



भारतीय रिज़र्व बैंक / Reserve Bank of India
संपदा विभाग / Estate Department
पटना / Patna

TENDER NOTICE

Tender ID	170271
NIT/RFP NO	10/NIT/CE/(PATNA)/CPWD/2026-27
Name of Work	Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installations, DG Set Electrical Sub-Station, Powe Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E and M works , CCTV, LAN Solar Water Heaters, OHT UGT, RWH, STP and External Development Work, Land- scaping and Art Work etc. in the EPC Mode-III
Estimated Cost	₹1,65,28,78,800
Earnest Money	₹1,75,28,788
Time Allowed	30 months
Bid Submission Closing Date & Time	Up to 15:00 Hrs. on 16/10/2026

The tender forms and other details can be obtained from the website
<https://etender.cpwd.gov.in>



भारत सरकार
GOVERNMENT OF INDIA
केंद्रीय लोक निर्माण विभाग
CENTRAL PUBLIC WORKS DEPARTMENT
कार्यालय मुख्य अभियंता (पटना)
OFFICE OF THE CHIEF ENGINEER (PATNA),
पटना-800025
PATNA – 800025



e-NIT
ई-निविदा आमंत्रण सूचना
ON
EPC MODE-III

NAME OF WORK : Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Land-scaping & Art Work etc. in EPC Mode-III.

NIT No. : 10/ NIT/CE(PATNA)/CPWD/2026-27

AMOUNT : Rs. 165,28,78,800/-
Rs.137,87,21,501/- (CIVIL & HORTICULTURE)
Rs. 27,41,57,299/- (ELECTRICAL)

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Name of Work:- Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Land-scaping & Art Work etc. in EPC Mode-III.

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Notice Inviting Tender (NIT) amounting to Rs. 165,28,78,800/- (Rupees One Hundred Sixty-Five Crore Twenty Eight Lakh Seventy Eight Thousand Eight Hundred) only from Page number 01 to 1300 is hereby approved).

**Assistant Engineer (C)-II
O/o the EE Patna-2
CPWD, Patna - 800025**

**Assistant Engineer (C)(P)
O/o the EE Patna-2
CPWD, Patna - 800025**

**Executive Engineer Patna-2
CPWD, Patna - 800025**

**Assistant Engineer (E)-III
O/o the EE (E) Patna
CPWD, Patna - 800025**

**Assistant Engineer (E) (P)
O/o the EE (E) Patna
CPWD, Patna - 800025**

**Executive Engineer (E) Patna
CPWD, Patna - 800025**

**Assistant Engineer (C) (P)
O/o the CE (Patna)
CPWD, Patna - 800025**

**Assistant Engineer (E) (P)
O/o the CE (Patna)
CPWD, Patna - 800025**

**Executive Engineer (C)-I
O/o the CE (Patna)
CPWD, Patna - 800025**

**Chief Engineer (Patna)
CPWD, Patna - 800025**

PART A

INFORMATION AND INSTRUCTIONS FOR BIDDERS FOR e-TENDERING

Forming part of bid document

The Executive Engineer, Patna-2, (Telephone No. 0612-2950367 email ID: eepatna2.cpwd@gmail.com) C.P.W.D., 1st floor, Karpoori Thakur Sadan, Ashiyana-Digha Road Patna-800025, on behalf of the President of India, invites percentage rate online composite bids on Engineering, Procurement and Construction (EPC-III mode) turnkey basis from CPWD enlisted contractors of appropriate class in "Building & Road" (erstwhile composite / building / infrastructure) category and eligible firms/contractors of repute in two bid system for the following work:

Sl. No.	NIT No.	Name of Work & location	Estimated cost put to bid Rs.	Earnest Money	Stipulated Period of Completion of work	Last date & time of online submission of bid, copy of receipt of deposition of original EMD and other Documents as specified in the bid	Date & Time of opening of bid
1	10/NIT/CE(PATNA)/CPWD/2026-27	Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Land-scaping & Art Work etc. in EPC Mode-III.	Civil: Rs. 137,87,21,501/- Elect: Rs. 27,41,57,299/- Composite: Rs. 165,28,78,800/-	RS. 1,75,28,788/-	30 (Thirty) months	Up to 03.00 PM on 16.10.2026	03.30 PM on 16.10.2026

1. Contractors who fulfill the following requirements shall be eligible to apply. Joint Ventures are not accepted. [1 (b), 1 (c) & 1 (d) are not applicable for CPWD enlisted contractors of appropriate class. 1 (a)(i), (ii) and 1(e) are applicable for CPWD enlisted contractor also].
 - (a) Should have satisfactorily completed the works as mentioned below during the last 7 (seven) years ending last day of the month previous to the one in which tenders are invited.
 - (i) Three similar completed works each costing not less than **Rs. 66.12 Crore**
 - Or**
 - Two similar completed works each of value not less than **Rs. 99.17 Crore**
 - Or**
 - One similar completed work of value not less than **Rs. 132.23 Crore**

Similar works shall mean “Construction of building works including water supply, sanitary installation, drainage, internal electric installation, lift, firefighting system and fire alarm system, having at least one building of minimum Ten (10) Storey executed under one agreement.”

NOTE:

- a. For this purpose, each basement, stilt constructed with the building shall be considered as a storey.
 - b. Mumty and machine room and OHT (including supporting structure above roof) will not be counted as storey for above purpose.
 - c. For the purpose of similar works, works executed in India only shall be considered.
 - d. Qualified similar works may be physically inspected by the CPWD Engineers to ascertain the completion, performance on quality of works for finalizing the technical bid.
The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to previous day of last date of submission of tender.
- (ii) One completed work costing not less than **Rs. 33.06 Crore** executed with the structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**”. This work can be part of eligible work at 1(a)(i) above or as a separate work. The value of executed work shall be brought to the current level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to previous day of last day of submission of tenders.

If the bidder does not have adequate experience of the structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**” then the bidder can associate with contractor having requisite experience of executing work in structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**”. Bidder has to submit MoU as per FORM-‘K’ with such associate contractor & experience certificate as per FORM-‘C2’ & FORM-‘D2’ with such associate contractor, along with his tender, for structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**” only. The associated contractor must satisfy the eligibility criteria of having successfully completed one work of structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**” having the cost of structural system not less than **Rs. 32.99 Crore** during the last seven years ending last day of month previous to the one in which tender is invited.

In case separate cost of structural system of “**monolithic concrete construction system technology using Aluminium Formwork**” technology is not available in the experience certificate of associated contractor; it will be taken as 30% of completed cost of project/work.

Associated contractor should not have been debarred from any Ministry or any govt. organization in the last five years.

In case, the eligible work has been executed by a Joint Venture through one or more individual firm(s), then cost of completed work shall be distributed among the individual firm(s) in proportion to their share in Joint Venture and that will be considered as work experience for individual firm(s) for pre-qualification in bidding.

- (b) Should have had average **Annual Financial Turn Over of Rs. 49.59 Crore** (30% of E.C.P.T) on construction works during the immediate last three consecutive financial years ending on **31st March 2026** (scanned copy of certificate from CA with Unique

documents Identification Number (UDIN) to be uploaded). The value of annual turnover figures shall be brought to the current value by enhancing the actual turnover figures at simple rate of 7% per annum.

(c) **Should not have incurred any loss (profit after tax should be positive)** in more than two years ending **31st March 2026** during available last five consecutive balance sheets (Standalone financial statement), duly certified and audited by the Chartered Accountant. **(Scanned copy of certificate from CA with Unique documents Identification Number (UDIN) to be uploaded).**

(d) Should have a Banker's certificate for **Rs. 66.12 Crore** (40% of E.C.P.T.) from a commercial bank

or

Net worth certificate of minimum **Rs. 16.53 Crore** (10% amount of ECPT) issued by CA with Unique documents Identification Number (UDIN) **(Scanned copy of original to be uploaded).**

(e) Bidding capacity (applicable for CPWD enlisted contractor also): Should have bidding capacity equal to or more than the estimated cost of the work put to tender. The bidding capacity shall be worked out by the following formula:

$$\text{Bidding capacity} = \{[A \times N \times 1.5] - B\}$$

Where,

A=Maximum turnover in construction works executed in any one year during the last seven years taking into account the completed as well as works in progress. The value of completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum.

N = Numbers of years prescribed for completion of work for which bids have been invited.

B = Value of existing commitments of ongoing works during the period of execution of work for which bids have been invited.

Notes:

- i. The bidder shall submit Bidding capacity as per form C-3.
- ii. Bidding Capacity is applicable for all the contractors including CPWD enlisted contractors.
- iii. Bidding capacity formula for CPWD contractors who are enlisted based on rule 6.1.7 of Enlistment Rules-2026 i.e. government retired engineer/ architect for three years from the date of issue of enlistment order, is as follows: -

$$\text{Bidding Capacity} = \{[A1 \times N \times 1.5] - B\}$$

Where,

A1= Banker Certificate figure as submitted by applicant (i.e. government retired engineer/ architect) at the time of enlistment for first year of enlistment and subsequent fresh bankers' certificate for second and third year respectively. Value of A for first year will be mentioned in the enlistment order by the member secretary of advisory committee for enlisting authority.

N= Number of years prescribed for completion of work for which bids have been invited.

B= Value of existing commitments of ongoing works during the period of execution of work for which bids have been invited. This value is for newly enlisted entity.

Within three years from the date of issue of enlistment order, the newly enlisted entity has to develop its own bidding capacity and thereafter the general bidding capacity

formula being used for other entities shall be Applicable to its for calculation of bidding capacity.

Newly enlisted entity may like to follow general bidding capacity formula even before period of three years if it so chooses.

- iv. Bidding capacity, for CPWD contractors who are enlisted based on rules 9.6.3 & 9.6.4 of Enlistment Rules -2026 i.e. new entity based on previously enlisted entity for three years from dates of issue of enlistment order, is as follows: -

Annual turnover of newly enlisted entity shall be in proportion to the shareholding of partners/directors in the original enlisted entity at the time of enlistment of the newly enlisted entity.

Within three years from the date of issue of enlistment order, the newly enlisted entity has to develop its own bidding capacity and thereafter the general bidding capacity formula being used for other entities shall be applicable to its for calculation of bidding capacity. Newly enlisted entity may like to follow general bidding capacity formula even before period of three years, if it so chooses.

Bidding capacity for newly enlisted entity (CPWD enlisted contractors) who are enlisted based on rules 9.6.3 and 9.6.4 of enlistment rules – 2024 shall be as follows:

$$\text{Bidding Capacity} = \{[A' \times N \times 1.5] - B\}$$

Where

A' = Proportionate share of newly enlisted director/ partner in originally enlisted company / firm multiplied by the factor A, as given below. Value of A' will be mentioned in the enlistment order by member secretary of Advisory committee for Enlistment Authority, it will remain same for three years.

A = Maximum turnover in construction works executed in any one year during the last seven years taking into account the completed as well as works in progress. The value of completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum. This value is of originally enlisted entity at the time of enlistment of newly enlisted entity.

N = Number of years prescribed for completion of work for which bids has been invited.

B = Value of existing commitments of ongoing works during the period of execution of work for which bids have been invited. This value is for newly enlisted entity.

- v. Enlisted entities based on rules 6.1.7, 9.6.3 or 9.6.4 of enlistment rules- 2024 can submit MoU from agency having requisite experience for structural system technology if the enlisted entity does not have required experience.

2. The intending bidder must read the terms and conditions of CPWD-6 carefully. He should only submit his bid if he considers himself eligible and he is in possession of all the documents required.
3. This Information and instructions for bidders posted on website shall form part of bid document.
4. The bid document consisting of plans, specifications, schedule of quantities of various types of items to be executed and the set of terms & conditions of the contract to be complied with and other necessary documents can be seen and downloaded from website <https://etender.cpwd.gov.in> or www.cpwd.gov.in free of cost.
5. But the bid can only be submitted after deposition of original EMD either in the office of Executive Engineer inviting bid or Division office of any Executive Engineer, CPWD within the period of bid submission and uploading the mandatory scanned documents such as insurance surety bonds, Account Payee Demand Draft or Bankers cheque or Fixed

- Deposit Receipts or/and Bank Guarantee (for balance amount as prescribed) from any of the commercial bank towards EMD in favor of **Executive Engineer, NIT Project Division, CPWD, Patna**, receipt for deposition of original EMD to Division office of any Executive Engineer (including NIT issuing EE/AE), CPWD and other documents as specified.
6. Those contractors who are not registered or have not updated their profile on the website mentioned above, are required to get registered/update their profile beforehand. The necessary training materials including the videos with step-to-step process are available on download section of <https://etender.cpwd.gov.in>.
 7. The intending bidder must have valid Class-III digital signature certificate with encryption key (combo type) to perform any operations / transactions on the e-tendering portal / website and the bidder should download and install the eMSigner on their system as per instructions available on download section of <https://etender.cpwd.gov.in>.
 8. On opening date, the contractor can login and see the bid opening process. After opening of bids, he will receive the competitor bid sheets.
 9. Contractor can upload documents in the form of JPG format and PDF format.
 10. **Certificate of Financial Turn over:** At the time of submission of bid contractor shall upload Affidavit/ Certificate from CA mentioning Financial Turnover of last 7 years or for the period as specified in the bid document and further details if required may be asked from the contractor after opening of technical bids. There is no need to upload entire voluminous balance sheet.
 11. Contractor must ensure to quote rate of each item. The column meant for quoting rate in figures appears in yellow colour and the moment rate is entered; it turns sky blue. In addition to this, while selecting any of the cells a warning appears that if any cell is left blank the same shall be treated as "0". Therefore, if any cell is left blank and no rate is quoted by the bidder, rate of such item shall be treated as "0" (ZERO). However, If a tenderer quotes nil rates against each item in item rate tender or does not quote any percentage above/below on the total amount of the tender or any section / sub head in percentage rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.
 12. The Technical Bid shall be opened first on due date and time as mentioned above. The time and date of opening of Financial Bid of contractors qualifying the Technical bid shall be communicated to them at a later date.
 13. Pre-bid conference shall be physically held in conference Room, office of the Chief Engineer, Patna, C.P.W.D., Karpoori Thakur Sadan, Ashiyana-Digha Road, Patna-25 at 11:30 Hrs. on: **29/ 09 / 2026** to clear the doubt of intending bidders, if any. Note:- Prospective bidders are requested to submit their queries in advance through e-mail at: [eeapatna2.cpwd@gmail.com/](mailto:eeapatna2.cpwd@gmail.com) patceez2.cpwd@gov.in. Based on the discussions and clarifications arising out of the Pre-Bid Conference, modifications/ addendums / corrigendum may be issued by the Department. All such modifications/ addendums/ corrigendum shall be uploaded only on the tender website only and shall form an integral part of the bidding documents. No separate publication of the same shall be made in newspapers.
 14. The department reserves the right to reject any prospective application without assigning any reason and to restrict the list of qualified bidders to any number deemed suitable by it, if too many bids are received satisfying the laid down criteria.
 15. Contractor has to adopt Monolithic Concrete construction system technology using Aluminium Shuttering for Tower B & C and Tower D & E, and RCC framed structure for remaining structures as per the attached/ issued structural drawings by the department.
 16. The bidder should never have been debarred or blacklisted by any Central Govt/State Govt./ Sports Authority / Municipal agency.

17. Earnest Money in the form of Insurance Surety Bonds, Account Payee Demand Draft, Fixed Deposit Receipt, Banker's Cheque or **Bank Guarantee including e-bank guarantee** (for balance amount as prescribed) from any of the Commercial Banks (**drawn in favour of Executive Engineer, NIT Patna Project Division CPWD, Patna**) shall be scanned and uploaded on the e-Tendering website within the period of bid submission. The original EMD should be deposited either in the office of Executive Engineer inviting bids or division office of any Executive Engineer, CPWD within the period of bid submission. The EMD receiving Executive Engineer (including NIT issuing EE/AE) shall issue a receipt of deposition of earnest money deposit to the bidder in a prescribed format (enclosed) uploaded by tender inviting EE in the NIT

A part of earnest money is acceptable in the form of bank guarantee also. In such case, minimum 50% of earnest money or Rs. 20 lac, whichever is less, shall have to be deposited in shape prescribed above, and balance may be deposited in shape of Bank Guarantee of any Commercial bank having **validity for a period of 180 days from the** last date of receipt of bids which is to be scanned and uploaded by the intending bidders.

The earnest money given by all the tenderers except the lowest tenderer shall be refunded immediately after the expiry of stipulated bid validity period or immediately after acceptance of the successful bidder, whichever is earlier. However, in case of two/ three bid system, earnest money deposit of bidders unsuccessful during technical bid evaluation etc. should be returned within 30 days of declaration of result of technical bid evaluation. Copy of Enlistment Order and certificate of work experience and other documents as specified in the notice inviting e- tender shall be scanned and uploaded on the e-Tendering website within the period of bid submission. **However, certified copy of all the scanned and uploaded documents as specified in e- tender notice shall have to be submitted by the lowest bidder within a week physically in the office of tender opening authority.** Online bid documents submitted by intending bidders shall be opened only of those bidders, who's original EMD deposited with any division of CPWD and other documents scanned and uploaded are found in order.

18. **Provision for comprehensive annual maintenance contract (CAMC) for two years has been taken in NIT. The contractor has to quote their rate for main projects only. The same percentage will be applied for CAMC works also. However, L1 contractor will be decided only based on the quoted rates and amount of main project works.**

The separate supplementary agreement will be drawn with the L1 contractor and RBI authorities as decided by RBI after completion of defect liability period of three years of the main project. The quoted amount for CAMC work shall be worked out based on the quoted % (above/below) for main project.

List of Mandatory Documents to be scanned and uploaded within the period of bid submission

(a) For CPWD enlisted contractors of appropriate category:

1.	Scanned copy of EMD as per Para 17 on Page 8 (as prescribed) & issued by a Commercial Bank against EMD.
2.	Letter of transmittal as per format (Section III) (Page 64 - 65)
3.	Copy of receipt for deposition of original EMD (in favour of The of Executive Engineer, NIT Patna Project Division CPWD, Patna (FORM- 'G') . Note: However, EMD shall be submitted in the form as described in this bid in division office of any Executive Engineer, CPWD (including NIT issuing EE) as Insurance Surety Bonds, Account Payee Demand Draft, Fixed Deposit Receipt, Banker's Cheque or Bank Guarantee (as prescribe) issued by a Commercial Bank if being made part of EMD.
4.	Enlistment order in appropriate class of B&R category in CPWD.
5.	Annual Turn Over on construction work as per FORM- 'A' to work out bidding capacity .
6.	Details of eligible similar nature of works completed during the last seven years as per FORM- 'C' and for ongoing works as per (FORM- 'C-1').
7.	Details of one work in support of having successfully completed with the structural system technology of " monolithic concrete construction system technology using Aluminium Formwork " to be used in the work (FORM- 'C-2').
8.	Performance report of works as per FORM- 'D' referred to in forms- "C" .
9.	Certificate in support of having successfully completed one work with structural system technology of " monolithic concrete construction system technology using Aluminium Formwork " to be use in the work as per FORM- 'D-2' .
10.	If the bidder associates with contractor having requisite work experience of the technology of " monolithic concrete construction system technology using Aluminium Formwork ", he also has to upload MoU (Form- 'K') with such associate contractor along with experience certificate of technology of " monolithic concrete construction system technology using Aluminium Formwork " (as per FORM- 'C2' & FORM- 'D2') gained by the Associate Contractor.
11.	Bidding capacity details as per FORM- 'C-3' .
12.	Structure & Organization as per FORM- 'E' .
13.	Undertaking on structural stability and soundness of completed buildings & infrastructure projects Affidavit to be furnished on Rs.200/- Non-Judicial stamp paper attested by Notary (FORM- 'F') .
14.	GST Registration Certificate if already obtained by the bidder. If the bidder has not obtained GST registration as applicable, then he shall scan and upload following under taking along with bid documents. "If work is awarded to me, I/we shall obtain GST registration certificate, as applicable, within one month from the date of receipt of award letter or before release of any payment by CPWD, whichever is earlier, failing which I/we shall be responsible for any delay in payments which will be due towards me/us on account of the work executed and/or for any action taken by CPWD or GST department in this regard".
15.	Proforma of Affidavit for Non-Black Listing should be furnished on Rs.100/-Non-Judicial stamp paper attested by Notary (FORM- 'H').
16.	Affidavit as per FORM- 'I' on Rs.100/- Non-Judicial stamp paper, attested by Notary.
17.	ERP (Enterprise Resource Planning) training certificate issued by CPWD.
18.	Permanent Account Number (PAN) as issued by the Income Tax Department

19.	Copy of valid Electrical License for executing of work in Bihar State or an undertaking stating that “I/We will either obtain valid electrical license at the time of execution of electrical work”.
20.	If the bidder is a firm in partnership, the bid shall be signed by all the partners of the firm above their full type written names and current address, or, alternatively, by a partner holding power of attorney for the firm. In the later case, a certified copy of the power of attorney should accompany the bid. In both cases a certified copy of the partnership deed and current address of all the partners of the firm should accompany the bid.
21.	If the bidder is a limited company or a corporation, the bid shall be signed by a duly authorized person holding power of attorney for signing the bid accompanied by a copy of the power of attorney. The bidder should also furnish a copy of the Memorandum of Articles of Association duly attested by a Public Notary.
22.	CPWD – EPC Form duly signed by the bidder.

(b) For Non-CPWD bidders:

1.	Scanned copy of EMD as per Para 17 on page 8 (as prescribe) & issued by a Commercial Bank against EMD.
2.	Letter of transmittal as per format (Section III) (Page 64 - 65)
3.	Copy of receipt for deposition of original EMD (in favour of The Executive Engineer, NIT Project Division, CPWD, Patna (FORM- ‘G’). Note : However EMD shall be submitted in the form as described in this bid in division office of any Executive Engineer, CPWD (including NIT issuing EE) as Insurance Surety Bonds, Account Payee Demand Draft, Fixed Deposit Receipt, Banker’s Cheque or Bank Guarantee (as prescribe) issued by a Commercial Bank if being made part of EMD.
4.	Annual turnover on construction work as per FORM- ‘A’.
5.	Banker’s Certificate as per FORM- ‘B’ or Net worth certificate as per FORM- ‘B-1’.
6.	Details of eligible similar nature of works completed during the last seven years as per FORM- ‘C’ and for ongoing works as per FORM- ‘C-1’.
7.	Details of one work in support of having successfully completed with the structural system technology of “ monolithic concrete construction system technology using Aluminium Formwork ” to be used in the work (FORM- ‘C-2’.
8.	Performance report of works as per FORM- ‘D’ referred to in forms-“C”.
9.	Certificate in support of having successfully completed one work with structural system technology of “ monolithic concrete construction system technology using Aluminium Formwork ” to be use in the work as per FORM- ‘D-2’.
10.	If the bidder associates with contractor having requisite work experience of the “ monolithic concrete construction system technology using Aluminium Formwork ” technology, he also has to upload MoU (Form-‘K’) with such associate contractor along with experience certificate of “ monolithic concrete construction system technology using Aluminium Formwork ” technology (as per FORM-‘C2’ & FORM-‘D2’) gained by the Associate Contractor.
11.	Bidding capacity details as per FORM- ‘C-3’.
12.	Structure & Organization as per FORM- ‘E’.
13.	Undertaking on structural stability and soundness of completed buildings & infrastructure projects Affidavit to be furnished on Rs.200/- Non-Judicial stamp paper attested by Notary (FORM- ‘F’).
14.	GST Registration Certificate if already obtained by the bidder. If the bidder has not obtained GST registration as applicable, then he shall scan and upload following under taking along with bid documents.

	"If work is awarded to me, I/we shall obtain GST registration certificate, as applicable, within one month from the date of receipt of award letter or before release of any payment by CPWD, whichever is earlier, failing which I/we shall be responsible for any delay in payments which will be due towards me/us on account of the work executed and/or for any action taken by CPWD or GST department in this regard".
15.	Proforma of Affidavit for Non-Black Listing should be furnished on Rs.100/-Non-Judicial stamp paper attested by Notary (FORM- 'H').
16.	Affidavit as per FORM- 'I' on Rs.100/- Non-Judicial stamp paper, attested by Notary.
17.	ERP (Enterprise Resource Planning) training certificate issued by CPWD, If already obtained by the bidder. If Bidder has not obtained ERP (Enterprise Resource Planning) training, then he shall scan and upload the undertaking along with bid documents as below:- "If work is awarded to me, I/we shall obtain ERP (Enterprise Resource Planning) training from CPWD, as applicable, within Two months from the date of receipt of award letter and failure to do so, a recovery of Rs.10,000/- per week shall be made from the R/A bill without giving any show cause notice in this regard."
18.	Permanent Account Number (PAN) as issued by the Income Tax Department
19.	Copy of valid Electrical License for executing of work in Bihar State or an undertaking stating that "I/We will either obtain valid electrical license at the time of execution of electrical work".
20.	If the bidder is a firm in partnership, the bid shall be signed by all the partners of the firm above their full type written names and current address, or, alternatively, by a partner holding power of attorney for the firm. In the later case, a certified copy of the power of attorney should accompany the bid . In both cases a certified copy of the partnership deed and current address of all the partners of the firm should accompany the bid.
21.	If the bidder is a limited company or a corporation, the bid shall be signed by a duly authorized person holding power of attorney for signing the bid accompanied by a copy of the power of attorney . The bidder should also furnish a copy of the Memorandum of Articles of Association duly attested by a Public Notary .
22.	CPWD – EPC Form duly signed by the bidder.

Note:-All the above documents are mandatory, to be scanned & uploaded along with Bid.

GOVERNMENT OF INDIA
CENTRAL PUBLIC WORKS DEPARTMENT
NOTICE INVITING BID
PART - A

The Executive Engineer, Patna-2, (Telephone No. 0612-2950367 email ID: eeapatna2.cpwd@gmail.com) C.P.W.D., 1st floor, Karpoori Thakur Sadan, Ashiyana-Digha Road Patna-800025, on behalf of the President of India, invites percentage rate online composite bids on Engineering, Procurement and Construction (EPC-III mode) turnkey basis from CPWD enlisted contractors of appropriate class in "Building & Road" (erstwhile composite / building / infrastructure) category and eligible firms/contractors of repute in two bid system for the following work: **"Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Land-scaping & Art Work etc. in EPC Mode-III.**

The enlistment of the contractors should be valid on the last date of submission of bids. In case the last date of submission of bid is extended, the enlistment of contractor should be valid on the original date of submission of bids.

- 1.1 The work is estimated to cost **Rs. 165,28,78,800/-**. This estimate, however, is given merely as a rough guide.
- 1.1.1 The authority competent to approve NIT for the combined cost and belonging to the major discipline will consolidate NITs for calling the bids. He will also nominate Division which will deal with all matters relating to the invitation of bids. For composite bid, besides indicating the combined estimated cost put to bid, should clearly indicate the estimated cost of each component separately. The eligibility of bidders will correspond to the combined estimated cost of different components put to bid.
- 1.2 Intending bidders is eligible to submit the bid provided he has definite proof from the appropriate authority, which shall be to the satisfaction of the competent authority, of having satisfactorily completed similar works of magnitude specified below:-
Criteria of eligibility for submission of bid documents
- 1.2.1 Criteria of eligibility for CPWD as well as non-CPWD contractors.
 - (a) Should have satisfactorily completed the works as mentioned below during the last 7 (seven) years ending last day of the month previous to the one in which tenders are invited.
 - (i) Three similar completed works each costing not less than **Rs. 66.12 Crore**
Or
Two similar completed works each of value not less than **Rs. 99.17 Crore**
Or
One similar completed work of value not less than **Rs. 132.23 Crore**

Similar works shall mean "Construction of building works including water supply, sanitary installation, drainage, internal electric installation, lift, firefighting system and fire alarm system, having at least one building of minimum Ten (10) Storey executed under one agreement."

NOTE:

- a. For this purpose, each basement, stilt constructed with the building shall be considered as a storey.
- b. Mumty and machine room and OHT (including supporting structure above roof) will not be counted as storey for above purpose.
- c. For the purpose of similar works, works executed in India only shall be considered.
- d. Qualified similar works may be physically inspected by the CPWD Engineers to ascertain the completion, performance on quality of works for finalizing the technical bid.

The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to previous day of last date of submission of tender.

- (ii) One completed work costing not less than **Rs. 33.06 Crore** executed with the structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**”. This work can be part of eligible work at 1(a)(i) above or as a separate work. The value of executed work shall be brought to the current level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to previous day of last day of submission of tenders.

If the bidder does not have adequate experience of the structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**” then the bidder can associate with contractor having requisite experience of executing work in structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**”. Bidder has to submit MoU as per **FORM-‘K’** with such associate contractor & experience certificate as per **FORM-‘C2’ & FORM-‘D2’** with such associate contractor, along with his tender, for structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**” only. The associated contractor must satisfy the eligibility criteria of having successfully completed one work of structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**” having the cost of structural system not less than **Rs. 32.99 Crore** during the last seven years ending last day of month previous to the one in which tender is invited.

In case separate cost of structural system of “**monolithic concrete construction system technology using Aluminium Formwork**” technology is not available in the experience certificate of associated contractor; it will be taken as 30% of completed cost of project/work.

Associated contractor should not have been debarred from any Ministry or any govt. organization in the last five years.

In case, the eligible work has been executed by a Joint Venture through one or more individual firm(s), then cost of completed work shall be distributed among the individual firm(s) in proportion to their share in Joint Venture and that will be considered as work experience for individual firm(s) for pre-qualification in bidding.

- (b) Should have had average **Annual Financial Turn Over of Rs. 49.59 Crore** (30% of E.C.P.T) on construction works during the immediate last three consecutive financial years ending on **31st March 2026** (scanned copy of certificate from CA with Unique documents Identification Number (UDIN) to be uploaded). The value of annual turnover figures shall be brought to the current value by enhancing the actual turnover figures at simple rate of 7% per annum.

(c) **Should not have incurred any loss (profit after tax should be positive)** in more than two years ending **31st March 2026** during available last five consecutive balance sheets (Standalone financial statement), duly certified and audited by the Chartered Accountant. **(Scanned copy of certificate from CA with Unique documents Identification Number (UDIN) to be uploaded).**

(d) Should have a Banker's certificate for **Rs. 66.12 Crore** (40% of E.C.P.T.) from a commercial bank

or

Net worth certificate of minimum **Rs. 16.53 Crore** (10% amount of ECPT) issued by CA with Unique documents Identification Number (UDIN) **(Scanned copy of original to be uploaded).**

(e) Bidding capacity (applicable for CPWD enlisted contractor also): Should have bidding capacity equal to or more than the estimated cost of the work put to tender. The bidding capacity shall be worked out by the following formula:

$$\text{Bidding capacity} = \{[A \times N \times 1.5] - B\}$$

Where,

A=Maximum turnover in construction works executed in any one year during the last seven years taking into account the completed as well as works in progress. The value of completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum.

N = Numbers of years prescribed for completion of work for which bids have been invited.

B = Value of existing commitments of ongoing works during the period of execution of work for which bids have been invited.

Notes:

iv. The bidder shall submit Bidding capacity as per form C-3.

v. Bidding Capacity is applicable for all the contractors including CPWD enlisted contractors.

vi. Bidding capacity formula for CPWD contractors who are enlisted based on rule 6.1.7 of Enlistment Rules-2026 i.e. government retired engineer/ architect for three years from the date of issue of enlistment order, is as follows: -

$$\text{Bidding Capacity} = \{[A_1 \times N \times 1.5] - B\}$$

Where,

A₁= Banker Certificate figure as submitted by applicant (i.e. government retired engineer/ architect) at the time of enlistment for first year of enlistment and subsequent fresh bankers' certificate for second and third year respectively. Value of A for first year will be mentioned in the enlistment order by the member secretary of advisory committee for enlisting authority.

N= Number of years prescribed for completion of work for which bids have been invited.

B= Value of existing commitments of ongoing works during the period of execution of work for which bids have been invited. This value is for newly enlisted entity.

Within three years from the date of issue of enlistment order, the newly enlisted entity has to develop its own bidding capacity and thereafter the general bidding capacity formula being used for other entities shall be Applicable to its for calculation of bidding capacity.

Newly enlisted entity may like to follow general bidding capacity formula even before period of three years if it so chooses.

- iv. Bidding capacity, for CPWD contractors who are enlisted based on rules 9.6.3 & 9.6.4 of Enlistment Rules -2026 i.e. new entity based on previously enlisted entity for three years from dates of issue of enlistment order, is as follows: -

Annual turnover of newly enlisted entity shall be in proportion to the shareholding of partners/directors in the original enlisted entity at the time of enlistment of the newly enlisted entity.

Within three years from the date of issue of enlistment order, the newly enlisted entity has to develop its own bidding capacity and thereafter the general bidding capacity formula being used for other entities shall be applicable to its for calculation of bidding capacity. Newly enlisted entity may like to follow general bidding capacity formula even before period of three years, if it so chooses.

Bidding capacity for newly enlisted entity (CPWD enlisted contractors) who are enlisted based on rules 9.6.3 and 9.6.4 of enlistment rules – 2024 shall be as follows:

$$\text{Bidding Capacity} = \{[A' \times N \times 1.5] - B\}$$

Where

A' = Proportionate share of newly enlisted director/ partner in originally enlisted company / firm multiplied by the factor A, as given below. Value of A' will be mentioned in the enlistment order by member secretary of Advisory committee for Enlistment Authority, it will remain same for three years.

A = Maximum turnover in construction works executed in any one year during the last seven years taking into account the completed as well as works in progress. The value of completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum. This value is of originally enlisted entity at the time of enlistment of newly enlisted entity.

N = Number of years prescribed for completion of work for which bids has been invited.

B = Value of existing commitments of ongoing works during the period of execution of work for which bids have been invited. This value is for newly enlisted entity.

- v. Enlisted entities based on rules 6.1.7, 9.6.3 or 9.6.4 of enlistment rules- 2024 can submit MoU from agency having requisite experience for structural system technology if the enlisted entity does not have required experience.

To become eligible for issue of bid, the bidders shall have to furnish an affidavit as under :-

I/We undertake and confirm that eligible similar works(s) has/have not been got executed through another contractor on back-to-back basis. Further that, if such a violation comes to the notice of Department, then I/we shall be debarred for bidding in CPWD in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee. (Scanned copy to be uploaded at the time of submission of bid)

2. Agreement shall be drawn with the successful bidders on prescribed Form No. CPWD-EPC (or other Standard Form as mentioned) which is available as a Govt. of India Publication and also available on website www.cpwd.gov.in. Bidders shall quote his rates as per various terms and conditions of the said form which will form part of the agreement.

3. The time allowed for carrying out the work will be **30 (Thirty) months** from the date of start as defined in schedule 'F' or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the bid documents.
4. The site for the work is available.
5. The architectural and structural drawings for the work are available
6. The bid document consisting of plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents except Standard General Conditions of Contract Form can be seen on website [https:// etender.cpwd.gov.in](https://etender.cpwd.gov.in) or www.cpwd.gov.in free of cost.
7. After submission of the bid the contractor can re-submit revised bid any number of times or withdraw it before last date and time of submission of bid as notified. No post-tender modification is allowed by the tenderers except through negotiations, if required. In case, any tenderer does so, the tender will be rejected and the tenderer will be debarred for future tendering in CPWD for two years by the concerned enlisting authority (in case of CPWD enlisted contractor) and by the concerned CE/~~SE~~ (in case of non-enlisted contractor).
8. While submitting the revised bid, contractor can revise the rate of one or more item(s) any number of times (he need not re-enter rate of all the items) but before last time and date of submission of bid as notified.
9. Earnest Money in the form of Insurance Surety Bonds, Account Payee Demand Draft, Fixed Deposit Receipt, Banker's Cheque or Bank Guarantee including e- Bank Guarantee (for balance amount as prescribed) from any of the Commercial Banks (**drawn in favour of Executive Engineer, NIT Patna Project Division CPWD, Patna**) shall be scanned and uploaded on the e-Tendering website within the period of bid submission. The original EMD should be deposited either in the office of Executive Engineer inviting bids or division office of any Executive Engineer, CPWD within the period of bid submission. The EMD receiving Executive Engineer (including NIT issuing EE/AE) shall issue a receipt of deposition of earnest money deposit to the bidder in a prescribed format (enclosed) uploaded by tender inviting EE in the NIT

A part of earnest money is acceptable in the form of bank guarantee also. In such case, minimum 50% of earnest money or Rs. 20 lac, whichever is less, shall have to be deposited in shape prescribed above, and balance may be deposited in shape of Bank Guarantee of any Commercial bank having validity for a period of 90 days for single bid works and 180 days for two bid system or more from the last date of receipt of bids which is to be scanned and uploaded by the intending bidders.

The earnest money given by all the tenderers except the lowest tenderer shall be refunded immediately after the expiry of stipulated bid validity period or immediately after acceptance of the successful bidder, whichever is earlier. However, in case of two/ three bid system, earnest money deposit of bidders unsuccessful during technical bid evaluation etc. should be returned within 30 days of declaration of result of technical bid evaluation.

Copy of Enlistment Order and certificate of work experience and other documents as specified in the notice inviting e- tender shall be scanned and uploaded on the e-Tendering website within the period of bid submission. However, certified copy of all the scanned and uploaded documents as specified in e- tender notice shall have to be submitted by the lowest bidder within a week physically in the office of tender opening authority. Online bid documents submitted by intending bidders shall be opened only of those bidders, whose original EMD deposited with any division of CPWD and other documents scanned and uploaded are found in order.

The bid submitted shall be opened at 03:30 PM on 16-10-2026

10. The bid submitted shall become invalid and e-Tender processing fee shall not be refunded if:
 - I. The bidder is found ineligible.
 - II. The bidder does not upload scanned copies of all the documents stipulated in the bid document.
 - III. If any discrepancy is noticed between the documents as uploaded at the time of submission of bid and hard copies as submitted physically by the lowest bidder in the office of bid opening authority.
 - IV. If a tenderer quotes nil rates against each item in item rate tender or does not quote any percentage above/below on the total amount of the tender or any section / sub head in percentage rate tender, the tender shall be treated as invalid and will not be considered as lowest tenderer.
11. The contractor whose bid is accepted will be required to furnish performance guarantee at specified percentage of the tendered amount as mentioned in schedule E and within the period specified in Schedule F. This guarantee shall be in the form of Insurance Surety Bonds, Account Payee Demand Draft, Fixed Deposit Receipt or Bank Guarantee from any of the Commercial Banks in accordance with the prescribed form. In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'F', including the extended period if any, the Earnest Money deposited by the contractor shall be forfeited automatically without any notice to the contractor. The earnest money deposited along with bid shall be returned after receiving the aforesaid performance guarantee. The contractor whose bid is accepted will also be required to furnish either copy of applicable licenses/ registrations or proof of applying for obtaining labour licenses, registration with EPFO, ESIC and BOCW Welfare Board including Provident Fund Code No. If applicable and also ensure the compliance of aforesaid provisions by the sub - contractors, if any engaged by the contractor for the said work within the period specified in Schedule F.

11. The description of the work is as follows:

The said work comprises of for **“Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Land-scaping & Art Work etc. in EPC Mode-III.**

Intending Bidders are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their bids as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. A bidder shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. The bidder shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a bid by a bidder implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Government and local conditions and other factors having a bearing on the execution of the work.

12. The competent authority on behalf of the President of India does not bind itself to accept the lowest or any other bid and reserves to itself the authority to reject any or all the bids received without the assignment of any reason. All bids in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the bidders shall be summarily rejected.
13. Canvassing whether directly or indirectly, in connection with bidders is strictly prohibited and the bids submitted by the contractors who resort to canvassing will be liable for rejection.
14. The competent authority on behalf of President of India reserves to himself the right of accepting the whole or any part of the bid and the bidders shall be bound to perform the same at the rate quoted.
15. The contractor shall not be permitted to bid for works in the CPWD Circle (Division in case of contractors of Horticulture/Nursery category) responsible for award and execution of contracts, in which his near relative is posted a Divisional Accountant or as an officer in any capacity between the grades of Superintending Engineer and Junior Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Gazetted officer in the Central Public Works Department or in the Ministry of Housing and Urban Affairs. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this Department
16. No Engineer of Gazetted Rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to work as a contractor for a period of one year after his retirement from Government service, without the prior permission of the Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the bid or engagement in the contractor's service.
17. The bids for the work shall remain open for acceptance for a period of **75 (Seventy Five) days** from the date of opening of bids technical bid in two bid system.
Further
 - (i) If any tenderer withdraws his tender within 7 days after last date and time (24 hours basis) of submission of bids, then the Government shall without prejudice to any other right or remedy, be at liberty to forfeit 50% of the earnest money absolutely irrespective of letter of acceptance for the work is issued or not.
 - (ii) If any tenderer withdraws his tender after expiry of 7 days after last date and time (24 hours basis) of submission of bids, then the Government shall without prejudice to any other right or remedy, be at liberty to forfeit 100% of the earnest money absolutely irrespective of letter of acceptance for the work is issued or not.
 - (iii) Withdrawal of the tender, by the tenderer, shall only be made through e-tender portal. Any other method i.e. through letter / e-mail etc. shall not be considered.
 - (iv) In case of forfeiture of earnest money as prescribed in para (i) and (ii) above, the bidders shall not be allowed to participate in the rebidding process of the same work.
18. This notice inviting Bid shall form a part of the contract document. The successful bidder/contractor, on acceptance of his bid by the Accepting Authority shall within 15 days from the stipulated date of start of the work, sign the contract consisting of:-
 - (a) The Notice Inviting Bid, all the documents including additional conditions, specifications and drawings, if any, forming part of the bid as uploaded at the time of invitation of bid and the rates quoted online at the time of submission of bid and acceptance thereof together with any correspondence leading thereto.
 - (b) Standard C.P.W.D. Form 7 or other Standard C.P.W.D. Form as applicable.

19. For Composite Bids

19.1.1 The Executive Engineer in charge of the major component will call bids for the composite work. The cost of bid document and Earnest Money will be fixed with respect to the combined estimated cost put to tender for the composite bid.

19.1.2 The bid document will include following five components:

Part A:- CPWD-6, CPWD - EPC including schedule A to F for the work, Standard GCC EPC Project 2024 as amended/modified & corrected up to **previous day of the last date of submission of bid**, Scope of work.

Part B:- General / specific/ specialized conditions, particular / specialized specifications etc. of civil work & Horticulture Specification, Horticulture Conditions and applicable to major component of the work.

Part C:-Scope of work, General/specific conditions, specifications of E&M works.

Part D :-Schedule of stage payment, Abstract of cost & Schedule of quantity for EPC work.

Part E :-All Architectural working drawings including MEP drawings.

Part F :-All Structural drawings (Good for Construction), & Soil investigation report.

19.1.3 The bidders must associate himself, with agencies as per NIT conditions.

19.1.4 The eligible bidders shall quote rates for all items of major component as well as for all items of minor components of work.

19.1.5 After acceptance of the bid by competent authority, the EE Patna-2, Engineer-in-Charge of civil component of the work shall issue letter of award on behalf of the President of India. After the work is awarded, the main contractor will have to enter into one agreement with EE Patna-2, Engineer-in-Charge of civil component and has also to sign two more copy of agreement, one for Engineer-in-charge of electrical work and one for the contractor itself. EE Patna-2, Engineer-in-Charge of civil component will operate Part-A, Part-B, Part-E and relevant part of Part-D of the agreement. Engineer-in-charge of electrical components shall operate Part-C along with Part-A, Part-E and relevant part of Part-D of the agreement.

19.1.6 Entire work under the scope of composite bid including major and all minor components shall be executed under one agreement.

19.1.7 Security Deposit will be worked out separately for each component corresponding to the estimated cost of the respective component of works.

19.1.8 The main contractor has to associate agencies for specialized component(s) conforming to eligibility criteria as defined in the bid document and has to submit detail of such agency(s) to Engineer-in-Charge of relevant component(s) within prescribed time. Name of the agency(s) to be associated shall be approved by Engineer-in-Charge of relevant component(s).

19.1.9 In case the main contractor intends to change any of the above agency/agencies during the operation of the contract, he shall obtain prior approval of Engineer-in-Charge of relevant specialized component(s).

The new agency/agencies shall also have to satisfy the laid down eligibility criteria. In case Engineer-in-Charge is not satisfied with the performance of any agency, he can direct the contractor to change the agency executing such items of work and this shall be binding on the contractor.

- 19.1.10 The main contractor has to enter into MoU with agency(s) associated by him. Copy of such MoU shall be submitted to EE/ DDH in charge of each relevant component as well as to EE-in-charge of major component. In case of change of associate contractor, the main agency(s) has to enter into MoU/agreement with the new contractor associated by him.
 - 19.1.11 Running payment for the major component shall be made by EE of major discipline to the main contractor. Running payment for minor components shall be made by the Engineer-in-Charge of the discipline of minor component directly to the main contractor. The CMB shall be maintained independently by Engineer-in- Charge of major and minor components.
 - 19.1.12A. The composite work shall be treated as complete when all the components of the work are complete. The completion certificate of the composite work shall be recorded by Engineer-in-Charge of major component after record of completion certificate of all other components.
 - 19.1.12B. Final bill of whole work shall be finalized and paid by the EE of major component. Engineer(s) in charge of minor component(s) will prepare and pass the final bill for their component of work and pass on the same to the EE of major component for including in the final bill for composite contract.
20. The intending bidders are required to update their profile in CPWD e- tender portal and to upload their bids well in advance of last date of submission of tender. Any issue related to updating profile/uploading tender can be resolved through the concerned Executive Engineer/ Assistant Engineer (Phone no **0612-2950367** email ID: **cepatna2.cpwd@gmail.com**)) or ERP helpline no. 18001803286 or e-mail Id cpwd.support@techmahindra.com. The e- tendering bidders are also advised not to wait to raise any issues till the last date of submission of bid in their own interest.

**GUARANTEE BOND TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL
OF DEFECTS AFTER COMPLETION IN RESPECT OF ANTI TERMITE
WORKS**

(ALL ANTI TERMITE)

The agreement made this..... day of (Two Thousandonly) betweenS/o..... (hereinafter called the GUARANTOR of the one part) and the PRESIDENT OF INDIA (hereinafter called the Government of the other part).

WHEREAS THIS agreement is supplementary to a contract (Hereinafter called the Contract) datedand made between the GUARANTOR OF THE ONE PART AND the Government of the other part where by the contractor inter-alia under took to render the building and structures in the said contract recited completely Anti termite.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the affect that the said work will remain Anti termite, for **five years** from the date of completion of the work.

NOW THE GUARANTOR hereby guarantee that work executed by him will render the structures completely Anti termite and the minimum life of such Anti termite treatment shall be **five years** to be reckoned from the date of completion of the work.

The decision of the Engineer-in-Charge with regard to nature and cause of defect shall be final and binding on Guarantor.

During this period of guarantee, the guarantor shall make good all defects and in case of any defect being found render the building termite proof to the satisfaction of the Engineer-in-Charge calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the Guarantor's cost and risk. The decision of the Engineer-in-Charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantee or fails to execute the Anti termite and fails to control all kinds of termite or commits breach there under, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and / or cost incurred by the Government, the decision of the Engineer-in-Charge will be final and binding on both the parties.

IN WITNESS WHEREOF these presents havebeen executed by the obligator andby for and on behalf of the PRESIDENT OF INDIA on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of :

1.....

2

SIGNED FOR AND BEHALF OF THE PRESIDENT OF INDIA BY in the presence of:

1.....

2.....

Note : For Anti Termite treatment, minimum Rs. 10.00 Lakh would be withheld as Guarantee Bond to watch the performance of the work done for five years from the date of completion of the work.

**GUARANTEE BOND TO BE EXECUTED BY CONTRACTORS FOR
REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF
WATER PROOFING WORKS**

The Agreement made this day of two thousand and between son of of (hereinafter called the Guarantor of the one part) and the PRESIDENT OF INDIA (hereinafter called Government of the other part).

WHEREAS this agreement is supplementary to a contract (hereinafter called the Contract) dated and made between the GUARANTOR of the one part and the Government of the other part, whereby the Contractor, inter alia, undertook to render the buildings and structures in the said contract recited completely water and leak-proof.

AND WHEREAS GUARANTOR agreed to give a guarantee to the effect that the said structures will remain water and leak-proof for five years from the date of giving of water proofing treatment.

NOW THE GUARANTOR hereby guarantees that water proofing treatment given by him will render the structures completely leak-proof and the minimum life of such water proofing treatment shall be five years to be reckoned from the date after the maintenance period prescribed in the contract.

Provided that the guarantor will not be responsible for leakage caused by earthquake or structural defects or misuse of roof or alteration and for such purpose:

- (a) Misuse of roof shall mean any operation which will damage proofing treatment, like chopping of firewood and things of the same nature which might cause damage to the roof;
- (b) Alteration shall mean construction of an additional storey or a part of the roof or construction adjoining to existing roof whereby proofing treatment is removed in parts; (c) The decision of the Engineer-in-Charge with regard to cause of leakage shall be final.

During this period of guarantee the guarantor shall make good all defects and in case of any defect being found, render the building water-proof to the satisfaction of the Engineer-in-Charge at his cost, and shall commence the work for such rectification within seven days from the date of issue of the notice from the Engineer-in-Charge calling upon him to rectify the defects, failing which the work shall be got done by the Department by some other contractor at the GUARANTOR'S cost and risk. The decision of the Engineer- in-Charge as to the cost, payable by the Guarantor shall be final and binding.

That if GUARANTOR fails to execute the water proofing or commits breach thereunder then the GUARANTOR will indemnify the Principal and his successors against all loss, damage, cost, expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance

of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the Government, the decision of the Engineer-in-Charge will be final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the Obligorand by and for and on behalf of the PRESIDENT OF INDIA on the day, month and year first above written.

Signed, sealed and delivered by OBLIGOR in the presence of

1.
2.

Signed for and on behalf of THE PRESIDENT OF INDIA by in the presence of

1.

Note : For Water proofing treatment minimum Rs. 50.00 Lakh would be withheld as Guarantee Bond to watch the performance of the work done for Five years from the date of completion of the work.

**GUARANTEE BOND TO BE EXECUTED BY THE CONTRACTOR FOR
REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF
uPVC WINDOWS**

The agreement made this..... day of (Two Thousandonly) betweenS/o..... (hereinafter called the GUARANTOR of the one part) and the PRESIDENT OF INDIA (hereinafter called the Government of the other part).

WHEREAS THIS agreement is supplementary to a contract (Hereinafter called the Contract) dated And made between the GUARANTOR OF THE ONE PART AND the Government of the other part where by the contractor inter alia under took to render the building and structures in the said contract structurally stable to fulfill its intended purpose, free from workmanship defects, discoloration, installation and use of only specified, certified material.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the affect that the said work will remain structurally stable to fulfill its intended purpose, free from workmanship defects, discoloration, installation and finishing for **five years** from the Actual date of completion of the work.

NOW THE GUARANTOR hereby guarantee that work executed by him will remain structurally stable to fulfill its intended purpose, and guarantee for quality workmanship, material, discoloration, installation and finishing for **five years** to be reckoned from the Actual date of completion of the work.

The decision of the Engineer-in-Charge with regard to nature and cause of defect shall be final and binding on Guarantor.

During this period of guarantee, the guarantor shall make good all defects and in case of any defect being found render the building to the satisfaction of the Engineer-in-Charge calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the Guarantor's cost and risk. The decision of the Engineer-in-Charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to execute the defect works and fails to control all kinds of quality and defect or commits breach there under, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and / or cost incurred by the Government, the decision of the Engineer-in-Charge will be final and binding on both the parties.

IN WITNESS WHEREOF these presents have been executed by the obligator andby for and on behalf of the PRESIDENT OF INDIA on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of :

1.....

2

SIGNED FOR AND BEHALF OF THE PRESIDENT OF INDIA BY in the presence of:

1.....

2.....

Note : For uPVC Windows minimum Rs. 25.00 Lakh would be retained as Guarantee Bond to watch the performance of the work done shall be withheld for five years from the actual date of completion of the work.

**GUARANTEE TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL OF
DEFECTS AFTER COMPLETION IN RESPECT OF SPECIFIED ITEMS OF WORK OF
SEWAGE TREATMENT PLANT**

This agreement made this..... day of Two Thousand betweenM/s(hereinafter called the GUARANTOR on the one part) and the President of India (hereinafter called the Government on the other part)

WHEREAS THIS agreement is supplementary to a Contract No. ..dated (Hereinafter called the Contract) and made between the GUARANTOR ON THE ONE PART AND the Government on the other part whereby the contractor inter alia undertook to render the work in the said contract structurally stable, workmanship, finishing and use of sound materials.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the affect that the said work will remain structurally stable and guaranteed against faulty workmanship, finishing and materials for 15 years to be reckoned from the date after the expiry of defect liability period prescribed in the contract.

NOW THE GUARANTOR hereby guarantee that work executed by him will remain structurally stable and defect free for minimum period of 15 (Fifteen) years to be reckoned from the date after the expiry of defect liability period prescribed in the contract.

During this period of guarantee, the guarantor shall make good all defects to the satisfaction of the Engineer-in-charge calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the Guarantor s cost and risk. The decision of the Engineer-in-Charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to make good all the defects, commits breach there under, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and or cost incurred by the Government, the decision of the Engineer-in-Charge will be final and binding on both the parties.

IN WITNESS WHEREOF these presents have been executed by the obligatorand by for and on behalf of the President of India on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of:

1. 2.

Signed for and Behalf of the President of India byin the presence of:

1.2.

**CPWD-EPC
GOVERNMENT OF INDIA
CENTRAL PUBLIC WORKS DEPARTMENT
Percentage Rate EPC Tender & Contract for Works
Tender and contract for works on EPC Mode**

State: Bihar
Place: Patna
CPWD, Patna

Zone: Patna
Division:- EE Patna-2,

Tender for the work of:- **“Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Land-scaping & Art Work etc. in EPC Mode-III.**

- (i) To be uploaded by 03:00 PM on 16-10-2026 at <http://etender.cpwd.gov.in or www.cpwd.gov.in>
- (ii) To be opened in presence of tenderers who may be present at 03:30 PM on 16-10-2026 in the office of the **EE Patna-2, CPWD, Patna.**

TENDER

I/We have read and examined the notice inviting bid, Schedule-A,D,E&F, Specifications applicable, Drawings & Designs, General Rules and Directions, General Conditions of Contract for CPWD Works for EPC Projects of 2024 with amendments up to the last date of submission of bids, clauses of contract, Special conditions, Bill of Quantities & other documents and Rules referred to in the conditions of contract and all other contents in the bid document for the work.

I/We hereby bid for the planning, designing and execution of the work as per scope mentioned in the tender document specified for the President of India within the time specified in Schedule 'F' viz., schedule of quantities and in accordance in all respect with the applicable municipal bye-laws, regulations, acts, NIT guidelines, specifications, designs, drawing and instructions in writing referred to in Rule-1 of General Rules and Directions and in Clause 11 of the Conditions of contract of 2024 for EPC projects with amendments up to the last date of submission of bids and with such materials as are provided for, by, and in respect of accordance with, such conditions so far as applicable.

I/We agree to keep the bid open for **Seventy-Five (75) days** from the date of opening of technical/Eligibility bid and not to make any modification in its terms and conditions.

I/We have deposited EMD for the prescribed amount in the office of concerned Executive Engineer as per the bid document.

A copy of earnest money deposit receipt of prescribed amount deposited in the form of Insurance Surety Bonds, Account Payee Demand Draft, Fixed Deposit Receipt, Banker's Cheque or Bank Guarantee (as prescribed) issued by a Commercial Bank is scanned and uploaded. If I/We, fail to furnish the prescribed performance guarantee within prescribed period, I/We agree that the said President of India or his successors in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely.

Correction...Nil Deletion... Nil Insertion...Nil Overwriting... Nil AE (C) (P) AE(E) (P) EE(C)-I

Further, if I/We fail to commence work as specified, I/We agree that President of India or the successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said performance guarantee absolutely. The said performance guarantee shall be a guarantee to execute all the works referred to, in the bid documents upon the terms and conditions contained or referred to those in excess of that limit at the rates to be determined in accordance with the provision contained in clause 12 of General Conditions of Contract 2024 for EPC Project with amendments up to the last date of submission of bids.

Further, I/We agree that in case of forfeiture of Earnest Money or Performance Guarantee as aforesaid, I/We shall be debarred for participation in the re-bidding process of the work.

I/we undertake and confirm that eligible similar work(s) has/have not been got executed through another agency on back-to-back basis. Further that, if such a violation comes to the notice of Department, then I/we shall be debarred for bidding in CPWD as per enlistment rules applicable.

Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-charge shall be free to forfeit the entire amount of Earnest Money Deposit/ Performance Guarantee.

I/We hereby declare that I/We shall treat the bid documents drawings and other records connected with the work as secret/confidential documents and shall not communicate information/derived there from to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of the State.

Dated

Signature of Contractor

Witness:

Postal Address

Address:

Occupation:

ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for and on behalf of the President of India for a sum of Rs.*.....(Rupees.....*.....)

The letters referred to below shall form part of this contract agreement: -

(a) *

(b) *

(c) *

For & on behalf of the President of India.

Signatures.....*.....

Dated:*.....

Designation.....*.....

(--*-- Blanks to be filled by **EE Patna-2, CPWD, Patna**)

PROFORMA OF SCHEDULES (Civil & Horticulture Work)

(Operative Schedules to be supplied separately to each intending tenderer)

SCHEDULE 'A'

Schedule of quantities	As per page No. 763-847 of Part - D
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SCHEDULE 'D'Extra schedule for specific requirements/document for the work, if any: **As per tender documents.****SCHEDULE 'E'**

Reference to General Conditions of contract.		GCC for EPC Projects 2024, as modified and corrected up-to previous day of the last date of submission of the tender.
Name of work		“Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Landscaping & Art Work etc. in EPC Mode-III.
Estimated cost of work		Rs. 165,28,78,800/- (Civil : Rs. 137,87,21,501/- , Elect: Rs. 27,41,57,299/-
(i)	Earnest money	Rs. 1,75,28,788/-
(ii)	Performance Guarantee	(a) 5 % (Five Percent) of tendered value or Estimated Cost Put to Tender (ECPT) whichever is higher. (b) Where the tender amount is less than eighty percent (80%) of the Estimated Cost Put to Tender (ECPT), the Performance Guarantee, in addition to requirement under (a) above, shall be increased by an amount equal to the difference between eighty percent (80%) of the ECPT and the tendered amount.
(iii)	Security Deposit	2.5 % of accepted tendered value

SCHEDULE 'F'

GENERAL RULES & DIRECTIONS:		
Officer inviting tender: -		Executive Engineer Patna-2, CPWD, Patna or his successor thereof
Applicable mode of EPC Contract		Mode- III
Type of Building		Permanent
Construction technologies to be adopted		(1) Monolithic Concrete constructions system using Aluminium form work for Tower B&C block and Tower D&E block as per approved issued structural drawings (2) RCC framed structure for RD Bungalow, Community Centre, remaining basement, boundary wall, security room, etc. as per attached/ issued structural drawings
Maximum percentage for quantity of items of work to be executed beyond which rates are to be determined in accordance with Clauses 12.2 & 12.3:		See below (Refer Clause-12)
Definitions:		
2(v)	Engineer-in-Charge :	1. Executive Engineer Patna-2, CPWD, Patna or his successor thereof for Civil works 2. DD(H) Patna or his successor thereof for Horticulture works
2(viii)	Accepting Authority:	The Chief Engineer (Patna) or his successor thereof after getting approval of RWB/Any other authority as notified by the CPWD Directorate
2(x)	Percentage on cost of materials and labour to cover all overheads and profits :	15%
2(xi)	Standard Schedule of Rates	(A). Civil 1. Plinth Area Rate 2025 with amendments issued up to previous day of last date of submission of bid. 2. Delhi Schedule of Rates 2023 Volume-I & II (Civil works) with amendments issued up to previous day of last date of submission of bid. 3. MR for Non-Schedule items (B.) Horticulture. 1. Horticulture Schedule of Rate 2025 with amendments issued up to previous day of last date of submission of bid.
2(xii)	Department	Central Public Works Department
9(ii)	Standard CPWD contract Form GCC for EPC-2024	GCC EPC projects-2024, CPWD EPC form as modified & corrected up-to previous day of the last date of submission of the tender.

Clause 1

(i)	Time allowed for submission of Performance Guarantee, Programme Chart (Time and Progress) and applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board or Proof of applying thereof from the date of issue of letter of acceptance :	7 days
(ii)	Maximum allowable extension with late fee @ 0.1% per day of Performance Guarantee amount beyond the period provided in (i) above :	3 days

Clause 2

Authority for fixing compensation under clause 2 :	Chief Engineer (Patna), CPWD, Patna or any other authority as notified by the CPWD Directorate from time to time or his successor thereof
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Clause 5

(i)	Authority to convey the decision of shifting of milestone and extension of time. (Engineer-in-Charge or Engineer-in-Charge of Major Component in case of Composite Contracts, as the case may be)	:	Executive Engineer Patna-2, CPWD, Patna or his successor thereof
(ii)	Authority to decide rescheduling of milestone and extension of time. (SE/SE&PD/ CE/ CE&ED).	:	Chief Engineer (Patna), CPWD, Patna or any other authority as notified by the CPWD Directorate from time to time or his successor thereof
(iii)	Shifting of date of start in case of delay in handing over of site. (SE/SE&PD/CE/ CE&ED)	:	Chief Engineer (Patna), CPWD, Patna or any other authority as notified by the CPWD Directorate from time to time or his successor thereof

Time allowed for execution of work	30 (Thirty) months
Number of days from the date of issue of letter of acceptance for reckoning date of start	10 days

Mile stone(s) as per table given below

5.1 Table of Milestone(s)

Sl. No.	Description of Milestone	Time allowed in days (From Stipulated date of start	Amount to be withheld in case of Non achievement of milestone
1.1	<u>Civil: -</u> a) Complete Demolition of existing buildings in the scope of work and disposal of malba/C&D waste etc. to clear the site as required. b) Completion of Labour Hutments, Field Laboratory & Mobilisation of Manpower. c) Submission of Design mix / RMC proposal for approval. d) Commissioning of Batching plant for concrete production. e) Temporary Barricading of the site. f) Association of Specialized agencies. g) Casting of test piles and conducting initial pile load test and lateral load test as per IS 2911 h) Completion of design, IIT/NIT vetting, approval by Engineer-in-Charge and RCC work of Diaphragm Wall. i) Submission of all Good for Construction Drawings using BIM Model of Architectural, Structural, Horticulture, MEP & finishing works, for obtaining NOC from Engineer in Charge (Including Revisions if Any). Finalization of shell plans for shuttering. j) Uploading all Drawings & BIM Models in ERP Collaboration Tool. k) Completion of piling work of 20% of total piles.	5 months	0.40% of tendered cost
	<u>Electrical: -</u> a) Submission of proposal specialized agency for approval and association. b) Submission of TDS of E&M equipment & materials for approval.		
1.2	<u>Civil: -</u> a) Completion of 100% piling work. b) Completion of Pile Cap / Pile raft work i/c waterproofing below raft	8 months	0.40% of tendered cost
	<u>Electrical: -</u> c) Supply of conduits for basement wall & roof.		

1.3	<u>Civil: -</u> a) Completion of RCC basement walls b) Completion of 100% podium slab	11 months	0.40% of tendered cost
	<u>Electrical: -</u> c) Completion of conduiting works in basement and podium slab. d) Supply of pipes for fire fighting		
1.4	<u>Civil: -</u> a) Completion of RCC work upto 3 rd Floor slab of Tower B&C block b) Completion of RCC work upto 3 rd Floor slab of Tower D&E block c) Completion of RCC work upto terrace Floor slab of RD Bungalow d) Completion of RCC work upto 2 nd Floor slab of Community Center. e) Waterproofing work of basement walls from outside and backfilling	14 months	0.70% of tendered cost
	<u>Electrical: -</u> f) Completion of piping work of fire fighting in basement. g) Completion of 50% of ventilation work in basement.		
1.5	<u>Civil: -</u> a) Completion of RCC work upto 7 th Floor slab of Tower B&C block. b) Completion of all partition work upto 4 th Floor in Tower B&C block. c) Completion of RCC work upto 7 th Floor slab of Tower D&E block. d) Completion of all partition work upto 4 th Floor in Tower D&E block. e) Completion of one sample quarter each of Grade B&C and Grade D&E in all respect. f) Completion of Brick work, plaster work and internal plumbing of RD Bungalow. g) Completion of all RCC structure work i/c Mumty and Machine room in Community Center. h) Completion of all partition work upto 1 st Floor in Community Center. i) Completion of RCC structure of boundary wall, security room and main gate.	17 months	0.70% of tendered cost
	<u>Electrical: -</u> j) Completion of piping of firefighting work up to 4 th floor in Tower B&C and Tower D&E. k) Completion of one sample quarter each of Grade B&C and Grade D&E in all respect.		

1.6	<u>Civil: -</u> a) Completion of RCC work upto 11th Floor slab of Tower B&C block. b) Completion of all partition work upto 8th Floor in Tower B&C block. c) Completion of RCC work upto terrace Floor slab of Tower D&E block. d) Completion of all partition work upto 8th Floor in Tower D&E block. e) Completion of all internal finishing work except painting in quarters upto 5th Floor in Tower B&C block and Tower D&E block. f) Completion of all internal & external finishing work except painting in RD Bungalow. g) Completion of partition work, internal & external plaster work, plumbing work and tile/ granite flooring in Community Center. h) Completion of Brick work and plaster work of boundary wall, security room and main gate.	20 months	0.70% of tendered cost
	<u>Electrical: -</u> i) Completion of piping of firefighting work up to 8th floor in Tower B&C and Tower D&E. j) Completion of all EI, Fire fighting work, Fire Alarm and Intercom system in quarters upto 5th Floor in Tower B&C block and Tower D&E block. k) Completion of all EI, Fire fighting work, Fire Alarm and Intercom system in RD Bungalow. l) Completion of piping of fire fighting and Fire Alarm work in community Center. m) Supply of lifts of community center.		

1.7	<u>Civil: -</u> a) Completion of RCC work upto terrace Floor slab of Tower B&C block. b) Completion of all partition work upto 12th Floor in Tower B&C block. c) Completion of all partition work in Tower D&E block. d) Completion of internal & external plaster work in Tower D&E block. e) Completion of all internal finishing work except painting in quarters upto 9th Floor in Tower B&C block and Tower D&E block. f) Completion of all external finishing work including all kind of cladding and installation of door & window in Community Center. g) Completion of toilet blocks in all respect i/c installing of sanitary fittings in Community Center h) Completion of 50 % of all roadwork, drainage and water supply.	23 months	0.60% of tendered cost
	<u>Electrical: -</u> i) Completion of piping of fire fighting work up to 10th floor in Tower B&C and Tower D&E. j) Completion of all EI, Fire fighting work, Fire Alarm and Intercom system in quarters upto 9th Floor in Tower B&C block and Tower D&E block. k) Completion of all EI, Fire fighting work, Fire Alarm and Intercom system in RD Bungalow. i) Completion of installation of VRV/ VRF system in community Center. j) Completion of installation of lifts in community center. k) Supply of balance lifts i/c capsule lifts. l) Supply of all Sub-Station Equipment i/c LT/ HT panel, transformer, DG Set, etc. m) Supply of equipment of UPS, façade lighting and Solar PV system.		

1.8	<u>Civil: -</u> a) Completion of all partition work in Tower B&C block. b) Completion of internal & external plaster work in Tower B&C block. c) Completion of all internal finishing work except painting in all quarters and common areas Tower D&E block. d) Completion of all internal finishing work except painting in quarters upto 13th Floor in Tower B&C block. e) Completion of all partition work and plaster work in Tower D&E block. f) Completion of all internal finishing work except painting in quarters upto 9th Floor in Tower B&C block and Tower D&E block. g) Completion of all external finishing work including all kind of cladding and installation of door & window in Community Center. h) Completion of toilet blocks in all respect i/c installing of sanitary fittings in Community Center. i) Completion of all roadwork, drainage and water supply. j) Supply of Plants, Filing of soil complete as required	26 months	0.50% of tendered cost
	<u>Electrical: -</u> k) Completion of installation of all EI, Fire Fighting, Fire Alarm, CCTV, EPABX/ Intercom, UPS system, Solar PV system in the scope of the work. l) Completion of installation of lifts in Tower B&C block and Tower D&E block. m) Completion of installation of capsule lifts.		
1.9	<u>Civil: -</u> a) Completion of all internal & external finishing work in all quarters, RD Bungalow, Community Center, Boundary wall, Main gate, security room and other common areas in all respect. b) Completion of all Completion of all construction works for all buildings, including thorough deep cleaning and removal of all protective films. c) Completion of all civil and development works including testing and commissioning. d) Obtaining local body clearances, completion certificates, occupation certificates etc. required to declare buildings and campus authorized for occupation including attending all Quality Assurance inspection Paras and handing over of the project.	28 months	0.50% of tendered cost

	Or 100% of Total civil component in Physical Terms e) Completion of horticulture work.		
	<u>Electrical: -</u> f) Completion of all installation & testing of all EI, Fire Fighting, Fire Alarm, CCTV, EPABX/ Intercom, UPS system, Solar PV system, Lifts, Sub-station equipment, etc under the scope of the agreement.		
1.10	<u>Civil: -</u> a) Completion of all construction works for all buildings, including thorough deep cleaning and removal of all protective films. b) Completion of all civil and development works including testing and commissioning. c) Submission of complete set of As-Built drawings. d) Obtaining local body clearances, completion certificates, occupation certificates etc. required to declare buildings and campus authorized for occupation including completion all Quality Assurance inspection Paras and handing over of the project.	30 months	0.10% of tendered cost
	<u>Electrical: -</u> e) Commissioning of all E&M works under the scope of the work and making the services functional as per the intended use. f) Submission of complete set of As-Built drawings. g) Obtaining local body clearances, completion certificates, occupation certificates etc. required to declare buildings and campus authorized for occupation including completion all Quality Assurance inspection Paras and handing over of the project.		
		Total	5% of tendered cost

Note: -

1. Withheld amount shall be released if and when subsequent milestone is achieved within respective time specified. However, in case milestones are not achieved by the Bidder for the work, the amount shown against milestone shall be withheld.
2. Intending bidder may submit phasing of activities/milestones based on their resources and methodology at the time of bidding corresponding to physical milestones/stages indicated in the above table. These shall form part of the agreement after approval of the accepting authority, otherwise it would be assumed that agency agrees with the above-mentioned physical milestones.
3. Monthly recovery for delay in submission of the monthly progress report within specified period in terms of delay days @ Rs 10000/- per day.

Clause 5

(A) Schedule of handing over of site

Part	Portion of site	description	Time period for handing over reckoned from date of issue of letter of intent.
Part A	Portion without any hindrance	Full site is available with the Client	Immediately after submission of P.G.
Part B	Portions with encumbrances	NIL	-
Part C	Portions dependent on work of other agencies	NIL	-

(B) Schedule for issue of design / drawing applicable

Part	Portion of Design	description	Time Period for issue of design reckoned from date of receipt of tenders
Part A	Portion already included in NIT	Applicable except diaphragm wall & sheet pile.	Immediately after submission of P.G.
Part B-1	Portions of Architectural Designs to be issued		-
Part B-2	Portions of Civil Designs to be issued		-
Part B-3	Portions of E&M Design to be issued		-

Clause 7

Gross work to be done together with net payment/adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment	Rs. 400 Lakh for Civil component. Rs. 10 Lakh for Horticulture component
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Clause 7A

Whether Clause 7A shall be applicable -	Yes, No Running Account shall be paid for the work till the applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board whatever applicable are submitted by the contractor to the Engineer-in-Charge.
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Clause 8

i) Detail of building/infrastructure project to be completed early for use: -	Full scope as per NIT conditions
ii) Competent Authorities to inspect and issue part/final completion certificate	The Chief Engineer (Patna) or his successor thereof /Any other authority as notified by the CPWD Directorate.

Clause 8A

Authority to decide compensation on account if contractor fails to submit completion plans, as built drawings.	Engineer-in-charge. (0.1% of Tendered amount or Rs. 25 Lakh whichever is more)
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Clause 10B

Whether Clause 10 B (ii) shall be applicable (Mob. Adv.)	Applicable
Whether Clause 10 B (iii) shall be applicable (T & P)	Applicable

Clause 10 CC – APPLICABLE**A For Construction Period:**

SI. No.	Relevant component of Material / Labour for price escalation	Percentage of total value of work
1.	Component of Cement	25%
2.	Component of Labour	20%
3.	Civil component for other civil Construction Materials including POL (diesel) and Bitumen	20%
4.	Electrical and Mechanical (E&M) Component of Construction Materials	13%
6.	Reinforcement steel bars / TMT bars / Structural Steels (including strands and cables)	22%
	TOTAL	100%

Clause 11

(i) Specifications to be followed for execution of work	(i) PAR 2025 Specifications (ii) Specifications 2019 volume -I & II with correction slips up-to last date of submission of bid. (iii) Horticulture & Landscaping 2020 with correction slips up-to last date of submission of bid. (iii) Other. a) ECBC 2017 (compliant). b) Rain Water Harvesting & Conservation Manual-2019. c) Harmonized Guidelines & Standards for Universal Accessibility in India-2021. d) Skilling of Construction workers and Safety Management in Projects-2019. e) Local Bye laws-Bihar Government. f) Indian Standards by BIS/National Building Construction Standards-2026. g) Additional/Particular Specifications as prescribed in this document. h) Manufactures specification for non-schedule items. (All above specifications shall be applicable with corrections slips up to the last date of submission of bid).
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(ii) Building information model (BIM) is applicable and BIM professional to be deployed by contractor	Yes
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Clause 12

Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for all type of works	
(i) SH – A (Building works (Civil & Electrical) of part - D	30%
(ii) SH – B, SH – C and SH – D of part -D	100%

Clause 16

Competent Authority for deciding reduced rates	(i) The Chief Engineer (Patna) or successor thereof up to 5% of total tendered amount. (ii) ADG (Patna) beyond 5% of tendered amount.
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Clause 19 C	-	Executive Engineer Patna-2, CPWD, Patna – Penalty Rs. 2000/- for each default.
Clause 19 D	-	Executive Engineer Patna-2, CPWD, Patna – Penalty Rs. 2000/- for each default.
Clause 19 G	-	Executive Engineer Patna-2, CPWD, Patna – Penalty Rs. 2000/- per day for each default.
Clause 19 K	-	Executive Engineer Patna-2, CPWD, Patna – Penalty Rs. 1000/- per tradesman per day.

Clause 25

Settlement of Dispute by Conciliation and Arbitration

SI. No.		
(i)	Conciliator	ADG (Patna), CPWD, Patna or his successor thereof
(ii)	Arbitrator Appointing Authority	The Chief Engineer (Patna) or his Successor thereof
(iii)	Place of Arbitration	Patna

Clause 32							
Requirement of technical representative(s) and recovery rate							
S. No	Minimum Qualification of Technical Representative	Designation of Technical Staff	Minimum experience (Years)	Number (Civil + E&M)	Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of clause36(i)		Period of Deployment
					Figures	Words	
1	Graduate Engineer (Civil Engineering)	Project Manager	20 (and having experience of one similar nature of work)	1 No.	Rs. 60,000/- per month	Rs. sixty thousand per month.	Full duration from start of work to final bill payment
2	Graduate Engineer (Civil / Electrical Engineering)	Deputy Project Manager (Civil and Electrical)	12 (and having experience of one similar nature of work)	2+1 Nos.	Rs. 40,000/- per month per person	Rs. forty thousand per month per person	From start of work to completion of respective component of Work
3	Graduate Engineer or Diploma Engineer (Civil / Electrical / Mechanical Engineering)	Project/Site Engineer	5 or 10 respectively	4+2 Nos.	Rs. 25,000/- per month per person	Rs. twenty five thousand per month per person	- do-
4	Graduate Engineer(Civil / Electrical Engineering)	Quality Engineer (Civil & Electrical)	8	1+1 Nos.	Rs. 25,000/- per month per person	Rs. twenty five thousand per month per person	- do-
5	Diploma Engineer (Civil Engineering)	Surveyor	8	1 No.	Rs. 15,000/- per month per person	Rs. fifteen thousand per month per person	- do-

6	Graduate Engineer(Civil/ Electrical Engineering))	Project Planning/Billing Engineer	6	1+1 Nos.	Rs. 20,000/- per month per person	Rs. twenty thousand per month per person	Full duration from start of work to final bill payment
7	Graduate Engineer or Diploma Engineer (Civil / Electrical / Mechanical Engineering	BIM professional	5	1 No.	Rs. 2,00,000/- per month per person.	Rs. Two lac per month per person	From start of work to completion of respective component of Work

Note:

1. Assistant Engineers retired from Government services, who are holding Diploma will be treated at par with Graduate Engineers. Diploma holder with minimum 10-years relevant experience with a reputed construction company can be treated at par with Graduate Engineers for such deployment subject to the condition that such diploma holders should not exceed 50% of requirement of degree engineers.
2. The above given strength shall be required to be deployed as and when necessity arises at site or so directed by Engineer-in-charge.
3. The Tenderer shall submit a certificate of employment of the technical representative (s) (in the form of copy of Form -16 or CPF deduction issued to the Engineers employed by him) along with every account bill/final bill and shall produce evidence of regular physical availability of such engineers on the above project at any times if so required by the Engineer-in-charge.
4. The Recovery on account of non-deployment of technical staff shall be made by the Engineer in Charge of the respective Discipline / Component.

Clause 38

(i)	(a)	Schedule/statement for determining theoretical quantity of cement & bitumen on the basis of Delhi Schedule of Rates 2023 printed by CPWD.	
(ii)		Variations permissible on theoretical quantities:	
	(a)	Cement, For works with estimated cost put to tender more than Rs. 25 lakh.	3% plus/minus
	(b)	Bitumen All Works	2.5% plus & only & nil on minus side.
	(c)	Steel Reinforcement and structural steel sections for each diameter, section and category	2% plus/minus
	(d)	All other materials	Nil

Provision of Independent External Monitors

(i)	Integrity Pact would be applicable for the work having estimated cost put to tender Rs.300 crore and above.	Not Applicable
(ii)	Particulars of IEMs appointed by CVC are given below :-	Not Applicable

Appendix –I

List of minimum testing equipment to be provided by the contractor at site lab will be as below and as per direction of Engineer-in-Charge.

1	STANDARD SIEVES (INDIAN STANDARD)	
a)	Set of sieves 450 mm internal dia (GI sheet frames) of sizes (100 mm, 80mm, 63mm, 50mm, 40 mm, 25 mm, 20 mm, 12.5 mm, 10.0 mm, 6.3 mm, 1.75 mm complete with lid and pan)	2 sets
b)	Set of fine sieves 200 mm internal dia (brass frame)consisting of (2.36 mm, 1.18mm, 600mic, 425microns, 300mic, 212microns, 150mic, 90microns, 75 mic with lid and pan)	2 sets
c)	Motorized sieve shaker for the above sieves	1 nos.
2	Compression Testing Machine with Electricity cum manually operated of required Capacity	2nos.
3	Slump test apparatus complete	4 nos.
4	Concrete cube moulds 15x15x15cm (ISI Marked)	60 nos.
5	Pruning Rods 2 kg weight length 40 cm and ramming face 25 mm ²	4 nos.
6	Mortar Cube Moulds 7.07x7.07x7.07 cm	10 nos.
7	Mortar Cube vibrator	2 no.
8	Vicate needle apparatus	2 nos.
9	Blaine's Apparatus	2 no.
10	Weighing platform capacity 100 kg (Digital)	2 no.
11	Weighing scale capacity 10 kg, 5 kg (Digital, least count 1 gram)	2 no.
12	Hot air oven (temp range 500C to 3000C, sensitivity 1 degree)	2 no.
13	Enamel Trays	2 nos.
14	300 x 250 x 40 mm	2 nos.
a)	Circular plates of 250 mm dia	2 nos.
b)	Hammer 1lb and 2 lb	2 nos. each
15	Wooden Hammer	2 nos.
16	Measuring steel tape 3,5,15 and 30metre	3 nos. each
17	Depth gauge 20cm	1 no.
18	Steel Foot Plate	4 nos.
19	Vernier Caliper (Digital)	2 nos.
20	Screw gauge	2 nos.
21	Digital PH meter least count 0.01	2 nos.
22	Digital Micrometer least count. 0.01mm	2 nos.
23	Digital paint thickness meter for steel 500 microns	2 nos.
24	Distance Measuring Laser Apparatus	2 nos.
25	Measuring cylinder TPX or Poly propylene capacity 100 ml, 250 ml, 500 ml,1000 ml	2 nos. each
26	Pyrex, corning or Borosil beakers with cover capacity 500 ml, 200 ml, 50 ml	2 nos. each
27	Thermometers 1-150 degree centigrade	2 nos.
28	Moisture Meter	2 no.
29	Dial Gauge, 25mm travel – 0.01 mm/division	2 nos.
30	LT Megger, HT Megger and Earth Tester	2 nos. each
31	Any other equipment for site tests as outlined in BIS codes and as directed by the Engineer-in-Charge.	As per Actual requirement
32.	Ultrasonic Pulse Velocity Test equipment as & when required	1 no.
33.	Rebound Hammer	2 nos.
34.	Water testing kit	2 nos.

Note :- All dial guage reading equipment shall be calibrated with NABL accredited lab or weight & measure department, Patna, Bihar.

