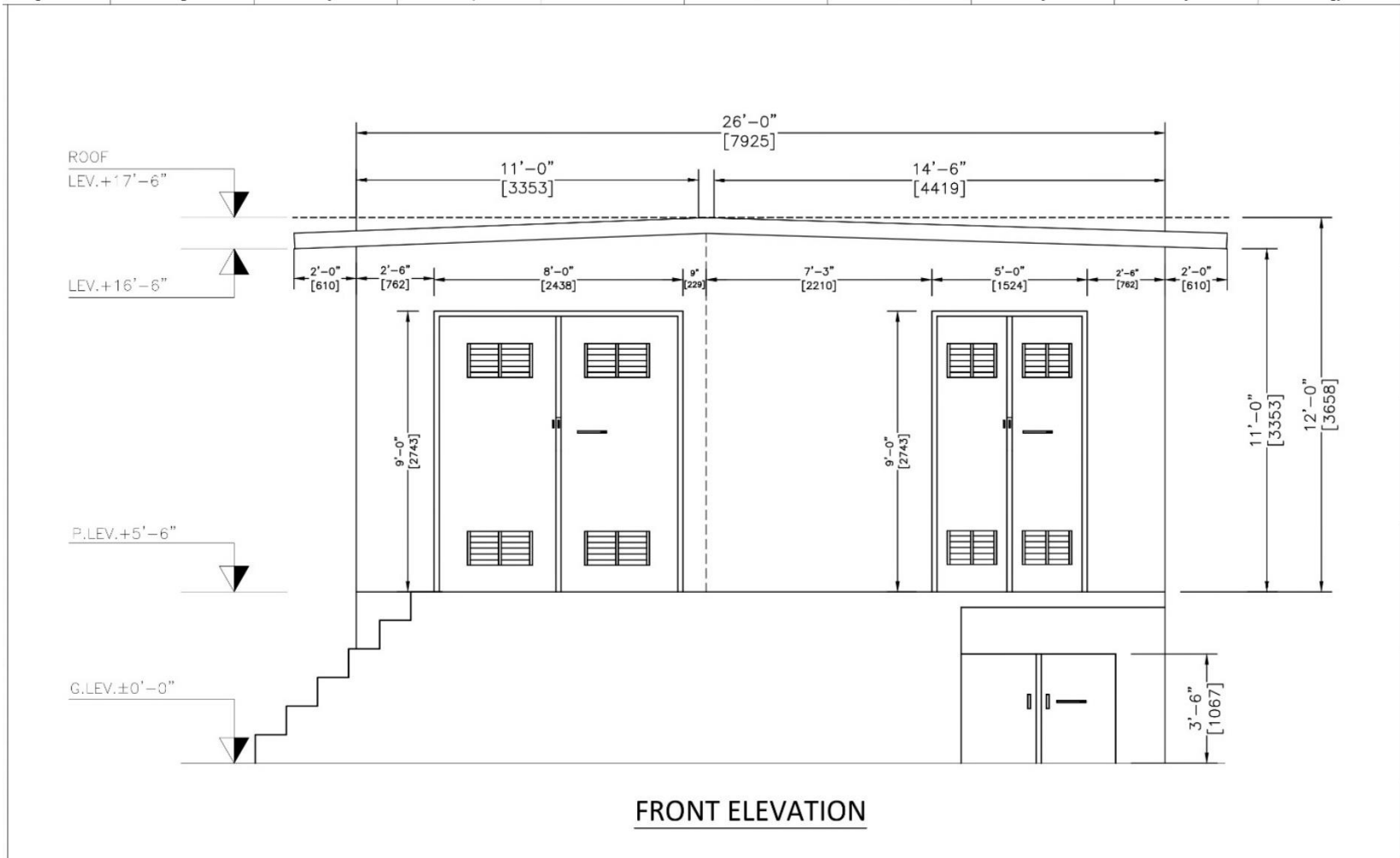


NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

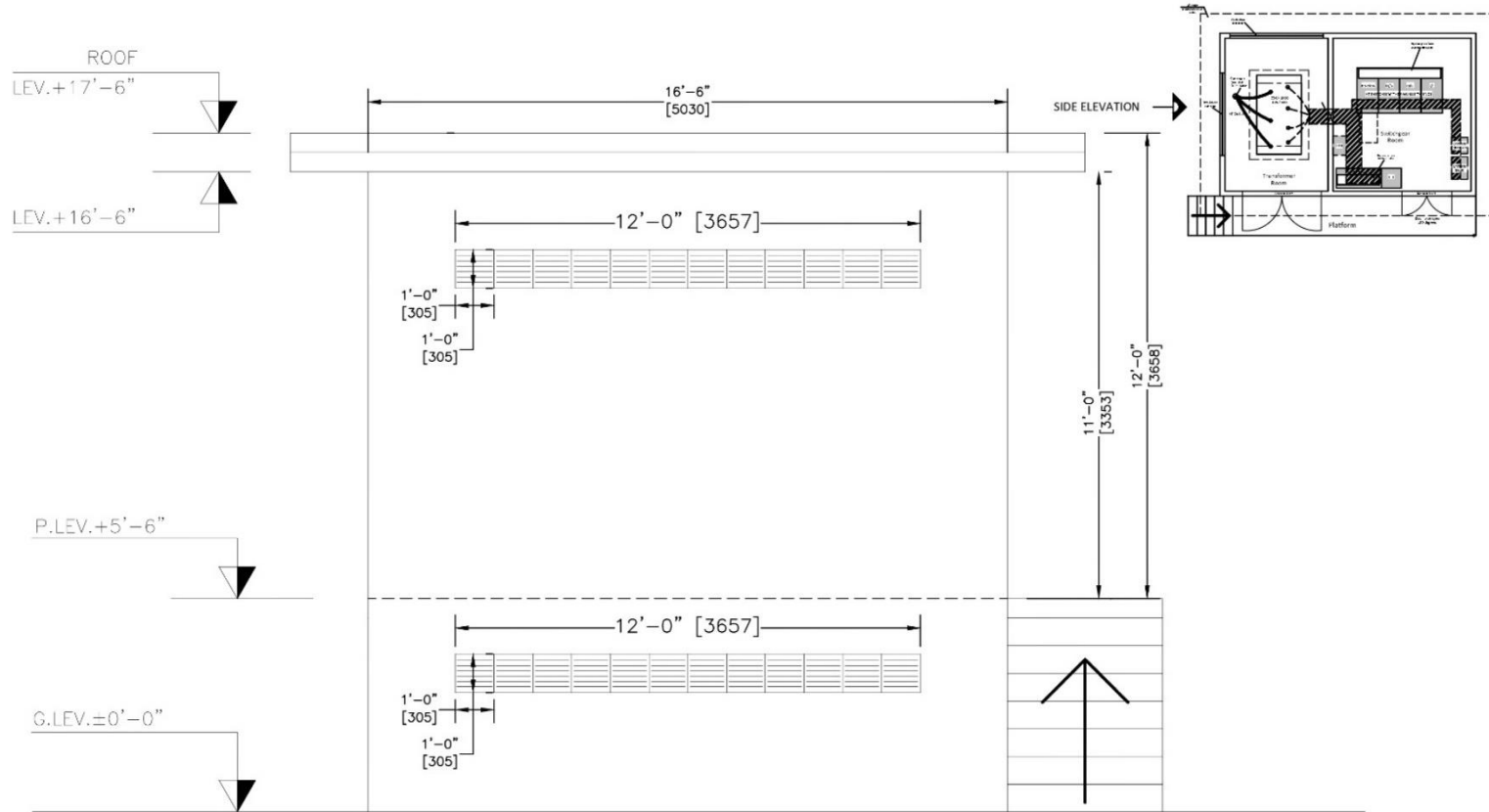


SECTION AT A-A

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

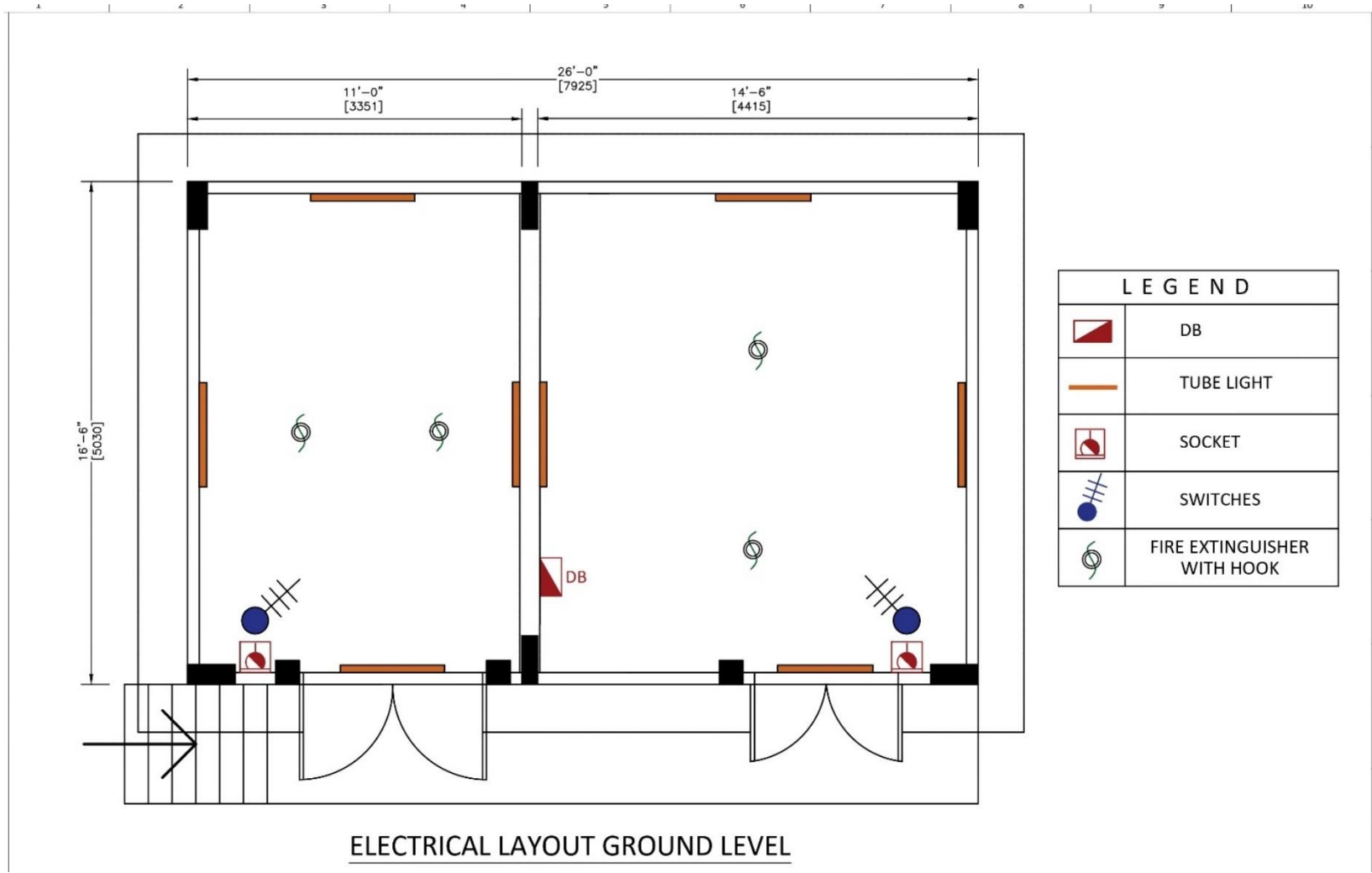


NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

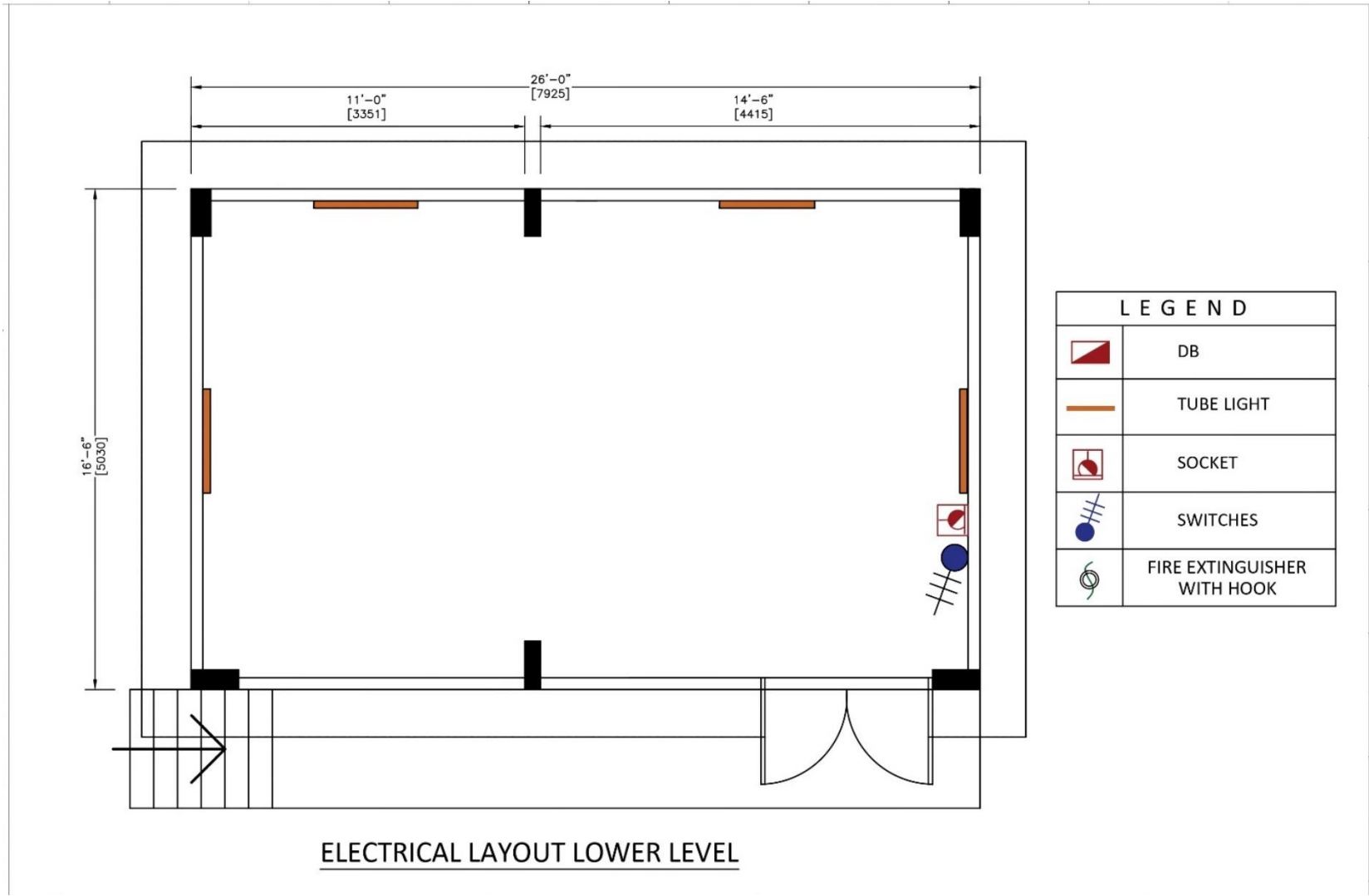


SIDE ELEVATION

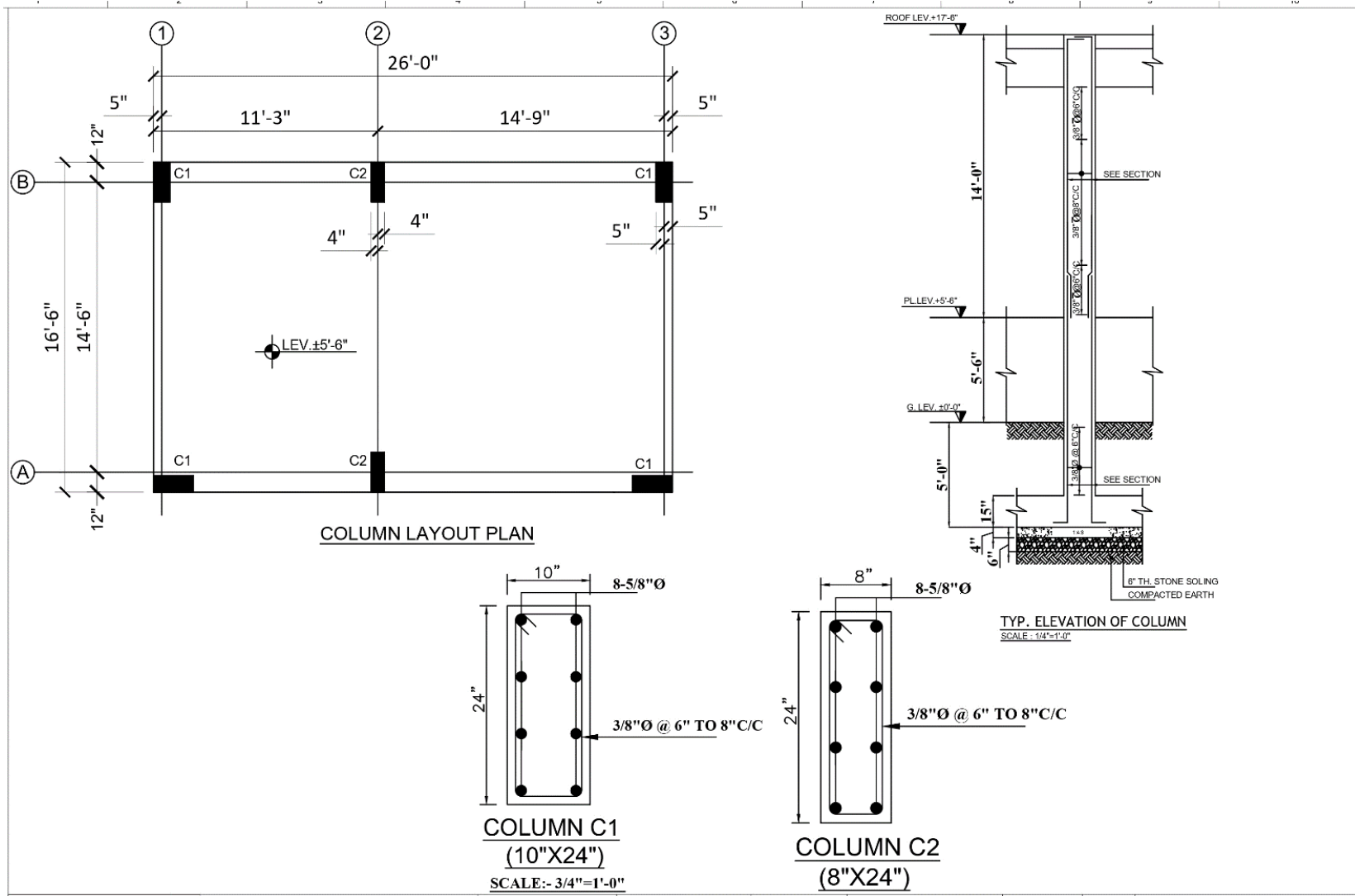
NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.