Appendix –II**List of Minimum machinery, tools & plants to be deployed by the contractor at site**

Sl. No.	Equipment	Numbers (Tentative)
1	Automatic batching Concrete Batch Plant fully Computerized (Capacity Min. – 50-60 cum/hrs)	1
2	Concrete Pumps and with sufficient length of pipe	2 nos. & 100 m
3	Fixed / Mobile Tower crane	2
4	Excavator cum loaders (JCB 3D model or equivalent).	4
5	Poclann for rock cutting	1
6	Cube testing machine of required capacity.	2
7	DG set of minimum capacity 125 KVA	1
8	Needle Vibrators	10
9.	Plate Vibrators	5
10.	Dumpers	4
11.	Reinforcement bending machines	2
12.	Reinforcement / Steel cutting machines	2
13.	Power driven earth rammers (Soil compactors).	2
14.	Real Time Kinematic (RTK) / Total station with distance meter	2
15.	Theodolite with tripod	2
16.	Tractor with trolley (As per requirement)	4
17.	Water tankers (minimum capacity 5000 litre)	2
18.	Welding machines 400 Ampere	2
19.	Screener for Coarse Sand and Fine Sand	4
20.	Centrifugal Mono Block Water Pump suitable for minimum 60 m head	4
21.	Transit Mixer	3
22.	Concrete Mixer	4
23.	Screed leveler	2
24.	Good quality Camera for taking photographs and video recording of major activities for record purpose and for quality assurance.	2
25.	Steel shuttering materials with necessary props	
	a) Steel shuttering	22000 Sqm.
	b) Aluminium shuttering	10000 Sqm
	c) Props	7000 Nos.
26.	Double steel scaffolding and staging materials (As & when required)	10,000 sqm
27.	Vibratory roller (As & when required)	1
28.	Drilling machine	3
29.	Floor grinding/polishing machines	6
30.	Granite cutting machine	4
31.	Ceramic tile cutting machine	5
32.	Granite polishing machine	4
33.	Granite hand polishing machine	4
34.	Concrete core cutting machine with required dia. drill bits.	2
35.	Rock breaker/excavator	As per Actual requirement
36.	Any other machinery required for completion of the work as per decision of Engineer-in-Charge.	As per Actual requirement

Note:

1. The above list is only indicative and not exhaustive. Any other machinery/ equipment desired for required progress shall be arranged by the agency as per direction of Engineer-in-Charge.
2. All dial gauge reading equipment shall be calibrated with NABL accredited lab or weight & measure department, Patna, Bihar.

Section - I
BRIEF PARTICULARS OF THE WORK

- 1.0 The proposed work is in the campus of RBI Officer's residential colony at Lohianagar, Knakarbagh, Patna. It comprises of **“Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Land-scaping & Art Work etc. in EPC Mode-III.**
- 2.0 The present bid comprises Dismantling & Demolition of existing RBI's Residential Quarters at Plot No. GC-4, Lohianagar, Kankarbagh, Distt-Patna, Bihar. The details of the existing structure are as below:

Sr. No.	Location of Buildings	No. of Buildings	No. of Storey	No. of Quarters
1	Old buildings to be dismantled & demolished.	02	Grade A (Ground+3) floor	40
2		01	Grade B & C (Ground+3) floor	40
3		01	Boundary wall	-
4		01	Underground sump	01
5		01	Panel room and pump house	01
6		01	Other misc. structures such as security cabin, Covered Parking sheds - 03 Nos., place of worship	-

The project site is fairly level ground located at Plot No. GC-4, Lohianagar, Kankarbagh, Distt-Patna, Bihar, approx. 4 km from Patna Railway Station. The land/space for labour huts/cement godown, batching plant, etc. shall be not be made available by CPWD/ RBI Patna authorities to the contractor in the proposed site due to non-availability of space inside the campus. The agency shall make own arrangement for land/space outside the campus nearby the site (ensuring that the area is safe and accessible for all workers) with consultation of Engineer-in-charge. Nothing shall be paid extra on this account.

3.0 The details of buildings along with plinth area details, to be constructed after demolition of existing structures and clearing the site, are described in Table-‘A’ at Page 55-57 This tender has been invited in EPC Mode-III, and CPWD shall issue all the Good For Construction (GFC) Architectural drawings, Structural drawings and services drawings/ MEP services drawings. However, agency shall submit shop drawings of various items as required during the execution of work, and shall submit completion plan along with As-built drawings after completion of work. The execution shall be done based on the approved working architectural & structural drawings, CPWD Specifications, relevant IS codes, National Building Construction Standards 2026, CPWD Green Rating Manual 2021, ECBC 2017, IGBC Green New Buildings Platinum Rating norms and other standard specifications shall be followed in general except otherwise mentioned in bid document. Samples of the materials of approved make or otherwise shall be got approved from the Chief Engineer Patna before use in the work. Buildings have been planned and designed to obtain IGBC Platinum rating, and shall be executed accordingly. The work is to be executed on **ENGINEERING, PROCUREMENT AND CONSTRUCTION (EPC) BASIS MODE-III.**

BRIEF SCOPE OF WORK

The scope of work includes –

(i) Statutory Approvals:

The status of statutory approvals is as below:

- (i) The pre-construction approval before start of work from Patna Metro Rail Corporation, CGWB, Environment Clearance, Pollution Control Board, Tree Felling/ Transplantation permission from forest Department has been obtained & Provisional Fire NOC in progress. The EPC Contractor shall comply with all conditions, stipulations, guidelines, and requirements contained in such approvals/clearances/NOCs during execution of the work.
- (ii) The EPC contractor shall mark all buildings boundaries, centerline of road, any other services line on ground within 10 days from date of start of work.
- (iii) Felling and/or transplantation of trees, as permitted by the Forest Department, shall be carried out by the EPC Contractor at his own cost and shall be deemed included in the contract. The scope shall include transplantation, cutting, conversion into logs, stacking, loading, transportation, and delivery of logs or other materials to the locations specified in the permission issued by the Forest Department. No additional payment shall be admissible on this account.
- (iv) Wherever applicable, the EPC Contractor shall, in coordination with the Consultant, prepare and submit monthly Environmental Impact Assessment (EIA) compliance monitoring reports and other environmental compliance reports at the prescribed stages of execution, in accordance with the applicable guidelines and statutory requirements.
- (v) After completion of work, all necessary required post-construction approval such as occupancy certificate from local body, NOC from fire department, NOC for sub-station and NOC from lift inspector (if any) shall be taken by the consultant. The EPC Contractor shall extend full cooperation and furnish all necessary documents, drawings, test reports, certifications, and compliance details required by the concerned authorities. The necessary fee for obtaining completion certificate from local bodies shall be paid by department (CPWD) directly on receipt of demand note from respective local bodies or reimbursed to contractor if paid by him based on the demand note raised by the local bodies & payment details submitted.
- (vi) The Consultant shall be responsible for securing GRIHA 5star Rating for the Project. The EPC Contractor shall execute the work in accordance with the applicable IGBC requirements and provide all necessary support, documentation, materials, systems, and compliance measures required for achieving the targeted IGBC Platinum Rating.
- (vii) **Blasting of rocks if required, can be taken only after getting the approvals in writing from competent explosive department/ District authority/ Patna Metro Rail Corporation by EPC contractor. If, permission of blasting is not granted by the concerned department then excavation of all kind of rocks can be done by mechanical / manually or by any other means. Nothing shall be paid extra for excavation / cutting / breaking of rocks (hard/soft).**
- (viii) Contractor shall take all necessary measures required to be taken to remove any live or dead service lines running through the plot area without any extra cost. All serviceable materials received from dismantling of existing RCC structure like Residential quarters, Boundary wall, security room, UG sump, pump room i/c drain, manholes & pipes etc. and any other serviceable material shall be the property of contractor and unserviceable materials shall be disposed as per direction of

Engineer-in-Charge outside the campus i.e. at Patna Municipal Corporation Dumping Yard.

(ii) Topographic Survey:

Contractors are advised to conduct a topographical survey of the entire residential plot area. The topographical survey conducted by EPC contractor by taking the maximum grid distance of 3 mtr. x 3 mtr. or small as per requirement.

(iii) Pile Load Test as per IS 2911: (Initial Pile Vertical Load Test, Lateral Load Test, Integrity Test & Routine Tests – Minimum No. of Tests required as per IS Code are included in the quoted amount by the contractor)

The EPC Contractor shall carry out the Initial Pile Load Tests immediately after award of the work in accordance with the Initial Pile Structural Drawings issued by the Department. Prior approval of the piling agency engaged for execution of the initial test piles and the pile testing agency shall be obtained by the Contractor well in advance of commencement of the testing programme.

The Contractor shall conduct the Initial Pile Load Tests in accordance with the approved drawings, specifications, relevant codes, and directions of the Engineer-in-Charge. Upon completion of the tests, the Contractor shall submit the complete test reports, duly authenticated by the testing agency, to the Consultant through the Engineer-in-Charge for review and further action.

Based on the results of the Initial Pile Load Tests, the Department/Consultant may revise the pile design, pile capacity, pile layout, foundation drawings, or any other related structural details. Such revised drawings, if required, shall ordinarily be issued within 15 (fifteen) days from the date of receipt of complete test reports for all initial piles. No hindrance on account of this shall be entertained.

In case additional or modified Initial Pile Load Tests are considered necessary based on the test results, revised drawings/details may be issued by the Department, and the Contractor shall carry out such tests accordingly and submit the requisite reports for incorporation of the final pile and foundation design.

The rates quoted by the Contractor shall be deemed to include all costs associated with execution of Initial Pile Load Tests, Lateral load test, Integrity test & Routine Test including construction of test piles, testing arrangements, preparation of reports, and all incidental works. No extra payment whatsoever shall be admissible on this account.

(iv) DESIGN AND CONSTRUCTION OF DIAPHRAGM WALLS

The Contractor shall be responsible for the complete design and construction of the Diaphragm Wall through an approved specialized agency. The design shall be based on the approved geotechnical investigation, actual site and groundwater conditions, adjoining structures/services, depth and sequence of basement excavation, applicable Metro NOC conditions and the latest applicable IS Codes/NBC provisions.

Before commencement of work, the Contractor shall submit complete design calculations and drawings, including wall depth/thickness, reinforcement, embedment, panel/joint details, temporary/permanent support or strutting/anchoring arrangement, construction methodology, dewatering and instrumentation/monitoring scheme. The complete design shall be independently vetted by IIT/NIT or any other Government

Engineering Institution approved by the Engineer-in-Charge, at the Contractor's own cost, and execution shall commence only after approval of the Engineer-in-Charge.

The Contractor shall remain fully responsible for the adequacy, stability, safety and performance of the design and execution notwithstanding such vetting or approval. All necessary temporary works, excavation support, dewatering, monitoring, protection and safety measures shall be provided to safeguard adjoining structures, roads, utilities, services, Metro infrastructure and properties, and any damage arising from the work shall be made good by the Contractor at his own cost.

The Diaphragm Wall shall be structurally integrated with the raft/basement structure and other structural components as per the approved and vetted design. It shall be constructed in design mix concrete of minimum Grade M30, unless a higher grade is required by the approved design, with specified integral crystalline waterproofing admixture and hydrophilic crystalline slurry/coating treatment to RCC surfaces.

Note: - A Metro Tunnel of the Patna Metro Rail Project passes along the front side of the site boundary (along Rajendra Nagar Flyover). The proposed construction under this contract falls within a distance of 20 metres from the approved Metro corridor. Accordingly, a No Objection Certificate (NOC) has been obtained from Patna Metro Rail Corporation Limited (PMRCL), and the architectural and structural drawings enclosed with the tender have been prepared in accordance with the requirements of PMRCL/DMRC. The tender drawings shall be treated as reference/design-intent drawings for the Diaphragm Wall/Sheet Piling system; the Contractor shall develop the final design in compliance with the NOC and obtain the required vetting and approvals before execution.

The Contractor shall strictly comply with all the terms and conditions stipulated in the NOC issued by PMRCL, including any amendments or additional conditions that may be imposed during execution of the work. The Contractor shall also comply with all directions issued by PMRCL, DMRC, the Engineer-in-Charge, and any other statutory authority from time to time. No claim whatsoever on account of compliance with these conditions shall be entertained.

The NOC from PMRCL (copy enclosed) has issued NOC for this work with following conditions: -

- a) Excavation shall be restricted to the founding depth as per Drawing.
- b) The work shall be carried out in close coordination of PMRCL and DMRC Engineer.
- c) The levels and condition of existing PMRCL structure shall be closely monitored throughout the construction period.
- d) All necessary precautions shall be taken up to minimize the vibrations due to the excavation at site by contractor as per the [Draft Provisional Code of Practice](#).
- e) Regular Inspection of DMRC, PMRCL and RBI Officials shall be carried out on Weekly Basis for monitoring of Metro Tunnel.
- f) **No excavation/construction activity shall be allowed in the 1st Reserve Line.**
- g) Any cracks, Sway, sag notices in the existing PMRCL structure may be brought to the notice of PMRCL and DMRC. The work shall be stopped until further instruction and approval of PMRCL and DMRC.

- h) The floor plans of the proposed building shall not be modified without prior information of PMRCL and DMRC.
- i) Proper instrumentation and monitoring to be ensured at the time of excavation and to be verified by PMRCL and DMRC engineer.
- j) As intimated during the meeting with RBI officials and their consultant, their plan for construction work will be scheduled after Completion of PMRCL tunneling activities. The same needs to be strictly adhered to.
- k) Any change in the scheme or layout of Construction between 1st Reserve Zone to 2nd Reserve Zone prior information and approval of PMRCL and DMRC must be sought.
- l) As intimated during the meeting with RBI officials and their consultant, Guard room, Panel rooms and allied utility building shall be of shallow RCC raft/plate mat foundation and shall be executed in the controlled and phased manner.
- m) Before start of Construction activity in the influence zone of Metro alignment, intimation to PMRCL and DMRC should be given in advance.

The Contractor shall submit a detailed construction programme, activity schedule, methodology, instrumentation and monitoring plan, contingency plan, and construction sequence for diaphragm wall and excavation works well in advance for review and onward submission to PMRCL/DMRC wherever required. The Contractor shall not commence the work until all requisite approvals have been obtained.

The Contractor shall continuously monitor all construction activities to ensure that no adverse effect is caused to the Metro Tunnel, Metro structures, adjoining buildings, underground utilities, or any other adjacent property. Any damage, loss, or liability arising due to the Contractor's acts, omissions, negligence, or execution methodology shall be entirely borne by the Contractor, who shall restore the affected structure or property to the satisfaction of the concerned authorities at his own cost. Nothing extra shall be payable on this account.

The excavation/ RCC work / backfilling of earth of the boundary wall, main gate, security room, panel room, etc above the metro tunnel shall be done in phased manner to avoid any kind of damage to the metro structures. The contractor shall submit construction plan/ methodology well in advance for review and onward submission to PMRCL/DMRC.

(v) DESIGN AND CONSTRUCTION OF SHEET PILING :

The Contractor shall be responsible for the complete design and construction of the Sheet Piling/temporary earth-retention system through an approved specialized agency having adequate experience in sheet piling and deep excavation works. The design shall be based on the approved geotechnical investigation, actual soil and groundwater conditions, depth and sequence of excavation, surcharge/construction loads, adjoining structures/services, Metro NOC conditions and the latest applicable IS Codes and statutory requirements.

Before commencement of work, the Contractor shall submit complete design calculations and drawings covering the type/section of sheet piles, depth and embedment, panel/installation arrangement, walers, bracing/strutting or anchoring system, excavation stages, dewatering, instrumentation/monitoring, removal or retention requirements and detailed construction methodology. The complete design shall be

independently vetted by IIT/NIT or any other Government Engineering Institution approved by the Engineer-in-Charge, at the Contractor's own cost, and execution shall commence only after approval of the Engineer-in-Charge.

The Contractor shall execute the sheet piling, staged excavation, earth cutting, dewatering, pile foundations, raft, basement and subsequent works in a safe and controlled sequence without causing instability, excessive movement, settlement, vibration or damage to adjoining structures, roads, underground utilities, Metro infrastructure or any public/private property.

The Contractor shall continuously monitor the behaviour of the excavation and sheet piling system during installation and all subsequent stages and shall immediately report any distress or instability to the Engineer-in-Charge and implement all necessary corrective measures.

All temporary works including guide arrangements, walers, bracing/struts/anchors, working platforms, access, dewatering, instrumentation, monitoring, lighting, barricading, traffic management and safety measures required for safe performance of the system shall be provided by the Contractor at his own cost.

The Sheet Piling system shall be maintained in a safe working condition until the permanent pile foundation, raft, basement and adjoining structural elements have attained adequate stability. Removal or permanent retention of sheet piles shall be carried out only in accordance with the approved and vetted design and directions of the Engineer-in-Charge.

The Contractor shall remain fully responsible for the adequacy, stability, safety and performance of the design and execution notwithstanding vetting or approval. Any damage arising due to the sheet piling, excavation, temporary works, dewatering or construction operations shall be made good by the Contractor at his own cost to the satisfaction of the Engineer-in-Charge and concerned authorities.

The Contractor shall comply with all applicable Indian Standards, statutory regulations, safety codes, Metro NOC conditions and directions of the Engineer-in-Charge/PMRCL/DMRC, wherever applicable.

The quoted rates shall be deemed to include the complete design, IIT/NIT/Government Engineering Institution vetting, specialized agency charges, labour, plant and machinery, temporary works, bracing/strutting/anchoring, dewatering, instrumentation, monitoring, safety measures, maintenance and removal/retention of the sheet piling system, as applicable, and all incidental operations required for complete and safe execution. No extra payment shall be admissible on this account.

NOTE: Wherever PCC of any grade is specified in the tender drawings/documents, including PCC M7.5 or M10, the same shall be read as PCC Grade M15. In no case shall the grade of PCC be less than M15.

and all subsequent excavation and construction activities. Any damage to adjacent

(vi) **EARTH WORK :**

The excavation for PCC, raft foundation, basement, and other below-ground structures is expected to extend to a depth of approximately 6.0 to 7.0 metres below the Natural Ground Level (NGL). The Contractor shall execute all excavation work strictly in accordance with the CPWD Specifications, approved drawings, and the directions of the Engineer-in-Charge.

The Contractor shall adopt suitable excavation methodology and execute the work in a safe, controlled, and phased manner. All necessary temporary works, including barricading, shoring, slope protection, dewatering, drainage arrangements, access ramps, working platforms, safety measures, and other incidental works required for safe

execution of the excavation shall be provided by the Contractor at his own cost.

The diaphragm walls and temporary sheet piling/earth-retention system shall be executed strictly in accordance with the approved and vetted design drawings and the construction programme approved by the Engineer-in-Charge. The Contractor shall coordinate the sequence of diaphragm wall construction, sheet piling, excavation, pile foundation, raft, basement and superstructure works to ensure stability of the excavation and adjoining structures throughout the execution period.

The Contractor shall take all necessary precautions to prevent any settlement, lateral movement, vibration, cracking, collapse, or damage to adjoining buildings, roads, Metro infrastructure, underground utilities, services, boundary walls, and other public or private property. Any damage arising due to the Contractor's method of execution, negligence, inadequate temporary works, or failure to maintain excavation stability shall be made good by the Contractor at his own cost to the satisfaction of the Engineer-in-Charge and the concerned authorities.

The Contractor shall excavate only to the lines, levels, and dimensions indicated in the approved drawings. Any over-excavation due to the Contractor's negligence or improper execution shall be made good by the Contractor at his own cost in the manner directed by the Engineer-in-Charge, without any extra payment.

The Contractor shall dispose of all surplus excavated earth, which is not required for backfilling, at his own cost to an approved dumping location after obtaining all necessary permissions from the concerned local/statutory authorities. The Contractor shall comply with all environmental regulations and shall ensure that disposal of excavated material does not create any nuisance, obstruction, or environmental hazard. No extra payment shall be admissible on this account.

As there is no space available within the project premises for stacking excavated earth, the Contractor shall identify, arrange, and maintain a suitable location outside the RBI Patna premises for temporary stacking of the excavated earth required for subsequent backfilling. The Contractor shall obtain all necessary permissions from the owner of the land and the concerned statutory authorities, wherever applicable, for temporary stacking of the excavated earth.

The Contractor shall transport the selected excavated earth to the identified stacking location, stack and protect it against contamination, erosion, and loss, maintain its safe custody throughout the construction period, and subsequently re-transport the required quantity of earth to the site for backfilling as and when directed by the Engineer-in-Charge. The Contractor shall carry out all backfilling, compaction, watering, testing, and finishing strictly in accordance with the CPWD Specifications and approved drawings.

The Contractor shall be solely responsible for any loss, deterioration, contamination, theft, or shortage of the stacked earth during storage and transportation. In the event that the stacked earth becomes unsuitable or insufficient for backfilling, the Contractor shall arrange suitable approved earth of the required quality at his own cost without any financial implication to the Department.

The rates quoted by the Contractor shall be deemed to include all labour, materials, plant and machinery, loading, unloading, multiple handling, transportation to and from the stacking location, stacking, protection, maintenance, watch and ward, permissions, royalty (where applicable), disposal of surplus earth, backfilling, compaction, testing, and all incidental operations required for complete execution of the earthwork. **Nothing extra shall be paid on account of temporary stacking, multiple handling, transportation, rehandling, disposal of surplus earth, or any other operation connected with excavation and backfilling.**

(vii) DEWATERING : -

The excavation for PCC, raft foundation, basement, and other below-ground structures is expected to extend to a depth of approximately 6.0 to 7.0 metres below the Natural Ground Level (NGL). The Contractor shall make his own assessment of the sub-soil conditions, groundwater table, seasonal variations, and all other site conditions before quoting and shall make adequate provision for dewatering operations required during execution of the work.

The Contractor shall carry out all necessary dewatering operations, including pumping, well points, deep wells, sump pumping, drainage channels, collection pits, standby pumping arrangements, power supply, and any other temporary works required to keep the excavation, foundation, and working areas dry during construction. Dewatering shall also include removal of water accumulating due to groundwater seepage, rainfall, surface runoff, leakage, or any other source throughout the execution period until the permanent structure is capable of resisting hydrostatic pressure.

Before commencement of excavation, the Contractor shall submit a detailed dewatering methodology for approval of the Engineer-in-Charge. The methodology shall include, inter alia, the proposed dewatering system, sequence of operation, pumping arrangements, standby equipment, disposal of discharged water, monitoring arrangements, protection of adjacent structures and utilities, contingency measures, and environmental safeguards. Approval of the methodology by the Engineer-in-Charge shall not relieve the Contractor of his responsibility for the adequacy, safety, and effectiveness of the dewatering system.

The Contractor shall ensure that the dewatering operations do not cause excessive lowering of the groundwater table, settlement, subsidence, instability, or any adverse effect on adjoining buildings, roads, underground utilities, metro infrastructure, or any other nearby structures. Suitable instrumentation and monitoring shall be carried out wherever directed by the Engineer-in-Charge or required by statutory authorities. The Contractor shall take all necessary precautions to prevent erosion, piping, boiling, uplift, slope instability, or collapse of excavation during dewatering operations.

Water discharged from the dewatering system shall be disposed of strictly in accordance with the directions of the Engineer-in-Charge and the requirements of the local/statutory authorities. The Contractor shall obtain all necessary permissions, wherever required, and shall ensure that no nuisance, flooding, pollution, or damage is caused to adjoining properties, roads, drains, or public utilities.

The Contractor shall be solely responsible for any damage to adjacent structures, roads, underground utilities, metro infrastructure, public property, or private property arising out of inadequate or improper dewatering operations and shall make good such damage at his own cost to the satisfaction of the Engineer-in-Charge and the concerned authorities.

The Contractor shall maintain sufficient standby pumps, power backup arrangements, manpower, and equipment to ensure uninterrupted dewatering during the entire construction period, including during power failures, heavy rainfall, or other emergencies.

The rates quoted by the Contractor shall be deemed to include the cost of all labour, materials, equipment, temporary works, pumping arrangements, power, fuel, maintenance, monitoring, permissions, disposal of water, and all incidental operations necessary for complete dewatering. No extra payment or compensation shall be admissible on account of dewatering arising due to groundwater, seepage, rainfall, seasonal variations in water table, flooding, or any other reason whatsoever.

(viii) Preparation of model :

The model of the building in 1:100 scale is to be planned and prepared by the contractor within 30 days of the award of work, and this model would be displayed at Engineer-in-Charge's office. This model shall become the property of Government of India. Rates quoted by the contractor are inclusive of this model. The model is to be prepared with the specifications given below.

- (a) Wall : Acrylic sheet of approved shade with CNC cutting
- (b) Window : Semi-Transparent blue plastic sheet
- (c) Base : Wooden Base with suitable strength and having space for handling, putting name plate of project covered with transparent glass.
- (d) Lighting : Led lighting inside the building as well as on the street with switch panel below the base for operation.
- (e) Scale : 1:100
- (f) Grass surface : Colored straw dust.
- (g) Trees : Readymade tree meant for model with approved size/shade/scale.
- (h) Dimension of Model for entire plot showing all infrastructure shall be restricted to 1.8 mtr. x 1.2 mtr. apart from scale 1:400.
- (i) The EPC contractor shall submit computerized 3D model of all building and playgrounds in soft and hard copy.

(ix) Other Works:

- (a) Provision shall be made as per Harmonized Guidelines & Standards for Universal Accessibility in India - 2021 for persons with disability and elderly persons. Also provision to be made for access to toilet facilities, approach ramp and signages in parking area, lifts etc.
- (b) Submission of measurements, for record and other purposes i/c calculation of theoretical consumption of various materials at work.
- (c) Submission of documents required for GRIHA 5 Star rating.
- (d) After completion of the work contractor shall submit as built drawings of all Buildings & services in Auto CAD including five sets of colored drawings on A0 size.
- (e) The EPC contractor shall submit structural stability & safety certificate of buildings etc. complete.

(x) Construction of Civil, Electrical, Horticulture and MEP works:**A. Buildings**

All the buildings shall be earthquake resistant structure and shall be constructed along with their mandatory services (e.g. internal electrification, fire services, water supply, drainage, sanitary installation, sewerage, lift, Central AC Plant, Substation, CCTV system etc.). The plinth area/other details of each building/sub-head are as below:

TABLE-A
Details of Plinth area & other details

Sl. No.	Descriptions	Plinth area (in SQM)	Floor Height
A	Basement Area	7174.00	4.35 m
	Basement Area underneath RD Bungalow, Tower B & C, Tower D & E and Community Centre		
	Basement Area underneath Podium slab		
B	Community Centre		
1	Ground Floor	873.82	3.60 m
2	First Floor	706.88	3.60 m
3	Second Floor	626.18	6.60 m
	Over Head Tank	26,000 ltrs	
	TOTAL AREA	2206.88	
C	Tower Grade B & C (S+14) Storey above Basement		
1	Stilt Floor	814.60	3.60 m
2	First to Fourteenth Floor (833.06 x 14)	11662.84	3.35 m
3	Over Head Tank	54,800 ltrs	
	TOTAL AREA	12477.44	
D	Tower Grade D & E (S+10) Storey above Basement		
1	Stilt Floor	314.69	3.60 m
2	First to Eighth Floor (372.64 x 8)	2981.12	3.35 m
3	Ninth Floor (Grade F quarter duplex type at 9 th & 10 th Floor)	372.64	3.35 m
4	Tenth Floor	273.93	3.35 m
5	Over Head Tank	20,900 ltrs	
	TOTAL AREA	3942.38	
E	Regional Director (RD) Bungalow (Duplex Bungalow above Basement)		
1	Ground Floor	297.72	3.60 m
2	First Floor	150.28	3.60 m
3	Parking area	52.43	3.00 m
4	Over Head Tank	1,500 ltrs	
	TOTAL AREA	500.43	
F	Ancillary Buildings		

1	Gate post 01 & Meter Room (Single Storey)	38.50	3.00 m
2	Gate post 02 (Single Storey)	8.28	3.00 m
3	Panel Room (Single Storey)	10.80	3.00 m
4	Connector Tower B & C to Community Centre	57.86	
5	Connector Tower D & E to Community Centre	76.02	
	TOTAL AREA	191.47	
	TOTAL PLINTH AREA	26492.60 sqm	
G	Boundary Wall (Length)		
1	Front Side towards Rajendra Nagar Flyover	116.00	
2	Back Side towards RN Singh Road	125.00	
3	Right Side towards Savera Hospital	71.00	
4	Left Side towards V-Care Hospital	71.00	
	Motorized steel gates upto 6 mtrs width	2 nos.	
	Total Length	383.00	
H	Development		
1	Green Area over Podium	1975.38 Sqm	
2	Green Area outside Podium	1041.22 Sqm	
3	Vertical Green Area	170.00 Sqm	
4	U.G.Sump	350000 ltrs	
5	Road above Podium	2082.00 Sqm	
6	Road outside Podium	1015.00 Sqm	
7	Levelling	2059.00 sqm	
8	Footpath with PCC base, 60 mm thick Paver Blocks and Kerb Stone edging	478.00 Sqm	
9	External Sewage	745.00 Mtrs	
10	Filter Water Supply Distribution Lines 100 mm Dia	341 Mtrs.	
11	Storm Water Drain including RCC NP3 pipe & Manholes.	1102 mtrs	
12	Rain Water Harvesting (RWH) excluding Collection Tank)	750.00 Mtrs.	
13	Trenches for services	402 mtrs	
14	Dismantling/Demolishing and disposal of malba	As per site requirement	

Plinth Area Calculation: For calculation of plinth area, rules for working out the plinth area as given in the PAR-2025 shall be followed

1. The following shall not be included in the plinth area as costs of these are included in the plinth area rates of buildings.
 - a) Area of loft
 - b) Area of architectural band, cornice, etc.

Correction...Nil Deletion... Nil Insertion...Nil Overwriting... Nil AE (C) (P) AE(E) (P) EE(C)-I

- c) Area of vertical sun breaker or box louver projecting out and other architectural features, for example slab projection for flower pot, etc;
 - d) Terrace
 - e) Open Platform on ground
 - f) Towers, turrets, domes projecting above terrace level.
 - g) Area of mummy and machine rooms.
2. Payment for approach ramps shall not be made separately as cost of the same has already been considered in the plinth area rates of buildings.

B. Electrical Works

Brief descriptions of E & M works are given in Part C of the tender document.

C. SITE DEVELOPMENT WORKS

The development works shall be executed as per the attached Good For Construction (GFC) drawings and other drawings issued by CPWD as and when required for completion of work. The required shop drawings shall be submitted by the EPC contractor well in advance of the execution of the respective activities for the approval of the Engineer-in-charge.

CEMENT CONCRETE ROADS AND R.C.C DRAIN

All road network of the campus shall be cement concrete road as per CPWD specification/MORTH specification and specification mentioned in the NIT. Based on the vertical alignment and the topographic conditions of the site, the road may be constructed over an embankment, cut or almost at the ground level itself. Roads shall be designed as per CPWD/MORTH Specification and parameters given in the particular specification. Details of road are as under.

Width of road will increase at curves, round about, near buildings etc. as per road design. Construction of road length and width of carriage way may vary marginally during construction of road as per site condition. The rates are included in the work nothing extra shall be paid on this account.

Speed breaker of approved design and shape shall be provided wherever required as per MORTH specification or direction of Engineer-in-Charge.

The design and construction of surface and sub-surface drains for campus drainage shall be carried out such that efficient drainage system to be provided. For quick disposal of precipitation on the road surface, the carriageway, shoulders and median shall have the requisite camber/ cross fall and longitudinal gradient as per the values specified in Section 2 of SP:73. The drains shall have sufficient capacity to carry normal peak run-off without over flowing. RCC drain with M.S. cover grating shall be provided along the road.

PATH AND FOOTPATH

Connecting paths from building to main road and around the building shall be provided as per approved architectural drawings and direction of Engineer-in-Charge

RETAINING WALLS / DESIGN AND CONSTRUCTION OF DIAPHRAGM WALLS

Retaining Walls shall be constructed as per the approved structural drawings. The Contractor shall be responsible for the complete design and construction of Diaphragm Walls through an approved specialized agency, based on the approved geotechnical investigation, actual site and groundwater conditions, adjoining structures/services, basement excavation requirements, Metro NOC conditions and the latest applicable IS Codes/NBC provisions.

The Contractor shall submit complete design calculations, drawings, support/strutting or anchoring arrangement, construction methodology, dewatering and monitoring scheme. The Diaphragm Wall design shall be independently vetted by IIT/NIT or any other Government Engineering Institution approved by the Engineer-in-Charge, at the Contractor's own cost, and shall be executed only after approval of the Engineer-in-Charge.

The Contractor shall remain fully responsible for the adequacy, stability, safety and performance of the design and execution notwithstanding such vetting or approval, and shall provide all temporary works and protection necessary for adjoining structures, utilities, roads, services, Metro infrastructure and properties. Any damage arising from the works shall be made good by the Contractor at his own cost.

The Diaphragm Wall and/or Retaining Wall shall be structurally integrated with the raft/basement and other structural components as applicable. RCC Diaphragm/Retaining Walls shall be constructed in design mix concrete of minimum Grade M30, unless a higher grade is required by the approved design, with specified integral crystalline waterproofing admixture and hydrophilic crystalline slurry/coating treatment.

WATER STORAGE TANKS

The water demand for the buildings shall be met from the Municipal supply of water/ deep tubewells, etc.

EPC contractor shall construct RCC UG Static Water Tank & pump house as per approved Structural and Architectural drawings issued by the department. The level of pump house flooring shall be provided to have positive suction pipes. Hydro pneumatic pumping arrangement to be provided for both the UG Sump as per design requirement. The fire pump shall be provided for the UG sump as per design requirement. The pipe line for domestic supply shall be G.I./Ductile iron pipe and MS pipe medium grade for fire pump as per design requirement respectively. Payment for piping G.I./ductile iron pipe and MS pipe and other accessories like valves, jointing of pipes, SFRC cover of UG water tank opening chamber, air vent, all Wall tiles / Floor tiles inside of UG water tank, Water proofing like grouting, piping (G.I. Pipe/ductile iron pipe and MS pipe along with all accessories) to connect UG water tank to Pump room etc. complete are all inclusive in the tender cost. Nothing shall be paid extra for completion of the work.

Terrace slab and mummy of pump room & U.G. Tank to be water proofed with integral water proofing as per DSR item No. 22.7. In the pump room a small sump of size as shown in the issued drawing shall be constructed and also provision of stair for entering in the pump room along with cutout in roof of pump house for lowering/lifting of equipment i/c ladder in each compartment.

Suitable arrangement for dewatering shall also be made for UG tank and pump house area of Water Tank. Floor and Wall tiles shall be provided inside the UG water tank as per DSR-23 item no. 11.37 & 8.31 respectively. Pump room floor shall be Kota stone flooring as per DSR items. All water retaining structures shall be constructed strictly as per structural drawings issued by the department. The work of water proofing of UG Tank shall be done by specialized agency (to be approved by Engineer-in-charge).

The tanks details and capacity shall be as per the design requirement.

WATER SUPPLY LINE

The water supply demand shall be estimated based on the requirement. as per NBCS 2026 and design of water supply line to be done as per norms of NBCS, local bye laws & applicable statutory norms. The different components related to this service are listed as below:

- Domestic water supply system
- Water supply distribution network system of the buildings which are within the scope of work.

The main line shall be designed as per the water requirement of the building. Single line shall be laid for domestic water supply to the buildings and to end user points.

From ground water tank, domestic water shall be pump directly into the taps.

Locations of water supply connection are to be decided by the RBI authority. However, providing and laying of G.I. pipe line along with all necessary fittings, valves etc from nearest supply line of DVC to ground water tank is in the scope of work.

The water supply lines from the ground water tank to Riser line shall be GI/ DI Pipe line which shall be conforming to IS : 1239 (Part-i) 1990. The dia of the pipe shall be as per design. The water supply distribution lines shall be designed as closed grid network of minimum nominal dia 65 mm. Ball valves, butterfly valves, air valves, NRV, PRV, isolation valves, water meters etc. shall be provided as per design requirement. Brick masonry chambers shall be made of required sizes for ball valves, butterfly valves, water meters etc. as per direction of Engineer-in-Charge

All water supply lines of GI PIPE shall be as per design conforming to IS : 1239 (Part-i) 1990.

All Water supply pipes shall be GI pipe (Medium Duty Class). Laying of GI pipe lines upto building shafts shall be underground as per CPWD specification. The water supply pipes inside buildings shall be concealed piping. To regulate the water supply in all type of grids, all necessary fittings and valves shall be provided at required places as per specification and direction of Engineer-in-Charge. To control the wastage of water during maintenance of pipe line, each toilet block have separate valve at approachable and suitable location.

All exposed GI pipe lines shall be painted with one coat of primer and two coats of synthetic enamel paint of approved colour, shade and quality. Pipe shall be painted to standard colour code as per direction of Engineer-in-Charge. All pipes below the ground shall be provided with anti-corrosive treatment.

STORM WATER DRAINS

Net work of under ground open/closed rains with removable covers shall be provided as per coordination with land scape and Architectural plan. RCC storm water drains are to be constructed required size to meet flow requirement. Drains/channels will lead water towards nearest existing main drain. Drains shall also be provided around each building to collect surface run off water and roof top rain water from buildings. Drains around buildings shall be connected to nearby drain channel Cross drainage road work and sub surface drainage works shall be done wherever required as per MORTH specification and as per direction of Engineer-in-Charge.

Drains along the roads shall be covered with precast RCC covers of grade M-30 / M.S. grating and around buildings shall be covered. As per site condition and design requirement wherever required uPVC drain pipe / RCC Hume pipe / HDPE pipe shall be used. Wherever required horizontal / vertical grating gully chamber of required sizes shall also be made.

Design Parameters

As per weather data, total yearly rain fall is around 1280mm& rain falls mainly in July, Aug, Sept. and Oct. month. July & August has maximum rainfall among all months. The rain fall intensity 30 mm/hr (minimum) is to be considered for designing of system for the project.

Minimum Pipe diameters for Rain Water Pipes from terraces shall be 100 mm. Minimum width and depth of drain shall be 300 mm to 500 mm as per site requirement. Local authority requirements / guidelines shall also be taken care by EPC contractor and stringent size of drain / diameter of pipe shall be opted. For road crossings, RCC pipes class NP3 as per IS:458 shall be provided as required.

The complete storm water drainage system shall be designed in combination of RCC pipes, uPVC pipe, covered RCC drain channels suitable for heavy loads, gully chambers etc.

SANITARY INSTALLATION AND SEWERAGE SYSTEM

The different components related to services are as under:

- Providing sanitary fixtures and C.P brass fittings.
- Soil, waste & rain water piping system.
- Disposal of internal soil and waste water.
- The sewer generated from the each building shall be connected to the STP sewer line which will be constructed near shopping complex.

Piping shall be designed on the basis of two pipe system for soil and waste pipes. Soil pipes shall carry the waste from WC's and urinal's etc. Soil pipes shall be connected directly to the 1st man hole outside the building. Waste pipes shall carry the waste from waste appliances (lavatory basins, kitchen, sinks, Bathroom etc). Waste stacks shall first connect to gully traps out side the buildings /inside sanitary shaft and then shall be connected to external manholes. Soil pipes for WC's and urinals should be separate. Soil and waste disposal of Ground floor toilets shall not be connected with disposal system of upper floors toilets. Internal soil and waste pipes and fittings nominal dia. shall not be less than 100 mm.

All vertical stacks shall terminate as vent pipes at parapet level and covered with cowl. All vertical stacks shall be installed in shafts as per approved architectural drawings. These pipes must be camouflaged aesthetically above terrace level. Provision shall be made for

suitable access in all sanitary shafts at all floor levels. Shaft openings at floor levels shall be casted after laying of pipes wherever required as per fire requirement.

The pipes and fittings shall be jointed with SS 304 grade coupling with EPDM rubber gasket as per requirement and specifications. Provision has to be made for providing access door fittings for maintenance purpose wherever necessary and required.

Wherever possible disposal system shall be directly from sanitary fixtures to pipes in shaft without any joints in between. For the same long arm trap upto 90cm length shall be used for connection of floor trap/ WC trap to vertical stack for soil / waste pipes in shaft. Wherever direct disposal is not possible in shafts, sanitary disposal system would be under the slab by core cutting RCC slab and suspended at bottom. Horizontal pipes running along ceiling shall be fixed on structural adjustable clamps of approved design. Horizontal pipes shall be laid to uniform slope and the clamps adjusted to the proper levels so that the pipes fully rest on them and are properly secured. Contractor shall provide all nuts, bolts, welding material and paint the clamps with one coat of red oxide and two or more coats of synthetic enamel paint.

For floor drain in kitchen, utility balcony and similar locations localized sunken slab for floor trap shall be made and it shall be directly discharged into the waste pipe in shaft. Kitchen waste from cafeteria, dining hall mess etc. shall be passed through grease trap / oil separator before discharging in to the external sewer line.

The domestic sewage shall be conveyed through the main sewerage network, which shall finally carry the entire sewage due to gravity. As per terrain of site where gravity flow from the discharging units into the external sewer line is not possible, a local sewage pumping station shall be provided at lowest point and pump into the external sewer line. Sewerage System Network shall be divided into parts. Each Sewerage Network shall be disposing into nearest working manhole which is connected to the STP

The manholes are to be constructed with brick masonry as per CPWD specifications. Manhole shall be provided at all the junctions, change of directions, change in pipe diameters and as per connection requirement. Spacing of manholes shall be kept as per codal provisions. Sizes of manholes shall be as follows:

- Rectangular of inside size 900 x 800 mm : from 0.45 m and upto 0.90 meter depth
- Rectangular of inside size 1200 x 900 mm : from 0.90 m and upto 1.20 meter depth
- Circular of inside dia at bottom 910 mm and at top 560 mm : from 0.91 m and upto 1.67 meter depth
- Circular of inside dia at bottom 1220 mm and at top 560 mm : from 1.68 m and up to 2.29 meter depth
- Circular of inside dia at bottom 1520 mm and at top 560 mm : above 2.30 metre depth

Heavy duty S.F.R.C. manhole covers shall be provided for manholes /service chambers/ gully traps falling on main roads & service roads and at all other locations medium duty S.F.R.C. man hole covers to be provided. Shape and dimensions of manhole and manhole covers shall conform to CPWD specifications &IS : 12592.

Soil / Waste pipes from building to 1st manhole shall be Hubless centrifugally cast (spun) iron pipes epoxy coated in sides and outside as per IS code 15905. From gully traps to manholes in suitable pipe of required dia shall be provide and it shall be laid for sewer line for external drainage. Design and scheme of drainage shall be such that it caters future expansion of campus as per approved master layout plan. External drainage line shall be terminated at nearest existing drainage line if slope required is appropriate.

The EPC contractor shall design all components of Civil and Electrical works. Civil/Electrical/Mechanical construction work shall be done as per approved design and drawing.

The contractor shall execute the civil work under the direction of Engineer-in-Charge (Civil works). Payment for civil & Electrical work shall be made as per Part D by the Engineer-in-Charge. Electrical works shall be carried out as per Part C.

SIGNAGES

Signages shall be provided for identification and guidance/approach to different blocks / buildings/ Toilets. The EPC Contractor shall carry out design, manufacturing, supply and fixing of different signages of various matters as briefed by the Engineer-in-Charge at his own cost. The scope of work consists of following type of signages:

Stainless steel signages made out of 1.20 mm thick stainless steel grade 304 brush line/matt finish sheet for general locations like building name/ rooms nos./ Room name/ Store floor level, at each floor of the buildings and inside stairs nos., male / female wash room signages, Drinking / Hand wash instructive / warning signages, directional signage inside building & index plate, Disabled toilet etc. The text and graphics finished with deep engraved acid etched and enamel painted & shall be fixed with star headed SS Screws etc.

Photo-luminescent III signage, with high intensity luminous properties covered with UV stabilized coating on 2mm thick Aluminium sheet shall be provided for lifts, fire hydrants, fire exit, fire safety measures etc. Photo-luminescent III signage shall have single side computerized setting of letters and fixed with SS screws / special adhesive tape or hanged from ceiling with SS chain, ring & hooks etc. Light illuminated signages shall be provided wherever required.

Matt finished stainless steel (Grade 304), **hollow type standard English alphabet and numerical letters 65mm to 75mm in width, 40mm to 50mm in depth and 500mm to 600mm in height**, made of 1 mm or more thick stainless steel plate shall also be provided for building and block names in front and back of building **i/c acrylic sheet and lighting on aluminium louvers** as per direction of engineer-in-charge.

Sizes of different type of signages shall be approved by Engineer-in-Charge. Above list of signages are indicative only. The contractor shall provide all necessary fire signages as per National Building Code 2016 Part IV and as per CPWD manual on Accessible Built Environment for the differently abled persons including Braille signages for visually impaired persons.

All signage work listed above shall be part of the building work and nothing shall be paid extra.

Retro reflective sign boards with 2 mm thick aluminium sheets covered with high intensity encapsulated heat activated retro reflective sheets confirming to Type-III of ASTM – D 4956 – 01 in blue & silver sheet or any other colour combination for external signages like layout plan (minimum three numbers), road guide maps, speed limit etc. in front of gates, parking & at corner etc. with stainless steel grade 304 tubular frame work complete.

Removing of Building rubbish, malwa & garbage.

The building rubbish, dumped malba, garbage lying at site of hostel/dining/HVAC building locations are to be removed and shall be disposed off in approved municipal dumping yard and necessary charges if any shall also be borne by the EPC contractor.

SECTION – II

1.0 General :

INFORMATION & INSTRUCTIONS FOR BIDDERS

- 1.1 Letter of transmittal and forms for deciding eligibility are given in Section III.
- 1.2 All information called for in the enclosed forms should be furnished against the relevant columns in the forms. If for any reason, information is furnished on a separate sheet, this fact should be mentioned against the relevant column. Even if no information is to be provided in a column, a "nil" or "no such case" entry should be made in that column. If any particulars/query is not applicable in case of the bidder, it should be stated as "not applicable". The bidders are cautioned that not giving complete information called for in the application forms or not giving it in clear terms or making any change in the prescribed forms or deliberately suppressing the information may result in the bid being summarily disqualified. Bids made by telegram or e-mailed or telex and those received late will not be entertained.
- 1.3 References, information and certificates from the respective clients certifying suitability, technical knowledge or capability of the bidder should be signed by an officer not below the rank of Executive Engineer or equivalent.
- 1.4 The bidder may furnish any additional information which he thinks is necessary to establish his capabilities to successfully complete the envisaged work. He is, however, advised not to furnish superfluous information. No information shall be entertained after submission of eligibility criteria document unless it is called for by the Employer.

2.0 Definitions:

- 2.1 In this document the following words and expressions have the meaning hereby assigned to them.
- 2.2 Employer: Means the President of India, acting through the Executive Engineer, Patna-2, CPWD, Patna.
- 2.3 Bidder: Means the individual, proprietary firm, firm in partnership, limited company private or public or corporation.
- 2.4 "Year" means "Financial Year" unless stated otherwise.

3.0 Method of application:

- 3.1 If the bidder is an individual, the application shall be signed by him above his full type written name and current address.
- 3.2 If the bidder is a proprietary firm, the application shall be signed by the proprietor above his full typewritten name and the full name of his firm with its current address.
- 3.3 If the bidder is a firm in partnership, the application shall be signed by all the partners of the firm above their full typewritten names and current addresses, or, alternatively, by a partner holding power of attorney for the firm. In the later case a certified copy of the power of attorney should accompany the application. In both cases a certified copy of the partnership deed and current address of all the partners of the firm should accompany the application.
- 3.4 If the bidder is a limited company or a corporation, the application shall be signed by a duly authorized person holding power of attorney for signing the application accompanied by a copy of the power of attorney. The bidder should also furnish a copy of the Memorandum of Articles of Association duly attested by a Public Notary.

4.0 Final decision-making authority

The employer reserves the right to accept or reject any bid and to annul the process and reject all bids at any time, without assigning any reason or incurring any liability to the bidders.

5.0 Particulars provisional

The particulars of the work given in Section I are provisional. They are liable to change and must be considered only as advance information to assist the bidder.

6.0 Site visit

The bidder is advised to visit the site of work, at his own cost, and examine it and its surroundings to himself collect all information that he considers necessary for proper assessment of the prospective assignment.

7.0 Initial Criteria for eligibility

7.1. Contractors who fulfill the following requirements shall be eligible to apply. Joint Ventures are not accepted. [1 (b), 1 (c) & 1 (d) are not applicable for CPWD enlisted contractors of appropriate class. 1 (a)(i), (ii) and 1(e) are applicable for CPWD enlisted contractor also].

(f) Should have satisfactorily completed the works as mentioned below during the last 7 (seven) years ending last day of the month previous to the one in which tenders are invited.

(iii) Three similar completed works each costing not less than **Rs. 66.12 Crore**

Or

Two similar completed works each of value not less than **Rs. 99.17 Crore**

Or

One similar completed work of value not less than **Rs. 132.23 Crore**

Similar works shall mean “Construction of building works including water supply, sanitary installation, drainage, internal electric installation, lift, firefighting system and fire alarm system, having at least one building of minimum Ten (10) Storey executed under one agreement.”

NOTE:

- e. For this purpose, each basement, stilt constructed with the building shall be considered as a storey.
- f. Mumty and machine room and OHT (including supporting structure above roof) will not be counted as storey for above purpose.
- g. For the purpose of similar works, works executed in India only shall be considered.
- h. Qualified similar works may be physically inspected by the CPWD Engineers to ascertain the completion, performance on quality of works for finalizing the technical bid.

The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to previous day of last date of submission of tender.

- (iv) One completed work costing not less than **Rs. 33.06 Crore** executed with the structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**”. This work can be part of eligible work at 1(a)(i) above or as a separate work. The value of executed work shall be brought to the current level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to previous day of last day of submission of tenders.

If the bidder does not have adequate experience of the structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**” then the bidder can associate with contractor having requisite experience of executing work in structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**”. Bidder has to submit MoU as per FORM-‘K’ with such associate contractor & experience certificate as per FORM-‘C2’ & FORM-‘D2’ with such associate contractor, along with his tender, for structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**” only. The associated contractor must satisfy the eligibility criteria of having successfully completed one work of structural system technology of “**monolithic concrete construction system technology using Aluminium Formwork**” having the cost of structural system not less than **Rs. 32.99 Crore** during the last seven years ending last day of month previous to the one in which tender is invited.

In case separate cost of structural system of “**monolithic concrete construction system technology using Aluminium Formwork**” technology is not available in the experience certificate of associated contractor; it will be taken as 30% of completed cost of project/work.

Associated contractor should not have been debarred from any Ministry or any govt. organization in the last five years.

In case, the eligible work has been executed by a Joint Venture through one or more individual firm(s), then cost of completed work shall be distributed among the individual firm(s) in proportion to their share in Joint Venture and that will be considered as work experience for individual firm(s) for pre-qualification in bidding.

- 7.2 The bidder should have had Average Annual Financial Turnover of **Rs. 49.59 Crore** (30% of E.C.P.T) on Civil/Electrical construction work during the last three consecutive years as per the balance sheets duly audited by Chartered Accountant. Year in which no turnover is shown would also be considered for working out the average. The value of annual turnover figures shall be brought to current value by enhancing the actual turnover figure at simple rate of 7% per annum.
- 7.3 The bidder should not have incurred any loss (profit after tax should be positive) in more than two years during available last five consecutive balance sheets (**standalone financial statement**) duly audited and certified by the Chartered Accountant.
- 7.4 The bidder should have a Banker’s certificate from a commercial bank for **Rs. 66.12 Crore** certified by his Bankers. (Not required if applicant is a CPWD registered contractor of appropriate class) or the bidder should submit Net worth Certificate of minimum 10% of ECPT issued by the certified Chartered Accountant.
- 7.5 The bidder should have sufficient number of technical and administrative employees for the proper execution of the contract. The bidder shall have to submit a list of these employees stating clearly how these would be involved in this work within 15 days of award of work.
- 7.6 Bidding capacity (applicable for CPWD enlisted contractor also) : Should have bidding capacity equal to or more than the estimated cost of the work put to tender. The bidding capacity shall be worked out by the following formula:

$$\text{Bidding capacity} = \{[A \times N \times 1.5] - B\}$$

Where,

A=Maximum turnover in construction works executed in any one year during the last seven years taking into account the completed as well as works in progress. The value of completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum.

N = Numbers of years prescribed for completion of work for which bids have been invited.

B = Value of existing commitments of ongoing works during the period of execution of work for which bids have been invited.

Notes:

vii. The bidder shall submit Bidding capacity as per Form C-3.

viii. Bidding Capacity is applicable for all the contractors including CPWD enlisted contractors.

ix. Bidding capacity formula for CPWD contractors who are enlisted based on rule 6.1.7 of Enlistment Rules-2024 i.e. government retired engineer/ architect for three years from the date of issue of enlistment order, is as follows: -

$$\text{Bidding Capacity} = \{[A_1 \times N \times 1.5] - B\}$$

Where

A₁ Banker Certificate figure as submitted by applicant (i.e. government retired engineer/ architect) at the time of enlistment for first year of enlistment and subsequent fresh bankers certificate for second and third year respectively. Value of A₁ for first year will be mentioned in the enlistment order by the member secretary of advisory committee for enlisting authority.

N= Number of years prescribed for completion of work for which bids have been invited.

B= Value of existing commitments of ongoing works during the period of execution of work for which bids have been invited. This value is for newly enlisted entity.

Within three years from the date of issue of enlistment order, the newly enlisted entity has to develop its own bidding capacity and thereafter the general bidding capacity formula being used for other entities shall be Applicable to its for calculation of bidding capacity.

Newly enlisted entity may like to follow general bidding capacity formula even before period of three years if it so chooses.

iv. Bidding capacity, for CPWD contractors who are enlisted based on rules 9.6.3 & 9.6.4 of Enlistment Rules -2024 i.e. new entity based on previously enlisted entity for three years from dates of issue of enlistment order, is as follows: -

Annual turnover of newly enlisted entity shall be in proportion to the shareholding of partners/directors in the original enlisted entity at the time of enlistment of the newly enlisted entity.

Within three years from the date of issue of enlistment order, the newly enlisted entity has to develop its own bidding capacity and thereafter the general bidding capacity formula being used for other entities shall be applicable to its for calculation of bidding capacity. Newly enlisted entity may like to follow general bidding capacity formula even before period of three years, if it so chooses.

Bidding capacity for newly enlisted entity (CPWD enlisted contractors) who are enlisted based on rules 9.6.3 and 9.6.4 of enlistment rules – 2024 shall be as follows:

$$\text{Bidding Capacity} = \{[A' \times N \times 1.5] - B\}$$

Where

A' = Proportionate share of newly enlisted director/ partner in originally enlisted company / firm multiplied by the factor A, as given below. Value of A' will be mentioned in the enlistment order by member secretary of Advisory committee for Enlistment Authority, it will remain same for three years.

A = Maximum turnover in construction works executed in any one year during the last seven years taking into account the completed as well as works in progress. The value of completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum. This value is of originally enlisted entity at the time of enlistment of newly enlisted entity.

N= Number of years prescribed for completion of work for which bids has been invited.

B= Value of existing commitments of ongoing works during the period of execution of work for which bids have been invited. This value is for newly enlisted entity.

8.0 Evaluation criteria for eligibility bid

8.1 The detailed submitted by the bidders will be evaluated in the following manner:

8.1.1 The initial criteria prescribed in para 7.0 above in respect of experience of eligible similar works completed, loss, Banker's Certificate and financial turn over and Bidding capacity etc. will first be scrutinized and the bidder's eligibility for the work be determined.

8.1.2 The bidders qualifying the initial criteria as set out in para 7.0 above will be evaluated for following criteria by scoring method on the basis of details furnished by them.

(a)	Financial strength (Form "A" "B" & "B-1")	Maximum 20 Marks
(b)	Experience in eligible similar nature of work during last Seven years (Form "C" and "C-1")	Maximum 20 Marks
(c)	Performance on works as per Form "D" for the work mentioned in Form "C" - Time over run	Maximum 20 Marks
(d)	Performance of works (Quality) as per Assessment in Form D-1	Maximum 40 Marks
	Total	100 Marks

To become eligible for short listing the bidder must secure at least **50% (fifty percent)** marks in each criteria (Section a, b, c & d as above) and **60% (sixty percent)** marks in aggregate.

Department, however, reserves the right to restrict the list of such qualified contractors to any number deemed suitable by it.

Note : - The average value of performance of works for time over run and quality shall be taken on the basis of performance report and eligible similar works.

9.0 Financial information

Bidder should furnish the Annual financial statement for the last seven years in (Form "A"). Banker's certificate in (Form "B") or Net-worth certificate in (Form "B-1").

10.0 Experience of similar works

10.1 Bidder should furnish the list eligible similar nature of works successfully completed during the last seven years in (Form “C”) and ongoing works as well (Form C-1).

10.A. Experience of Technology of monolithic concrete construction system technology using Aluminium Formwork to be used in the work.

Bidder should furnish the detail of one work successfully completed during the last seven years using the structural system technology of **monolithic concrete construction system technology using Aluminium Formwork** (Form “C-2”) along with experience certificate in Form "D-2".

11.0 Organization information

Bidder is required to submit the information in respect of his organization in Forms “E”

12.0 Letter of transmittal

The bidder should submit the Letter of Transmittal attached with the document.

13.0 Opening of Price bid

After evaluation of applications, a list of short-listed agencies will be prepared. Thereafter, the financial bids of only the qualified and technically acceptable bidders shall be opened at the notified time, date and place in the presence of the qualified bidders or their representatives.

14.0 Award Criteria

- 14.1 The employer reserves the right, without being liable for any damages or obligation to inform the bidder, to:
 - (a) Amend the scope of work and value of contract.
 - (b) Reject any or all the applications without assigning any reason.
- 14.2 Any effort on the part of the bidder or his agent to exercise influence or to pressurize the employer would result in rejection of his bid. Canvassing of any kind is prohibited.

PROFORMA - 1

**CRITERIA FOR EVALUATION OF THE PERFORMANCE OF CONTRACTORS
FOR PRE-ELIGIBILITY**

Sl. No.	Attributes	Max. Marks	Evaluation criteria			
(A)	Financial strength	(20)	(i) 60% marks for minimum eligibility criteria (ii) 100% marks for twice the minimum eligibility criteria or more In between (i) & (ii) – on pro-rata basis.			
(i)	Average annual turnover	16				
(ii)	Net worth Certificate or Bankers certificate	4				
(B)	Experience in eligible similar nature of work	(20)	(i) 60% marks for minimum eligibility criteria (ii) 100% marks for twice the minimum eligibility criteria or more In between (i) & (ii) – on pro-rata basis.			
(C)	Performance on works (time over run)	(20)	[TOR = AT/ST, where AT = Actual Time; ST = Stipulated Time in the Agreement plus (+) Justified Period of Extension of Time]. Note: Marks for value in between the stages indicated above is to be determined by straight line variation basis.			
	If TOR =		Score			
			1.00	2.00	3.00	> 3.50
(i)	Without levy of compensation		20	15	10	10
(ii)	With levy of compensation		20	5	0	-5
iii)	Levy of compensation not decided		20	10	0	0
(D)	Performance of works (Quality) as per assessment in form “D-1”	(40)				
	Completed works (max 25 Marks)		Ongoing works (max. 15 marks)		(Total Marks assessed)	

SECTION III
INFORMATION REGARDING ELIGIBILITY

LETTER OF TRANSMITTAL

From:

To,

Executive Engineer Patna-2
CPWD, Patna
Ashiyana Digha Road
Patna-800025

Sub: - Submission of bid for the work of “Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Land-scaping & Art Work etc. in EPC Mode-III.

Sir,

Having examined the details given in the bid document for the above work, I/we hereby submit the relevant information.

1. I/we hereby certify that all the statements made and information supplied in the enclosed forms and accompanying statements are true and correct.
2. I/we have furnished all information and details necessary for eligibility and have no further pertinent information to supply.
3. I/we submit the requisite certified Solvency certificate and authorize the **Executive Engineer Patna-2 CPWD, Patna** to approach the Bank issuing the solvency certificate to confirm the correctness thereof. I/we also authorize **Executive Engineer Patna-2, CPWD, Patna** to approach individuals, employers, firms, and corporation to verify our competence and general reputation.
4. I/we submit the following certificates in support of our suitability, technical knowledge, and capabilities for having successfully completed the following **eligible similar works**.

Sl. No.	Name of work	Certificate from
1		
2		
3		

5. I/we hereby certify that I/we will use structural system technology of **monolithic concrete construction system technology using Aluminium Formwork** in the work.
6. I/we submit the certificate in support of having successfully completed the following work with the technology proposed to be used in the work

Sl. No.	Name of work	Certificate from
1		
2		
3		

7. I/we hereby attaching copy of type test report conducted in respect of precast concrete construction system technology proposed to be used in the work.
8. I/We hereby submit undertaking on structural stability and soundness as per prescribed format

Certificate:

It is certified that the information given in the enclosed eligibility bid are correct. It is also certified that I/we shall be liable to be debarred, disqualified/ cancellation of enlistment in case any information furnished by me/us found to be incorrect.

Enclosures: Seal of bidder

Date of submission:

Signature(s) of Bidder(s).

FORM - 'A'**FINANCIAL INFORMATION**

- I. Financial Analysis – Details to be furnished duly supported by figures in balance sheet/ profit & loss account for the last seven financial years duly certified by the Chartered Accountant, as submitted by the applicant to the Income Tax Department (Copies to be attached).

Sl. No.	Description	Financial Years						
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
(i)	Gross Annual turnover amount on construction works							
(ii)	Profit / Loss (Stand alone financial statement)							

- II. Financial arrangements for carrying out the proposed work.

Signature of Chartered Accountant with Seal

Signature of bidder(s)

FORM - "B"**BANKERS' CERTIFICATE FROM A COMMERCIAL BANK**

To,

Executive Engineer Patna-2
CPWD, Patna
Ashiyana Digha Road
Patna-800025

This is to certify that to the best of our knowledge and information that M/s./ Sh..... having marginally noted address,as a customer of our bank are/is respectable and can be treated as good for any engagement up to a limit of Rs..... (Rupees.....)

This certificate is issued without any guarantee or responsibility on the bank or any of the officers.

(Signature) For the Bank

NOTE

1. Bankers Certificates should be on letter head of the Bank, addressed to tendering authority.
2. In case of Partnership firm, certificate should include names of all partners as recorded with the Bank.

FORM - 'B-1'**FORM FOR CERTIFICATE OF NET WORTH FROM CHARTERED
ACCOUNTANT**

It is to certify that as per the audited Balance Sheet and Profit & Loss Account during the Financial Year....., the Net Worth of M/s (Name & Registered Address of Individual/ Firm/ Company), as on (the relevant date) is Rs..... after considering all liabilities. It is further certified that the Net Worth of the company has not eroded by more than 30% in the last three years ending on (the relevant date).

Unique Document Identification Number (UDIN).....

(Signature of Chartered Accountant)

.....

Name of Chartered Accountant

.....

Membership No. of ICAI

Date and Seal

FORM - 'C'

**DETAILS OF ELIGIBLE SIMILAR NATURE OF WORKS COMPLETED DURING
THE LAST SEVEN YEARS ENDING LAST DAY OF THE MONTH PREVIOUS TO
THE ONE IN WHICH TENDERS ARE INVITED**

Sl. No.	Name of work/ project and location	Owner or sponsoring organization	Cost of work in crores of rupees	Date of commencement as per contract	Stipulated date of completion	Actual date of completion	Litigation/ arbitration cases pending/ in progress with details*	Name and address / telephone number of officer to whom reference may be made	Whether the work was done on back to back basis Yes/No
1	2	3	4	5	6	7	8	9	10

* Indicate gross amount claimed and amount awarded by the Arbitration Tribunal.

Signature of Bidder(s)

Note:

1. The bidder/contractor should give list of only those eligible works which are of similar nature.

FORM - 'C-1'**PROJECTS UNDER EXECUTION**

Sl. No.	Name of work/ project and location	Owner or sponsoring organization	Cost of work in crores of rupees	Date of commencement as per contract	Stipulated date of completion	Up to date percentage progress of works	Slow progress if any and reasons thereof	Name and address / telephone number of officer to whom reference may be made	Remarks
1	2	3	4	5	6	7	8	9	10

Signature of Bidder(s)

**DETAIL OF ONE WORK IN SUPPORT OF HAVING SUCCESSFULLY
COMPLETED WITH THE MONOLITHIC CONCRETE CONSTRUCTION
SYSTEM USING ALUMINIUM FORMWORK STRUCTURAL SYSTEM
TECHNOLOGY TO BE USED IN THE WORK**

Sl. No.	Name of work/ project and location	Owner or sponsoring organization	Cost of work in crore of rupees	Date of commencement as	Stipulated date of completion	Actual Date of completion	Type of Structural system technology	Litigation / Arbitration cases pending / in progress with	Name and address / telephone number of officer to whom reference may be made	Whether the work was done on back to back basis (Yes or No)
1	2	3	4	5	6	7	8	9	10	11

* Indicate gross amount claimed and amount awarded by the Arbitration Tribunal.

Signature of Bidder(s)

Calculation of bidding capacity
Details of existing commitments and ongoing works

Sl. No.	Name of work/ project and location	Owner or sponsoring organization	Contract value in crore of rupees	Date of commencement as	Stipulated date of completion	Upto date percentage progress of works	Remaining work in percentage (100- column 7)	Existing commitment Column 4 x Column 8 /100	Name and address / telephone number of officer to whom reference may be made	Remarks
1	2	3	4	5	6	7	8	9	10	11

Total (B) =

Maximum turnover in last seven years = Rs.....

Updated value of turnover (A) = Rs.....

No. of Years (N) =

Bidding Capacity = $\{[A \times N \times 1.5] - B\}$ =

Certificate :

I certify that all the awarded and ongoing works have been included in the above list.

Signature of Bidder(s)

FORM - 'D'**Work experience certificate of completed work(s) mentioned in form-C****No.....****Date:.....**

1.	Name of work		
2.	Location of work (mention city and state)		
3.	Name of contractor (same as mentioned in Award letter)		
4.	Agreement/work order number		
5.	Estimated Cost		
6.	Agreement/work order amount (Rs.)		
7.	Gross value of completed work (Rs.)		
8.	Amount of Gross value of last paid bill, (if final bill not paid).		
9.	Stipulated date of start (DD-MM-YYYY)		
10.	Date of completion:		
	(a) Stipulated date of completion (DD-MM-YYYY)		
	(b) Actual date of completion (DD-MM-YYYY)		
	(c) Justified extended date of completion, if decided (DD-MM-YYYY)		
11.	Details of work		
	(a) Nature of work (Building/Infrastructure/Road/ Horticulture)		
	(b) Type of structure (RCC framed/load bearing/ composite of any other)		
	(c) (i) Type of Technology used e.g. Cast-in-Situ Structural System, Monolithic concrete construction system, Precast RCC Systems, Steel Structure, Pre-stressed concrete system etc.		
	(ii) Technology used of his own or through Associated Agency.		
	(d) Type of Building/Infrastructure (Office/College/ Hospital/School/Hostel/Quarters/Flyover/Bridge/Road/ Culvert etc.)		
	(e) In case of Road work, whether bituminous/CC or both.		
12.	Name of electrical/specialized MEP items executed in the work (Please write the names of specialized services)	Executed by self	Executed by associated agency
	(a) Internal Electrical installation, External Electrical installation, Lift, Scada, EPBAX, CCTV, LAN		
	(b) Firefighting, Fire Alarm, HVAC		
	(c) Electrical Substation, DG set, STP/ETP Plant		

	(d)	Solar Photo Voltaic Power Generation/Solar Water Heating, Access Control, Baggage Scanner System, Conveyor Belt		
	(e)	Gas/Oxygen Supply Line, OT Room		
	(f)	Any other Specialized Services		
13.	Other information			
	(a)	If completed work is building construction, then number of storey(s) constructed without basement.		
	(b)	Number of basement(s)		
	(c)	If completed work is building construction, then approximate pliant area of the building.		
14.	(a)	Amount of Horticulture work(s), (if executed)		
	(b)	Horticulture work(s), whether executed by self or through associated agency		
15.	Details of extension of time for delayed completion.			
	(a)	Whether extension of time for delayed completion has been decided or not? Owner department officers are requested to only mention either “Yes or No” against this option. (Option of writing “Not applicable” is only acceptable where work is completed before stipulated date of completion).		
	(b)	If extension of time for delayed completion has been decided, then amount of compensation levied, if any?		
16.	Is there any Conciliation/Mediation/Arbitration/Court Case(s) (from start of work till issue of this certificate), Owner/department officers are requested to only mention either “Yes or No”.			
17.	Status of owner/department Owner/department officers are requested to only mention (Central/State Government/PSU/Private)			
	(a)	Name of Project Manager or Executive or Equivalent		
	(b)	Address		
	(c)	Phone		
	(d)	e-mail		
18.	Remarks, if any			

The above work has been / was completed satisfactorily.

**Signature with seal and designation
(Project Manager or Executive
Engineer or
Equivalent Officer of owner
department)**

FORM - 'D-1'**Assessment of Quality for Completed as well as ongoing Works**

Name of work:

Date of inspection:

Date of submission of report:

A.	General Observation & Operational aspects	Yes/ No
1.	Availability of approval from local bodies in case of Construction of private buildings.	
2.	Availability of approved structural drawing	
3.	Observation on seepage/ leakage in the building	
4.	Whether line & level maintained	
5.	In case of basement, observation on seepage, if any	
6.	Any structural defects/ distress observed. If yes give details	
7.	Whether safety measures adopted at site as per CPWD Safety Code and or govt. guidelines are adequate or not	
8.	Whether the welfare facilities provided to labour as per clause 19 H of GCC for CPWD works/ and or govt. guidelines are adequate or not.	
9.	Whether AHU getting automatically switched off and fire dampers closed in case of fire signal	
10.	Whether thimbles used for termination of wires in DBs, EBDs & panels?	
B.	Quality of work	Marks Assessed
1.	Quality of plaster/ finishing	
2.	Quality of RCC/ CC work	
3.	Quality of flooring	
4.	Quality of wood work	
5.	Quality of steel work/ aluminum work	
6.	Quality of plumbing and sanitary installation	
7.	Quality of Workmanship	
8.	Quality of waterproofing	
9.	If cladding done, observation on efficiency/ quality of cladding/ brick work	
10.	Quality of internal electrification work	
11.	Quality of DBs, EBDs & panels?	
12.	Quality of E&M equipments, panels & feeder pillar	
13.	Quality of fire alarm system/ fire fighting system	
14.	Quality of Air Conditioning work	
15.	Quality of Sub-station based on complete live diagram, capacitor panel, power factor, insulating Mat, cleanliness, cable termination, earthing pits, earthing of transformer / DG sets	
16.	Any other aspects (To be elaborated)	

Average Marks (To be awarded out of 100 Marks based on average of marks assessed on each attribute mentioned as above.)

- **Note:-**

1. All the above parameters may be considered for assessing the overall quality of work executed by the contractor. Each attribute shall be assessed on maximum marks of 10 under B above.
2. In case, any attribute is not applicable, the same may not be included in assessment and mentioned are not applicable(N/A)
3. The works as assessed above shall be converted on a scale of 25/15 marks for completed/ongoing works, respectively.
IN case of eligible completed works being more than one the average marks assigned for eligible completed works shall be considered for marking purpose. Only one ongoing work to be assessed.

FORM - 'D-2'

**CERTIFICATE OF EXPERIENCE IN SUPPORT OF HAVING SUCCESSFULLY
COMPLETED ONE WORK WITH THE STRUCTURAL SYSTEM TECHNOLOGY
PROPOSED TO BE USED IN THE WORK**

1. Name of work/project and location
2. Owner or sponsoring organization
3. Cost of work in crores of rupees
4. Date of commencement as per contract
5. Stipulated date of completion
6. Actual date of completion
7. Type of structural system Technology used
8. Litigation/arbitration cases Pending/in progress with details
9. Name and address/telephone number of officer to whom reference may be made
10. Whether the work was done on back to back basis (yes /no)

Certified that M/s has completed the above work with the structural system technology as per details mentioned above

To be signed with date and seal of the owner / sponsoring organization

STRUCTURE AND ORGANIZATION

1. Name & Address of the bidder
2. Telephone No./Telex No./Fax No.
3. Legal status of the bidder (Scan & upload copies of original document defining the legal status)
 - a. An Individual
 - b. A proprietary firm
 - c. A firm in partnership
 - d. A limited company or corporation
4. Particulars of registration with various Government Bodies (Scan & upload attested photocopy)

Organization/Place of Registration	Registration No.
---	-------------------------

- 1.
- 2.
- 3.

5. Names and titles of Directors & Officers with designation to be concerned with this work.
6. Designation of individuals authorized to act for the organization
7. Has the bidder, or any constituent partner in case of partnership firm, limited company / Joint Venture, ever been convicted by the court of Law? If so, give details
8. In which field of Civil Engineering construction the bidder has specialization and interest?
9. Any other information considered necessary but not included above.

Signature of Bidder(s)

FORM – ‘F’**Undertaking on structural stability and soundness of already completed buildings and infrastructure projects.**

I/we undertake and confirm that any building / infrastructure constructed by our firm /partnership firm/ company has not suffered any failure, making it unfit for intended use, either due to structural design and defects or due to use of sub-standard materials or execution of sub-standard work, poor workmanship or any other reason during the last 25 (twenty-five) years.

I/we, further, undertake that if such information comes to the notice of CPWD, then Engineer-in-Charge shall be free to terminate the bid/agreement and to forfeit the entire amount of earnest money deposit, performance guarantee and security deposits.

I/we, also undertake that in addition to above, the Engineer-in-Charge shall be free to debar us forever from tendering in CPWD. The decision of Engineer-in-Charge or any higher authority shall be final and binding.

Signature of notary with seal

Signature of bidder or an
authorized person of the
firm with stamp

Note : (i) Affidavit to be furnished on a ‘Non-judicial’ stamp paper of Rs. 200/- (scanned copy of the notarized affidavit to be uploaded at the time of submission of bid)

RECEIPT OF DEPOSITION OF ORIGINAL EMD

(Receipt No...../date.....)

Name of work:- “Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Land-scaping & Art Work etc. in EPC Mode-III.

1. NIT No: - **10/ NIT/CE(PATNA)/CPWD/2026-27**
2. Estimated Cost: - Rs. 165,28,78,800/-
3. Amount of Earnest Money Deposit: -Rs. **1,75,28,788/-**
4. Last date of submission of bid: - **Up to 15.00 hours on 16-10-2026.**

(* to be filled by Executive Engineer Patna-2, CPWD, Patna)

1. Name of contractor: -#
2. Form of EMD: -#
3. Amount of Earnest money deposit#
4. Date of submission of EMD#

(# to be filled by EMD receiving EE)

EMD Drawn in favour of Executive Engineer, NIT Project Division, CPWD, Patna.

Signature, Name and Designation
of EMD receiving officer
along with Office stamp
(EE/AE(P)/AE/AAO)

Form – ‘H’**AFFIDAVIT**

I/we declare that, I/we have not been debarred/restrained/ black listed by CPWD, MoHUA or Ministry of finance etc.

Signature of
Notary with Seal

Signature of bidder or an authorized
person of the firm with stamp

Note: Affidavit to be furnished on a ‘Non-judicial’ stamp paper of Rs. 100/- (scanned copy of the notarized affidavit to be uploaded at the same time of submission of bid).

To be signed by the bidder and same signatory competent/authorized to sign the relevant contract on behalf of CPWD.

AFFIDAVIT

I/We undertake and confirm that eligible similar work (s) has / have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/We shall be debarred from bidding in CPWD in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

Signature of
Notary with Seal

Signature of bidder or an authorized
person of the firm with stamp

Note: Affidavit to be furnished on a ‘Non-judicial’ stamp paper of Rs. 100/- (scanned copy of the notarized affidavit to be uploaded at the same time of submission of bid).

To be signed by the bidder and same signatory competent/authorized to sign the relevant contract on behalf of CPWD.

On non-judicial stamp paper of minimum Rs. 100**(Guarantee offered by Bank to CPWD in connection with the execution of contracts) Form of
Bank Guarantee for Earnest Money Deposit/Performance Guarantee/Security Deposit/
Mobilization Advance**

1. Whereas the Executive Engineer.....(name of division)....., CPWD on behalf of the president of India (hereinafter called “The Government”) has invited bids under(NIT number).....datedfor..... (name of work).....The Government has further agreed to acceptirrevocable Bank Guarantee for Rs.....(Rupees.....only) valid upto.....(date)*.....as Earnest Money Deposit from(name and address of contractor).....(hereinafter called “the contractor”) for compliance of his obligations in accordance with the terms and conditions of the said NIT.

OR**

Whereas the Executive Engineer.....(name of division)....., CPWD on behalf of the president of India (hereinafter called “The Government”) has entered into an agreement bearing number.....with.....(name and address of contractor).....(hereinafter called “the contractor”) for execution of work.....(name of work).....The Government has further agreed to accept anirrevocable Bank Guarantee for Rs.....(Rupees.....only) valid upto.....(date).....as Performance Guarantee/ Security Deposit/ Mobilization Advance from the said contractor for compliance of his obligations in accordance with the terms and conditions of the agreement.

2. We, (indicate the name of bank).....(hereinafter referred to as "the Bank") hereby undertake to pay to the Government an amount not exceeding Rs. (Rupees..... Only) on demand by the Government within 10 days of the demand.
3. We,(indicate the name of the Bank)....., do hereby undertake to pay the amounts due and payable under this guarantee without any demure, merely on a demand from the Government stating that the amount claimed as required to meet the recoveries due or likely to be due from the said contractor(s). Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. (Rupeesonly).
4. We, (indicate the name of the Bank)....., further undertake to pay the government any money so demanded notwithstanding any dispute or disputes raised by the contractor in any suit or proceeding pending before any court or Tribunal, our liability under this Bank Guarantee being absolute and unequivocal. The payment so made by us under this Bank Guarantee shall be a valid discharge of our liability for payment there under and the contractor shall have no claim against us for making such payment.

5. We, (indicate the name of the Bank)....., further agree that the Government shall have the fullest liberty without our consent and without affecting in any manner our obligation hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor from time to time or to postpone for any time or from time to time any of the powers exercisable by the Government against the said contractor and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of the Government or any indulgence by the Government to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.
6. We, (indicate the name of the Bank)....., further agree that the Government at its option shall be entitled to enforce this guarantee against the bank as a principal debtor at the first instance without proceeding against the contractor and not with standing any security or other guarantee the government may have in relation to the contractor's liabilities.
7. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).
8. We, (indicate the name of the Bank)....., undertake not to revoke this guarantee except with the consent of the Government in writing.
9. This Bank guarantee shall be valid up to*.....unless extended on demand by the Government. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs. (Rupeesonly) and unless a claim in writing is lodged with us within the date of expiry or the extended date of expiry of this guarantee, all our liabilities under this guarantee shall stand discharged.

Date.....

Witness :

1. Signature.....

Name and address

Authorized signatory

Name

Designation

Staff code no.

Bank seal

1. Signature

Name and address

* Date to be worked out based on the basis of validity period of 90 days where only financial bids from the date of submission of tender.

** In paragraph 1, strike out the portion not applicable. Bank Guarantee will be made either for earnest money or for performance guarantee/security deposit/ mobilization advance, as the case may be.

On non-judicial stamp paper of minimum Rs. 100

MEMORANDUM OF UNDERSTANDING (MOU) FOR ASSOCIATED CONTRACTOR

M/s. (Name of the firm with full address)

(Henceforth called the Main Contractor)

And

M/s. (Name of the firm with full address)

(Henceforth, called the Associated Contractor)

Name of work:
.....

NIT No.

This MoU is made at on between
the..... (herewith called the main contractor) and
(herewith called the Associated contractor).

Whereas the main contractor has agreed to entrust the STRUCTURAL SYSTEM of **monolithic concrete construction system technology using Aluminium Formwork** only to the associated contractor.

We state that MoU between us will be treated as an agreement and has legality as per Indian Contract Act (amended up to date) and the department (CPWD) can enforce all the terms and conditions of this agreement for execution of the STRUCTURAL SYSTEM of **monolithic concrete construction system technology using Aluminium Formwork** only in respect of above work. Both of us shall be responsible for the execution of STRUCTURAL SYSTEM as per the agreement to the extent this MoU allows. In case of any delay in the payment by the main contractor, the associated contractor can apply to the CPWD to release the payment under Clause 7B and deduct the same from the bills of the main contractor. In case of any dispute, either of us will go for mediation by the CE or SE (as the case may be) and his decision shall be final and binding on both of us.

We have further agreed as under:

1. The Associated Contactor will execute STRUCTURAL SYSTEM of **monolithic concrete construction system technology using Aluminium Formwork** works as per terms and conditions of this agreement.
2. All the machinery and equipment, tools and tackles required for execution of the STRUCTURAL SYSTEM of **monolithic concrete construction system technology using Aluminium Formwork** works, as per this MoU, shall be the responsibility of the Associated Contractor.
3. The site staff required for the execution of STRUCTURAL SYSTEM of **monolithic concrete construction system technology using Aluminium Formwork** work shall be arranged by the Associated Contractor as per terms and conditions of this MoU.

4. All the correspondence regarding execution of the STRUCTURAL SYSTEM of **monolithic concrete construction system technology using Aluminium Formwork** work shall be done by the department with the main contractor. In case of non-compliance of the provisions of agreement of the work by the associated contractor, the main contractor shall be held responsible and action will be taken against him as per agreement provisions.
5. In case of non-performance, associated contractor will be debarred from participation or association in the CPWD tenders by the CPWD.

(Authorized Signatory)

SIGNATURE OF THE MAIN CONTRACTOR

Date :

Place :

1. Witness with address

(From main contractor side)

(Authorized Signatory)

SIGNATURE OF ASSOCIATED CONTRACTOR

Date :

Place :

1. Witness with address

(From associated contractor side)

PART – B
(Civil Works)

CONDITIONS FOR ASSOCIATE AGENCY FOR SPECIALIZED WORKS

1. The Contractor(s) shall submit MoU with Associate Specialized Firm along with their technical capability /experience and consent letter of Associate agency to be engaged by him within 1 months from date of start of work.
2. It shall be the responsibility of main contractor to sort out any dispute / litigation with the Specialized Agencies without any time & cost overrun to the Department. The main contractor shall be solely responsible for settling any dispute / litigation arising out of his agreement with the Specialized Agencies. The contractor shall ensure that the work shall not suffer on account of litigation/ dispute between him and the specialized agencies. No claim of hindrance in the work shall be entertained from the Contractor on this account. No extension of time shall be granted and no claim whatsoever, of any kind, shall be entertained from the Contractor on account of delay attributable to the Specialized Agencies.
3. The agency must be currently actively engaged in execution of the said specialized item and must have satisfactorily executed three similar works costing not less than 40% or two similar works costing not less than 60% or one similar works costing not less than 80% of estimated cost of that sub head (Estimated cost of specialized item shall be worked out by the engineer in charge) during last 7 (Seven) years from date of submission of proposals for approval of associate specialized agency.
4. In the event that the Associate Agency fails to perform satisfactorily or does not complete the assigned work within the stipulated time or as per the contractual requirements, the Main Contractor shall, upon receiving written directions from the Engineer-in-Charge, remove the Associate agency deployed on the work and shall submit proposal for approval of new associate agency. Such replacement shall be made without any delay, extension of time, or additional financial implication to the Department. No change of associate agency will be allowed without prior approval of the Engineer-in-charge of the work.

DETAILS OF ASSOCIATING AGENCY FOR SPECIALIZED WORKS :

I/we hereby propose the following agency for execution of specialized work component mentioned herein. Consent Letter from the proposed associated agency is enclosed.

- i. Name of work :
- ii. Component of specialized Work :
- iii. Name of Associated Agency :.....
- iv. Consent Letter of agency attached : (Yes/No)
- v. Copy of completion certificates of similar work experience attached: (Yes /No)

Encls: Self Attested photocopies of as stated above

Seal & Signature of the Main Contractor

Annex – ‘B’**CONSENT LETTER FROM ASSOCIATE AGENCY FOR SPECIALIZED WORKS****Name of Work:**

/ We hereby give my consent to associate with M/s....., for executing the (Mention category) component of specialized work of the above-mentioned work.

I / We will execute the work as per specifications and conditions of the agreement for the work and as per directions of the Engineer-in-Charge for the said component of specialized work till the completion of the work.

I / We will be responsible for necessary action to handover the installations and for rectification of defects and repair during the maintenance / warranty period.

I / We will employ full time technically qualified Engineer / supervisor for the said component of specialized work as required for the work.

I / We will attend inspection of work by officers of the department as and when required.

Dated:

Seal & Signature of Associate Contractor

**(Proforma of MoU with Associate Specialized Firm on a Non-Judicial stamp paper worth Rs.100/-)
MEMORANDUM OF UNDERSTANDING (MOU)
Between**

M/shaving his registered office at..... [Henceforth called the Main Contractor] which expression shall unless repugnant to the subject or context include its administrators, successors and assigns.

And

M/shaving his registered office at[Henceforth called Specialized Firm] which expression shall unless repugnant to the subject or context include its administrators, successors and assigns.

Whereas, the Central Public Work Department (CPWD), have called online Tenders for the work ofas per Scope of Work, Schedule of Quantities, Specifications, Terms and Conditions contained in the NIT.

Whereas, This Memorandum of Understanding has been entered into for assigning responsibility of execution of component of Specialized Work forming part of the above work to the Associate Specialized Firm in the event contract for the work is awarded to the Main Contractor.

Now therefore, it is agreed between the Parties here to as follows:

1. Both the parties have gone through and understood the various Terms & Conditions and Clauses of the proposed Contract for the work anticipated to be awarded to the Main Contractor and the Associate Specialized Firm willingly agree to abide by them as applicable to Specialized Work assigned to them.
2. The Associate Specialized Firm will execute complete component of Specialized Work in the wholesome manner as per Terms & Conditions of the Contract. However, both Parties shall be jointly and severally responsible for the execution of said component of Specialized Work as per the Contract.
3. It is understood that payment for component of Specialized Work even though executed by the Associate Firm, shall be done by the Department (CPWD) to the Main Contractor as per Terms & Condition of the Contract in an escrow account to be opened by the main contractor jointly with Associate Firm. The Parties have entered into separate agreement on Terms & Conditions for payment to be made by the Main contractor to the Associate Specialized Firm for the work done by them. The main Contractor shall promptly make payment to the Associate Specialized Firm as per agreed Terms & Condition between them.
4. In case of any dispute between Parties, either of them may go for mediation by the Engineer-in-charge. In the event of disagreement with decision of Engineer-in-Charge, either of the Parties may appeal to the CE, Patna in whose jurisdiction the work falls. His decision shall be final and binding on both Parties.

5. The Associate Specialized Firm shall be liable for disciplinary and penal action(s) as per Contract if he fails to discharge his contractual commitments related to component of Specialized Work as per the Contract.
6. All the machinery and equipment, tools and tackles required for execution of the Specialized Work, as per the Contract, shall be the responsibility of the Associate Specialized Firm.
7. The Technical and other site staff required for the said component of Specialized Work shall be arranged by the Associate Specialized Firm as per terms and conditions of the Contract.
8. Site Order Book & other Registers maintained for the said work shall be signed by the Representatives of Main Contractor as well as Associate Specialized Firm or their joint representative.
9. All the correspondence regarding execution of the component of Specialized Work shall be done by the department with the Associate Specialized Firm with a copy to the Main contractor. In case of non-compliance of the provisions of the Contract, the Main Contractor, as well as the Associate Specialized Firm shall be responsible and action under Clauses 2 and 3 may be initiated and taken against the Main Contractor.
10. This MoU between Parties will be treated as an agreement and has legality as per Indian Contract Act (amended up to date) and the Department (CPWD) can enforce all the Terms and Conditions of the Contract for execution of the above work.
11. This MOU shall be valid till the duration of completion of above work and shall be extended if so required by the CPWD.

Date:

Place:

Signature of Main Contractor
Firm

Signature of Associate Specialized

1. Witness with address

2. Witness with address

(From Main Contractor side)(From Associate Specialized Firm side)

ADDITIONAL CONDITIONS

1.0 COMPLIANCE WITH LOCAL BYE-LAWS, RULES AND REGULATIONS

The work shall be carried out in the manner complying in all respects with the requirements of relevant byelaws of the local body under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-Charge and nothing extra shall be paid on this account. The contractor shall give due notices to the Municipality, Police and /or other authorities as may be required under the law / rules under force and obtain all requisite licenses / permissions to carry out the work and pay all charges which may be leviable on account of his execution of the work under the agreement. Nothing extra shall be payable on this account.

In the event of any restrictions being imposed by Municipality, Police and traffic Police or any other authority having jurisdiction in the area on the working or movement of labour / material, the contractor shall strictly follow such restrictions and nothing extra shall be payable to the contractor on this account. The loss of time on this account, if any, shall have to be made up by engaging additional resources etc.

2.0 PROTECTION OF EXISTING STRUCTURES / SERVICES AND INTERFERENCE WITH OTHER WORKS

The contractor shall protect existing drains, pipes, cables, overhead wires, sewer lines, waterlines and other services encountered in the course of execution of the work, and shall repair any damage caused by him at his own expense. The contractor shall not store materials or otherwise occupy part of the site in a manner likely to hinder the operation of such services.

The contractor shall carry out his work so as not to interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Engineer-in-Charge and shall as far as possibly arrange his work and shall place and dispose of the materials being used or removed, so as not to interfere with the operations of other contractors. He shall arrange his work with that of the others in an acceptable and coordinated manner and shall perform it in proper sequence to the complete satisfaction of Engineer-in-Charge.

3.0 RECESSES, HOLES, OPENINGS, ETC.

The contractor shall leave such recesses, holes, openings, etc. as may be required for the electric, air-conditioning and other related works also for future provisions for which inserts, sleeves, brackets, conduits, base plates, clamps etc. shall fix the same at the time of casting of concrete, stone work and masonry work or at any similar location if required, and nothing extra shall be payable on this account.

4.0 TEMPORARY ELECTRICITY AND TELEPHONE CONNECTION FOR EXECUTION OF WORK

The contractor shall make his own arrangements for temporary electric and telephone connection, if required and make necessary payment including all initial cost, security money and electric / telephone charges for its use direct to the authority concerned. The Engineer-in-Charge will provide all possible assistance by way of reasonable recommendation for obtaining electricity connection to the concerned authorities but bears no responsibility for the same.

5.0 JURISDICTION OF COURT

Courts at Patna alone shall have the jurisdiction to decide any dispute arising out of or in respect of this contract.

6.0 TENDER DRAWINGS

The bid has been called in EPC Mode-III. All working architectural, structural and services drawings available at the time of tender have been enclosed with the tender documents. Any additional working drawings, if required, shall be issued by the Department subsequent to the award of work. The Contractor shall prepare and submit detailed shop drawings for required items well in advance and obtain approval of the Engineer-in-Charge prior to commencement of the respective activities.

In case the bidder requires any additional Good for Construction (GFC) drawings before submission of the bid, the same may be obtained from the Executive Engineer, Patna-2, CPWD, Patna. The Department shall not be responsible for any lack of knowledge on the part of the Contractor or for any consequences arising therefrom. The Department reserves the right to issue revised drawings, if considered necessary during execution of the work, and the Contractor shall execute the work accordingly without any claim for additional payment or extension of time, unless otherwise admissible under the contract.

It shall be deemed that the Contractor has fully satisfied himself regarding all site conditions, possible contingencies, incidental expenses, wastages, construction constraints, bottlenecks, sequencing requirements, and coordination among various agencies involved in the execution of the work. The Contractor shall make due allowance for the same while quoting his rates. No extra payment or compensation whatsoever shall be admissible on account of such factors or for any coordination required with other agencies during the execution of the work.

7.0 ORDER OF PREFERENCE

Should there be any difference or discrepancy between the description of items as given in the schedule of quantities, particular specifications for individual items of work (including special conditions) and I.S. Codes etc., the following order of preference shall be observed.

- (i) Description of Schedule of quantities
- (ii) General schedule and specification for the work
- (iii) Particular specifications and special condition if any
- (iv) Drawings
- (v) CPWD Specifications including correction slips issued up to the last date of submission of tender.
- (vi) PAR 2025 including correction slips issued up to the last date of submission of tender.
- (vii) DSR 2023 including correction slips issued up to the last date of submission of tender.
- (viii) National Building Construction Standards 2026 and relevant IS codes.
- (ix) ASTM, BS, or other foreign origin code mentioned in tender document.
- (x) Manufacturer's specifications and as decided by the Engineer-in-Charge.
- (xi) Sound Engineering practices or well-established local construction practices

8.0 ALL HEIGHTS, LIFTS, LEADS AND DEPTHS & ALL SLOPES

Unless otherwise specified in tender document, the rates tendered by the contractor shall be all inclusive and shall apply to all heights, lifts, leads and depths and all slopes of the building and nothing extra shall be payable to him on this account.

9.0 STACKING OF MATERIALS

The Contractor(s) shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, services and compound walls are to be constructed. The stacking shall take place as per stacking plan however, if any change is required, the same shall be done with the approval of Engineer-in-Charge.

10.0 PREVENTION OF NUISANCE AND POLLUTION CONTROL

The contractor shall take all necessary precautions to prevent any nuisance or in convenience to the owners, tenants or occupiers of adjacent properties and to the public in general and to prevent any damage to such properties from pollutants like smoke, dust, noise. The contractor shall use such methodology and equipment so as to cause minimum environmental pollution of any kind during and minimum hindrance to road users and to occupants of the adjacent properties or other services running adjacent/near vicinity. The contractor shall make good at his cost and to the satisfaction of the Engineer-in-Charge, any damage to roads, paths, cross drainage works or public or private property whatsoever caused due to the execution of the work or by traffic brought thereon by the contractor. All waste or superfluous materials shall be carried away by the contractor, without any reservation, entirely to the satisfaction of the Engineer-in-Charge.

11.0 DAMAGE CAUSED BY RAIN, SNOWFALL, FLOOD OR ANY OTHER NATURAL CALAMITY

No payment shall be made for any damage caused by rain, snowfall, flood, earth quake or any other natural calamity, whatsoever during the execution of the work. The contractor shall be fully responsible for any damage to the government property and the work for which payment has been advanced to him under the contract and he shall make good the same at his risk and cost. The contractor shall be fully responsible for safety and security of his material, T&P/Machinery brought to the site by him.

12.0 WATCH AND WARD/GUARD OF THE BUILDINGS

The contractor shall be responsible for the watch and ward/guard of the buildings, safety of all fittings and fixtures including all equipment, services provided by him against pilferage and breakage during the period of Installations and thereafter till the buildings are physically handed over to the RBI Patna or one year after physical date of completion whichever is earlier. No extra payment shall be made on this account and no claim shall be admissible on this account for this period.

13.0 PROTECTION OF FLORA

The contractor will take reasonable precautions to prevent his workman and employees from removing and damaging any flora (plant/vegetation) from the project area.

14.0 SETTING OUT

- (i) It shall be responsibility of the contractor to ensure correct setting out of alignment. Real Time Kinematics / Total Station survey instruments only shall be used for layout, fixing boundaries, and centre lines, etc., Nothing extra shall be payable on this account.
- (ii) Though the site levels are indicated in the drawings the contractor shall ascertain and confirm the site levels with respect to benchmark from the concerned authorities. The contractor shall protect and maintain temporary/ permanent benchmarks at the site of work throughout the execution of work. These benchmarks shall be got checked by the Engineer- in-Charge or his authorized representatives. The work at different stages shall be checked with reference to bench marks maintained for the said purpose. Nothing extra

shall be payable on this account.

- (iii) The contractor shall be entirely and exclusively responsible for the horizontal, vertical and other alignments, the level and correctness of every part of the work and shall rectify effectively any errors or imperfections there in. Such rectifications shall be carried out by the Contractor at his own cost to the entire satisfaction of the Engineer-in-Charge.

15.0 SCAFFOLDING/ SHUTTERING

Wherever required for the execution of work, all the scaffolding shall be provided and suitably fixed, by the Contractor. It shall be provided strictly with steel double scaffolding system, suitably braced for stability, with all the accessories, gangways, etc. with adjustable suitable working platforms to access the areas with ease for working and inspection. It shall be designed to take all incidental loads. It should cater to the safety features for workmen. Nothing extra shall be payable on this account. It shall be ensured that no damage is caused to any structure due to the scaffolding.

At the request of contractor, the use of Marine Ply shuttering for beams and columns may be permitted by Engineer-in-Charge. Nothing extra shall be paid on this account. Foam Sheet/ Jointing tape shall be used in the joints of shuttering to ensure no leakage of cement slurry. Nothing extra shall be paid on this account.

16.0 CO-OPERATION WITH OTHER CONTRACTORS /SPECIALIZED AGENCIES / SUBCONTRACTORS

The Contractor shall take all precautions to abide by the environmental related restrictions imposed by any statutory body having jurisdiction in the State as well as prevent any pollution of streams, ravines, river bed and water ways. All waste or superfluous materials shall be transported by the Contractor, entirely to the satisfaction of the Engineer-in-Charge and disposed at designated places only. Utmost care shall be taken to keep the noise level to the barest minimum so that no disturbance as far as possible is caused to the occupants / users of adjoining buildings. No claim what so ever on account of site constraints mentioned above or any other site constraints, lack of public transport, inadequate availability of skilled, semi-skilled or unskilled workers in the near vicinity, non-availability of construction machinery spare parts and any other constraints not specifically stated here, shall be entertained from the Contractor. Therefore, the Tenderers are advised to visit site and get first-hand information of site constraints. Accordingly, they should quote their tenders. Nothing extra shall be payable on this account.

- (i) The Contractor shall cooperate with and provide the facilities to the sub-Contractors and other agencies working at site for smooth execution of the work. The Contractor shall:
 - (a) Allow use of scaffolding, toilets, sheds etc.
 - (b) Properly co-ordinate their work with the work of other Contractors.
 - (c) Provide control lines and bench marks to his Sub-Contractors and the other Contractors.
 - (d) Provide electricity and water at mutually agreed rates.
 - (e) Provide hoist and crane facilities for lifting material at mutually agreed rates.
 - (f) Co-ordinate with other Contractors for leaving inserts, making chases, alignment of services etc. at site.
 - (g) Adjust work schedule and site activities in consultation with the Engineer-in-Charge and other Contractors to suit the overall schedule completion.
 - (h) Resolve the disputes with other Contractors/ sub-contractors amicably and the Engineer-in- Charge shall not be made intermediary or arbitrator.
- (ii) Other agencies will also simultaneously execute and install the works of substation / generating sets, air-conditioning, lifts, etc. for the work and the contractor shall afford

necessary facilities for the same.

- (iii) The contractor shall conduct his work, so as not to interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Engineer-in-Charge and shall as far as possible arrange his work and shall place and dispose off the materials being used or removed so as not to interfere with the operations of other contractor or he shall arrange his work with that of the others in an acceptable and in a proper co –ordination manner and shall perform it in proper sequence to the complete satisfaction of others.
- (iv) For completing the work in time, the Contractor might be required to work in two or more shifts (including night shifts). No claim whatsoever shall be entertained on this account, not with- standing the fact that the contractor may have to pay extra amounts for any reason, to the labour sand other staff engaged directly or indirectly on the work according to the provisions of the labour and other statutory bodies regulations and the agreement entered upon by the Contractor with them.
- (v) All material shall only be brought at site as per program finalized with the Engineer-in-Charge. Any pre-delivery of the material not required for immediate consumption shall not be accepted and thus not paid for.

17.0 SAFETY PRACTICES AND SUPERVISION

- (i) Necessary protective and safety equipment shall be provided to the Site Engineer, Supervisory staff, labour and technical staff of the contractor by the Contractor at his own cost and to be used at site.
- (ii) No in flammable materials including P.O.L shall be allowed to be stored in huge quantity at site. Only limited quantity of P.O.L may be allowed to be stored at site subject to the compliance of all rules / instructions issued by the relevant authorities and as per the direction of Engineer-in- Charge in this regard. Also all precautions and safety measures shall be taken by the Contractor for safe handling of the P.O.L products stored at site. All consequences on account of unsafe handling of P.O.L shall be borne by the Contractor.
- (iii) In addition to the supervision of work by CPWD engineers, the Consultants/safety teams deployed by the client RBI Patna shall also be carrying out regular and periodic inspection of the ongoing activities in the work and deficiencies, short comings, inferior workmanship pointed out by them shall be communicated by CPWD engineers to the contractor. Upon receipt of instructions from Engineer-in-Charge these are also to be made good by necessary improvement, rectification, replacement upto his complete satisfaction.
- (iv) All the hidden items such as water supply lines, drainage pipes, conduits, sewers etc. are to be properly tested as per the design conditions before covering and their record measurements in computerized measurement book duly checked shall be deposited with Engineer-in-Charge or his authorized representative, prior to hiding these items.
The contractor shall follow “Safety, Health and Environment Handbook 2019” issued by CPWD in 2019.

18.0 SUBMISSION AND DOCUMENTATION

- (i) The Contractor shall display all permissions, licenses, registration certificates, bar charts, other statements etc under various labour laws and other regulations applicable to the works, at his site office. He should also keep at site at least one set of BIS Codes and other relevant codes at site and produce the same if asked for by Engineer-in-Charge. In case of non-compliance, these codes will be purchased from the market and actual cost of purchase will be recovered from the next RA Bill of the Contractor.
 - (ii) The Contractor shall make available four (04) sets of completed Building Drawings and
- Correction...Nil Deletion... Nil Insertion...Nil Overwriting... Nil AE (C) (P) AE(E) (P) EE(C)-I*

services drawings like drainage, sewerage, water supply, road, culverts and electrical installations, “As Built Drawings” along with literatures, manuals, warranty certificates etc. of various installed fittings, fixtures and equipment for the completed projects. This shall be the prerequisite for payment of final bill.

19.0 PROGRAMME CHART:

The Contractor shall prepare an integrated programme chart within fifteen days of issue of award letter including civil as well as E & M activities for the execution of work, showing clearly all activities from the start of work to completion, with details of manpower, equipment and machinery required for the fulfillment of the program within the stipulated period and submit the same for approval of the Engineer-in-Charge. These shall be submitted by the contractor through electronic media besides forwarding hard copies of the same. The integrated programme chart so submitted should not have any discrepancy with the physical milestones attached in the contract agreement. The programme chart should include the following:

- (i) Descriptive note explaining sequence of various activities.
- (ii) Construction Programme prepared on latest version of **PRIMAVERA P6** Software, which will indicate resources in financial terms, manpower and specialized equipment for every important stage.
- (iii) Programme for procurement of materials by the contractor.
- (iv) Programme for arranging and deployment of man power both skilled and unskilled so as to achieve targeted progress.
- (v) Programme of procurement of machinery / equipment having adequate capacity, commensurate with the quantum of work to be done within the stipulated period, by the contractor.
- (vi) In case of non compliance / delay in compliance in this, a recovery @ **Rs. 10,000/-** per day will be imposed which will be recovered from the immediate next R/A Bill of the Contractor.
- (vii) If at any time, it appears to the Engineer-in-Charge that the actual progress of work does not conform to the approved programme referred above, the contractor shall produce a revised program within seven days showing the modifications to the approved programme with additional resources to ensure completion of the work within the stipulated time. A recovery of **Rs. 5,000/-** shall be made on per day basis in case of delay in submission of the modified programme.
- (viii) The submission for approval by the Engineer-in-Charge of such programme or the furnishing of such particulars shall not relieve the contractor of any of his duties or responsibilities under the contract. This is without prejudice to the right of Engineer-in-Charge to take action against the contractor as per terms and conditions of the agreement.
- (ix) Contractor shall provide a **laptop (latest version i.e. i7/ ryzen7, 16 GB RAM, 6 GB Graphics, 01 TB SSD, Windows 10 operating system)** with 1 no. latest version of **PRIMAVERA P6** Software, BIM Software and MS Office installed in it as per direction of Engineer-in-charge and shall be maintained by the agency till completion of work. The EPC contractor should purchase the same through local vendor to ensure technical support during execution of project.

20. CLEANLINESS OF SITE AND INSPECTIONS

The contractor shall take instructions from the Engineer-in-Charge regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, services and compound walls are to be constructed.

- (i) Senior Officers of CPWD, Dignitaries from Central Ministry / Department, RBI Patna authorities shall be inspecting the on-going work at site at any time with or without prior intimation. The contractor shall, therefore, keep updated the following requirements and detailing.
 - a) Display Board showing detail of work, weekly progress achieved with respect to targets, reason of short fall, status of manpower, wages being paid for different categories of workers.
 - b) Entrance and area surrounding to be kept clean.
 - c) Display layout plan, key plan, building drawings including plans, elevations and sections.
 - d) Upto date displays of Bar chart, CPM and PERT etc.
 - e) Keep details of quantities executed, balance quantities, deviations, possible Extra item, substituted Item etc.
 - f) Keep plastic / cloth mounted one sets of building drawings.
 - g) Set of Helmets and safety shoes for exclusive use for officers/ dignitaries visiting at site.

21.0 PRODUCT DELIVERY, STORAGE AND HANDLING OF CHEMICALS

- (i) The contractor shall construct storage space for Chemicals materials to ensure that the storage conditions are as recommended by the manufactures.
- (ii) All the materials shall be procured and delivered in sealed containers with labels legible and intact.
- (iii) All the chemicals {polymers, epoxy, water proofing compound, plasticizer, Polysulphide, SBR based elastomeric, APP (Atactic Polypropylene Polymer), all exterior and interior paints, polish etc.) shall be procured in convenient packs say 20 litres/kg} capacity packing only or as approved by the Engineer-in-Charge, and not in bigger capacity containers, say 200 litre (kg) drums unless otherwise specifically permitted by the Engineer-in-Charge. One sample from each lot of the chemical procured by the contractor shall be tested in a laboratory as approved by the Engineer- in-Charge.
- (iv) All material required for the execution of the work shall be got approved, procured and deposited with the Departmental supervisory staff. The materials shall be kept in joint custody of the contractor and the Department. The watch and ward of such material shall, however, remain to be the responsibility of the contractor and no claim, what so ever, on this account shall be entertained. Different containers of each chemical shall be serially numbered on packing and also consumed in that order. Day-to-day account of receipt, issue and balance shall be regulated by the Department and proper account shall be maintained at site of work in the prescribed form as per the standard practice.
- (v) All the chemicals shall be procured by the contractor directly from the manufacturer. In exceptional circumstances, the contractor may be allowed to procure the materials from the authorized dealers of the manufacturers, if specifically permitted by the Engineer-in-Charge.
- (vi) The original copies of challan /cash memos towards the quantity of various chemicals procured shall be made available by the contractor at the request from the Engineer-in-Charge

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and a copy of the same shall be kept in record.

- (vii) The Name of manufacturers, manufacturer's product identification, manufacturer's mixing instructions, warning for handling and toxicity and date of manufacturing and shelf life shall be clearly and legibly mentioned on the labels of each container.
- (viii) The contractor shall submit for the chemicals procured, manufacturer's sand /or authorized dealer's certificate regarding supplying and verifying conformance to the material specifications, as specified.
- (ix) All filled containers shall be handled in safe manner and in a way to avoid breaking container seals.
- (x) Empty containers of the chemicals should not be removed from site till the completion of work and shall be removed only with the written approval of the Engineer-in-Charge.
- (xi) All arrangements for measuring, dosing and mixing of material / chemicals at site have to be made by the contractor.
- (xii) Contractor shall suitably advise his site Engineer and all the workers as regards safe handling of chemicals. Necessary protective and safety equipment's in form of hand gloves, goggles etc. shall be provided by the contractor and be also used at site.
- (xiii) All incidental charges of any kind including cartage, storage and wastage and safe custody of material etc. shall be borne by the contractor and no claim, whatsoever, shall be entertained on this account.
- (xiv) The chemicals shall be tested in an independent laboratory as approved by the Engineer-in-Charge at the frequency as specified. If required, more samples may have to be tested as per the directions of the Engineer-in-Charge. Nothing extra shall be payable on this account. However, testing charges shall be borne by the department for the samples satisfying the requirements specified in the tender.

22.0 DE-WATERING

- (i) De-watering required, shall be done conforming to BIS Code IS: 9759 (guide lines for de-watering during construction) and / or as per the methodology/ specifications approved by the Engineer-in- Charge. Design of an appropriate and suitable dewatering system shall be the Contractor's responsibility.
- (ii) Such scheme shall be modified / augmented as the work proceeds based on fresh information discovered during the progress of work, at no extra cost. At all times during the construction work, efficient drainage of the site shall be carried out by the Contractor and especially during the laying of plain cement concrete, taking levels etc. The Contractor shall also ensure that there is no danger to the nearby properties and installations on account of such lowering of water table. If needed, suitable precautionary measures shall be taken by the Contractor. Also the scheme of dewatering adopted shall have adequate built in arrangement to serve as stand-bye to attend to repair of pumps etc. and disruption of power / fuel supply. Nothing extra shall be payable on this account.
- (iii) In trenches where surface water is likely to get into cut / trench during monsoons, a ring bund of puddle clay or by any other means shall be formed outside, to the required height, and maintained by the Contractor. Also, suitable steps shall be taken by the Contractor to prevent back flow of pumped water in to the trench. Nothing extra shall be payable on this account.
- (iv) For works below ground level the contractor shall keep that area free from water. If dewatering or bailing out of the water is required, the contractor shall do the same at his own cost and nothing extra shall be paid. Nothing extra shall be paid for execution of work in or under water and / or liquid mud including pumping out of water as required.

23.0 PREPARATION OF SAMPLE

A sample shall be prepared in all buildings sample of one typical room and one typical toilet block in each shall be prepared in all respect. Samples shall be prepared by the contractor well in advance before taking up the mass execution at the appropriate time as intimated by Engineer-in-Charge or as indicated in the Mile Stone table. These sample rooms, toilets etc. shall be made in respective buildings.

24.0 The contractor shall provide water and electricity for testing of pipe lines and E & M works.

25.0 QUALITY ASSURANCE WINGS OF CPWD

In order to achieve high standards of materials, workmanship and overall quality of the execution, the quality assurance shall be got done by the team of CPWD officials from ADG/TPQA/. These agencies will carry out the checks of the quality assurance procedures followed at site, take samples of the materials for independent testing and check the workmanship of the works carried out. The contractor shall extend full cooperation to the QA in facilitating the inspections and collection of samples and regulate the execution stages with regards to the hold and witness points which shall be strictly adhered to by the contractor. The contractor shall be required to co-operate with agency in carrying out various activities including documentation at no extra time and cost to the owner. In case of any adverse findings by the QA, the contractor shall do the needful rectifications to the entire satisfaction of the QA Wing. If contractor fails to rectify the defects of the serious nature within a reasonable time frame no further payment shall be made or Engineer in charge will take any action as deemed fit. If work is stopped due to non- rectification of defects and delay occurs on this account, no relief incompleteness of milestone by way of grant of EOT or any other relaxation be given.

QA team will conduct test as per TPQA CPWD circular and carry out tests on input materials and construction activity as per guidelines on Quality Control Systems for Building Code and CPWD specification. Random Sampling of materials for testing will be done by QA team in such a way that a minimum of 10% of all mandatory test recommended as per CPWD specifications/ contracts specifications are covered and it represents the whole work. The samples shall be collected in presence of representatives of construction agency and clients.

QA team shall use field lab established by the EPC contractor at site for testing of samples. In case any sample collected by the QA team sent to outside lab for conducting tests then testing charges including cost of materials, packaging, transportation charges shall be borne by the contractor. Tests conducted by QA team shall be counted towards mandatory requirement of tests to be conducted in outside approved lab for quality assurance.

26.0 CONSTRUCTION VEHICLES TYRE WASHING FACILITIES

All the vehicles leaving the site shall be loaded in such a manner that the excavated materials, mud or debris will not be deposited on roads. All such loads shall be covered or protected to prevent dust being emitted. The wheels of all vehicles shall be washed properly before leaving the site to avoid the deposition of mud and debris on the roads. The contractor shall provide a wash pit and a wheel washing facility with high pressure water jets for this purpose. Also, the contractor shall make necessary arrangements for sweeping and removal of mud from roads if it is deposited even after washing of wheels of vehicles leaving site. A penalty of Rs. 2000 per day for violation of such measures shall be levied. Nothing extra shall be paid for providing and maintaining this facility.

27.0 COMPLIANCE TO ENVIRONMENTAL LAWS

The contractor shall comply the directives of Hon'ble National Green Tribunal dated 04.12.2014 & 10.04.2015 and EIA Guidance Manual issued in February 2010 and Construction & Demolition Waste Management Rules, 2016. The compliance of the contractor shall not be limited to the following:

- (i) The contractor shall not store/ dump construction material or debris on metalled road.
- (ii) The contractor shall get prior approval from Engineer-in-Charge for the area where the construction material or debris can be stored beyond the metalled road. This area shall not cause any obstruction to the free flow of traffic /inconvenience to the pedestrians. It should be ensured by the contractor that no accidents occur on account of such permissible storage.
- (iii) The contractor shall ensure that all the trucks or vehicles of any kind which are used for construction purposes/ or are carrying construction material like cement, sand and other allied material are fully covered. The contractor shall take every necessary precaution that the vehicle are properly cleaned and dust free to ensure that enroute their destination, the dust, sand or any other particles are not released in air/contaminate air.
- (iv) The contractor shall provide mask to every worker working on the construction site and involved in loading, unloading and carriage of construction material and construction debris to prevent inhalation of dust particles.
- (v) The contractor shall provide all medical help, investigation and treatment to the workers involved in the construction of building and carry of construction material and debris relatable to dust emission.
- (vi) The contractor shall ensure that C&D waste is transported to the approved C&D waste site of local authority only as per Construction & Demolition Waste Management Rules, 2016 and due record shall be maintained by the contractor.
- (vii) The contractor shall compulsorily use jet in grinding and stone cutting.
- (viii) The contractor shall comply all the preventive and protective environmental steps as stated in the MoEF Guidelines, 2010.
- (ix) The contractor shall carryout on-road-inspection for black smoke generating machinery. The contractor shall use cleaner fuel.
- (x) The contractor shall ensure that the DG sets comply emission norms notified by MoEF.
- (xi) The contractor shall use vehicles having pollution under control certificate. The emissions can be reduced by a large extent by reducing the speed of a vehicle to 20 kmph. Speed bumps shall be used to ensure speed reduction. In cases where speed reduction cannot effectively reduce fugitive dust, the contractor shall divert traffic to nearby paved areas.
- (xii) The contractor shall ensure that the construction material is covered by tarpaulin. The contractor shall take all other precaution to ensure that no dust particles are permitted to pollute air quality as a result of such storage.
- (xiii) No extra payment will be made for operation/activity mentioned at Sl. No. i to xiii above.

28.0 STRUCTURAL DRAWINGS FOR STRUCTURAL SAFETY

The EPC contractors ensure that all structural drawings and designs are available before commencement of work.

Following guidelines to be followed where height of casting of concrete is higher than 3.5 m or where higher loading are coming during casting of concrete or large span structure more than 8 meter long or some special structure like domes, vaults etc.

- I. Centering/ scaffolding/ staging for casting of these structures should be properly designed by a qualified and experienced person/agency having past experience in design of false work (centering) for concrete structures and should be proof checked by similar experienced person/ agency and it should be properly approved by Engineer-in-Charge. The provisions of clause 7 of IS:14687 may be referred for design of false work (centering).
- II. A method statement for erection and dismantling of the centering/ scaffolding/ staging and process of concreting shall be prepared by contractor and submitted to Engineer-in-Charge for approval and the work shall be commenced only after approval of method statement by Engineer-in-Charge. The provisions of clause 9 of IS: 14687 may be referred for erection of false work (centering), safety precautions and other site operations, pertaining to false work (centering).
- III. Engineering form watcher shall be engaged during erection, concreting and dismantling for early detection of any movement or instability in the system.
- IV. A detailed programme of field safety inspection of centering/ scaffolding/ form work of such structures during different stages should be chalked out and strictly followed.
- V. Provision of safety net, fall arresting system including other safety gears, for workers, working over these structures shall be made in contract and should be followed strictly.

29.0 For avoiding of scratch marks or damage to the vitrified / ceramic floor tile, the necessary arrangement of hessian cloth with a coat of plaster of paris over it shall be provided. Nothing shall be paid extra on this account.

30.0 Protection of existing buildings in the vicinity of working area and valuables shall be responsibility of the contractor. Fall nets and scaffolding nets for protection from debris/ dusts and noise etc. are to be provided during the construction period.

31.0 The huts for labour are to be erected outside of the campus by the contractors at his own cost. He shall also identify suitable place for installation of fully automatic concrete batch plant, yard for keeping various materials, cement/steel store outside the RBI Patna campus. Suitable place for erection of labour huts, batching plant and other stores shall be identified in consultation with CPWD. All labour and staff of contractor shall possess valid identity cards such as Aadhar Card, Voter Card etc. Before tendering, he shall visit the site and assess the manner in which he is able to arrange the above facilities. The Engineer-in-Charge shall in no way be responsible for any delay on these accounts and no claim, whatsoever, on these accounts shall be entertained.

32.0 The duly signed original copies of challan/cash memos towards the quantity of various materials procured shall be made available by the contractor and a copy of the same shall be kept in record. Warranty/ Guarantees cards of various materials shall also be submitted by the contractor before recording Completion Certificate of the building.

33.0 Quality Assurance: Quality of work is of paramount importance. Contractor will be required to engage well-experienced supervisors, engineers, skilled labour and deploy modern T&P and other equipments to execute the work in a time bound manner. Many items like exposed finish form work, specialized flooring work, factory made door-window shutters, proper slope maintaining in toilet units, sanitary- water supply installation, textured finishing, aluminium and glass work and water proofing treatment will specially require engagement of skilled workers having experience particularly in execution of such items.

The contractor shall ensure quality construction in a planned and time bound manner. Any sub- standard material / work beyond set out tolerance limit shall be summarily rejected by the Engineer-in-Charge & contractor shall be bound to replace/ remove such sub-standard/ defective work immediately. If any material, even though approved by Engineer-in-Charge is found defective or not conforming to specifications shall be replaced / removed by the contractor at his own risk & cost.

In addition to the supervision of work by CPWD engineers, the Consultants / Quality Assurance team of CPWD / Third party Quality Assurance and representatives of RBI Patna shall also be carrying out regular and periodic inspections of the on-going activities in the work and deficiencies, short comings, inferior workmanship pointed out by them shall be communicated by CPWD engineers to the contractor. Upon receipt of instructions from Engineer-in-Charge these are also to be made good by necessary improvement, rectification, replacement upto his complete satisfaction. Special attention shall be paid towards line and level of internal and external plastering, exposed smooth surface of RCC members by providing fresh shuttering plates, rubberized linings to all the shuttering joints, accurate joinery work in wooden doors and windows, thinnest joints in stone/ tiling / cladding work, non-hollowness in floor and dado tiles work, protection of scratches over flooring by impounding layer of Plaster of Paris, water tight pipe linings, absence of hollow vertical joints in brick masonry, proper compaction of filled up earth and up keeping of quality assurance shall be of paramount importance. It is proposed to have monthly meeting having CPWD officers, RBI Patna officials, members of quality assurance or any one nominated by Engineer-in-charge, consultant of EPC contractor etc for progress review. The progress of the work shall be captured using CCTV camera. The details are as under :-

- 1. The agency shall provide the required number (minimum 10) of CCTV cameras of approved specifications at site including its live coverage for monitoring and real time update of the work as per the directions of the Engineer- in-Charge. The charges for installation, operation and maintenance of CCTV cameras shall be borne by the agency and nothing extra shall be paid on this account.**
- 2. PTZ and Bullet type CCTV cameras for monitoring construction work for all building shall be provided by the agency. The video feed from these cameras shall be available for viewing remotely as per direction of Engineer-in-Charge. Video management system will be installed at Command-and-control centre in the Directorate, which will facilitate the EEs, CE/SE, CE cum ED/ SE cum PD and SDG/ ADG for remote viewing of project. Minimum 4 cameras along with mounting arrangement, cabling including all necessary hardware and software shall be installed. To enable this remote viewing, the bidder will be required to take internet connection and make necessary payments for the same to the service provider, nothing extra shall be payable.**
- 3. The Contractor shall make arrangement of at least 02 (Two) high-definition mirror less Cameras of make Sony, Canon, Nikon or equivalent capable of recording 4K video for the documentation of the project during construction. These camera are separate from the monitoring camera.**

Note : Inspection done by vigilance team of CPWD or CTE, and their observations shall be complied by the agency.

34.0 Method Statement: The Contractor shall submit within 15 (fifteen) days after the date of award of work, a detailed and complete method statement for the execution, testing and Quality Assurance. All the materials to be used in the work to give the finished work complete in all respects, shall comply with the requirements of the specifications and shall pass all the tests required as per specifications as applicable or such specifications / standards as directed by the Engineer-in-Charge. However, keeping the Quality Assurance in mind, the Contractor shall submit, on request from the Engineer-in-Charge, his own Quality Assurance procedures for basic materials and such items, to be followed during the execution of the work, for approval of the Engineer-in-Charge.

35.0 Checklist

- (i) As and when any important item is taken up for execution, the Contractor shall submit the specifications and invariably make a checklist. This checklist should be got approved from the Executive Engineer / Executive Engineer and Senior Manager, and should be shown to the inspecting officers. The important items inter-alia include foundation work, including reinforcement and shuttering, brick work, doors & windows, plumbing, including water supply pipe lines, roof treatment, earth filling etc. which are a few illustrative items for checklist purpose.

Sample checklists for items of concrete for raft, columns/ beams/ slabs, water supply lines, brick work and plastering are given in CPWD Specification 2019 with correction slip upto last date of submission of bid. In addition to this all other important items such as flooring, door windows, sanitary, painting etc. shall be made on these guidelines in consultation with Engineer-in-Charge.

The tests, as necessary, shall be conducted in the laboratory approved by the Engineer-in-Charge. The samples shall be taken for carrying out all or any of the tests stipulated in the particular specifications and as directed by the Engineer-in-Charge or his authorized representative.

All the registers of tests carried out at Construction Site or in outside laboratories and all material at site (MAS) registers including cement register shall be maintained by the contractor which shall be issued to the contractor by Engineer-in-Charge. All the entries in the relevant registers will be made by the designated Engineering Staff of the contractor and same should be regularly reviewed by JE/ AE/ AEE/ EE/ EE&SM/ CE of CPWD. Contractor shall be responsible for safe custody of all the registers.

The Contractor shall at his own risk and cost make all arrangements and shall provide free of cost all such facilities including material and labour, the Engineer-in-Charge may require for collecting, preparing, forwarding the required number of samples for testing as per the frequency of test stipulated in the contract specifications or as considered necessary by the Engineer-in-Charge, at such time and to such places, as directed by the Engineer-in-Charge. Nothing extra shall be payable for the above.

The Contractor or his authorized representative shall associate in collection, preparation, forwarding and testing of such samples. In case he or his authorized representative is not present or does not associate him, the result of such tests and consequences thereon shall be binding on the Contractor. The Contractor or his authorized representative shall remain in

contact with the Engineer-in-Charge or his authorized representative associated for all such operations. No claim of payment or claim of any other kind, whatsoever, shall be entertained on this account.

36.0 TESTING CHARGES:

Samples of all materials required for testing is included in the cost of work. Similarly expenditure for testing in house or through **outside approved laboratory shall be borne by the contractor**. Frequency of testing of material will be as per frequency laid down in CPWD Specification or otherwise specified. **No reimbursement of testing charges shall be done.**

If any load testing or special testing is to be done for any sample whose strength is doubtful, the cost of the same shall also be **borne by the contractor**. All the hidden items such as water supply lines, drainage pipes, conduits, sewers etc. are to be properly tested as per the design conditions before covering.

Water tanks, taps, sanitary, water supply and drainage pipes, fittings and accessories should confirm to by laws and municipal body / corporation where CPWD Specifications are not available. The contractor should engage licensed plumbers for the work and get the materials (fixtures/ fittings) tested by the Municipal Body/ Corporation authorities wherever required at his own cost. The contractor shall give performance test of the entire installation (s) as per the standing specifications before the work is finally accepted and nothing extra whatsoever shall be payable to the contractor for the test.

The contractor shall have to execute guarantee bonds in respect of specified items mentioned in tender document.

The Contractor shall arrange electricity at his own cost for testing of the various electrical installations as directed by Engineer-in-Charge and for the consumption by the contractor for executing the work. Also, all the water required for testing various electrical installations, fire pumps, wet riser / firefighting equipments, fire sprinklers etc. and also testing water supply, sanitary and drainage lines, water proofing of underground sump, overhead tanks, water proofing treatment etc. shall be arranged by the contractor at his own cost. Nothing extra shall be payable on this account.

Quality Assurance is to be done by CPWD team of **ADG Patna office/TPQA/Expert**. Contractor shall co-operate with the Quality Assurance team of CPWD /**TPQA/Expert** for quality assurance of the construction work. The Quality Assurance team of CPWD/**TPQA/Expert** will collect the samples of construction materials/ reinforcement for necessary tests. The samples would be collected jointly in the presence of the representatives of contractor and Engineer-in-Charge. The cost of sample materials/ reinforcement, packaging, transportation charges shall be borne by contractor. All necessary test records shall be produced and maintained by the quality engineer of contractor.

Rate quoted by contractor is inclusive of GST and Labour Cess, nothing is payable on this account.

- 37. GREEN BUILDING PRACTICE:** The project is targeted to achieve a GRIHA 5-Star rating. All materials, fittings, fixtures, equipment, and systems incorporated into the works shall comply with the requirements of Super ECBC (Energy Conservation Building Code) or any applicable revisions thereto.

The Contractor shall execute the works in strict accordance with the green building requirements and shall adopt all necessary measures to facilitate the achievement of the targeted GRIHA 5-Star rating. The Contractor shall comply with all recommendations, specifications, and instructions issued by the Project Consultant and the Engineer-in-Charge in relation to green building compliance, sustainability requirements, documentation, material submittals, testing, and construction practices necessary for obtaining the proposed rating.

- 38. CPWD SITE OFFICE:** The Contractor shall construct and maintain a temporary site office for the exclusive use of the CPWD site staff, as per the layout approved by the Engineer-in-Charge, with a minimum carpet area of 500 sq. ft. The site office shall include separate toilet facilities, adequate lighting, AC/ fans, electrical wiring, drinking water, and all other amenities required for its proper functioning.

The site office shall be furnished with at least four (4) office tables, four (4) executive office chairs, adequate number of visitor chairs and four (4) All-in-One desktop computers for use by the Executive Engineer (EE), Assistant Engineer (AE), and Junior Engineer (JE), along with a printer, internet connectivity, and other essential office accessories as directed by the Engineer-in-Charge. The office shall also include a conference room with adequate furniture for meetings and a dedicated area for displaying material samples approved by the Engineer-in-Charge.

In case adequate space is not available at the site during the initial stages of construction, the Contractor may provide two (2) portable cabins (porta cabins) with attached toilet facilities for use as the CPWD site office until the podium slab is completed. Thereafter, the Contractor shall construct the temporary site office as specified above.

The Contractor shall maintain the site office, furniture, equipment, utilities, and toilet facilities in good, clean, and serviceable condition throughout the execution of the work. Upon completion of the work and finalization of accounts, the Contractor shall dismantle the temporary site office/porta cabins, remove all furniture and equipment provided by him, and restore the site to its original condition or as directed by the Engineer-in-Charge.

No extra payment shall be made on account of construction, furnishing, operation, maintenance, utilities, dismantling, removal of the site office, or restoration of the site, and the quoted rates shall be deemed to include all such costs.

38. The scope of the defect liability will be as under:

S.No	Description	Defect Liability
(i)	Concrete	(a) Rectification of structural /superficial/non-structural cracks. (b) Rectification of dampness/leakages/seepage in roof slab/junctions & sunken portion, depressed portion, through RCC slab, vertical ties, bands, walls, base slab, junction of RCC walls with base slab and construction joints of RCC water tanks. (c) Rectification of cracks in beam, slab, column, lintels, vertical ties, plinth bands, lintel bands etc.

(ii)	Brick work/AAC blockwork Solid Concrete blockwork	(a) Rectification of cracks in confined masonry panel wall/partition wall in full length or in part portion. (b) Cracks / settlement of main wall, partition wall or dwarf walls. I Rectification of efflorescence, dampness.
(iii)	Woodwork & Joinery	(a) Replacement of warped / bent / weather affected joinery, termite & borer affected joinery of wooden door / window shutters and frames. (b) Cracks in panels, bars / rails / styles of wooden door / window shutters etc.
(iv)	Builders Hardware	(a) Repairs / Replacement of loosened / premature failure of fittings including lever mechanics in door locks, hydraulic door closers, handles, tower bolts, cupboard locks etc. (b) Tightening / Replacement of sag in mosquito proofing SS net.
(v)	Steel & iron work	(a) Rectification / Replacement of defective part of gate, shutter, etc. (b) Redoing of defective portion in fabrication / welding including painting thereon. I Structural steel work and MS railing with Epoxy paint. (d) Windows, grills, gates etc. – Defects to be rectified.
(vi)	Roof treatment	(a) Rectification of leakage / seepage in roof slab, expansion/ seismic joints, floor junctions, inadequate/ faulty slope, drain outlets, including covering at junction till guarantee period.
(vii)	Finishing	(a) Rectification of structural / superficial cracks. (b) Rectification of protruding / peeling off plaster. I Rectification of efflorescence, dampness appeared. (d) Undulation / unevenness in plaster. I Paint & polishing.
(viii)	Flooring	(a) Rectification of sunken / deflected / depressed portion of plinth protection, flooring in rooms, toilets, entrance foyer, staircase and other locations. (b) Rectification / Replacement of settled floors. I Settlement of foundation & floors and resultant undulation of door finishes. (d) Rectification / Replacement of floor tiles which are sunken / uneven / undulating at joints / different in colour, texture, etc.
(ix)	Aluminium/ uPVC Doors & windows and Flush doors	(a) Rectification / Replacement of defective part of uPVC windows and flush door shutters.

Note:

- (i) The above list is illustrative for civil work and not exhaustive. The rectification will include all Civil and Electro-Mechanical works including internal and external services without any exclusion.
- (ii) Security deposit will be released as per Schedule-F after expiry of periods from the date of completion of work on satisfactory performance during defect liability period.

SPECIAL CONDITIONS FOR CEMENT

1. In all contracts where departmental issue of cement and steel is not stipulated, special conditions shall be incorporated as below:

1.1 Conditions for Cement (Grey Cement).

- i) The contractor shall procure 43 grade ordinary Portland cement conforming to IS 8112/Portland Pozzolana Cement (PPC) [conforming to IS:1489 (Part-I)], as required in the work, from reputed manufacturers of grey cement as mentioned in approved list of materials or from any other reputed cement Manufacturer having a production capacity not less than one million tones per annum as approved by **Chief Engineer/Chief Project Manager for that zone**. Supply of cement shall be taken in 50 Kg. bags bearing manufacturer's name and ISI marking. Samples of cement arranged by the Contractor shall be taken by the Engineer-in-charge and got tested in accordance with provisions of relevant BIS codes. In case the test results indicate that the cement arranged by the contractor does not conform to the relevant BIS codes, the same shall stand rejected and shall be removed from the site by the Contractor at his own cost within a week's time of written order from the Engineer-in-charge to do so.

- ii) Use of Portland pozzolana/ordinary portland/ portland slag cement, admixtures in recommended proportions as per IS : 9103 shall be used in RCC structures in accordance with the circular issued by the Directorate General of Works vide dated -16-02-2021- The use of cement shall be regulated as per the following conditions stipulated in the circular dt. 09.04.2009:-

- a) IS:456-2000 Code of Practice for Plain and Reinforced Concrete (as amended upto date) shall be followed in regard to Concrete Mix Portion and its production as under:
- (i) The concrete mix design shall be done as "Design Mix Concrete" as prescribed in clause-9 of IS 456 mentioned above.
- (ii) Concrete shall be manufactured in accordance with clause 10 of above mentioned IS:456 covering quality assurance measures both technical and organizational, which shall also necessarily require a qualified Concrete Technologist to be available during manufacture of concrete for certification of quality of concrete.
- b) Minimum M-30 grade of concrete shall be used in all structural elements made with RCC both in load bearing and framed structure.
- c) The mechanical properties such as modulus of elasticity, tensile strength, creep and shrinkage of flyash mixed concrete or concrete using flyash blended cements (PPCs) are not likely to be significantly different and their values are to be taken same as those used for concrete made with OPC.
- d) To control higher rate of carbonation in early ages of concrete both in flyash admixed as well as PPC based concrete, water/binder ratio shall be kept as low as possible, which shall be closely monitored during concrete manufacture. If necessitated due to low water/binder ratio, required workability shall be achieved by use of chloride free chemical admixtures conforming to IS:9103. The compatibility of chemical admixtures and super

plasticizers with each set OPC, fly ash and /or PPC received from different sources shall be ensured by trials.

- e) In environment subjected to aggressive chloride or sulphate attack in particular, use of flyash admixed or PPC based concrete is recommended. In case, where structural concrete is exposed to excessive magnesium sulphate, flyash substitution/content shall be limited to 18% by weight. Special type of cement with low C3A content may also be alternatively used. Durability criteria like minimum binder content and maximum water/binder ratio also need to be given due consideration in such environment.
 - f) Wet curing period shall be enhanced to a minimum of 10 days or its equivalent. In hot & arid regions, the minimum curing period shall be 14 days or its equivalent.
 - g) Subject to General Guidelines detailed out as above, PPC manufactured conforming to IS:1489 (Part-I) shall be treated at par with OPC for manufacture of Design Mix Concrete for structural use in RCC.
 - h) Till the time, BIS makes it mandatory to print the %age of flyash on each bag of cement, the certificate from the PPC manufacturer indicating the same shall be insisted upon before allowing use of such cements in works.
 - i) While using PPC for structural concrete work, no further admixing of flyash shall be permitted.
- III. The cement shall be brought at site in bulk supply of approximately 50 tonnes or as decided by the Engineer- In- Charge. The cement godown of the capacity to store a minimum of 2000 bags of cement or as decided by NIT approving authority in case less than 100 MT cement is required for the work, shall be constructed by the contractor at site of work for which no extra payment shall be made. For small maintenance works, NIT approving authority shall decide the requirement of the storage/godown.
- IV. The contractor shall be responsible for the watch and ward and safety of the cement godown. The contractor shall facilitate the inspection of the cement godown by the Engineer-in-Charge at anytime.
- V. The cement shall be got tested by the Engineer-In-Charge and shall be used on the work only after satisfactory test results have been received. The contractor shall supply free of charge the cement required for testing including its transportation cost to testing laboratories. The cost of tests of cement shall be borne by the contractor.
- VI. The actual issue and consumption of cement on work shall be regulated and proper accounts maintained as provided in clause 10 of the contract. The theoretical consumption of cement shall be worked out as per procedure prescribed in clause 42 of the contract and shall be governed by conditions laid therein. In case the cement consumption is less than theoretical consumption including permissible variation, recovery at the rate so prescribed shall be made after ensuring structural soundness and stability on the basis of testing. In case of excess consumption no adjustment need to be made.

- VII. The cement brought to the site and the cement remaining unused after completion of the work shall not be removed from site without the written permission of the Engineer-in- charge.
- VIII. The damaged cement shall be removed from the site immediately by the contractor on receipt of a notice in writing from the Engineer-In-Charge. If he does not do so within 3 days of receipt of such notice, the Engineer-In-Charge shall get it removed at the cost of the contractor.
- IX. Chief Engineers/CPMs/ADGs/SDGs may change the brand of Cement depending upon availability in local market but conforming to grade mentioned in the NIT and only with ISI mark, if warranted. The name of manufacturers should be finalized after taking into consideration the availability and cost factor.

CONDITIONS FOR STEEL REINFORCEMENT (CRS-CORROSION RESISTANCE STEEL)

1. The contractor shall procure ISI marked TMT Bars (CRS) of Fe 550D/Low alloy steel or more grade as per OM No. CSQ/SE(TAS)/ Steel/2024/262-H, dated 14.08.2024 (copy attached) and CSQ/SE(TAS)/Steel/2024/264-H, dated 21.08.2024 (copy attached) from the steel manufacturer such as SAIL, TISCON, RINL, Jindal Steel & Power Ltd. and JSW Steel ltd. or their authorized dealer having valid BIS License for IS 1786-2008 (Amended – November 2012). If TMT bars of any dia of above mentioned make is not available in market
2. At any time then the contractor on producing non availability certificate from the manufacturers may procure TMT bars of that dia from Steel manufacture as per the following guidelines:
3. The Special Director General of Project Region Kolkata of CPWD shall approve the steel manufactures subject to the guidelines for eligibility criteria and other technical parameters given below.

Credentials for eligibility criteria & other technical parameters for steel manufacturer:

The manufacturer should meet the following eligibility criteria:

- a) The Steel manufacture should have following documentary evidence:
 - i. Certificate of incorporation
 - ii. Memorandum of articles of Association
 - iii. Credit rating of the company from CARE/CRISIL/ICRA (the grading should not be C/D grade for minimum last 3years)
- b) The Steel manufacturer must have following licenses and certificates:
 - i. ISI certificate for billets (IS2830:2012)
 - ii. ISI certificate for TMT Bars (IS1786:2008 (Amendment-1 November 2012))
- c) The Steel manufacturer should also preferably have the following licenses:
 - i. ISO9001:2015
 - ii. ISO 14001:2015
 - iii. OHSAS 18001:2007
- d) The steel manufacturer should be using iron ore as the basic raw material. The entire gamut of iron and steel production is owned by the same company or its subsidiary company(ies) and the iron making capacity is sufficient matching the steel making capacity, adopting any of the refining technologies for manufacturing steel & TMT Bars as given under are eligible:
 - i. BF-BOF route
 - ii. COREX-BOF route
 - iii. DRI-EAF route (Each Electric Arc Furnace should be 100MT or more)
- e) Billets produced must be ISI marked (IS2830:2012)
- f) The TMT bars produced must be ISI marked (IS1786:2008)
- g) The steel manufacturer should have the following in house testing facilities (NABL Accredited):
 - i. Computerized Universal Testing Machine
 - ii. Spectrometer
 - iii. Bend Re-bend facility as per IS : 1786:2008 (Amendment-1 November 2012)
 - iv. Raw material laboratory: Arrangement for testing Carbon, Sulphur & Phosphorous etc.
 - v. Other testing facilities as specified in IS : 1786:2008 & IS : 2830:2012

4. Steel can also be procured from any particular steel manufacturer who has been suo motto approved by the Special Director General of Project Region Kolkata, CPWD.

5. Samples shall also be taken and got tested by the Engineer-in-Charge as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the contractor does not conform to the specifications, the same shall stand rejected, and it shall be removed from the site of work by the contractor at his cost within a week time or written orders from the Engineer-in-Charge to do so.
6. The steel reinforcement bars shall be brought to the site in bulk supply of 10 tonnes or more, or as decided by the Engineer-in-Charge.
7. The steel reinforcement bars shall be stored by the contractor at site of work in such away as to prevent their distortion and corrosion, and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.
8. For checking nominal mass, tensile strength, bend test & re-bend test etc. specimen of sufficient length shall be cut from each size of the bar at random at frequency not less than the specified below:

<i>Size of bar</i>	<i>For consignment below 100 tonnes</i>	<i>For consignment above 100 tonnes</i>
Under 10 mm dia bars	One sample for each 25 Tones or part thereof	One sample for each 40 Tones or part thereof
10mm to 16mm dia bars	One sample for each 35 Tones or part thereof	One sample for each 45 Tones or part thereof
Over 16mm dia bars	One sample for each 45 Tones or part thereof	One sample for each 50 Tones or part thereof

8. The contractor shall supply free of charge the required steel bars for testing including its transportation to testing laboratories. **The cost of tests shall be borne by the contractor.**
9. The actual issue and consumption of steel on work shall be regulated and proper accounts maintained as provided in clause 10 of the contract. The theoretical consumption of steel shall be worked out as per procedure prescribed in clause 38 of the contract and shall be governed by conditions laid therein. In case the consumption is less than theoretical consumption including permissible variations leading to under designing of the structure, the work shall be summarily rejected, otherwise recovery at rate so prescribed shall be made after ensuring structural soundness and stability. In case of excess consumption no adjustment need to be made.
10. Steel brought to site and remaining unused shall not be removed from site without the written permission of Engineer-in-Charge
11. The standard sectional weights referred to shall be as given in Table 5.4 in para 5.3.4 in CPWD Specification 2019 Vol.-I and will be considered for conversion of length of various sizes of TMT Bars in to standard weight. Record of actual sectional weights shall also be kept dia. And lot wise. The average sectional weight for each diameter shall be arrived at from samples from each lot of steel received at site. The decision of the Engineer-in-Charge shall be final for the procedure to be followed for determining the average sectional weight of each lot. Quantity of each diameter of steel received at site of work each day will constitute one single lot for the purpose. The weight of steel by conversion of length of various sizes of bars based on the actual weighted average sectional weight shall be terms as Derived Actual Weight.
 - a) If the derived weight is less than the standard weight, then the Derived Actual Weight shall be accepted if it is within the following tolerances specified in IS:1786-2008, otherwise whole lot will be rejected. However, deductions shall be made for the difference in derived actual weight and standard weight at the rate mentioned in clause 10CA for TMT-500D reinforcement bars. Tolerance on nominal mass shall be in accordance with Table 5.4A of CPWD Specification 2019.
 - b) If the derived actual weight is found more than the standard weight, then nothing shall be paid extra for the difference in derived actual weight and standard weight.

12. The contractor shall submit original vouchers from the manufacturer for the total quantity of steel supplied under each consignment to be used in the work. All consignment received at the work site shall be inspected by the Site staff along with the relevant documents before acceptance. The contractor shall obtain Original Vouchers and Test Certificates and furnish the same to the Engineer-in-Charge in respect of all the lots of steel brought by him from approved supplier to the site of work. The original vouchers and test certificates shall be defaced by the Site staff and kept on record in the site office.
13. Guidelines for use of reinforcement bars in structures.
- 13.1 For reinforced cement concrete or pre-stressed concrete works, the reinforcement bars shall consist of the following grades conforming to IS 1786 : 2008 (Indian Standard specification for high strength deformed steel bars and wires for concrete reinforcement) : Fe 500D or more.
 - 13.2 The contractor shall obtain manufacture's certificate stating the process of manufacture, chemical composition and test sheet giving result of each mechanical test applicable to the material purchased and submit it to the Engineer-in-Charge. Each test certificate shall indicate the number or identification mark to be found on the material.
 - 13.3 The Engineer-in-Charge shall get each consignment tested for both chemical composition and physical properties (including bend and re-bend test) as specified in IS : 1786 from NABL accredited laboratory any Government laboratory.
 - 13.4 **Corrosion resistant steel rebars shall be used.**
 - 13.5 All testing charges of reinforcement (TMT) bars shall be borne by the contractor.



भारतसरकार

केंद्रीय लोकनिर्माणविभाग

तकनीकीअनुप्रयोग एवंमानक एकाई

कमरा सं0 418 ए-विंग, निर्माणभवन, नईदिल्ली।

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E-9156762

No. CSQ/SE(TAS)/Steel/2024/ 262-*FD*

Dated: 14/08/2024

OFFICE MEMORANDUM

Subject:- Guidelines for use of TMT steel /Low Alloy Steel reinforcement Bars in CPWD worksand enlistment of the steel manufactures in respect of TMT steel /Low Alloy Steel reinforcement Bars in CPWD.

1. The Ministry of Steel, through notification dated 12.05.2016 and order dated 9.8.2016, abolished classification of steel producers as Integrated steel producers, primary steel producers, secondary steel producers, main producers, major producers or others as well as on the basis of process route of steel manufacturing in India.
2. The Ministry of Steel, vide Circular No. 4(13)/2016-SD(I) dated 14.12.2016, reiterated their Notification dated 12.05.2016. They further issued an order dated 09.08.2016, asking the users to ascertain the quality of the steel products, to be procured, as per relevant BIS standards.
3. Para 27.2 of Works Manual 2014 was modified through OM No. DG/MAN/382 dated 06.02.2019. In this OM, under the heading "Special Condition of Steel reinforcement bars", eligibility criteria and other technical parameters were set for steel manufactures. In the eligibility criteria, incorporation details of the company, various licences, certifications, in house testing facility at plant, and refining technologies used for manufacturing of steel and TMT bars (like BF-BOF route, COREX-BOF Route, DRI-EAF route) were cited. Those manufacturers, who met the aforesaid eligibility criteria, could be included in the preferred make list of Notice Inviting Tenders (NITs) of CPWD works.
4. However, CPWD Works Manual 2014 was replaced by CPWD Works Manual 2019 and came into force with effect from 07.03.2019. In CPWD Works manual 2019, para 4.10.1 deals with use of steel and cement in works and states that "Special conditions shall be incorporated by the NIT approving authority keeping in view the guidelines issued by the Directorate from time to time in this regard which are available on CPWD website".
5. Since no Criteria /guidelines were available for approval of TMT bars manufacturer after release of the CPWD works manual 2019, an Office Memorandum No. CE(CSQ /SE(TAS) /EE(TAD) /Steel/ 2019/ 497-H dated 27.12.2019 was issued. This OM specified that (i) only ISI marked TMT bars of various grades shall be procured for use in CPWD works, (ii) SDG/ADG shall approve the steel manufacturers based on eligibility criteria and other technical parameters as per OM No. DG/MAN/382 dated 06.02.2019
6. The OM 497-H dated 27.12.2019 was withdrawn and modified guidelines for use of reinforcement bars in structures was issued vide OM No. 50-H dated 17.02.2021. The use of corrosion resistant steel (CRS) reinforcement bars in structures was also mandated vide OM No. 50-H dated 17.02.2021. Further,

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clarification regarding corrosion resistant steel was issued vide OM No. 257-H dated 23.06.2022.

7. The single bench of Hon'ble High Court at Calcutta in the case of SRMB Srijan Private Limited & others V/s Union Of India & Others (W.P.A 9990 of 2020) SRMB Srijan Private Limited & others Vs. Union of India & others With (W.P.A 24267 of 2019) has quashed the modified Clause 27.2 of the CPWD Works Manual of 2014, para 4.10.1 of the CPWD Works Manual of 2019, and consequential Memorandums issued by the CPWD and directed to implement the Notification of the Ministry of Steel, Government of India dated May 12, 2016, the Order dated August 9, 2016 and the reminders of the said Ministry dated December 14, 2016 and February 7, 2017.
8. Subsequently an appeal was filed in Division Bench (DB) of Hon'ble High court at Calcutta by CPWD. In the said case, Hon'ble High court at Calcutta, passed the judgment dated 15.04.2024. The operative part of this judgement reads as *"Accordingly we find no grounds to interfere with the order passed by the Learned single bench except with regard to the direction issued in paragraph 53 of the impugned order whereby the modified clause 27.2 of the CPWD Works Manual has been quashed and instead of quashing the said modified clause 27.2 we direct the CPWD to appropriately amend their Works Manual to be in consonance with the notification issued by the Ministry of Steel, Govt. of India as done by the notifications referred to above."*
9. In compliance of the above directions of the Hon'ble High Court at Calcutta, an Expert Committee was constituted by DG CPWD vide OM No. CSQ/SE(TAS)/EE(TAD)/Steel/2024/190-H dated 10.06.2024 for deciding the criteria for the selection of steel manufacturers for CPWD works. The expert committee has conveyed their final recommendation {enclosed as annexure I(d)} vide Minutes of Meeting dated 24th July 2024 and the same has been accepted by DG, CPWD. The brief of these recommendations are as follows:

Steel Bars shall be classified as:

- a) Bar Set I, if it complies with the requirements given in the latest version of IS 1786, and additional requirement (e.g. Chemical Composition Requirement for Manganese and Copper, Tempered Martensite (TM) Ring Requirement, Marking Requirement and compliance of the provisions of ISO 9001:2015 and ISO 14001:2004) mentioned in the recommendations.

And

- (b) Bar Set II, if it complies with the requirements given in the latest version of IS 1786.

The committee has also recommended use of above mentioned Steel Bar sets considering the importance of quality in construction of public structures in different projects of CPWD, on the basis of (a) earth quake zones, (b) environment conditions (coastline and exposure condition), (c) Structure category, and (d) heights of buildings and structures.

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10. Accordingly, it is decided that the reinforcement steel bars produced by plants of SAIL, RINL, TATA, JSW & JSPL which are in wider use in CPWD may be continued to be used as preferred make in the NIT in respect of Bar Set-I mentioned in para no. 9 above and Annexure-1(c). Further, it has also been decided that DG, CPWD may enlist more manufacturer plants for TMT steel/Low Alloy Steel reinforcement Bars on the basis of selection criteria recommended by the Expert Committee. These enlisted manufacturers plants for particular bar set may also be considered for stipulation as preferred make in the NIT depending upon their use.
11. The procedure for enlistment of the steel manufactures in respect of TMT steel /Low Alloy Steel reinforcement Bars in CPWD works is also enclosed herewith as Annexure-I and I (a) to I (f)

This issues with the approval of DG, CPWD.

Encl: As above


(Dinesh Kumar Ujjainia)
 Superintending Engineer (TAS)
 14/2/24

Copy to (Through CPWD Website):

The SDG (Chennai) / SDG (Chandigarh) / SDG (Kolkata) / SDG (Mumbai) for information please.

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Annexure-I

PROCEDURE FOR ENLISTMENT OF THE STEEL MANUFACTURES IN RESPECT OF TMT STEEL / LOW ALLOY STEEL REINFORCEMENT BARS IN CPWD WORKS.

1. The following procedure shall be adopted for enlistment of the manufacturers, in respect of TMT steel / Low Alloy steel reinforcement bars of different diameter and grades for use in CPWD works.
 - i. All manufacturers having their manufacturing plants in India are eligible for enlistment in CPWD subject to the condition that they are producing steel bars of different grades conforming to the latest version of IS 1786.
 - ii. The Thermo Mechanically Treated (TMT) steel / Low Alloy steel reinforcement bars conforming to IS:1786 must be manufactured using iron ore, virgin or processed with necessary refining facilities. The rolling / processing facilities, from iron making to finished steel reinforcement bar, may be owned by the same company or its subsidiary company (ies). In this regard the necessary proof may be submitted along with application.
 - iii. The eligible manufacturer shall apply **online** to CPWD website portal to **SDG (Chennai, Chandigarh, Kolkata, & Mumbai)** on their letter head along with requisite details in prescribed application (**as per Annexure-I(a)**) along with documents (**as per Annexure-I (b)**). The manufacturer shall mention name and location of plants to be enlisted for supply of steel reinforcement bar and shall pay enlistment fee of Rs. 1,00,000.00 (Rs. One Lac Only) per plant. The manufacturer is required to pay total enlistment fees to CPWD through e-payment in **Account Number 244189- AE(Cash), CSQ, NirmanBhawan, New Delhias per Annexure-I (f)** and receipts of payment shall be enclosed with the application form.
 - iv. The enlistment fee, once paid, is non-refundable due to any reason. Therefore, manufacturers are advised to ensure that they fulfil the eligibility requirements and possess all necessary documents for enlistment before payment.
 - v. The online application submitted along with documents will be scrutinized by the **CE (Works & TLQA) O/oSDG (Chennai,**



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Chandigarh, Kolkata, & Mumbai) and shortcoming (s) or deficiency (ies) in the submitted application, if any, will be communicated to the applicants through online portal. The applicants will be allowed to submit clarifications or information online within a period of one month from the date of intimation of shortcomings.

- vi. If the manufacturer fails to submit the required clarifications or information within one month from the date of intimation of shortcomings, the application shall be summarily rejected and no further communication shall be entertained. The enlistment fees shall be forfeited.
- vii. All the relevant clarifications and/or information received within the time period shall be considered and if found in order, such manufacturer shall be informed about the dates of plant (s) visit by the team of CPWD officers consisting of **one SE, one EE and one AE (to be nominated by respective SDG)**.
- viii. On site verification of documents, submitted at the time of application, will be done by the CPWD team, during the plant(s) visit. Further, the testing of individual bars of particular grade (s), at each plant, shall be carried out in the lab available at plant in presence of CPWD team and representative of manufacturer (**as per Annexure-I(c)**). The entire testing process shall also be video recorded.
- ix. CPWD team, at each plant, shall also collect the samples (i.e. one sample consist of three bars) of each diameter of different grades and sealed in presence of manufacturer's representative. The type testing of these samples shall be done in one of the designated lab of National Test House, IITs, NITs and NCCBM in presence of CPWD representatives. The dates of testing of samples in the designated laboratory shall be decided by the manufacturer in consultation with the lab authorities and CPWD team. The entire testing process, including opening of sealed samples, shall be video recorded.
- x. After plant visit by the CPWD team, a report along with photographs / video of the plants and results of the tests conducted during visit shall be uploaded on the portal within 5 working days.
- xi. The results of the type tests, conducted in the designated lab, shall be uploaded on the portal within 5 working days of receipt of the same.

xii. After getting all the test reports, complete case along with documents and recommendation of respective SDG (**Chennai, Chandigarh, Kolkata, & Mumbai**) will be sent to CE, CSQ (Civil), CPWD, Nirman Bhawan, New Delhi.

2. A committee comprising of following officers will evaluate the case received from SDG (**Chennai, Chandigarh, Kolkata, & Mumbai**) for the enlistment of steel manufactures' plant for reinforcement bar of different grades on the basis of criteria given in **annexure-I(d)** in CPWD Directorate, Nirman Bhawan, New Delhi.

ADG (Tech)	-	Chairman
CE (Project)	-	Member (to be nominated by ADG (Tech))
CE, CSQ (Civil)	-	Member
SE (Design)	-	Member (to be nominated by ADG (Tech))
SE (TAS)	-	Member Secretary

The committee will recommend the steel manufacturers' plant for enlistment or otherwise to DG, CPWD for his approval.

3. The approval of the competent authority shall be intimated to the respective manufacturer in respect of a particular plant for each diameter of different grades of steel under category Bar Set I / Bar Set-II
4. If, no bar diameter of specific grade of steel of the particular plant of a manufacturer is found suitable, then he will be intimated accordingly. The manufacturer may apply afresh next time when applications are re-invited for enlistment. In case of rejection of application, the decision of the CPWD shall be final and binding on the applicants.
5. **Validity of Enlistment:** The enlistment of manufacturer's plant for particular bar diameter and grade of steel shall be valid for a period of 3 (three) years from the date of issue of enlistment order. The enlistment shall be open to review by the enlisting authority i.e. Director General, CPWD at any time. In case any adverse report is received against the manufacturer, the enlistment is liable to be suspended/cancelled/or manufacturer can be black listed for future enlistment in CPWD or any other action as deemed fit (as per **Annexure-I(e)**).



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Annexure-I(a)

Application for Enlistment OF THE STEEL MANUFACTURES IN RESPECT OF TMT STEEL / LOW ALLOY STEEL REINFORCEMENT BARS and re-enlistment (Supporting documents annexed with the application form should be uploaded as per Annexure-I(b))

1. (a) Name of the applicant

(b) Status of entity (Limited Liability Partnership/Ltd. Company).....

2. Address

(a) Registered Office.....

(b) Head Office (if different from Registered office).....

3 Contact Details

(a) Name of contact person and Designation.....

(b) Telephone Number.....

(c) Mobile Number

(d) Email Id.....

(e) Website URL (If any)

4 Detail of Plant (s) for which Enlistment applied:

i. (a) Name of Plant.....

(b) Location.....

ii. (a) Name of Plant.....

(b) Location.....

5. Enlistment fee(s) detail (Fees Rs. 1,00,000.00 per Plant) :

(a) Transactions Reference Number

(b) Transaction Date.....

(c) Amount.....

6. Certificates (Strike out whichever is not applicable)

- a. I/We (including all partners) certify that I/we have read the Rules for Enlistment of steel manufacturer in CPWD as amended upto date and shall abide by them.

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- b. I/We certify that I/we are not enlisted and will not get myself / ourselves registered as steel manufacturer in the Department under more than one name.
- c. I/We have neither employed nor shall we employ any person within one year of his retirement from the Government except with the prior permission of the Government.
- d. I/We will not make changes in the owner ship of the company without prior intimation to department.
- e. I/We have not declared or is in the process of being declared bankrupt, insolvent, wound up, dissolved or partitioned.
- f. I/We have not been removed/suspended/blacklisted/debarred/restrained from the business by any central /state government department/PSUs.

I/We certify that the information given above is true to the best of my/our knowledge. I/We understand that if any information is found incorrect, our enlistment is liable to be cancelled and I may be blacklisted / suspended / debarred for future enlistment in CPWD.

Place :

Signature of applicant

Date:

(Authorized Signatory)



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Annexure-I (b)**A. Documents required to be submitted with application:**

1. Documents regarding Ownership / Promoters of the manufacturing plant, its head office address, location and address of steel manufacturing facility.
2. If any subsidiary company(ies) exists, then documents regarding Ownership / Promoter ship of the subsidiary company, Subsidiary company's address and its relation with main company, location and address of manufacturing units of subsidiary company.
3. Copies of Certificate of Incorporation & Memorandum of Article of Association of Main Company.
4. Approval/ enlistment of manufacturer company by CPWD (in past), or any other Central/State Government departments/PSUs for use of steel reinforcement bars.
5. Document and Production process flow diagram / chart of steel making for production of TMT and Low alloy steel (Corrosion Resistant Steel) Reinforcement bars for Fe 415D, Fe 500D, and Fe 550D of bar sizes 8 mm to 45 mm dia.
6. Document related to Quality Assurance Plan adopted in manufacturing of steel and calibration record of measuring and testing equipments.
7. Authenticated copies of BIS certificate for billets (IS 2830 : 2012) & BIS certificate for TMT bars (IS 1786 :2008) (with up to date Amendment)
8. Copy of ISO-9001:2008 (Quality Management System), Quality Management System, ISO-14001:2004 (Environment Management System).
9. The CO2 emission per kg of steel production.
10. Whether manufacturer is blacklisted/suspended/debarred/restrained from business by any Central / State Government Department or PSU for poor quality of reinforcement steel bar (if any) supplied by the company.
11. Test results of bars as per Annexure-I(c).

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Annexure- I(c)**Testing requirement for individual reinforcement bar diameter of Particular Grade of steel:**

Tests required for Fe 415D, Fe500D, Fe550D grade of steel and Low alloy steel reinforcement bars:

A. FOR BAR SET- I

1. Tests as per IS 1786 (latest version) and specified therein

1.1 Chemical Properties

Ladle analysis of steel for above grades for maximum percentage of constituents

- i. Carbon (C), (ii) Sulphur (S) and (iii) Phosphorous (P) and (iv) Nitrogen and Carbon Equivalent

1.2 Physical Properties

- (i) 0.2 percent proof stress / yield stress, minimum, N/mm².
- (ii) Ratio of Tensile Strength (Ts) to Actual Yield Strength (or 0.2 % of yield stress (Ys)) of the test piece N/mm².
- (iii) Elongation, percent, Minimum, on gauge length $5.65\sqrt{A}$, where A is the cross-sectional area of the test piece.
- (iv) Total elongation at maximum force, percentage, minimum on gauge length $5.65\sqrt{A}$, where A is the cross-sectional area of the test piece.
- (v) Bend test and re-bend test.
- (vi) The mean area of ribs (in mm²) per unit length (in mm) above the core of the bar, projected on a plane normal to the axis of the bar.
- (vii) Pull-out testing in accordance with IS 2770 (Part 1)

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2. Additional requirement

2.1 Permissible limit for Manganese and Copper as follows:

Constituent	Permissible Limit (% of cast metal quantity)		
	Fe 415 D	Fe 500 D	Fe 550 D
Manganese (Mn)			
Maximum	1.60	1.60	1.60
Copper (Cu)			
Maximum	0.80	0.80	0.80
Minimum	0.20	0.20	0.20
Notes: The above composition shall be obtained as per latest version of IS 228 1. Manganese using Periodate Spectrophotometric Method (Part 12), and 2. Copper using Thiosulphate Iodide Method (Part 15) or Spectrophotometric (Diethyl Dithiocarbonate) Method (Part 21)			

2.2 Tempered Martensite Ring Test as per Annexure-I (d).

2.3 The process of manufacturing steel shall comply with the provisions of ISO9001: 2015 and ISO14001: 2004.

(B)FOR BAR SET-II

1. The test requirements given in para 1.1 and 1.2 above.

Annexure-I(d)

1. CRITERIA FOR CLASSIFICATION OF BARS

The steel bars manufactured in India shall be classified as specified hereunder for the purposes of their use in works of CPWD.

1.1 Process of Classification

Steel Bars shall be classified as *Bar Set I* and *Bar Set II*. The bars shall be placed under one of these categories based on *Type Test* (the test performed to select the bars) performed as specified hereunder. These tests to be performed are those specified in the latest version of **IS 1786** published by the Bureau of Indian Standards, and the additional tests mentioned in Para 2 of this document.

The *Type Test* shall be performed at any one of the National Test Houses, IITs, NITs, and NCCBM, subject to:

- (a) The test samples being collected from the manufacturing facility by the representative engineer of CPWD,
- (b) The availability of the required test facility at the said laboratory, and
- (c) The test being witnessed by representative engineer of CPWD.

1.2 Classification of Steel Bars

The bar shall be classified as:

- (1) *Bar Set I*, if it complies with the requirements given in the latest version of **IS: 1786**, and those given in Para 2 of this document, and
- (2) *Bar Set II*, if it complies with the requirements given in the latest version of **IS 1786**.

2. ADDITIONAL REQUIREMENTS

Four additional requirements as specified hereunder.

2.1 Chemical Composition Requirement

The permissible limits of additional elements shall be as per **Table 1**.

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Table 1: Permissible limits of additional elements

Constituent	Permissible Limit (% of cast metal quantity)		
	Fe 415 D	Fe 500 D	Fe 550 D
Manganese (Mn)			
Maximum	1.60	1.60	1.60
Copper (Cu)			
Maximum	0.80	0.80	0.80
Minimum	0.20	0.20	0.20
Notes: The above composition shall be obtained as per latest version of IS 228 : (1) Manganese using Periodate Spectrophotometric Method (Part 12), and (2) Copper using Thiosulphate Iodide Method (Part 15) or Spectrophotometric (Diethyl Dithiocarbonate) Method (Part 21).			

2.2 TM Ring Requirement

The following two requirements shall be met with:

- (1) Does the *Tempered Martensite(TM) Ring* satisfy the visual analysis as per **Step 1** of **Table 2**; and
- (2) The thickness of the TM Ring obtained as per **Step 2** of **Table 2** shall be between $0.07f$ and $0.15f$, where f is the *original nominal diameter* of the bar.

(a) Test Procedure

The following is the procedure:

- (1) The test setup to capture the *Cross-Sectional Phase Distribution (CSPD)* of the TMT bars shall be as shown in **Figure 1**.
- (2) Steel bars may be cut using handsaw or an abrasive cutter with continuous supply of coolant to limit the temperature of steel, and thereby avoid any transition or changes in *Tempered Martensite(TM)* and *Ferrite-Pearlite (FP)* phases (**Figure 2**). The sharp edges of cut bars should be smoothened using

silicon carbide abrasive sheets. A metal polishing machine can be used to achieve effective smoothening.

- (3) The smoothened steel specimen shall be moulded in cold setting epoxy with good surface finish. Setting time of epoxy is about 10-15 minutes.
- (4) The moulded specimen surface shall be course polished using abrasive sheets of 80, 150, 220, 320, and 600 grit sizes in sequence. Specimens shall be micro-etched using Nital (5% Nitric acid in alcohol) to capture the CSPD.