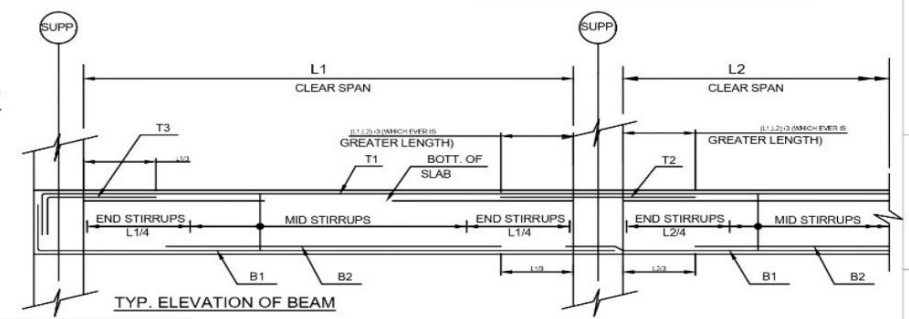
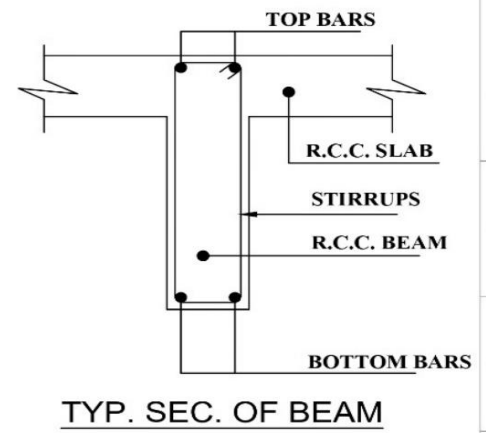
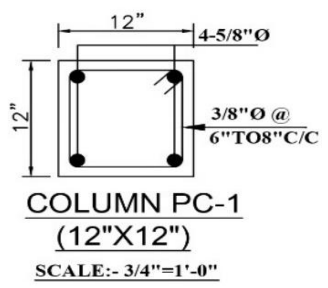
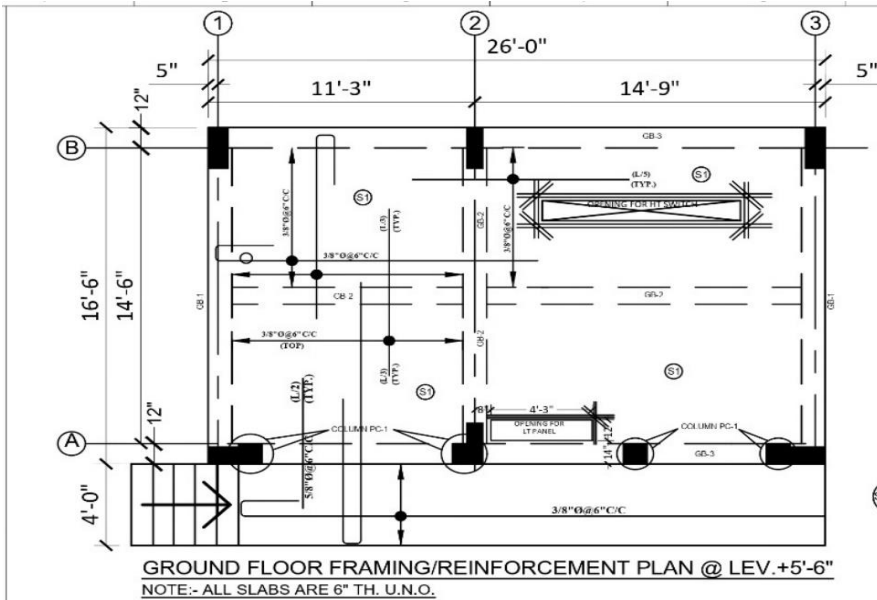
NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.



NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.



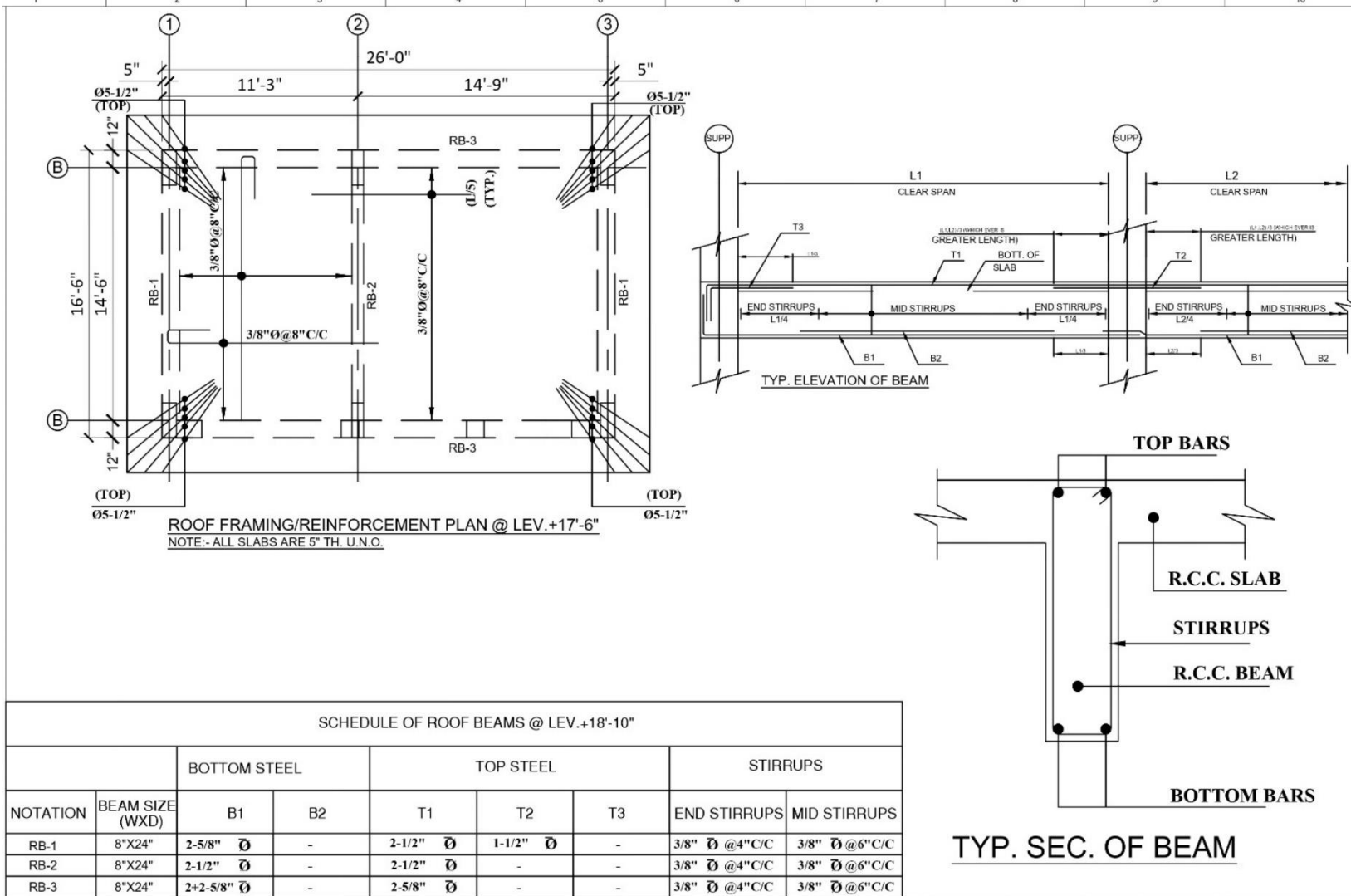
NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.



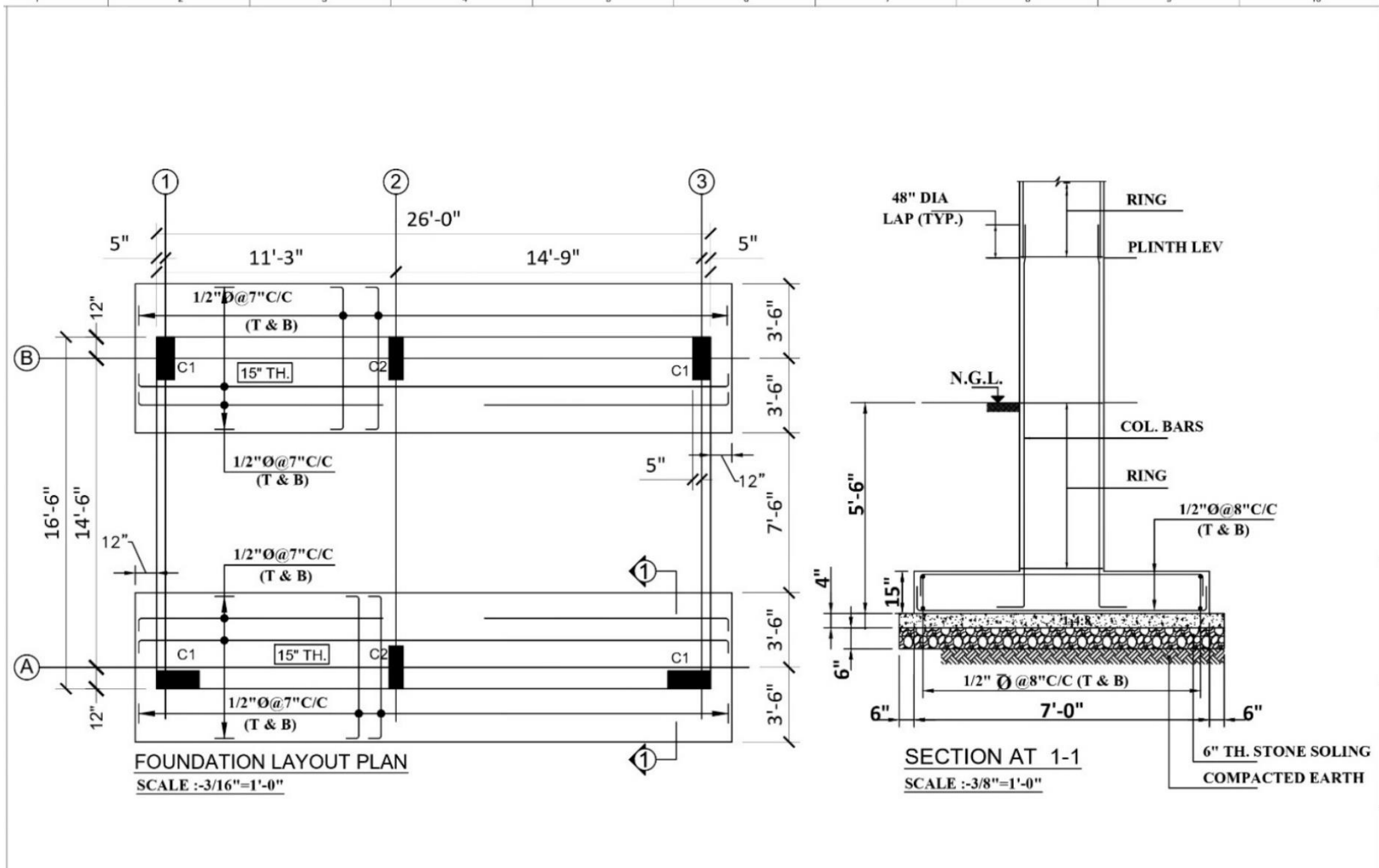
SCHEDULE OF GROUND FLOOR BEAMS @ LEV. +5'-6"

NOTATION	BEAM SIZE (WxD)	BOTTOM STEEL		TOP STEEL			STIRRUPS	
		B1	B2	T1	T2	T3	END STIRRUPS	MID STIRRUPS
GB-1	12"X24"	4-5/8" Ø	-	3-5/8" Ø	2-1/2" Ø	2-1/2" Ø	3/8" Ø @ 4"C/C	3/8" Ø @ 6"C/C
GB-2	10"X18"	2-5/8" Ø	-	2-1/2" Ø	-	-	3/8" Ø @ 4"C/C	3/8" Ø @ 6"C/C
GB-3	12"X24"	5-3/4" Ø	-	2-5/8" Ø	3-5/8" Ø	-	3/8" Ø @ 4"C/C	3/8" Ø @ 6"C/C

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.



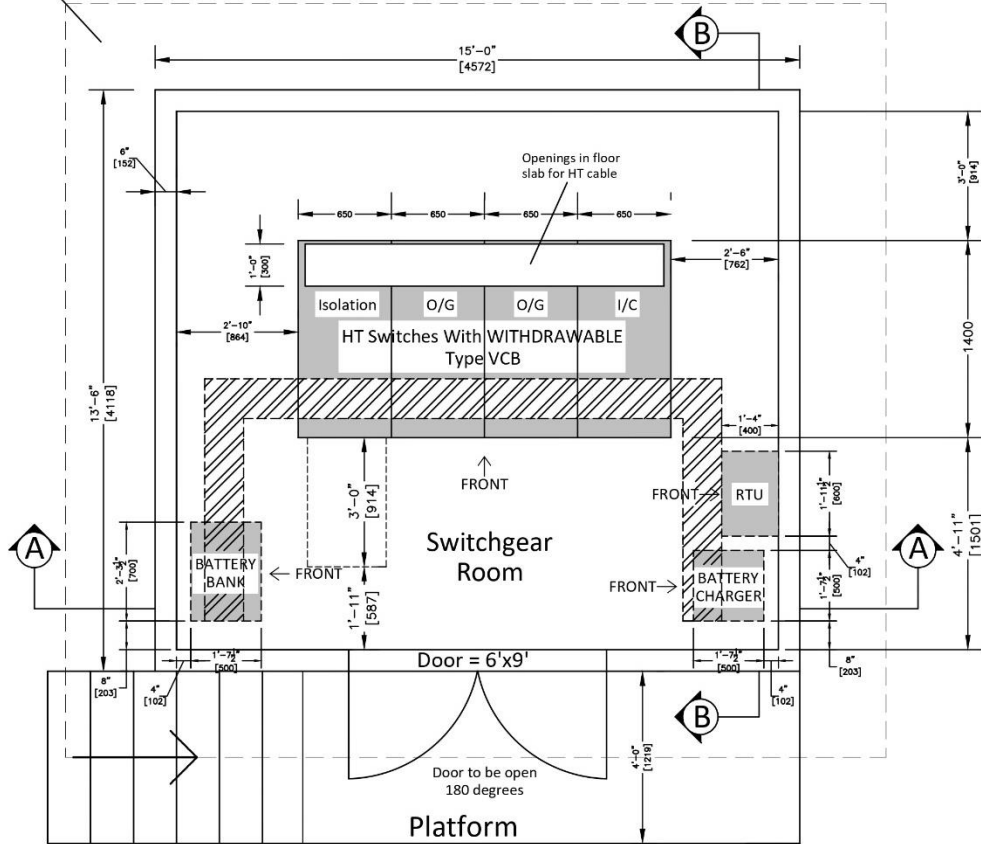
NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.



NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

**Raised Hollow Design
(HT Bulk Supply Room)**

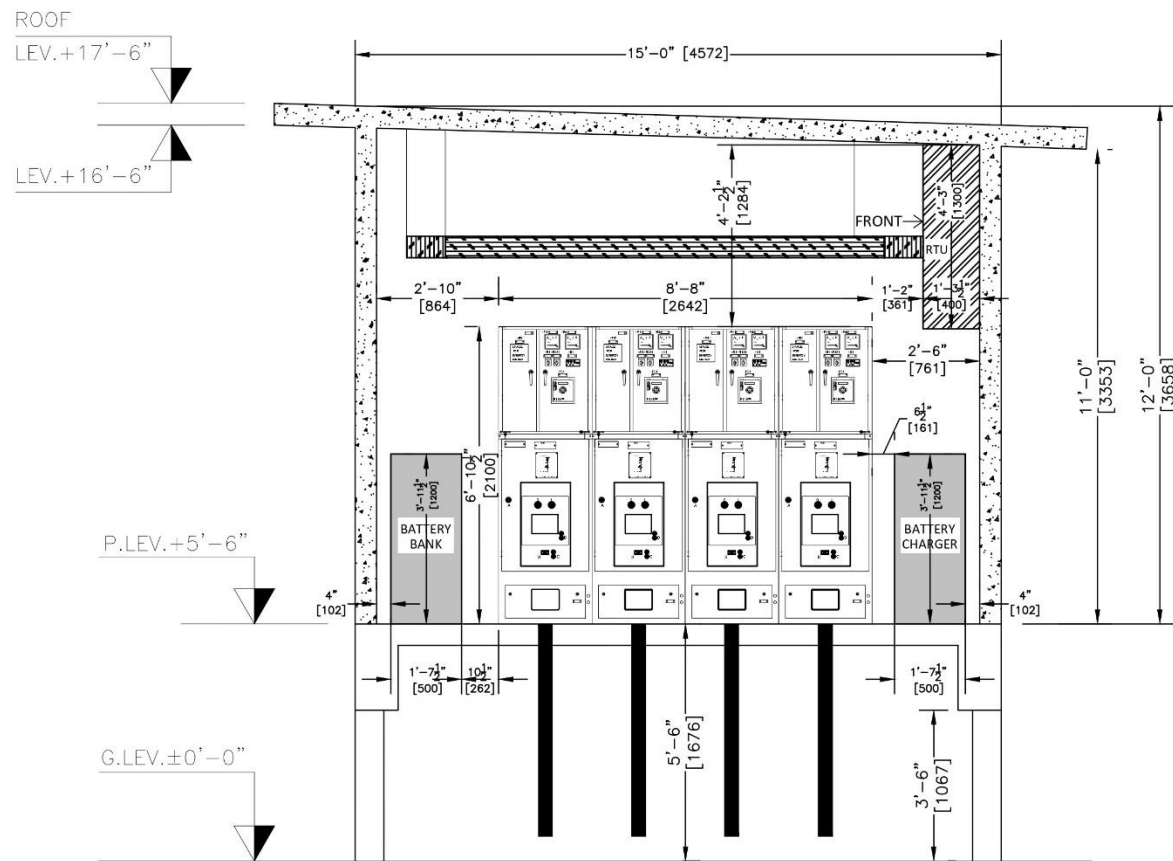
2ft wide projection on all sides



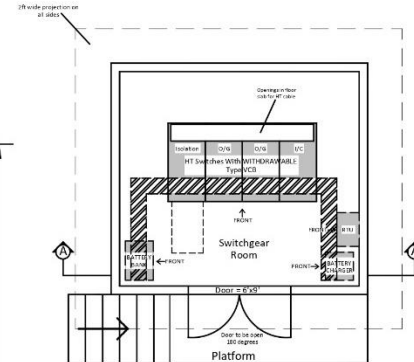
NOTE:

- 1) All the equipments to be fixed in the floor by anchor bolts, as per manufacturer's recommendations.
- 2) Clearances to be maintained as per the drawing.
- 3) Any change in the switch room layout, to be approved from Network Engineering department.
- 4) Earthing to be done as per earthing SOP.
- 5) Opening to be covered.