(b) Measurements

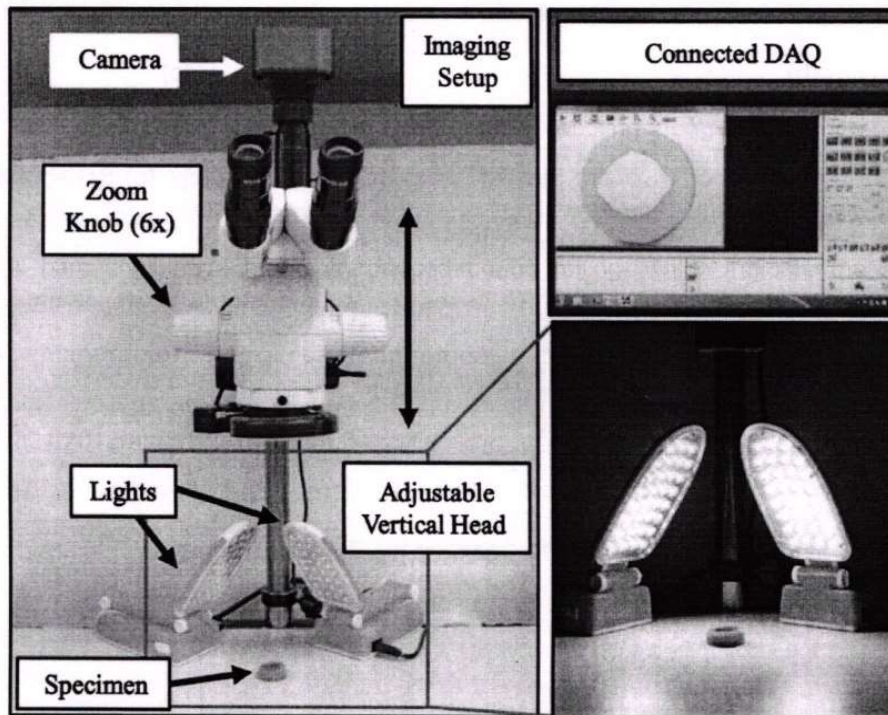
The procedure for obtaining the CSPD of the TM Ring along the perimeter shall be as per **Table 2**.

2.3 Marking Requirement

All bars shall have marks introduced during rolling, which indicate the *name of manufacturer* or *brand name*, and *grade of steel*.

2.4 Manufacturing Process Requirement

The process of manufacturing steel shall comply with the provisions of ISO 9001:2015 and ISO 14001:2004.



(a)

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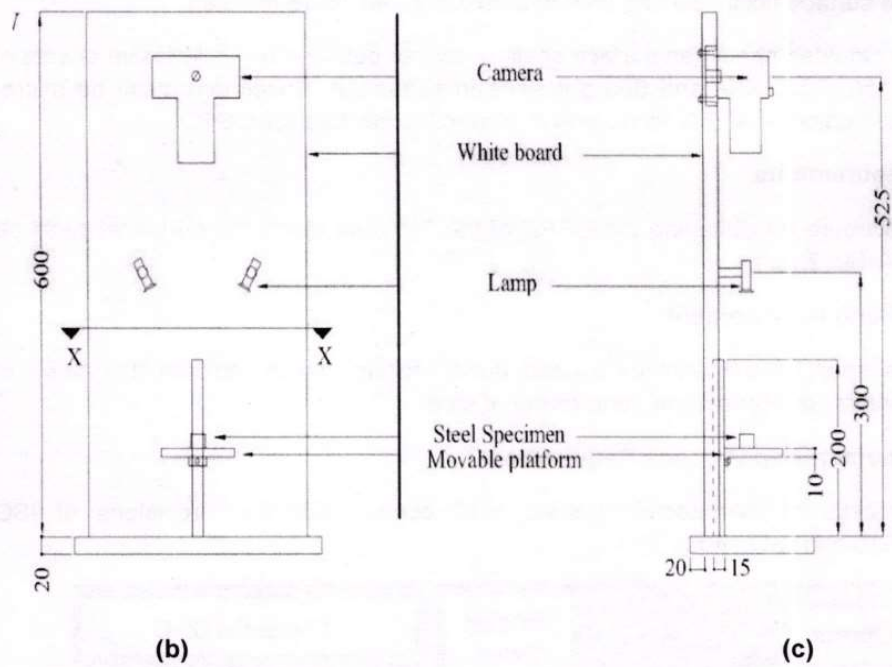


Figure 1: Test setup for CSPD of the TMT bars: (a) Imaging Setup, (b) Schematic Front View (c) Schematic Side View

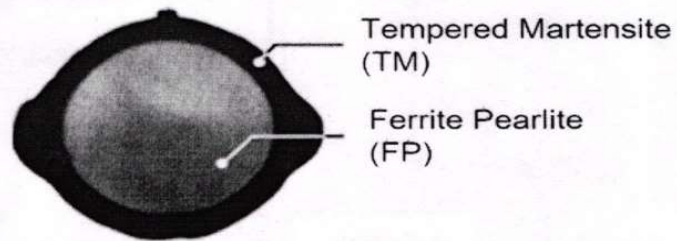


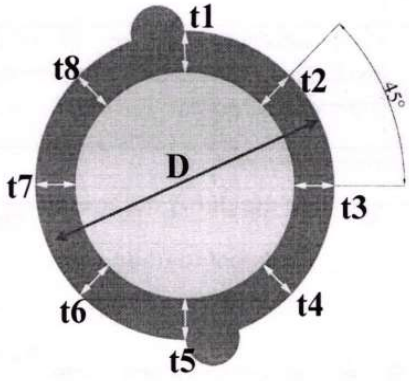
Figure 2: Cross-section of the steel bar showing the TM and FP areas

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Table 2: Method of obtaining CSPD of TM Ring

Step 1: Visual Analysis of etched Cross-Section			
			
	A	B	C
	Acceptable	Not acceptable	Not acceptable
1.	Is a dark grey peripheral region and light grey core seen as in Case A?		Yes/No
2.	Does the dark grey peripheral region form a continuous outer ring?		Yes/No
Step 2: Dimension Analysis of TM-Ring thickness			
3.	Diameter D (mm) of the steel bar		
4.	Geometry		
		t_1	
		t_2	
		t_3	
		t_4	
		t_5	
		t_6	
		t_7	
		t_8	
		Measured t_{min} (mm)	
		Measured t_{max} (mm)	
5.	Is the measured $t_{min} \geq 0.07 f$?		Yes / No
	Is the measured $t_{max} < 0.15 f$?		Yes / No



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3. GUIDELINES FOR USE OF STEEL BARS IN DIFFERENT PROJECTS

Considering the importance of quality in construction of public structures, the basis for use of bars in different projects of CPWD shall be as given in **Table 3**.

Table 3: Use of Bar Sets I and II in CPWD Projects

S.No.	Consideration	Bar Set I	Bar Set II
1.	Earthquake Zones	All zones	Only <i>Earthquake Zone II</i>
2.	Environment Conditions		
	(a) Coastline	All conditions	Beyond 10 km from the coastline of India
	(b) Exposure Conditions	All exposure conditions as per IS 456 (latest version)	Only <i>Mild</i> and <i>Moderate</i> Exposure Conditions as per IS 456 (latest version)
3.	Structure Category	All categories	Only <i>Normal Buildings</i> as per Table 4 and standalone <i>Normal Structures</i> as per Table 5 .
4.	Heights of Buildings and Structures	All heights	Only structures up to 12 m height excluding <i>staircase headroom</i> and <i>liftmachine rooms</i>

Table 4: List of Normal Buildings

Residential or Non-Residential Buildings with occupancy less than 100 persons, *excluding*:

- (1) Educational buildings,
- (2) Buildings of strategic importance,
- (3) Buildings and structures identified by Government of India and State Governments to be critical for governance or Disaster Management,
- (4) Hospital buildings,
- (5) Buildings that house the control or operations of utilities (for example, water, power, and sewage disposal), and lifeline (for example, communication and transportation facilities) structures,
- (6) Buildings related to defense and space applications,
- (7) Buildings identified by Government of India, State Governments and UT Administrations to be of *Special Importance*, and
- (8) Any other building identified with the approval of DG, CPWD.

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Table:5 List of Standalone Normal Structures

Water Tanks and Water Sumps up to 50,000 liters, and Pump Rooms of area less than 20 m ²
Septic Tanks, Sewage Treatment Plants, and Effluent Treatment Plants up to 10,000 liters/day
Bridges and Culverts of spans up to 6 m
Earth Retaining Structures up to 4 m
Compound Walls, Entry Gates, and Small Reception Rooms
Storm Water Drains
Cable Trenches
Parking Structures of single storey
Security Cabins and Sentry Post
Any other structure identified with the approval of Technical Sanctioning Authority of CPWD



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Annexure-I(e)**Grounds for Removal/ Suspension/ Blacklisting/ Debarring of manufacturer from CPWD**

1. The manufacturer may be removed/suspended/blacklisted/debarred, if any of the following is established:
 - i. If found to have given false particulars at the time of Application; or
 - ii. Has indulged in any type of forgery or falsification of records; or
 - iii. Changes in the ownership of the company without prior intimation to department.
 - iv. Declared or is in the process of being declared bankrupt, insolvent, wound up, dissolved or partitioned or
 - v. Violates the labour rules and regulations or
 - vi. Is involved in complaints of serious nature received from any source which have been proved; or
 - vii. Ceases to fulfil eligibility criteria based on which manufacturer's name was approved; or
 - viii. Is considered as not required to be in list of CPWD enlisted manufacturer for any other reason considered fit by the enlisting authority; or
 - ix. Received reports from field units of CPWD for supply of sub-standard quality of steel in more than one occasion; or
 - x. Has been removed/suspended/blacklisted/debarred/restrained from the business by any central /state government department/PSUs.

2. Whenever, any type of complaint mentioned above at serial number (i) to x), is received against a manufacturer. The manufacturer will be served with suitable show cause notice to give reply within a period of 15 days. After considering the reply/non-reply of the Show cause notice and other facts on records, further action will be taken as deemed fit. In case of Removal/ Suspension/ Blacklisting/ Debarring of the manufacturer, the minimum period will not be less than three years from the date of issue of the order. The re-application/application already under consideration for fresh enlistment of such manufacturer shall not be processed till the period of Removal/ Suspension/ Blacklisting/ Debarring is over. The manufacturer has to apply afresh for enlistment after period of Removal/ Suspension/ Blacklisting/ Debarring is over.



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Annexure-I (f)**Procedure for online payment of enlistment fee**

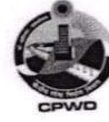
1. Log on to home page of NTR portal on <https://bharatkosh.gov.in>.
2. Go to "Quick Payment" link on the home page.
3. Select the Ministry/Department "030-Housing and Urban Affairs" from the drop-down menu.
4. Select the purpose as "Enlistment fee from contractor" from the drop-down menu.
5. Click NEXT and Select the DDO as" 244189-AE(CASH),CSQ, NIRMAN BHAWAN, NEW DELHI" from the drop-down menu.
6. Enter the amount of enlistment fee(s) in the amount window.
7. Under Remarks write "enlistment fee for enlistment of steel manufacturer for the plants (i)...., (ii)... , (iii)...., ".
8. After filling all the mandatory fields in "Depositor's detail", click" Next".
9. Confirm the information entered in the preview and click the "Confirm" button.
10. After confirmation, the portal will open the Payment Gateway.
11. Make payment using the Payment Gateway and download the system generated electronic receipt.



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भारत सरकार
केंद्रीय लोक निर्माण विभाग
तकनीकी अनुप्रयोग एवं मानक एकाई
कमरा सं० 418 ए-विंग, निर्माण भवन, नई दिल्ली।
टैलीफैक्स-011-23062339 ईमेल-delsetascsq.cpwd@nic.in



No. CSQ/SE(TAS)/Steel/2024/ 264-H

Dated: 21/08/2024

OFFICE MEMORANDUM

Sub: Advisory regarding Special Condition of use of Steel reinforcement in NITs.

As per CPWD Works Manual 2024 para 4.10.1, the NIT approving authority shall incorporate the special conditions of use of steel reinforcement on the basis of guidelines issued by the Directorate from time to time in this regard.

The Directorate has issued the "Guidelines for use of TMT steel /Low Alloy Steel reinforcement Bars in CPWD works and enlistment of the steel manufactures in respect of TMT steel/Low Alloy Steel reinforcement Bars in CPWD" vide OM No. CSQ/SE(TAS)/Steel/2024/262-H Dated: 14/08/2024. This Office Memorandum has superseded all the earlier Office Memorandums, regarding use and special/additional/particular conditions of reinforcement bars in NITs.

All the field officers are directed to incorporate the special/additional/particular conditions in NITs on the basis of guidelines issued vide Office Memorandum dated 14/08/2024.

It may be ensured that above instruction are followed strictly.

This issues with the approval of DG, CPWD.

(Dinesh Kumar Ujjainia)
Superintending Engineer (TAS)

Copy to: (Through CPWD Website)

1. Special DG (Chennai, Chandigarh, Kolkata & Mumbai) for information please.
2. Additional DG (RD, PRD, Border, Lucknow, Chandigarh, Bangalore, Patna, Mumbai, Kochi, Jammu, Hyderabad, Guwahati & Bhopal for information please.
3. All CE/SE/EE/AE i.e. NIT Approving Authorities for necessary compliance.

(Govind Hari)
Executive Engineer (TAS)

Particular Specification

1.0 DISMANTLING/ DEMOLISHING :

1.1

The work shall be done in accordance with CPWD Specifications - 2019 - Vol. I & Vol. II with correction slips upto the last date of submission of tender document and National Building Construction Standards 2026.

1. The Contractor shall dismantle and demolish all existing structures, installations and ancillary works at the site, as required for construction of the proposed new building, strictly in accordance with the tender drawings, specifications, applicable CPWD specifications, relevant BIS Codes, Construction and Demolition Waste Management Rules, 2016 and amendments thereto, National Green Tribunal (NGT) directions, MoEFCC guidelines, and all applicable local authority requirements.
2. The Contractor shall inspect the site and satisfy himself regarding the existing structures, their condition, dimensions, services, access, adjoining properties and all other site conditions before commencement of work. The information and drawings furnished by the Department are for general guidance only, and the work shall be executed on an **“as-is-where-is”** basis.
3. The cost of complete dismantling/demolition, including labour, tools and plants, machinery, scaffolding, temporary works, barricading, safety arrangements, segregation, loading, transportation, disposal, removal of debris and rubbish, cleaning, dressing and levelling of the site, as well as all other incidental activities required for completion of the work, has been included in the **Job Item for dismantling/demolition. No extra payment whatsoever shall be admissible on any account** for such works.
4. The Contractor shall submit a detailed dismantling/demolition methodology and safety plan to the Engineer-in-Charge for approval before commencement of demolition. The sequence of dismantling shall be planned so as to ensure the stability and safety of adjoining structures, existing services, roads, boundary walls, trees and other property.
5. **Boundary Walls:**
 - a. The **left-side and right-side existing boundary walls shall not be demolished**, as these are required to be retained for the safety and protection of the adjoining structures.
 - b. The existing **MS angles/supports and concertina/barbed wire arrangement provided above the left-side and right-side boundary walls shall, however, be carefully removed** to facilitate construction of the proposed new boundary wall over/along the retained wall, as directed by the Engineer-in-Charge.
 - c. The **front and rear boundary walls, including the concertina/barbed wire and associated fittings, shall be completely dismantled/demolished and removed** as required for construction of the new works.
 - d. Any damage caused to the retained left-side or right-side boundary walls or

adjoining properties during dismantling shall be made good by the Contractor at his own cost.

6. All existing buildings, residential quarters, foundations, underground/overground structures, sheds, security cabins, panel rooms, pump houses, underground sumps, worship structures and other miscellaneous structures specifically identified for demolition shall be completely dismantled/demolished, including their superstructure and substructure, unless specifically directed otherwise by the Engineer-in-Charge.
7. Existing services and installations such as electrical cables, water supply lines, sewer/drain lines, storm-water drains, gas lines, communication cables, poles and other utilities shall be identified and adequately protected during demolition. No service belonging to any service provider or authority shall be damaged or disconnected without prior approval of the Engineer-in-Charge and the concerned authority.
8. The existing **storm-water drain falling within the demolition/construction area shall be dismantled as required for the proposed construction**. Where necessary, the Contractor shall make suitable temporary arrangements for uninterrupted flow/diversion of sewerage or storm water and shall execute the replacement/diversion drain or pipe arrangement as directed by the Engineer-in-Charge. All such incidental arrangements shall be deemed included in the quoted Job Item unless specifically provided as a separate item in the Schedule of Quantities.
9. Existing **DG sets, solid waste processing/management plant, pumps, equipment, machinery, installations and other ancillary facilities identified for removal** shall be dismantled, disconnected, taken out and removed from the site by the Contractor, including all associated fittings, supports, cables, pipes, foundations and ancillary components wherever required. The Contractor shall coordinate with the Engineer-in-Charge before removal of any such installation.
10. All dismantled and removed materials, including bricks, concrete, reinforcement steel, structural steel, doors, windows, timber, roofing materials, electrical installations and fittings, sanitary fittings, plumbing materials, metalwork, DG set components, solid waste plant components and other materials arising from the demolition, shall be handled, segregated, loaded, transported and disposed of/removed by the Contractor as directed by the Engineer-in-Charge and in accordance with applicable rules.
11. Unless otherwise specifically directed in writing by the Department, **all serviceable and unserviceable materials arising from dismantling/demolition shall become the property of the Contractor**, and the Contractor shall have no further claim against the Department in respect of such materials. The Contractor shall account for and remove all such materials from the site.
12. The Contractor shall not remove or dispose of any material which is specifically identified by the Engineer-in-Charge for retention, handing over or separate

disposal. Such materials shall be carefully dismantled, stacked and handed over at the location directed by the Engineer-in-Charge.

13. All Construction and Demolition (C&D) waste generated from the work shall be segregated at source, handled safely and transported only to approved/authorized C&D waste processing facilities, dumping grounds, landfills or other locations permitted by the competent local authority. The Contractor shall obtain all necessary permissions/NOCs and comply with all applicable statutory requirements at his own cost.
14. The Contractor shall maintain proper records of the quantity and disposal of C&D waste and shall submit documentary evidence, challans, weighment slips, receipts or other disposal records to the Engineer-in-Charge as and when required.
15. No debris, dismantled material or waste shall be stored or dumped on adjoining roads, public roads, footpaths or other unauthorized areas. Temporary storage within the site shall be only at locations approved by the Engineer-in-Charge and shall not obstruct traffic, pedestrians, existing services or construction activities.
16. The Contractor shall provide and maintain suitable barricading, safety signage, warning boards, green screens/wind barriers, dust-control arrangements and other protective measures around the demolition area. The retained boundary walls and adjoining properties shall be adequately protected throughout the demolition operation.
17. Demolition shall be carried out using safe and controlled methods. **Use of explosives for dismantling or demolition is strictly prohibited.** The Contractor shall adopt methods that minimize vibration, dust, noise and the risk of damage to adjoining structures and public property.
18. The Contractor shall take all necessary measures for control of dust and air pollution, including regular water sprinkling, wet methods for cutting/grinding, covering of debris and vehicles, use of anti-smog guns where directed by the Department/local authority, wheel washing and cleaning of roads affected by site operations. All applicable NGT, MoEFCC, State Pollution Control Board and local authority requirements shall be complied with.
19. All vehicles carrying demolition waste or dismantled materials shall be suitably covered and shall be loaded in a manner that prevents spillage or emission of dust. Vehicle wheels shall be cleaned/washed before leaving the site wherever necessary to prevent mud and debris from being carried onto public roads.
20. The Contractor shall take into account that, considering the location of the site in a densely populated area and in the vicinity of sensitive establishments such as hospitals, schools, residential premises, etc., the local/statutory authorities may impose restrictions on permissible noise levels, working hours, timing and nature of activities, particularly during night hours or other specified periods. The Contractor shall comply with all such restrictions and directions of the competent authorities and shall suitably plan, sequence and programme all activities, deploy adequate resources and adopt appropriate methods to ensure completion of the work within the stipulated contract period. The bidders shall assess the likely

impact of such restrictions while quoting their rates and preparing their work programme. **No extension of time, additional payment or compensation shall be admissible on account of any such restrictions imposed by the local/statutory authorities.**

21. The Contractor shall provide adequate and competent safety personnel and shall ensure that all workers are provided with and use appropriate personal protective equipment, including helmets, safety shoes/gumboots, gloves, goggles, masks, safety belts/harnesses and other PPE as required.
22. The Contractor shall ensure that no unauthorized person enters the demolition area. All unsafe conditions, exposed electrical conductors, dangerous moving machinery parts, unstable structures and other hazards shall be immediately rectified. Live electrical services shall be isolated before commencement of dismantling in the concerned area.
23. The Contractor shall be solely responsible for the safety of his workmen, staff, visitors and the public during the entire period of dismantling/demolition. Any accident, injury, loss, damage or claim arising out of the Contractor's operations shall be dealt with by the Contractor at his own risk and cost, and the Contractor shall indemnify the Department against all such claims, subject to applicable law.
24. The Contractor shall take all precautions to prevent damage to adjoining buildings, retained boundary walls, roads, drains, utilities, trees and public/private property. Any damage caused by the Contractor shall be repaired/restored to the satisfaction of the Engineer-in-Charge at the Contractor's own cost.
25. The Contractor shall arrange all temporary electricity, water, fuel, generators, lighting, tools, plants, machinery, access arrangements, scaffolding and other resources required for execution of the dismantling/demolition work. No separate payment shall be made for these arrangements.
26. The Contractor shall maintain adequate watch and ward/security of the site, existing structures, dismantled materials and equipment after taking possession of the site and until completion and formal handing over. The Department shall not be responsible for loss, theft, pilferage or damage to materials under the Contractor's custody.
27. The Contractor shall conduct and submit high-resolution photographs and videography of the site and existing structures **before commencement of dismantling and after completion of demolition and site clearance.** The records shall clearly establish the condition of the site before and after the work and shall be submitted to the Engineer-in-Charge in the prescribed electronic format.
28. Dismantling, segregation, loading, transportation and removal of debris shall proceed simultaneously with the demolition work to the extent practicable. The Contractor shall not allow accumulation of debris to such an extent as to obstruct safe working space or create a safety, traffic, fire or environmental hazard.
29. On completion of demolition, the entire site shall be cleared of all dismantled materials, debris, rubbish, temporary works, scaffolding, barricades and surplus materials, except those specifically required to be retained by the Department.

The site shall be dressed, levelled and left **clean, clear, tidy and suitable for commencement of the proposed new construction**, generally up to the existing road level or as directed by the Engineer-in-Charge.

30. The Contractor shall remove all temporary installations and facilities created by him for execution of the demolition work before handing over the site, unless otherwise directed by the Engineer-in-Charge.
31. The Contractor shall obtain all permits, approvals, NOCs and permissions required from the local body, traffic police, pollution control authorities, utility agencies and other competent authorities for dismantling, transportation and disposal of demolition waste. All associated fees, charges, deposits, permissions and compliance costs shall be borne by the Contractor and shall be deemed included in the quoted Job Item.
32. The Contractor shall comply with all applicable statutory provisions, including CPWD Specifications, relevant BIS Codes, Construction and Demolition Waste Management Rules, 2016 and amendments, NGT directions, MoEFCC/State Pollution Control Board requirements, local building bye-laws, traffic regulations and directions issued by the Engineer-in-Charge.
33. The Contractor shall not reside or permit any person to reside at the site. Only authorized security/watch-and-ward personnel may remain at the site during the contract period, subject to the approval of the Engineer-in-Charge.
34. The Contractor shall coordinate the demolition sequence with other agencies/contractors working at the site so that the demolition activities do not hinder subsequent construction or other authorized works.
35. In case demolition activities are required to be carried out in multiple shifts or during restricted working hours, the Contractor shall obtain necessary permissions from the concerned authorities and make all arrangements for safe execution. No additional payment shall be admissible on this account.
36. The Contractor shall comply with all directions issued by the Engineer-in-Charge regarding the sequence, extent and method of dismantling. Any structure, component or installation proposed for retention shall not be demolished or removed without written/recorded instruction from the Engineer-in-Charge.
37. The **salvage value of dismantled materials and the complete cost of dismantling/demolition and site clearance have already been duly considered in the estimated cost as a Job Item**. Accordingly, the Contractor shall be deemed to have included in his quoted rate all costs, risks, obligations and incidental works associated with dismantling, demolition, removal, salvage, segregation, loading, transportation, disposal of C&D waste, removal of valuable/serviceable items, protection of retained structures, statutory compliance and final cleaning/levelling of the site.
38. **No separate or additional payment shall be made under any circumstances for dismantling/demolition of structures or installations, removal of salvageable or unserviceable materials, removal of DG set/solid waste plant or other ancillary installations, removal/disposal of debris and rubbish, protection of retained**

structures, barricading, dust/noise control, transportation, disposal, site cleaning, dressing or levelling, or any other activity necessary to complete the dismantling and demolition work and hand over the site in a clean and construction-ready condition.

39. The Contractor shall be deemed to have fully inspected the site and assessed the quantity, nature and value of all dismantling/salvage materials and the constraints associated with the retained boundary walls and adjoining structures before quoting his rates. No claim on account of any discrepancy in quantity, condition, accessibility, recoverability or salvage value of materials shall be entertained subsequently.
40. Completion of the dismantling/demolition work shall be deemed to have been achieved only after all structures and installations within the approved scope have been removed, all required salvage/debris has been taken out, the site has been cleaned and levelled, retained structures have been protected, statutory disposal requirements have been complied with, and the site has been handed over to the satisfaction of the Engineer-in-Charge for commencement of construction of the proposed new building.

2.0 EARTH WORK :

2.1 The work shall be done in accordance with CPWD Specifications - 2019 - Vol. I & Vol. II with correction slips upto the last date of submission of tender document and National Building Construction Standards 2026.

2.2 Excavation shall be carried out to the width of the retaining wall footing, development works, and MEP works, including the necessary margins required for construction operations, as per the drawings or as otherwise directed by the Engineer-in-Charge. Where the nature of the soil, the depth of the trench, or the season of the year does not permit vertical sides, the Contractor shall, at his own cost, provide the necessary shoring, strutting, and planking, or excavate the sides to safe slopes, with or without steps, or adopt a combination of both, with due regard to the safety of personnel and the works, to the satisfaction of the Engineer-in-Charge. The cost of providing such steps, slopes, shoring, strutting, and planking, as required, shall be deemed to be included in the scope of work.

All the major excavation shall be carried out by mechanical excavator. No extra payment shall be made for that.

The rates are inclusive for all depths & nothing extra shall be paid for additional lift etc.

The soil under the area has a tendency to slide, if deep cuts are made in rainy season. Additional precautions are required if cutting of soil is being done specially during rainy season. No extra time or hindrance of any kind is permissible on this account.

The surplus excavated earth and malba etc.(which is not required at site either for filling or raising the ground to achieve desired formation level as per approved architectural drawings) shall be disposed of outside the campus as per direction of Engineer-in-Charge and nothing extra shall be paid on this account. Similarly if earth is required for filling or raising the ground/plinth as per site requirement, nothing extra shall be paid.

2.3

The Contractor shall, at his own cost, make all necessary arrangements to maintain the water level in the area under execution sufficiently below the working level so as to prevent any damage to the works or hindrance in their execution. The rates quoted for all items of work shall be deemed to include the cost of pumping out or bailing out water, dewatering, and providing strutting, shoring, or any other necessary protective measures, if required, and no extra payment shall be made on this account.

This shall include water from any source whatsoever, including but not limited to rainfall, accumulated rainwater, flooding, leakage from water supply or sewer lines, seepage, high sub-soil water table, or any other cause. The Contractor shall make adequate arrangements for pumping, dewatering, dredging, and bailing out water from all such sources. The excavation and all associated works shall be kept free from water throughout the execution period by adopting a suitable dewatering system approved by the Engineer-in-Charge.

The sub-soil groundwater table indicated in the Soil Investigation Report is only indicative and may vary depending upon seasonal and site conditions. The Contractor shall make an independent assessment of the groundwater conditions likely to be encountered during execution. Variations in the groundwater level due to the monsoon, seepage from existing drains, utility corridors, or any other source shall be deemed to have been considered by the Contractor while quoting the rates.

The Contractor shall provide adequate arrangements for dewatering to lower and maintain the groundwater table below the proposed foundation level throughout the construction period. Where required, suitable measures, including anchorage against uplift, shall be adopted in accordance with the approved structural design and relevant Indian Standards, including their latest amendments, at no extra cost to the Department.

The sub-soil water table shall be maintained at least 500 mm below the PCC level during laying of PCC, waterproofing treatment, construction of the raft foundation, and placement and compaction of earth/sand filling. The groundwater level shall not be permitted to rise above the underside of the raft foundation until the completion of the raft, waterproofing, and backfilling, and until the structure has attained sufficient dead load to safely resist uplift pressure. The cost of pumping out or bailing out water, wherever required, shall be deemed to be included in the quoted rates.

The sequence and methodology of excavation, dewatering, foundation construction, and backfilling shall be submitted by the Contractor and approved by the Engineer-in-Charge before commencement of the work.

The Contractor shall take all necessary safety precautions to prevent collapse of excavation sides and adjoining ground, including the provision of sheet piles, diaphragm walls, shoring, bracing, or any other suitable support system, as required based on site conditions.

2.4

The Royalty of surplus earth, if any, shall be paid by the Contractor to concerned authority of state government at the prevailing royalty rates.

2.5

Dewatering: The dewatering of the site shall be deemed to be included in the scope of this Contract in accordance with the provisions of this Tender Document. The Contractor shall, at his own cost, design, install, operate,

monitor, maintain, and subsequently dismantle the complete dewatering system. The dewatering system shall be designed and supervised by qualified and experienced personnel throughout the execution of the works.

2.5.1 Wherever required, the Contractor shall install, maintain, and operate an appropriate system of wells, well points, trenches, sumps, pumps, pipelines, or any other approved dewatering arrangement necessary for carrying out excavation, construction of the permanent works, and placement of backfill under dry and stable conditions.

2.5.2 The dewatering system shall be designed and operated in a manner that prevents seepage, piping, boils, loss of fines, erosion, softening of the bearing strata, or any adverse effect on the stability of the excavation bottom, side slopes, adjoining structures, or utilities.

2.5.3 If, in the opinion of the Engineer-in-Charge, any damage to the works occurs due to inadequacy, malfunction, or failure of the dewatering system, whether in whole or in part, the Contractor shall, at his own cost, repair, reconstruct, or replace the damaged work with all necessary labour, materials, plant, equipment, and incidentals, to the satisfaction of the Engineer-in-Charge.

2.5.4 The Contractor shall prevent the accumulation of surface water within the excavation area. Surface runoff and water discharged from the dewatering system shall be collected, conveyed, and disposed of outside the working area in a safe manner and at locations approved by the Engineer-in-Charge.

2.5.5 The Contractor shall execute all works necessary for effective control of surface runoff and groundwater, including construction and maintenance of drains, ditches, sumps, pumping stations, pipelines, and all associated facilities of adequate capacity.

2.5.6 The Contractor shall provide a reliable power supply of adequate capacity for continuous operation of both the primary and standby dewatering systems throughout the execution of the works.

2.5.7 The Contractor shall provide, install, and maintain an automatic alarm system capable of alerting responsible personnel in the event of power failure or malfunction. The system shall also automatically start the standby pumping units.

2.5.8 The standby dewatering system shall be designed so that it can be immediately connected to and operated in conjunction with the primary dewatering system whenever required.

2.5.9 The Contractor shall obtain all necessary permissions, approvals, and clearances from the competent authorities, including the local body, traffic police, irrigation department, municipal authority, pollution control authority, or any other statutory authority, as applicable, for discharge of dewatering water.

2.5.10 The Contractor shall make all necessary arrangements, including the supply and laying of pipelines, construction of drains, pumping arrangements, treatment (if required), transportation, and final disposal of dewatering discharge, entirely at his own cost. No separate payment or claim whatsoever shall be entertained by the Department on this account.

2.6 Shoring/ soil stabilization: - The scope of this tender also includes the design

and execution of shoring, sheet piling, and soil stabilization works, in addition to the diaphragm wall/sheet piles, to safely resist all applicable dead and live loads, including earth pressure, hydrostatic pressure, traffic loads, point loads, line loads, and surcharge loads.

2.7

Shoring system may be in the form of RCC piles, reinforced concrete, pre-stressed concrete or steel. Depending upon the materials adopted by looking at various parameters, the conformance shall be as per the specifications given for reinforced concrete; pre stressed concrete and steel sheet pile. Sheet pile in accordance with IS: 2911 (part II)-1980, IS: 456-1978, IS: 1343-1980 and IS: 2314 – 1963 respectively. The Contractor shall quote the rates accordingly. No extra payment shall be made for the design, supply, installation, maintenance, or removal (where required) of the shoring system, and the quoted rates shall be deemed to include all such costs.

3.0 CEMENT CONCRETE

The work shall be done in general as per CPWD Specifications 2019, Volume-I & II with date correction slip issued up to last date of submission of bid.

Contractor is permitted to use RMC for cement concrete & Reinforced cement concrete work. Contractor shall submit at least 2 sets of plants. Engineer-in-charge may approved one or two plants as per requirement of contractor after getting the design mix approved for each plant. In case contractor wants to use design mix concrete for cement concrete & Reinforced cement concrete work by providing from his batch mix plant at outside the campus, **he is permitted**.

4.0 R.C.C./C.C WORK (DESIGN MIX CONCRETE):

4.1

The RCC work shall be done with Design Mix Concrete. Wherever letter M has been indicated, the same shall imply for the Design Mix Concrete. The Design Mix Concrete will be designated based on the principles given in the latest IS: 456, 10262 & SP 23. The condition and specifications stated herein shall have precedence over all conditions and specifications stated in relevant I.S. codes / CPWD specifications. The concrete mix shall be designed for specified target mean compressive strength in order to ensure that the work test results do not fall below the acceptance criteria specified for the concrete mix. The Contractor shall design mixes for each class of concrete indicating that the concrete ingredients and proportions will result in concrete mix meeting requirements specified. The mix shall be designed with quantities of admixture / plasticizer proposed to achieve required workability & strength. The specifications mentioned here in below shall be followed for Design Mix Concrete.

The sources of coarse aggregate, fine aggregate & water to be used in concrete work shall be identified by the contractor & he will satisfy himself regarding their conforming to the relevant specification & their availability before getting the same approved by the Engineer-in-Charge.

Coarse Aggregate: As per CPWD Specifications 2019 – Volume-I & II with up to date correction slips up to last date of submission of bids.

Fine Aggregate: As per CPWD Specifications 2019 – Volume I & Vol. II with up to date correction slips up to last date of submission of bids.

Water: It shall confirm to requirements laid down in IS : 456-2000 / CPWD Specifications 2019 – Volume I & Vol. II with up to date correction slips up to last date of submission of bids.

Cement: PPC shall be used for design mix concrete and shall conform to IS-1489 (Part I). However, **if OPC/ higher grade of cement used by the contractor nothing extra shall be paid on this account.**

Admixtures / Plasticizers: - The admixture shall conform to IS: 9103, wherein required, the admixture of approved quality and approved make only shall be used to attain the required workability. Nothing extra shall be paid for use of admixtures.

Grade of Concrete: The compressive strength of various grades of concrete shall be given as below.

Grade Designation	Compressive strength on 15 cm cubes minimum 7 days (N/mm ²)	Specified Characteristic Compressive Strength at 28 days (N/mm ²)	Maximum Water Cement Ratio	Minimum Cement to be used in (kg per cum)
M-10	As per design	10	0.50	220
M-15	As per design	15	0.50	240
M-20	As per design	20	0.50	300
M-25	As per design	25	0.50	330
M-30	As per design	30	0.45	350
M-35	As per design	35	0.45	370
M-40	As per design	40	0.45	390

NOTE: In the designation of a concrete mix letter M refers to the mix and the number of the specified characteristic compressive strength of 15 cm – cube at 28 days expressed in N/mm².

The contractor shall engage one of the following approved laboratories/ test house at their own expenses for designing the concrete mix in accordance with relevant IS Codes and to conduct laboratory test to ensure the target strength and workability criteria for a given grade of concrete.

- IIT Kharagpur
- IIT Madras
- IIT Mumbai
- IIT Delhi
- IIT Patna
- NIT Durgapur
- NIT Patna
- Any other Institute / Laboratory as approved by ADG (Patna), CPWD or his successor thereof.

The various ingredients for mix design / laboratory tests shall be sent

to the lab / test houses through the Engineer-in-Charge and the samples of such aggregates sent shall be preserved at site.

The contractor shall submit the report on design mix from any of above approved laboratories for approval of Engineer-in-Charge within 30 days from the date of issue of letter of acceptance of the tender. No concreting shall be done until the design mix is approved.

In case of change of source or characteristic properties of the ingredients used in the concrete mix during the work, a revised laboratory mix design report conducted at laboratory established at site shall be submitted by the contract or as per the direction of the Engineer-in-Charge.

4.2

Trial Batches

The designed mix proportion shall be checked for target mean compressive strength by means of trial batches. The quantities of materials for each trial mix shall be sufficient for at least six specimens (cubes) and the concrete required for carrying out workability tests. The workability of Trial Mix No. 1 shall be measured and mix shall be carefully observed for freedom from segregation, bleeding and its finishing characteristics. The water content, if required, shall be adjusted corresponding to the required changes in the workability. With the modified water content, the mix proportions shall be recalculated by keeping with water cement ratio unchanged. The mix proportions, as modified, shall form the Trial Mix No.2 and tested for the specified strength and workability. In addition, Trial Mix No. 3 and 4 shall be designed by keeping water contents same as that determined for trial mix 2 but varying the water cement ratio ± 10 percent of the specified value and tested for their design characteristics. All cost of mix designing and testing connected herewith including charges payable to the laboratory shall be borne by the contractor including re-designing of the concrete mix whenever required as directed by Engineer-in-Charge.

4.3

APPROVAL OF DESIGN MIX:

The mix design for a specified grade of concrete shall be done for a target mean compressive strength $T_{ck} = F_{ck} + 1.65 S$ or $F_{ck} + X$, whichever is higher

Where,

F_{ck} = Characteristic compressive strength at 28 days.

S = Standard deviation which depends on degree of quality control.

X = factor based on the grade of concrete, as per Table 1 (IS:10262-2019)

The degree of quality control for this work is “good” for which the standard deviation (s) obtained for different grades of concrete shall be as follows

Table 1

GRADE OF CONCRETE	STANDARD DEVIATION(S)
M-10	3.5
M-15	3.5
M-20	4.0
M-25	4.0
M-30	5.0

M-35	5.0
M-40	5.0

Minimum three sets of separate preliminary test shall be carried out for each trial batch of concrete mix. Each test shall comprise six specimens and only one test set of six specimens shall be made on any particular day. Out of the six specimen of each set, three shall be tested at seven days and remaining three at 28 days. The preliminary tests at seven days are intended only to indicate the strength to be attained at 28 days. While the design mix shall be approved only on the basis of test strength of 28 days. The design mix shall be considered satisfactory and approval if at least three preliminary test- sets individually satisfy the following strength and workability criteria -

- The average strength of each test sets is not less than the specified target means compressive strength (T_{CK}).
- The strength of any specimen cube is not less than $0.85 T_{ck}$.
- The concrete mix of required degree of workability and acceptance concrete finish.

All cost of mix designing and testing i/c cartage of test materials including charges payable to the laboratory shall be borne by the Contractor

4.4

FREQUENCY OF TEST:

The frequency of sampling of concrete of each grade shall be done as per CPWD Specification 2019. At least one sample shall be taken from each shift. 90% of the total tests shall be done at the laboratory established at site by the contractor and remaining 10% in approved external laboratory.

4.5

STANDARD OF ACCEPTANCE:

Acceptance criteria of design mix shall be in accordance with Para 5.8.3 of CPWD Specification 2019 Volume I.

For cast-in-situ (if required), the contractor has to arrange at site centering and shuttering as given in Proforma of Schedule before one month from stipulated date of start of work. Only M.S. centering / shuttering and scaffolding material /as per structural system technology adopted by the bidder, unless & otherwise specified shall be used for all R.C.C. work to give an even finish of concrete surface. However, marine-ply shuttering as per site requirement may be used on specific request from contractor as approved by the Engineer-in-Charge. No extra payment shall be made on any of these grounds.

In order to keep the floor finish as per architectural drawings and to provide required thickness of the flooring as per specifications, the level of top surface of R.C.C. shall be accordingly adjusted at the time of its centering, shuttering and casting for which nothing extra shall be paid to the Contractor.

As per general engineering practice, the finished floor level of toilets, bathrooms, balconies, and similar wet areas shall be kept 15 mm lower than the finished floor level of the adjoining rooms, corridors, or general floor areas, or as indicated in the approved drawings. The shuttering shall be

adjusted accordingly, and the slabs/flooring shall be laid to the required slope towards the drainage points to ensure proper drainage. No extra payment shall be made on this account.

4.6

Production of Concrete

All concrete shall be produced using minimum 1 no. fully automatic weigh-batching plant of suitable capacity (not less than 30 cum/hr.) conforming to IS:4925 with the arrangements for automatic dispensing of admixture and having facility of giving print out indicating weight / details of all ingredient of concrete in each lot/ batch and variations from the approved design mix if any.

The batching and mixing plants shall be dedicated plants for this project. Contractor shall make his own arrangements for the necessary infrastructure for installation of batching plant and other machineries.

Automatic batcher shall be charged by devices which when actuated by a single starter switch will automatically start the weighing operation of each material and stop automatically when the designated weight of each material is fed in the mixer. The batching plant shall have automatic arrangement for dispensing the admixture and shall be capable of discharging water in more than one stage.

A batching plant essentially shall consist of the following components:

- Separate storage bins for different sizes of aggregates, silo for cement, water storage tank.
- Batching equipment
- Mixers
- Control Panels
- Mechanical material feeding and elevating arrangements

The compartments of storage bins for aggregates shall be approximately of equal size. The cement compartment shall be centrally located in the batching plant. It shall be water tight and provided with necessary air vent, aeration fittings for proper flow of cement & emergency cut off gate. The aggregate and sand shall be charged by power operated centrally revolving chute. The entire plant from mixer floor upward shall be enclosed and insulated. The batch bins shall be constructed so as to be self-cleansing during draw- down. The batch bins shall in general conform to the requirements of IS:4925.

The batching equipment shall be capable of determining and controlling the prescribed amounts of various constituent materials for concrete accurately i.e. water, cement, sand, individual size of coarse aggregates etc. The accuracy of measuring devices shall fall within the following limits.

Measurement of Cement:	$\pm 2\%$ of the quantity of cement in each
batch Measurement of Water:	$\pm 3\%$ of the quantity of water in each
batch Measurement of Aggregate:	$\pm 3\%$ of the quantity of aggregate in

each batch Measurement of Admixture: $\pm 3\%$ of the quantity of admixture in each batch

The batching and mixing plant shall have the provision of adjusting the plus / minus quantity of various ingredients in the next batch so that there is no variation in quantity of ingredients from design mix in a lot consisting of 5 to 6 batches.

The mixer in the batching plant shall be so arranged that mixing action in the mixer can be observed from the operator's station. The mixer shall be equipped with a mechanically or electronically operated timing, signaling and metering device which will indicate and assure completion of the required mixing period. The mixer shall have all other components as specified in IS: 4925.

Space for the installation of Batching plant, construction of stores/steel yard, Office and labour hutment is not available in the campus of RBI Patna at Lohianagar where the work is to be executed. The agency has to arrange space for the same in proximity of the work site not more than in radius of 10.00 (Ten) kms from the campus of RBI Patna at Lohianagar and will take prior approval of Engineer-in-charge. Contractor has to transport concrete from the batching plant to the work site by Transit Mixer only. The bidder must quote his rate accordingly and nothing extra shall be paid on this account.

Condition for Ready mix concrete

1. The cost of packaging, sealing, transportation, loading, unloading, cost of samples and the testing charges for mix design in all cases shall be borne by the contractor.
2. Ready mix concrete as per approved design mix shall be arranged by the contractor from ACC, Ambuja, UltraTech, Nuvoco (Lafarge) or as approved by Engineer-in-Charge.
3. The contractor shall arrange Ready Mix Concrete from RMC producing plants (within 30 KM distance from the site of work) supplying concrete.
4. For procurement of ready mix concrete from RMC Plants, the contractor shall submit name of RMC Plant Companies of repute along with details of such Plants, including details of transit mixer with pumps etc. to be deployed indicating name of owner /company, its location, capacity, technical establishment, past experience and text of MOU proposed to be entered between purchaser (the contractor) and supplier (RMC Plant) to the Engineer-in-Charge. Engineer-in-Charge shall give approval in writing (subject of drawl of MOU). The contractor shall draw the MOU with

- approved RMC Plant Owner/Company and submit to Engineer-in-Charge within a week of such approval.
5. The Engineer –in-Charge will reserve right to inspect at any such stage, and reject the concrete if he is not satisfied about quality of product. The contractor should therefore, draw MOU/Agreement with RMC Owner/Company very carefully keeping all terms and conditions/specifications forming a part of this tender document.
 6. The Engineer-in-Charge reserves the right to exercise control over the : ingredients, water and admixtures purchased, stored and to be used in the concrete including conducting of tests for checking quality of materials, recordings of test results and declaring the materials fit or unfit for use in production of mix.
 7. Calibration Checks of the RMC. Weight and quantity check on the ingredients, water and admixtures added for batch mixing.
 - (i) Time of mixing of concrete.
 - (ii) Testing of fresh concrete, recordings of results and declaring the mix fit or unfit for use. This will include continuous control on the workability during production and taking corrective action.
 8. PPC of brand/make/source as approved by Engineer-in-Charge shall only be used for production of concrete.
 9. The item of design mix cement concrete shall be inclusive of all the ingredients including admixtures if required, labour, machinery T&P, transportation etc. (except shuttering which will be measured and paid for separately) required for a design mix concrete of required strength and workability. The rate quoted by the agency shall be net and nothing extra shall be payable on account of change in quantities of concrete ingredients like aggregates and admixtures etc. as per the approved mix design.
 10. 90% of Mandatory test as per CPWD specification for aggregates, cement, water shall be done at Site laboratory in presence of Contractors Engineers, authorized representative of RMC plants.
 11. 10% of Mandatory test as per CPWD specification for aggregates, cement, water shall be done from laboratory as mentioned in 2.6.8 of Particular specifications.
 12. Slump test shall be done during unloading of RMC from transit mixer in presence of Contractors Engineers, authorized representative of RMC plants at site.
 13. Cube sample of compressive strength shall be taken during unloading of RMC from transit mixer in presence of Contractors Engineers, authorized representative of RMC plants at site.

4.7 Land for Temporary Use

The land/space for labour huts/cement godown and batching plant shall be not made available by RBI/CPWD authorities to the contractor in the proposed site due to non-availability of space inside the campus. The agency shall make own arrangement for land/space outside the campus nearby the site (ensuring that the area is safe and accessible for all workers) with consultation of Engineer-in-charge.

4.8 TRANSPORTATION, PLACING AND COMPACTION OF CONCRETE

- a. Mixed concrete from the batching plant shall be transported to the point of placement by transit mixers and placed in position through concrete pumps and/or steel closed bottom buckets capable of carrying minimum 0.6 cum concrete. In case the concrete is proposed to be transported by transit mixer, the mixing speed shall not be less than 4 rev / min. of the drum nor greater than a speed resulting in a peripheral velocity of the drum 70 m/ minutes at its largest diameter. The agitating speed of the agitator shall be not less than 2 rev/min nor more than 6 rev/min of the drum. The number of revolution of the mixing drum or blades at mixing speed shall be between 70 to 100 revolutions for a uniform mix, after all ingredients, has been charged into the drum. Unless tempering water is added, all rotation after 100 revolutions shall be at agitating speed of 2 to 6 rev/min and the number of such rotations shall not exceed 250. The general condition of transit mixer and other requirement shall conform to IS : 5892.
- b. In case concrete is to be transported by pumping, the conduit shall be primed by pumping a batch of mortar through the line to lubricate it. Once the pumping is started, it shall not be interrupted (if at all possible) as concrete standing idle in the line is liable to cause a plug. The operator shall ensure that some concrete is always there in the pump receiving hopper during operation. The lines shall always be maintained clean and shall be free of dents at all stages. Special precaution shall be taken that surrounding temperature during concreting shall not exceed 30 degree centigrade.
- c. Except where otherwise agreed to by the Engineer-in-Charge, concrete shall be deposited in horizontal layers to a compacted depth of not more than 450 mm. Unless agreed to by the Engineer-in-Charge, concrete shall not be dropped into place from a height exceeding 1.5 metre. In order to avoid such situations chutes, tremie pipe or closed bottom buckets shall be used. These shall be kept clean and used in such a way as to avoid segregation. Slope of the chute shall be so adjusted that concrete flows without the use of excessive quantity of water. The delivery end of chute shall be as close as possible to the point of deposit. The chute shall be thoroughly flushed with water before and after each working period and

the water used for this purpose shall be discharged outside the formwork. The concrete shall be compacted by using immersion type vibrators. When the concrete is being continuously deposited to a uniform depth along a member, vibrator shall not be operated within one meter of free end of the advancing concrete. Every effort shall be made to keep the surface of the previously placed layer of concrete alive so that the succeeding layer can be amalgamated with it by the vibration process. In case the concrete in underlying layer has hardened to such an extent that it cannot be penetrated by the vibrator but is still fresh (that is, just after initial set), un-imposed bond shall be achieved between the top and underlying layer by first scarifying the lower layer before the new concrete is placed by systematically and thoroughly vibrating the new concrete. The points of insertion of vibrator in the concrete shall be so spaced that the range of action overlap to some extent and the freshly filled concrete is sufficiently consolidated at all locations. The spacing between the dipping positions of vibrator shall be maintained uniformly throughout the surface of concrete so that concrete is uniformly vibrated. The vibrating head shall be regularly and uniformly inserted in the concrete so that it penetrates of its own accord and shall be withdrawn slowly while running so as to allow re-distribution of concrete in its way and allow the concrete to flow back into the hole behind the vibrator. The vibrator head shall be kept in one position till the concrete within its influence is completely consolidated. Vibration shall be continued until the coarse aggregate particle have blended into the surface but have not disappeared. The contractor shall keep at-least two additional vibrators in serviceable condition to be used in the event of break downs and maintenance problems.

- d. The vibrator head shall not be brought more than 200 mm near to the form work as this may cause formation of water stagnations. The form work shall be strong and great care shall be exercised in its assembly. It shall be designed to take up increased pressure of concrete and pressure variations caused in the neighborhood of vibrating head, which may result in excessive local stress on the formwork. The joints of the form work shall be made and maintained tight and close enough to prevent the squeezing out slurry or sucking in of air during vibration. The form work to receive concrete shall be cleaned and made free from standing water, dust, etc. The contractor shall keep provision for screed and shutter vibrators at site.
- e. No concrete shall be placed in any part of the structure until the approval of Engineer-in-Charge has been obtained. If concreting is not started within 24 hours of the approval being given, it shall have to be obtained again from the Engineer- in- Charge. Concreting shall be done continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept, clean, thoroughly wetted and covered with a 13 mm thick layer of mortar composed of cement and sand in the same ratio as

- in the concrete mix itself. The 13 mm layer of mortar shall be freshly mixed and placed immediately before placing of new concrete.
- f. Where concrete is not fully hardened, all latency shall be removed by scrubbing the wet surface with wire or bristle brushes. Care shall be taken to avoid dislodgement of particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. Particular attention shall be given to corners and close spots.
 - g. In case of rejection of concrete on account of unacceptable compressive strength, governed by para “Standard of Acceptance” as above, the work for which samples have failed shall be redone at the cost of contractor. However, the Engineer-in-Charge may order for additional tests (like cutting cores, ultrasonic pulse velocity test, load test on structure on part of structure, etc) to be carried out at the cost of contractor to ascertain if the portion of structure wherein concrete represented by the sample has been used, can be retained on the basis of results of individual or combination of these tests. The Contractor shall take remedial measures necessary to retain the structure as approved by the Engineer- in-Charge without any extra cost. However, for payment, the basis of rate payable to contractor shall be governed by the 28 days cube test results and reduced rates.

4.9

Specification for Self-Compacting Concrete in RCC:

1. The work involves providing and laying in position, machine batched, machine mixed, Self Compacting Cement Concrete (SCC) produced in fully automatic plant (2 nos. plants installed by Contractor having minimum Capacity 60 + 30 cum/ Hours) of M-40 grade or more as per approved design mix using Ordinary Portland cement with adding cementitious material fly ash, silica fume etc. as per IS 15388 and EN-197-1 having minimum content of silica fume @ 5% of cement. SCC shall be with a slump flow of 650-750 mm at pouring in site (3 hrs. from batching) with minimum density of 2350Kg/m³. Viscosity shall be 6 to 12 seconds measured in V Funnel and pass ability shall be ≥ 0.9 measured in an L Box (3 rebar) at mix design/ development in the laboratory for Fair Finished reinforced cement concrete work in super structure at all floor levels, including transportation of concrete through transit mixer to site of laying, finishing, curing, vibrating (if required) for all leads, all floor levels, all height, pumping of concrete to site of laying, including admixtures conforming to IS 9103 as per designed proportions to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. The Mix design shall comply with IS 4926, IS 456 design parameters and IS 516 & BS EN 12350 testing parameters (for parameters mentioned) and shall be got approved by Engineer-in- Charge before execution of the item. The Self compacting concrete shall comply provisions as per CPWD Specifications.

2. Applicable codes:

- i. EFNARC Specification and Guidelines 2005 – Self Compacting Concrete.
- ii. ACI 237R-07 – Self Consolidating concrete.
- iii. IS:456-2000 – Plain and reinforced code for practice.
- iv. IS: 2386 (Part-III 1963) Methods of test for aggregates for concrete Specific gravity, density, voids absorption and bulking.

3. The RCC work shall be with design mixed Self Compacting Concrete/normal reinforced cement concrete of specified grade as directed by the Engineer-in-charge, produced at site in fully automatic computerized batch mix concrete (BMC) plant conforming to IS:4925 after approval of the Engineer-in-Charge. In the nomenclature of items wherever letter M has been indicated, the same shall imply for the Design Mix of Self Compacting Concrete. The mix design shall be carried out as per EFNARC Specifications and Guidelines for Self Compacting Concrete / European Guidelines for Self Compacting Concrete. For mix design, all three workability parameters (filling ability, passing ability and segregation resistance) need to be assessed to ensure that all aspects are fulfilled. In case, the contractor wants to use Design Mix of Self Compacting Concrete from outside RMC plant, the prior approval of Engineer-in- Charge will be obtained and nothing extra shall be payable in case of use of RMC instead of BMC. In the designation of a concrete mix, letter M refers to the mix and the number to the specified characteristic compressive strength of 15 cm Cube at 28 days expressed in N / mm². Self-Compacting Concrete shall include all quantity of cement as per design mix. The consumption of any quantity of cement as per approved design mix shall be included in the scope of work and no extra payment shall be considered on this account.

4. Ingredients:

The sources of coarse aggregate, fine aggregate, water, mineral admixture, chemical admixture and cement to be used in self compacting concrete work shall be identified by the contractor and he will satisfy himself regarding their conforming to the relevant specifications and their availability before getting the same approved from the Engineer in-Charge.

- (a) Coarse Aggregate:- It shall conform to IS:383 Maximum size: Upto 20 mm content ranges from 750 kg/cum to 1000 kg/cum
- (b) Fine Aggregate:- It shall conform to IS:383
- (c) Water shall conform to IS:456.
- (d) Cement:- OPC 43 Grade conforming to IS:8112(Part-I)/PPC
- (e) Mineral Admixture:- It shall conform to standards, as applicable
- (f) Chemical Admixture:-High range water reducing admixture (PCE based) conforming to IS:9103 in appropriate dosage.
 - i. Super plasticizers shall comply with provisions of EN 934-2: 2000.
 - ii. Viscosity modifying admixture in appropriate dosage.
- (g) Powder / Fine Preferably be in the range of 400 kg/cum to 600

- (size less than 0.125 mm)
 (h) Water to Powder 0.85 to 1.0 (by volume)

All the materials identified from the sources as above by the contractor shall conform to CPWD Specification and other relevant standards, as applicable. The contractor, before proposing any of these materials for approval of Engineer-in-charge, shall himself assure that the proposed materials conform to the relevant specifications and standards.

5. Fine Filler

Ordinary Portland cement with adding cementitious material like fly ash, Alccofine, silica fume etc., However the Engineer – in – charge reserves right to revisit the cementitious content in the mix based on its test results. Alccofine and silica fume shall be as approved by Engineer- In-Charge.

6. Mixed process:

Workability tests shall be conducted on every load, until consistent and complaint results are obtained. Subsequently, every delivered batch shall be visually checked before transportation to site, and routine testing carried out to be frequency specified in EN206.

7. Placing:

For forms in excess of 3 m in depth, the full hydrostatic head shall be used.

8. Placing distance:

Following to be ensured during placing:

- Limit the vertical free fall distance to 5 m
- Limit the permissible distance of horizontal flow from point of discharge to 10m

9. Curing

SCC tends to dry faster than conventional concrete because there is little or no bleed water at the surface. Initial curing shall therefore be commenced as soon as practicable after placing in order to minimize the risk of shrinkage cracking. Curing compound shall be used as per suggestion of Engineer in charge.

10. Quality Control:

10.1 Production control

All SCC shall be subject to production control under the responsibility of the Contractor, and this shall be in accordance with the requirements of EN 206-1, clause-

10.2 Testing

List of test methods for workability properties of SCC for Initial Mix Design of SCC.

Sl. No.	Method	Property
1	Slump-flow by Abrams cone	Filling ability
2	T50cm slump flow	Filling ability
3	J-ring	Passing ability
4	V-funnel	Filling ability
5	V-funnel at T 5 minutes	Segregation resistance
6	L-Box	Passing ability
7	U-box	Passing ability
8	Fill-box	Passing ability
9	GTM screen stability test	Segregation resistance
10	Orimet	Filling ability

10.3 Tests for site quality control:**Table-1: Workability properties of SCC:**

Property	Test methods	Field (QC)	Modification of test according to max. aggregate size
	Lab (mix design)		
Filling ability	1 Slump flow	1 Slump flow	None
	2 T50cm slump flow	2 T50cm slump flow	
	4 V-funnel 10 Orimet	4 V-funnel 10 Orimet	Max20 mm
Passing ability	6L-box 7 U-box 8Fill-box	3J-ring	Different openings is L-box, U-box and J-ring
Segregation resistance	9 GTM test 5V-funnel at T5minutes	9 GTM test 5V-funnel at T5minutes	None

10.4 Typical acceptance criteria for Self-compacting Concrete:

Table-2: Acceptance criteria for Self-compacting concrete:

Sl. No	Method	Unit	Typical range of values	
			Minimum	Maximum
1	Slump-flow by Abramscone	Mm	650	750
2	T50cm slum flow	Sec	2	5
3	J-ring	Mm	0	10
4	V-funnel	Sec	6	12
5	V-funnel at T5minutes	Sec	0	+3
6	L-Box	h2/h1	0.8	1.0
7	U-box	(h2/h1)mm	0	30
8	Fill-box	%	90	100
9	GTM screen stability test	%	0	15
10	Orimet	Sec	0	5

4.10 Mix composition:

The mix composition shall satisfy all performance criteria for the concrete in both the fresh and hardened states. For the fresh concrete, the requirements are set out in Table 1 & Table 2 above. In the hardened state, the requirement of EN 206 shall be fulfilled.

4.10.1 Initial Mix Composition:

Indicative typical ranges of proportions and quantities in order to obtain self-compatibility are given below: Further modifications will be necessary to meeting strength and other performance requirements.

- Water / powder ratio by volume of 0.80 to 1.10.
- Total powder content -160 to 240 litres (400-600 kg.) per cubic meter.
- Coarse Aggregate content normally 28 to 35% by volume of the mix.
- Water: cement ratio is selected based on requirements in EN206. Water content shall not exceed 20 litre /m³.

The sand content shall balance the volume of the other constituents

4.10.2 Adjustment of mix:

Laboratory trials shall be used to verify properties of the initial mix composition. If necessary, adjustments to the mix composition shall then be made. Once all requirements are fulfilled, the mix shall be tested at full scale at the concrete plant or at site. In the event that satisfactory performance cannot be obtained, then consideration shall be given to fundamental redesign of the mix. Depending on the apparent problem, the following courses of action might be appropriate:

- Using additional or different types of filler, (if available).

- Modified the proportions of the sand or the coarse aggregate.
- Using a viscosity modifying agent, if not already included in the mix.
- Adjusting the dosage of the super-plasticizer and/ or the viscosity modifying agent.
- Using alternative types of super-plasticizer (and/or VMA), more compatible with local materials.
- Adjusting the dosage of admixture to modify the water content, and hence the water/ powder ratio.

The formwork shall be suitably designed for achieving the desired form finish of the exposed concrete. For further specifications and guidelines reference shall be made to the **EFNARC document “Specifications and Guidelines for Self Compacting Concrete”**.

4.11 Curing of Concrete

Curing of concrete shall be complete and continuous using water that is free of harmful amounts of deleterious materials that may attack, stain or discolour the concrete.

Immediately after compaction and completion of any surface finishes, the concrete shall be protected from evaporation of moisture by means of polyethylene sheets, wet hessian or other material kept soaked by spraying. As soon as the concrete has attained a degree of hardening sufficient to withstand surface damage, moist curing shall be implemented and maintained for a period of at least 14 days after casting.

Method of curing and their duration shall be such that the concrete will have satisfactory durability and strength and members will suffer a minimum distortion, be free from excessive efflorescence and will not cause undue cracking in the works by its shrinkage.

The top surface of the slabs and other horizontal surfaces shall be cured by impounding water in cement mortar bunds. Steeply sloping and vertical formed surfaces shall be kept completely and continuously moist prior to and during the striking of formwork by applying water to the top surfaces and allowing it to pass down between the formwork and the concrete. After removal of form, moist curing to be done by wrapping hessian cloth, etc. and keeping it moist by suitable means.

Approved non-wax base curing compounds can be applied on vertical and inclined surfaces, if it is proved that by using curing compound the concrete shall not have less strength than concrete cured by water curing. It shall not leave any discoloration on the structural concrete.

4.12 Concreting of Narrow Members

Wherever the concreting of narrow member as in case of walls piers/ column (as adjudged by Engineer-in-Charge) is required to be carried out within shutters of considerable depth, temporary openings in the sides of the shutters shall, if so desired by the Engineer-in-charge, be provided to facilitate the pouring and consolidating of concrete. Before any concreting is commenced, shutters and centering shall be carefully examined and the space to be occupied by the concrete shall be thoroughly cleaned out. The concrete in such members shall be compacted with suitable shutter vibrators as appropriate

4.13 Protection of Concrete below ground level

Concrete placed below the ground shall be protected from falling earth during and after placing. Concrete placed in ground containing deleterious substances shall be kept free from contact with such ground and with water draining there from during placing and for a period of seven days or as otherwise instructed thereafter. Approved means shall be taken to protect immature concrete from damage by debris, excessive loading, abrasion, vibrations, deleterious ground water, mixing with earth or other materials, and other influences that may impair the strength and durability of the concrete.

4.14 Construction Joints

Before the concrete is fully hardened, all latency shall be removed by scrubbing the wet surface with wire or bristle brushes. Care shall be taken to avoid dislodgement of particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. Particular attention shall be given to corners and close spots.

Construction joints in all concrete work shall be made as directed by the Engineer-in-Charge. Where vertical joints are required, these shall be shuttered as directed and not allowed to take the natural slope of the concrete. Before fresh concrete is placed against a vertical joint, the old concrete shall be chipped, cleaned and moistened.

When a horizontal construction joint is formed, provision shall be made for interlocking with the succeeding layer by the embedment of saturated wooden blocks or wooden strips bevelled on four sides to facilitate their removal. Prior to the next pour the wooden pieces shall be loosened and removed in such a manner as to avoid injury to the concrete. After about 8 to 12 hours of concreting, contact surface shall be hacked to expose the aggregate surface and remove laitance. Immediately thereafter clean the surface using compressed air to remove all the dirt. The surface shall then be compressed cleaned to remove all dirt. Before applying fresh concrete, the contact surface shall be wetted for at least 6 hours. After the surface has dried, a coat of cement slurry with application of Nito bond by brush application only to improve the property of the previous surface for compatibility with the fresh green concrete to achieve the bond strength and

attain the homogeneous surface of the concrete, at the dosages of approved manufacturer shall be applied uniformly using a brush over the old concrete just before placing the fresh concrete. The fresh concrete shall be placed immediately after applying the cement coats. The fresh concrete shall be thoroughly vibrated near the construction joint so that the mortar from the new concrete flows between the large aggregate and develop proper bond with old concrete. The construction joint shall ensure proper bond and leak proof joint.

If use of metal, rubber or plastic water stops is specified, this shall be cast into joints. Measures shall be taken by the Contractor to ensure that no displacement or distortion of water stops takes place during placing of concrete. The construction joints shall ensure proper bond and leak proof joint.

4.15 Defects in Concrete – Cracks

If external cracks developed in concrete construction are more than 0.2 mm and in the opinion of the Engineer-in-Charge, these are detrimental to the strength of the construction, the Contractor at his own expense will conduct 'Loading Tests' on the structure in the manner as decided by Engineer-In-Charge. If under such test loads the cracks develop further, the Contractor shall dismantle the construction, carry away the debris, replace the construction and carry out all consequential work thereto.

If any cracks develop in the concrete construction are not more than 0.2 mm or in the opinion of the Engineer-in-Charge, the cracks are not detrimental to the stability of the construction, the Contractor at his own expense shall grout the cracks with neat cement grout or with other composition as directed by Engineer-in-Charge and also at his own expense and risk shall make good to the satisfaction of the Engineer-in-Charge all other works such as plaster, moulding, surface finish, which in the opinion of the Engineer-in-Charge have suffered damage either in appearance or stability owing to such cracks. The Engineer-in-Charge's decision as to the extent of the liability of the Contractor in the above matter shall be final and binding. If desired by Engineer-in-charge, the contractor may have to make suitable arrangement of Grouting/Jacketing/Strengthening etc. for rectification for which the total cost will be borne by contractor.

4.16 Preparation of mixes as per approved design mix and conducting confirmatory test at field lab

- a. The contractor shall make the cubes of trial mixes as per approved mix design at site laboratory for all grades using sample of approved materials proposed to be used in the work prior to

commencement of concreting and get them tested for 7 days and 28 days. Test cubes shall be taken from trial mixes as follows.

- b. For each mix, a set of six cubes shall be made from each of the three consecutive batches. Three cubes from each set of six shall be tested at age of 7 days and remaining three cubes at age of 28 days. The cubes shall be made, cured, transported and tested strictly in accordance with specifications. The average strength of nine cubes at age of 28 days shall exceed the specified target mean strength for which design mix has been approved, the evaluation of test results will be done as per IS:456.

4.17 Work Strength Test:

(a) Test Specimen

Work strength test shall be conducted in accordance with IS: 516 on random sampling. Each test shall be conducted on six specimens, three of which shall be tested at 7 days and remaining three at 28 days. Additional samples shall be prepared, if required, as per direction of Engineer in charge for testing samples cured by accelerated method as described in IS: 9103.

(b) Test Results of Sample

The test results of the sample shall be the average of the strength of three specimens. The individual variation shall not be more than +/- 15% of the average. If more, the test results of the sample are invalid. 80% of the total tests shall be done at the laboratory established at site by the Contractor and remaining 20% in the laboratory of Government Engineering colleges, or in any other approved laboratory as directed by the Engineer-in-charge.

(c) Standard For Acceptance

Standard of acceptance shall be same as specified in clause 16 of IS 456-2000.

4.18 In order to keep the floor finish as per direction of Engineer-in-charge and as per Architectural drawings and to provide required thickness of the flooring as per Structural Drawings, the level of top surface of RCC shall be accordingly adjusted at the time of its centering, shuttering and casting which is included in the scope of the work.

- 4.19** ➤ Tolerances shall be as per CPWD specifications and relevant BIS code. In case of rejection of concrete on account of unacceptable compressive strength, governed by para 'Standard of Acceptance' as above, the work for which samples have failed shall be redone at the cost of contractors. However, the Engineer in charge may order for additional tests (like cutting cores, ultrasonic pulse velocity test, load test on structure or part of structure etc.) to be carried out at the cost of contractor to ascertain if

the portion of structure wherein concrete represented by the sample has been used, can be retained on the basis of results of individual or combination of these tests.

The contractor shall take remedial measures necessary to retain the structure as approved by the Engineer in charge

4.20 Cement arranged by the contractor will be OPC 43/53 Grade (in bags/bulkers) conforming to IS:8112(Part-I). However, in the event of change of type of cement, change of source of coarse/ fine aggregate, filler materials, chemical admixture, etc. to be used, fresh design mix shall be got done by the contractor from approved labs at his own cost and nothing extra shall be payable on this account. This shall be subject to the approval of design mix by the Engineer-in-charge.

4.21 The various ingredients for mix design and laboratory tests connected therewith shall be sent to the lab / test houses through the Engineer-in-Charge and the samples of such aggregates sent shall be preserved at site by the department. In the event, if all the above laboratories are unable to carry out the requisite design / testing connected therewith, the contractor may have it done from any other Govt. laboratory with prior approval of Engineer-in-Charge.

4.22 As per general engineering practice, level of floors in toilet / bath, balconies, shall be kept 12mm to 20mm or as required, lower than general floors, the shuttering should be adjusted accordingly. In toilets/wash, wet area/shower area shall be additionally down by 12 to 15mm from rest of toilet, the shuttering should be adjusted accordingly. The landing level of mumty/ staircase cabin shall be kept one riser level higher than adjoining slab level so as to accommodate water proofing treatment over terrace slab. In case of kitchen slab the portion of floor trap below kitchen platform shall be kept at lower level as per approved drawings.

For the execution of centering and shuttering, the contractor shall use Reebol chemical mold release agent as shuttering oil as approved by Engineer-in-charge

4.23 **Charges for design mix:**
All cost of mix designing and testing connected therewith including charges payable to the laboratory shall be borne by the contractor including redesigning of the concrete mix whenever required and as directed by the Engineer-in-Charge.

5.0 Expansion Joint

Floor Joint

General requirement of material

The expansion joint system will be of extruded aluminum base members, self aligning /self centering arrangement and support plates etc. as per ASTM B221-02. The system shall be such that it provides floor to floor/ floor to wall expansion control system for various vertical locations in

load application areas that accommodate multi directional seismic movement without stress to its components and shall be capable of taking vehicular loads as per the design requirements. The system shall consist of metal profiles with universal aluminum base member designed to accommodate various project conditions and finish floor treatments. The cover plate shall be designed of width and thickness required to satisfy projects movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self centering arrangement that freely rotates/ moves in all directions. The self-centering arrangements shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexure in all directions including vertical displacement. Provision of moisture barrier membrane in the joint system to have water tight joint is mandatory requirement. The scope of work includes all labour, materials, equipments and services and performs all operations required for complete installation of expansion joint system.

Performance Requirement: Material and works shall conform to the latest edition of reference specifications as specified in the item and to all applicable codes and requirement of local authorities having jurisdiction.

Approval of expansion joint system :Sample of expansion joint system along with manufacturers latest published literature for material specified herein, material test reports, shop drawings etc. shall be submitted for obtaining approval before material are delivered at the site. The expansion joint cover assembly should be from one source (from single manufacturer).

Installation of expansion joint system: In all cases the manufacturer's standard written instruction or specific instructions for installation shall be followed.

Wall Joint

General requirement of material

The expansion joint system related with wall joint (internal/ external) shall be of extruded aluminum base members, self aligning / centering arrangement and support plates as per ASTM B221-02. The material shall be such that it provides an Expansion joints system suitable for vertical wall to wall/ wall to corner application, both new and existing construction in office buildings & complexes with no slipping down tendency amongst the components of the joint system. The Joint System shall utilize light weight aluminum profiles exhibiting minimal exposed aluminum surfaces mechanically snap locking the multi cellular to facilitate movement. (Material shall confirm to ASTM6063)

Performance Requirement: Material and works shall conform to the latest edition of reference specifications as specified in the item and to all applicable codes and requirement of local authorities having jurisdiction.

Approval of expansion joint system :Sample of expansion joint system along with manufacturers latest published literature for material specified herein, material test reports, shop drawings etc. shall be submitted for obtaining approval before material are delivered at the site. The expansion joint cover assembly should be from one source (from single manufacturer)

Installation of expansion joint system: In all cases the manufacturer's standard written instruction or specific instructions for installation shall be followed.

Roof Joint

General requirement of material

The expansion joint system for various roof locations shall be of extruded aluminum base members with, self aligning and self centering arrangement support plates as per ASTM B221-02. The system shall be such that provides that is capable to accommodating multi directional seismic movement without stress to its components. System shall consist of metal profile that incorporates a universal aluminum base member designed to accommodate various project conditions and roof treatments. The cover plate shall be designed of width and thickness required to satisfy movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates/ moves in all directions. The self centering arrangement shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexures in all directions including vertical displacement. The joint system shall resist damage or deterioration from the impact of allying ice, exposure to UV, airborne contaminants and occasional foot traffic from maintenance personnel. Provision of moisture barrier membrane in the joint system to have water tight joint is mandatory requirement.

Performance Requirement: Material and works shall conform to the latest edition of reference specifications as specified in the item and to all applicable codes and requirement of local authorities having jurisdiction.

Approval of expansion joint system :Sample of expansion joint system along with manufacturers latest published literature for material specified herein, material test reports, shop drawings etc. shall be submitted for obtaining approval before material are delivered at the site. The expansion joint cover assembly should be from one source (from single manufacturer).

Installation of expansion joint system: In all cases the manufacturer's standard written instruction or specific instructions for installation shall be followed.

6.0 SHUTTERING / FORM WORK:

- a) RCC work in the 02 Nos. residential towers shall be done by using readymade aluminium formwork for monolithic RCC construction. The Aluminium form work should be minimum 4 mm thick with aluminium of 6061 T6 Grade. The formwork should be certified by the Firm every month for fitness and usability and execute further work with the approval of Engineer-in-charge
- b) For RCC framed construction – RD Bungalow, Community Center and other buildings like security room, guard room, boundary wall, etc. will be RCC framed structure and can be cast with properly designed shuttering system as per CPWD specifications and OM No. 17/SE(TAS)/BMTPC/2024/195 (H) dated 14.06.2024. Use of Steel plate/ plywood/ Marine ply may be allowed subjected to approval by Engineer-in-charge.
- c) The Contractor shall ensure that there shall be no leakage at formwork joints and there shall be no movement at joints or bending of the formwork under pressure of the concrete. The entire responsibility of planning, design, erection and safety of formwork shall lie with the Contractor.
- d) All shuttering shall be designed by contractor and submitted to Engineer in charge along with design calculations for approval. Shuttering shall be executed as per approved shop drawing and design calculation.
- e) **Form work design shall consider the following:**
 - (i) Dimensional tolerance.
 - (ii) Demountable without shock, disturbance or damage to concrete.
 - (iii) All construction joints in beams and slabs shall be provided as shown in drawings.
 - (iv) Ties shall be provided where required.
 - (v) Cambers shall be provided where shown.
 - (vi) Props / supports of extra ceiling height shall be specially designed.
- f) Formwork placement and removal:- Form work shall be placed and removed as per time line provided in CPWD-specifications or as decided by engineer-in-charge in accordance with QA plan or sound engineering practice.
- g) The work shall be done in general as per CPWD Specifications 2019, Volume-I & II with date correction slip issued upto last date of submission of bid.
- h) Double steel scaffolding having two sets of vertical supports shall be provided for external wall finish, cladding etc. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding platform shall be fixed. Scaffolding shall have steel staircase for inspection of works at upper levels.
- i) Nothing extra shall be paid for the centering and shuttering,

circular in shape whenever the form work is having a mean radius exceeding 6m in plan.

- j) In order to keep the floor finish as per architectural drawings and to provide required thickness of the flooring as per specifications, the level of top surface of R.C.C. shall be accordingly adjusted at the time of its centering, shuttering and casting for which nothing extra shall be paid to the Contractor.
- k) As per general engineering practice, level of floors in toilet / bath, balconies, shall be kept minimum 15 mm lower than general floors as required. Shuttering should be adjusted accordingly. Nothing extra is payable on this account. Steel shuttering as approved by the Engineer-in-Charge shall be used by the contractor. Minimum size of shuttering plates shall be 600 mm x 900 mm except for the case when closing pieces required completing the shuttering panels. Dented, broken, cracked, twisted or rusted shuttering plates shall not be allowed to be used on the work.
- l) The shuttering plates shall be cleaned properly with electrically driven sanders to remove any cement slurry or cement mortar or rust. Proper shuttering oil or de-bonding compound shall be applied on the surface of the shuttering plates in the requisite quantity before assembly of steel reinforcement.
- m) For the execution of centering and shuttering, the contractor shall use propriety Reebole Chemical Mould release agent of FOSROC or equivalent as shuttering oil as approved by Engineer-in-Charge and nothing extra shall be paid on this account.
- n) Concreting of upper floor shall not be done until concrete of lower floor has set atleast for 10 days but form work and reinforcement can be taken up after the concrete has set atleast for three days.

All existing form work that fail to meet the specifications mentioned above or do not qualify to meet the minimum standards in the view of Engineer-in-Charge shall have to removed and stacked

7.0 REINFORCEMENT:

- a) The reinforcement shall be done as per CPWD Specifications 2019, Volume-I & II with correction slip upto last date of submission of bid.
- b) The rate of item of reinforcement of RCC work includes all operations including straightening, cutting, bending, welding, binding with annealed steel or welding and placing in position at all the floors with all leads and lift complete as per CPWD Specifications 2019, Vol.-I & Vol.-II with correction slip upto last date of submission of bid.
- c) The contractor shall provide approved type of support for maintaining the bars in position and ensuring required spacing and correct cover of concrete to reinforcement as called for in the drawings, spacer blocks of required shape and size. Chairs and spacer bars shall be used in order to ensure accurate positioning

of reinforcement. To ensure proper cover, factory made round / rectangular type cover blocks will be used to avoid displacement of bars in any direction and nothing extra will be paid for that.

- d) Reinforcement TMT bars (CRS) of grade Fe 550 D or more to be used in this work.

e) Bar Bending Schedule

The agency shall prepare bar bending schedule drawings as per approved structural drawings and submit to Engineer-in-Charge in advance for approval. The bar bending schedule shall conform to Indian Standard IS 2502-Code of Practice for Bending and Fixing of bars for Concrete Reinforcement. Before execution of work, five copies of these drawings each including for revision will be submitted to Engineer-in-Charge for approval. Keeping in view the quantum of the work, the BBS shall preferably be prepared with software and one person acquainted with preparing BBS with software shall be deputed at site to speed up the work. One software shall also be installed in the office.

8.0 Reinforcement coupler/ Mechanical splice:-

1. Reinforcement couplers shall conform to Class 'L' of Indian Standard IS 16172-2023 amended upto last date of bid submission and CPWD specifications issued by OM 08/SE(TAS)/BIS/2025/17-H Dated: 24.01.2025 or later till date of bid submission.
2. The nominal sizes of reinforcement couplers based on their internal diameter shall correspond to the nominal sizes of bars covered under IS 1786. The couplers are to be procured from Approved make list as specified in the agreement. All the couplers should be manufactured in a factory which is ISO 9001:2008 (or higher revision) certified for "Manufacturing of Mechanical Steel Rebar Couplers & Accessories" and also be certified for "Site Management of Threading & Processing of Rebar including Sales and Distribution". Mechanical Splicing System with parallel threads shall be used.
3. Testing of Mechanical Splicing System:
The reinforcement couplers shall meet the performance requirements as prescribed in the Indian Standard IS 16172-2023 namely:
 - (a) Static Tensile Test
 - (b) Slip Test
 - (c) Cyclic Tensile Test
 - (d) Low-Cycle Fatigue Test and High-Cycle Fatigue Test, if required
 - (e) Static Tensile Test and as per IS code meet the "fy" not less than 130 % (where "fy" specified minimum yield stress as per proof stress IS 1786.
4. The test results shall be submitted to the Engineer-in-Charge for acceptance and use of before execution of work. The number of

samples for each test, sampling and criteria for conformity shall be as per Annex F of IS 16172-2023.

5. Binding of reinforcement bars shall be done using re-bar tying machine of approved make and quality.
6. The agency shall deploy Automatic Ring making for making of all types/shapes of stirrups.

All bending and cutting of reinforcement shall be done by reinforcement bending and cutting machine.

9.0 MASONRY WORK:

- a) The masonry shall be done as per CPWD Specifications 2019, Volume-I & II with correction slips upto last date of submission of bid.
- b) Brick masonry with burnt clay F.P.S. (non modular) of class designation 7.5 shall be done in foundation, all work upto plinth level, wet areas, boundary wall, and other area as specified in the approved drawings with cement mortar as specified in the approved drawings.
- c) Autoclave Aerated Concrete Blocks (AAC) in super structure above plinth level of 115 mm thick internal wall and 230 mm thick in external wall as indicated in the approved drawings.
- d) All 150 mm to 300 mm thick Autoclaved Aerated concrete(AAC) blocks masonry with Grade-1 AAC blocks of density 551 to 650 kg/cum conforming to IS:2185 (Part 3) shall be laid in super structure with RCC band at sill level and lintel level with approved block laying polymer modified adhesive mortar all complete as per direction of Engineer-in-Charge.
- e) All 100 mm/ 125 mm thick Autoclaved Aerated concrete(AAC) blocks masonry with Grade-1 AAC blocks of density 551 to 650 kg/cum conforming to IS:2185 (Part 3) shall be laid in super structure RCC band at sill level and lintel level with approved block laying polymer modified adhesive mortar. 2 Nos 6 mm dia M.S. bars shall be provided at every third course of masonry work.