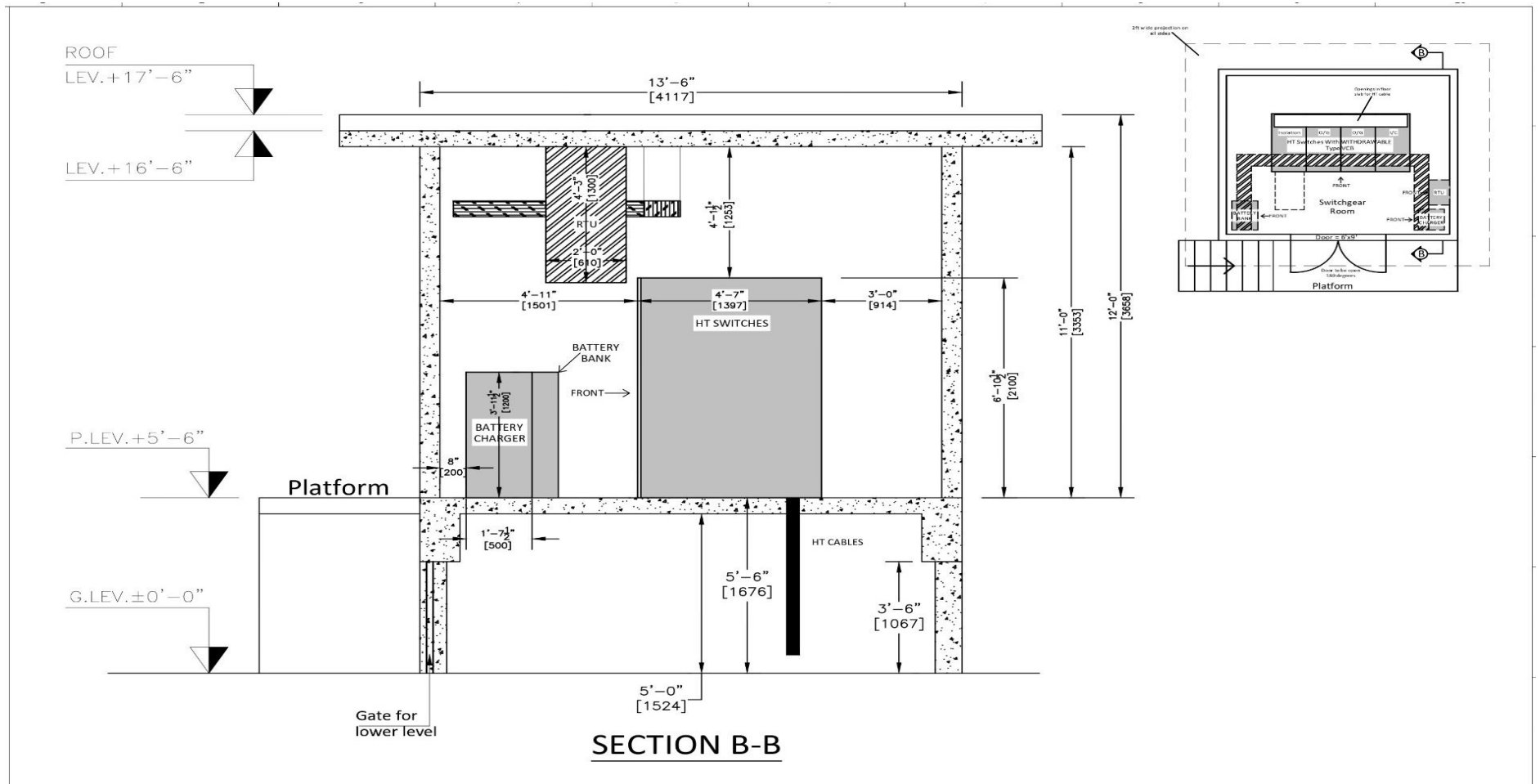
SWITCHROOM LAYOUT WITH WITHDRAWABLE TYPE VCB



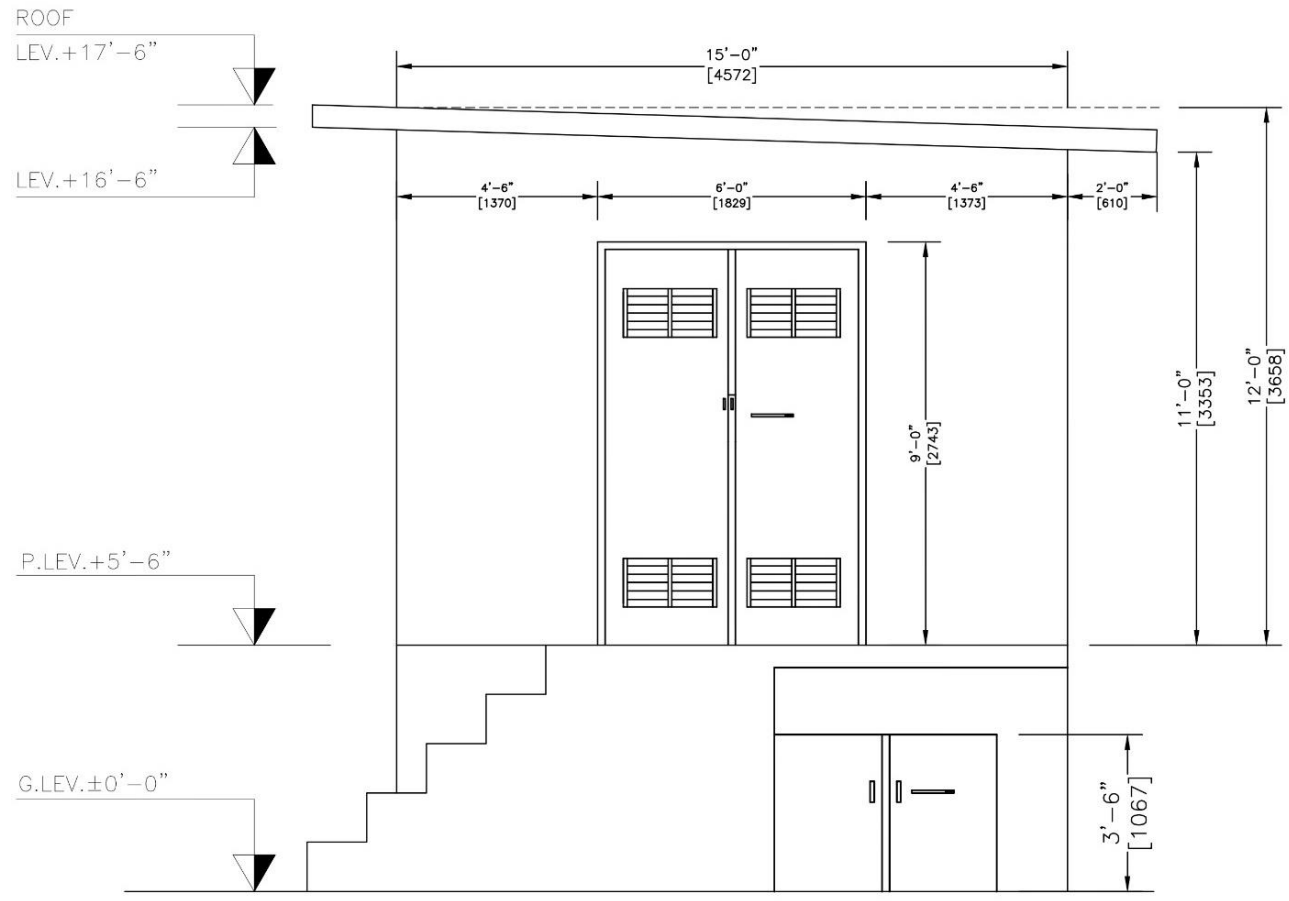
SECTION A-A



NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

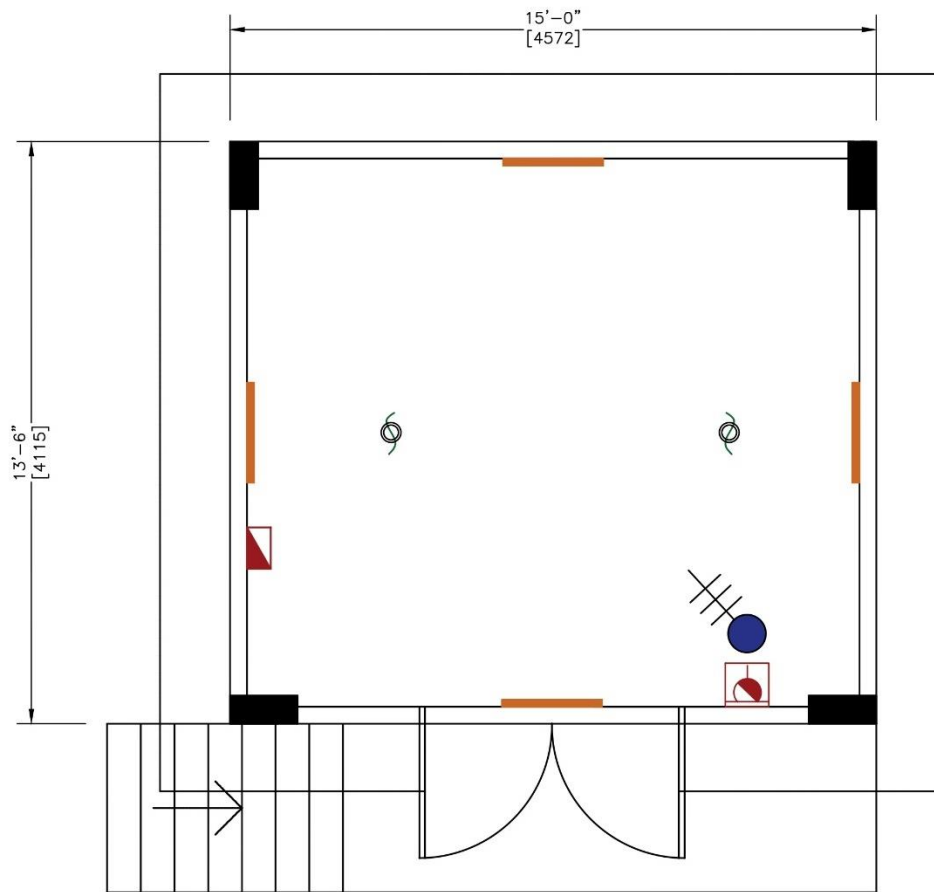



NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.