This thickness of the band shall be approved by the Engineer-in-Charge or as specified in drawing. The RCC band shall be provided in full width of external wall masonry.

10.0 STEEL WORK:

Steel work in general shall be carried out as per CPWD Specifications 2019, Volume-I & II with correction slips upto last date of submission of bid. Stainless steel generally shall be Grade 1.4301 (SS 304) or 1.4401 (SS 316). Lower grades shall not be used. Railing in exposed location shall be of Corrosion resistant high

grade 1.4401 (SS 316) stainless steel. Surface finish of all the stainless-steel materials will be in 240 grit satin finish / matt finish. All stainless-steel material will have to be coated by a solution of Inox to avoid finger in prints and avoidance of settlement of environment / atmospheric dust.

Height of stainless steel railing in balconies, parapets and similar locations shall not be less than 1200 mm. Stainless steel railing shall be provided with adequate SS balusters, runners etc. as per approved architectural drawing.

Fixing shall be done by stainless steel expansion bolts of approved size and make as per Engineer-in-Charge and welding to be done by using organ welding rods and the surface being duly finished and cleaned by K2 passivation, which is nitric acid plus florid acid solution treatment by which the chances of corrosion will be eliminated and any burn out makes on the metal will also be eliminated.

Stainless steel grade 304 wire gauge with wire of dia 0.50 mm and average width of aperture 1.4 mm in both directions shall be used in wire gauge shutters for doors and windows.

11.0 WOOD WORK

The wood work in general shall be carried out as per CPWD Specifications 2019, Volume-I & II with correction slips up to last date of submission of bid.

The samples of species of timber to be used shall be deposited by the contractor with the Engineer-in-Charge before commencement of the work. The contractor shall produce cash vouchers and certificates from standard kiln seasoning plant operator about the timber to be used on the work having been kiln seasoned by them, failing which it would not be accepted as kiln seasoned.

Specified timber shall be of good quality and well-seasoned. It shall have uniform colour, reasonably straight grains and shall be free from dead knots, cracks and sap wood.

Wood work shall not be painted, oiled or otherwise treated before it has been approved by the Engineer-in-Charge.

All portion of timber including architrave abutting against masonry, concrete, stone or embedding round shall be painted with approved wood preservative or with boiling coal tar as per item.

All fittings and fixtures shall be got approved from the Engineer-in-Charge before procurement well in advance and the approved samples shall be kept at site till completion of the work.

For Door Frame :

A. Wood Polymer Composite Door Frame:

WPC (Wood Polymer Composite) solid door/ window/ Clerestory windows & other Frames/ Chowkhat of minimum size Frame size 45 x 85 mm or as indicated in approved drawings, comprising of virgin PVC polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice husk/ wheat husk) and non-toxic additives (maximum toxicity index of 12 for 100 gms) fabricated with miter joints after applying PVC solvent cement and screwed with full body threaded star headed SS screws having minimum frame density of 750 kg/cum, screw withdrawal strength of 2200 N (Face) & 1100 N (Edge), minimum compressive strength of 58 N/mm², modulus of elasticity 900 N/mm² and resistance to spread of flame of Class A category with property of being termite/ borer proof, water/ moisture proof and fire retardant, shall be fixed in position with SS dash fasteners of required dia and length complete as per direction of Engineer-In- Charge.

B. Teak Wood Door Frame:

The factory-made door frames shall be chemically treated, kiln seasoned 2nd class teak wood, minimum 125x75mm. Door frames shall be fixed in position with hold fast lugs or with dash fasteners of required dia & length as per scale of amenities given in this document to be provided as per relevant CPWD specifications 2019 with upto date correction slips. The door frames shall be finished with minimum 2 coats of melamine polish as specified in this NIT. The agency shall submit the list of at least three reputed and well- equipped factories with their credentials to Engineer-in-Charge for approval before placing order. The anchor fastener of approved size and make shall not be less than 8 Nos. in each door frame upto opening 1100 mm and more than 1100mm shall not be less than 10 Nos. or if required more as per design is also in the scope of work as per direction of Engineer-in-charge.

C. Architrave:

All wooden doors shall be architrave of IInd class teak wood beading of upto size 125x20 mm with edge moulding or approved section, design and finished with melamine polish matching with door frame shall be provided outside along the door frame with the wall as per directions of Engineer-in-Charge.

For Door Shutter :**A. Wood Polymer Composite Door Shutter:**

30 mm thick single extruded WPC (Wood Polymer Composite) solid decorative type flush door shutter of required size comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice husk/wheat husk) and non-toxic additives (maximum toxicity index of 12 for 100 gms) having minimum density of 650 kg/cum and screw withdrawal strength of 1800 N (Face) & 900 N (Edge), minimum compressive strength 50 N/mm², modulus of elasticity 850 N/mm² and resistance to spread of flame of Class A category with property of being termite/borer proof, water/moisture proof and fire retardant. WPC to be laminated with PVC foil of minimum 14 microns thick of approved design pasted with hot melt adhesive on both faces of shutter, shall be fixed with stainless steel butt hinges of required size with necessary full body threaded star headed counter sunk S.S screws, all as per direction of Engineer-In- Charge.

B. Flush Door Shutters:

35 mm thick ISI marked flush door shutters conforming to IS : 2202 (Part I) decorative type, core of block board construction with frame of 1st class hard wood and well matched teak 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters shall be fixed with Door frames using ISI marked Stainless Steel butt hinges with necessary screws.

C. Melamine Polish:

Applying three or more coats of melamine polish of approved quality and shade to have desired finish to teak wood members, veneering, beadings, architraves, etc. including preparing of surface by sand papering, applying putty, etc. complete with following process in the sequence as detailed below:

1. The surface to be polished is rubbed with sand paper 80/120 no. and then with sand paper of 160/180 nos.
2. Applying two coats of sealer with spray gun and allowing sufficient drying time for 1st coat and 2nd coat is allowed to dry for 8 to 12 hrs.
3. On drying of sealer coat, wet rubbing with emery cloth of finer grading with ample water to remove excess sealer layer and make the surface further smooth after this wet rubbing, then surface is applied with special grade melamine fillers to fill all the small and big holes/grooves etc. Filler coat to be allowed to dry for 4 to 6 hrs on which again a light wet rubbing is done this surface is further allowed to dry for 12 hrs.
4. On this, 1st coat of melamine polish is applied with spray gun using melamine clear polish and melamine thinner in required proportion. This

1st coat is allowed to dry for 24 hrs then this dry surface is again fine wet rubbed smooth, which is further allowed to dry for 12 hrs. The final melamine polish is applied with compressor pressure spray gun using melamine clear polish and melamine thinner mixed in required proportion complete as per direction of Engineer-in-Charge. (Final coat to be done in 1 or 2 layers without gap of time.)

Preparation of surface

The surface shall be thoroughly cleaned. All unevenness shall be rubbed down smooth with sand paper and shall be well dusted. Surface must be dry, free from dust, oil, wax, greases etc.

Application

Mix melamine (matt or gloss) base with the catalyst in the specified ratio as per manufacturers specification. Add melamine thinner upto 30% (as specified by the manufacturer) by volume of mixture. Stir it and allow it to mature for 2-3 minutes. The melamine is sprayed, using spray gun pressure of 45-55 psi, from a distance of 7"-10" from substrate.

12.0 uPVC Door, Windows, Door-Windows, Ventilators etc. specifications

Extent and Intent: - All uPVC elements shall be manufactured in factory and shall be installed at site through an approved specialized agency, who shall furnish all material, labour, accessories, equipment, tool and plants and incidentals required for providing and installing uPVC windows, louvers and other items as called for on the drawings / shop drawings or as directed by the Engineer-in-charge. The drawings and specifications cover the major requirements only. The supplying of additional fastenings, accessories, fixtures and other items not mentioned specifically herein, but which are necessary to make a complete installation shall be a part of this contract. Hinges for casement uPVC window shall be stainless steel Friction stays of Grade AISI 304 of approved make. uPVC doors, window, ventilators etc approvals design, other fittings, single and multi-point locking system for windows and doors respectively shall be as per CPWD specification with upto date correction slip till last date of bidding and also CPWD specification correction slip no 17 dated 06.05.2022.

- 1.** **General:** -uPVC door, windows etc. shall be of sizes, section details as shown on the drawings. The details shown on the drawings indicate generally the sizes of the component parts and general standards. Before proceeding with any manufacturing, the contractor shall prepare and submit complete manufacturing and installation drawings for approval of the Engineer-in-Charge and no work shall be performed until the approval of these drawings is obtained.
- 2.** **Samples:** - Samples of windows, door, door-windows, ventilators etc. shall be fabricated, assembled in the factory and submitted to Engineer-in-Charge for his approval. They shall be of sizes, types etc. as decided by Engineer-in-Charge.
- 3.** **Sections:** - All uPVC elements shall be fabricated as per detailed drawings. The sections shall be extruded by the manufacturers approved by the Engineer-in-Charge. Similar design, size and thickness uPVC profiles and reinforcements to be followed from top floor to ground floor as per the structural design requirements at

top floor.

- 4. Handling and Stacking:** -Fabricated materials shall be carried in an approved manner to protect the material against any damage during transportation. The loading and unloading shall be carried out with utmost care. On receipt of material at site, it shall be carefully examined to detect any damaged pieces. Arrangements shall be made for expeditious replacement of damaged pieces/ parts. Materials found to be acceptable on inspections shall be repacked in crates and stored safely.

5. Fabrication:

- (i) The structural design and drawing proof checked from approved IIT/NIT/Engineering Institute shall be provided by uPVC window/door manufacture and submitted through the contractor to the Engineer-in-charge for approving good for fabrication. Charge of proof checking shall be born by contractor.
- (ii) ccording to the drawing, the required dimension and length of uPVC frame, sash and mullion profiles shall be mitered cut and reinforced with galvanized iron section of required length and thickness.

6. Specification for uPVC doors & windows:

- 6.1 uPVC doors and windows shall be provided and fixed as per CPWD Specifications and DSR'23 Item No. 9.147. All windows/doors Glass & hardware must be as per approved make, sizes, color & pattern of windows shall be as per approved architectural drawings.
- 6.2 **There would be manufacturers' warranty of 10 years on Profile frames & one year on hardware from the date of completion of the work. uPVC windows & doors must be installed by profile manufacturer/ authorized vendors only.**

Note: For UPVC frames, sash and mullion extruded profile frames, minus 5% tolerance in dimension i.e. in depth & width of profile shall be acceptable.

7. Standards & Tests (Certificates must be submitted)

Follow the British Standard (BS EN 12608, UK)/ IS: 17953, CEPT Ahmedabad, tested by Central Building Research Institute, Roorkee & Shriram Institute of Industrial Research, New Delhi.

All uPVC work shall be executed as per CPWD specification Vol-I as amended upto last date of submission of the bid. Minimum percentage of titanium dioxide content in uPVC profiles shall not be less than 7.00 percent and calcium carbonate content shall not be more than 10.00 percent.

8. Installation :-

1. The window, door, door-windows, ventilators etc. must be aligned in plumb and water level and installed using high-quality stainless-steel fasteners. The outer frame of door/ window and sill/soffit/jambs must be sealed with silicone-based sealants from outside and acrylic paintable sealant from inside. Installation shall be done by manufacturer.

2. The gap between uPVC window / door and adjacent RCC/Masonry/Stone cladding work shall be filled with weatherproof silicon sealant of approved make to maximum 5mm depth and 5mm width to allow expansion/contraction of uPVC profiles. Silicon sealant of matching colour of uPVC profile shall be applied over backer rod.
3. The fasteners to be used for fixing window/door units to the opening shall be Stainless Steel grade 304 of minimum 10mm Dia. & required length so as to have minimum penetration of 75mm into the structural members i.e. side jamb, sill & soffits (excluding the thickness of cladding/stone/finishing).
4. The fastener shall be sufficiently distanced from the edge of the frame and at maximum interval of 450mm c/c.
5. TPV/Neoprene gaskets: The contractor shall provide and install TPV/Neoprene gaskets of approved size, profile & make at all locations as shown and as called for to render the windows absolutely air tight and weather tight. The contractor shall produce samples of the gaskets for approval and shall procure the same after approval only.
6. Fittings: Hinges, stays, handles, tower bolts, locks and other fittings shall be of quality and manufacturer as approved by the Engineer-in-Charge. All the fittings of window, door, door-windows, ventilators etc. are included within the scope of work and the contractor shall clearly indicate these in the shop drawings. Samples of all the fittings shall be submitted by the contractor for obtaining approval of the Engineer-in-charge before placing any bulk orders.
Silicon sealant: The gaps between frames and supports and also any gaps in the windows sections shall be raked out as directed and filled with silicon sealant of approved colour and make to ensure complete water tightness. The silicon sealant shall be of such colour and composition that it would not stain the masonry/concrete work, shall receive paint without bleeding, will not sag or run and shall not set hard or dry out under any conditions of weather. The sample of silicon sealant to be used for this purpose shall be got approved from the Engineer-in-Charge before its actual use.

2. Glazing gasket & Weather pile strip/ Wool pile

Material for glazing gaskets shall be of EPDM (Ethylene propylene diene monomer) and shall be used on both side of glass panes in uPVC sash and glazing bead profiles.

Sl.No	Characteristic	Test Method	Requirement
1	IRHD/Shore hardness A	IS 3400 (Part 2) / IS 3400 (Part 23)	Range shall be from 60to 80 Shore A.
2	Compression set % High- at 100 °C for (24hrs) Low- at -25 °C for (24hrs)	IS 3400 (Part 10)	≤ 35 % ≤ 85 %

3	Ozone resistance (50 pphm for 96 hrs @ 40 °C	IS 3400 (Part 20)	No visible cracks
4	Ageing test (for 168 hours at 100 °C) Co-efficient of deterioration of Hardness change max. (Shore A) Tensile strength changes max. Elongation at break change max.	IS 3400 (Part 4)	+15 / -5 -25% of initial value -50% of initial value
5	Minimum tensile strength	IS 3400 (Part1)	7.5MPa
6	Minimum Elongation	IS 3400 (Part1)	200%

Weather pile strip / Wool pile shall be used in uPVC sliding door and window to reduce air filtration and water penetration

10.

Window / Door Hardware and Fittings Materials:

For all hardware except for fixing shall have at least the equivalent corrosion resistance of EN 1670-1988 grade 4 (240 hrs) when subjected to natural salt spray testing in accordance with IS 9844 or equivalent. Testing shall be carried out on complete hardware items and also duly approved by the Engineer -in-charge before use at the site of work. Hardware like hinges, rollers and locking devices shall have been for at least 15000 operating cycles for windows and shall be minimum 25000 operating cycles for doors (i.e. opening and closing) without deterioration, failure or excessive wear. Hardware / fittings such as handle, roller, touch lock, multipoint locking, 3D hinges, friction hinges etc. shall be directly screwed not pre-drilled or hammered.

- a. For Casement windows/ ventilator - Approved quality stainless steel friction hinges (SS 304 grade) with SS screws shall be provided as per approval of Engineer-in-charge and length of friction hinges should cover morethan80 percent width of the shutter and minimum two number friction hinges required for each shutter one at top and one at bottom.
- b. For Casement doors - Minimum four numbers of approved quality 3D hinges with necessary SS screws shall be provided in the casement door shutter.
- c. For sliding windows/doors:
All sliding door/windows shall be provided with zinc alloy (powder coated) handles with key on one side of extreme panels along with zinc plated stainless steel multi point locking having transmission gear, cylinder with keeps& one side key, zinc alloy (powder coated) crescent lock (if required), each shutter of sliding door and windows shall have one pair of stainless steel (SS 304 grade) body with adjustable double nylon rollers (minimum weight bearing capacity to be 120 kg).
- d. The Casement/ Casement/ ventilator cum fixed glazed door/ window/ ventilator:

Each shutter/leaf shall be provided with zinc alloy (powder coated) minimum two nos. S.S. 304 grade friction hinges and one handle along with powder coated zinc alloy suitable multipoint locking arrangement.

11. Guarantee Bond: Ten (10) years guarantee bond in prescribed proforma shall be submitted by the contractor which shall also be signed by both the specialized agency and the contractor to meet their liabilities under the guarantee bond. However, the sole responsibility about efficiency of uPVC work shall rest with the building contractor. If any defect is noticed during the guarantee period, it shall be rectified by the contractor within seven days of receipt of intimation of defects in the work. If the defects pointed out are not attended within the specified period, the same will be got done from other agency at the risk and cost of contractor.

12. Fly/Mosquito proof Stainless Steel Wire Mesh:
Fly/ mosquito proof wire mesh of stainless-steel grade 304 shall be fixed to all openable/sliding uPVC doors and windows using wire gauge with average width of aperture 1.4 mm in both directions with wire of dia 0.50 mm as indicated in the approved drawings, all complete as per approved make, quality and patten after fitting gaskets of approved quality and make all as per approval of Engineer-in-charge.

13. Double Glass Units (DGUs):
Double glazed units (DGUs) comprising of hermetically-sealed 6-12-6 mm insulated glass (double glazed) panel units shall be fixed to the uPVC doors and windows of size and shape as required and specified, comprising of an outer High performance coloured tinted toughened glass 6mm thick substrate with reflective soft coating on outer face, + 12mm Airgap + 6mm Heat Strengthened clear Glass having properties as Visible Light transmittance (VLT) of 50-55% , Light reflection internal 10 to 15%, light reflection external 10 to 20 %, SHGC –0.34 (Max.) and U value of less than 3 W/m²degree k 1.8 W/m² degree K etc., spacer tube 12mm wide, desiccants, including primary seal and secondary seal (structural silicone sealant) etc. all complete for the required performances, as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineer-in-Charge. The DGUs shall be assembled in the factory/workshop of the glass processor. The glass in all the uPVC doors and uPVC windows shall be Double glazed unit as per CPWD Specifications 2019 and CPWD Delhi Schedule of Rates-2023 with upto date & correction slips -5 dated: 19-12-2024 with low e-value and high- performance glass.

Note: The contractor shall submit credentials and details of works experience of three glass processor vendor for making DGU/Toughening to engineer-in-charge and he shall approve the same. The Engineer-In-Charge may reject all the three with reasons and in such last case, the contractor shall submit a fresh panel of three glass processor.

Note:- The department reserves the right to approve the higher specifications in order to comply with the requirement of Eco Niwas Samhita as per the NIT without any extra cost.

13.0 Stainless Steel Railing (Modular type):

Any kind of welding or fabrication for railing shall not be allowed at site. Sample shall be approved before execution. Contractor shall submit the shop drawing base on concept drawing. As per approved shop drawing, contractor shall arrange mock-up of railing system (2 or 3 no) in required length as directed by Engineer in charge. Contractor shall protect railing system up till handing over the project. The cost of soild section i/c all sections, accessories if required in railing shall be included in this item.

1. Staircase and ramp railing:-

(a) **Ramp railing**-Factory made (Modular) passivated Stainless Steel Railing SS 304 Grade in Satin Finish to be used. Balusters and Handrail having Dia-50mm and wall thickness 2mm, SS Base plate -8mm thick as per drawing with SS cover plate. Baluster to baluster distance shall be as per drawings. Top mounted baluster shall be fixed to the RCC/CC/masonry with SS 304 grade dash fasteners/anchor fastener of required dia and length to the RCC/masonry as per approved design. Minimum 4 nos. of Infill tubes (Parallel to top member) Dia minimum -19x1.5 mm thick in the ramp to be provided all complete with all modular accessories using flexible bends & modular system or expansion & ball socket system, bends and termination including all required hardware complete in all respects as per approved architectural drawing.

(b) **Staircase railing** -Factory made (Modular) passivated Stainless Steel Railing SS 304 Grade in Satin Finish to be used. Balusters and Handrail having Dia-50mm and minimum wall thickness 2mm, SS Base plate -10 mm thick minimum as per drawing with SS cover plate. Baluster to baluster distance shall be as per drawings. side mounted baluster shall be fixed to the RCC/CC/masonry with SS 304 grade dash fasteners/anchor fastener of required dia. and length to the RCC/masonry as per approved design.

Minimum 5 nos. of Infill SS plate (Parallel to top member) size minimum - 50X10 mm thick in the staircase railing to be provided all complete with all modular accessories using flexible bends & modular system or expansion & ball socket system, bends and termination including all required hardware complete in all respects as per approved architectural drawing. And Hand rail side mounted on wall as per drawing and approved by the Engineer-in-charge.

2. Balcony railing (SGP Laminated Glass with SS 316 Balusters)-

The balcony railing shall comprise Heat Soak Tested Toughened Laminated Safety Glass with SentryGlas® Plus (SGP) ionoplast interlayer and SS 316 Grade Stainless Steel balusters and fittings, complete in all respects as per the approved architectural drawings, structural glazing design, and the directions of the Engineer-in-Charge.

The glass shall be minimum 21.52 mm thick, consisting of 10 mm Heat Soak Tested Toughened Frosted Glass + 1.52 mm SGP Interlayer + 10 mm Heat Soak

Tested Toughened Glass. The glass shall be manufactured in accordance with relevant Indian Standards/EN Standards and shall be free from bubbles, scratches, chips, distortion, or other visible defects.

For curved balconies, the glass panels shall be hot bent (where specified) or faceted, as required to match the balcony geometry, without inducing residual stresses beyond the permissible limits. The method of fabrication shall be submitted by the contractor for approval.

The railing shall be supported on SS 316 Grade satin-finished balusters fabricated from hollow sections of suitable size and thickness, with a minimum wall thickness of 2.0 mm, designed to safely resist all applicable loads. Balusters shall be fixed to RCC members using SS 316 Grade chemical anchors/dash fasteners of suitable diameter, embedment, and grade, as per the approved structural design. All exposed fasteners, bolts, nuts, washers, brackets, clamps, spiders, patch fittings, and other accessories shall be of SS 316 Grade.

Glass panels shall be connected to the balusters through SS 316 Grade heavy-duty glass clamps/brackets provided with neoprene/EPDM setting blocks and gaskets to prevent direct metal-to-glass contact. No drilling or cutting of the glass at site shall be permitted.

The railing system, including glass, balusters, handrail (if provided), anchorages, and all fittings, shall be designed to withstand the applicable dead loads, imposed loads, impact loads, and wind loads in accordance with IS 875 (Part 3), IS 16231 (Structural Use of Glass in Buildings), NBCS 2026, and other relevant Indian Standards. The contractor shall submit design calculations, shop drawings, structural analysis, and manufacturer's details for approval before fabrication.

All stainless steel components shall be factory fabricated, modular, weld-finished, pickled and passivated, with a uniform satin finish. Site welding shall be avoided as far as practicable. Any unavoidable welds shall be ground smooth, polished, and re-passivated to restore corrosion resistance.

The quoted rate shall include the supply, fabrication, testing, transportation, lifting, installation, hot bending/faceting of glass (where required), all SS fittings and accessories, anchors, templates, mock-up (if required), protection during construction, cleaning, and all incidental works necessary to complete the railing system. Nothing extra shall be payable on this account.

The complete glass railing system shall be designed, detailed, and certified by a specialist structural glazing agency. The design shall be proof-checked by IIT/ NIT and shall be submitted to the Engineer-in-Charge for approval prior to fabrication. The minimum glass thickness specified is indicative only, and the contractor shall increase the thickness, if required, based on structural design calculations, without any extra cost to the Department.

3.

SS Security Door

Factory made stainless steel door of grade 316 with SS 316 grade wire mesh approved stainless steel hardware, accessories, including fixing as per approved drawings shall be provided in all Main Door. The quoted rate shall include the supply, fabrication, transportation, installation, testing, all stainless steel hardware,

accessories, and all incidental works required for complete installation. No extra payment shall be made on this account.

14.0 FIRE CHECK DOORS: Fire Doors/Windows

As per NBCS norms & CPWD Specification with upto date correction slip and Specification of OM CSQ office vide No. 136/ अधि, अभि/टास/ विनिर्देश /2024/308-हि dt. 01 /10/2024.

The contractor shall provide and fix fire rated doors as per IS 3614: 2021, for 120 min integrity & 30 min insulation for partially insulated fire door. Recommended fire door shall be tested as per IS from National Test House or any other lab as per Assam Fire Department norms with approval by Engineer-in-Charge. Labeled fire doors shall be with fire rated hardware and vision panel all as a complete assembly. Proper label confirming the type of door and the hourly rating is mandatory

14.1 Metallic Fire Door Sets

- This specification covers metallic fire rated partially insulated and un-insulated door set consisting of frame, shutter / door leaf (hollow metal door or sandwich panel door), its hardware and vision panel as complete assembly along with its sizes, design, materials, general construction requirements, finishing and performance criterion. It is intended to define standard items not subject to variation.
- The door set defined herein should have demonstrated successful test performance to establish the minimum fire rating of 120 min. Metallic Fire Door frame and shutter shall conform to IS 3614: 2021. This specification does not cover the Stainless steel or laminated steel or Wooden Composite, Metallic Sliding or Metallic Rolling fire doors. Single skin door shutter shall not be used as fire door and door tested with single skin shall not be the part of this specification.
- The space between the wall and frame shall be filled with fire rated puff and joineries to be closed with fire rated silicon sealant as per direction of the engineer in charge.
- The door set (both frame and shutter leaf/leafs) shall be factory finished with minimum 30 micron polyester powder coating in desired shade as per Engineer in-Charge.

14.1.1 (I) Fire Door Frames and Door Leaf

- a. The alloy type Zinc coated steel sheet shall be used for frame and door leaf conforming to IS 277. The coating weight shall meet the minimum requirement of 120 gm/m² for both sides of sheet. The sheet material with embossed design, grained steel design can be used for fire doors for better aesthetics and interior surface finishes of the doors if any and it shall not compromise the construction integrity of the doors. The surface of the

door frame shall be pretreated with phosphate by chemical means conforming to IS: 1477 Part-1. No pickling is required for galvanized surface.

- b. The steel sheet thickness of 1.2 mm (18 gauge) minimum shall be used for a frame having depth upto 150 mm. Any addition in depth from 150 mm shall require higher sheet thickness of at least 1.6 mm (16 gauge). The maximum depth of frame shall not be more than 350mm. The tolerance of + 1 mm for all dimension of profile will be admissible.
- c. For door leaf of 120 min fire rating of un-insulated and partially insulated door, the minimum sheet thickness shall be 1.2 mm (18 gauge).
- d. Electrolytic alloy deposited zinc coated steel shall be provided for anchors and accessories and should meet the minimum requirements for coatings of 120 gm/m².
- e. The door frame and shutter shall be finished with polyester powder coating of minimum thickness of 30 micron confirming to IS: 13871 in desired shade as per the direction of Engineer in-Charge.
- f. The minimum frame size shall be as per approved drawing or as per IS: 4351 and provided with cover plate of required size as per manufacturer's specifications inside the frame at the places where hinges are to be fixed and threaded to take the required size of machine screw. Frame design and construction shall be as per tested specimen in butt, mitred or welded assembly with proper reinforcement and protection for taking required hinges, locks, strike plate including door closers. The door frame shall have provision for housing EPDM smoke seal.
- g. The infill material used in door leaf shall be Resin bonded materials like honeycomb paper core, mineral wool of minimum density 96 to 120 kg /cum, ceramic wool and any proprietary material provided they satisfy the requirement of fire door rating of un-insulated and partially insulated door. Polyurethane foam (PUF) as an infill material for fire doors shall not be permitted.
- h. An intumescent seal of minimum size 15 mm wide and 1.5 mm thick shall be provided with insulated doors which is chemically designed to expand when exposed to heat. It is of two types i.e. Rigid and flexible type and both react differently, therefore it should be tested with the door. The intumescent seal provided in the door brought at site should be of the same formulation, dimensions and configuration as mentioned in the door manufacturer's fire test report.
- i. Smoke seal shall be fixed either in the grooved frame profile or stuck with adhesive on the entire perimeter of the frame to stop smoke passing through the gaps. It is independent of intumescent seal provided on the door leaf. The smoke seal material shall be of EPDM or any other material tested in accordance with ASTM E-84/BS 476 (Part-22) Standard Method of Testing for Surface Burning Characteristics of Building Materials and Assemblies and should have a flame-spread classification of 25 or less.

• **Fire Rated Hardware**

- (a) Stainless steel (grade SS 304 and above) ball bearing hinges as per EN 1935:2002 or butt hinges (as per IS 12817:2020) of minimum size 100 mm x 75 mm x 3 mm.
 - (b) Fire rated Stainless Steel Mortise dead lock 55/60/65/70/80mm Back Set size (as per test of door), Square for end of 20/22/24 mm size (as per test of door) including Escutcheon (key hole flap) and 65 mm dia cylinder with both side key as per IS:3564/EN:12209.
 - (c) D type Pull handle (SS 304) of 22/25 mm dia, centre to centre distance -300 mm, back to back fixing with spindle.
 - (d) Panic devices of 120 minutes fire rating, single point panic push bar (carry bar) suitable for single leaf door as per EN:1125 with appropriate classification code.
 - (e) Panic devices of 120 minutes fire rating, two point panic push bar (carry bar) with vertical bolt for active leaf in case of single leaf door and on Inactive leaf in case of double leaf door as per EN:1125 with appropriate classification code.
 - (f) External lever handle with euro profile half cylinder as per EN: 1125 with appropriate classification code.
 - (g) Shaft lock of 120 minutes fire rating, 70mm back set square for end, with alien key and dead strike plate as approved by Engineer in-Charge.
 - (h) Stainless steel (SS 304 or more) recessed flush pull handle of minimum size 40mm x120mm as approved by Engineer in-Charge.
 - (i) Concealed flush bolt (Dye-cast stainless steel finish) of length 300 mm for door height of 2100 mm shall be provided and for more than 2100 mm door height, the length of concealed flush bolt will be door height minus 1800 mm.
 - (j) Dust proof socket of 300 mm length for bottom concealed flush bolts.
 - (k) CSK headed fastener of minimum size 8 mm dia & 80 mm long hot dip galvanized with 8 mm dia polyamide sleeves.
-
- (l) 120 min fire rating heavy duty door closer of spring size 3-5 for partially insulated door and for un-insulated door spring size 2-4 with standard arm as per IS:3564 with appropriate classification code.
 - (m) Surface integral door coordinator with telescopic shock absorber to be provided for use on fire doors for sequencing the closing of active and inactive leaf of the panic device in double door as approved by Engineer in-Charge.
 - (n) Hardware such as tower bolts, a drops, sliding bolts, chains with pad locks shall not be used on fire doors.
 - (o) All the hardware to be used on fire doors shall be type tested for 2 hrs fire rating. All other hardware mentioned which is not tested as part of the door assembly, proper fire test certificates for compliance for recommended fire rating to be provided.

• **Fire Rated Vision Panel**

- (a) The glass of fire rating of 120 minutes integrity shall be used for vision panel minimum 300x400 mm & 6mm thick. The annealed or tempered glass or tempered wired glass or inter layer glass or laminated gel glass which become opaque and affect visibility shall not be used. The glass should have indelible mark on all the panels showing the name of manufacturer and name of product.
- (b) Whenever larger vision pane is required the overall glass area can be increase by upto 15% of the door leaf size provided the door has been tested with a larger glass. Such increase is not applicable for any insulated door.
- (c) Ceramic tape of minimum size 13x2 mm or size as per manufacturer's specification.

(II) FD 120 P1 fire rated partially insulated hinged Door set

- (a) Partially insulated metallic hinged fire door set shall have 120 minutes integrity and 30 minutes insulation along with complete assembly tested in latch condition. It shall comprise of single rebate door frame and double skinned sandwich door shutter along with necessary hardware and vision panel.
- (b) All double leaf fire door assembly shall be provided and tested with astragals to ensure compatibility with actual fire performance.
- (c) The performance of partially insulated fire rated doors (single / double leaf) depend on the quality of infill material. The infill material shall be resin bonded mineral wool, ceramic wool and of any proprietary material provided it satisfies the requirement of insulation fire door rating. The overall thickness of double skinned single or double leaf fire rated insulated door shall be **minimum 50 mm thick** or as per test evidence furnished by the respective manufacturer in compliance of its fire rating as FD 120 PI. The performance of the fire door varies based on infill material, hence changing the infill material in fire door supplied at site shall not be allowed other than the tested with infill material.
- (d) The intumescent seal shall be provided in the groove/on the surface on the three sides of door leaf (i.e. on top, hanging and meeting edges of door leaves). The formulation, material, dimensions and configuration of intumescent seal provided in the door shall be of the same material or of which the test report is produced by the manufacturer.
- (e) The smoke seal of appropriate size shall be provided on three sides of door frame (i.e. on top and sides). The formulation material dimensions and configuration of EPDM/self-adhesive smoke seal shall be the same with which the test report are produced by the manufacturer.

- (f) Each of the door leaf shall be provided with vision panel of size not more than 0.06 sqm in size (minimum width 300 mm and minimum height 400mm) with fire rated clear glass having at least 13 mm wide and 2 mm thick ceramic tape on the perimeter of glass on both faces.
- (g) Minimum 4 no. of hinges shall be fixed with machine screws of M6 x 25 CSK (conforming to IS:1365) per door leaf upto 2100 mm height and 5 hinges for door leaf height above 2100 mm or as per test evidence.
- (h) The fire rated door set (frame & shutter leaf together) shall be provided as a complete system along with following necessary hardware.

(A) For single leaf door

- 1. The maximum size of single leaf door shall be 1250 mm x 3000 mm
- 2. One number Panic device shall be provided on the push side of the single leaf door.
- 3. One number External trim shall be provided on pull side of the door.
- 4. One number Surface mounted heavy-duty door closer of spring size 3 to 5 shall be provided as per width and weight of the door leaf on pull side of the door.

(B) For Double leaf door

- 1. The maximum size of double leaf door shall be 2400 mm x 3000 mm
- 2. One number Panic device shall be provided on the push side of the active leaf and one number vertical bolt shall be provided on the push side of Inactive leaf.
- 3. One number External trim shall be provided on pull side of the door.
- 4. In case of double leaf doors with inactive leaf width less than 450 mm, single point panic device for active leaf and additional fire rated auto flush bolt on both top and bottom of the inactive leaf shall be provided.
- 5. One number Surface mounted heavy-duty door closer of spring size 3 to 5 shall be provided on each door leaf as per width and weight of the door leaf on pull side of the door.

6. One number integral surface door coordinator with telescopic shock absorber shall be, provided for sequencing the closing of active and inactive leaf of the panic device in double door.

(III) Un-insulated hinged fire door set FD 120.

- a. Un-insulated metallic hinged fire door set shall have 120 minutes integrity along with complete assembly tested in unlatch condition. It shall comprise of single rebate door frame and double skinned sandwich door shutter along with necessary hardware and vision panel.
- b. All double leaf fire door assembly shall be provided and tested with astragals to ensure compatibility with actual fire performance.
- c. The performance of un-insulated fire rated doors (single / double leaf) depend on the quality of infill material. The infill material shall be resin bonded honey comb paper core and it should satisfy the requirement of un-insulated fire door rating. The overall thickness of double skinned single or double leaf fire rated un-insulated door shall be minimum 46 mm thick or as per test evidence furnished by the respective manufacturer in compliance of its fire rating as FD 120. The performance of the fire door varies based on infill material, hence changing the infill material in fire door supplied at site shall not be allowed other than the tested with infill material.
- d. The maximum door leaf width for single leaf shall be 1250 mm, and for double leaf 2400 mm. The performance of un-insulated fire rated doors (single / double leaf) depends on the quality of infill material. The infill material shall be resin bonded honey comb paper core provided it satisfies the requirement of fire door rating. The overall thickness of double skinned single or double leaf fire rated un-insulated door shall be minimum 46 mm thick or as per test evidence furnished by the respective manufacturer in compliance of its fire rating as FD 120. The performance of the door varies based on infill material, hence changing the infill material in fire door supplied at site shall not be allowed other than the tested with infill material.
- e. The smoke seal of appropriate size shall be provided on three sides of door frame (i.e. on top and sides). The formulation material dimensions and configuration of EPDM/ self-adhesive smoke seal shall be the same with which the test report are produced by the manufacturer.
- f. Each of the door leaf shall be provided with vision panel of size

not more than 0.12 sqm in size (maximum width 400 mm and maximum height 800mm) with fire rated clear glass having at least 13 mm wide and 2 mm thick ceramic tape on the perimeter of glass on both faces.

- g. Minimum 4 no. of hinges shall be fixed with machine screws of M6 x 25 CSK (conforming to IS:1365) per door leaf upto 2100 mm height and 5 hinges for door leaf height above 2100 mm or as per test evidence whichever is higher.
- h. The fire rated door set (frame & shutter leaf together) shall be provided as a complete system along with following necessary hardware.

(A) For single leaf door

The maximum size of single leaf door shall be 1250 mm x 3000 mm

Egress doors for AHU, store room, electrical room locations

1. One number Mortise dead lock shall be provided on the single leaf door.
2. One pair Pull handle D type shall be provided on pull side of the door.
3. One number Surface mounted heavy duty door closer of spring size 2 to 4 shall be provided as per width and weight of the door leaf on pull side of the door.

Non Egress doors for all type of shaft locations

1. One number Mortise Shaft locks shall be provided.
2. One number flush pull handle shall be provided on pull side of the door.

(B) For Double leaf door

The maximum size of double leaf door shall be 2400 mm x 3000mm

Egress doors for AHU, store room, electrical room locations

1. One number Mortise dead lock shall be provided on the single leaf door.
2. Two pair Pull handle D type shall be provided on the door.
3. One number 300 mm long concealed flush bolt on inactive leaf at bottom along with dust proof socket.

4. One number concealed flush bolt on inactive leaf at top of the leaf (Height of the CFB = door height — 1800 mm).
5. Two number Surface mounted heavy-duty door closer of spring size 2 to 4 shall be provided as per width of the door leaf and weight of the door leaf on pull side of the door.

Non Egress doors for all type of shaft locations

1. One number Mortise Shaft locks shall be provided on the single leaf door.
 2. One number flush pull handle shall be provided on the door per leaf.
 3. One number 300 mm long concealed flush bolt on inactive leaf at bottom along with Dust proof socket.
 4. One number concealed flush bolt on inactive leaf at top of the leaf (Height of the CFB = door height — 1800 mm).
- The door frames shall be fixed to the opening with minimum 10 Nos. (4 numbers on each vertical side up to 2100 mm height and 2 numbers on top) of fasteners and 12 numbers of fasteners for height 2400 mm (5 Nos. on each vertical side and 2 Nos. on top) with minimum M8 size, 80mm long hot dipped galvanized fasteners with polyamide sleeves inserted in pre marked & machine drilled holes for single/double leaf doors.
 - The door set (both frame and shutter leaf/leaves) shall be factory finished with minimum 30 micron polyester powder coating in desired shade as per Engineer in- Charge
 - Metal Fire Check Door with required Fire rated hardware shall be provided in allbasement level fire staircases, all exit passageways and at other locations as required (except central core area of residential towers. lift lobby or insulated glass doors mentioned in the tender drawings) by Delhi fire department and decided by Engineer-in-charge.
 - Un-Insulated Metal Fire Check Door with required Fire rated hardware shall be provided in Electrical shaft, Low & Medium Voltage Shaft, Electric room, AHU/FAN rooms, DG set room, UPS/Battery room, IT server room, etc. and other doors as decided by Engineer-in-charge as per above specifications.

14.2 Partially Insulated FULLY GLAZED FIRE DOOR/ WINDOW:

As per NBCS Norms, fully glazed fire doors in lift lobby entrance door at Stilt shall be provided. The windows in the fire tower staircase and public staircase lift lobby etc. shall be fixed fully glazed.

The contractor shall provide and fix fully glazed fire door as per, NBCS 2026 guide line of insulated doors and IS for stability, integrity (E/EW 120) & Insulation (EI 30). With frames Pressed galvanized steel

confirming to IS 277 with the following specification. Glazed door shall be tested for integrity & insulation (E/EW 120). Glazed door shall be tested from CBRI/ TBW / CERTIFIER for maximum rating of 120mins with 30mins Insulation. Test certificates should be made available for door sizes tested as a complete assembly.

Door frame: Door frames shall be single rebate frame profile of size 50 x 60 mm on horizontal side and 35x60 mm on vertical side or higher size as approved by engineer in charge made out of 1.6mm (16gauge) minimum thick galvanized steel sheet. Frames shall be butted/mitered and with mandatory provision for smoke seal and field assembled with self tabs. All transom profiles and side panels shall be from similar profile and should be as per the tested specimen. For partitions, Glass should be held in its place with 1.2 mm GI clip-on beading 19mm height. Screws shall be 8 x 19mm steel screws, self-tapping and concealed inside the beading at every 250 mm c/c and a ceramic tape of the cross section of 4 mm x 13mm as per the test evidence. Door frames shall be with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. The top support for mounting shall be included as per design requirement. Once frame installed should be filled with PUF/mineral wool insulation (96 kg/cum) as approved by the engineer in charge.

Glazed Door Leaf: Providing and fixing 60 mm thick glazed fire resistant door shutters of 120 min Fire Rating confirming to IS:3614 (Part II) or EN1634 - 1:1999, tested and certified by CBRI, with suitable mounting on door frame, consisting of vertical styles, top rail & side rail 60 mm x 60 mm wide and bottom rail of 110 mm x 60 mm made out of 1.6 mm thick G.I. sheet (zinc coating not less than 120gm/m²) duly filled mineral wool insulation having density minimum 96 kg/m³ and fixing with necessary stainless steel ball bearing hinges of size 100x89x3mm of approved make, including applying a coat of approved fire resistant primer or powder coating not less than 30 micron etc. all complete as per direction of Engineer-in-charge. (Panelling to be paid for separately). Note: The above-mentioned sizes of door leaf are minimum required subject to compliance for integrity & radiation control (EW120) and minimum 30 minutes of insulation (EI30).

Glass: Providing and fixing glazing in fire resistant door shutters etc., with G.I. beading made out of 1.6 mm thick G.I. sheet (zinc coating not less than 120 gm/m²) of size 20 x 33 mm screwed with M4 x 38 mm SS screws at distance 75 mm from the edges and 150 mm c/c, including applying a coat of approved fire-resistant primer/ powder coating of not less than 30 microns on G.I. beading, & special ceramic tape of 5 x 20 mm size etc complete in all respect as per NBCS 2026, IS 16231

(Part 3):2016 and as per direction of Engineer-in-charge with glass of required thickness having 120 minutes of fire resistance both integrity & radiation control (EW120) and minimum 30 minutes of insulation (EI30). The manufacturer has to give test report/certification of fire glass and the glass should have the stamp showing the value of E, EW & EI. The glass shall be tested for 5000 hours of UV resistance as per EN ISO 12543-4. The glass shall be EPD (Environmental Production Declaration) verified in accordance to EN 15804, ISI Marked & Make IN India approved NABL accredited lab or by any other accreditation body which operates in accordance with ISO/IEC 17011 and accredits labs as per ISO/IEC 17025 for testing and calibration scopes shall be eligible. The maximum glazing size shall not be more than 1100x2200 mm (w x h) or 2.42 sqm.

Partially Insulated fully glazed fire check door with required fire rated hardware shall be provided in lift lobby at, stilt, all podium levels, Staircase etc.

Fire Check Door hardware:

All fire check door shall be provided with the following fire check hardware compliant to minimum fire rating/insulation required as a complete unit, compliant to relevant IS Code with prior approval of Engineer-in-charge. HINGES: Stainless steel (grade SS 304 and above) two ball bearing hinges minimum size 100mmx 89mmx3mm or as approved by Engineer-in-charge as fixed flushed to the frame and shutter

- a) LOCK: Fire rated Stainless steel Mortise sash lock with internal thumb turns and external keys operation with lever handle.
- b) FLUSH BOLTS: (DOUBLE DOOR) (If required)300mm concealed extended lever action flush bolt satin finish, fixed to top and bottom of the inactive blade.
- c) Panic Bar with External Trim Lock: (Fire rated) Panicbar with 304 stainless steel body hardware for easy access from fire staircase with panic hardware mounted on the fire doors.
- d) Electro Magnetic Device: Door hold on electromagnetic device with suitable arrangements to be connected to active fire alarm systems.
- e) Door Coordinates: (Fire rated) Mechanical Door coordinates for coordination proportionally of double doors.
- f) Smoke Seals: (30-minute fire rated)- PEMKO/ZERO/ATHMER make heavy duty smoke seal for smoke check door.
- g) Door closer: Door closer of spring size EN 3-5 for door with standard arm as per EN 1154 with appropriate classification code of Dormakaba/ Geze/ Assabloy/Hormann or equivalent with extruded

aluminium body heavy duty 2 hours fire rated door closer with stainless steel full body cover.

- h) Offset D-type Pull Handles Stainless steel 304 grade of 300mm x 25mm dia (minimum), back to back fixing with spindle of approved design with necessary accessories and screws etc. all complete.
- i) Dead lock Two Hrs. fire rated Narrow Style dead lock with 80mm double cylinder one side key and other side knob complete as per approved design.
- j) Flush Bolt: Minimum 300mm long, Stainless Steel 304 grade with necessary screws, etc. Complete in all respect as directed by the Engineer-in-charge.

14.3 CODES & ACCEPTANCE CRITERION

The complete assembly of the doors i.e. frame, shutter, vision glass and hardware shall conform to following codes:

IS 3614: 2021	Specification for fire doors and door set
IS 4351:2003	Steel door frames-Specifications
IS 277-2003	Standard specification for steel sheet zinc coated (Galvanized)
IS 8183-1993	Bonded mineral wool
IS 16231 (Part 3)-2019	Use of Glass in Buildings — Code of Practice Part 3 Fire and Loading
ISO 834-1 : 1999	Fire-resistance tests — Elements of building construction
IS/ISO-834 Part- 8	Fire-resistance tests — Elements of building construction — Part 8: Specific requirements for non-loadbearing vertical separating elements
IS 17518 Part-I	Fire resistance tests Door and shutter assemblies
EN 1125	Building Hardware
EN 1154 / IS 3564	Door closer / Door coordinators for 2 hrs fire rating
EN 12209 / IS 3564	Mechanically operated locks, latches and locking plates for 2 hrs fire
IS 16074	Steel Flush door shutters-Specifications
EN 1906	Lever handles and knob furniture for 2 hrs fire rating
IS 13871	Power Coatings— Specification

Necessary documentation/ test certificates obtained from the manufacturer by contractor/ agency shall be furnished to Engineer-in-charge for approval before actual supply for installation. All hardware of fire door shall be subjected to approval by Engineer-In-Charge. Each Door set shall be provided with BIS certificate and a Label (metal plate) on the frame and

shutter indicating fire rating, name of the manufacturer, certification details, Partially Insulated or Un-insulated, S. No. of the door, and year of manufacture all as per IS 3614: 2021.

Fire door set shall be tested for both latched and un-latched condition and shall satisfy the requirement of the application and site condition. All doors with dead bolt are considered to be unlatched and the door manufacturer shall have separate test certificate for doors tested in latched and un-latched condition. All hardware & glazing, shall be 120 mm fire rated and compliant to IS standards /EN standards with appropriate classification code.

14.4

INSTALLATION

Fire door set installation shall be as per manufacturer's specifications for which contractor shall submit the shop drawing to the Engineer-in Charge. Shop drawings shall include all details of construction, anchoring, connections, fastener etc.

The installation of doors sets shall be carried out by the manufacturer or installers trained by the manufacturer.

a. Door Frame Installations

All frame shall be fastened to the adjacent structure to retain their position and stability. The maximum allowable gap between the frame and structure should not be more than 5mm and sealed with proper sealant once the frame is installed. Installations of frame shall be as per manufacture's recommendation and should be suitable for various type of wall construction.

b. Door leaf Installation:

Doors shall be installed and fasteners to maintain alignment with frame to achieve a perimeter clearance of maximum 3-4 mm unless otherwise more clearance is requested due to smoke seal which require a larger gap but the gap should be within the tested tolerances.

c. Hardware Installation:

The hardware item shall be installed in accordance with good practices and hardware manufacturer's recommendation/templates. The hardware to be installed shall be approved by the Engineer-in-charge before installation in view of intended use, corrosion condition, door mass, durability etc. The hardware shall be fixed with door, frame and shutter with screws and fasteners as suggested by hardware manufacturer. The self- adhesive seals shall be fitted into the groove / surface when it is dry and free from dust to ensure good bond. In areas where temperature falls below 10degree centigrade, self- adhesive seals shall also be fixed mechanically.

d. Fire Stop Seal–

For Shaft (As per NBCS norms):30 minutes fire resistance fire stop seal (for Shaft) with lightweight Mortar specially formulated cement composition supplied as a pre-mixed dry powder for on-site addition of water to seal the opening in floors (as per NBCS 2026) through which services are passing from one compartment to another in accordance with the criteria of BS 476: Part 20: 1987 and EN 1366-3, and fire classification to EN13501 – 2. For 30 min fire resistance the Firemen mortar, 3M, Promac is mixed with suitable amount of water and the mixture is cast uniformly, 100mm thick over mineral wool of minimum of 50mm x 96 kg/m³ when supported with metal shuttering of all around angle frame of minimum 25mm x 25mm x 3mm with intermediate angles at every 300mm complete in all respect for sealing of the shaft for 2 hrs. fire rating complete in all respect as specified and as directed by the Engineer-in-charge.

14.5

TESTING AND CERTIFICATION

The Door set shall be tested from CBRI, Roorkee or any of the lab as approved by Engineer-in-charge for the complete assembly i.e. frame, shutter, vision panel and hardware. Any certificate from any manufacturer shall not be acceptable to the effect that **all parts** of the assembly are covered. All doors shall be tested in accordance to the Indian standard IS 17518 (Part-I) and shall satisfy the criteria mentioned in the standard for integrity and insulation as per applicable category of doorset. Test certificates submitted shall be valid at the time of supply of doorset and its validity period shall be 5 years from the date of issue of the test report by the lab. Cost of the complete door set for testing and testing charges shall be borne by the contractor

- (i) Fire door test certificate within its validity period shall not be required any additional test except as mentioned below:
 - a. Change in design, material and construction of door including infill material.
 - b. Overall perimeter of the door, width and height or total area is more than the tested specimen. This is applicable for both, doors with or without vision panel.
 - c. Change in size of the vision glass or vision panel.
 - d. For doors with continuous partitions as a part of an assembly or fixed glazed partitions, it is necessary to provide assessment report from approved laboratory based on one or more combination of test reports. These reports shall be validated for integrity or integrity along with insulation.

- (ii) Manufacturers Test Certificate shall be submitted for material and sheet thickness of doors and frames. The Engineer-in-Charge or his authorized representative shall inspect the manufacturer before supply to the site of work for checking sheet thickness, infill material, construction process and weight of the doorset, facility hardware etc. Additionally, if required, site engineer shall cut any fire door, single or double leaf as per his discretion and evaluate material for sheet thickness, reinforcement, construction, infill material etc.
- (iii) The following test shall be conducted on site on the door shutter in accordance with IS: 4020 at site.

(a) Dimension and Squareness Test

The following tolerance on size of door shutters shall apply:

Dimension	Tolerance (mm)
Width	+0/-2
Height	+0/-4
Thickness	±1.5

The door shutter shall not deviate by more than 1.00 mm on a length of 500 mm. The thickness of the door shutters shall be uniform throughout with the permissible variation of not more than 0.8 mm between any two points

(b) General Flatness Test

Tested in accordance with IS 4020 (Part 3), the twist, cupping and warping in door shutter shall not exceed 5 mm.

(c) Local Planeness Test

When tested in accordance with IS 4020 (Part 4), the depth of deviation measured at any point of the door shutter shall not be more than 0.5 mm.

14.6

SUBMITTALS BY THE CONTRACTOR

Following documentation / drawings shall be furnished.

- 1) Specimen Test Certificate of the doorset as a complete assembly
- 2) Specification/ Manufacturer's literature, Test certificates and other documents of related items intended to be used.
- 3) Glass and hardware manufacturer literature along with their individual test certificate.
- 4) The letter of compliance for supply and installation of fire rated doors as mentioned in ANNEX-C page No. 21 of IS 3614: 2021
- 5) There shall be a warranty of 5 years from the manufacturer side for all

parts and components of the fire rated doorset system except counterbalance spring and finish

14.7

Mock-up: Before proceeding for mass production of all units, the agency shall fix typical mock-up units of each type to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. The agency shall proceed for mass production only after approval of mock-ups by Engineer-in-Charge or his authorized representative. The Item should be executed as approved by the Engineer-in-charge. Necessary shop drawings for the doors shall be prepared by the specialized vendor and submitted to Engineer-in-Charge for approval.

The specifications and method statement shall be submitted by the agency well in advance before the start of execution. The execution shall be allowed only after due approval of Engineer-in-Charge.

15.0

False Ceiling work:

Various types of false ceiling work shall be carried out by the contractor referring the false ceiling layouts as per Architectural drawings. Contractor needs to schedule of attached with tender document for all type false ceiling. Contractor will submit minimum three samples of each item proposed in tender document to Engineer in charge for approvals before executing the respective job. All false ceiling work shall be executed through the specialized sub-contractor/ vendors. The engagement of specialized agency/associated agency shall be approved by the Engineer-in-charge on submission of work experience certificate of that agency for the amount and number as per general condition of tender and as per specifications for various types of false ceiling detailed below.

15.1

Gypsum False Ceiling:

The False ceiling shall be done with 12.5mm thick tapered edge gypsum moisture resistant board conforming to relevant BIS code for all heights as per approved design and drawing:

Providing and fixing at all height false ceiling including providing and fixing of frame work made of special sections power pressed from M.S. sheet and galvanised in accordance with zinc coating of 120 gms/sqm (both side inclusive) as per IS:277 and consisting of angle cleats of size 25mm wide x 1.6mm thick with flanges of 27mm and 37mm at 1200mm centre to centre one flange fixed to the ceiling with dash fastener 12.5mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50mm of required length with nuts & bolts of required size and other end of angle hanger being fixed with nut and bolts to G.I. channels 45mm x 15mm x 0.9mm running at the rate of 1200mm centre to centre to which the ceiling section 0.5mm thick bottom wedge of 80mm with tapered flanges of 26mm each having clips of 10.5mm at 450mm centre to centre shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64mm dia x

230mm long G.I. wire at every junction including fixing perimeter channels 0.5mm thick 27mm high having flanges of 20mm and 30mm long, the perimeter of ceiling fixed to wall/ partition with the help of rawl plugs at 450mm centre to centre with 25mm long dry wall screws @ 230mm interval including fixing gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25mm at 230mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound, jointing tapes, finishing with jointing compound in 3 layers covering up to 150mm on both sides of joint and two coats of primer suitable for gypsum board as per manufactures specification and making openings for light fittings, grills, diffusers, cut-outs made with frame of perimeter channels suitably fixed all complete as per drawing and specification and direction of the Engineer-in-charge with 12.5mm thick tapered edge gypsum moisture resistant board conforming to IS:2095.(Part-I). Contractor needs to provide all types of coves and metal powder coated shadow profile at the junction of wall and ceiling as per the approved detailed false ceiling drawings by the Engineer in charge. The work to be carried out as per the CPWD Specifications.

15.2

Metal Ceiling System:

The G.I. metal false ceiling shall be provided in toilets, part of kitchen and at ceiling where pipes are hanging to cover the hanging sanitary pipes & fittings in toilets, chimney fume pipe and loft tanks as per approved drawings, schedule of finishes and scope of work. GI metal false ceiling system of specified materials of size 600x600 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanized steel sections as per following specifications and as directed by Engineer-in-charge shall be provided:

The contractor shall provide and fix in positions GI Clip in Metal Ceiling System of 600x600 mm module which includes providing and fixing 'C' wall angle of size 20x30x20 mm made of 0.7mm thick pre painted steel along the perimeter of the room with help of nylon sleeves and wooden screws at 300 mm center to centre, suspending the main C carrier of size 10x38x10 mm made of G.I steel 0.7 mm thick from the soffit with help of soffit cleat 37x27x25x1.6 mm, rawl plugs of size 38x12 mm and C carrier suspension clip and main carrier bracket at 1000 mm c/c. Inverted triangle shaped Spring Tee having height of 24 mm and width of 34 mm made of GI steel 0.45 mm thick is then fixed to the main C carrier and in direction perpendicular to it at 600 mm center with help of suspension brackets. Wherever the main C carrier and spring T have to join, C carrier and spring T connectors have to be used. All sections to be galvanized @ 120 gms/sqm (both side inclusive), fixing with clip in tiles into spring T with : GI Metal Ceiling Clip in plain Bevelled edge global white/ approved color tiles of size 600x600 and 0.5 mm thick with 25 mm height, made of GI sheet having galvanizing of 120 gms/ sqm (both sides inclusive) and 20%

perforation area with 1.8 mm dia holes and having NRC of 0.5, electrostatically polyester powder coated of thickness 60 microns (minimum), including factory painted after bending and perforation.

16.0 Plastering & Finishing Work

The joints between RCC members and masonry or any two dissimilar materials shall be covered by plaster mesh strips and a groove shall be provided at such joints.

16.1

Internal plaster:

- Inside walls of Residential blocks, Utility Blocks, Guard room, Boundary Wall, Public Toilet shall be plastered with 12 mm self curing/ curing free ready mix plaster including provision of 145 GSM fiber glass mesh (as per manufacturer specification) with Alkali Resistant coating at RCC-masonry junctions and at locations of conduits, pipes etc. with necessary nails/screws at junction of concrete and masonry work (AAC or concrete block) or between different materials, hacking of concrete/ application of bonding agent, finishing, curing, scaffolding for all floor, all level, all height etc. complete as directed by Engineer in charge
- Monolithic construction:- All Residential Blocks' Utility blocks- ceiling, Podium, inside retaining wall, staircase, lift lobby, reception, porch, stilt wall & wet area, Balcony etc. ceiling shall be plastered with 6 mm self curing/ curing free ready mix plaster including provision of 145 GSM fiber glass mesh (as per manufacturer specification) with Alkali Resistant coating at RCC-masonry junctions and at locations of conduits, pipes etc. with suitable nails at junction of concrete and masonry work (AAC or pre-cast concrete block) or between different materials, hacking of concrete/ application of bonding agent, finishing, curing, scaffolding for all floor, all level, all height etc. complete as directed by Engineer in charge.
- Non-monolithic construction :- All Residential units, Utility blocks ceiling (without false ceiling, Balcony), shall be plastered with 6 mm self curing/ curing free ready mix plaster, applied on hacked / uneven background to finished in smooth line and level etc. complete after applying bond coat primer as per approval of Engineer-in-charge.

16.2

External plaster

Residential Blocks, Utility Blocks, Guard room, Boundary wall, etc.(except monolithic shutter finished surface outside walls), in development work etc. shall be plastered with 15 mm self curing/ curing free ready mix plaster including provision of 145 GSM fibre glass mesh (as per manufacturer specification) with Alkali Resistant coating at RCC-masonry junctions at locations of conduits, pipes etc. with necessary nails/ screws at junction of concrete and masonry work (AAC or concrete block) or between different materials, hacking of concrete/ application of bonding agent, finishing, curing, scaffolding for all floor, all level, all height etc. complete as directed by Engineer in charge.

16.3

Workmanship

The mesh is to be fixed with nails/ screws and cement paste at the junctions of different materials (column and block work, at beam bottom level, on the face of beam and block work) to avoid cracks in the plaster. Fiber mesh shall be fixed before the plasterwork. The mesh shall be fixed in such a way that it is totally concealed in the plaster. Plaster mesh shall be fixed in such a way that minimum 150 mm mesh is provided on either side of the joint. The mesh shall be fixed on both the elements with the help of nail/ screws. Drilling shall be carried out if required in RCC member.

The work carried out at any height, position, shape, floor and for all necessary scaffolding, etc. as may be required. Hacking/ bush hammering be done to form key for plaster or bonding agent application and for spatter dash treatment as specified as directed by engineer in charge.

All work in narrow width, rounded angles, chamfered external angles, drip moulds, grooves and for making good after all trades. Groove to be formed in plaster at junction two different materials i.e. RCC and brick work etc.

17.0 Exterior Grade Texture Paint

17.1

This paint shall be executed on all exposed surfaces of buildings i/c exterior of walls, balcony walls, parapet, Staircase mumty, O/H tanks, compound wall, other locations, exposed soffits etc. as decided by Engineer-in-charge. Cleaning the surface free of dirt/dust and laitance, repairing the substrate must be checked for its soundness using small hammer, and filling the cracks with sealers and polymer modified cement mortar for bigger gaps making the surface smooth, even & free from cracks and local depressions.

17.2

Providing and applying one coat of acrylic primer in approved shade of texture coating mixed with wall sealer and water in the ratio of 1:1: 1 (1 sealer : 1 primer: 1 water) over the plastered surface followed by application of alkali resistant exterior acrylic modified resin-based primer coats in approved shade of texture @ 80 - 90 Sq.feet / kg / Coat by brush this shall be followed by providing and applying weather and UV Resistant, Water Repellent, Dust, Dirt & Stain Resistant, Fungus & Algae Resistant and 100% natural non-pigmented crushed granite Chips (100% natural crushed Granite chips) texture paint of approved make with final coat of texture with natural granite stone chips (attainable thickness: 0.80 to 0.90mm to offer grooved finish) applied with spray over a coat of texture without chips (attainable thickness: 0.80 to 0.90mm to offer smooth surface as base coat) of desired shade in two coats or more @ 4.0 - 5.0 Sq. Feet / kg / Coat in approved pattern. Finally, application of two coats of water base acrylic protection coat (co-polymer of acrylic) applied @ 140 - 160 Sq.feet / litre. / Coat with roller and brush to form a film of 30 – 40 microns thick and make the surface streak resistance. The texture paint shall be done after scrapping and properly cleaning the surface before application of wall sealer and primer as per the manufacture's specification and direction of Engineer-in-charge. The texture applied shall form a durable membrane, seamless and have strong adhesion, high sheen and

anti-carbonization properties. The entire operation including cost and conveyance of all material, labour, sundries, tools and machinery etc. all complete. All complete as per direction and approval of Engineer-in-charge.

17.3

Premium Acrylic Emulsion Interior Paint:

This paint shall be executed on all internal surface of residential towers and utility blocks, guard rooms, ATM, Public toilet etc. with stilts, podiums, ramps etc. with 1mm thick white cement based waterproof putty, priming coat, in atleast three coats of premium quality acrylic emulsion paint shades and colours of paint shall be as per materials palette approved by the Engineer-in-charge. The work shall be carried out as per CPWD 2019 specifications with correction slips up to the last date of submission of tender documents with provision of IS Codes listed in CPWD specifications shall form a part of this document with all latest codes.

18.0 Thermoplastic paint

This paint shall be executed for road markings, parking areas demarcation in open area, stilt, marking at Parking columns upto 1200mm height, wall ramps and kerb stone painting, zebra crossing etc. as per the approved Architectural drawings. Paint shall be 2.5mm thick (retro-reflective) of specified shade/ colour using hot thermoplastic material by fully/ semi-automatic thermoplastic paint as per direction of Engineer-in-Charge and accordance with applicable specifications as per CPWD 2019 specifications Volume I and II with correction slips up to the last date of submission of tender documents with provision of IS Codes listed in CPWD 2019 specifications shall form a part of this document with all latest codes.

19.0 Polycarbonate work:

Opening of all shafts at terrace, courtyard opening/open to sky portion/core area at terrace and ramp openings leading to basement shall be covered with 16mm thick multiwall three or more layered polycarbonate sheet roofing supported on GI frames/truss as approved by Engineer-in-charge. Designing, providing and fixing 16 mm thick, 1000 ($\pm 10\%$) wide panel with U value not more than 2.10 W/m²K and weight not less than 2.75 kg/sqm multiwall three or more layered polycarbonate sheet panel co-extruded Ultra Violet (UV) protective coating on external surface with standing seam on both the running ends, sheet shall be connected using polycarbonate connectors having grip lock double tooth locking mechanism and provided with endcap at the ends to ensure water and air tightness. The light transmission from transparent or translucent or opaque or in combination polycarbonate sheet. varies from 15 to 85%, shall be decided by engineer in charge as per requirement. The polycarbonate sheet shall have Dart drop impact value more than 60 Joules as per IS14434:2023 and confirm either flame retardancy of class UL- 94HB/94V-0 category as per IS14434:2023 or category VO & HB as per ASTM D635-18 or BS1D0 classification as per EN13501 for fire safety. The yellowness index tested

as per ASTM E313 (D1925) or ASTM E313 (D1925) shall be equal to or more than 10 unit or 6 units respectively on a sample after 5000 Hours of exposure of UV / sun light. The cross section ends of poly carbonate sheet shall be provided with self-adhesive aluminium impermeable tape at top and aluminium ventilated tape at bottom of the sheet and covered with polycarbonate / aluminium u-shaped protective profile. The poly carbonate sheet shall be held in position by using stainless steel (SS304 grade) trapezoidal cleat of 1 mm thick having minimum bottom width 35mm and top width 50mm or any other shape and size as per design requirement and manufacturer specification, cleat fixed with 2 or more stainless steel screws of 5 mm diameter with 25mm long with structural steel framework. The cleat shall be tested to withstand pull out force equal to wind speed of 50m/s as per IS: 875 and design test report shall be submitted to Engineer-in-charge for approval before use. The cost of ridge and gutters of pre-coated galvanized iron sheet of approved specifications and structural steel framework of shall be paid in respective item for separately.

Note: The fixing arrangement using cleat shall be designed separately for coastal areas for cyclonic wind speed. The work shall be carried out as per CPWD specification with up to date correction till last date of bid submission and direction of Engineer-in- charge. The contractor shall provide a guarantee/ warrantee bond of minimum 10 years against any manufacturing defect of the polycarbonate panels.

20.0 Specification For Urinal Partition:

All urinals shall be provided with 10mm thick frosted toughened glass urinal partition of required shape and size (900mm high and 450mm wide average dimensions) including Stainless Steel 304 grade bracket/clamp with required fasteners etc. complete as per direction of Engineer-in- Charge shall be provided. in all urinals

21.0 Sanitary fittings:

The sanitary fittings such as W.C., wash basin, taps (all of premium range) etc. are to be provided shall be as per relevant attached Schedules of Sanitary and CP Brass fittings/Fixtures in accordance with CPWD Specifications 2019 and according to in accordance schedule as attached in this tender document.

22.0 Internal Water Supply Pipe Line(recessed):

22.1

Internal water supply pipe line of all outlets including bathroom, toilet, kitchen etc shall be of CPVC with all fittings, clamps for fixing shall be provided as per relevant CPWD specification with up to date correction slip. The water supply pipe grid running inside the residential units exposed on wall/ceiling shall be covered with suitable gypsum board false ceiling in box type / cove as per drawing and design approved by Engineer-in-Charge.

22.2 All External garden hydrants system piping shall be uPVC 10 kg/cm² conforming to IS 4985

22.3 Internal pipes exposed on wall in shafts, terrace and other exposed area, down water supply line from terrace water tank to individual flats, other toilets, kitchens etc. shall be GI & with fittings including fixing by necessary clamps etc complete as per approved plumbing design and drawing and executed with prior approval of Engineer-in-charge.

23.0 External (Exposed) Pipe Lines in buildings:

GI pipes (Class-C) and fittings for water supply lines from UG tank to terrace, firefighting tanks etc. water feeding line shall be as per approved plumbing drawing. The G.I. pipes and to be provided as per relevant CPWD Specifications 2019 with upto date correction slips and scale of amenities, including fittings and fixtures like socket, reducer socket, elbow, reducer elbow, tee, reducer tee, nipple, unions, check valve, ferrule, non-return cross over, plug, etc. all shall be provided by the contractor as per valve, extension nipple, cross, approved plumbing layout plans and as per direction of Engineer-in-charge. GI pipes and fitting/fixtures shall conform IS 1239 & IS 4736.

24.0 Vacuum Dewatered Concrete (VDC):

Vacuum dewatered concrete flooring will be carried out in the stilt parking, podium and area with required thickness as per design requirement to sustain load of vehicle movement in M-30 grade concrete minimum Thickness 200mm/As per drawing. Final brooming as per requirement (to achieve desired surface finish) shall be made before the floor top becomes too hard and if required at top surface to making groove cutting and filling with silicate etc.

24.1 Material:

All materials of construction like cement, aggregate, sand, water etc. shall be as per CPWD specifications. The total filler content consisting of cement and fine particle shall be limited to a minimum. This factor is of foremost importance both for the vacuum and for the reduction of shrinkage.

24.2 Grade of Concrete:

Minimum grade of concrete used shall be M-30 conforming to IS:456. Only Design Mix Concrete using admixtures with the prior approval of the Engineer-in-Charge shall be used.

24.3 Special Requirement:

All works covered by this specification shall be carried out by an experienced agency having expertise in vacuum dewatering concrete system after getting the same approved. Only skilled and experienced operators shall be employed for the purpose. Prior approval of the agency shall be obtained

from the Engineer-in-Charge before starting the work. All the equipment shall be of approved and proven types and suitable for the work involved. Concrete laying pattern shall be decided in consultation with the Engineer-in-Charge and with his approval. The maximum width of a slab strip shall not generally exceed 4 meters and minimum number of construction joints shall be used. Alternate slab strips shall be sequentially laid. Any damage to the already finished top surface shall be avoided. At construction joints no overflow of mortar or slurry on the already hardened surface shall be allowed while concreting the intermediate slab strip. Such construction joints shall be marked with a thread in a straight line while the concrete is still green. Continuity of reinforcement shall be maintained while laying concrete in slab strips. Edges at expansion joints shall be protected and proper arrangement of shear-transfer shall be provided standards.

For Concrete compaction after placing concrete in position, it shall be vibrated thoroughly using poker/ needle vibrators and thereafter leveled with surface vibrators to produce a homogeneous and smooth concrete surface. In order to achieve a smooth surface to the satisfaction of the Engineering-in-Charge, surface vibrators shall be very carefully used by skilled operators. Over vibration resulting in excess mortar near the surface shall be avoided.

24.4

Dewatering:

Suction mats shall be spread over the leveled fresh concrete surface and shall be connected by suction hose to the vacuum pumps for De-watering of surplus water in the concrete. During De-watering it shall be ensured that no cement/ cement slurry is pumped out.

24.5

Floating and Troweling:

This shall be done after De-watering by using skim floater (power floater). After this, surface shall be towed with minimum two passes of power trowel to achieve a wear resistant surface to the satisfaction of the Engineer-in-Charge.

24.6

However, all care shall be taken to avoid any stain or any permanent stain on the surface. Any stain or permanent marking on the top surface shall be removed by approved means.

Approach Working Platform & Formwork:

The Agency shall arrange all approaches, scaffolding, working platforms etc. for carrying out the entire operation safely and in a work-man-like manner. The working area shall be nearly maintained, and all the facilities required by the Engineer-in-Charge for proper supervision of the work shall be provided. The specification and method statement shall be submitted by the agency well in advance before the start of execution. The execution shall be allowed only after due approval of Engineer-in-Charge.

24.7**Additional Specifications for Roads:**

For designing and construction of internal roads, the consultant of the contractor has to consider road section, etc. based on projected traffic, IRC, BIS and other applicable codes/guidelines and as per MORTH specifications. However, following **minimum** specifications are to be adopted: -

- i. For stilt, podium, basement and over the basement slab and over any other RCC slab, ramps—150mm (avg.) Pavement quality concrete (PQC) in M-30 grade over waterproofing treatment.
- ii. Over ground i.e. directly on the earth—200mm Granular-Sub-Base (GSB), 100mm PCC(1:4:8) and 150mm Pavement quality concrete (PQC) M-30 grade.
- iii. Parking Ramp (over ground i.e. on earth if any)-150mm Granular-Sub-Base (GSB), 100mm PCC(1:4:8) and 150mm Pavement quality concrete (PQC) M- 30 grade.

24.8**Granular-Sub-Base: -**

Providing, laying, compacting, etc. close graded Material conforming to specifications, mixing in a mechanical mix plant at optimum moisture content (OMC), spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density in following 3 Grades, complete as per specifications and directions of Engineer-in-Charge.

- i. With material conforming to Grade-I (size range 75 mm to 0.075 mm) having CBR Value-30,
- ii. With material conforming to Grade-II (size range 53 mm to 0.075 mm) having CBR Value-25,
- iii. With material conforming to Grade-III (size range 26.5 mm to 0.075 mm) having CBR Value-20.

24.9

Road Marking: - Marking with approved quality thermoplastic paint of 2.5 mm thick road marking strips (retro reflective) of specified shade/ colour using hot thermoplastic material by fully/ semi-automatic thermoplastic paint applicator machine fitted with profile shoe, glass beads dispenser, propane tank heater and profile shoe heater, driven by experienced operator on road surface to be carried out on all internal roads, ramps, basement parking, etc. as decided by Engineer-in-charge.

24.10

In road work grooves of 5mm wide and 50mm deep as per approved pattern and design to be provided by the cutter and filled with PU Sealant.

24.10.1

The junction where RCC structure and soil come in contact with each other and over its road to be constructed, has to be treated with due care to avoid cracks in future and necessary reinforcement has to be provided.

25.0 Aluminum Works:

25.1 All Aluminum works shall in general be executed in accordance with CPWD Specifications 2019 Vol-I & II with correction slips up to last day of submission of bid and as per approved drawings and as per the direction of Engineer-in-Charge and shop drawings for the same shall be got approved from Engineer-in- charge before execution. Minimum wall thickness for the structural members & non-structural member shall be 3.0 mm and 2mm, respectively or as per design approved by proof consultant in accordance with relevant IS codes.

25.2 Aluminum extruded sections shall conform to IS: 733 and IS: 1285. All sections shall be fixed with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/neoprene gasket etc. Aluminum sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, aluminum snap beading for glazing / paneling, C.P. brass/ stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge. Aluminum sections shall be Polyester powder coated (minimum thickness of polyester powder coating 50 micron). Extruded profiles shall be free from die lines, pressure marks, scratches or graphite lines.

25.3 Aluminum Louvers:

All service shaft opening and access doors and other such doors shall be made with aluminium frame & aluminium Louvers (factory fabricated powder coated of minimum thickness 50 micron) as per approved drawings. All aluminium louvered doors shall be fixed with stainless steel grade 304 butt hinges of required size as CPWD specifications. 180-degree stainless steel grade 304 hinges shall be used wherever required for fixing of aluminum members, door panels, etc. as per approved sample. Stainless steel grade 304 hardware shall be fixed as directed by the Engineer-in- charge. All plumbing and sanitary rain water pipe lines exposed on outer face of wall shall be covered with Aluminum Louver. The rain water pipe or any other any pipe exposed on outer face of balcony walls shall also be covered with Aluminum Louver or any other suitable materials of approved design, drawing and make by Engineer-In-Charge. Adequate structural support system and provision for maintenance of services shall also be provided. The specification includes all operations from manufacturing stage to the installation. Aluminum louvers panels shall be as per structure stability, and support pattern as per approved design requirement.

25.4 All rain water, plumbing and sanitary lines exposed on outer face of wall/shaft shall be covered with Aluminum louver of approved design & pattern. Adequate structural support system and provision for maintenance of services shall also be provided.

25.5 The Service lines/pipes shall not be visible on the exterior faces of the building. As far as possible all the services shall be taken through the shaft

intended for that purpose. Inside the shaft, the service lines shall be carried on GI bracket of suitable size rather than fixing them directly on shaft walls

25.6

The shaft shall be duly covered in elevation with Aluminum Louvers to retain the aesthetic elegance of the building. MS platform of suitable size with supports of required section duly epoxy coated paint as per approval of Engineer-in-charge shall be provided in the shaft at every floor level to facilitate working for repairs.

25.7

The louvers shall be with Aluminium horizontal Z- Louver system with screw at c/c distance 50mm. Louver shall be made out of 30mmx50mmx2mm or higher frame with screw fixing. The necessary fittings for opening of louver system in the shaft shall be provided as per approved drawing and design and in the opening of podium elevation for fixed portion and openable part to be proposed by the firm and approved by the Engineer-in-charge etc. are in the scope of work.

All service shaft opening and access doors and other such doors etc as required at site shall be with louvers of approved sizes with Aluminium horizontal Z- Louver system with screw at c/c distance 50mm and made out of 30mmx50mmx2mm or higher frame with screw fixing arrangements. The necessary fittings for opening and closing of louver system in the shaft along with locking arrangements shall be provided as per approved drawing and design

25.8

Podium Façade: -As per Drawing.

26.0

General Conditions for Water Proofing Works

26.1

The Agency shall be responsible for the water proofing design, proper installation and performance of waterproofing systems to make the sub-structure and superstructure completely watertight.

26.2

The work shall be got executed from the specialized agency as approved by the Engineer-in-Charge. Agency shall submit the names of atleast three “water proofing specialist” from the list of approved makes given in this bid document along with information about their technical capabilities and list of similar works executed by the specialized agency in the past seven years for the approval of Engineer-in-Charge at least 100 days in advance from the start of waterproofing work. For the Quality assurance and quality of workmanship, waterproofing specialist applicator should be proficient in handling and installing water proofing membrane / crystalline compound etc.

26.3

Total quantity of the water proofing compound required shall be arranged only after obtaining the prior approval of the make by Engineer-in-

Charge in writing. Materials shall be kept under double lock and key and proper account of the water proofing compound used in the work shall be maintained. It shall be ensured that the consumption of the compound is as per specified requirements.

- 26.4** The finished surface after water proofing treatment shall have adequate smooth slope as per the directions of the Engineer-in-Charge.
- 26.5** Before commencement of treatment on any surface, it shall be ensured that the outlet drain pipes / spouts have been fixed and the spout openings have been eased and rounded off properly for easy flow of water.
- 26.6** The approved specialized agency for the work of water proofing will have to execute a guarantee bond in prescribed proforma enclosed at for removing any defects for at least 05 (Five) years. Guarantee bond shall be signed by both the specialized agencies as approved by the Engineer-in-Charge and the main Agency to meet their liability under the guarantee bond. However, the sole responsibility about the efficiency of water proofing treatment shall rest with the main agency. Any leakage /defects in waterproofing arising during the defect liability period shall have to be got attended immediately within a reasonable time and rectified by the main Agency at their cost to the satisfaction of the Engineer-in-Charge. This would include any incidental cost e.g. flooring, filling, tilling, piping and plaster etc. complete and nothing shall be payable to the agency on this account
- 26.7** 10% of the cost of water proofing work shall be retained as additional security deposit and the amount so withheld would be released after five years from the date of completion of the entire work under the agreement. If the performance of the work done is found unsatisfactory and any defects noticed during the guarantee period, they shall be rectified by the agency within seven days of receipt of intimation of defects in the work. If the defects pointed out are not attended to within the specified period, the same will be got done from another agency at the risk and cost of the agency.
- 26.8** In all waterproofing works, due care shall be taken on the openings, around pipes or any other service ducts / pipes etc. by using epoxy painting around it and providing bond with non-shrinkable water proof epoxy grout GP2 after sealing the bottom opening.
- 26.9** The specifications and method statement shall be submitted by the Agency well in advance before the start of execution. The execution will be done only by the applicator authorized by the manufacturer and after due approval of Engineer-in- Charge. Method statement for each type of water proofing shall have to be provided by the firm and work execution to be taken up only after approval of the Engineer-in- charge for the same.

26.10 Waterproofing with Fully Bonded HDPE membrane

26.10.1 Fully bonded HDPE membrane type water proofing is to be carried out in raft foundation work.

26.10.2 1.5mm thick composite thickness (Bare film thickness of HDPE shall be minimum 0.90 mm) fully bonded weldable HDPE membrane confirming to IS 16471:2017, requirements to provide Type A fully bonded protection to underground structures and it shall provide an intimate bond to the underneath of the poured concrete used as base/ raft slab to resist water migration. Membrane shall be supplied with original manufacturer's material test certificate (MTC) and membrane shall be installed in strict accordance with original manufacturer's instructions. The agency shall prepare the method statement for the approval of the Engineer-in Charge before the execution of this item.

26.10.3 The fully bonded HDPE sheet membrane shall consist of a multi-layer composite film which consists of highly resilient HDPE film, self-adhesive polymer layer and a trafficable weather resistant layer and shall be capable of UV Resistance for the exposure of minimum 45days. The minimum width of the HDPE membrane shall be 2.00 meter in order to minimize the number of joints and with minimum 75mm factory made selvages and confirming to IS 16471:2017 requirements of underground waterproofing structures. End laps and side laps should be a minimum of 75 mm width with double weld system, comprising of two parallel welds of 15 mm wide each with a 20 mm air channel gap in between the two weld lines.

26.10.4 Fully bonded HDPE sheet membrane shall be chemically resistant in all types of soil or water and is unaffected by ground settlement beneath slabs. The fully bonded HDPE sheet waterproofing membrane shall have following typical properties:

- a) Peel Adhesion to concrete > 800 N/M (as per ASTM D903: 1998).
- b) Elongation (HDPE film)> 400% (ASTM D 412 Modified).
- c) Tensile strength>25Mpa. (ASTM D 412 Modified).
- d) Thickness: 1.5mm composite thickness, HDPE thickness not less than 0.9mm (ASTM D 3767).
- e) Puncture Resistance - 1000 N(ASTM E154).
- f) Resistance to Hydrostatic Head >70 m (ASTM D 5385 Modified).
- g) Lap Joint Strength at Overlaps > 15000 N/m (ASTM D 6392:2012) (Side and End Laps).

26.10.5 Pre-applied fully bonded HDPE membrane shall be installed with selvedge laps, and end laps executed with supplier's instructions. Pre-applied fully bonded HDPE membrane shall be laid over the entire area and returned on to the diaphragm/retaining wall and terminated as per manufacturer's instructions

till the level of raft slab.

26.10.6 Purpose of these technical specifications is to establish, monitor and control all activities to execute the waterproofing and reinforced concrete retaining walls including, sampling, inspections and execution without any safety hazard. This procedure is exercised in order to meet the requirements specified in drawings, project specifications and up to the satisfaction level of Engineer-in-Charge and the consultant.

26.10.7 Controlling specifications shall be of Original Manufacturer Shop Drawings (Private Label Supplier Shop Drawings not acceptable) and Original Manufacturer Method Statement (Pvt. Label Supplier Method Statement not acceptable) after due approval of Engineer-in-Charge.

26.11 Waterproofing of Underground & Overground Water Tank

26.11.1 First Step shall be treatment to concrete defects like Construction Joints, Cold Joints, Honeycombs & Porous Concrete. All construction joints, honeycombs, cold joints, of concrete shall be treated by hacking and opening the affected area till sound concrete, fixing nozzle and grouting the same, under pressure with cement slurry mixed with IWP non shrink additive of approved make and sealing all the construction joints with styrene butadiene latex.

26.11.2 Wall and Slab Joint / Construction Joint Treatment

After the entire surface preparation has been completed on the mother slab, all the Wall and Slab Joints / Construction Joints to be treated with joint tapes having minimum tensile elongation more than 300% of size 25m x 200mm fixed in place with flexible cementitious waterproofing slurry with quick curing and waterproofing. Apply 1st coat of Waterproofing slurry on the Wall – Slab joint and immediately place the tape over it and press it into the still wet slurry with steel trowel to ensure adhesion and release any trapped air. In the same manner the entire Wall – Slab joints / Construction Joints to be treated on the whole area. The water/pipe outlets to be treated in the same manner. as per original Manufacturer's specifications all over the entire horizontal and upto full height vertical surface.

26.11.3 Waterproof Coating

After the entire surface preparation has been done, pre wetting of the entire concrete surface and providing and application of the 1st coat of approved make flexible cementitious waterproofing slurry with quick curing and waterproofing with a mason's brush. After the 1st coat has sufficiently dried now apply the 2nd coat of water proof slurry. The total

consumption of the product should be as per manufacturer specification for two coat. The product should have a tensile elongation of 120%, tensile strength of 1Mpa, adhesion strength of 2Mpa, crack bridging capacity of 2mm as per EN 1062-7 complete as per manufacturer's specifications and approved by Engineer-in-Charge. After completion of the above said applications, the waterproofed coating should be left to air cure for minimum of 48 hours. Care should be taken that during this curing period walking or any other activities should be avoided on it. Ponding test can be done after air curing to check for any leakages.

26.11.4 Providing and laying of protection plaster 20mm thickness with 1:4 cement and sand mortar as per approved specification admixed with integral waterproofing compound as per original Manufacturer's specifications. to prevent the Waterproof Coating from getting damaged. The waterproofing system should be applied directly by the manufacturer with 10 years of complete system warranty against leakage.

26.11.5 Laying slope making and protection with 40mm avg. thick of M25 grade fibrated screed and applying waterproof plastering with CM 1:4 of thickness 20mm admixed with integral waterproofing compound as per original Manufacturer's specifications.

26.11.6 Controlling specifications shall be of Original Manufacturer Shop Drawings (Private Label Supplier Shop Drawings not acceptable) and Original Manufacturer Method Statement (Pvt. Label Supplier Method Statement not acceptable) after due approval of Engineer-in-Charge.

26.12 Water Proofing of Water Retaining Structures-

26.12.1 First Step shall be treatment to concrete defects like Construction Joints, Cold Joints, Honeycombs & Porous Concrete. All construction joints, honeycombs, cold joints, of concrete shall be treated by hacking and opening the affected area till sound concrete, fixing nozzle and grouting the same, under pressure with cement slurry mixed with IWP non shrink additive of approved make and sealing all the construction joints with Master Latex mortar.

26.12.2 **Wall and Slab Joint / Construction Joint Treatment**

After the entire surface preparation has been completed on the mother slab, all the Wall and Slab Joints / Construction Joints to be treated with joint tapes having minimum tensile elongation more than 300% of sizes 25m x 200mm fixed in place with flexible cementitious waterproofing slurry with quick curing and waterproofing. Apply 1st coat of Waterproofing slurry on the Wall –Slab joint and immediately place the tape over it and press it into the still wet slurry with steel trowel to ensure adhesion and release any trapped air. In the same manner the entire Wall – Slab joints / Construction Joints to be treated on the whole area. The water/pipe outlets to be treated in the same manner.as per original Manufacturer's specifications all over the entire horizontal and upto full height vertical surface.

26.12.3

Waterproof Coating:

26.12.4

After the entire surface preparation has been done, pre wetting of the entire concrete surface and providing and application of the 1st coat of flexible cementitious waterproofing slurry with quick curing and water proofing with a mason's brush. After the 1st coat has sufficiently dried now apply the 2nd coat of water proof slurry. The total consumption of the product should be as per manufacturer specification for two coat. The product should have a tensile elongation of 120%, tensile strength of 1Mpa, adhesion strength of 2Mpa, crack bridging capacity of 2mm as per EN 1062-7 as per manufacturer's specifications and direction of Engineer-in-Charge. After completion of the above said applications, the waterproofed coating should be left to air cure for minimum of 48 hours. Care should be taken that during this curing period walking or any other activities should be avoided on it. Ponding test can be done after air curing to check for any leakages.

26.12.5

Providing and laying of protection plaster 20mm thickness to prevent the Waterproof Coating from getting damaged. The waterproofing system should be applied directly by the manufacturer with 10 years of complete system warranty against leakage.

26.12.6

Laying slope making and protection with 40mm avg. thick of M-40 grade fibred screed and applying waterproof plastering with CM 1:4 of thickness 20mm admixed with integral waterproofing compound as per original Manufacturer's specifications.

26.12.7

Controlling specifications shall be of Original Manufacturer Shop Drawings (Private Label Supplier Shop Drawings not acceptable) and Original Manufacturer Method Statement (Pvt. Label Supplier Method Statement not acceptable) after due approval of Engineer-in-Charge.

26.12.8**Moisture Sensitive Bituminous Epoxy Coating:**

Over the plaster providing & applying 2 coats of Moisture Sensitive Bituminous Epoxy Coating at a consumption of @500/Gms/sq.mtr with Bonding / adhesion of 1.2 to 1.4 N/mm² as per ASTM D 4541, Water resistance, immersion – 7 days passes as per ASTM D 870-09, Chemical resistance, immersion in dilute acid alkali & salt solutions – 7 days -Passes as per ASTM 868 as per manufacturer's instruction.

26.12.9

Controlling specifications shall be of Original Manufacturer Shop Drawings (Private Label Supplier Shop Drawings not acceptable) and Original Manufacturer Method Statement (Pvt. Label Supplier Method Statement not acceptable) after due approval of Engineer-in-Charge.

26.13

Waterproofing of Landscape Garden/Hardscape:

26.13.1

The First part consist of all surface area should cleaned up to visible of hair cracks / aggregate texture. Cleaning of RCC member should be done by hacking tool, wire brush, wire grinder & air blower etc. Open cracks & construction joints should be sealed with cement mortar mixed with IWP of

approved make. All clean & treated area should be tested for water tightness by flooding water. All wet spots & water leakage area should mark for treatment. Application shall be done by approved specialized agency, and comprehensive warranty shall be given by specialist applicator.

26.13.2

Second part includes providing & applying solvent free resin/epoxy primer coat by roller @ 0.30 kg/sqm on the prepared surface. Allow to cure for max 5-6 hours. Spread anti-slip grains of 200-300 micron (dried sand) on wet primer at coverage of 0.8-1 kg/m² and allow to come to touch dry condition before application of Membrane. The epoxy primer shall have an adhesive strength of 2 Mpa.

26.13.3

Third part shall consist of applying 2 components, solvent free, liquid applied elastomeric seamless hybrid polyurea Membrane coating@ 1.6 kg/sqm, using high pressure two components spray/brush equipment, to form a minimum system thickness of 1.5 mm in two or more alternative coats.

The coating should pass Dynamic Crack Bridging as per EN 1062-7, Method B for 20,000 cycles at - 20 degree temperature. The membrane shall be applied on horizontal surfaces and on verticals up to 300mm height above the FFL / Soil fill level, self-curing for 2 days, there after ponding with water for 2 days to test the water tightness.

The coating should be having the following minimum properties:

- i) Solids Content (zero VOC) (ASTM D1353) : 100%,
- ii) Tensile strength (ASTM D 412): >10 MPa,
- iii) Tear Resistance (ASTM D1004): > 60 N/mm,
- iv) Shore A Hardness (ASTM D 2240): >80,
- v) Elongation (ASTM D412): >450%,
- vi) Bond Strength/Adhesion to concrete (ASTM D 4541) > 2 Mpa,
- vii) Crack Bridging displacement (ASTM C 836)> 2 mm,
- viii) Puncture Resistance (ASTM E154) > 1000 N,

26.13.4

Fourth part, before laying of screed is done single layer of non-woven nle membrane/cloth of 150 – 180 gsm shall be laid on the water proof coating so as to create separation layer between the coating and the screed and followed by laying of protective concrete screed of average thickness of 75 mm using M25 grade concrete with minimum thickness of 40 mm at the rainwater outlet and a slope of 1:120, making gola at the junctions of horizontal and vertical surfaces to a float finish, well compacted, curing for 7 days etc. complete

26.13.5

Fifth part(for landscape areas) includes Providing and laying Dimple drain boards with inbuilt geo textile drainage membrane on top having dimple height of 20-25 mm, average number of dimples 400 per sqm, compressive strength not less than 180 kN/m² and geotextile drainage member having mass of 120 gsm, laid with minimum overlap of 50 man Note: If HDPE Drain cells / Drainmats along with a layer of geotextile having weight of 120 gsm and tensile strength not less than 2.4 kN/m as per ASTM D 4595 is provided in place of dimple drain board with inbuilt geotextile, it shall not be paid as extra.

This geotextile fabric composite allows passage of moisture through fabric while preventing fine soil from entering to drainage channel bonded to a high strength polypropylene geotextile fabric

26.13.6

Controlling specifications shall be of Original Manufacturer Shop Drawings (Private Label Supplier Shop Drawings not acceptable) and Original Manufacturer Method Statement (Pvt. Label Supplier Method Statement not acceptable) after due approval of Engineer-in-Charge.

26.14

Waterproofing of Terrace / Mumty / Roof Slab Waterproofing with Insulation:

26.14.1

The system includes surface preparation by thorough grinding, construction joint treatment as per the methodology, making angle fillets of 125mmx125mm with polymer modified mortar at the junction between slab and parapets and allowing it to cure followed by applying two component high solids content cold applied pure Polyurethane liquid elastomeric seamless waterproofing membrane meeting the requirements of LAM as per ASTM C836 and having excellent tensile strength of > 6 MPa (As per ASTM D412), elongation > 600% (as per ASTM D 412), tear strength of 35 N/mm (As per ASTM D624), adhesion to concrete of > 1.50 MPa (as per ASTM D 4541), tack free time < 4 hours , full dry time < 24 hours , Shore A Hardness of > 70 (As per ASTM D2240), resistance to hydrostatic pressure head of 7 Bar (As per ASTM D 5385/ DIN 16726), puncture resistance of >300N (As per ASTM E154), static crack bridging ability > 3.5 mm (As per EN 1062-7),resistance to root (As per CEN TS/14416) and fire resistance of class E (As per EN 13501-1).

The coating shall be applied to achieve a total system DFT of 1.5mm thereby satisfying the requirements of LAM as per ASTM C898 and shall be applied on the entire horizontal surface extending upto 300mm above the FFL on the vertical surface including all around the pedestals for solar panels, thrust blocks etc.as per the methodology.

26.14.2

Insulation Layer: Spray applied an average minimum 75mm thick GRIHA enlisted CFC & HCFC polyurethane foam (To comply to the U-Value requirement of 0.33 W/m²K for roof as per ECBC guidelines) satisfying the requirements of application as per IS 12423-Part3 which is applied in multiple passes with each spray pass of average 10- 12mm thick with a skin formation on the top of each layer to enhance imperviousness of the layer. The spray applied polyurethane foam must have a free rise density of 33-35 kg/m³ and a spray density in the range of 45- 50 kg/m³(as per ASTM D1622), initial thermal conductivity of 0.023 W/m.k at 24°C (as per ASTM C518), tensile strength of >400kPa (as per ASTM D 1623), compressive strength greater than 300kPa (as per ASTM D-1621), closed cell content greater than 95% (as per IS 11239

Part5) , water absorption less than 1.5% (asper ASTM D2856), fire test property conforming to Class B2 as per DIN 4102 and Dimensional Stability of < 1.5% for 7 days when tested at -15& +70°C (as per ASTM D2126). This layer shall not be executed over podium.

26.14.3

On top of Polyurethane foam, applying single component, elastomeric 100% pure Polyurethane coating free from bitumen & tar, which meets the requirements of LAM as per ASTM C836-18, having elongation of 400% (As per ASTM D412), Tensile strength greater than 2MPa (As per ASTM D 412), Tensile set >7% (As per ASTM D412), Tear strength greater than 15 N/mm (As per ASTM D 624), Water Vapor Permeability greater than 25 gm/m²/day (As per ISO 9932:91), Resistant to water pressure of 5 Bar (As per EN 12390:8), Crack bridging capability of 3.2mm (As per ASTM C1305) and extensibility after heat ageing of No crack observed for 6.4mm (As per ASTM C1522).The coating shall be applied with a total consumption of minimum 1.5 Kg/Sqm in two coats and shall be applied on the entire horizontal surface extending up to 300mm above the FFL on the vertical surface as per the methodology. It shall be followed by laying 150 gsm Geotextile (non-woven polyester) over the entire membrane on horizontal areas maintaining proper overlaps. Elastomeric Polyurethane coating shall not be executed over podium.

26.14.4

Providing 100 mm average thick M25 grade PP fiber reinforced concrete screed mixed with Crystalline admixture Min. 75 mm thick at the rain water outlets, laid to a slope of 1:120, and making angle fillet of 100mmX100mm using M25 grade concrete at the corners, compaction, curing for 7 days etc. complete.

PU Foam shall have following Minimum properties:

Property	Test Standard	Results
Density	ASTMD 1622	45-50 kg/m ³
Compressive strength	ASTMD1621	>300 kPa
Tensile Strength	ASTM D1623	>400 Kpa
Thermal conductivity	ASTM C 158	0.023 W/mk
Water Absorption	ASTMD 2842	<1.5%
Closed Cell Content	IS 11239 Part5, 1985 & ASTM D6226	> 95%
Dimensional stability	ASTM D 2126	<1.5 %
Flammability	DIN 4102	B2

Two components Polyurethane coating shall have following minimum properties:

Property	Test Standard	Results
	ASTMD 2369	> 98%
Elongation	ASTMD412	>600 %
Tensile strength	ASTM D412	>6 Mpa
Puncture Resistance	ASTME 154	>300 N
Shore A Hardness	ASTMD 2240	>70
Crack bridging displacement	EN 1062-7	>3.2 mm
Bond Strength to concrete	ASTMD 4541	>1.5 N/mm ²

26.14.5

Top surface shall be provided with Heat Resistant Tiles of approved make and specifications as per directions of the Engineer-in-Charge.

26.14.6

Controlling specifications shall be of Original Manufacturer Shop Drawings (Private Label Supplier Shop Drawings not acceptable) and Original Manufacturer Method Statement (Pvt. Label Supplier Method Statement not acceptable) after due approval of Engineer-in-Charge.

26.15

Waterproofing of Toilet/Bathroom, Sunken Area, Balcony, Refuse Floor and Similar Areas:

Clean the entire surface free of dirt, dust, laitance, and all adhesion inhibiting materials, etc. and inspect for cracks depressions, holes on the entire surface if any and remove all surface imperfections, protrusions, loose concrete & filling of cracks with high strength polymer modified mortar/micro concrete and the surface shall be fully repaired and levelled.

26.15.1

Wall and Slab Joint / Construction Joint Treatment:

After the entire surface preparation has been completed on the mother slab, all the Wall and Slab Joints / Construction Joints to be treated with Joint Sealing Tape made up of High-end Polyethylene with upper and lower surface heat laminated, having minimum weight 0.06 kg/mtr., tensile elongation 300%. The size of tape shall be 25m x 200mm. the tape shall be fixed in place with flexible cementitious waterproofing slurry with quick curing and waterproofing. After surface preparation apply 1st coat of Waterproofing slurry (two component High strength acrylic waterproofing system) on the Wall –Slab joint and immediately place the tape over it and press it into the still wet slurry with steel trowel to ensure adhesion and release any trapped air. In the same manner the entire Wall – Slab joints / Construction Joints to be treated on the whole area. The water/pipe outlets to be treated in the same manner.as per original Manufacturer's specifications all over the entire horizontal and upto full height vertical surface. The slab and wall junction shall be also make fillet of size 75x75

mm with by laying 150 gsm Geotextile (non-woven polyester) with proper over laps as per manufacturer specification.

26.15.2

Waterproofing of Coating –

After the entire surface preparation has been done, Providing & applying solvent free resin/ epoxy primer coat by roller @ 0.30 kg/sqm on the prepared surface. Allow to cure for max 5-6 hours. Spread anti-slip grains of 200-300 micron (dried sand) on wet primer at coverage of 0.8-1 kg/m² and allow to come to touch dry condition before application of Membrane. The epoxy primer shall have an adhesive strength of 2 Mpa.

Providing & applying applying 2 components, solvent free, liquid applied elastomeric seamless hybrid polyurea Membrane coating @ 1.6 kg/sqm, using high pressure two components spray/brush equipment, to form a minimum system thickness of 1.5 mm in two or more alternative coats.

The coating should pass Dynamic Crack Bridging as per EN 1062-7, Method B for 20,000 cycles at -20 degree temperature. The membrane shall be applied on horizontal surfaces and on verticals up to 300mm height above the FFL / Soil fill level, self-curing for 2 days, there after ponding with water for 2 days to test the water tightness. Care should be taken that during this curing period walking or any other activities should be avoided on it. Ponding test can be done after curing to check for any leakages

The coating should be having the following minimum properties:

- i) Solids Content (zero VOC) (ASTM D1353) : 100%,
- ii) Tensile strength (ASTM D 412): > 10 MPa,
- iii) Tear Resistance (ASTM D1004): > 60 N/mm,
- iv) Shore A Hardness (ASTM D 2240): >80,
- v) Elongation (ASTM D412): >450%,
- vi) Bond Strength/Adhesion to concrete (ASTM D 4541) > 2 Mpa,
- vii) Crack Bridging displacement (ASTM C 836)> 2 mm,
- viii) Puncture Resistance (ASTM E154) > 1000 N,

26.15.3

Providing and laying of protection plaster 20mm thickness to prevent the Waterproof Coating from getting damaged. The waterproofing system should be applied directly by the manufacturer with 10 years of complete system warranty against leakage.

26.15.4

Laying slope making and protection with 30 to 40mm avg. thick of M25 grade fibred screed for horizontal surface and applying waterproof plastering with CM 1:4 of thickness 20mm for vertical walls upto 1 m height in toilets/bathrooms, 0.30m height in refuse floor and other areas admixed with integral waterproofing compound as per original Manufacturer's specifications.

26.15.5

Sanitary pipe inserts shall be sealed in following manner:

- a. Place the pipe in the core cut (core cut dia. Shall be 25 – 30mm more than pipe dia.) remove all the dust, loose particles by air blowing or vacuum pump.

- b. Apply polymer bonding agent the pipe and substrate for enhanced bonding
- c. Close the bottom of sleeve/ core cut with by wrapping with double sided bituminous tape around the pipe
- d. Now pore the non-shrinkable polymer grout till full depth of core.

26.15.6 Controlling specifications shall be of Original Manufacturer Shop Drawings (Private Label Supplier Shop Drawings not acceptable) and Original Manufacturer Method Statement (Pvt. Label Supplier Method Statement not acceptable) after due approval of Engineer-in-Charge.

26.16 Waterproofing of Construction Joints:

26.16.1 Providing and laying swellable Water Stops at all construction joints for preventing water migration at construction joints below grade. Construction Joint should be swellable type of minimum 20mm X 25mm in position at all vertical & horizontal construction joints detailing and fixed by using epoxy adhesive @ 3.78 litre per 240 running metre. The swellable water stop shall be have water absorption min. 1.2 kg/m and shellability of more than 1000%.

26.16.2 Controlling Specifications shall be of original manufacturer shop drawings (private label supplier shop drawings not acceptable) and original manufacturer method statement (private label supplier method statement not acceptable) after due approval of Engineer-in-Charge.

26.16.3 The internal surfaces (floor and wall) of the water reservoirs like underground tanks, terrace tanks, sumps etc. shall be provided with ceramic tiles of size 300mm x 300mm or more of approved shade and brand with cement based high polymer modified quick set tile adhesive type-III(water based) conforming to IS: 15477 of approved make and specification complete as per directions of the Engineer-in-Charge.

26.16.4 **Crystalline Water proofing compound**

Integral crystalline admixture for water proofing treatment shall be used for RCC structures like basement raft, retaining walls, reservoir, swimming pool sewage & water treatment plant, underground water storage tanks, overhead water tanks, podiums slab, refuge floor, terrace slab, mumty, lift machine room, toilet, balcony slabs etc. at the time of transporting of concrete into the drum of the ready-mix truck, using integral crystalline admixture @ 0.80% (minimum) to the weight of cement and cementitious content both per cubic meter of concrete or higher as recommended by the manufacturer's specification in reinforced cement concrete at site of work in accordance with the CPWD Specifications 2019 Vol-II. The crystalline admixture shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specifications and the directions of the Engineer-in-Charge. The minimum concrete design mix for all the liquid retaining structures shall be M-30. Before in

corporating the crystalline admixture into the project it is impetive that a comprehensive testing process shall be initiated.

27.0 Fire stops & Fire sealants

All openings (provisions for MEP) & Joints (provision to accommodate movement) in rated wall & floor shall be closed with tested & listed firestop systems.

Firestop system for all MEP application should have 2 hours fire rating when tested in accordance with ASTM E 814/UL 1479 standards and IS 12458 and all joints shall be tested in accordance to ASTM E1966 and Façade joint between (non-rated) & rated floor shall be tested in accordance ASTM E 2307. If equivalent test standards are followed then equivalency can be arrived by comparing parameters like movement, Hose Stream test, L rating, Sound insulation, mould and mildew resistance etc.

27.1

The system shall be UL listed & classified and product shall bear the UL & FM approval logo on the packing. If none of UL test certificate comply with actual application, an EJ document prepared by qualified personnel and based on nearest third party tested & approved systems like UL test certificates & in accordance with IFC guidelines shall be produced by manufacturer. A firestop submittal shall be produced by manufacturer, in accordance with approved passive fire protection method statement, for technical approval. Firestop installation shall be done by Company Accredited Firestop Specialty Contractor (CAFSC) and in accordance with Company guidelines and UL system test certificates or approved EJ document. Firestop Specialty Contractor needs to submit work completion certificate along with installation report through documentation Software CFS DM for periodic inspection & maintenance purpose.

27.2

This method statement describes a proper work procedure that shall be followed for fire stopping applications as per site requirement, specification(s) and contract drawing(s). The scope of work covers:

27.2.1

Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions

27.2.2

Gap between edge-of-floor slabs and curtain walls

27.2.3

Openings/joints between structurally separate sections of fire rated wall or floors

27.2.4

Gaps between the top-of-walls and ceilings or roof assemblies

27.2.5

Openings and penetrations in fire-rated partitions or walls containing fire doors

27.2.6

Openings around structural members which penetrate floors or walls

27.3 The aspects covered in the scope of work are as follows: -

27.3.1 Identification of breaches in fire rated walls/floors that need to be fire stopped as per fire plan or site requirement.

27.3.2 Identification and procurement of appropriate firestop assembly as per requirement of site, fire plan, specification(s) and/or contract drawing(s).

27.3.3 Surface preparation as per requirement and installation of firestop assembly according to manufacturer's instructions .

27.3.4 Inspection and documentation of firestop assembly.

28.0 **Thermal Insulation.**

28.1 **Scope:**

As per the provisions of **ECO-Niwas SAMHITA 2024** amended upto the last date of submission of bids, the building envelope is to be constructed in such a way that the maximum value of residential envelope transmittance value (RETV) except roof shall not be more than the prescribed limit. The thermal transmittance of roof (*Uroof*) shall not be more than 1.2W/sqm.K. The cost shall deemed to be included in the bid amount and nothing extra shall be payable to the agency on this account later on.

29.0 **Factory fabricated Modular Kitchen and Modular Wardrobe: - Modular Kitchen**

29.1 **Under storage cabinets Floor Unit in Kitchen:** Factory-made built-in cabinets, carcass made up of box and shelves with both sides balancing laminated and shutters with one side decorative (Acrylic Laminate) and other side balancing laminated 19 mm thick

BWP grade marine ply (Termite resistant) conforming to IS 710 and 12 mm thick prelaminated marine ply (Termite resistant) back panels and drawer bottoms, with SS hardware (to be included) 304 grade with cooking platform as per design & details approved by Engineer-in-Charge with:-

a) pre-polished granite with nosing cooking platform basic rate of polished granite of minimum rs.175/- per sqft excluding GST and duly supported by tax invoice. stainless steel SS 304 kitchen 1 mm thick, double bowl sink and single bowl sink with drain board as per IS 13983 with drain board & extended swinging spout (mixer). Density shall be 850 kg/m³ each panel shall be precisely cut by the beam saw machine and edge banding done on edge banding machine with PVC edge band bonded with pur glue. The machining of panels like holes for minifix, housing for hinges, grooves for back panels are done by CNC machining center. all the panels shall be made and packed in the factory. only installation shall be done at site.

All modules shall be independent and no common vertical panels shall be acceptable. The kitchen shall be installed on adjustable legs clad with 100 mm skirting.

Readymade cutlery organizer shall be of SS 304 grade of approved make. Modular kitchen basket and accessories such as right-angle basket (Plain Cup & Saucer, plant, Partition, Bottle rack, Thali, Cutlery) kitchen utensil basket, Dinner set basket, kitchen grain basket, Multipurpose basket as per mentioned drawing including finishing (wherever required) and fittings. The same shall be fixed with necessary stainless-steel nuts & bolts, screws & telescopic channel etc. as per approved drawing and direction of Engineer-in charge

Wooden carcass and shutters shall have to pass the test like Static Load test, Shelf deflection test. Modular kitchen accessories of approved make and models shall be fixed in the drawer / Cabinet with suitable provision with panels of bottom and rear shelves with thickness of 12 mm as per technical requirement. The carcass of floor units and tall units will be supported by minimum 100mm Stainless Steel Grade 304 height vertical adjustable legs of approved make which will be covered with powder coated aluminium skirting of matching colour, approved make attached by hardware of skirting. The unit shall be fixed to the floor/wall/slab using metal screws of appropriate size and raw plugs. The work shall be executed as per drawing/ Sample prepared in sample flat at site and direction of Engineer-in- Charge.

Fittings - Satin finished G type profile handle, Innotech channel system for drawer of approved make with necessary fixing complete cabinet to be made in mini fix with all fixtures as per requirement.

The contractor shall provide and install 1 no. chimney kit consisting of Aluminum flexible pipe of dia. 6-inch, length upto 8.5 feet, cowl, clamps, screw & wall plug for installation all complete in each quarter after making necessary size of hole in masonry/RCC and sealing the hole all complete as per direction of Engineer-in- charge. The contractor shall also cover the vertical exposed portion of chimney fume pipe all around by providing an installing stainless steel (grade 304) sheet of minimum 1.2mm thick with necessary bracket and fixing arrangement as per direction of Engineer-in-charge.

29.2 Modular Kitchen: Top Unit in Kitchen:

Factory-made built-in 19 mm thick one side decorative (Acrylic Laminate) and other side balancing lamination factory pressed BWP grade marine ply (Termite resistant) conforming to IS 710 shelves, in tiers up to height as mentioned in drawing in niche and covered with 19 mm thick one side

decorative (Acrylic Laminate) and other side balancing lamination factory pressed BWP grade marine ply (Termite resistant) as per IS 710, and 12 mm thick prelaminated marine ply (Termite resistant) with balancing laminate for back portion, with stainless steel hardware as per architectural design and specifications.

29.3 Kitchen Accessories and Hardware:

Fittings - Satin finished G type profile handle, Innotech channel system for drawer of approved make with necessary fixing complete cabinet to be made in mini fix with all fixtures as per requirement.

Note: - All samples for material and product to be used in the work shall be got approved from the Engineer-in-Charge.

30.0 Modular Wardrobe, Cupboard etc.:

30.1

As per tender drawings. factory-made built- in cupboard/ wardrobes made up of 19 mm thick both side balancing lamination factory pressed BWP grade marine ply (Termite resistant) conforming to IS 710 for the carcass, box, sides, top and bottom and 19 mm thick one side decorative and other side balancing lamination factory pressed BWP grade marine ply (Termite resistant) as per IS 710 for front and side, and 12 mm thick prelaminated marine ply (Termite resistant) with balancing laminate for back portion, with stainless steel hardware as per architectural design and detailed technical specifications.

Fittings: Modular Wardrobe accessories shall be fixed in the drawers. A) Auto closing/soft close hinges, B) Drawers movements quadro soft close channels of size 450mm or more as approved, C) cloth hanging rod: 38 mm oval shape stainless steel 304 grade (minimum 12 gauge) with a pair of required stainless steel brackets (minimum 14 gauge) fixed with SS screws as per technical requirement, D) All shutters shall have SS Satin finished fancy handle of approved make and minimum size 300 x 10 mm, E) Each drawer shall have powder coated aluminium profile handle of approved color, in full width of drawer as per make and other hardware including locking arrangements as approved by Engineer-in-charge. The carcasses of wardrobe units will be fixed on IPS platform made for the

purpose. The work shall be executed as per drawing/ Sample prepared in sample flat at site and direction of Engineer-in- Charge. The Cabinet shall be with depth and dimensions as per approved drawings.

31.0 Signages:

Contractor shall develop shop drawings for all types of required signage's for the project as per the intent suggested by the Architect and shall submit to the Engineer in charge for approvals before executing the works. Contractor will arrange samples and required mock-ups as instructed by Engineer in charge for some important areas. The signages shall have provisions for universal accessibility related provisions like braille engravings, etc.

The scope in this section shall be engineering, procurement and execution of all types of signages like informative, cautionary and mandatory signages. Some indicative signages are mentioned below and any additional signage required as per local body requirements shall also be provided by the contractor, sizes of signages shall be sufficient in proper proportion as per the matter to be displayed.

31.1 External Signages: -

The contractor shall provide following signage as required, necessary and as per direction of engineer in charge. Sizes mentioned are indicative for intent purpose.

31.1.1 "Building name" signages in SS 316 grade cut letters of minimum 25mm thick, 500mm height in English and Hindi with back light on each tower.

31.1.2 Buildings name" "Gate number" at main gates and "No parking" signages – SS 316 grade 3mm thick Stainless-Steel plate of minimum size 600X400mm, laser engraved text (English Language) in approved colour laser fused pigment, "Buildings name" signages at each main gate columns on front and back face, "No Parking" Signages on each buildings main entrance.

31.1.3 "You Are Under CCTV Surveillance" - Minimum 900 nos. if required more as approved drawing and local authority at various location in the campus in SS 316 grade 3mm thick Stainless-Steel plate of minimum size 300X300mm, laser engraved text with logo in approved colour laser fused pigment, fixed on wall.

31.1.4 "External Parking" "Way to Buildings, Basements, park" Signage of minimum size 600X150mm- Aluminium composite panel 4mm thick (ACP) as base board, micro prismatic retro reflective sheet and electro cut coloured overlay film. Micro prismatic retro-reflective

sheet conforming to Type-IX of ASTM: D 4956- 07 shall be pressure fixed on ACP which will be over laid with electro - cut transparent film fixed on wall bat stilt, basements.

31.2

Internal Signages: -

The contractor shall provide following signage as required, necessary and as per direction of engineer in charge. The Sizes, shapes mentioned are indicative for intent purpose.

31.2.1

“Building Directory” at GF Entry - SS 316 grade 3mm thick Stainless-Steel plate of minimum size 900X1500mm, laser engraved text fixed on wall. Signages shall be fixed at appropriate location in every blocks as decided by Engineer-in- charge.

31.2.2

“Flat Number”, “Individual Room” and “Reception” - SS 316 grade 3mm thick Stainless-Steel plate of minimum size 150X100mm, over wooden plate of minimum size 200X150mm made of 18mm plywood 4 mm thick veneer on front side and 0.80 mm thick matt finish laminate with teak beading of minimum size 30x10 mm including melamine polishing etc. Signages shall be fixed at every flat, individual room signage in rooms of Utility Blocks and reception signages at every reception counter.

31.2.3

“Floor Identification”, “Wash Room” for all common toilets - SS 316 grade 3mm thick Stainless-Steel plate of minimum size 300X150mm, “Floor identification” fixed at every floor of all staircases and every floor of all lift lobbies. “Wash room” for common toilets in Towers, Utility blocks and public toilet.

31.2.4

“Lift Number”, “Exit”, “Use stairs in case of fire”, “Fire Hydrant”, “Parking Number” – Signage of minimum size 300X150mm made with 4mm thick aluminium composite panel (ACP) as base board, micro prismatic retro reflective sheet and electro cut coloured overlay film. Micro prismatic retro- reflective sheet conforming to Type-IX of ASTM: D 4956-07 shall be pressure fixed on ACP which will be over laid with electro - cut transparent film, fixed on wall and signages shall be fixed as

- i). “Lift Number” at every floor showing lift number
- ii). “Exit” at all lift lobby at every floor, basements, basement stair, ramps
- iii). “Use stairs in case of fire” in lift lobby at every floor iv).
- “Fire Hydrant” at all fire hydrant door at every floor v). “Parking Number” at stilt, basements etc. in the buildings.
- iv). “Fire Hydrant” at all fire hydrant door at every floor v). “Parking

Number” at stilt, basements etc. in the buildings.

31.2.5

“Entry” “Exit” and “Fire Evacuation Plan” – Signage to be in 4mm thick Acrylic Base + Photo luminescent sheet / Auto Glow sheet with 2hrs glowing effect+ Content in vinyl printing, some signage to be fixing with double sided tape with silicon paste on walls and some shall be double sides painted and hanging from ceiling with SS rods. Signages shall be fixed with intervals of 10metre centre to centre or as decided by engineer-in- charge and “Fire Evacuation Plan” to be pasted on the wall without hanger as per fire department guideline for standard size and drawing approved by Engineer-In-Charge.

31.3

Rubber Guard-

Providing and fixing of 1000mm, corner rubber guard in L shape with yellow reflective tapes for high visibility in the parking area, columns, wall corners, podium, stilt, etc. as per direction of engineer-in-charge.

32.0 Monolithic Aluminum Form Work : General

The aluminum formwork shall conform to IS:14687-1999 and execution of work shall be in general as per CPWD SPECIFICATIONS 2019 (Vol.-I & Vol.-II) with correction slips up to last date of submission of bid. The formwork shall be made of aluminum extruded section conforming to IS 733: 1983. The formworks shall be designed based on the structural requirements of building units.

- i. Before taking up the work, the contractor shall submit his design, shop drawings and method statement for the Aluminum Form Work for approval of the Engineer- in-Charge.
- ii. The aluminum form work shall be customized as per the architectural and structural drawings of various buildings as approved by the Engineer-in-Charge.
- iii. The repetitions in usage of aluminum formwork shall not be more than 100 times.
- iv. In external walls, ties used in shutter connection create holes in wall after de- shuttering. Care shall be taken to clean and degrease these holes and thereafter grout the holes to avoid any seepage or leakage. It shall be ensured that there shall not be any shrinkage cracks in the concrete sections anywhere. If required control strips may be provided in structure to control the shrinkage cracks due to heat of hydration.
- v. Aluminum form work should be designed and customized as requirement of architectural/ service drawings.
- vi. Contractor must bring required number of sets of shuttering to achieve construction as pe the milestone, required quantity of cement slurry tight aluminum form work, its accessories, hardware and related items

required to achieve the milestone progress to complete the project in time.

- vii. A mockup of aluminum formwork shall be inspected by the Engineer-in-Charge or his authorized representative at the factory location for which the agency will be required to make necessary arrangements.
- viii. It is advisable to order extra accessories and hardware to avoid site delays.
- ix. Lubricants for the formwork must be applied as per manufacturer guidelines.
- x. De-shuttering and stocking for formwork must be done as per manufacturer guidelines.

Manufacturer of aluminum formwork will provide adequate supervisors/shuttering experts to execute the work under supervision, provide training and assistance to workers for entire period of RCC casting. The supervisors will provide training to workers in regard of erection of shuttering, conduiting, plumbing, casting of RCC, de-shuttering, stacking of de-shuttering material, oiling and lubricating etc.

- i. Since the finishing of concrete has the biggest role in the final finished product, it is mandatory to achieve the finish up to the satisfaction of the Engineer-in-Charge.
- ii. A sample unit with complete finishing items using approved material shall be constructed taking into account approved layout plans, location of electrical, sanitary and water supply appliances, switches and sockets, etc. The unit should be furnished complete in all respect with doors and windows including fittings, painting, hardware, flooring etc. Nothing extra shall be paid for the sample unit and same shall be refinished at the time of completion of project.
- iii. Aluminium formwork should be handled carefully by trained labourers of manufacturer or contractor.
- iv. Sealing of joints shall be done with approved material (non-shrink grout) for cut outs meant for sanitary/ water supply/ firefighting cables, pipes etc. after proper cleaning of the holes/grooves, for which nothing extra shall be paid.

32.1

Material.

- i) Aluminium for panel sheets shall be minimum 4 mm thick using grade 5052.
- ii) Aluminium for extruded sections shall be of grade 6061 (T-6).
- iii) Pins and wedges to be made of high-grade mild steel.

32.2

Components

The form work includes:

- i) Beam components i.e., beam side panel, prop head for soffit beam, beams soffit panel, beam soffit bulk head.
- ii) Deck components i.e., deck panel, deck prop, prop length, deck mid, soffit length, deck beam bar.
- iii) Wall components i.e., wall panel, rocker, kicker and internal soffit corner, external soffit corner, external corner, internal corner etc.
- iv) The panels shall be held in position by a simple pin and wedge system that passes through holes in the outside rib of each panel.

32.3

Tolerance

- i) The tolerance of finished panels shall be (-1 mm).
- ii) Manufacturer of aluminium form work will submit certificate in every month through contractor to Engineer-in-Charge ensuring the form work is fit for achieving good quality concrete work in all respect. Agency has to remove defective aluminium formwork from site promptly.

32.4

The firm will be required to prepare detailed method of statement for the work execution using aluminium formwork covering different steps involved, precautions to be taken and steps for achieving proper finish giving details of material and T&P to be used. The method of statement shall be submitted to the Engineer-in-charge for approval before taking up execution.

33.0 Sport field

Technical specification for Synthetic **Badminton court.**

(a) Badminton court:

The Technical Parameters: The sports flooring system demonstrates a shock absorption of 49% as per EN 14808:2005. The vertical deformation measured according to EN 14809:2005 is 1.6 mm. Friction, tested under EN 13036-4:2011 (CEN rubber, dry), records a value of 94. Vertical ball behaviour as per EN 12235:2013 shows 94% for basketball and 81% for squash ball. Wettability testing using the World Squash Method confirms a hydrophobic surface. Construction gaps, also assessed by the World Squash Method, show no gaps exceeding 2.5 mm, and visual inspection confirms the surface is visually compliant. Resistance to a rolling load per EN 1569:2020 shows a permanent indentation of 0.25 mm, with no excessive damage observed. Resistance to wear, tested under ISO 5470-1:2016 (CS10, 500 g, 1000 cycles), results in 71 mg. Specular gloss measured at 85° under EN ISO 2813:2014 is 28 GU. Resistance to indentation as per EN 1516 is 0.00 mm, and resistance to impact under EN 1517 shows a residual indentation of 0.40 mm.

The Surface Board: Imported Wood (of your choice) surface board finished with 21 mm thick, 50 to 110 mm width and in random length in machined tongue and groove shape on four sides. The boards will have bottom side with air pass groove. The Imported Wood (of your choice) will be Kiln Seasoned to less than 12% moisture content.

The Under Frame: Made of European SPF wood runners of 70 mm X 45 mm fixed on the bottom side with 18 mm EPDM thick air-cushioning pads by staples through the two wings at 350 mm c/c. All runners will be joint using 6 pieces of corrugated fasteners for superior strength. Also each joint will be supported by a 18mm EPDM thick air-cushioning pad below it.

The Installation: A vapour barrier will be placed on the leveled IPS sub-floor before laying the under frame. The runners having air cell cushioning pads will be placed on the vapour barrier in perfect level at 350 mm c/c in one direction. The surface boards will be screwed to the runners through the tongue only and will lock the screwed tongue by the groove of the adjoining boards using Black Screws. The ends of the boards will be locked by inserting the wooden fingers through the edge grooves and fixed with joinery adhesive of brand Pidilite or equivalent. An expansion gap of 10 to 15 mm will be left open between the wooden flooring and the surrounding tiled area/wall. The Finishing: After construction of the floor will be machine sanded in uniform level and finished with non-skid MATT finish Imported Water Based Polyurethane Lacquer. Game line marking will be carried out in required colors before applying the finish coat. The Water Based Polyurethane Lacquer will be procured from a company having FIBA Certification. BASE PREPARATION TO BE CARRIED OUT BY YOU: The IPS sub-floor, Toweled and finished smooth, levelled to a tolerance of 3 mm is to be provided by you for installation of our flooring system. The total height of the floor assembly including runners will be app. 84 mm and therefore the surface of the under-floor should be brought to 84 mm below the level of the upper surface of the finished floor.

NOTE: THE FLOOR SYSTEM WILL BE CONSTRUCTED AFTER THE CONCRETE (FRESH) HAS BEEN CURED FOR 21 DAYS.

TIMBER:

- (1) The timber used for surface boards will be of teak wood.
- (2) The varying colour of the wood due to its natural characteristics will not be considered as a defect.
- (3) The surface board will be free from bee or borer holes splits, cracks and fungal attack. (4) All timber will be kiln seasoned with moisture content of app.12 %. and dimensions will have a tolerance of ± 1 mm

SPECIFICATION OF GAME LINE MARKING

Game Line Marking will be carried out as per International Federation Standard in appropriate colours.

SPECIFICATION OF MOVABLE NET & POLE FOR BADMINTON COURT Movable Net & Poles having total weight of approx. 200kg as per BWF standard.

IPS/CEMENT CONCRETE for base FLOORING: (As per 11.4 of DSR-2023)

62 mm thick cement concrete flooring with concrete hardener topping, under layer 50 mm thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) and top layer 12 mm thick cement hardener consisting of mix 1:2 (1 cement hardener mix : 2 graded stone aggregate, 6 mm nominal size) by volume, hardening compound mixed @ 2 Litre per 50 kg of cement or as per manufacture's specifications. Aluminium strip 15 mm wide and 3 mm thick to be fixed in a pattern as shown in drawings or as directed by Engineer-in-Charge in joints of cement concrete floors. Scope to Include materials, labour, wastages, curing, cleaning, lead, lifts, tools, tackles, protection till handover, etc., finishing the top with desired finish as per specifications and directed by the engineer in-charge complete and any other related works, all complete as per drawings, specifications and as directed by the Engineer in charge.

34.0 Rolling Shutter:

Supplying and fixing rolling shutters of size 80x1.25 mm M.S. laths with 1.25 mm thick top cover and of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters including ball bearing for rolling shutters and mechanical device chain and crank operation for operating rolling shutters if required as per direction of engineer-in-charge.

35.0 40 mm thick Dholpur Stone & 30/35 mm thick Granite Stone Dry Cladding:

- (i) Stone :The stone shall be red or white as specified in the drawings. The stone shall be hard, sound, tough, free from cracks, decay & weathering. In case of red sand stone, white patches or streaks shall not be allowed. However scattered spots upto 10 mm diameter will be permitted. Before starting the work the contractor shall get samples of stone approved by

Correction...Nil Deletion... Nil Insertion...Nil Overwriting... Nil AE (C) (P) AE(E) (P) EE(C)-I

the Engineer-in Charge. The stone shall be gang saw cut into slabs of required thickness along the planes parallel to the natural bed of stone.

- (ii) Surface Preparation- The RCC element (Beam / Band) surface is properly cleaned by removing any loose material, dirt, or debris, ensuring it's dry and free of any contaminants. This may include filling in any hair cracks or holes with filler, then sanding for a smooth surface. Sealing any hole / gap with high strength grout which helps prevent water infiltration and ensures a clean finish.
- (iii) Preparation of MS Frame Structure - The primer is done to all elements of MS Frame Structure i.e. MS plate, MS tube, angles, channels etc. This is ensured before starting framework installation to prevent corrosion. First of all 8mm thick MS plate of required size is fixed on the RCC member (Beam / Lintel / Band) with required number of SS fasteners of size 12x100 mm of Hilti brand. After fixing of MS plates, vertical MS tube of size 96x48 is fixed to the MS plate using Arc welding and with help of required cleats etc. as per the structural design. The maximum horizontal spacing of vertical tubes is 1.8 m as per the structural drawings. Proper MS cleat angles are used to support MS tube junction. Fixing MS angles/channels to plates & MS tubes as required according to the site condition. The vertical tubes are fixed after necessary check of line and plumb. After fixing of vertical MS tubes, the horizontal MS tubes of size 60x40 is fixed to the vertical tubes using Arc welding and with help of required cleats etc. as per the structural design. The maximum vertical spacing of horizontal tubes is 490 mm as per the structural drawings. Proper MS cleat angles are used to support MS tube junction. After completion of framework, the line, level and plumb of framework is re-checked before starting the stone cladding work. The frame work is painted with epoxy paint of any good brand like Asian paint having properties as durability, and resistance to harsh conditions. While painting it is ensured that no welded portion in any corner is left unpainted.
- (iv) Starting of Stone cladding work - Application of Sealant on stone Surface: Apply a protective coating (Sealer proofing) behind the stone cladding for making the stone surface sealed enough to prevent any water absorption by the stone .
- (v) Fixing of Stone cladding to the frame with SS Clamp - Carefully position the SS clamp on horizontal MS tubes after due checking of line and level of the stone cladding to be installed. After temporary fixing the clamp and then cross checking its line, level and plumb, the holes are being done in the tube through the clamp to fasten it to the tube

using SS nut and bolt. Fix the SS clamp with the MS tubes using Arc welding as well as nut and bolt of size. After SS clamps are fixed, the welded portion must be painted again with the epoxy paint. Final checking of plumb of the clamps before starting the cladding of the stones. Securely fasten the stone to the SS clamp using the appropriate method while fixing the stone, small Gap of 5 mm is kept in vertical direction after every stone (of height 490 mm) to ensure the sufficient space for thermal expansion of the stones in vertical direction also in horizontal direction the gap is left at both ends of shaft to ensure for thermal expansion in horizontal direction.

- (vi) Filling of gaps using sealant / silicon - After the stones are fixed, before filling of the gap using sealant / silicon the final line level and plumb of the fixed stones are checked. Filling up of the gap using silicon / sealant to prevent any ingress of water through the gap. The sealant should be good quality and to accommodate thermal variation without rupture.
- (vii) Final cladding and finishing using extra pins etc. as per site requirement - Checking and fastening of all the bolts and pins, ensuring proper and secure fastening of the stone to the Framework.
- (viii) Final Checks: - Ensure proper welding & removing of carbon before stone fixing. After welding and before stone fixing, any weld portion left unpainted must be painted with the Epoxy paint. Ensure the stone cladding is line, level, plumb, and properly aligned with the design and Structural & architectural Drawings. Ensure proper fasteners & chair clamps used. Check for any gaps or loose stones and make necessary adjustments. Clean any debris or dirt that may have accumulated during the installation process. The grooves left should be filled with proper sealant to prevent any ingress of water behind the stone.

36.0

KOTA STONE FLOORING:

The kota stone slabs shall be of selected quality, hard, sound, dense and homogeneous in texture free from cracks, decay, weathering and flaws. They shall be hand or machine cut to the requisite thickness. They shall be of the colour indicated in the drawings or as instructed by the Engineer-in-Charge. The slabs shall have the top (exposed) face polished before being brought to site, unless otherwise specified. The slabs shall conform to the size required. Before starting the work the contractor shall get the samples of slabs approved by the Engineer-in-Charge. Dressing Every slab shall be cut to the required size and shape and fine chisel dressed on the sides to the full depth so that a straight edge laid along the side of the stone shall be in

full contact with it. The sides (edges) shall be table rubbed with coarse sand or machine rubbed before paving. All angles and edges of the slabs shall be true, square and free from chippings and the surface shall be true and plane. The thickness of the slab after it is dressed shall be 20, 25, 30 or 40 mm as specified in the description of the drawings. Tolerance of ± 2 mm shall be allowed for the thickness. In respect of length and breadth of slabs Tolerance of ± 5 mm for hand cut slabs and ± 2 mm for machine cut slabs shall be allowed. Preparation of Surface and Laying The specification shall be as described in except that the edges of the slabs to be jointed shall be buttered with grey cement, with admixture of pigment to match the shade of the slab. The thickness of the joints should be minimum as possible. In any location, it shall not exceed 1 mm. Polishing and Finishing The specifications shall be as described in except that (a) first polishing with coarse grade carborundum stone shall not be done, (b) cement slurry with or without pigment shall not be applied on the surface before polishing.

37.0**EPOXY PAINT:**

Primer for plaster/wood work/Iron & Steel/Aluminium surfaces shall be as specified below:

S.No	Surfaces	Primer to be used
1	Wood work (hard and soft wood)	Pink conforming to IS 3536
2	Resinour wood and plywood	Aluminium primer conforming to IS 3585
3	(A) Aluminium and light alloys	Zinc chromate primer conforming to IS 104
	(B) Iron, Steel and Galvanized steel	Red Oxide Zinc chromate Primer conforming IS 2074
4	Cement/Conc/RCC/brick work, Plastered surfaces, non-asbestos surfaces to receive Oil bound distemper or Paint finish.	Cement primer conforming to IS 109

The application of priming coat for relevant steel or cement surface shall be as per the description. Epoxy paint is supplied in two parts i.e. (base and hardener). Stir the base and hardener separately. Mix hardener gradually into the base under continuous stirring as per mixing ratio as specified by the manufacturers.

The epoxy paint shall be consumed within the working pot life as specified by the manufacturers. Part mixing should be avoided. To achieve optimum performance of the product, minimum 2-3 coats by brushing would be required to get the desired dry film thickness (DFT) as specified by the manufacturer. Relative humidity in the environment should preferably be below 85%.

38.0 CNC cut Aluminium Jali:

Designing, Supplying, Assembling/ fabricating, Installation, finishing, testing and fixing in position of 2 mm thick 6063 T6 Aluminium Laser/CNC Cut Elevational Panels (Jali design) of approved make, color, shape, size & design and to have monotonous span without joint as per manufacturers specifications & standards with a warranty of 20 years. The product composition to be Aluminium with extended exterior coatings and with a warranty for coating of 20 years. The assembly to be fixed using 19 mm SS316 (10mm or 20mm), Coloured 22 mm Wafer Head Screws, Aluminium rivets etc complete to the satisfaction of the Architect & Engineer in charge and as per directions.

39.0 12MM THICK FRAMELESS TOUGHENED GLASS DOOR SHUTTER:

The 12mm thick clear toughened safety glass frameless shutter is fixed with the help of corner patch fittings. The corner patch fittings are simply a bolt through glass metal fitting requiring a corner cut out and hole in the glass. These discrete corner patch fittings provide a sleek and clean frameless look. The lock body patch fitting can also be installed where there is a necessity to provide locking arrangements for frameless shutter. The maximum size of frameless doors shutters using corner patch fittings should not exceed from 1000mm X 2400mm. Bigger size doors should not be fixed with these fittings.

The frameless toughened glass door shutters of required thickness as specified in the item should be installed with the help of 304 grade stainless steel patch fittings of approved brand and manufacturer. These fittings should be complete in all respect with top and bottom pivots and double action hydraulic floor spring types fixing arrangement. These fittings should be based on a modular system, consisting of a base unit, functional inserts, and clip-on covers in a wide range of finishes. The fittings should be suitable to support the weight of the complete glass door in such a way that the movement of the door is smooth and free. The fittings should be got approved from the engineer-in-charge and all the fixings etc. shall be done

as per manufacturer specification and corresponding codes described in the description of the fitting.

40.0 HETROGENEOUS PVC VINYL FLOORING

Supply & Installation of 3.45 mm thick hetrogeneous PVC Vinyl flooring in required colour, profile and pattern of specified approved make of required size as per the site conditions, etc. all complete. The vinyl flooring shall be certified by EN(European Standard) 14904, total weight 3295 g/m², Shock Absorption as per EN 14808 - 6%, Friction as per EN 13036-4 - 80 to 110, Vertical deformation as per EN 14809 - 0.4mm, Vertical Ball Behaviour as per EN 12235 - 98%, 100% recyclable, VOC emission after 28 days lower than $\leq 10\mu\text{g}/\text{m}^3$, Phthalate Free. The flooring shall comply the fire rating CFL S1 as per EN 13501. The flooring shall be laid over damp proof base using rubber based adhesives of approved quality. The joints should be thermo welded with matching welding rods provided by the manufacturer. After welding the flooring will be seamless. The subsurface should be absolutely at one level (Zero).

41.0 EPDM (ETHYLENE PROPYLENE DIENE MONOMER) RUBBER FLOORING:

Providing and fixing 36 mm thick Styrene Butadiene Rubber (SBR) with EPDM (Ethylene Propylene Diene Monomer) rubber flooring out of total Thickness of 36 mm the First Layer of 30 mm thick should be of Black SBR, Second Layer of 6 mm thick should be with Color EPDM. The above flooring of EPDM should be done with different color grains as per design approved by engineer in charge. The glue used should be of

- 1) PU Binder, it's glue which gives bonding to Rubber and should be in Transparent Color, USP of it should have low UV minimal color change EDPM Granules.
- 2) Butyl Acetate, its again a kind of Glue which gives bond in-between different layers.

SBR Buffing (Styrene-Butadiene Rubber), it should be in Black Color and should have excellent weather properties (Ethylene Propylene Diene Monomer), should be in Multi Color Options , its should be Synthetic Rubber which should have water resistance, durable, UV stable high & consistent quality product, including necessary slope, finishing, etc. all complete as directed by the Engineer-in-Charge.

42.0 Locker:

Supplying & fixing in position GREENLAM or equivalent LOCKER, Locker made of heat, bacteria, water, chemical, scratch and impact resistant

03mm & 09mm thick solid compact laminate panels including doors, self, side panels finished with approved texture/shade as per the details drawings and as per IS 2046 (Indian Standard). The compact laminate should be anti bacterial and having Green Guard Certificate. This also includes providing and fixing in position necessary hardware made out of Aluminium (Grade-6063-T6) and Stainless Steel (Grade-304) (i) Camlock (ii) Hinges (iii) Front Section (iv) Back Section (v) Infill Section (vi) Rubber Lining (vii) Screws, Nuts and Bolts. Locker shall be constructed with 4 aluminium interlocking supporting frame work, making it strong and rigid. Tier-4-Suede-1898, (Thickness, Door, Divider Height, Overall Height, Depth, Width -As per drawing.)

43.0

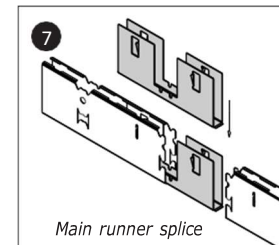
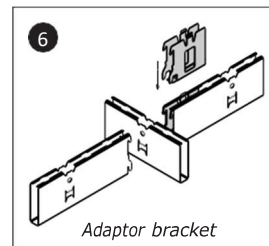
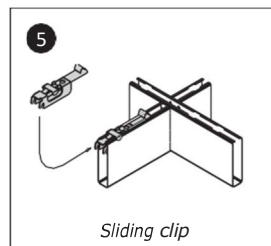
Open Cell False Ceiling:-

PANELS

Cell 50 panels are assembled from aluminium U-profiles and create perfect detailing of the connecting profiles, which are designed to conceal uncoated edges.

SUSPENSION

The 600 x 600 mm and 600 x 1200 mm panels feature an integrated system with main and cross runners from the same profiles as the panels. The panels are easily (de)mounted with the sliding clips.



Material specifications for open cell ceiling :-

Base Material: Cell Ceiling systems are manufactured from aluminium alloy HD5050 or equal (according to EN 1396).

Coating: The tough and durable 2-layer polyester finish in a nominal thickness of 20 microns is stove enamelled in a continuous coil-coating process to ensure uniform coating thickness and absolute adhesion.

Colour range: The standard Hunter Douglas or equivalent interior colour range for Cell Ceiling systems includes a wide variety of colours and finishes. For more information, see our colour chart.

Any other (RAL or NCS) colour is available upon request.

44.0 Wooden Wall Paneling with Melamine Polish – Specification

1. Material

- **Core:** Marine Plywood (BWP, I.S. 710)/Wooden Plank with appropriate thickness (18mm depending on structural needs).

- **Face:** High-quality wood veneer.
- **Finish:** Melamine polish coating for surface protection and aesthetic appeal.

2. Dimensions

- **Panel thickness:** 18mm (depending on design and wall requirements).
- **Panel size:** Typically 4 ft x 8 ft sheets or custom dimensions as per design.
- **Edge finish:** Smooth, sealed, and treated with melamine polish to prevent chipping and moisture ingress.

3. Surface Treatment

- Panels to be coated with **melamine polish**:
 - Clear or tinted, glossy or matte finish depending on design.
 - Provides high resistance to scratches, stains, heat, and moisture.
 - Multiple coats (typically 2-3 coats) with proper sanding between coats for smooth finish.

4. Installation

- Panels to be fixed on M.S./Aluminium framework using concealed fasteners or adhesive.
- Joints between panels to be seamless or covered with matching wooden strips or trims.
- Expansion gaps as per manufacturer's recommendations to accommodate wood movement.

5. Performance Requirements

- Resistant to scratches and abrasion.
- Resistant to moisture and humidity – suitable for interior use.
- Fire retardant treatment if required (confirm local fire codes).
- Easy to clean and maintain.

6. Accessories & Trims

- Matching wooden trims or molding to cover panel edges.
- Optional integrated grooves or designs as per architectural requirements.

7. Quality Assurance

- Material to comply with relevant standards for Marine plywood and surface finishes.
- Sample panels to be approved by client/architect before installation.
- Finished panels inspected for uniform polish, no bubbles, cracks, or defects.

45.0**Specification for NP-2 and NP-3 RCC Pipes****1. General**

- **Standard:** Pipes shall conform to IS 458: 2003 (Specification for Precast Concrete Pipes, Pipes Joints and Accessories for Drain and Sewerage) & CPWD Specifications 2019.
- **Type:** NP-2 and NP-3 pipes are nominal pressure pipes designed for specific pressure classes.

2. Materials

- **Concrete:** Minimum Grade M25 (1:1:2 mix or as per IS standards), using ordinary Portland cement, clean coarse aggregates, and clean potable water.
- **Reinforcement:** High yield deformed steel bars (Fe 415 or Fe 500 grade), placed according to design for structural strength.
- **Mortar:** Cement mortar for jointing pipes to comply with IS standards.

3. Dimensions and Pressure Rating

Parameter	NP-3 RCC Pipe
Nominal Diameter (mm)	As per Mentioned in Drawing
Nominal Pressure (kg/cm ²)	3 kg/cm ²
Thickness	Varies based on diameter and pressure class (as per IS 458)
Length	Standard length: 1.0m or 1.5m (custom lengths as per site requirement)

4. Manufacturing

- Pipes manufactured using centrifugal casting or spinning process ensuring uniform compaction.
- Curing: Pipes cured for a minimum of 14 days to achieve design strength.

5. Physical and Mechanical Requirements

- **Compressive Strength:** Concrete to have minimum compressive strength of 25 MPa (or as specified).
- **Water Tightness:** Joints to be watertight, tested as per IS standards.
- **Load Bearing:** Pipes must withstand soil and live loads as per design criteria.
- **Tolerance:** Diameter, thickness, and length tolerances shall comply with IS 458.

6. Jointing

- Joints shall be flexible or rigid as required.
- Use of rubber gaskets or cement mortar joints for sealing.
- Jointing materials must ensure water-tight and gas-tight seals.

7. Testing

- Each batch of pipes shall be tested for compressive strength, dimensional accuracy, and joint tightness.
- Pipes must pass hydrostatic and load tests as per IS standards.

8. Marking

- Each pipe should be marked with:
 - Manufacturer's name
 - Date of manufacture
 - Nominal size
 - Pressure class (NP-3)
 - Batch number or code for traceability

46.0 Acoustic wall paneling:

Providing & fixing of 100% Natural Material- Magnesite (Hygroscopic & biologically sound binding agent) bonded woodwool Panel "Heradesign - Superfine series planks of 600Mm*1200Mm*25Mm thickness made out of wood wool fibre of width 1Mm Fiber thickness mixed with Natural water & Magnesite (No-Cement) with open & smooth surface texture. A Completely harmless Environment & Human Friendly & also a disposable or recyclable Material & can last for long span in building interiors As it has long lifespan & suitable for Indoor conditions with relative air humidity of upto 90%. Magnesite protects the wood cells against ageing & fungal attack. To achieve upto NRC=1.00 it should be a clear gap of 200Mm from wall slab. Heradesign Woodwool - Acoustical Wall Mounting System Solutions- Ecologically Sound Material with high mechanical strength with Crash test of 90Km/H with Ball Impact Test DIN18032 & EN13964 with flying colors & A sustainable material (PEFC & FSC Certified) along with EPD Certified Acc. to EN ISO 14025 (AUB- Environmental Product declaration). To ensure specification of tiles, Manufacturers Test Certificate is required having complete site address & duly signed by Manufacturer

47.0 Modular type Rainwater Harvesting:-**ITEM DESCRIPTION****Modules:-**

Supply and installation of a 100% recycled polypropylene modular tank system (non-plate and non- hyperboloid design) engineered for underground applications. The system shall be based on a mat raft foundation with a single-column base structure and unidirectional assembly of modular units. Each module measures 600 mm × 600 mm × 250 mm and offers an effective water holding capacity of 85 litres, with a void ratio of 94.5% for maximum runoff storage. The design allows tool-free stacking up to 6 meters, making it ideal for deep cavity installations. Made from high-quality recycled PPCP, the structure is resistant to chemicals and high temperatures and offers a minimum service life of 20 years. It is designed to withstand vehicle loads up to SLW 60 (HGV class) with appropriate backfilling and features a double-lock connection mechanism for enhanced stability. The vertical column structure is engineered to distribute loads evenly, with column spacing not exceeding 75–80 mm and a minimum column density of 75–80 columns per square meter. Systems using more than four components per module shall not be permitted.

Unit: Cubic Meter (CUM)

Geotextile:-

Supply and installation of high-strength, non-woven polypropylene (PP) geotextile fabric, minimum 400 GSM, used for wrapping modular tanks to enhance filtration and prevent silt ingress.

- Tear Strength: ≥ 250 N (ASTM D4533)
- Width-wise Strength: ≥ 215 N (ASTM D4533)
- Puncture Resistance: ≥ 1550 N (ASTM D6241)
- Elongation at Break: $\geq 57\%$ (ASTM D4595)

Fabric is needle-punched, heat-welded, and made from long synthetic fibers ensuring high porosity, effective filtration, and seamless percolation. Includes all necessary activities such as cutting, sizing, seaming, and wrapping around tank modules.

Application: Essential for proper tank functioning, sediment control, and structural reinforcement. Unit: Square Meter (SQM)

Filtration Unit: -

Supply and installation of FRP-based Rainwater Harvesting Microfilter with 750mm diameter and 1000mm height, equipped with dual 6" inlet and outlet ports. The filter includes an internal SS 304 mesh for effective primary filtration.

- Flow Rate Capacity: Minimum 40–45 KL/hr
- Constructed from UV-resistant, corrosion-proof FRP body for long life
- Suitable for rooftop and stormwater collection
- Must be GRIHA and SVAGRIHA Certified (GRIHA Criteria 18 & 21, SVAGRIHA Criterion 9) with valid certification on date of installation
- Compatible with modular tank systems for both recharge and reuse applications

Pumping facility :-

A suitable capacity pumps system shall be installed to use the stored water for Horticulture and other purpose. A stand by pump alongwith all electrical panels and cabling shall be provided for using the stored water for Horticulture purpose or pumping the surplus water into the municipal drain in the rainy season.

Ground water recharge borewell :-

For groundwater recharge, supply, assembly, lowering, and fixing in a vertical position of unplasticized PVC (uPVC) medium well casing (CM) pipes and uPVC medium well screen (RMS) pipes with ribs, of 200 mm diameter, conforming to IS:12818, shall be carried out complete with all necessary fittings, accessories, labour, and hire charges. The work shall be executed for all depths as directed by the Engineer-in-Charge.

The recharge bore shall be constructed to a total depth of minimum 65 metres depending upon water availability in the sub soil strata. From the ground level up to a depth of 10 metres, uPVC medium well casing (CM) pipes shall be used. Below this level, a combination of uPVC medium well casing (CM) pipes and uPVC medium well screen (RMS) pipes with ribs shall be provided to facilitate efficient groundwater recharge.

All works shall be completed in accordance with the relevant specifications, IS standards, and the instructions of the Engineer-in-Charge.

48.0 Electric Kitchen chimney:-**(a) Description and Specification**

Supplying, installation, testing and commissioning of high-performance, energy-efficient ductless wall-mounted kitchen chimney of sleek black finish, suitable for contemporary modular kitchens, having 60 cm width, suction capacity of 1500 m³/hr, equipped with BLDC motor technology for silent operation, auto-clean functionality, gesture control, and remote-control operation, complete with all accessories, filters, electrical connections, and mounting hardware as required for complete installation. The chimney shall be equipped with thermal auto-clean technology with oil collector tray and suitable LED lights. Make: FABER, Model: SIGMA BLDC HC SC BK 60, or approved equivalent.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors;

assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

**TECHNICAL SPECIFICATIONS
FOR
SUPPLY, FABRICATION, INSTALLATION, TESTING AND COMMISSIONING OF FURNITURE,
FURNISHINGS AND APPLIANCES**

SECTION 1

SCOPE OF WORK

1.1 These specifications form part of the Tender Documents and shall be read in conjunction with Schedule of Quantities/BOQ, Drawings, and other Contract Documents.

1.2 The scope of work covered under this Section comprises providing, fabricating, manufacturing, supplying, delivering, assembling, installing, testing and commissioning of all furniture, furnishings, fixtures, appliances and outdoor/playground equipment as described in the Schedule of Items forming Section 3 of this document, complete in all respects, at the locations directed by the Engineer-in-Charge, within the RBI Officers Housing Colony redevelopment project at Kankarbagh, Patna.

1.3 The rates quoted by the Contractor against each item shall be deemed to be for the complete item of work described, inclusive of all materials, components, hardware, fittings, labour, tools and plant, transportation, loading, unloading, carriage to site, vertical and horizontal conveyance within the building/site, fabrication, fixing, testing, commissioning, and cleaning, unless expressly stated otherwise.

1.4 Nothing extra shall be payable on account of wastage of material, minor site variations in dimensions to suit as-built conditions, or on account of the Contractor's own working methods, unless such variation is beyond the tolerance expressly permitted below and is certified by the Engineer-in-Charge.

SECTION 2

GENERAL TECHNICAL CONDITIONS APPLICABLE TO ALL FURNITURE, FURNISHING AND APPLIANCE ITEMS

2.1 Codes, Standards and Statutory Compliance

All materials, components, fabrication, and workmanship shall conform to the relevant and latest editions of Bureau of Indian Standards (BIS/IS), including but not limited to IS:710 (Plywood), IS:303 (BWP grade plywood), IS:1659 (Block boards), IS:2202 (Wooden flush doors), IS:2553 (Safety glass), IS:513 (Cold Reduced Carbon Steel Sheets), IS:1161 (Steel tubes), EN 120 (Formaldehyde emission), BIFMA (Business and Institutional Furniture Manufacturers Association) standards for ergonomic seating, and SCS Global Indoor Air Quality certification, as referred to against individual items. Electrical and electronic appliances shall additionally comply with Bureau of Energy Efficiency (BEE) star-rating norms and Central Electricity Authority (CEA) safety regulations, wherever applicable. Where a specific make/model is indicated, an equivalent of equal or superior specification, duly approved in writing by the Engineer-in-Charge, may be permitted.

2.2 Samples and Prototype Approval

Before commencement of bulk fabrication/procurement, the Contractor shall submit samples/prototypes of each item, together with manufacturer's technical literature, test certificates, and material samples (veneer, laminate, upholstery fabric/leatherette, hardware, glass, and finish shade cards), for written approval of the Engineer-in-Charge. No fabrication or supply shall proceed without such prior written approval. Approved samples shall be retained at site/office for reference and comparison with bulk supply throughout execution.

2.3 Mock-up

The Contractor shall, if so directed by the Engineer-in-Charge, prepare one full-size mock-up/prototype unit of each major item of custom-fabricated furniture (e.g., wall units, cabinets, sofas) at his own cost, for inspection and approval prior to bulk manufacture. Any modification suggested at mock-up stage shall be incorporated at no extra cost.

2.4 Materials and Workmanship

All timber and plywood used shall be well-seasoned, free from knots, warping, insect/fungal attack, and shall be treated with approved anti-termite and preservative chemicals prior to fabrication. All plywood shall be of BWP (Boiling Water Proof) grade conforming to IS:303/IS:710 unless a superior grade is specified against the item. All exposed and semi-exposed surfaces shall receive a uniform, blemish-free

finish as specified, and all edges of boards/panels shall be edge-banded/lipped as specified to prevent moisture ingress and delamination. All metal components shall be free from burrs, sharp edges, and shall receive corrosion-resistant treatment (zinc phosphating/powder coating/anodizing) as specified against the item.

2.5 Hardware and Fittings

All hinges, locks, handles, knobs, castors, drawer channels, gas-lift mechanisms, and other hardware shall be of Stainless Steel 304 grade ISI-marked/approved branded make, and suitable for the intended frequency of use. Soft-close/self-close mechanisms, where specified, shall function smoothly through the full design life without adjustment. All fasteners in contact with exterior/humid environments shall be of stainless steel (SS304 or as specified).

2.6 Dimensional Tolerance

All dimensions given in the item descriptions are approximate/nominal and are subject to actual site measurement and verification by the Contractor prior to fabrication. A tolerance of ± 25 mm in overall dimensions of custom-fabricated carcass furniture shall be permissible to suit site conditions (window/door/services locations) without any change in unit rate, subject to the item continuing to serve its intended function and being approved by the Engineer-in-Charge. For factory-made/branded items, the manufacturer's standard tolerance shall apply.

2.7 Mode of Measurement and Payment

Unless otherwise stated against an individual item, furniture and appliance items shall be measured and paid on a "per number/unit" (each) basis for the complete, installed, and commissioned unit, ready for use, and inclusive of all incidental items of work described in the item and in this Section. Items measured otherwise (running metre, square metre, kilogram) shall be specifically so indicated against the item and measured net, in-situ, in accordance with CPWD Standard Method of Measurement.

2.8 Rate to be Inclusive of

The quoted/accepted rate for each item shall be firm and inclusive of the cost of all materials, components and hardware; fabrication, transportation to site, all taxes, duties, levies and octroi as applicable; loading, unloading, and carriage within the site including to upper floors by hoist/lift/manual carriage; unpacking, assembly, fixing/fastening, alignment, and levelling; all consumables, adhesives, fasteners and incidental sundries; testing, trial-running, and commissioning; protective covering during the defects liability period; and cleaning of debris/packing material from the site after installation. No claim for extra payment on any of the above accounts shall be entertained.

2.9 Quality Assurance, Testing and Inspection

The Engineer-in-Charge or his authorized representative shall be entitled to inspect the Contractor's/manufacturer's factory premises and witness in-process and pre-dispatch inspection/testing at any stage of manufacture. The Contractor shall furnish test certificates (from NABL-accredited or manufacturer's in-house laboratories, as applicable) for load-bearing capacity, formaldehyde emission, fire retardance, and other parameters specifically called for against individual items, prior to installation. Items found not conforming to the approved sample or specification shall be rejected and shall be removed from site and replaced by the Contractor at his own cost within the time stipulated by the Engineer-in-Charge.

2.10 Guarantee/Warranty

All furniture and appliance items shall carry a minimum comprehensive warranty period as specified against the individual item (and in no case less than one year from the date of handing over) against manufacturing defects, structural failure, hardware malfunction and premature deterioration of finish/upholstery under normal conditions of use, and the Contractor shall furnish a Manufacturer's/Supplier's Warranty Certificate to this effect for each item at the time of handing over. Items covered under a longer manufacturer's warranty (e.g., 5-year BIFMA/SCS-rated seating) shall carry that longer period. During the warranty period, any defect brought to the notice of the Contractor shall be rectified/replaced free of cost within 7 days of intimation.

2.11 Safety, especially of Children's Play Equipment

All outdoor playground equipment shall additionally comply with relevant safety norms for children's play equipment (including EN 1176 or equivalent IS provisions as applicable), with all edges rounded, moving parts guarded, and equipment securely anchored in RCC/concrete foundations of adequate depth as per the manufacturer's design and the direction of the Engineer-in-Charge. Ground clearance, fall-safety surfacing, and age-appropriateness signage shall be provided as directed.

2.12 Cleaning and Handing Over

On completion of installation of each item/lot, the Contractor shall remove all packing material, offcuts and debris from the site, clean the item and the surrounding area, and hand over the item along with operation & maintenance manuals, warranty cards, and spare keys/remote controls (as applicable) to the Engineer-in-Charge against a signed handing-over certificate.

SECTION 3

ITEM-WISE DETAILED TECHNICAL SPECIFICATIONS

(To be read as an integral part of the Schedule of Quantities / Bill of Quantities. Each item below is deemed to incorporate, in addition to the specific description, all General Technical Conditions set out in Section 2.)

ITEM NO. 1**(a) Description and Specification**

Providing, fabricating, and installing a Telephone Stand cum Book Rack or Wall Unit Cabinet of approximate finished size 2200 mm (W) × 2100 mm (H), or as per actual site conditions, suitably modified to fit within the planned wall space considering window and door locations. The unit shall be constructed from 18 mm thick BWP-grade marine plywood for the main structure, finished externally with 4 mm thick teak wood veneer, and melamine polished to a smooth, semi-matte finish. The back (wall-facing) side shall be fabricated using 6 mm thick marine ply, laminated with 4 mm thick teak wood veneer and similarly melamine polished. The design shall include functional shelves and compartments for organized placement of books, telephone units, music systems, and TV accessories, as per layout. A sturdy and suitably designed base shall be provided to support the structure and ensure durability. All visible plywood edges shall be neatly finished with melamine-polished teakwood beading. All fabrication and installation shall be done using high-quality joinery techniques, waterproof adhesives, stainless steel screws, and finished to the complete satisfaction of the Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and

commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 2

(a) Description and Specification

Providing, fabricating and installing a wooden storage cabinet for crockery display and storage, of approximate finished size 2200 mm (W) × 1500 mm (H) (with depth and exact size to be finalized at site, depending on space constraints such as windows/doors). The unit shall be constructed from 18 mm thick BWP grade marine plywood, externally finished with 4 mm thick teak wood veneer, melamine polished to a high-quality satin finish.

The cabinet shall be provided with shelves and vertical/horizontal partitions suitable for crockery storage. The front face shall be glazed using clear glass panels embedded in teak wood shutter frames, also finished with melamine polish. The shutter frames shall be fitted with necessary hinges, knobs, and magnetic catches of approved make.

The back (wall-facing) side shall be finished with 6 mm thick marine plywood, laminated with 4 mm teak wood veneer and melamine polish to match the rest of the unit. A suitable base platform/plinth shall be provided for elevation, made from the same plywood and veneered to maintain continuity in design.

All exposed plywood edges shall be finished with solid teak wood beading, neatly rounded and melamine polished. The entire unit shall be manufactured with high-quality joinery, using water-resistant adhesives, SS screws, and all materials and accessories approved by the Engineer-in-Charge. The glass shall be minimum 5 mm thick float glass or toughened glass (as specified), securely fixed in the wooden frame.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 3**(a) Description and Specification**

Providing, fabricating, and installing a custom-designed Shoe Rack Cabinet of approximate finished size 1200 mm (W) × 1200 mm (H), made to suit the site conditions and accommodate constraints like windows, doors, etc. The cabinet shall be constructed using 18 mm thick BWP grade marine plywood for the carcass, finished externally with 4 mm thick teak wood veneer, melamine polished to smooth finish.

The unit shall include multiple horizontal shelves and vertical partitions for optimized storage of shoes and similar items. The back (wall-facing) side shall be finished with 6 mm thick marine plywood, also laminated with 4 mm thick

teak wood veneer and melamine polish. The front face shall include swing shutters made from the same 18 mm ply, teak veneered and polished, with necessary SS butt hinges, magnetic catches, and knobs/handles.

A suitable base with ventilation slits or louvered design shall be provided for air circulation and durability. All exposed edges of plywood shall be finished with solid teak wood beading, duly rounded and melamine polished to match the overall aesthetic.

The complete work shall be executed in line with best joinery practices, using waterproof adhesives, SS screws, and approved quality materials, including edge banding, hardware, and polish, and to the full satisfaction of the Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 4**(a) Description and Specification**

Providing and installing a premium-quality surface-mounted two-door mirrored cabinet of approximate overall dimensions 756 mm (H) x 610 mm (W), fabricated from rust-proof aluminium finished in dark anodized aluminium or equivalent finish. The cabinet shall have a low-profile design with a sleek wall-hugging profile, and mirror-finished doors on the front and mirrored inner surfaces to enhance visibility and reflection. The internal configuration shall consist of three fixed shelves — one full-width and two partial shelves — with an innovative staggered layout to accommodate containers of varying heights. Hinges shall be two-way adjustable with 108° opening capability for smooth operation and easy access. The unit shall be supplied complete with factory-assembled body, and all necessary mounting hardware for easy surface-mounted installation without wall cutting. Installation shall be as per manufacturer's guidelines and to the satisfaction of the Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 5**(a) Description and Specification**

Providing and fixing a wall-to-wall frameless shower enclosure having a width between 2401 mm to 2800 mm and height up to 2000 mm. The enclosure shall consist of two fixed toughened glass panels and one openable door panel, fabricated from 10 mm thick clear toughened glass conforming to IS:2553 standards. All glass edges shall be polished and beveled to ensure safety and aesthetics. The entire assembly shall be supported and secured using high-quality chrome-plated fittings made from stainless steel (Grade SS304) or anodized aluminum, including top guide rails, wall connectors, floor channels, hinges, stabilizer bars, glass holders, and handles.

The door shall operate smoothly with sliding or pivot hinges as approved, and include magnetic seals to ensure water tightness. All joints shall be sealed using approved quality clear silicone sealant or gaskets to make the unit leak-proof. The installation shall be done as per approved manufacturer's specifications, ensuring proper alignment, plumb, and slope for water drainage. The item includes all labour, cutting, polishing, drilling, fixing hardware, fasteners, anchoring, and cleaning the site after completion.

The work shall be executed in accordance with the drawings and to the satisfaction of the Engineer-in-Charge. The rate shall be inclusive of all components, accessories, labour, and incidental works required to complete the item in all respects.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and

carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 6

(a) Description and Specification

Manufacturing, providing and placing in position **Sofa Set:**

The sofa to be provided and placed shall be designed with a wooden structure fabricated using high-quality hardwood that has been duly seasoned and treated with an approved anti-termite chemical and methodology. The wooden base frame of the sofa is reinforced with M.S. helical springs and high-quality elastic belts measuring 70-80mm for the seat and 40-60mm for the sides and back. The seat and back are covered with jute and foam, which is then layered with Polyfilla and finished with thick marking cloth before the final upholstery using leatherette material of approved quality and shade.

The component specifications are as follows: the seat is made from PU foam with a density of 28-32 kg/cum and a thickness of 100mm. The back is made from PU foam with a density of 28-32 kg/cum and a thickness of 50mm. The inside sides are made from PU foam with a density of 28-32 kg/cum and a thickness of 11-13mm, while the outside sides and the back are made from PU foam with a density of 28-32 kg/cum and a thickness of 13mm. The sofa arms and back top are constructed with PU hard foam with a density of 25-30mm and a density range of 50-80 kg/cum.

The seat shell rests on an SS base frame section with a height ranging from 50-180mm. All stainless steel work is done with SS 304/202, utilizing a 5-8mm solid

bar for the base of the frame and a 50-25mm pipe. The sofa is infilled with suitable wooden sections to provide proper support to the seat. The height of the sofa base is approximately 110-160mm, and the finished width of the arm, after upholstery work, is approximately 100-140mm.

The sofa is fully upholstered with leatherette material of approved quality and shade, duly embossed, and includes all necessary materials and hardware as directed by the Engineer in charge. The construction and upholstery ensure durability and comfort, meeting the specified standards and aesthetic requirements.