FRONT ELEVATION

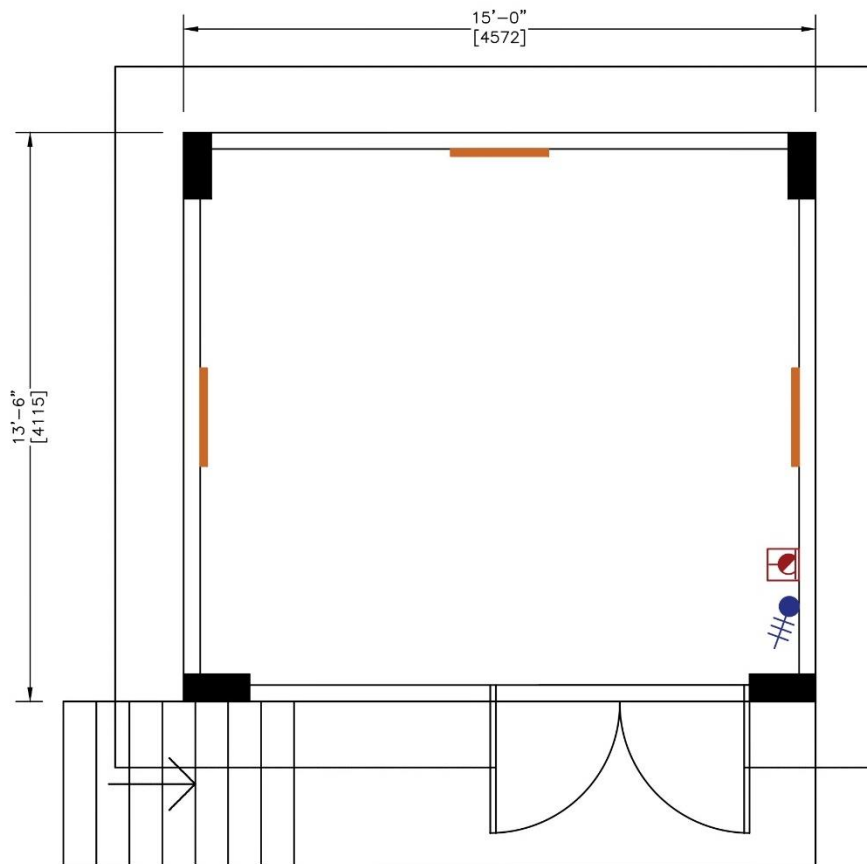
NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.




LEGEND	
	DB
	TUBE LIGHT
	SOCKET
	SWITCHES
	FIRE EXTINGUISHER WITH HOOK

ELECTRICAL LAYOUT GROUND LEVEL

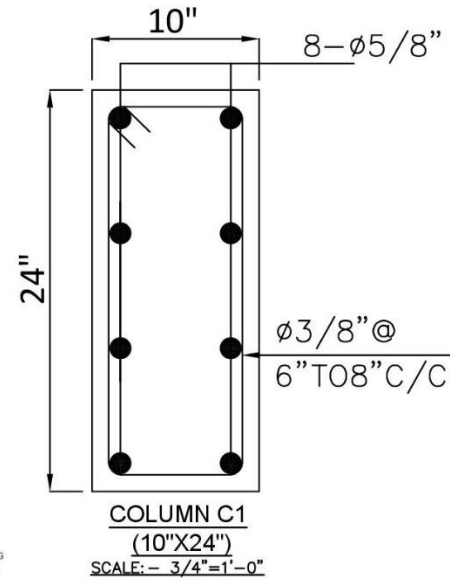
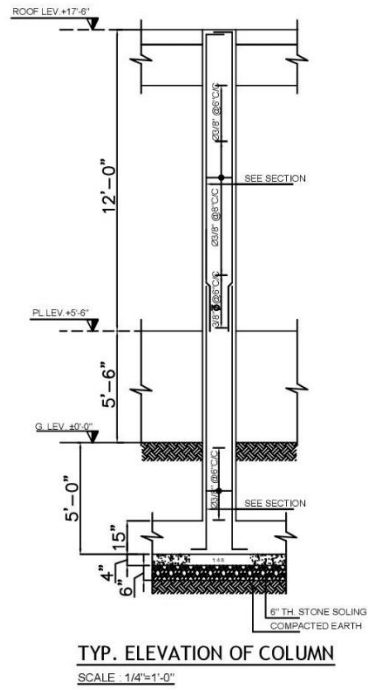
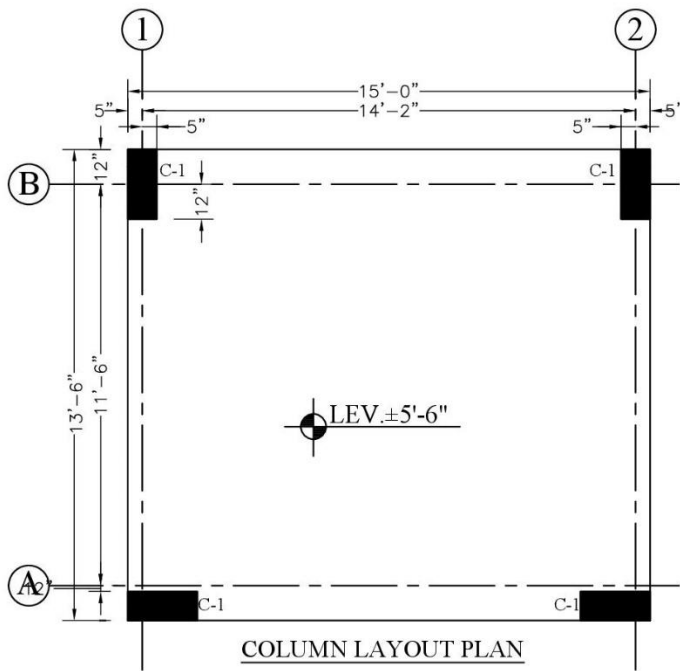
NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.



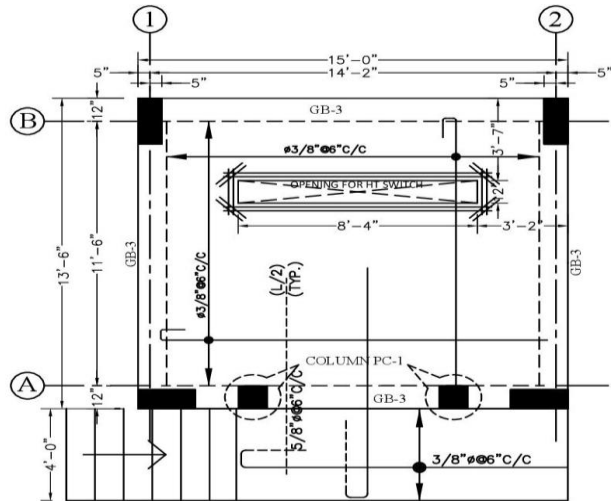
L E G E N D	
	DB
	TUBE LIGHT
	SOCKET
	SWITCHES
	FIRE EXTINGUISHER WITH HOOK

ELECTRICAL LAYOUT LOWER LEVEL

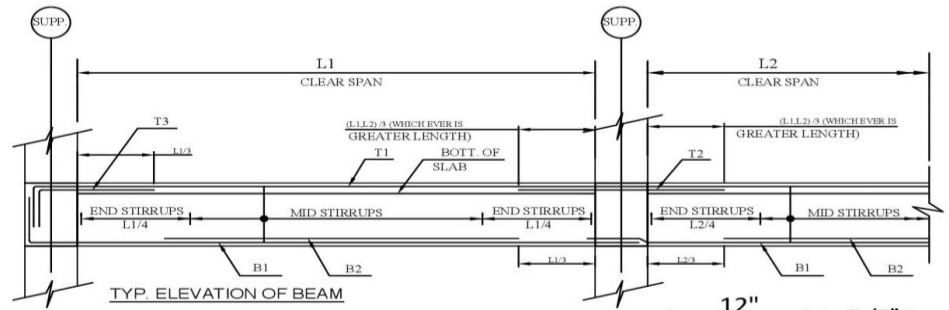
NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.



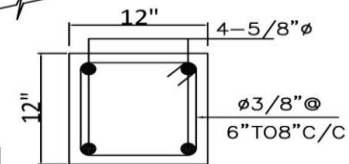
NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.



**GROUND FLOOR FRAMING/
REINFORCEMENT PLAN @ LEV.+5'-6"**
NOTE:- ALL SLABS ARE 6" TH. U.N.O.



TYP. ELEVATION OF BEAM

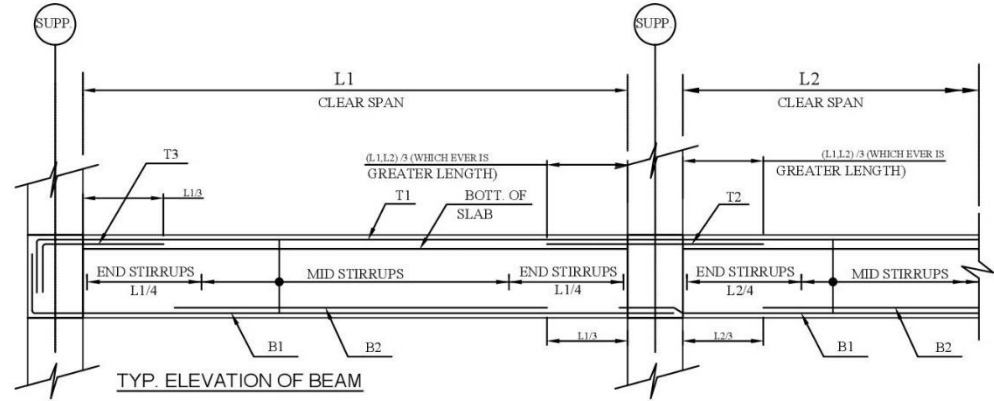
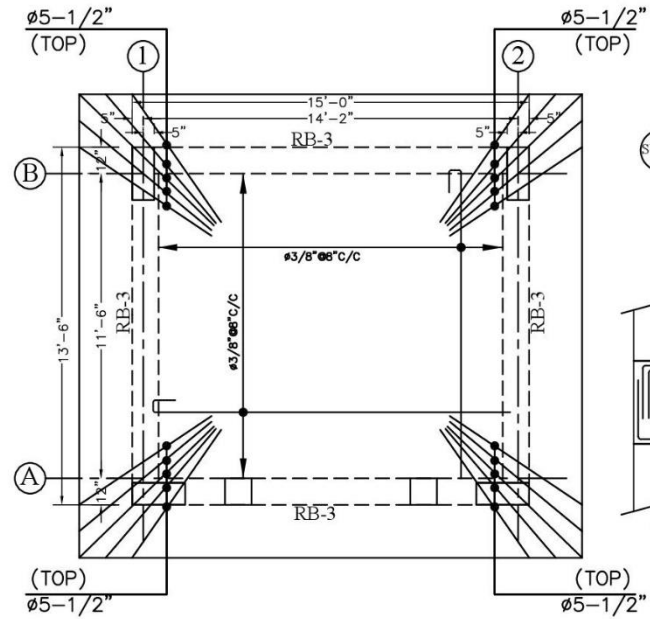