This product is BIFMA Gold-rated and SCS Global certified for in-house air quality, reflecting its adherence to high industry standards. The chair comes with a 5-year warranty, guaranteeing its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 6.1

(a) Description and Specification

2 seater sofa overall dimension - 1700mm W x 810-830mm D x 680-700mm H, Seating Height 440mm,

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 6 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 6.2

(a) Description and Specification

3 seater sofa overall dimension - 2100mm W x 810-830mm D x 680-700mm H, Seating Height 440mm,

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 6 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 7

(a) Description and Specification

Manufacturing, providing and placing in position **Center Table**

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 7.1**(a) Description and Specification**

Providing and placing a center table measuring 1000mm in width, 1000mm in depth, and 400-420mm in height. The table top shall be constructed using 25mm thick Pre-Laminated MDF Board, while the understructure, which includes an integrated shelf, shall be fabricated from 18mm thick Pre-Laminated MDF Board. All exposed edges of the table components shall be finished with 2mm thick PVC edge banding tape, while unexposed edges shall receive 0.6mm thick PVC edge banding tape. The edge banding process shall be executed using specialized machinery at a temperature of 200 degrees Celsius with hot melt glue to ensure secure and durable edge protection.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 7 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 8**(a) Description and Specification**

Manufacturing, providing and placing in position **High Back Chair**

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 8.1**(a) Description and Specification**

The high back chairs to be provided and placed are designed for ergonomic comfort, featuring an overall height of 1280-1290mm and an overall width of 510mm. The backrest, measuring 580mm in height and 510mm in width, is constructed with a comfortable fiberglass and nylon frame upholstered with mesh and includes adjustable lumbar support for enhanced comfort. These high back chairs also feature an adjustable mesh headrest to accommodate various user preferences.

The seat, with dimensions of 508mm width and 508mm depth, is made of medium-density foam and molded plywood, upholstered with high-quality fabric for added comfort. Each chair is equipped with 2D adjustable armrests featuring TPU pads for comfort, with height adjustments ranging from 279.4 to 355.6mm. The back tilt mechanism allows for single-position upright locking, providing a simple and efficient user experience. The chair is supported by a Class IV Samhonsa gas lift, offering height adjustments between 460mm and 560mm.

An additional feature includes a coat hanger integrated into the chair. The base is made of polished aluminum with a 660mm diameter, fitted with five heavy-duty twin-wheel nylon castors, each with a diameter of 60mm.

This product is BIFMA Gold-rated and SCS Global certified for in-house air quality, reflecting its adherence to high industry standards. The chair comes with a 5-year warranty, guaranteeing its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 8 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 9

(a) Description and Specification

Manufacturing, providing and placing in position Mid Back Chair

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 9.1**(a) Description and Specification**

The mid back chairs to be provided and placed are designed for ergonomic comfort, featuring an overall height of 1100mm and an overall width of 510mm. The backrest measures 580mm in height and 510mm in width and is constructed from a fiberglass and nylon frame, upholstered with mesh for breathability and comfort. It also includes an adjustable lumbar support feature to enhance the user's seating experience.

The seat, with dimensions of 508mm width and 508mm depth, is made from medium-density foam and molded plywood, upholstered with durable fabric to ensure comfort and longevity. Each chair is equipped with 2D adjustable armrests featuring TPU pads for added comfort, with height adjustments ranging from 279.4mm to 355.6mm. The back tilt mechanism allows for a single-position upright locking feature, providing a simple yet effective seating adjustment option.

The chair's support system includes a Class IV Samhonsa gas lift, allowing for height adjustments between 460mm and 560mm to accommodate various user preferences. The base is constructed from polished aluminum with a 660mm diameter, providing stability and durability. It is fitted with five heavy-duty twin-wheel nylon castors, each with a diameter of 60mm, ensuring smooth and effortless movement across different floor surfaces.

This product is BIFMA Gold-rated and SCS Global certified for in-house air quality, reflecting its adherence to high industry standards. The chair comes with a 5-year warranty, guaranteeing its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 9 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 10**(a) Description and Specification**

Manufacturing, providing and placing in position machine made factory assembled Reception Table of following dimensions with the following specifications.

Reception Counter of size: 2000W x 750D1/550D2 x 1100/740 H mm

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 10.1**(a) Description and Specification**

This comprehensive office furniture set combines functionality with modern design, emphasizing environmental friendliness and high-quality materials. The

attention to detail in wire management and storage options makes it suitable for professional office environments.

The desk should feature a top and legs constructed from 36mm thick E1 grade laminate, finished with 2mm thick PVC edge banding and a melamine finish. The grains of the table top must be unidirectional for a consistent appearance. The front hanging panel should be made of 18mm thick decorative E1 grade board.

The desk must adhere to specifications provided and images approved by the project architect, consultant, and engineer in charge. The drawer unit should include a 3-drawer melamine pedestal (Box + Box + File) with overall internal and external dimensions of 420 mm (W) x 450 mm (D) x 600 mm (H). The drawer body must be made of E1 grade laminate. The exposed edge of the worktop should be secured with 2mm thick PVC edge banding tape in an approved color.

E-1 Grade laminate used to ensure no urea formaldehyde emission, with phenol base formaldehyde emission not exceeding 8mg/100g oven-dry board (perforated method), complying with EN 120-1892 standards.

The product is BIFMA Gold-rated and SCS Global certified for in-house air quality, ensuring compliance with industry standards. It comes with a 5-year warranty, reflecting its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 10 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 11

(a) Description and Specification

Manufacturing, providing and placing in position machine made factory assembled Reception Table of following dimensions with the following specifications.

Reception Counter of size: 1500W x 750D1/550D2 x 1100/740Hmm

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 11.1**(a) Description and Specification**

This comprehensive office furniture set combines functionality with modern design, emphasizing environmental friendliness and high-quality materials. The attention to detail in wire management and storage options makes it suitable for professional office environments.

The desk should feature a top and legs constructed from 36mm thick E1 grade laminate, finished with 2mm thick PVC edge banding and a melamine finish. The grains of the table top must be unidirectional for a consistent appearance. The front hanging panel should be made of 18mm thick decorative E1 grade board.

The desk must adhere to specifications provided and images approved by the project architect, consultant, and engineer in charge. The drawer unit should include a 3-drawer melamine pedestal (Box + Box + File) with overall internal and external dimensions of 420 mm (W) x 450 mm (D) x 600 mm (H). The drawer body must be made of E1 grade laminate. The exposed edge of the worktop should be secured with 2mm thick PVC edge banding tape in an approved color.

E-1 Grade laminate used to ensure no urea formaldehyde emission, with phenol base formaldehyde emission not exceeding 8mg/100g oven-dry board (perforated method), complying with EN 120-1892 standards.

The product is BIFMA Gold-rated and SCS Global certified for in-house air quality, ensuring compliance with industry standards. It comes with a 5-year warranty, reflecting its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 11 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 12

(a) Description and Specification

Manufacturing, providing and placing in position machine made factory assembled Linear Table of following dimensions with the following specifications.

Table :- 1200mm X 600mm X 740mm H

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk

manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 12.1

(a) Description and Specification

Providing & Placing of Table with Melamine Mobile Pedestal with following details and specifications :

Table Top and legs are made of 25mm E-1 grade particle board finished with 2mm PVC edge banding. E1 grade laminate with zero urea formaldehyde emissions ($\leq 8\text{mg}/100\text{ g}$ oven dry board-perforated method) for better in-house air quality. This should comply with (EN 120-1992). The exposed edge of worktop shall be secured with 2mm thick PVC edge banding. The 18mm Thick Modesty panel is made of E-1 grade particle board finished with 2mm PVC edge banding. E1 grade laminate with zero urea formaldehyde emissions ($\leq 8\text{mg}/100\text{ g}$ oven dry board-perforated method) for better in-house air quality. This should comply with (EN 120-1992). The exposed edge of worktop shall be secured with 2mm thick PVC edge banding. Wire management: Completely concealed wiremanagement with Aluminium anodized flipper with soft closure, wiring tray & Housing made from MS sheet 1.2 mm., flange structure epoxy powder 70-80 micron coated spray color, baked at temperature 200c with vertical wire uptake from floor via Flexibale cable riser/ Metal Powder pole Drawer Unit : 3 drawer melamine finish pedestal of overall dimensions internal and external dimensions 390-420 mm (W) x 430-460 mm (D) x 600-620 mm (H). Drawer should be made of 18mm thick E1 Grade particle board with matching edge banding. Each pedestal should have 5 Nos castor fitted. One castor to be fitted to lower most drawer to provide extra stability. E1 Grade laminate to be used which provide no urea formaldehyde emission and formaldehyde should be phenol base with emission of not more than ($\leq 8\text{mg}/100\text{ g}$ oven dry board-perforated method) for better in-house quality. This should comply with (EN 120-1892).Product should be BIFMA gold rated SCSglobal certified for inhouse air quality and with 05 years warranty.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 12 above, and shall be read together with sub-

clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 13

(a) Description and Specification

Manufacturing, providing and placing in position machine made factory assembled Linear Table of following dimensions with the following specifications.

Table :- 1500mm X 600mm X 740mm H

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 13.1**(a) Description and Specification****Providing & Placing of Table with Melamine Mobile Pedestal with following details and specifications :**

Table Top and legs are made of 25mm E-1 grade particle board finished with 2mm PVC edge banding. E1 grade laminate with zero urea formaldehyde emissions ($\leq 8\text{mg}/100\text{ g oven dry board-perforated method}$) for better in-house air quality. This should comply with (EN 120-1992). The exposed edge of worktop shall be secured with 2mm thick PVC edge banding. The 18mm Thick Modesty panel is made of E-1 grade particle board finished with 2mm PVC edge banding. E1 grade laminate with zero urea formaldehyde emissions ($\leq 8\text{mg}/100\text{ g oven dry board-perforated method}$) for better in-house air quality. This should comply with (EN 120-1992). The exposed edge of worktop shall be secured with 2mm thick PVC edge banding. Wire management: Completely concealed wiremanagement with Aluminium anodized flipper with soft closure, wiring tray & Housing made from MS sheet 1.2 mm., flange structure epoxy powder 70-80 micron coated spray color, baked at temperature 200c with vertical wire uptake from floor via Flexibale cable riser/ Metal Powder pole Drawer Unit : 3 drawer melamine finish pedestal of overall dimensions internal and external dimensions 390-420 mm (W) x 430-460 mm (D) x 600-620 mm (H). Drawer should be made of 18mm thick E1 Grade particle board with matching edge banding. Each pedestal should have 5 Nos castor fitted. One castor to be fitted to lower most drawer to provide extra stability. E1 Grade laminate to be used which provide no urea formaldehyde emission and formaldehyde should be phenol base with emission of not more than ($\leq 8\text{mg}/100\text{ g oven dry board-perforated method}$) for better in-house quality. This should comply with (EN 120-1892).Product should be BIFMA gold rated SCSglobal certified for inhouse air quality and with 05 years warranty.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 13 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 14**(a) Description and Specification**

Manufacturing, providing and placing in position Waiting Sofa

3 seater sofa overall dimension - 1860mm W x 800-820mm D x 690-710mm H/
SH430mm

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 14.1**(a) Description and Specification**

The sofa to be provided and placed is designed with a wooden structure fabricated using high-quality hardwood that has been duly seasoned and treated with an approved anti-termite chemical and methodology. The wooden base frame of the sofa is reinforced with M.S. helical springs and high-quality elastic belts measuring 70-80mm for the seat and 40-60mm for the sides and back. The seat and back are covered with jute and foam, which is then layered with Polyfilla and finished with thick marking cloth before the final upholstery using leatherette material of approved quality and shade.

The component specifications are as follows: the seat is made from PU foam with a density of 28-32 kg/cum and a thickness of 100mm. The back is made from PU foam with a density of 28-32 kg/cum and a thickness of 50mm. The inside sides are made from PU foam with a density of 28-32 kg/cum and a thickness of 11-13mm, while the outside sides and the back are made from PU foam with a density of 28-32 kg/cum and a thickness of 13mm. The sofa arms and back top are constructed with PU hard foam with a density of 25-30mm and a density range of 50-80 kg/cum.

The seat shell rests on an SS base frame section with a height ranging from 50-180mm. All stainless steel work is done with SS 304/202, utilizing a 5-8mm solid bar for the base of the frame and a 50-25mm pipe. The sofa is infilled with suitable wooden sections to provide proper support to the seat. The height of the sofa base is approximately 110-160mm, and the finished width of the arm, after upholstery work, is approximately 100-140mm.

The sofa is fully upholstered with leatherette material of approved quality and shade, duly embossed, and includes all necessary materials and hardware as directed by the Engineer in charge. The construction and upholstery ensure durability and comfort, meeting the specified standards and aesthetic requirements.

This product is BIFMA Gold-rated and SCS Global certified for in-house air quality, reflecting its adherence to high industry standards. The chair comes with a 5-year warranty, guaranteeing its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 14 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 15

(a) Description and Specification

Manufacturing, providing and placing in position Center & Corner Table of following specifications.

Centre table Size - 1200mm W x 600mm D x 365mm H

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 15.1**(a) Description and Specification**

The center and corner tables will be constructed using 25 mm thick E-1 grade prelaminated particle board, which is environmentally friendly and finished with a durable melamine surface. To enhance durability and aesthetics, the edges will be covered with 2 mm thick PVC edge banding. The understructure of the tables will feature a polished stainless steel chrome base, providing both stability and an elegant appearance.

The E-1 grade laminate will ensure zero urea formaldehyde emissions (≤ 8 mg/100 g oven-dry board via the perforated method), promoting a healthier indoor environment and complying with EN 120-1992 standards. This combination of materials and finishes guarantees that the tables are not only functional but also contribute positively to in-house air quality.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 15 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 16**(a) Description and Specification**

Manufacturing, providing and placing in position machine made factory assembled Waiting Chair of following dimensions with the following specifications.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 16.1**(a) Description and Specification**

The seat and back of the waiting chairs (3 Seater) are constructed from 3 mm MS perforated sheet inserts for durability and comfort. The seat dimensions are 52.0

cm in width and 46.5 cm in depth, while the back measures 52.0 cm in width and 51.5 cm in height.

The crossbeam is made from black powder-coated MS ERW square tubing, with dimensions of 6.0 cm x 6.0 cm and a thickness of $0.018 \text{ cm} \pm 0.016 \text{ cm}$. The tubing is fitted with polypropylene end caps for a neat finish.

The legs and armrests are manufactured from high-pressure aluminum die-cast and are powder-coated for additional durability and aesthetics. The legs are equipped with soft grip PVC level-adjusting shoes, ensuring stability on uneven surfaces.

This product is BIFMA Gold-rated and SCS Global certified for in-house air quality, reflecting its adherence to high industry standards. The chair comes with a 5-year warranty, guaranteeing its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 16 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 17

(a) Description and Specification

Manufacturing, providing and placing in position machine made factory assembled Examination Couch of make M/s Rockworth/ Godrej/ Durian or as per approved make list (as per finally approved sample by department) of following dimensions with the following specifications.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 17.1**(a) Description and Specification**

Overall Sizes Diagonal Leg Dia 538 mm H470 min-655maxSS 202 made sheet with spin section of thickness 1mm & should be non corrosive. It should have a diameter of 305mm, seat base is made of MS ring and rectangular tube. EN8 Screw having dia of 22 mm should be used for height adjustment of the seat base. The hub should be made of MS ERW tube having dia of 38mm and thickness 2 mm. The Hub should be welded with the legs and it should accommodate and cover the lead screw mechanism. The under structure should consist of 4 legs made up of MS ERW tube of diameter 25.4 mm and 1.6mm thick. The press formed pipe leg should give a round & clean look. All the legs should be provided with 4 nos of Nylon-6 bush. All metal components should be pre treated with zinc phosphating in 9 tank process and then powder coated with anti microbial epoxy polyester powder coating to fulfil the requirements for bacterial protection against at least 2 commonly found bacteria in Hospital environment [Gram positive and Gram Negative]. Safe working load must be 135kg

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 17 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 18**(a) Description and Specification**

Manufacturing, providing and placing in position machine made factory assembled Examination Couch bed of following dimensions with the following specifications.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 18.1**(a) Description and Specification**

Size and Construction: Examination couch is a fixed upholstered top piece, divided into two sections. Its framework is constructed using rectangular and square MS CRC (Cold Rolled Close Annealed) tubes, which are mounted on PVC stumps or shoes for stability. The design features a knockdown construction for easy assembly and disassembly. For user comfort and versatility, the backrest is adjustable via a hand lever mechanism. The entire piece has been pre-treated and finished with an epoxy powder coating for durability and aesthetics. The overall approximate dimensions of the item are 1800mm in length, 600mm in width, and 800mm in height.

Certification and Warranty: The locker unit will be BIFMA Gold rated and SCS Global certified for indoor air quality, ensuring compliance with high standards for safety and environmental responsibility. It will come with a 5-year warranty to guarantee its quality and longevity.

These specifications ensure that the locker unit is highly durable, secure, and functional, suitable for a range of professional and personal storage needs.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 18 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 19

(a) Description and Specification

Manufacturing, providing and placing in position machine made factory assembled Single Bed of following dimensions with the following specifications.

Single bed : 2020L x 960Wx750/600Hmm

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 19.1**(a) Description and Specification**

Providing and placing of Beds of the following specifications. Material : Head/Tail board/Side Rail is made of 18 mm thick E-1 grade particle board finished with 2mm PVC edge banding. E1 grade laminate with zero urea formaldehyde emissions ($\leq 8\text{mg}/100\text{ g}$ oven dry board-perforated method) for better in-house air quality. This should comply with (EN 120-1992). The exposed edge of worktop shall be secured with 2mm thick PVC edge banding.

Mattress panel is made out of 12mm MDF Board. Metal Understructure : 'C' type frame & Cross members are made up of 25X25X1.2mm THK MS Square pipe with Epoxy powder coated spray paint, baked at temperature 200 C° coated of 70-80 micron thickness. Foot pad : Made up of injection moulded in Nylon, Diameter 15mm and 7mm thk on the Head and Tail Board and 25 X 25 X 3mm thk Injection moulded nylon bush on Square pipe.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 19 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 20**(a) Description and Specification**

Manufacturing, providing and placing in position machine made factory assembled Lockers of following dimensions with the following specifications.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification

above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 20.1

(a) Description and Specification

The supply and installation of a 4-door locker unit equipped with cam locks, designed to meet the following detailed specifications. The locker unit will have overall dimensions of 380 mm in width, 450 mm in depth, and a height ranging from 1800 mm to 1850 mm, making it ideal for use in office or workspace environments, and providing ample storage space for personal belongings.

Constructed from 100% virgin epoxy powder-coated Cold Reduced Carbon Steel Sheets (CRCA), the locker unit will conform to IS: 513 CR2 (Cold Reduced Carbon Steel Sheets & Strips, Part 1, 2016). The steel sheets will be procured from TATA Steel, and test certificates will be available upon request. The materials will undergo a rigorous seven-stage nano-technology-based pre-treatment process before powder coating, ensuring high corrosion resistance and durability.

The locker will feature a superior finish achieved through a fully automatic powder coating plant utilizing world-leading GEMA™ spray booth technology and AkzoNobel™ powder, resulting in a smooth, uniform, and high-quality coating. The unit will employ modern rigid knock-down construction made from 0.8 mm thick CRCA sheet, providing extra strength and durability, with each compartment shelf supporting a uniformly distributed load capacity of up to 35 kg. Designed for ease of transportation, the locker unit will be a 100% knock-down product, facilitating safe and efficient shipping. Assembly will be

completed on-site, simplifying logistics and installation processes. The locker features a simple yet effective design, offering ample capacity for storing clothes, shoes, sports gear, mobile phones, bags, office supplies, and cleaning materials. Each door will be equipped with a lift-up handle and recessed hasp, paired with cam locks for secure storage. Label holders will be included for easy identification, especially useful when multiple lockers are stacked together.

To maintain a fresh environment and prevent bad odors, each shutter will feature louvers that allow free airflow. The locker unit will be BIFMA Gold rated and SCS Global certified for indoor air quality, ensuring compliance with high standards of safety and environmental responsibility. Additionally, it will come with a five-year warranty to guarantee quality and longevity. These specifications ensure that the locker unit is highly durable, secure, and functional, making it suitable for a range of professional and personal storage needs.

(The above constitutes the detailed technical specification of the component/sub-item forming part of Item No. 20 above, and shall be read together with sub-clauses (b) to (e) provided against the parent item, and with the General Technical Conditions in Section 2.)

ITEM NO. 21

(a) Description and Specification

Providing and placing in position stainless steel frame chairs for use in Ladies and Gents Maintenance Staff areas. The chair shall be of sturdy design, with stainless steel tubular frame construction, and fitted with cushioned seat and backrest made of high-density foam upholstered in premium-grade synthetic leather (Candy Black finish). The chair shall have fixed armrests with padded tops and be suitable for prolonged usage in staff rooms or maintenance lounges. The back shall be of “wing-back” design for ergonomic support, and the seat and backrest shall be upholstered in stitched square patterns to enhance comfort and aesthetics. The chair should be non-revolving, maintenance-free, with plastic foot caps to avoid floor scratches. Product dimensions approximately 83.8 cm (H) × 55.9 cm (W) × 83.8 cm (D). All items to be delivered, assembled and placed at the designated locations as per site requirements and to the satisfaction of Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 22**(a) Description and Specification**

Providing and fixing Triple Wave Playground Slide fabricated from high-strength and UV-resistant Fibre Reinforced Plastic (FRP), suitable for outdoor use in schools, parks, and recreational areas. The slide shall be of triple wave design for increased capacity and enhanced safety, having approximate dimensions of 371 cm (Length) × 63 cm (Width) × 244 cm (Height). The unit shall be mounted on a powder-coated MS steel support frame of adequate structural strength to withstand outdoor weather and play loads, complete with anti-slip climbing stairs, handrails, and a smooth contoured sliding surface to ensure child safety. The entire unit shall be installed on a prepared site with proper anchoring and alignment as per manufacturer's installation guidelines, including necessary fixtures and support components.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause

2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 23

(a) Description and Specification

Providing, supplying, and fixing of high-quality roller slide for children's play area, fabricated from powder-coated MS frame with smooth-finish multi-coloured roller-type sliding surface made from heavy-duty plastic or MS pipes. The structure shall include a sturdy staircase with handrails for access, support columns with proper bracing, and a reinforced base suitable for safe outdoor installation on natural ground or sandpit. The slide shall be designed for safety and durability, with rounded edges, child-safe finishes, and weather-resistant coating. Installation shall include all necessary civil works, anchoring, alignment, and fixing in position complete in all respects as per the manufacturer's specification and direction of Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause

2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 24

(a) Description and Specification

Providing and fixing of Round Metal Sunset Climber Junior, suitable for children aged 5 to 10 years, fabricated from heavy-duty mild steel tubular sections. The frame shall be constructed in a geodesic dome shape with all joints securely welded and surfaces ground smooth to ensure child safety. The structure shall be duly treated with anti-corrosive red oxide primer and finished with two coats of weather-resistant synthetic enamel paint in multiple child-friendly colours. The equipment shall be installed over a compacted base with appropriate anchoring into the ground using concrete footings as per manufacturer's specifications to ensure stability and safety. Complete in all respects, including fabrication, finishing, transport, and installation at site.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for

use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 25

(a) Description and Specification

Providing and fixing of double-seated see saw unit for playground installation, comprising two sets of green and yellow see saws mounted on a common mild steel frame. Each unit accommodates four children (two on each side), suitable for age group 5–12 years. The structure is fabricated using heavy-duty mild steel pipes and flats with smooth edges for safety, powder coated with weather-resistant green and yellow synthetic enamel paint. The seats are ergonomically designed using moulded plastic or FRP for comfort and durability, with safety handles and footrests provided on each side. The see saw is firmly anchored into the ground using base plates and grouted foundation bolts to ensure stability during use. The entire unit shall be installed at site complete in all respects including all accessories, labour, transportation, and necessary anchoring arrangements.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 26**(a) Description and Specification**

Providing and fixing of Loop Rung for children's outdoor play area, fabricated using high-grade mild steel structure with powder-coated finish for long-term durability and resistance to weather conditions. The equipment shall comprise of a horizontal bar supported by vertical posts with a series of looped hand grips hanging from the bar to aid children in swinging from one loop to the next. The structure shall include ladder steps on one side for safe access and cater to the age group of approximately 4 to 14 years. The overall installation should have a clear and safe ground area of approx. 3.6 m × 0.6 m and a height of approximately 2.5 m. All edges shall be rounded for safety and the unit shall be securely anchored in a concrete base as per manufacturer's guidelines. Installation shall be complete in all respects including civil works, grouting, and finishing, to the satisfaction of the Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 27**(a) Description and Specification**

Providing and fixing of Outdoor Multiplay System made of high-quality FRP (Fibre Reinforced Plastic) and suitable for installation in public parks, schools, or residential complexes. The system shall include two slides (curved and straight), an elevated playhouse with canopy, climbing features, and safe access steps, all fixed over a firm base as per manufacturer's design. The equipment is designed for children aged 3 to 15 years, supporting 8 to 12 users at a time, and is suitable for a maximum capacity of 10–15 children simultaneously.

The entire system shall be installed on a clear area of approximately 20 ft × 20 ft × 12 ft (L × W × H) and shall be supplied complete in all respects, including all accessories, fixtures, base preparation, anchoring, and painting works, as

required. Installation must ensure safety and durability, conforming to standard playground equipment norms. The unit shall be delivered and installed as per the site condition and to the satisfaction of the Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 28

(a) Description and Specification

Providing and fixing of outdoor parallel bars suitable for use in playgrounds, fabricated using high-strength mild steel with a durable anti-rust coating and powder-painted in vibrant color finish. The setup includes two parallel steel rods supported on vertical posts, dimensionally measuring approximately 6.56 ft x 2.28 ft. The structure shall be robust, weather-resistant, and ergonomically designed for children's physical activities and bodyweight training. The equipment shall be installed on a properly levelled and compacted surface as per

manufacturer's specifications, complete in all respects including all labour, materials, tools, and installation accessories as required to the satisfaction of Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 29

(a) Description and Specification

Providing and installing a factory-finished, heavy-duty Round Merry-Go-Round, suitable for outdoor playground applications for children aged 4 to 15 years. The equipment shall consist of a circular platform made of durable FRP (Fibre Reinforced Plastic) with an anti-skid surface finish for enhanced safety. The platform shall be supported on a robust central rotating mechanism allowing smooth 360-degree rotation, and fitted with six or more powder-coated mild steel

tubular handrails for safe grip and balanced standing during operation. The total diameter of the structure shall not be less than 1500 mm, and the system shall have a total seating/standing capacity of four children at a time. The unit shall be weather-resistant, UV-stable, rust-proof, and finished in red colour (or as approved), capable of withstanding outdoor environmental conditions without degradation in performance. The system shall include all anchoring, bolting, and safety components to ensure stable ground installation and child safety during rotational use. All work shall be executed as per manufacturer's specifications, including necessary labour, tools, and fittings, and completed in all respects to the satisfaction of the Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 30**(a) Description and Specification**

Providing and fixing of Rainbow Playground Climber of approved make, design, and color suitable for outdoor playground application. The equipment shall be fabricated from high-quality mild steel with smooth and child-safe manual climbing features. The structure shall be powder-coated or painted with weather-resistant, non-toxic coating in bright color finish (typically red) to enhance visibility and durability in outdoor conditions.

The equipment is specifically designed for children aged 4–12 years, promoting physical activity, motor coordination, and upper body strength through manual climbing. The climber shall be arch-shaped, securely embedded into the ground with proper RCC concrete footings as per manufacturer's instructions, ensuring safety and structural stability.

The unit shall be installed complete in all respects, including all necessary fasteners, anchor bolts, labor, tools, foundation works, transportation, loading, unloading, and handling at site. Delivery and installation shall be completed within 10 days from the date of order. Item quoted is exclusive of all taxes, duties, or contractor overheads.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section

2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 31

(a) Description and Specification

Supplying and placing in position cast iron framed 3-seater outdoor garden bench of approved design and make, having decorative armrest and legs made from high-strength cast iron duly powder coated in black finish for corrosion resistance. The seat and backrest to be fabricated from Fibre Reinforced Plastic (FRP) slats with a natural wooden texture finish, ensuring high durability, termite resistance, and suitability for long-term outdoor exposure. Bench size shall accommodate 3 adults comfortably with standard height and ergonomic back support. The item includes all required nuts, bolts, anchoring accessories and anti-rust coatings. The bench shall be placed at designated locations as per instructions of Engineer-in-Charge and fixed properly on hard concrete/paved flooring using appropriate anchoring system. Rate includes cost of bench, transportation, loading, unloading, and placing complete in all respects.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 32**(a) Description and Specification**

Supplying and placing a high-quality table tennis setup consisting of one professional-grade table tennis table of approximate dimensions 2740 mm x 1525 mm with a 25 mm thick blue playing surface. The table shall be of STAG GLOBAL Deluxe 1000 DX model or equivalent as approved, featuring a durable and stable metal underframe with powder-coated finish and lockable caster wheels for easy mobility and safety during play. The equipment shall be delivered complete with 2 table tennis rackets, 6 balls, 1 clamp-type net with support posts, and 1 protective table cover. The table shall be foldable for compact storage and allow single-player playback configuration. The scope includes transportation, placement at designated indoor location, and necessary unpacking and basic alignment at site.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 33**(a) Description and Specification**

Supplying, Installation, Testing and Commissioning (SITC) of Aquaguard Blaze Insta RO + UV + TA Hot and Ambient Water Purifier with Active Copper Technology, 5.6 Litres (Black):

Providing and fixing of wall-mounted/standing Aquaguard Blaze Insta water purifier of 5.6 litres capacity, with dual dispensing system for hot and ambient water. The unit shall include advanced multi-stage purification comprising Reverse Osmosis (RO), Ultra Violet (UV), and Taste Adjuster (TA) purification stages. The purifier shall have a filtration capacity of minimum 15 litres/hour and storage capacity of 5.6 litres for ambient and 0.6 litres for hot water. The system shall be integrated with Active Copper Zinc Booster Cartridge, Copper Guard and UV e-Boiling technology, capable of ensuring healthy, mineral-enriched drinking water output. The appliance shall be provided with digital touch display, child-lock feature on hot water dispensing, and suitable power connections. The quoted item shall be inclusive of all accessories, necessary plumbing, wiring, clamps, fittings, and installation charges, complete in all respects as per manufacturer's specifications and to the satisfaction of Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 34**(a) Description and Specification**

Supplying, installing, testing and commissioning of 5-litre capacity electric instant water heater of reputed make such as Racold PRONTO NEO or equivalent, suitable for vertical wall-mounted installation in bathrooms or pantries. The geyser shall be constructed with a high-grade rust-proof ABS outer body and incorporate a fire-retardant cable, high-pressure resistance design suitable for high-rise buildings, and 3 levels of safety including thermostat, cut-out, and safety valve. The unit shall include anti-bacterial backflow protection system, and faster heating element for instant hot water delivery. The heater shall be BEE compliant and capable of operating on 230V, 50Hz AC supply, complete with all accessories, connecting pipes, fixing brackets, suitable electrical connections, and internal wiring termination as required. The item shall be installed at the specified location and made fully operational to the satisfaction of the Engineer-in-Charge. The heater shall carry a minimum 5-year warranty on tank and 2-year warranty on the heating element, as per manufacturer's standard.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause

2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry the manufacturer's/supplier's warranty as specified in the description above, which shall in no case be less than the minimum warranty period prescribed under Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 35

(a) Description and Specification

Providing and placing of Heavy Duty 3-Tier Foldable Cloth Drying Stand, brand – DryNest by HAVAI, suitable for both indoor and outdoor use. The unit shall be made from premium-grade anti-rust stainless steel, ensuring long-lasting durability and high resistance to corrosion. The drying rack shall feature 24 robust hanger rods designed to hold large loads of wet clothes without bending, including heavy garments, bedsheets, towels, and curtains.

The design shall incorporate 3 jumbo-sized drying racks with ample spacing, foldable side wings for flexible drying of longer clothes, and smooth 360° caster wheels for easy mobility even when the unit is fully loaded. The stand shall be fully portable, collapsible, and space-saving, enabling easy storage when not in use. Minimum dimensions when unfolded shall accommodate a large family's laundry with a stable and balanced structure, suitable for balconies, laundry rooms, or open terraces.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 36**(a) Description and Specification**

Supplying, assembling, and placing in position a slotted angle storage rack made of prime quality CRC (Cold Rolled Close Annealed) sheet construction, comprising six (6) storage shelves and four vertical angle uprights. Each shelf shall be capable of supporting up to 100 kg of uniformly distributed load. The complete rack shall be finished with high-grade grey-colored oil paint for corrosion resistance and durability. The unit shall be modular and multipurpose, suitable for use in industrial stores, warehouses, kitchens, book storage, bath items, and general-purpose shelving in residential or commercial environments. The standard unit shall measure approximately 78 inches (H) × 47 inches (W) × 24 inches (D), and constructed with 18 gauge CRC sheet shelves and 14 gauge slotted angle uprights. The unit shall be delivered in two separate packets – one

containing all angles/uprights and the other containing the shelves – and shall be supplied complete with nuts, bolts, and necessary fittings for onsite installation. The entire assembly shall be quick to install, sturdy, and designed for robust and long-term indoor use.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 37

(a) Description and Specification

Supplying and placing in position foldable 5-step premium household-grade ladder, fabricated from high-strength steel pipes with 7-layer processed powder-coated finish (Blue & Black), anti-rust and corrosion resistant, suitable for indoor and outdoor maintenance access. The ladder shall consist of 5 anti-skid PPCP steps with a secure top platform, step size approx. 30 cm x 20 cm, spaced at 23

cm, and shall withstand load capacity up to 150 kg. The ladder shall have extra thick D-section steel pipe frame of minimum 0.6 mm thickness and outer diameter 38.1 mm, equipped with anti-slip caps for stability and scratch-proofing on floors. Foldable and space-saving design with approximate closed dimensions: 6 cm (L) x 53 cm (W) x 182 cm (H) and open dimensions: 106 cm (L) x 53 cm (W) x 170 cm (H). Top platform height from ground: 117 cm. Product shall be backed by minimum 5-year manufacturer warranty and delivered fully assembled.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry the manufacturer's/supplier's warranty as specified in the description above, which shall in no case be less than the minimum warranty period prescribed under Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

ITEM NO. 38**(a) Description and Specification**

Supply, installation, testing, and commissioning of commercial-grade RO + UV Water Purification System of model PRIMA 100 B of Eureka Forbes or approved equivalent, with 7-stage purification process comprising particulate filter, pre-carbon filter, antiscalant filter, sediment filter, RO membrane (with >90% TDS rejection), post-carbon filter, and UV disinfection system. The system shall be suitable for input TDS up to 2000 ppm, delivering a purification capacity of 100 LPH with a purified water recovery rate of 50%, and effective bacterial and viral removal through high-efficiency 8W UV lamp. The purification system shall operate on 24V / 48V DC power supply, with an input voltage of 170–230V AC / 50 Hz, and a maximum power rating of 230 W $\pm$ 10%.

The frame shall be constructed from durable CRCA steel, and the unit shall be compact with dimensions of 630 mm (W) $\times$ 340 mm (D) $\times$ 650 mm (H) and net weight of 33 kg. The RO system shall incorporate a self-cleaning mechanism, high-efficiency thin-film composite membrane (0.0001 micron) for better water taste and microbiological safety, and shall be suitable for commercial applications such as hospitals, offices, educational institutes, manufacturing plants, and hospitality segments. The system shall include complete accessories, plumbing, inlet and outlet connections, and shall be installed to the satisfaction of the Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number/unit" (each) basis for the complete unit, manufactured/procured, delivered, assembled, installed, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above, unless a specific unit of measurement is indicated in the Schedule of Quantities.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all materials, hardware, fittings and accessories referred to in the specification above; fabrication/manufacture; transportation to site; loading, unloading and carriage to the location of installation including to upper floors; assembly, fixing, and alignment; all consumables and incidental sundries; testing and commissioning where applicable; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Samples/prototypes, material swatches, finish shade cards, and manufacturer's technical literature and test certificates for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to bulk

manufacture/procurement, in accordance with Clauses 2.2, 2.3 and 2.9 of Section 2 above. No item shall be fabricated, procured, or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects, structural failure, and premature deterioration of finish, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

SECTION 4

CONCLUDING PROVISIONS

4.1 These specifications are supplementary to, and shall be read in conjunction with, the CPWD General Specifications, the Preliminary Specifications, Special Conditions of Contract, and Drawings issued for this work. In the event of any ambiguity, the decision of the Engineer-in-Charge, in consultation with the Architect/Consultant, shall be final and binding on the Contractor.

4.2 The list of items and specifications above is subject to such additions, deletions, or modifications as may be directed by the Engineer-in-Charge/Client (Reserve Bank of India) during execution, and shall be dealt with under the relevant provisions of the General Conditions of Contract relating to extra items and deviations.

**TECHNICAL SPECIFICATIONS
FOR
SUPPLY, ASSEMBLY, INSTALLATION, TESTING AND COMMISSIONING OF HEALTH CLUB &
GYMNASIUM EQUIPMENT**

SECTION 1

SCOPE OF WORK

1.1 These specifications form part of the Tender Documents and shall be read in conjunction with the Schedule of Quantities/BOQ, Drawings, and other Contract Documents.

1.2 The scope of work covered under this Section comprises supplying, assembling, placing in position, installing, testing, and commissioning of all cardio, strength-training, free-weight, and ancillary fitness equipment described in the Schedule of Items forming Section 3 of this document, complete in all respects, in the Health Club/Gymnasium block of the RBI Officers Housing Colony redevelopment project at Kankarbagh, Patna, at the locations directed by the Engineer-in-Charge.

1.3 The rates quoted by the Contractor/Supplier against each item shall be deemed to be for the complete item described, inclusive of all equipment, accessories, hardware, consumables, labour, tools and plant, transportation, loading, unloading, carriage to site, vertical and horizontal conveyance within the building/site, unpacking, assembly, installation, electrical connection (where applicable), testing, demonstration, and commissioning, unless expressly stated otherwise.

1.4 Nothing extra shall be payable on account of minor site variations, packaging wastage, or the Contractor's own working methods, unless such variation is beyond the tolerance expressly permitted below and is certified by the Engineer-in-Charge.

SECTION 2

GENERAL TECHNICAL CONDITIONS APPLICABLE TO ALL HEALTH CLUB & GYM EQUIPMENT ITEMS

2.1 Codes, Standards and Statutory Compliance

All gymnasium equipment, materials, and workmanship shall conform to the relevant and latest editions of applicable standards, including IS:2553 (Safety/toughened glass, where mirrors or glazed components are used), IS:513/IS:1161 (steel sheet/tube for equipment frames), relevant Bureau of Energy Efficiency (BEE) norms for motorized/electrical equipment (treadmills and similar), Central Electricity Authority (CEA) safety regulations for electrical connections, and internationally recognized fitness-equipment standards such as EN 957 (Stationary Training Equipment) or ASTM F2276 (Treadmills), as applicable to the specific item. Where a specific make/model/brand is indicated (e.g., COSCO, ATE, Rhino), the same or an equivalent of equal or superior specification, duly approved in writing by the Engineer-in-Charge, may be permitted.

2.2 Samples, Technical Literature and Approval

Before procurement, the Contractor shall submit product catalogues/technical datasheets, load/weight-capacity certificates, electrical load details (for motorized equipment), and colour/finish samples of each item for written approval of the Engineer-in-Charge. No equipment shall be procured, assembled, or installed without such prior written approval. Where the Engineer-in-Charge so directs, one sample unit shall be presented for physical inspection and trial use prior to placing of the bulk order.

2.3 Materials, Frame Construction and Finish

All equipment frames shall be fabricated from high-grade structural/tubular steel, free from manufacturing defects, weld spatter, or sharp edges, and shall receive a corrosion-resistant powder-coated or electroplated/chrome finish as specified against the item, of uniform colour and texture, suitable for continuous indoor gymnasium use. All upholstery/padding (benches, seats) shall be of high-density foam with tear- and sweat-resistant synthetic leather/vinyl upholstery, free of visible seams that could cause discomfort or injury. All moving parts (pulleys, cables, hinges, resistance mechanisms) shall operate smoothly, quietly, and without jerk through their full range of motion.

2.4 Electrical Equipment and Safety

Motorized equipment (treadmills and similar) shall be supplied complete with the manufacturer's standard power cord, safety key/emergency stop switch, and shall operate on standard 230V/single-phase AC supply unless otherwise specified, with equipment earthing/grounding provided as part of the installation. The Contractor shall coordinate final electrical connection with the electrical sub-contractor/services agency and shall demonstrate safe start-stop, incline, and speed-control operation to the Engineer-in-Charge prior to handing over. No equipment with exposed live wiring, damaged insulation, or non-functional safety cut-off shall be accepted.

2.5 Hardware, Fasteners and Accessories

All nuts, bolts, pins, safety catches, J-cups, collars, and other hardware shall be of the manufacturer's standard/approved make, corrosion-resistant, and matched to the load rating of the equipment. Free weights (plates, barbells, dumbbells) shall be dimensionally standardized to Olympic specifications where so described, ensuring interchangeability and compatibility across the gymnasium's equipment inventory.

2.6 Dimensional and Load-Capacity Tolerance

Dimensions, weights, and load capacities stated in the item descriptions are as per the manufacturer's standard specification and shall not vary beyond the manufacturer's published tolerance. Any equipment offered as an "approved equivalent" shall match or exceed the load capacity, weight range, and principal dimensions of the specified make/model, and shall be got approved in writing before supply, in accordance with Clause 2.2 above.

2.7 Mode of Measurement and Payment

Unless otherwise stated against an individual item, equipment shall be measured and paid on a "per number/each/set" basis, as indicated in the Unit column of the Schedule of Quantities, for the complete, installed, tested, and commissioned unit/set ready for use, inclusive of all incidental items of work described in the item and in this Section.

2.8 Rate to be Inclusive Of

The quoted/accepted rate for each item shall be firm and inclusive of the cost of the equipment and all its standard accessories; all applicable taxes, duties, levies including GST; freight and transportation to site; loading, unloading and carriage within the site including to the designated floor/room; unpacking, assembly, installation and levelling; electrical connection/testing where applicable; demonstration of correct and safe operation to users/staff; and removal of all packing material and debris from the site after installation. No claim for extra payment on any of the above accounts shall be entertained.

2.9 Quality Assurance, Testing and Inspection

The Engineer-in-Charge or his authorized representative shall be entitled to call for and inspect manufacturer's test certificates, load-testing reports, and BEE/EN/ASTM compliance certificates, as applicable, prior to acceptance of any item. Equipment found not conforming to the approved sample/specification, or found damaged, defective, or short of the specified capacity, shall be rejected and shall be removed from site and replaced by the Contractor at his own cost within the time stipulated by the Engineer-in-Charge.

2.10 Guarantee/Warranty

All equipment shall carry, as a minimum, the manufacturer's standard warranty period specified against the individual item, and in no case less than one year from the date of handing over, against manufacturing defects, mechanical/electrical malfunction, structural failure of frames, and premature wear of upholstery, cables, and resistance mechanisms under normal use. Items carrying a longer specific warranty (e.g., lifetime warranty against bending of the Olympic barbell, or extended warranty on adjustable dumbbells) shall carry that longer period, and the Contractor shall furnish a Manufacturer's/Supplier's Warranty Certificate for each item at the time of handing over. During the warranty period, defects reported shall be rectified/the item replaced free of cost within 7 days of intimation.

2.11 User Safety

All equipment shall be installed with due regard to user safety, including adequate clear floor space around each unit for safe operation and spotting, secure anchoring/stability without tipping under maximum rated load, and provision of any safety signage, weight-limit markings, or operating instructions supplied by the manufacturer. Free-weight equipment (bumper plates, barbells) shall be stored/racked as directed to prevent accidental damage to flooring or injury.

2.11 Cleaning and Handing Over

On completion of installation of each item, the Contractor shall remove all packing material and debris from the site, clean the equipment and surrounding area, and hand over the item along with the manufacturer's operation & maintenance/user manual and warranty card to the Engineer-in-Charge against a signed handing-over certificate.

SECTION 3**ITEM-WISE DETAILED TECHNICAL SPECIFICATIONS****ITEM NO. 1**

Nomenclature: Wall Mirrors (Gym Type), 5mm Float Glass, Aluminium Channel Fixed

Unit of Measurement: Each

(a) Description and Specification

Providing and fixing 5 mm thick clear float glass mirror, of panel size 2000 mm x 2000 mm or as per approved drawings, with all edges ground and polished, fixed to wall with heavy duty aluminium channel/clamp fixing and backing support, complete, as per following technical parameters:

- (i) Glass: Clear float glass, silvered on back face by chemical deposition of silver, copper-backed and double-coat protected, thickness 5 mm $\pm$ 0.2 mm, reflectivity not less than 83%.
- (ii) Panel size: 2000 mm (H) x 2000 mm (W), tolerance $\pm$ 3 mm; edges to be arrised/bevelled and polished on all four sides.
- (iii) Fixing system: Extruded aluminium U-channel/clamp of minimum 1.5 mm wall thickness, anodized, fixed to wall/backing frame at not less than 600 mm centre-to-centre, with plumb and level checked by spirit level before final fixing.
- (iv) Backing: 12 mm thick water-resistant plywood/MDF backing board fixed to wall to provide uniform bearing and to arrest vibration; mirror to be bedded on backing with neoprene setting blocks/EPDM gasket at fixing points to prevent glass-to-metal contact.
- (v) The finished installation shall be free from waviness, distortion, and edge chipping, and shall be checked for true verticality and flatness across the full panel.

(b) Mode of Measurement

The item shall be measured on "per each" basis for the complete unit/set, supplied, assembled, installed, tested, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all equipment, accessories and hardware referred to in the specification above; all taxes and duties including GST; transportation to site; loading, unloading and carriage to the location of installation; unpacking, assembly, fixing and alignment;

electrical connection and testing where applicable; demonstration of safe operation; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Technical literature, load/capacity certificates, and colour/finish samples for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to procurement, in accordance with Clauses 2.2 and 2.9 of Section 2 above. No item shall be procured or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects and mechanical/electrical malfunction, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

(f) Safety and Demonstration

Prior to handing over, the Contractor shall demonstrate the safe and correct operation of the equipment, including all adjustment, resistance/incline, and safety-lock mechanisms as applicable, to the Engineer-in-Charge and/or designated Health Club staff, in accordance with Clause 2.12 of Section 2 above.

ITEM NO. 2

Nomenclature: Motorized Treadmill, Motor 8 HP (Peak), Speed up to 20 kmph

Unit of Measurement: each

(a) Description and Specification

Supplying, placing in position and commissioning of motor-driven treadmill of the following minimum technical specification, complete with control console, safety accessories and standard tool kit:

- (i) Motor: AC drive motor of 8 HP peak duty rating, continuous duty rating not less than 4 HP, with electronic speed controller.
- (ii) Speed range: 0.8 kmph to 20 kmph, variable in steps of 0.1 kmph.
- (iii) Incline: Motorized auto-incline mechanism, minimum 15 levels, 0% to 15% gradient (or equivalent degree range as per manufacturer's standard).
- (iv) Running surface: Running belt of minimum size 558 mm x 1524 mm, anti-static, anti-slip surface, mounted over minimum 2-ply orthopaedic deck/shock-absorption cushioning system.

(v) Load rating: Maximum user weight capacity not less than 150 kg; frame of minimum 2 mm thick MS/steel tube construction, powder coated.

(vi) Console: LED/LCD display indicating time, speed, distance, incline, pulse rate and calories; minimum 12 pre-set workout programmes; heart-rate sensing through handgrip contact sensors.

(vii) Safety features: Magnetic safety key/emergency stop switch, automatic motor cut-off on key removal, non-slip handrails on both sides.

(viii) Electrical: To operate on $230V \pm 10\%$, single phase, 50 Hz AC supply, with 3-pin earthed plug top and MCB-protected circuit; wiring and motor windings to be factory tested for insulation resistance and earth continuity before dispatch.

(ix) The equipment shall be supplied with manufacturer's test certificate, operation manual, and shall be demonstrated for safe start, stop, speed and incline change, prior to handing over.

(b) Mode of Measurement

The item shall be measured on "per each" basis for the complete unit/set, supplied, assembled, installed, tested, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all equipment, accessories and hardware referred to in the specification above; all taxes and duties including GST; transportation to site; loading, unloading and carriage to the location of installation; unpacking, assembly, fixing and alignment; electrical connection and testing where applicable; demonstration of safe operation; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Technical literature, load/capacity certificates, and colour/finish samples for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to procurement, in accordance with Clauses 2.2 and 2.9 of Section 2 above. No item shall be procured or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects and mechanical/electrical malfunction, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

(f) Safety and Demonstration

Prior to handing over, the Contractor shall demonstrate the safe and correct operation of the equipment, including all adjustment, resistance/incline, and safety-lock mechanisms as applicable, to the Engineer-in-Charge and/or designated Health Club staff, in accordance with Clause 2.12 of Section 2 above.

ITEM NO. 3

Nomenclature: Indoor Spin Bike, Magnetic Resistance Type, 6 kg Flywheel

Unit of Measurement: Each

(a) Description and Specification

Supplying and placing in position indoor spin/exercise bike of magnetic resistance type, of the following technical specification:

- (i) Flywheel: Balanced steel flywheel of weight not less than 6 kg, mounted on precision sealed bearings for smooth, low-noise rotation.
- (ii) Resistance system: Magnetic resistance mechanism, stepless/ininitely variable, adjustable through a manually operated tension knob/dial, without belt or friction-pad contact.
- (iii) Frame: MS/steel tube frame of minimum 2 mm thickness, powder coated, with adjustable stabilizer levellers at base.
- (iv) Seat and handlebar: 4-way adjustable seat (vertical and horizontal) and 2-way adjustable handlebar, to suit rider height range of approximately 1.5 m to 1.95 m.
- (v) Pedals: Self-levelling pedals fitted with adjustable toe/foot straps and SPD-compatible clip fitting (where specified).
- (vi) Load rating: Maximum user weight capacity not less than 120 kg.
- (vii) Console: Battery-operated LCD display indicating time, speed, distance, RPM and calories burnt.
- (viii) The unit shall be supplied complete with transport wheels, levelling feet, and manufacturer's assembly/operation manual, and shall be demonstrated for smooth resistance adjustment prior to handing over.

(b) Mode of Measurement

The item shall be measured on "per each" basis for the complete unit/set, supplied, assembled, installed, tested, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all equipment, accessories and hardware referred to in the specification above; all taxes and duties including GST; transportation to site; loading, unloading and carriage to the location of installation; unpacking, assembly, fixing and alignment; electrical connection and testing where applicable; demonstration of safe operation; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Technical literature, load/capacity certificates, and colour/finish samples for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to procurement, in accordance with Clauses 2.2 and 2.9 of Section 2 above. No item shall be procured or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects and mechanical/electrical malfunction, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

(f) Safety and Demonstration

Prior to handing over, the Contractor shall demonstrate the safe and correct operation of the equipment, including all adjustment, resistance/incline, and safety-lock mechanisms as applicable, to the Engineer-in-Charge and/or designated Health Club staff, in accordance with Clause 2.12 of Section 2 above.

ITEM NO. 4

Nomenclature: Adjustable Dumbbell Set, Quick-Adjust Dial Type, 2.5 kg to 24 kg (Pair)

Unit of Measurement: Set

(a) Description and Specification

Supplying and placing in position one pair (set of two) adjustable dial-type dumbbells, of the following technical specification:

(i) Weight range: 2.5 kg to 24 kg per dumbbell, adjustable in a minimum of 15 discrete increments through a rotary selector dial.

(ii) Construction: Cast-iron/steel weight plates encased in moulded weight-selection housing; selector pin/dial mechanism to positively engage the selected plates without play or slippage under load.

- (iii) Handle: Chrome-plated or knurled steel handle of ergonomic diameter (approx. 28-30 mm), with non-slip rubberized/textured grip zone.
- (iv) Storage cradle: Each dumbbell to be supplied with a matching anti-roll storage cradle/tray of adequate strength to support the fully loaded weight, permitting safe dial adjustment while seated in the cradle.
- (v) Finish: Weight plates in matt black finish with engraved/printed high-visibility weight increment markings at each dial position.
- (vi) The set shall be supplied complete with the manufacturer's warranty card (minimum 6 months) and instructions for safe adjustment and use.

(b) Mode of Measurement

The item shall be measured on "per set" basis for the complete unit/set, supplied, assembled, installed, tested, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all equipment, accessories and hardware referred to in the specification above; all taxes and duties including GST; transportation to site; loading, unloading and carriage to the location of installation; unpacking, assembly, fixing and alignment; electrical connection and testing where applicable; demonstration of safe operation; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Technical literature, load/capacity certificates, and colour/finish samples for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to procurement, in accordance with Clauses 2.2 and 2.9 of Section 2 above. No item shall be procured or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry the manufacturer's/supplier's warranty as specified in the description above, which shall in no case be less than the minimum warranty period prescribed under Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

(f) Safety and Demonstration

Prior to handing over, the Contractor shall demonstrate the safe and correct operation of the equipment, including all adjustment, resistance/incline, and safety-lock mechanisms as applicable, to the Engineer-in-Charge and/or designated Health Club staff, in accordance with Clause 2.12 of Section 2 above.

ITEM NO. 5**Nomenclature: Multi-Functional Fitness Bench****Unit of Measurement: set****(a) Description and Specification**

Supplying, assembling and placing in position one multi-functional fitness bench of approved equivalent, of the following technical specification:

(i) Frame: MS square/rectangular tube frame of minimum 1.2 mm wall thickness, corrosion-resistant powder-coated finish, with cross-braced base for stability.

(ii) Bench adjustment: Backrest adjustable to a minimum of 3 positions (incline, flat, decline) through pin-and-hole or ratchet-type locking mechanism, positively locking at each position.

(iii) Padding: High-density foam padding, minimum 50 mm thickness on backrest and seat, upholstered in tear- and sweat-resistant synthetic leatherette, stitched with reinforced seams.

(iv) Barbell stand/rack: Integrated barbell support uprights with safety catches, adjustable in height to suit incline/flat/decline bench-press positions, load rated for standard Olympic barbell and plate loading.

(v) Leg developer attachment: Leg curl/leg extension attachment with roller pads, pivoting on a sealed-bearing joint, adjustable resistance/position as per manufacturer's standard.

(vi) Ancillary pads: Ergonomically contoured foam ankle/leg pads and abdominal crunch attachment (where provided as standard with the model), securely bolted to the frame.

(vii) Load rating: Minimum safe working load of 150 kg (combined body weight and free-weight load), as certified by the manufacturer.

(viii) The bench shall be supplied complete with all fixing hardware, assembly tools, and a minimum 1-year manufacturer's warranty, and shall be assembled strictly as per the manufacturer's fitting instructions.

(b) Mode of Measurement

The item shall be measured on "per set" basis for the complete unit/set, supplied, assembled, installed, tested, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all equipment, accessories and hardware referred to in the specification above; all taxes and duties including GST; transportation to site; loading, unloading and

carriage to the location of installation; unpacking, assembly, fixing and alignment; electrical connection and testing where applicable; demonstration of safe operation; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Technical literature, load/capacity certificates, and colour/finish samples for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to procurement, in accordance with Clauses 2.2 and 2.9 of Section 2 above. No item shall be procured or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry the manufacturer's/supplier's warranty as specified in the description above, which shall in no case be less than the minimum warranty period prescribed under Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

(f) Safety and Demonstration

Prior to handing over, the Contractor shall demonstrate the safe and correct operation of the equipment, including all adjustment, resistance/incline, and safety-lock mechanisms as applicable, to the Engineer-in-Charge and/or designated Health Club staff, in accordance with Clause 2.12 of Section 2 above.

ITEM NO. 6

Nomenclature: Bumper Weight Plates, Black 3.0, Olympic Type, 150 kg Set

Unit of Measurement: Set

(a) Description and Specification

Providing and supplying Olympic bumper weight plates (Black Bumper Plates 3.0 or approved equivalent), of the following technical specification:

- (i) Construction: Solid rubber-encased plate with precision CNC-machined stainless-steel centre hub/insert, vulcanised/bonded to the rubber body to prevent hub separation under repeated drop-loading.
- (ii) Set composition: Total set weight 150 kg, comprising 2 nos. each of 5 kg, 10 kg, 15 kg, 20 kg and 25 kg plates (10 plates in all).
- (iii) Dimensions: Outer diameter of each plate 450 mm $\pm$ 2 mm (standardized across all weights in the set to maintain uniform bar height when loaded), centre bore diameter to match standard 50 mm Olympic sleeve.
- (iv) Tolerance: Weight tolerance not to exceed $\pm$ 1% of the nominal marked weight per plate.

(v) Colour coding/markings: Weight denomination to be moulded or engraved and clearly legible on both faces of each plate.

(vi) Performance: Plates to withstand repeated drop-testing from overhead lifting position onto a hard surface without cracking, delamination of rubber, or damage to the centre hub, and shall exhibit low bounce and low noise characteristics on impact.

(vii) The set shall be supplied complete with manufacturer's test/quality certificate confirming weight tolerance and drop-test compliance.

(b) Mode of Measurement

The item shall be measured on "per set" basis for the complete unit/set, supplied, assembled, installed, tested, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all equipment, accessories and hardware referred to in the specification above; all taxes and duties including GST; transportation to site; loading, unloading and carriage to the location of installation; unpacking, assembly, fixing and alignment; electrical connection and testing where applicable; demonstration of safe operation; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Technical literature, load/capacity certificates, and colour/finish samples for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to procurement, in accordance with Clauses 2.2 and 2.9 of Section 2 above. No item shall be procured or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects and mechanical/electrical malfunction, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

(f) Safety and Demonstration

Prior to handing over, the Contractor shall demonstrate the safe and correct operation of the equipment, including all adjustment, resistance/incline, and safety-lock mechanisms as applicable, to the Engineer-in-Charge and/or designated Health Club staff, in accordance with Clause 2.12 of Section 2 above.

ITEM NO. 7

Nomenclature: Olympic Barbell, Men's 20 kg Capacity

Unit of Measurement: Each

(a) Description and Specification

Providing and supplying Olympic weightlifting barbell (Men's, 20 kg), of the following technical specification:

(i) Material: High-tensile alloy steel shaft, minimum tensile strength 200,000 PSI (1380 N/mm²), chrome/zinc plated or equivalent corrosion-resistant finish.

(ii) Dimensions: Overall length 2200 mm; shaft diameter 28 mm $\pm$ 0.2 mm; loadable sleeve length 415 mm on each side; sleeve diameter to suit standard 50 mm bore Olympic plates.

(iii) Bearing system: Sleeve rotation on needle roller bearings, minimum 10HK series (or equivalent), providing smooth, low-friction rotation under full rated load.

(iv) Knurling: Standard single/centre knurl pattern with knurl depth/pitch of approximately 1.2 mm, providing secure grip without excessive hand abrasion; centre knurl to be provided for back-squat grip reference; knurl marks (rings) to be provided at standard powerlifting/Olympic-lift grip width.

(v) Whip and load rating: Bar to exhibit elastic whip characteristics suitable for Olympic-style lifts (snatch/clean & jerk) and to have a rated maximum load capacity not less than 20 kg self-weight plus standard Olympic plate loading as per manufacturer's specification.

(vi) Warranty: Bar to carry a lifetime warranty against bending/permanent deformation under rated load, as certified by the manufacturer.

(b) Mode of Measurement

The item shall be measured on "per each" basis for the complete unit/set, supplied, assembled, installed, tested, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all equipment, accessories and hardware referred to in the specification above; all taxes and duties including GST; transportation to site; loading, unloading and carriage to the location of installation; unpacking, assembly, fixing and alignment; electrical connection and testing where applicable; demonstration of safe operation; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Technical literature, load/capacity certificates, and colour/finish samples for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to procurement, in accordance with Clauses 2.2 and 2.9 of Section 2 above. No item shall be procured or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry the manufacturer's/supplier's warranty as specified in the description above, which shall in no case be less than the minimum warranty period prescribed under Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

(f) Safety and Demonstration

Prior to handing over, the Contractor shall demonstrate the safe and correct operation of the equipment, including all adjustment, resistance/incline, and safety-lock mechanisms as applicable, to the Engineer-in-Charge and/or designated Health Club staff, in accordance with Clause 2.12 of Section 2 above.

ITEM NO. 8

Nomenclature: Squat Stand, Heavy-Duty with Pull-up Bar**Unit of Measurement: Each****(a) Description and Specification**

Supplying, assembling and installing squat stand, of the following technical specification:

(i) Frame: Height 86/ 91 inches with Monkey Bar, Offset Bar, 2-Handle Bar, 2X3 Square, fabricated from structural-grade steel, with precision laser-cut holes for J-cup and safety-arm height adjustment.

(ii) Base and stability: Horizontal floor-level stabilizer bar/base plate connecting both uprights, of adequate length and section to provide free-standing stability without floor anchoring, under maximum rated load including dynamic loading during lift and re-rack.

(iv) Fittings: J-cups (barbell rest hooks) lined with UHMW/nylon or similar non-marring liner, and safety spotter arms, both adjustable in height through the laser-cut hole pattern and secured with locking pins.

(v) Finish: All members to be degreased, phosphated and powder-coated (colour red, or as approved) for corrosion resistance and uniform appearance.

(vi) The unit shall be assembled strictly as per the manufacturer's fitting instructions, checked for plumb, level and rigidity, and demonstrated for safe loading/unloading of the barbell prior to handing over.

(b) Mode of Measurement

The item shall be measured on "per each" basis for the complete unit/set, supplied, assembled, installed, tested, and made ready for use at the location directed by the Engineer-in-Charge, in accordance with Clause 2.7 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of all equipment, accessories and hardware referred to in the specification above; all taxes and duties including GST; transportation to site; loading, unloading and carriage to the location of installation; unpacking, assembly, fixing and alignment; electrical connection and testing where applicable; demonstration of safe operation; and cleaning of the site after installation, in accordance with Clause 2.8 of Section 2 above.

(d) Samples, Approval and Quality Assurance

Technical literature, load/capacity certificates, and colour/finish samples for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to procurement, in accordance with Clauses 2.2 and 2.9 of Section 2 above. No item shall be procured or installed without such prior written approval.

(e) Guarantee/Warranty

The item shall carry a minimum warranty period of one year from the date of handing over against manufacturing defects and mechanical/electrical malfunction, in accordance with Clause 2.10 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

(f) Safety and Demonstration

Prior to handing over, the Contractor shall demonstrate the safe and correct operation of the equipment, including all adjustment, resistance/incline, and safety-lock mechanisms as applicable, to the Engineer-in-Charge and/or designated Health Club staff, in accordance with Clause 2.12 of Section 2 above.

**TECHNICAL SPECIFICATIONS
FOR
DESIGN, FABRICATION, SUPPLY AND ERECTION OF GLASS-FIBRE REINFORCED CONCRETE
(GRC) ARCHITECTURAL GATEWAYS — TORAN GATE AND CHAITYA-ARCH GATE**

SECTION 1

SCOPE OF WORK

1.1 These specifications form part of the Tender Documents and shall be read in conjunction with the Schedule of Quantities/BOQ, architectural and structural drawings, and other Contract Documents.

1.2 The scope of work covered under this Section comprises design detailing, artwork development, factory fabrication, supply, transportation, and erection at site of two architectural gateway structures in Glass-fibre Reinforced Concrete (GRC) — a Toran Gate and a Chaitya-arch Gate — depicting traditional Indian/Buddhist cultural motifs, complete with structural steel core, GRC cladding, surface finish, and foundation, at the location(s) shown on the architectural drawings within the RBI Officers Housing Colony redevelopment project at Kankarbagh, Patna, and as directed by the Engineer-in-Charge.

1.3 The work covered under this Section is a composite structural-cum-architectural item involving reinforced cement concrete/structural steel foundation and framing, factory-cast GRC panel work, artistic bas-relief/sculptural detailing, and heavy erection (crane-assisted) at height, and shall accordingly be executed by a Contractor/specialist agency having demonstrated prior experience in GRC architectural cladding works of comparable scale, complexity, and height, as may be prescribed in the qualifying criteria of the Tender.

1.4 The rate quoted by the Contractor shall be deemed to be for the complete gateway structure described against each item, inclusive of design, detailing, structural vetting, fabrication, materials, transportation, erection, foundation, and all incidental works described in the item and in this Section, unless expressly stated otherwise.

SECTION 2

GENERAL TECHNICAL CONDITIONS APPLICABLE TO THE GRC GATEWAY WORKS

2.1 Codes and Standards

Design, materials, and workmanship shall conform to the relevant and latest editions of: IS:456 (Plain and Reinforced Concrete); IS:800 (General Construction in Steel); IS:816/IS:9595 (Welding of structural steel); IS:875 (Design Loads — wind, Part 3); IS:1893 (Criteria for Earthquake Resistant Design of Structures, Part 1); IS:2911 (Design and Construction of Pile Foundations, where piled foundations are adopted); IS:12269 (OPC 53 Grade Cement) or equivalent; and manufacturer's/GRCA (GRC Association) international guidelines for glass-fibre reinforced concrete cladding, in the absence of a specific governing Indian Standard for factory-cast GRC architectural panels. AR-glass fibre used in the GRC mix shall be alkali-resistant grade, suitable for use in a cementitious matrix, and free from degradation due to alkali attack over the design service life.

2.2 Design, Structural Vetting and Shop Drawings

The Contractor shall prepare and submit, for the written approval of the Architect/Consultant and the Engineer-in-Charge, a 3-dimensional design model/visualization, GFC (Good-for-Construction) shop drawings of the structural steel frame and foundation, GRC penalization/joint layout drawings, and artwork/motif patterns (bas-relief detailing, sculptural discs, cultural iconography) prior to commencement of fabrication. The structural design of the concealed MS frame, foundation, and anchorage system shall be got vetted by a structural design consultant/IIT of repute, as directed by the Engineer-in-Charge, for wind load, seismic load, self-weight of GRC cladding, and erection/handling loads, before fabrication is taken up. No fabrication shall commence without such approved drawings and structural vetting certificate.

2.3 Structural Steel Core

The concealed structural frame supporting the GRC cladding shall be fabricated from hollow structural steel sections (RHS/SHS/CHS as per design) of grade and size as per the vetted structural design, with all welded joints executed by qualified welders as per IS:816, and with 100% visual inspection and DP/UT testing of critical welds as directed by the Engineer-in-Charge. The frame shall be shop-primed with a zinc-rich/epoxy primer and finished with a minimum two-coat polyurethane (PU) paint system, of total dry film thickness as recommended by the paint manufacturer for long-term corrosion protection of a concealed, cladding-enclosed steel structure.

2.4 GRC Panel Manufacture

GRC panels shall be factory-cast (spray-up or premix process, as per manufacturer's standard) using AR-glass fibre reinforced cementitious matrix, achieving a minimum 28-day compressive strength of 40 MPa and water absorption not exceeding 14%, with integral stiffening ribs and back-up framing/support studs cast monolithically or securely bonded to the panel to prevent bowing, cracking, or delamination under self-weight, thermal movement, and wind loading. Panel thickness shall be as specified against the individual item, with uniform thickness control (± 3 mm) across each panel. All panels shall be cured under controlled factory conditions and shall be free from surface blow-holes, honeycombing, and visible repair patches prior to dispatch.

2.5 Sculptural and Artwork Detailing

Bas-relief artwork, sculptural discs, cultural motifs, and decorative terminals shall be executed strictly in accordance with the artwork patterns and 3D model approved under Clause 2.2 above, by craftsmen/artisans experienced in relief sculpture work, with dimensional accuracy and symmetry of motifs verified panel-to-panel prior to dispatch. Any panel found deficient in artistic fidelity, symmetry, or surface quality, as assessed by the Architect, shall be rejected and re-cast at the Contractor's cost.

2.6 Surface Finish

The exposed face of all GRC panels shall receive a breathable mineral/silicate-based surface coating in terracotta tone (or as approved shade), applied in accordance with the coating manufacturer's specification, providing weather resistance, UV stability, and resistance to efflorescence, while permitting moisture vapour transmission from the cementitious substrate. All panel joints shall be sealed with an approved elastomeric sealant of matching shade, and all touch-up/patch work at joints and lifting-point plugs shall be finished flush and indistinguishable from the surrounding panel surface.

2.7 Transportation and Handling

GRC panels, being brittle and susceptible to damage from flexural stress during transit, shall be transported in purpose-built cradles/racks with adequate padding and restraint, and shall be lifted only at the manufacturer-designated lifting points using appropriate rigging (soft slings/spreader bars) to avoid point-loading or cracking. Any panel damaged during transportation or handling shall be rejected and replaced at the Contractor's cost, and shall not be repaired and used unless specifically permitted in writing by the Engineer-in-Charge.

2.8 Foundation and Anchorage

RCC foundations for the gateway structures shall be designed and constructed in accordance with IS:456 and the vetted structural design, for the combined dead load, wind load, and seismic load as applicable, with adequate embedment of anchor

bolts/base plates for the structural steel core. Concrete grade, reinforcement detailing, and curing shall be as per the approved structural drawings; foundation excavation, backfilling, and reinstatement of the surrounding ground/paving shall be carried out as part of this item and to the satisfaction of the Engineer-in-Charge. GRC panels shall be fixed to the structural frame using stainless steel (SS304) brackets/cleats and chemical (resin) anchors of load rating certified by the anchor manufacturer for the panel self-weight and wind-suction forces, with due allowance for differential thermal movement between the GRC skin and the steel frame.

2.9 Erection

Erection of the structural frame and GRC panels shall be carried out using a mobile crane of adequate capacity and reach, with a method statement and lift plan submitted for the approval of the Engineer-in-Charge prior to commencement, addressing crane positioning, ground-bearing capacity, lift sequence, temporary bracing/guying of the frame during erection, and site safety exclusion zones. Scaffolding, work platforms, and safety nets/barricading shall be provided as necessary for safe working at height, in accordance with the relevant safety provisions of the General Conditions of Contract and applicable Factories/BOCW safety regulations.

2.10 Quality Assurance and Quality Control (QA/QC)

The Contractor shall implement a documented QA/QC regime covering: batching and mix-design records for the GRC mix; compressive-strength and water-absorption test results for each casting batch (from an accredited/NABL laboratory, or the manufacturer's in-house laboratory as agreed with the Engineer-in-Charge); dimensional and visual inspection records for each panel prior to dispatch; weld-inspection records for the structural frame; and anchor pull-out/proof-load test records for a sample of installed anchors, as directed by the Engineer-in-Charge. All records shall be maintained and made available for inspection, and shall be handed over as part of the completion documentation.

2.11 Protection till Handover

Completed gateway structures shall be protected against damage, staining, or vandalism (including from ongoing construction activity in the vicinity) by means of temporary barricading/wrapping, as necessary, until final handing over to the Client, and any damage occurring prior to handover shall be made good by the Contractor at his own cost.

2.12 Mode of Measurement and Payment

Each gateway structure shall be measured and paid on a "per number" (each) basis for the complete structure — including design, structural steel core, GRC panels, surface finish, foundation, and erection — supplied, erected, and handed over

complete in all respects as described in the item and in this Section, unless otherwise indicated in the Schedule of Quantities.

2.13 Rate to be Inclusive Of

The quoted/accepted rate shall be firm and inclusive of: design, 3D modelling, shop drawings, artwork development, and structural vetting; all materials including structural steel, AR-glass fibre, cement, aggregates, admixtures, surface-coating materials, sealants, SS304 brackets and chemical anchors; fabrication, factory casting and curing of GRC panels; all applicable taxes, duties and levies including GST; transportation to site (including specialized packing/cradling for GRC panels); RCC foundation including excavation, reinforcement, and backfilling; mobile crane, scaffolding, and all erection plant, tools, and labour; QA/QC testing; protection till handover; and cleaning of the site after erection. No claim for extra payment on any of the above accounts shall be entertained.

2.14 Guarantee/Warranty

The complete gateway structure, including the structural steel core, GRC panels, surface finish, and jointing/sealant work, shall carry a minimum warranty period of three years from the date of handing over, and the Contractor shall make good any such defect at his own cost within the warranty period.

SECTION 3

ITEM-WISE DETAILED TECHNICAL SPECIFICATIONS

(To be read as an integral part of the Schedule of Quantities/Bill of Quantities. Each item below is deemed to incorporate, in addition to the specific description, all General Technical Conditions set out in Section 2.)

ITEM NO. 1

Nomenclature: GRC Toran Gate, Clear Width 7.0 m x Height 10.0 m, Panel Thickness 50 mm minimum

Unit of Measurement: Each **Quantity:** 1

(a) Description and Specification

Providing, fabricating, supplying, transporting and erecting at site one number Glass-fibre Reinforced Concrete (GRC) Toran Gate, inspired by traditional Indian Toran gateway architecture and depicting Indian cultural motifs, of overall clear width 7.0 m and overall height 10.0 m (as per approved architectural drawings), comprising decorated pylons and a curved lintel member with sculptural discs and bas-relief artwork, conforming to the following minimum technical parameters:

(i) **Design and detailing:** Complete 3D model/visualization, GFC shop drawings of the structural frame and foundation, GRC panel-joint layout, and artwork/motif patterns, together with structural vetting of the design for self-weight, wind load (as per IS:875 Part 3) and seismic load (as per IS:1893 Part 1), all as described in Clauses 2.1 and 2.2 of Section 2 above.

(ii) **Structural core:** Concealed structural steel frame of hollow sections (RHS/SHS/CHS, size and grade as per vetted design) forming the pylons and curved lintel profile, fully welded as per IS:816, shop-primed with zinc-rich/epoxy primer, and finished with a minimum two-coat PU paint system, as described in Clause 2.3 of Section 2 above.

(iii) **GRC panels:** Factory-cast GRC panels of minimum thickness 50 mm, manufactured using AR-glass fibre reinforced cementitious matrix achieving 28-day compressive strength not less than 40 MPa and water absorption not exceeding 14%, complete with integral stiffening ribs and back-up support framing, cast and finished as described in Clause 2.4 of Section 2 above.

(iv) **Sculptural detailing:** Pylon faces and lintel soffit/fascia to incorporate bas-relief artwork, sculptural discs and symbolic Indian motifs, executed in strict conformity with the approved artwork patterns and 3D model, as described in Clause 2.5 of Section 2 above.

(v) **Surface finish:** Breathable mineral/silicate coating in terracotta tone (or as approved shade) applied to all exposed GRC surfaces, with elastomeric joint sealant and flush touch-up finish at all panel joints and lifting-point plugs, as described in Clause 2.6 of Section 2 above.

(vi) **Foundation and fixing:** RCC foundation designed and constructed as per IS:456 and the vetted structural design, with anchor bolts for the structural steel core, and GRC panels fixed to the frame using stainless steel (SS304) brackets and chemical anchors, as described in Clause 2.8 of Section 2 above.

(vii) **Erection:** Erection using mobile crane, scaffolding, and rigging as per an approved method statement/lift plan, with temporary bracing during erection as necessary, as described in Clause 2.9 of Section 2 above.

(viii) **QA/QC and protection:** Complete QA/QC documentation as described in Clause 2.10, and protection of the completed structure till handover as described in Clause 2.11 of Section 2 above.

(ix) **The item shall be complete in all respects** — including design, structural steel, GRC panels, surface finish, RCC foundation, anchor bolts, erection plant and labour — as per the architectural drawings and the direction of the Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number" (each) basis for the complete gateway structure, designed, fabricated, supplied, transported, erected, and handed over complete in all respects at the location directed by the Engineer-in-Charge, in accordance with Clause 2.12 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of design, structural vetting, structural steel core, GRC panels, surface finish, RCC foundation, anchor bolts, erection plant (mobile crane, scaffolding), QA/QC, and all other items described in the specification above, in accordance with Clause 2.13 of Section 2 above.

(d) Design Submittals, Approval and Structural Vetting

The 3D model, shop drawings, artwork patterns, and structural vetting certificate for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to commencement of fabrication, in accordance with Clause 2.2 of Section 2 above. No fabrication shall commence without such prior written approval.

(e) Quality Assurance and Erection Safety

The Contractor shall implement the QA/QC regime described in Clause 2.10, and shall submit a method statement/lift plan for erection for the approval of the Engineer-in-Charge prior to commencement of erection, in accordance with Clause 2.9 of Section 2 above.

(f) Guarantee/Warranty

The completed gateway structure shall carry a minimum warranty period of three years from the date of handing over, in accordance with Clause 2.14 of Section 2 above.

ITEM NO. 2

Nomenclature: GRC Chaitya-Arch Gate, Clear Width approx. 15.0 m x Height 13.5 m, Panel Thickness 30 mm minimum

Unit of Measurement: Each Quantity: 2

(a) Description and Specification

Providing, fabricating, supplying, transporting and erecting at site Glass-fibre Reinforced Concrete (GRC) Chaitya-arch gateway(s), inspired by traditional Buddhist/Indian architecture, of overall clear width approximately 15.0 m and overall height 13.5 m (as per approved architectural drawings), comprising a full arch profile

with projecting ribs, decorative terminals and moulded cultural motifs, conforming to the following minimum technical parameters:

- (i) **Design and detailing:** Complete 3D model/visualization, GFC shop drawings of the structural frame and foundation, GRC panel-joint layout, and artwork/motif patterns, together with structural vetting of the design for self-weight, wind load (as per IS:875 Part 3) and seismic load (as per IS:1893 Part 1), all as described in Clauses 2.1 and 2.2 of Section 2 above, with particular attention to the arch thrust/curvature and its transfer to the foundation given the larger span and height of this structure.
- (ii) **Structural core:** Concealed structural steel frame of hollow sections (RHS/SHS/CHS, size and grade as per vetted design) forming the full arch profile and projecting rib members, fully welded as per IS:816, shop-primed with zinc-rich/epoxy primer, and finished with a minimum two-coat PU paint system, as described in Clause 2.3 of Section 2 above.
- (iii) **GRC panels:** Factory-cast GRC panels of minimum thickness 30 mm, manufactured using AR-glass fibre reinforced cementitious matrix achieving 28-day compressive strength not less than 40 MPa and water absorption not exceeding 14%, complete with integral stiffening ribs and back-up support framing, panelized to suit the curved arch geometry, cast and finished as described in Clause 2.4 of Section 2 above.
- (iv) **Sculptural detailing:** Projecting ribs, decorative arch terminals, and moulded cultural motifs to be executed in strict conformity with the approved artwork patterns and 3D model, as described in Clause 2.5 of Section 2 above.
- (v) **Surface finish:** Breathable mineral/silicate coating in terracotta tone (or as approved shade) applied to all exposed GRC surfaces, with elastomeric joint sealant and flush touch-up finish at all panel joints and lifting-point plugs, as described in Clause 2.6 of Section 2 above.
- (vi) **Foundation and fixing:** RCC foundation designed and constructed as per IS:456 and the vetted structural design, proportioned for the higher overturning/thrust forces of the larger arch span, with anchor bolts for the structural steel core, and GRC panels fixed to the frame using stainless steel (SS304) brackets and chemical anchors, as described in Clause 2.8 of Section 2 above.
- (vii) **Erection:** Erection using mobile crane, scaffolding, and rigging as per an approved method statement/lift plan, with temporary bracing/guying of the arch frame during erection until the structure is self-supporting, as described in Clause 2.9 of Section 2 above.

(viii) **QA/QC and protection:** Complete QA/QC documentation as described in Clause 2.10, and protection of the completed structure till handover as described in Clause 2.11 of Section 2 above.

(ix) The item shall be complete in all respects — including design, structural steel, GRC panels, surface finish, RCC foundation, anchor bolts, erection plant and labour — as per the architectural drawings and the direction of the Engineer-in-Charge, for each of the 2 (two) gateway structures covered under this item.

(b) Mode of Measurement

The item shall be measured on "per number" (each) basis for the complete gateway structure, designed, fabricated, supplied, transported, erected, and handed over complete in all respects at the location directed by the Engineer-in-Charge, in accordance with Clause 2.12 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of design, structural vetting, structural steel core, GRC panels, surface finish, RCC foundation, anchor bolts, erection plant (mobile crane, scaffolding), QA/QC, and all other items described in the specification above, in accordance with Clause 2.13 of Section 2 above.

(d) Design Submittals, Approval and Structural Vetting

The 3D model, shop drawings, artwork patterns, and structural vetting certificate for this item shall be submitted for written approval of the Architect/Consultant and the Engineer-in-Charge prior to commencement of fabrication, in accordance with Clause 2.2 of Section 2 above. No fabrication shall commence without such prior written approval.

(e) Quality Assurance and Erection Safety

The Contractor shall implement the QA/QC regime described in Clause 2.10, and shall submit a method statement/lift plan for erection for the approval of the Engineer-in-Charge prior to commencement of erection, in accordance with Clause 2.9 of Section 2 above.

(f) Guarantee/Warranty

The completed gateway structure shall carry a minimum warranty period of three years from the date of handing over, in accordance with Clause 2.14 of Section 2 above.

**TECHNICAL SPECIFICATIONS
FOR
SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF ORGANIC WASTE CONVERTER
MACHINE**

SECTION 1

SCOPE OF WORK

1.1 These specifications form part of the Tender Documents and shall be read in conjunction with the the Schedule of Quantities/BOQ, Drawings, and other Contract Documents.

1.2 The scope of work covered under this Section comprises design coordination, supply, installation, testing, commissioning, and trial-running of a fully automatic Organic Waste Converter (in-vessel composting) machine, complete with all civil, electrical, plumbing and mechanical works incidental thereto, at the location directed by the Engineer-in-Charge within the RBI Officers Housing Colony redevelopment project at Kankarbagh, Patna, so as to achieve on-site processing of biodegradable/organic waste generated within the complex, in compliance with the Solid Waste Management Rules, 2016 (as amended) and applicable Bihar State Pollution Control Board/Central Pollution Control Board (CPCB) norms.

1.3 The rate quoted by the Contractor/Supplier shall be deemed to be for the complete installation described, inclusive of the machine and all its standard accessories, electrical and control panel, foundation/plinth or skid-mounting arrangement, interconnecting piping/ducting, transportation, installation, testing, commissioning, trial run, and training of the Client's operating staff, unless expressly stated otherwise.