**COLUMN PC-1
(12"X12")**

SCALE: - 3/4"=1'-0"

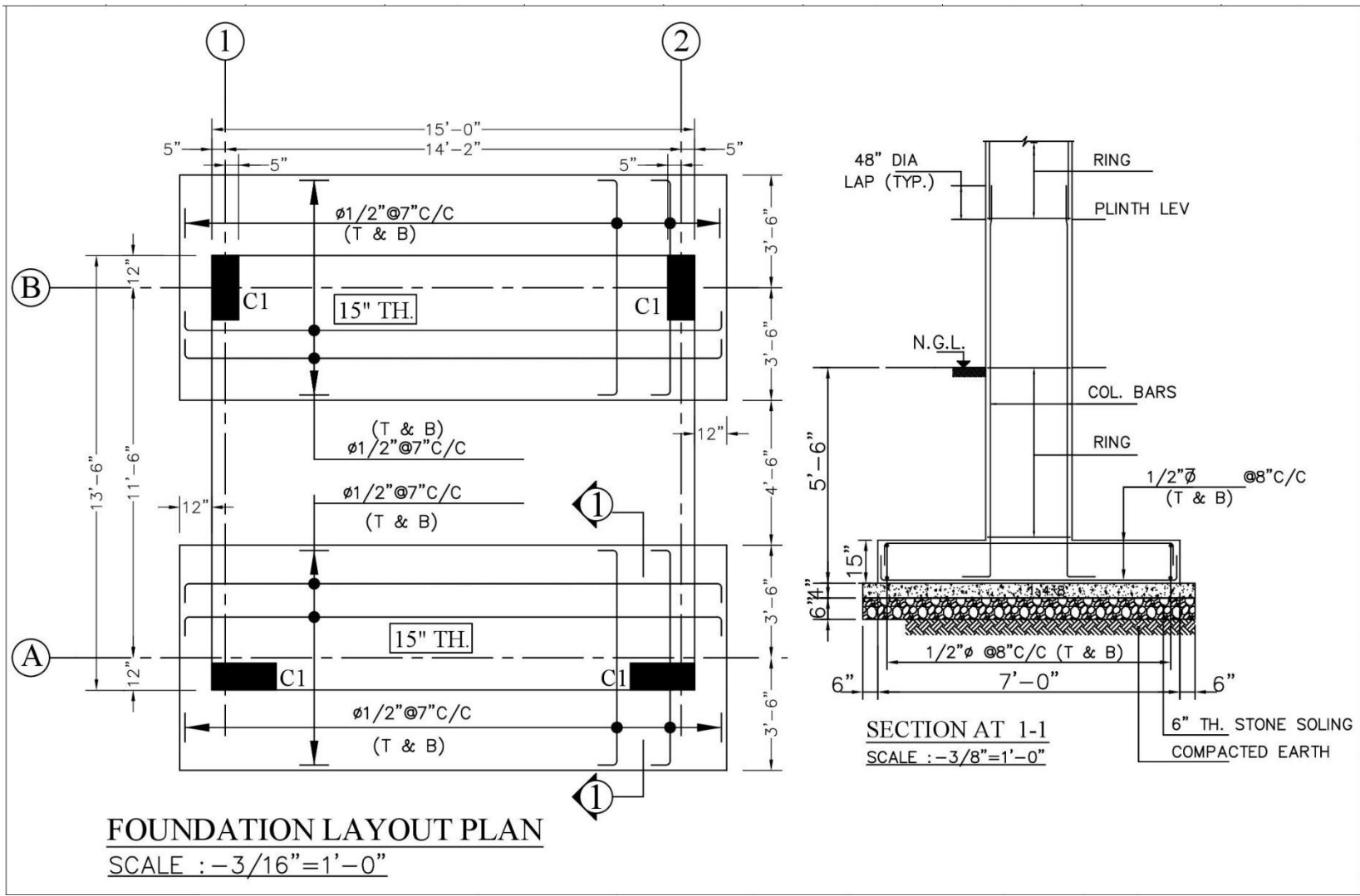
SCHEDULE OF GROUND FLOOR BEAMS @ LEV.+5'-6"

NOTATION	BEAM SIZE (WxD)	BOTTOM STEEL		TOP STEEL			STIRRUPS	
		B1	B2	T1	T2	T3	END STIRRUPS	MID STIRRUPS
GB-1	12"X24"	4-5/8" \emptyset	-	3-5/8" \emptyset	2-1/2" \emptyset	2-1/2" \emptyset	\emptyset 3/8" @ 4" C/C	\emptyset 3/8" @ 6" C/C
GB-2	10"X18"	2-5/8" \emptyset	-	2-1/2" \emptyset	-	-	\emptyset 3/8" @ 4" C/C	\emptyset 3/8" @ 6" C/C
GB-3	12"X24"	5-3/4" \emptyset	-	2-5/8" \emptyset	3-5/8" \emptyset	-	\emptyset 3/8" @ 4" C/C	\emptyset 3/8" @ 6" C/C



**ROOF FRAMING/REINFORCEMENT
PLAN @ LEV. +17'-6"**
NOTE:- ALL SLABS ARE 5" TH. U.N.O.

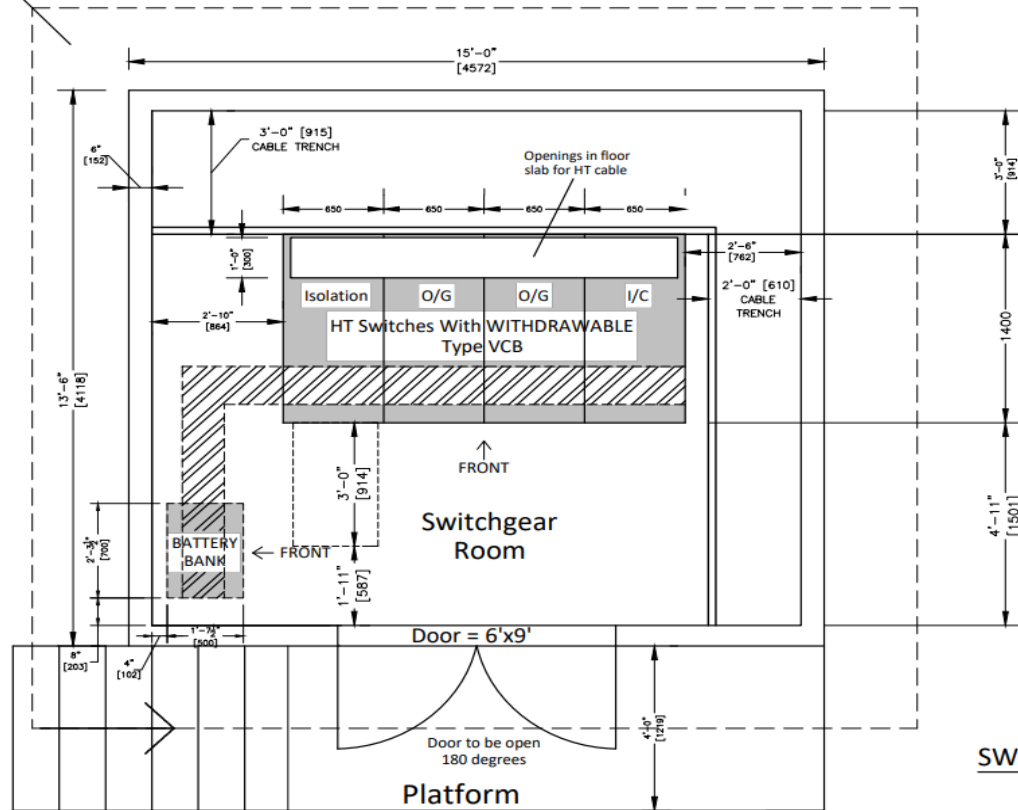
SCHEDULE OF ROOF BEAMS @ LEV. +18'-10"								
		BOTTOM STEEL		TOP STEEL			STIRRUPS	
NOTATION	BEAM SIZE (WxD)	B1	B2	T1	T2	T3	END STIRRUPS	MID STIRRUPS
RB-1	8"X24"	2-5/8" ϕ	-	2-1/2" ϕ	1-1/2" ϕ	-	$\phi 3/8''@4''$ C/C	$\phi 3/8''@6''$ C/C
RB-2	8"X24"	2-1/2" ϕ	-	2-1/2" ϕ	-	-	$\phi 3/8''@4''$ C/C	$\phi 3/8''@6''$ C/C
RB-3	8"X24"	2+2-5/8" ϕ	-	2-5/8" ϕ	-	-	$\phi 3/8''@4''$ C/C	$\phi 3/8''@6''$ C/C



NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

**Switch room layout (Solid Type)
(for Multistory buildings)**

2ft wide projection on all sides



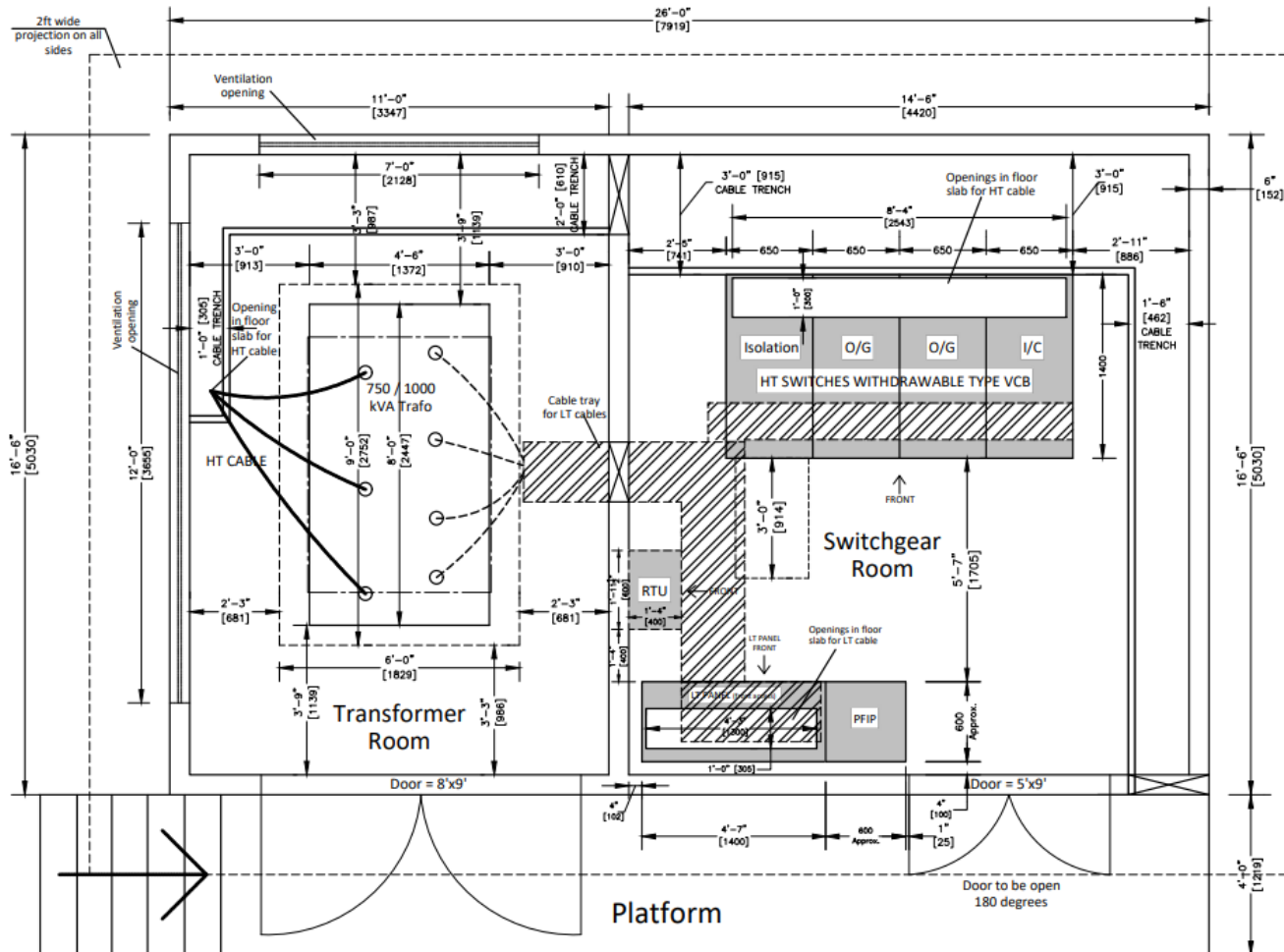
NOTE:

- 1) All the equipments to be fixed in the floor by anchor bolts, as per manufacturer's recommendations.
- 2) Clearances to be maintained as per the drawing.
- 3) Any change in the switch room layout, to be approved from Network Engineering department.
- 4) Earthing to be done as per earthing SOP.
- 5) Opening to be covered.

**SWITCHROOM LAYOUT (CABLE TRENCH)
WITH WITHDRAWABLE TYPE VCB**

Annexure – B4

**Substation layout (Solid Type)
(for Multistory buildings)**



**SUBSTATION LAYOUT (SOLID TYPE)
WITH WITHDRAWABLE TYPE VCB**

NOTE:

- 1) All the equipments to be fixed in the floor by anchor bolts, as per manufacturer's recommendations.
- 2) Clearances to be maintained as per the drawing.
- 3) Any change in the substation layout, to be approved from Network Engineering department.
- 4) Earthing to be done as per earthing SOP.
- 5) Opening to be covered.

Legends:

-----	Conventional Tubular Trafo
-----	Corrugated Tank Trafo
-----	Dry Type Trafo

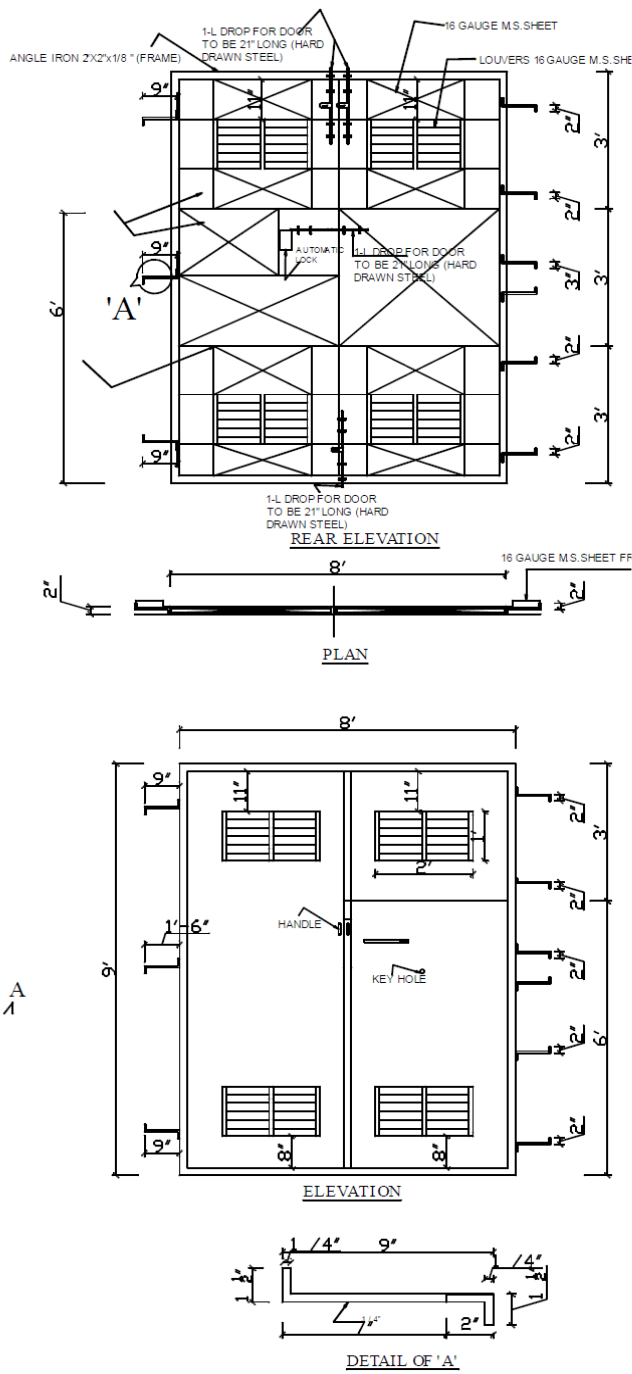


Figure 2 Anti-Theft Door Detail

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

Annexure-C

Following checklists are to be used for inspection at various stages:

CHECKLIST AT SUBSTATION LAYOUT STAGE

S.NO	DESCRIPTION
1	Approved scheme drawing is available at site?
2	Layout of the substation site is done as per the scheme drawing.
3	Any additional comments.

Table 3 Check list at substation layout stage

CHECKLIST AT FOUNDATION POURING STAGE

S.NO	DESCRIPTION
1	Approved scheme drawing is available at site?
2	Foundations are same as per the layout?
3	Machine Mixer is being used for concrete

Table 4 Checklist at foundation pouring stage

CHECK LIST AT FIRST SLAB POURING STAGE

S.NO	DESCRIPTION
1	Approved drawing is available at site?
2	Level marks are present at site?
3	Cable holes/slits are made as per the approved equipment layout.
4	Floor level is as per the KE requirements.

Table 5 Check list at first slab pouring stage

CHECK LIST AT SUBSTATION ROOF SLAB STAGE

S.NO	DESCRIPTION
1	Approved drawing is available at site?
2	Construction is done as per the approved layout?
3	Proper slope is given in roof?
4	Clear height of the substation is as per the requirement.
5	Level marks are provided?

Table 6 Check list at substation roof slab stage

Annexure – D



CYAN 0 MAGENTA 50 YELLOW 100 BLACK 0	CYAN 80 MAGENTA 34 YELLOW 100 BLACK	CYAN 50 MAGENTA 100 YELLOW 100 BLACK	CYAN 100 MAGENTA 100 YELLOW 100 BLACK	CYAN 100 MAGENTA 100 YELLOW 100 BLACK 100	CYAN 0 MAGENTA 100 YELLOW 100 BLACK 0	CYAN 75 MAGENTA 100 YELLOW 100 BLACK	CYAN 60 MAGENTA 40 YELLOW 30 BLACK

FONTS:
 English : Helvetica Condensed Bold
 URDU : Noori Nastaliq

Figure 3: Substation Branding Format

NOTE: All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

Annexure – E (Prequalified Vendor List)

Participants	Focal Person Contact Person
Classic Associates	Salman (0300-2010752)
AF Engineering	Farrukh Munawar 03002029121
BS Traders & Engineering Services	Waqar Ahmed 0300-8958477 & 0333-8958477
FACTS PAKISTAN	Adnan Zahid 0334-3991272
Quality Constructions	Sakhawat Hashmi 0345-3360035
Raza & Brothers	Mashood (0332-2909023)
A. K. BUILDERS	Abdul Khaliq 0334-3856685 Zahid 0323-3270654
YASIR ENGINEERING WORKS	Ammar Yasir 0334-3073508
Zaheer & Brother	Shahrukh (0324-2592733 & 0331-2674113)