1.4 Nothing extra shall be payable on account of minor site adjustments necessary to accommodate the machine within the designated waste-processing yard/room, unless such variation is beyond the tolerance expressly permitted below and is certified by the Engineer-in-Charge.

SECTION 2

GENERAL TECHNICAL CONDITIONS APPLICABLE TO THE ORGANIC WASTE CONVERTER INSTALLATION

2.1 Statutory and Regulatory Compliance

The equipment, its installation, and the resultant compost/output shall comply with the Solid Waste Management Rules, 2016 (Ministry of Environment, Forest and Climate Change) as amended, and with the guidelines/consent conditions of the Bihar State Pollution Control Board and Central Pollution Control Board (CPCB), including norms for bio-degradable waste processing, odour control, and disposal/reuse of processed compost. All electrical components shall conform to relevant BIS/IS standards and Central Electricity Authority (CEA) safety regulations. The stainless-steel chamber and food/waste-contact components shall conform to IS:6911 (Stainless Steel Plate, Sheet and Strip) grade SS304 or better.

2.2 Site Preparation and Civil Interface

The Contractor shall verify the foundation/plinth, electrical supply point, water supply point (for chamber cleaning, if required), and drainage/leachate collection arrangement at the designated location prior to installation, and shall bring to the notice of the Engineer-in-Charge, in writing, any incompatibility between the machine's installation requirements and the site as prepared. Anchor bolts/foundation bolts, if required by the manufacturer, shall be cast/grouted true to the machine's base template.

2.3 Technical Literature, Approval and Pre-Delivery Inspection

The Contractor shall submit the manufacturer's General Arrangement (GA) drawing, technical datasheet, single-line electrical diagram, and type-test/performance-test certificates (capacity, power consumption, and odour/emission performance) for written approval of the Engineer-in-Charge prior to dispatch of the machine. Where called for, the Engineer-in-Charge or his authorized representative shall be entitled to witness factory testing/pre-dispatch inspection of the machine.

2.4 Electrical Installation and Safety

The machine shall be supplied complete with a factory-wired control panel housing the starter, thermal overload/heater-protection relay, moisture-sensor interlock, and indicating lamps/digital display, mounted in a dust- and moisture-protected enclosure of minimum IP54 rating. Power supply shall be drawn from the nearest distribution board through an MCB/isolator of adequate rating, with proper earthing of the machine body and control panel in accordance with IS:3043 (Code of Practice for Earthing). All wiring shall be carried out in conformity with the National Electrical

Code and shall be got tested for insulation resistance and earth continuity prior to commissioning.

2.5 Odour and Environmental Control

The bio-filter/odour-control unit shall be capable of maintaining the ambient odour level at the site boundary within acceptable limits as prescribed by the Pollution Control Board, and shall not cause nuisance to the residents of the housing colony. Leachate, if generated, shall be collected in a sealed sump/container and shall not be permitted to discharge into open drains without treatment. Noise level from the blower/motor assembly shall not exceed 75 dB(A) at 1 metre distance during normal operation.

2.6 Mode of Measurement and Payment

The item shall be measured and paid on a "per number" (each) basis for the complete machine, supplied, installed, tested, commissioned, and handed over in working condition, together with all accessories, starter kit, and training, as described in the item and in this Section, unless otherwise indicated in the Schedule of Quantities.

2.7 Rate to be Inclusive of

The quoted/accepted rate shall be firm and inclusive of the cost of the machine and its standard accessories; all applicable taxes, duties and levies including GST; freight, transportation, loading, unloading and carriage to the installation site; foundation/skid-fixing arrangement; electrical wiring from the nearest distribution point to the machine's control panel (unless the same is covered under a separate electrical sub-head, in which case only the terminal connection shall be included); interconnecting ducting/piping for air blower, bio-filter, and leachate drainage; testing, trial-running, and commissioning; the initial starter kit/inoculum for commissioning of the composting process; training of the Client's operating staff; and cleaning of the site after installation. No claim for extra payment on any of the above accounts shall be entertained.

2.8 Testing, Trial Run and Performance Guarantee

On completion of installation, the Contractor shall carry out a trial run of not less than 15 continuous days (or such longer period as the Engineer-in-Charge may direct) under actual/simulated organic-waste loading, during which the machine shall be demonstrated to process the rated quantity of organic waste per day, to maintain the specified process temperature range, to produce dry, stabilized, odour-free compost within the specified processing cycle, and to operate within the specified power consumption. The machine shall be accepted only after successful completion of the trial run and submission of a performance-test report to the satisfaction of the Engineer-in-Charge.

2.9 Guarantee/Warranty

The machine, its control panel, and all standard accessories shall carry a minimum comprehensive warranty of one year from the date of successful commissioning/handing over, covering manufacturing defects, mechanical breakdown, electrical/control-panel malfunction, and premature failure of the stainless-steel chamber, shaft, paddles, heater, blower, and bio-filter media, under normal conditions of use and loading within the rated capacity. During the warranty period, any defect brought to notice shall be attended to and rectified within 48 hours of intimation, and any part found defective shall be replaced free of cost.

2.10 Operation & Maintenance Manual, Spares and Training

The Contractor shall supply, along with the machine, two sets of the manufacturer's Operation & Maintenance Manual, a recommended list of consumables/spares with sourcing details, and shall impart hands-on training to the Client's designated operating staff/housekeeping agency in daily feeding, moisture management, bio-filter maintenance, and safety precautions, prior to handing over.

2.11 Handing Over

On successful completion of the trial run, the Contractor shall hand over the machine, along with warranty card, O&M manual, electrical drawings, and test/performance certificates, to the Engineer-in-Charge against a signed handing-over certificate.

SECTION 3

ITEM-WISE DETAILED TECHNICAL SPECIFICATIONS

ITEM NO. 1

Nomenclature: Fully Automatic Organic Waste Converter (In-Vessel Aerobic Composting) Machine, Model EF-150, Capacity 150 kg/day, SS304 Chamber

Unit of Measurement: Each **Quantity:** 1

(a) Description and Specification

Supplying, installing, testing and commissioning at site one number fully automatic, skid-mounted Organic Waste Converter machine (in-vessel aerobic composting type), rated processing capacity 150 kg of segregated organic/biodegradable waste

per day, complete with heating, aeration, odour-control and control-panel systems, conforming to the following minimum technical parameters:

(i) Processing chamber: Horizontal/vertical cylindrical chamber fabricated from Stainless Steel SS304 sheet of minimum 3 mm thickness for the inner shell and 2 mm for the outer cladding/insulated jacket, seam-welded and ground smooth, of capacity sufficient to hold not less than 3 days' accumulated feed at rated loading, mounted on a structural MS base-frame/skid.

(ii) Mixing/aeration mechanism: Central rotating shaft fitted with SS304 paddles/blades of number and pitch as per manufacturer's standard, driven through a gear-motor/gearbox assembly of adequate torque rating, providing intermittent (timer-controlled) rotation to ensure uniform mixing, breaking of lumps, and aerobic aeration of the composting mass, without manual intervention.

(iii) Heating system: Electric band/tubular heater(s) of adequate wattage fitted externally/internally to the chamber, controlled through a PID or equivalent temperature controller and RTD/thermocouple sensor, to maintain and hold the process temperature within the range of 50°C to 60°C, with an independent thermal-overload cut-out (heater protection) to prevent dry-run/over-temperature condition.

(iv) Aeration and odour-control system: Integrated air blower of adequate capacity (in m³/hr, as per manufacturer's design) to supply forced/induced air through the composting mass, connected in series to a UV sterilization chamber and a bio-filter/odour-scrubbing unit (activated carbon or biological media type, as per manufacturer's standard), so as to discharge treated, substantially odour-free exhaust air to atmosphere.

(v) Sensors and automatic controls: The machine shall be provided with a moisture sensor to monitor the moisture content of the composting mass and to alert/regulate the process accordingly, an automatic feed-control mechanism/hopper interlock to prevent overloading beyond rated capacity, level sensor(s) as applicable, and a PLC/microprocessor-based control panel with digital display of process temperature, run-status, and fault indication.

(vi) Discharge: The machine shall be provided with a discharge chute/door for periodic removal of processed compost, designed for safe and convenient access by the operating staff, with an interlock (where provided by the manufacturer) to prevent discharge-door opening during active rotation/heating cycle.

(vii) Electrical rating: The complete machine (heater, blower, drive motor and controls) shall operate on single-phase, 230 V $\pm$ 10%, 50 Hz AC supply, with total connected/rated power consumption not exceeding 1.5 kW, and shall be provided with a factory-wired control panel of minimum IP54 protection incorporating MCB,

contactor/starter, and heater-protection relay as described in Clause 2.4 of Section 2 above.

(viii) Process performance: The complete system shall achieve conversion of fresh organic waste into dry, stabilized, pathogen-reduced, substantially odour-free compost within a processing cycle of 24 hours under rated loading and ambient conditions, based on the principle of controlled aerobic decomposition.

(ix) Finish: All external surfaces, frame and cladding shall be powder-coated (colour as approved) over a suitably prepared and primed surface, for corrosion resistance and durability in an outdoor/semi-outdoor waste-yard environment; all SS304 wetted/contact parts shall be left in mill/matt finish, free of weld slag and sharp edges.

(x) Scope of supply: The quoted item shall include the machine complete with all standard accessories and control panel as described above, an initial starter kit/microbial inoculum sufficient for commissioning of the first composting cycle, one-year comprehensive warranty as per Clause 2.9 of Section 2 above, and installation, testing, trial-running and commissioning at the site, complete in all respects as per the manufacturer's specifications and to the satisfaction of the Engineer-in-Charge.

(b) Mode of Measurement

The item shall be measured on "per number" (each) basis for the complete machine, supplied, installed, tested, commissioned, and handed over in working order at the location directed by the Engineer-in-Charge, in accordance with Clause 2.6 of Section 2 above.

(c) Rate shall be Inclusive Of

The rate quoted against this item shall be firm and shall be deemed to be inclusive of the machine, control panel and all accessories referred to in the specification above; all taxes and duties including GST; transportation to site; foundation/skid-fixing arrangement; electrical connection up to the machine's control panel; interconnecting ducting/piping for the blower, bio-filter and leachate drainage; the initial starter kit/inoculum; testing, trial-running and commissioning; training of the Client's operating staff; and cleaning of the site after installation, in accordance with Clause 2.7 of Section 2 above.

(d) Samples, Approval and Quality Assurance

The manufacturer's General Arrangement drawing, technical datasheet, single-line electrical diagram, and performance-test certificates for this item shall be submitted for written approval of the Engineer-in-Charge prior to dispatch, in accordance with Clause 2.3 of Section 2 above. No machine shall be dispatched, installed, or commissioned without such prior written approval.

(e) Trial Run and Performance Guarantee

The machine shall be subjected to a trial run of not less than 15 continuous days under actual/simulated waste loading, and shall be accepted only on successful demonstration of the rated processing capacity, process temperature, compost quality/odour performance, and power consumption specified above, in accordance with Clause 2.8 of Section 2 above.

(f) Guarantee/Warranty

The machine shall carry a minimum one-year comprehensive warranty from the date of successful commissioning, in accordance with Clause 2.9 of Section 2 above. A Warranty Certificate shall be furnished at the time of handing over.

Additional Specifications for Plumbing Works

1. The scope of work which the agency will be required to carry out is detailed as under: -
 - 1.1. **External Water Supply System:**
 - i) Connection from Borewell for entire water requirement of residential buildings.
 - ii) Water transfer pumps for towers will be designed & placed in pump room/s to be constructed along with storage tanks.
 - iii) Water pumping & water distribution System:
Water pumps for Towers will be designed & placed in pump room/s.
 - iv) Garden Hydrant System (Irrigation system):
Garden irrigation pumps & equipment's and distribution system for project will be designed & provided in STP/other locations as required, to be constructed.
 - 1.2. **Sewerage System**
 - i) Collection and Conveyance.
 - ii) Connection to external Sewerage line.
 - iii) Sewage Treatment Plant.
 - 1.3. **Reuse of Treated Water from STP for Flushing & irrigation:**
Equipment's for reuse of water from STP for flushing & irrigation will be placed in proposed plant room of STP/ other locations as required, as covered in work.
 - 1.3.1 Extra treated water received from the STP shall be disposed into the nearby local municipal drain/sewer line or to the UG reservoir for the nearby colonies; permission for the same is to be obtained by the agency from the local municipal authority. Any statutory fee to be paid for this work shall be borne by the agency and reimbursed by the Engineer-in-Charge on production of the original receipt.
 - 1.4. **Storm Water Drainage System:**
Collection and conveyance of excess storm water outside the boundary wall to the local municipal line shall be done through NP3 RCC pipe with manholes as per approved drawing and as per direction of Engineer in charge.
Construction of rainwater harvesting recharging wells as per CPWD Rainwater Harvesting & Conservation Manual-2019/NBCS-2026 and as per guidelines of Central Ground Water Board (CGWB), Ministry of Water Resources, Govt. of India.
 - a) Construction of on ground and underground rainwater structure/ systems for Modular Rainwater Harvesting.
 - b) Rainwater from open surface as well as from roof top would be taken to filtration units. Filtration unit should consist the following units in chronological order: -

- (i) Sedimentation tank (de-silting & oil trap chamber)
- (ii) Filtration through micro-filters of FRP filters or similar arrangements (filtration chamber)
- (iii) Water then would be taken to the Modular Rainwater Harvesting unit.

1.5. Internal Plumbing Works:

- i) Internal water supply system.
- ii) Soil, waste, vent & rainwater pipes
- iii) Disposal to 1st manhole/ storm water drain.
- iv) All sanitary fixtures and fittings.
 - a) To recycle and reuse the products as much as possible recharging the underground water sources.
 - b) To use standard engineering practices.

2. Water Supply System:

The requirement of water supply will be worked out based on parameters / guidelines provided in National Building Construction Standards-2026(as amended up to the last date of submission of bids).

The source of water shall mainly be from:

- 1) Augmentation from boring tube wells as per prevailing practice and CPWD Specification 2019.
- 2) By recycling the treated effluent of the STP for flushing and horticultural purposes.

3. Location for Plant Room & Storages for Project:

3.1. Plant room & water storage tank.

The U.G. water tanks are adjacent to the plumbing & fire fighting plant room having fire pumps, water supply pumps. These services shall act as a centralized system within the respective parts.

4 Materials for External Water Supply System:

- 4.1 All external water supply underground shall be GI 'C' Class pipes as per IS:1239 (Heavy Class)
- 4.2 All external water supply rising main shall be GI 'C' Class pipes as per IS:1239 (Heavy Class) & fittings shall be malleable cast iron fittings as per IS:1879 with welded flanged connections.
- 4.3 All water supply pipes from the UG tank/ STP tank till terrace water tanks etc shall be GI pipes (class-C).
- 4.4 All down water supply pipes exposed on wall and in shafts, on terrace and other exposed area from terrace water tank to individual flats, and any other toilets, kitchens etc. shall be GI 'C' Class pipes as per IS:1239 (Heavy Class).
- 4.5 All water supply distribution pipes laid within toilets, kitchens in ceiling, horizontal runs within the residential units or in concealed chases shall be CPVC pipes and accessories/ fittings.
- 4.6 All tubewell rising mains from tubewell nominal dia to be decided as per the design capacity and shall be double flanged ductile iron pipes of class K-

9 conforming to IS:8329. The specials for ductile iron pipes shall be of class K-12 conforming to IS:9523.

5. Valves:

5.1 Butterfly valves (80mm and above):

Butterfly valves shall be of centric disc construction with single piece body of cast iron with disc of CF 8 stainless steel with nitrile seat and stem shall be of stainless steel. Butterfly valve shall conform to PN 10/16/25 rating and shall be provided with suitable matching flanges compatible with PN 10/16/25 rating of valves.

5.2 Non-return valve (80mm and above):

Cast iron non-return valves of diameter 80mm and above shall be dual plate non-return valve of PN 10/16/25 rating with ductile iron disc and SS 304 spring & hinge pin.

5.3 Ball valves (65mm and below):

Ball valves shall be lever operated, screwed type of gun metal ball valve of PN 10/16/25 rating as per IS:318 with SS ball and SS stem with mild steel lever.

5.4 Non-return valve (65mm and below)

Non-return valves and 65mm and below shall be gun metal non-return valve of PN 10/16 rating (class 2) as per IS:778 with screwed ends.

5.5 Pressure Reducing Valves (Bellow type)

Pressure reducing valves shall be of Gun metal/bronze body with screwed female ends to BSP. Pressure reducing valves shall have high quality Nitrile rubber "O" ring and setting pressure of 1-2Kg/cm² in the downstream side. Provide strainer, isolation & reducing valves

Special type of control valves like pressure reducing valves (PRV) and solenoid valves shall be provided as per requirement to control and regulate the flow of water. PRV's shall be provided at easily accessible location to enable repair / maintenance.

5.6 Air Release Valves.

Air release valves shall be single acting type air valves with cast iron body and bronze/gunmetal internal parts and plastic float.

5.7 Strainers.

Strainers shall be bucket type strainers with gunmetal/bronze body up to 50mm dia and SS-304 body above 50mm dia. It shall have screwed female ends to BSPT, flanged ends to BS:10, Table D and shall have perforated S/S(AISI-304) sheet with large screen area.

6 Sewerage System:

6.1 The external sewage network shall collect the sewage, and flow by gravity for further treatment in the proposed sewage treatment plant located in the basement.

7 **Type of distribution:**

7.1 Generally, all flow shall be by gravity up to the final disposal points. Wherever gravity flow from the discharging units into the external sewer line is not possible a local sewage pumping system shall be provided either directly to the final disposal point or into the external sewer line.

8 **Final Disposal of Treated Effluent:**

The treated effluent from the sewage treatment plant shall be recycled for flushing, gardening purposes etc. Surplus treated water from STP shall be disposed into the nearby local municipal drain/sewer line; permission for the same is to be obtained by the agency from local municipal authority. Any statutory fee to be paid for this work shall be borne by the agency and reimbursed by the Engineer-in-Charge on production of the original receipt.

9 **Appurtenances & Material Specifications for the Sewerage System:**

9.1 **Pipes:**

i. **Upto First Manhole:**

The sewage from the vertical stack shall be carried through the Hub-less centrifugally spun cast iron pipes upto the first manhole as per approved drawing and design.

ii. **NP-3 RCC pipes for storm water & sewerage:**

After first manhole, NP-2/NP-3 of required diameter shall be provided conforming as per IS: 458:2021 for normal slopes and general site conditions and as per design requirements.

iii. **Manholes:**

The manholes shall be constructed of brick masonry as per standard specifications of National Building Construction Standards and shall be having details as follows:

Type 'A' — Rectangular

- i) Rectangular of size 900x800mm upto 0.90-meter depth.
- ii) Rectangular of size 1200x900mm upto 2.5 meter depth.

Type 'B' — Circular

- i) Circular of size 910mm dia for depth upto 1.65 meter.
- ii) Circular of size 1220mm dia for depth above 1.65m and upto 2.3 meter depth.
- iii) Circular of size 1520mm dia for depth above 2.30 meter & up to 9 meter depth.

9.2 **Depths of Manhole:**

- i) On branches — as per approved drawing and required invert level.
- ii) On laterals and mains — as per approved drawing and required invert level.

9.3 **Spacing:**

- i) Manholes shall be provided at all junctions, change of directions, change in diameters as per connection requirements from every unit or as indicated in the approved drawings.

- ii) A distance of 30 meters or less on the main sewer lines as indicated in the approved drawings. conditions.

9.4 Manhole Covers:

The contractor shall provide and fix Steel Fibre Reinforced Concrete (SFRC) manhole covers and frames, manufactured from high-strength concrete of approved grade, reinforced with uniformly distributed steel fibres of approved quality and conforming to the relevant provisions of IS 456, IS 10262, IS 383 and IS 15658, wherever applicable. The SFRC cover shall be factory manufactured using suitable moulding/compaction and controlled curing processes to ensure uniformity, dimensional accuracy, strength, durability and resistance to impact and abrasion.

The SFRC manhole cover shall be designed to withstand the specified vehicular loading without cracking, excessive permanent deformation or failure. The cover shall have a suitable anti-skid/textured top surface and shall be provided with adequate lifting/access holes or suitable lifting arrangement. The frame shall be of SFRC or other approved material, suitably designed and firmly embedded/fixed over the manhole chamber to provide uniform bearing and prevent rocking of the cover during traffic movement.

The cover and frame shall be of suitable dimensions to fit the specified clear opening and shall be accurately aligned and levelled with the finished road/drain surface. The bearing surfaces shall be properly finished to ensure full and uniform contact between the cover and frame. The cover shall be capable of being removed for maintenance by suitable lifting keys/tools.

The SFRC cover shall be tested for load-bearing capacity, permanent set/deformation and other applicable requirements in accordance with IS 1726 (1991) and/or BS EN 124, as applicable to the specified loading class. The load class and test load shall correspond to the intended location and traffic conditions. The manufacturer shall submit test certificates from an approved/NABL-accredited laboratory, wherever required by the Engineer-in-Charge.

The SFRC material shall be dense, homogeneous and free from honeycombing, segregation, cracks, exposed fibres, surface defects and other imperfections that may adversely affect its performance. The steel fibres shall be uniformly dispersed throughout the concrete matrix and shall conform to the manufacturer's approved design mix and technical requirements.

The contractor shall submit shop drawings, material specifications, manufacturer's details, design calculations and test certificates for approval. The SFRC manhole cover and frame shall be procured from an approved manufacturer and the material shall be got approved from the Engineer-in-Charge before execution.

- a) For manholes on service roads having an approximate total load capacity of 40 MT, the SFRC cover and frame shall be designed for the specified service-road traffic loading, with minimum clear opening of 600 mm × 600 mm, unless otherwise specified.
- b) For manholes on main roads having frequent heavy traffic, the SFRC cover and frame shall have a minimum load-carrying capacity of 60 MT, with a minimum clear opening of 600 mm × 600 mm, and shall be suitable for heavy vehicular traffic.
- c) SFRC recessed type/flat type/flushed type chamber cover of 40 MT load-carrying capacity for storm-water drainage shall be provided with adequate drainage openings, as approved by the Engineer-in-Charge, to permit free drainage of surface water while preventing entry of large debris. For recessed type covers, suitable filling material such as lawn grass, paver blocks or other approved material shall be provided as specified. The chamber cover shall be of size 450 mm × 450 mm or 600 mm × 600 mm and suitably fitted on chamber sizes of 600 mm × 600 mm or 900 mm × 900 mm, as applicable.

The rate shall include the cost of SFRC cover and frame, steel fibres, concrete, moulding, reinforcement/fibre incorporation, curing, surface finishing, lifting arrangement, transportation, loading/unloading, fixing, levelling, bedding, all necessary accessories and incidentals, testing and commissioning, complete as directed by the Engineer-in-Charge.

9.5 The following colour codes are recommended for Water Pipes:

Sl.No.	Particulars	Ground colour	First Colour Band	Second Colour Band
(1)	(2)	(3)	(4)	(5)
1	Drinking water	Sea green	French blue	Signal red
2	Treated water	Sea green	Light orange	-
3	Fire water	Fire red	Crimson red	-
4	Cold water from storage tank	Sea green	French blue	Canary yellow
5	Domestic, hot water	Sea green	Light grey	-
6	Untreated sea/river water	Sea green	White	-
7	Filtered water	Sea green	Light brown	-
8	Soft water	Sea green	Light brown	Signal red
9	Sprinkler and Hydrant water	Sea green	White	Signal red

10	Wastewater	Sea green	Canary yellow	Signal red
11	Warm water	Sea green	Light grey	Canary yellow
12	Cooling Water	Sea green	French blue	

10 Sewage Treatment Plant in this Project: As per SH : Electrical, (Part-C) of this NIT.

10.1 Drainage & Rainwater Harvesting System:

10.1.1 Introduction

Due to urbanization of the land and sharp growth in population and thus increase in water demand for various uses, the fresh water is becoming scarce in most regions of the area. In certain areas due to almost total dependency on the underground water, the wells and bore wells are getting deeper and deeper. Also, due to increase in paved surface/roof areas, the amount of natural percolation of rainfall is reducing very drastically.

Therefore, it has become necessary to harvest the rain water as much as possible. The drainage system has been planned with a view to incorporate rainwater harvesting principles as detailed in the NIT.

10.1.2 Irrigation Works:

Irrigation system for Project areas around shall be catered by independent STP treated effluent in Project.

10.2 Storm Water Drainage System:

10.2.1 The system shall be executed as per the approved drawings. The Contractor shall study and verify the Department-issued drawings and specifications before commencement of the work and shall bring to the notice of the Engineer-in-Charge any discrepancy, ambiguity, conflict or site condition affecting execution of the work.

The storm water drainage system provided by the Contractor shall take into consideration the provisions shown in the Department-issued design and drawings, including:

- The slope pattern of site terrain.
- The existing conditions of site and surrounding.
- The final levels and patterns of different type of roads.
- The need for incorporation of rainwater harvesting within the site area.
- Final disposal to external drainage system as per site.

10.3 Bypass arrangement of storm water disposal:

A suitable bypass arrangement for the storm water drainage system shall be provided through the installation of storm water pumping facilities and appropriate sluice gates, located near the modular rainwater harvesting chamber or as required by the design. The collected storm water shall be utilized for groundwater recharge and horticultural purposes.

During periods of heavy rainfall, such as the monsoon season or any instance of high water inflow, the bypass system shall be capable of effectively diverting excess water from the internal drainage network to the municipal

drain. The arrangement should be planned by the agency and submit for approval of Engineer-In-Charge before execution of work.

The capacity of the bypass drainage pumps shall be able to handle a minimum rainfall intensity of 25 mm/hour across the entire site.

11 Internal Plumbing Systems:

11.1 Plumbing System Adopted: - Two pipe (stack) system as recommended in code of practice for soil and waste pipes above ground (IS: 5329 – 1964). The colour coding for pipes shall be as per NBCS 2026. This implies there are separate vertical stacks as per the following: -

- i) Soil pipes shall carry the wastes from WC's & urinals. Soil pipes shall connect directly to manhole outside the building.
- ii) Waste pipes shall carry the wastes from wash basins, sinks, floor drains, etc. Waste pipes shall connect to gully traps outside the building, which shall in turn be connected to the external manholes.
- iii) Rainwater pipes shall also be provided which shall dispose outside the building into the external catch – basin chambers / external drains for rainwater harvesting purpose.

11.2 To ensure that the plumbing system is unhindered, all wet – areas shall be designed with the following structural provisions: -

Details	Requirements/Recommendation
Wet Areas slab to be partially sunk	Approx. 100mm/ or as indicated in approved drawings, sunken area required in wet areas (toilet/wash & kitchen) for connection of wash basins sinks & floor drains. For balconies also, 100mm/ or as indicated in approved drawings sunken, area is required. All traps, soil & waste pipes shall be hanging at ceiling level below, by hanging the pipes with G.I structural supports/dash fasteners and proper clamping etc. with proper slope (1:60). Cleanout plugs shall be provided at the ceiling level below as per detailing. All structural beams at ceiling level should be inverted (upwards oriented) for toilet /kitchen area.

	Cut-outs for traps and WC soil pipes shall be marked and provided before execution. In case any Indian WCs are provided, adequate depth as required for sunken slab shall be provided for that area. However, P-trap shall be hanged with G.I structural supports/dash fasteners and proper clamping etc. at the ceiling level and further connected to the soil pipe. This option is recommended for most wet areas from the point of view of easy cleaning and maintenance of the plumbing systems, as all pipes are accessible from the ceiling for easy repair and replacement. However the decision of the Engineer-in-charge shall be final and binding to the contractor.
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11.3 Fixtures and Fittings (As per Schedule of Sanitary and CP Brass Fittings/Fixtures):

11.3.1 All Sanitary fixtures shall be off-white /pastel colours/special colours vitreous china and of standard quality and make, as per approval of Engineer-in-Charge complying to the preferred makes as per NIT of respective items.

11.3.2 All CP fittings shall be of standard quality and make as per Schedule of Sanitary and CP Brass fittings/fixtures, as per approval of Engineer-in-Charge complying to the preferred makes as per NIT of respective items.

11.4 Materials for Internal Plumbing Soil, Waste & Rainwater Pipes:

Double stack system shall be proposed for drainage system with separate pipes for soil and waste disposal. The soil, waste, vent & rain water pipes shall be designed as per NBCS-2026 with the required colour coding.

11.4.1 Waste pipe from sinks, wash basins, Urinals shall be Hubless Centrifugally Cast (Spun) Iron Pipes of minimum 100 mm diameter/as mentioned in Drawing with epoxy coated inside & outside IS: 15905 with all the required Hubless Centrifugally Cast (Spun) Iron Fittings to make the soil waste and vent pipe system complete and functional in all respects as per drawings approved by Engineer-in-charge.

11.4.2 All suspended soil, waste and vent pipes and fittings (horizontal in toilets/kitchens and vertical in shafts) shall be cast iron hubless pipes (vertical pipes and fittings nominal dia shall be minimum 100mm /as mentioned in Drawing as per IS: 15905 (Epoxy coated inside & outside) and jointing with stainless steel (SS-304) shielded coupling with a double stainless steel bolt and screw housing incorporating an elastomeric rubber gasket

system having low noise level with proper test certificate as per code IS/ASTM including all necessary fittings and fixing by GI lamps, anchor fasteners, Clamps/Channels etc as approved by Engineer in charge.

Note : Horizontal connection pipes and fittings in toilets/ kitchens nominal dia shall be minimum 100mm or required more as per design and , the horizontal main connection pipes from verticle shaft at ground level to STP shall be minimum 200mm nominal dia or required more as per design.

- 11.4.3** All soil & waste and vent pipes and fittings (main headers at Ground level) shall be hubless pipes.
- 11.4.4** For rainwater pipes shall below noise (less than 18 db) system rain water pipes made of hubless including all fittings, grating at inlet face of bend/Tee, collar in the vertical lines should be between 1-2 mtrs and as recommended by the manufacturer and direction of engineer in charge.

12 List of References to be followed with all the amendments upto the last date of submission of bids:

1. Hand book of Water Supply and Drainage, Bureau of Indian Standards.SP-35 (S&T) 1987.
2. Manual of water supply & Treatment–1997, Central Public Health and Environmental Engineering Organization.
3. Manual on Sewerage and Sewage Treatment revised upto 1993 (Ministry of Urban Development, New Delhi), (Govt. of India)
4. Schedule of specifications of C.P.W.D. revised upto 2009, (Govt. of India) with all latest amendments issued from time to time
5. National Building Code -2016 by Bureau of Indian Standards.
6. Code of practice for provision and maintenance of water supplies for firefighting IS: 9668:1990
7. Other relevant ISI codes.
8. Code of basic requirement for water supply, drainage and sanitation IS:1172:1983 by Bureau of Indian Standards.

General Condition and Specification of Horticulture Works

General Condition

1. The work shall be carried out as per CPWD yardstick, CPWD Specification-2019 Vol. I & II and specification Horticulture & Landscaping-2020 with up to date correction slips.
2. The contractor shall take instruction from the officer-in-charge regarding supply and stacking of material at site and execution of work etc. He shall bear all charge for storage and safe custody of materials.
3. All garden rubbish/waste/garbage etc. generated due to any operation from Horticulture works and in lawn areas whatsoever shall be disposed off on daily basis by the contractor to the specified common disposal point and nothing extra shall be paid on this account.
4. The Department shall not be responsible for any injury, or death of any worker at site due to accident during functioning of the equipment or by negligence of the contractor/agency.
5. In case of any restriction imposed for working in the area by the security agencies or any other authorities during events, contractor shall strictly follow such restriction and nothing extra shall be payable to the contractor on this account.
6. In case of absence from duty by labourer, amount shall be recovered @ double of current minimum wages from the contractor's bill.
7. The contractor or his representative should be available at site on every visit, of officer-in-charge as well as visit of senior officers.
8. All cess/duties/taxes as applicable on the date of receipt of tender shall be borne by the contractor. The contractor shall quote his rates considering all such cess/duties/taxes. Contractor must have GST registration. No reimbursement shall be made for taxes paid like GST etc.
9. The GST Bill of each replaced part shall be submitted to the officer in-charge.
10. For execution of Horticulture work, the main agency has to associate with CPWD registered contractor in appropriate Horticulture category duly approved by Engineer- in - charge.
11. The contractor shall be responsible for removal of garden waste from the site and disposed off at designated dumping area or any other composting yard as approved by Engineer-in- charge
12. The agency shall fill the ditches created due to removal of trees by lean cement concrete M-10 free of cost.
13. If girth of trees is 40 to 60 cm at 1.2 m from ground level, transplantation of trees shall be done by agency. Whole payment shall be withheld for 3 years. If trees survive for 3 years after date of completion Rs. 5000/- per tree shall be made after completion of defect liability period

CONDITION FOR PLANTS

1. The plants should be full of fresh and healthy foliage.
2. The plants should be free from insect, pest and disease.
3. Plant should be healthy and vigorous growth.
4. The height of plants will be measured from top of the pots.
5. The plants should be well settled and should not be newly shifted.
6. The plants should be true to the variety and named variety should be tagged.
7. The rejected plants materials should be removed from the site immediately.
8. The plant should be well established and good spread.
9. Pot used for filling the plants should be proper size good quality not damaged.
10. There should be proper drainage in pots/polybag for plants.
11. The Flowering plants should be also having proper and should be true to the variety.
12. All plants should have the tendency of growth and should not be stunned type.
13. There should be no stagnation of water in the pots/polybag.

CONDITIONS FOR HORTICULTURE WORK

- 1 The work shall be carried out as per CPWD yardstick, CPWD Specification-2019 Vol. I & II and specification for Horticulture & Landscaping-2020 with up to date correction slips.
- 2 The contractor shall take instruction from the officer-in-charge regarding supply and stacking of material at site and execution of work etc. He shall bear all charge for storage and safe custody of materials.
- 3 All garden rubbish/waste/garbage etc. generated due to any operation from Horticulture works and in lawn areas whatsoever shall be disposed off on daily basis by the contractor to the specified common disposal point and nothing extra shall be paid on this account.
- 4 The contractor or his supervisor will regularly meet with the site officer-in-charge for taking the direction.
- 5 In case of any causality of shrubs, trees or any other plants, during defect liability period, contractor will have replace the trees/shrubs/other plants of the same height and specification at his own risk and cost and nothing extra shall be paid for the same, in this regard recovery of the Rs. 60/- per shrubs, Rs. 250/- per tree, Rs. 200/- for each other foliage/decorative plants and Rs. 100/- per Sqm. for lawns shall be made. The decision of the Engineer in charge shall be final and binding in this regard.
- 6 The staff deployed for horticulture work must have good knowledge about horticulture works operations like hedge cutting, lawn mowing, planting of trees/seedlings, lawn maintenance, potted plants maintenance etc. and supervisor should be well behaved, experienced and qualified to communicate with the clients, occupants, staff and officers.

- 7 The contractor shall maintain the attendance of staff/labourer deployed at site with authentic proof of attendance, nothing shall be paid extra to the agency on this account.
- 8 The contractor shall have registration with EPFO and ESIC for safeguard the interest of his workers. The contractor shall make deduction on account of EPF & ESIC to labourer /staff deployed by him on the work and will furnish detail of each worker at division office every month.
- 9 All the T&P, related spare parts, its repairing, fuel and other then T&P items like irrigation pipe, hessian cloth, broom etc. required for maintenance shall be arranged by the contractor at his own cost.
- 10 The Department shall not be responsible for any injury, or death of any worker at site due to accident during functioning of the equipment or by negligence of the contractor/agency.
- 11 The contractor will be responsible for police verification of the labourer& permission of vehicles deployed for the execution of work. They have to follow all the security norms/guidelines of the concerned Ministries/Department. A list of workers deployed will have to provide to the Officer-in-charge before starting the work to get the necessary security passes and other security clearance well in advance.
- 12 All the engaged workers are to be equipped with photo identity cards issued by the contractor and contractor will maintain their particulars (i.e. Name, Father's Name, Local Address and permanent address etc.). A copy of the same will be provided to the Officer-in-charge. The expenditure on this account will be borne by contractor and nothing will be reimbursed for it.
- 13 The attendance register shall be maintained by the contractor. Officer-in-charge can verify this register at any time. This will be submitted with each RA bill along with particulars as mentioned above.
- 14 In case of any restriction imposed for working in the area by the security agencies or any other authorities during events, contractor shall strictly follow such restriction and nothing extra shall be payable to the contractor on this account.
- 15 In case of absence from duty by labourer, amount shall be recovered @ double of current minimum wages from the contractor's bill.
- 16 The contractor or his representative should be available at site on every visit, of officer-in-charge as well as visit of senior officers.
- 17 Contractor will have to give payment on minimum wages, fixed by Chief Labour Commissioner, Government of India, as per direction of Officer-in-charge, which are revised time to time through Bank or ECS or online transfer to the Bank account of deployed staff. Any increase in the labourer wages by Chief Labour Commissioner, Government of India subsequently may be retrospective effect, shall be binding to the contractor and labourer shall be paid at the increased rates w.e.f. the date mentioned in the notification.

- 18 All cess/duties/taxes as applicable on the date of receipt of tender shall be borne by the contractor. The contractor shall quote his rates considering all such cess/duties/taxes. Contractor must have GST registration. No reimbursement shall be made for taxes paid like GST etc.
- 19 The contractor shall follow provision of contract labour(Abolition and regulation) ACT 1970 & minimum wages ACT.
- 20 The contractor is bound to distribute the salary / wages to his worker by 7th of each month, positively, by ECS or online transfer to the Bank account of deployed staff, as feasible.
- 21 The following documents should be the part of bill submitted by the agency and Engineer-in-Charge/ authorized representative of Engineer-in-Charge should verify these documents before making payment: -
 - a. Details of employees with date of their engagement.
 - b. Document of payment made to the employees directly in their bank accounts.
 - c. Authentic proof of attendance.
 - d. Document of deposition of ESI & EPF deductions in the employee's accounts. If any bill submitted for payment before deposition of ESI/EPF deductions, then document of deposition of ESI/EPF deduction for the previous month.
 - e. Any penalty imposed on the agency for delay in disbursing payment & deposition of ESI/EPF deductions in the employee's accounts.
 - f. Any other documents required to ensure the disbursing minimum wages on or before time and ESI/EPF deduction deposited in their account timely.
- 22 The contractor shall maintain all garden features in good and healthy conditions during construction period and further for a period of 36 months after the actual date of completion. The maintenance of garden features i/c Complete maintenance of the entire garden features of the garden area i.e. lawn, trees, shrubs, hedge, ground cover etc. and watering, hoeing, making of plants basin, manuring, trimming/clipping and cleaning of hedges, tree plants, shrub plant, spraying of insecticides, fungicides, weeding, mowing of lawn, top dressing of lawn with good earth and manure and removal of the garden waste as per directions and satisfaction of the Engineer- in-charge.

Particular Specification of transplantation of trees

1.1 SCOPE OF WORK

It is proposed to avoid cutting of trees to the maximum extent and instead transplant the affected trees, within the site or in the vicinity, in a phased manner. Trees which are to be transplanted as per the requirement of site and permission from Forest authority shall be done by the contractor. Survey shall be done by the bidder to ascertain the number of trees before starting the work.

The work of transplantation of trees in RBI Patna envisaged to ensure that these valuable trees are transplanted in a scientific manner thereby ensuring that they survive the transplantation procedure. Contractor the transplant the required tree to the location approved by Forest authority and Engineer-in-charge. CPWD reserves the right to make reasonable field adjustment to ensure proper implementation of the said work.

Particular Specifications of work

1.2 GENERAL

GUIDELINES

- 1.2.1** Transplantation of trees from one location to another site is a major operation. The work shall be executed & supervised by a well experienced person in this type of work. Roots investigation, Diagnosis of health & treatment of infected area must be done before initiation. Care must be taken while production of root ball by digging mechanically or manually all around the tree, carefully cutting the roots, then wrapping the root ball in netting. The difficulty is to handle the root ball without causing deformation to it.
- 1.2.2** The work shall be executed & supervised by a well experienced person in this type of work. Analysis of the soil at the proposed transplant site where the tree has to be transplanted shall be carried out. Analysis should include tests of pH, Organic Matter, Major and Trace Elements and Exchangeable cations.
- 1.2.3** The transplantation process including excavation, transporting and planting should be completed within the same day. Shorter transplantation time can provide better conditions for the survival of seedlings.

1.3 PREPARATION OF TREES

- 1.3.1** Formative Pruning: - Selectively remove specific branches to enhance form and improve structure, and to directionally shape the tree. With smaller diameter branches it may be necessary to reduce the branch to a dormant bud. Formative Pruning shall aim to reduce the development of structural weaknesses and to accommodate site constraints and reduce encroachment on utilities as the tree grows.
- 1.3.2** Root Excavation, Preparation, Requirements and Responsibilities: - Root pruning and soaking shall be carried out a minimum desirable period before transplanting. reparation of the root system, that is, a circular partial cutting of the roots all around the tree is to be done before transplanting.
- 1.3.3** Prior to digging, the soil around the root system shall be thoroughly moistened to help keep the root ball together. The root ball shall be excavated around the

outside of the root trench. All exposed roots shall be pruned flush with the face of the root ball. Sharp Blades shall be used to cut the roots. Roots shall be cut in a way that will not jar and loosen the soil in the root ball

1.3.4 The diameter of the excavated root system or soil ball should be five times the diameter of the base of the tree trunk, but not less than 40 cm. The depth of the excavation should be 2 to 3 times of the soil ball's diameter, but not shallower than 25 cm. The depth of the root ball shall depend on each individual tree species. Digging below the root ball shall occur when the number of roots reduces considerably within the root ball trench. Tension shall be applied by the crane while undercutting the root ball.

1.3.5 After being excavated, the tree trunk should be wrapped with protective materials (e.g. sackcloth, canvas). Natural fibre materials that have not been chemically treated shall be used to support the root ball. Synthetic material shall not be used. The root ball shall be encased in biodegradable material such as jute twine, burlap etc. and then wired casing shall be installed over it to provide strength.

**1.4 EXCAVATION
AND
TRENCHING:**

1.4.1 All trenches 1.5 meters or more in depth shall at all times be supplied with at least one ladder for each 20 meters in length or fraction thereof. Ladder shall be extended from bottom of trench to at least 1 meter above surface of the ground. Sides of a trench, which is 1.5 meters, or more in depth shall be stepped back to give suitable slope, or securely held by timber bracing, so as to avoid the danger of sides collapsing. Excavated material shall not be placed within 1.5 meters of edge of trench or half of depth of trenches whichever is more. Cutting shall be done from top to bottom. Under no circumstances shall undermining or undercutting be done.

1.4.2 These safety provisions shall be brought to the notice of all concerned, by display on a notice board at a prominent place at the work spot.

1.4.3 Persons responsible for ensuring compliance with the safety code shall be named therein. by the Contractor.

(i) To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Contractor shall be open to inspection by the CPWD's Representative.

(ii) The Contractor is responsible to protect and maintain the areas of intermediate completed work from damages of the surface due to movement of operational vehicles/manpower or construction equipment, if any.

(iii) All chemicals, pesticides, fungicides to be handled with care and register to be maintained for how empty containers/ cans/bottles are disposed.

(iv) Provision for drinking water, hand washing and toilet arrangement's to be provided to workers by agency.

1.4.4 The Tree must be supported during excavation to prevent damage by falling to one side.

**1.5 PREPARATION
OF RECEPTOR
SITE**

1.5.1 Trees will not tolerate highly compacted soil, which should be broken up over as large an area of the site as possible. Planting pits should be provided with drainage to allow effective percolation of water.

- 1.5.2** Any unsuitable material brought to the surface during excavation shall be removed from site. The planting hole shall be excavated by spade.
- 1.5.3** The root zone and base of trees should be free from shrubs or other planting to facilitate the proper establishment of trees.
- 1.5.4** During pit preparation, the existing topsoil ploughed from digging should be stripped and put aside for reuse as much as possible and to avoid a distinct interface between the planting pit and the surrounding soil.
- 1.5.5** The width and the final depth of a planting hole are determined by the depth and firmness of the root ball and other characteristics of the site. The soil directly beneath the root ball should be undistributed or prepared to prevent settling.
- 1.5.6** In general, the depth of the planting hole shall not exceed the depth of the root ball and the sides of the planting hole should be scarified to facilitate root penetration. In general, the planting hole width should follow international practice at a minimum of 1.5 times the diameter of the root ball to suit the location. If the depth of the hole exceeds the root ball height, compacted soil shall be added to the hole to prevent settling after transplanting. The bottom of the hole shall be de-compacted to a depth of 150 mm and lightly compacted.
- 1.6 TRANSPORTATION**
- 1.6.1** During transporting the tree to the new destination, cushions should be placed between the tree and the body of the vehicle, to avoid damaging the branches. The tree shall be fastened with ropes for safety's sake, regardless of how far it is being transported.
- 1.6.2** Loading, unloading, and handling shall be done gently and dragging shall be avoided while transporting. It shall be ensured that there is no damage to the soil ball or any scratching and splitting of the root system. The tree should be kept intact without injuries to its root system, trunk and crown.
- 1.6.3** The trees being transported shall be kept properly moistened, sheltered and protected from wind, over-watering, strong sunlight, rain, cold weather and theft all the time. The transplanting must be done as soon as root ball has been prepared. In case of delay, the prepared trees shall be stored in shady area and shall be covered with damp mulch.
- 1.6.4** Lifting of trees shall be carried out or supervised by a qualified and/or suitably experienced person and crane operator using a crane and supports.
- 1.6.5** The transport vehicle shall be adequate to transport the tree without damage/congestion of crown.
- 1.6.6** The route shall be selected by the bidder to ensure sufficient vertical and horizontal clearances for the tree transportation and no extra payment shall be made on this behalf by CPWD.
- 1.6.7** The transportation shall not cause public hindrance/ damage to any property in anymanner. Charges/ penalty levied on the agency shall not be paid by CPWD.
- 1.6.8** Crown of the tree shall be carefully wrapped/ tied to each other to minimize the risk of drying, branch damage due to excessive movements, and wind damage.

1.7 PLANTING

- 1.7.1** Excavated soil may be used as backfill if it is free of weeds, deleterious materials and particles larger than 25 mm. When backfilling, sedimentary layers in soil shall be observed so topsoil remains above the subsoil
- 1.7.2** Orientation - The tree shall be orientated at the new site in the best suited direction and as per the requirement of the site.
- 1.7.3** The twine, burlap, and metal cage should be removed from at least the top third of a B&B root ball to avoid poor root growth and root idling.
- 1.7.4** Backfill - The backfilled soil should comprise 40% yellow soil, 20% pond silt, 10% organic fertilizers, 10% peat soil, 20% pumice and 0.1% moisturizer as required. There should not be any rocks or impurities larger than 1 cm in diameter in the soil. Any soil deficiencies shall be rectified prior to placing backfill.
- 1.7.5** Fertilizer and Soil Additives - Requirements of fertilizer and/or other soil additives as per experienced person. The backfill shall be soil injected with a sucrose solution at 20 grams. per litre of water and approximately 100 litres of solution applied per tree. Soil injections of Sucrose Solutions improve the defence systems of stressed trees and increase the volume of new roots. Rooting hormone shall be mixed with the backfill material before the tree is positioned.
- 1.7.6** Tree Support: Supporting structures shall be immediately installed after planting, to prevent tree leaning. Structures of less than 20 cm in diameter should be made up of materials of at least 5 cm in diameter, while structures of over 20 cm in diameter should be made up of materials of at least 10 cm in diameter, and they should be firmly pressed at least 4 inches into the soil. The parts where the trunk is in contact with the structures shall be protected with thick soft materials (such as plastic or fabrics), to avoid injuries to the bark. The trees shall be fastened with ropes. For supporting pre or post transplantation of the trees, Scaffoldings or cranes shall be used.
- 1.7.7** Watering: Immediately following transplantation, each tree shall be soaked to remove air pockets from the soil. It shall be ensured that trees maintain health and are free of water stress at all times. Monitor moisture levels to determine the exact watering requirements to ensure tree survival. Water shall be applied to the entire root area and not just the immediate trunk base.
- 1.7.8** Maintenance: The tree shall be maintained for a period as specified in schedule of quantities by professional horticulturists. Regular inspection & instructions as given in this document should be followed for maintenance. The soil shall be kept constantly moist after transplanting. The excess water shall be drained off in time. During the maintenance period, avoid watering at noon when the weather is hot.
- 1.8 AFTERCARE**
- 1.8.1** Aftercare is vital to transplanting success. In addition to watering, aftercare may also include misting, weeding, mulching, support hardware, and follow-up visits.
- 1.8.2** The quality and quantity of backfill shall be such that it promotes rapid initial root development and does not restrict root spread beyond the planting hole.
- 1.8.3** Mulch shall be used to conserve soil moisture, to buffer soil temperature extremes, to control weeds and other competing vegetation, and to replenish organic matters and nutrients in the soil. The size of the mulched area depends on the size of the tree. Mulch layer around 5 cm thick usually covers

the area where roots will grow during the first two years after planting. However, mulch used shall be free from pests and diseases. The root zone and base of trees should be free from shrubs or other planting to facilitate the proper establishment of trees. Mulch should not be placed too close to the tree trunk or root collar.

- 1.8.4** As the trees are to be transplanted within the site, the transplanted trees shall be protected with robust fencing covering the Root Protection Area.
- 1.8.5** Staking or initial guying used to retain a tree in an upright position until sufficient roots are developed, should be removed, replaced or adjusted as necessary to ensure their effectiveness and to prevent constriction or abrasion damage to the tree. In general, the supports can be removed after the tree establishment. Supports that stay too long without proper adjustment will do more harm than good to the trees.
- 1.8.6** The agency shall carry out social audit and get certified "Survival Assessment report" at the end of each maintenance sub-period (quarterly) to ascertain survival rate.
- 1.8.7** The agency shall adhere to all the technical specifications for carrying out tree transplantation in Patna as issued from time to time by the Department of Forests and Wildlife, Govt. of Bihar.

1.0 SPECIAL CONDITION

- 1.1** The work of transplantation has to be carried out specialized agencies for tree transplantation having experience of tree plantation. The main contractor associated with an agency, who should have satisfactorily completed the said specialized work of amount as mentioned below during the last 7 (seven) years ending previous day of last date of submission of bids.
Three similar works, each of value not less than 40% of ECPT of this item
OR
Two similar works, each of value not less than 60% of ECPT of this item
OR
One similar work, each of value not less than 80% of ECPT of this item.
Similar work shall mean "Tree Transplantation"
- 1.2** The work carried by specialized agencies for tree transplantation approved by any Govt. authority and having experience of tree plantations.
- 1.3** No material, tools, plants, equipment, electricity and water shall be provided by CPWD and nothing extra shall be paid for this.
- 1.4** The agency shall be responsible for safety and security of their material and staff. The agency shall be liable for any damage to other's property / material during the work.
- 1.5** The agency shall be fully responsible for dismantling / demolishing of any stone/concrete structure built around or in the vicinity of the tree required for transplantation of tree and nothing extra shall be paid for this.
- 1.6** The agency shall submit the methodology of tree transplantation before starting the work. Presentation shall be made to CPWD/RBI or any State / Central Govt. to satisfy their requirements to get their Approval. However, CPWD shall extend full support to get this approval.
- 1.7** The girth and height of the tree shall be measured and recorded before start of any activity. Photographs of each tree before start of process of translocation

- shall be submitted by the bidder. The tree shall be geo-tagged before and after tree transplantation.
- 1.8 All permissions needed for tree transportation etc. shall be taken from competent authority by the contractor.
 - 1.9 The entire process of translocation shall be video graphed and submitted fortnightly to CPWD. Penalty of Rs.3,000 per tree shall be imposed if the agency fails to do so.
 - 1.10 The Engineer-in-Charge reserves the right to compensation regarding death or weakening of trees caused by negligence in following the guidelines. Only 50% amount will be paid for every transplanted tree, after defect liability period full amount will be released if transplanted trees survive, if doesn't survive after transplanting nothing shall be paid for this i.e. remaining 50% amount shall be not released.
 - 1.11 Invasive exotic tree species shall not be transplanted.
 - 1.12 Agency shall mandatorily use Tree Spade Machine for Transplanting trees for all girth.
 - 1.13 Wherever operations undertaken are likely to interface with public traffic, specific traffic management plans shall be drawn up and implemented by the contractor in consultation with the prior approval of local police authorities, and /or the concerned officers/ authorities as the case may be.
 - 1.14 Such traffic management plans shall include provision for traffic diversion and selection of alternative routes. If necessary, the contractor shall carry out road widening before commencement of works to accommodate the extra load. The contractor shall be responsible for getting the "Traffic Management Plan" approved from Traffic Police before taking up any construction activity on the road.
 - 1.15 The guiding principles to be adopted for safety in construction zone are to Warn the road user clearly and sufficiently in advance, provide safe and clearly marked lanes for guiding road users and marked buffer and work zones. The contractor shall provide adequate measures that control driver behavior through construction zones.
 - 1.16 The primary traffic control devices used in work zones shall include signs, delineators, Barricades, cones, pylons, pavement markings and flashing lights, deployment of sufficient number of Marshalls on diversion roads.
 - 1.17 Materials hanging over/ protruded from the chassis / body of any vehicle especially during material handling shall be indicated by red indicator (red light/flag) to indicate the caution to the road users.
 - 1.18 Street sweeping and sprinkling of water at access road shall be carried out where ever soil/material is spilled by the agency and as per the directions Engineer in charge. Wheel washing at entry/exit shall be done.
 - 1.19 The agency shall coordinate with other agencies working on the site.
 - 2.0 SAFETY GUIDELINES**
 - 2.1 The contractor shall ensure a safe environment on the landscape area at all times. All safety provisions shall be properly maintained. All safety precautions and requirements shall be strictly complied with at all times.
 - 2.2 Appropriate Personal Protective Equipment (PPE) shall be supplied and maintained for all workers. Minimum PPE shall include a hi-visibility jacket,

- safety shoes and gloves. Supervisors shall undertake a pre-inspection of roadside landscaping works to assess risk, if any.
- 2.3 Vehicle shall be parked off the roadways so as not to obstruct driver's view of the presence of workers. Vehicles shall not, under any circumstances, be driven against the normal flow of traffic.
 - 2.4 Any vehicles used for landscaping should be registered, roadworthy and well maintained.
 - 2.5 Carting material from one side to another to be undertaken in such a manner as to cause minimum amount of pollution.
 - 2.6 Supervisors should meet the workers and instruct them about the safety aspects of the day's activities prior to commencement of works.
 - 2.7 Particular attention and planning is to be given to ensuring that landscaping works does not impede vehicle flow. Concentration needs to be given to the provision of traffic control/security where the work or the location requires the obstruction of the normal roadway.
 - 2.8 10% of the work force/supervisors are to be trained in first aid established and trade supervisor in procedures for the rapid acquisition of emergency works in the event of an accident
 - 2.9 No landscaping or building material are to be stockpiled or unloaded on to the road surface except while being moved into the work area, even then, only when barricaded and signposted with reflective warning signs.
 - 2.10** Payment – Only 50% amount will be paid for every transplanted tree with running bill. After completion of defect liability period i.e. three years after date of completion of project, full amount will be released if transplanted trees survive. If doesn't survive after transplanting nothing shall be paid for this i.e. remaining 50% amount shall be not released.

**Fitting & Inventory Details
Basement Floor**

Sl. No.	Description	Basement Floor
1	Un-Insulated Fire Rated Door	11
2	Glazed Fire door with Fittings in Fire Shaft	4
3	Glazed Fire door with fittings in Stair case & Lift	11
4	Rolling Shutters	4

Tower Grade B & C

Sl. No.	Item	Stilt Floor	1st Floor	2nd Floor	3rd Floor	4th Floor	5th Floor	6th Floor	7th Floor	8th Floor	9th Floor	10th Floor	11 th Floor	12th Floor	13th Floor	14th Floor	Terrace Floor
1	Wall mounted EWC	-	11	12	12	12	12	12	12	12	12	12	12	12	12	12	-
2	Semi Recessed Counter top Wash Basin	-	15	16	16	16	16	16	16	16	16	16	16	16	16	16	-
3	Divyang Toilet WC Pan	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Divyang Toilet Wash Basin	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	Divyang Toilet Accessories set i/c L,U grab bars etc. as per norms	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Toilet Paper Holder	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
7	CP Brass Two way bib cock	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
8	Bottle Trap	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20	-
9	CP Brass Health Faucet	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
10	Concealed Diverter (Mixer) with Spout & Hand shower	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
11	CP Brass Shower rose with arm	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
12	CP Brass Soap Dish	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
13	CP Brass Towel Rod	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
14	CP Brass Towel Ring		12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
15	CP Brass Angle Valve	-	84	84	84	84	84	84	84	84	84	84	84	84	84	84	-
16	Connection pipe	-	40	40	40	40	40	40	40	40	40	40	40	40	40	40	-
17	CP Basin Mixer	-	16	16	16	16	16	16	16	16	16	16	16	16	16	16	-
18	Liquid soap dispenser	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
19	Mirror Size 630 mm X 445mm	-	16	16	16	16	16	16	16	16	16	16	16	16	16	16	-
20	Corner Glass shelf		24	24	24	24	24	24	24	24	24	24	24	24	24	24	
21	Mortice Lock	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20	-
22	Tumbler Holder		12	12	12	12	12	12	12	12	12	12	12	12	12	12	-

Correction...Nil Deletion... Nil Insertion...Nil Overwriting... Nil AE (C) (P) AE(E) (P) EE(C)-I

Sl. No.	Item	Stilt Floor	1st Floor	2nd Floor	3rd Floor	4th Floor	5th Floor	6th Floor	7th Floor	8th Floor	9th Floor	10th Floor	11 th Floor	12th Floor	13th Floor	14th Floor	Terrace Floor
23	Coat Hook		12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
24	Overhead Towel Rack		12	12	12	12	12	12	12	12	12	12	12	12	12	12	-
25	D type 150 mm handle for cupboard	-	44	44	44	44	44	44	44	44	44	44	44	44	44	44	-
26	D type 300 mm handle for cupboard	-	44	44	44	44	44	44	44	44	44	44	44	44	44	44	
27	Cupboard lock	-	24	24	24	24	24	24	24	24	24	24	24	24	24	24	
28	Auto tower bolt	-	24	24	24	24	24	24	24	24	24	24	24	24	24	24	
29	Magnetic Catcher for cupboard	-	44	44	44	44	44	44	44	44	44	44	44	44	44	44	
30	Glazed Fire door with fittings in Fire Shaft	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
31	Glazed Fire door with fittings in Stair case & Lift	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
32	Un-Insulated Fire Rated Door	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
33	Double bowl Kitchen Sink	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	-
34	Sink Mixer	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	-
35	300 MM D TYPE HANDLE BACK TO BACK	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
36	150 MM D TYPE HANDLE BACK TO BACK	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
37	D type 150 mm handle for PH Shaft Doors	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	-
38	ALDROP 200MM FOR PH SHAFT DOOR	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
39	Sliding Latch/Tadi of approved make 250 mm long	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
40	Baby latch with indicator	-	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
41	Magnetic catcher	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20	

Correction...Nil Deletion... Nil Insertion...Nil Overwriting... Nil AE (C) (P) AE(E) (P) EE(C)-I

Sl. No.	Item	Stilt Floor	1st Floor	2nd Floor	3rd Floor	4th Floor	5th Floor	6th Floor	7th Floor	8th Floor	9th Floor	10th Floor	11 th Floor	12th Floor	13th Floor	14th Floor	Terrace Floor
	Door stopper																
42	Hydraulic door closer	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
43	Stainless Steel ball bearing hinges	-	188	188	188	188	188	188	188	188	188	188	188	188	188	188	
44	Magnetic eye/peep holes	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
45	Night lock	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
46	MS Door	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4

Tower Grade D, E & F

Sl. No.	Item	Ground Floor	1st Floor	2nd Floor	3rd Floor	4th Floor	5th Floor	6th Floor	7th Floor	8th Floor	9th Floor	10th Floor	Terrace Floor
1	Wall mounted EWC	1	3	3	3	3	3	3	3	3	5	2	-
2	Semi Recessed Counter top Wash Basin	1	4	4	4	4	4	4	4	4	6	2	-
3	Divyang Toilet WC Pan	-	1	1	1	1	1	1	1	1	-	-	-
4	Divyang Toilet Wash Basin	-	1	1	1	1	1	1	1	1	-	-	-
5	Divyang Toilet Accessories set i/c L,U grab bars etc. as per norms	-	1	1	1	1	1	1	1	1	-	-	-
6	Toilet Paper Holder	1	4	4	4	4	4	4	4	4	5	2	-
7	CP Brass Two way bib cock	1	4	4	4	4	4	4	4	4	5	2	-
8	Bottle Trap	1	7	7	7	7	7	7	7	7	8	2	-
9	CP Brass Health Faucet	1	4	4	4	4	4	4	4	4	5	2	-
10	Concealed Diverter (Mixer) with Spout & Hand shower	-	4	4	4	4	4	4	4	4	5	2	-
11	CP Brass Shower rose with arm	-	4	4	4	4	4	4	4	4	5	2	-
12	CP Brass Soap Dish	1	4	4	4	4	4	4	4	4	5	2	-
13	CP Brass Towel Rod	-	4	4	4	4	4	4	4	4	5	2	-
14	CP Brass Towel Ring	1	4	4	4	4	4	4	4	4	5	2	-
15	CP Brass Angle Valve	4	23	23	23	23	23	23	23	23	27	8	-
16	Connection pipe	2	11	11	11	11	11	11	11	11	13	4	-
17	CP Basin Mixer	1	5	5	5	5	5	5	5	5	6	2	-
18	Liquid soap dispenser	1	5	5	5	5	5	5	5	5	6	2	-

Correction...Nil Deletion... Nil

Insertion...Nil

Overwriting... Nil

AE (C) (P)

AE(E) (P)

EE(C)-I

Sl. No.	Item	Ground Floor	1st Floor	2nd Floor	3rd Floor	4th Floor	5th Floor	6th Floor	7th Floor	8th Floor	9th Floor	10th Floor	Terrace Floor
19	Mirror Size 630 mm X 445mm	1	5	5	5	5	5	5	5	5	6	2	-
20	Corner Glass shelf	1	8	8	8	8	8	8	8	8	10	4	
21	Mortice Lock	-	6	6	6	6	6	6	6	6	7	4	-
22	Tumbler Holder	2	4	4	4	4	4	4	4	4	5	2	-
23	Coat Hook	-	4	4	4	4	4	4	4	4	5	2	-
24	Overhead Towel Rack	-	4	4	4	4	4	4	4	4	5	2	-
25	D type 150 mm handle for cupboard	-	12	12	12	12	12	12	12	12	12	4	-
26	D type 300 mm handle for cupboard	-	12	12	12	12	12	12	12	12	12	4	-
27	Cupboard lock	-	6	6	6	6	6	6	6	6	6	2	-
28	Auto tower bolt	-	6	6	6	6	6	6	6	6	6	2	-
29	Magnetic Catcher for cupboard	-	12	12	12	12	12	12	12	12	12	4	-
30	Glazed Fire door with fittings in Fire Shaft	1	1	1	1	1	1	1	1	1	1	1	1
31	Glazed Fire door with fittings in Stair case & Lift	4	4	4	4	4	4	4	4	4	4	4	-
32	Un-Insulated Fire Rated Door	3	3	3	3	3	3	3	3	3	3	3	1
33	Double bowl Kitchen Sink	-	1	1	1	1	1	1	1	1	1	-	-
34	Sink Mixer	-	1	1	1	1	1	1	1	1	1	-	-
35	300 MM D TYPE HANDLE BACK TO BACK	-	6	6	6	6	6	6	6	6	6	4	-
36	150 MM D TYPE HANDLE BACK TO BACK	-	4	4	4	4	4	4	4	4	5	2	-
37	D type 150 mm handle	6	6	6	6	6	6	6	6	6	6	3	-

Correction...Nil Deletion... Nil Insertion...Nil Overwriting... Nil AE (C) (P) AE(E) (P) EE(C)-I

Sl. No.	Item	Ground Floor	1st Floor	2nd Floor	3rd Floor	4th Floor	5th Floor	6th Floor	7th Floor	8th Floor	9th Floor	10th Floor	Terrace Floor
	for PH Shaft Doors												
38	ALDROP 200MM FOR PH SHAFT DOOR	6	6	6	6	6	6	6	6	6	6	3	-
39	Sliding Latch/Tadi of approved make 250 mm long	1	4	4	4	4	4	4	4	4	5	2	-
40	Baby latch with indicator	1	4	4	4	4	4	4	4	4	5	2	-
41	Magnetic catcher Door stopper	-	6	6	6	6	6	6	6	6	6	4	-
42	Hydraulic door closer	4	1	1	1	1	1	1	1	1	1	1	-
43	Stainless Steel ball bearing hinges	37	54	54	54	54	54	54	54	54	63	31	-
44	Magnetic eye/peep holes	-	1	1	1	1	1	1	1	1	1	1	-
45	Night lock	-	1	1	1	1	1	1	1	1	1	1	-
46	MS Door	-	-	-	-	-	-	-	-	-	-	-	3

Regional Director Bungalow

Sl. No.	Description	Ground Floor	1st Floor	Terrace Floor
1	Wall mounted EWC	6	2	-
2	Semi Recessed Counter top Wash Basin	7	2	-
3	Toilet Paper Holder	6	2	-
4	CP Brass Two way bib cock	6	2	-
5	Bottle Trap	8	2	-
6	CP Brass Health Faucet	6	2	-
7	Concealed Diverter (Mixer) with Spout & Hand shower	3	2	-
8	CP Brass Shower rose with arm	3	2	-
9	CP Brass Soap Dish	6	2	-
10	CP Brass Towel Rod	6	2	-
11	CP Brass Towel Ring	6	2	-
12	CP Brass Angle Valve	32	8	-
13	Connection pipe	16	4	-
14	CP Basin Mixer	7	2	-
15	Liquid soap dispenser	6	2	-
16	Mirror Size 630 mm X 445mm	6	2	-
17	Corner Glass shelf	12	4	
18	Mortice Lock	8	5	-
19	Tumbler Holder	6	2	-
20	Coat Hook	5	2	-
21	Overhead Towel Rack	5	2	-
22	D type 150 mm handle for cupboard	8	8	-
23	D type 300 mm handle for cupboard	8	8	-
24	Cupboard lock	4	4	-
25	Auto tower bolt	4	4	-
26	Magnetic Catcher for cupboard	8	8	-
27	Glazed Fire door with fittings in Fire Shaft	0	0	-
28	Glazed Fire door with fittings in Stair case & Lift	0	0	-
29	Un-Insulated Fire Rated Door	0	0	-
30	Double bowl Kitchen Sink	1	0	-
31	Sink Mixer	1	0	-
32	300 MM D TYPE HANDLE BACK TO BACK	8	5	-
33	150 MM D TYPE HANDLE BACK TO BACK	7	2	-
34	D type 150 mm handle for PH Shaft Doors	0	0	-
35	ALDROP 200MM FOR PH SHAFT DOOR	0	0	-

Sl. No.	Description	Ground Floor	1st Floor	Terrace Floor
36	Sliding Latch/Tadi of approved make 250 mm long	6	2	-
37	Baby latch with indicator	6	2	-
38	Magnetic catcher Door stopper	7	5	-
39	Hydraulic door closer	1	0	-
40	Stainless Steel ball bearing hinges	53	26	-
41	Magnetic eye/peep holes	1	0	-
42	Night lock	1	0	-
43	MS Door	0	0	1

Community Center

Sl. No.	Description	Ground Floor	1st Floor	2nd Floor	Third Floor	Terrace Floor
1	Wall mounted EWC	12	10	6	0	-
2	Urinal	4	6	3	0	
3	Semi Recessed Counter top Wash Basin	13	12	6	0	-
4	Toilet Paper Holder	12	10	6	0	-
5	CP Brass Two way bib cock	12	10	6	0	-
6	Bottle Trap	13	16	9	0	-
7	CP Brass Health Faucet	12	10	6	0	-
8	Concealed Diverter (Mixer) with Spout & Hand shower	3	1	0	0	-
9	CP Brass Shower rose with arm	3	1	0	0	-
10	CP Brass Soap Dish	13	12	6	0	-
11	CP Brass Towel Rod	3	1	0	0	-
12	CP Brass Towel Ring	13	12	6	0	-
13	CP Brass Angle Valve	32	34	20	0	-
14	Connection pipe	6	6	2	0	-
15	CP Basin Mixer	13	12	6	0	-
16	Liquid soap dispenser	13	12	6	0	-
17	Mirror Size 630 mm X 445mm	13	12	6	0	-
18	Corner Glass shelf	6	2	0	0	
19	Mortice Lock	17	13	9	0	-
20	Tumbler Holder	0	0	0	0	-
21	Coat Hook	0	0	0	0	-
22	Overhead Towel Rack	0	0	0	0	-
23	D type 150 mm handle for cupboard	4	0	0	0	-
24	D type 300 mm handle for cupboard	4	0	0	0	-
25	Cupboard lock	2	0	0	0	-
26	Auto tower bolt	2	0	0	0	-
27	Magnetic Catcher for cupboard	4	0	0	0	-
28	Glazed Fire door with fittings in Fire Shaft	2	2	2	2	-
29	Glazed Fire door with fittings in Stair case & Lift	2	2	2	7	-
30	Un-Insulated Fire Rated Door	4	4	4	4	-
31	Double bowl Kitchen Sink	0	2	4	0	-
32	Sink Mixer	0	2	4	0	-
33	300 MM D TYPE HANDLE BACK TO BACK	17	13	9	0	-
34	150 MM D TYPE HANDLE BACK TO BACK	5	2	0	0	-
35	D type 150 mm handle for PH Shaft Doors	2	2	2	0	-
36	ALDROP 200MM FOR PH SHAFT DOOR	2	2	2	0	-
37	Sliding Latch/Tadi of approved make 250 mm long	5	2	0	0	-
38	Baby latch with indicator	5	2	0	0	-
39	Magnetic catcher Door stopper	15	13	11	0	-
40	Hydraulic door closer	17	13	11	0	-
41	Stainless Steel ball bearing hinges	81	64	44	0	-
42	MS Door	0	0	0	1	2

GENERAL SCHEDULE AND SPECIFICATION FOR THE WORK

The scope of work shall include the supply, fabrication (where applicable), transportation, laying, installation, testing, commissioning, and fixing, complete in all respects, of all the items specified herein and shown in the approved drawings, so as to make the building fully functional and complete to the satisfaction of the Engineer-in-Charge. The quoted rates shall be deemed to include all incidental works, materials, labour, tools and plants, consumables, accessories, fittings, and any other items required for the satisfactory completion and functioning of the building, whether or not specifically mentioned. No extra payment shall be made on this account. The work shall be executed in accordance with these specifications, the relevant CPWD Specifications, the approved drawings, and the directions of the Engineer-in-Charge. -

Item No	DESCRIPTION	BRIEF SPECIFICATIONS/Guide lines
1.	GENERAL SPECIFICATIONS/ GUIDELINES	All the items of Delhi Schedule of Rates are in the scope of work against the tender, as may be applicable, as per approved Good For Construction drawings. CPWD specifications Vol - I and Vol - II 2019 with upto date correction slips as amended from time to time shall be applicable for all the items to be executed as per Good for Construction drawings. Provisions contained in harmonized guidelines & standards for universal Accessibility in India 2021 (available on CPWD website) of ministry of housing and urban affairs, government of India shall be complied. C&D waste products and recycled aggregates to the extent provided in is codes shall be used as per extant provisions of green building measures. Type of cement to be used in the work shall be as per provisions of is: 456 with regard to exposure conditions including sulphate attack. Only Potable water shall be used in the work. DSR items are only indicative, items are to be executed for all heights and all levels. Provision contained in GRIHA 5 Star Rating norms.
2.	Earthwork, Foundation and Plinth	1.Scope of work includes all items of DSR as contemplated in the Sub Head Earthwork of DSR (including bailing and pumping out water, strutting etc.) as may be applicable to the work as per design and drawings submitted by the contractor and as confirmed by the Engineer-in-Charge and are to be executed as per CPWD specifications. 2. Surplus excavated earth shall be disposed of by the contractor after remittance of due royalty to concerned authority, as applicable, by the contractor.

Item No	DESCRIPTION	BRIEF SPECIFICATIONS/Guide lines
		3. Filling available earth or earth brought from outside shall be done as per requirement to level the ground as per approved drawings. 4. Plinth filling shall be done as per the recommendation of the soil investigation report or with earth suitable for plinth filling including filling of sand of grading zone IV or V as per CPWD specifications and thickness as per drawing. 5. Anti-termite treatment as per the necessity of ground shall be carried out as per relevant Indian standard codes/ CPWD specifications. 6. Structural/Non- Structural Grade slab as per the necessity at site/design requirement and as per the functional requirement of supported flooring shall be provided as per approved drawings or as per direction of Engineer-in-charge. 7. Damp proof course shall be provided wherever required as per CPWD specification. 8. Drainage and Plinth protection along the perimeter of the buildings shall be provided as per CPWD specifications or as per specific functional requirement or as indicated in the approved drawings.
3.	Superstructure	Tower B & C (S+14) Storey above basement and Tower D & E (G+10) Storey above basement shall be constructed using Monolithic Concrete construction system using Aluminium Formwork as per approved drawings. Remaining structure shall be constructed as RCC framed structure as per approved drawings. RCC work shall be executed with design mix concrete as specified in the approved Good For Construction drawings. Minimum Fe-550 D grade low alloy steel as per provisions contained in Note-3 of Para 4.2 of amendment number 3 to IS 1786 shall be used in the work. Expansion joints/seismic separation joints shall be provided as per the approved structural drawing and treated and covered as per CPWD specifications / manufacturer specifications. The Structural Steel shall be made at least 2 hrs fire resistant by using Intumescent Fire Paint/ Vermiculite coating as per manufacturer's specifications and by applicators approved by them in case measures stipulated in NBCS 2026 are not possible to adopt. /. Non- structural External walls and internal partitions / walls of the super structure shall be provided as per Schedule (Civil) No. 1
4.	Flooring	1. Flooring shall be provided as per Schedule (Civil) No. 2. 2. Skirting minimum 100 mm high to be provided as per functional and architectural requirement, or as per approved drawings.

Item No	DESCRIPTION	BRIEF SPECIFICATIONS/Guide lines
		3. Leveling course to be provided on the top of RCC slab before laying flooring as per site requirement, if required
5.	Doors, windows ventilators, fittings & fixtures,	1. Doors, windows, ventilators including fittings fixtures and glazing shall be provided as per Schedule (Civil) No 3. 2. Windows along with glazing shall be designed for wind loads applicable to the area/location as per relevant IS codes. 4. Wherever required for security concerns, SS 304 grills in windows as per approved design shall be provided as per Schedule (Civil) No. 9 5. Curtain rods of Stainless steel shall be provided as per requirement at as per Schedule (Civil) No 3. 6. Blinds vertical / horizontal / roller of approved make and opacity shall be provided at windows at as per Schedule (Civil) No 3.
6.	Internal finishing Painting, wall paneling, dado, false ceiling	Internal finishing like painting, wall paneling, dado, false ceiling shall be provided as per Schedule (Civil) No. 4
7.	Cupboards, wardrobe & kitchen cabinets /Modular kitchen	Cupboards, wardrobe & kitchen cabinets/modular kitchen in kitchen shall be provided as per Schedule (Civil) No. 5
8.	External finishing Painting, Cladding, Structural glazing	1. External finishing including painting, cladding, structural glazing shall be provided as per Schedule (Civil) No. 6 2. Structural glazing/cladding system shall be designed for applicable wind loads, thermal expansions and seismic movements.
9.	Internal Water Supply, Sanitary lines and fittings fixtures	1 Dual piping system shall be provided as per Schedule (Civil) No. 7 wherever recycled water is used for flushing. Separate pipe lines for hot and cold-water supply shall be provided. Pipe lines and their accessories shall be of approved make. 2. Plumbing shall have provision for Geysers, water purifier, washing machines, Dish washers, cage washers or any other equipment as per functional requirement as per Schedule (Civil) No. 7. 3. In toilets and other waste water disposal areas sanitary pipe lines shall be suspended from the floor slabs i.e. the floor slabs should not be depressed on account of accommodating sanitary lines. These overhanging sanitary lines shall be camouflaged by moisture resistant false ceiling (GI Metal).

Item No	DESCRIPTION	BRIEF SPECIFICATIONS/Guide lines
		4. Plumbing system shall be provided as per the approved drawings and the functional requirements of the buildings. 5. Double stack system shall be followed. All sewerage to be connected to one stack and all drainage to be connected to other stack. 6. Water supply and sanitary fittings shall be provided as per the functional and architectural requirements. 7. Exposed pipes shall be placed over saddle duly fixed to the wall by bracket. 8. All drainage in balconies shall have their inlets in plan. All drainage through balconies shall be connected to Rain Water Harvesting. 9. Utility balcony drainage shall be suitably treated and shall be not connected to Rain Water Harvesting System. 10. For high rise buildings (Buildings whose height is more than 15m) - the stacks shall be provided in shafts and the shafts shall be opening in balconies, shafts shall be covered with weather proof doors and accessible from balconies for maintenance.
10.	External Water supply pipelines & sewage lines. Fittings & fixtures/chambers Sewage pipeline Fitting & fixtures/ chamber	1. External water supply & sanitary installation fittings and fixture shall be provided as per Schedule (Civil) No. 8 2. Dual piping system shall be provided, as required, where recycled water is used for flushing, Horticulture, firefighting purposes and for cooling towers for chiller units. 3. Inspection chambers/manholes/ gullies chambers/ valves and other accessories of approved specifications and make shall be provided considering all the site conditions and reduced level as per design parameters. As far as possible green and recyclable materials shall be preferred, as per approved drawings.
11.	Road's/footpaths/ kerb stones Parking, Signages Compound wall & gate Horticulture & landscaping. Rain water harvesting.	1. Reinforced Cement Concrete (Tremix Concrete) – wearing course. Minimum 200mm thick Wet mix macadam/150 mm thick dry lean concrete base course as per approved drawings. 2. Minimum 250mm thick Granular sub base outside podium area. More thickness to be provided as per design considering actual ground conditions and traffic load. 3. Footpaths shall be provided as per requirement and design with 60mm thick factory-made interlocking paver blocks of M-35 grade / 16 mm thick factory-made chequered cc tiles/vitrified tiles. Factory made Kerb stones of required sizes along the sides of roads and footpaths shall be provided as indicated in the approved drawings.

Item No	DESCRIPTION	BRIEF SPECIFICATIONS/Guide lines
		4. Retro-reflective sign boards shall be made of aluminium/Stainless steel sheet supported on epoxy painted MS/SS frame work as per approved drawings. 5. Road markings shall be with thermoplastic reflective paint. SS-304 motorized entrance gates with RCC/Steel support structure with provision for security guard rooms, toilet etc. 6. Compound wall of required height shall be provided wherever required with RR masonry/Brick masonry/RCC/Precast with RCC and MS grills as per the approved architectural drawing and structural drawings. 7. Horticulture and landscaping shall be carried out as per approved horticulture plan and specifications. 8. Rainwater harvesting system shall be designed and provided as appropriate to the site and as per Municipal byelaws and Central Ground Water Board norms. 9. Roof top rain water has to be harvested. 10. Storm water drains shall be provided wherever required with RR masonry/Brick masonry/RCC/Precast RCC/non-pressure RCC pipes/HDPE pipes as per approved development plan and site conditions. (i) NP3 / HDPE pipe of required diameter including testing of joints as per specification shall be provided at road crossings. (ii) Manholes of required dia and depth shall be provided with brick wall (with Sewer Bricks/CD-100 bricks) as per CPWD specifications or IS codes. In adverse sub soil conditions, manholes and sewer lines pipes shall be appropriately designed and provided..
12.	Waterproofing treatment	1. Waterproofing treatment shall be done as applicable and as required on terraces, sunken slabs, toilet slabs, lift pits, basement rafts & walls, water tanks, UG sumps, OHTs and any other liquid retaining structures as per Schedule (Civil) No. 9 Water stops shall be provided in construction joints of liquid retaining structures
13.	Railings & grills	1. Stainless steel of grade SS 304 grade railings and grills shall be provided as per architectural design in Balconies, staircases, steps, Ramps corridors and in other common circulation areas as indicated in drawings and in accordance with provisions of NBCS 2026 as per Schedule (Civil) No. 10

14.	Facade/Jalis of shaft	Aluminium louvers, GFRC (Glass fibre reinforced concrete)/WPC (Wood Polymer Composite) CNC curtain jalis to cover exposed Rain water pipe shafts, Toilet shafts and other areas shall be provided as per requirement and as per approved drawings. The sections for fixing of such jalis shall be designed as per codal provisions to withstand wind loads, seismic movements etc. as per Schedule (Civil) No. 10
15.	Miscellaneous	All shafts (Civil and E&M) shall be appropriately closed horizontally and covered with appropriate door system vertically. This arrangement may be augmented as per fire requirements. Accessible roofs shall have parapets.

SCHEDULE OF FINISHES

Schedule (Civil) No. 1			
Schedule of Walls			
External Walls			
S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	All partition works other than structural walls.	AAC block partition walls as per DSR'23 Item No. 6.5, 6.38 and 6.47 and CPWD Specifications 2019 with upto date correction slips as per the drawings. Brick work in toilets shall be of common burnt clay F.P.S. brick as per DSR'23 Item No. 6.1.1, 6.5 and 6.13.1 and CPWD Specifications 2019 with upto date correction slips as per the drawings.	Fiber mesh shall be provided over the AAC wall surface before plaster, extending with the specified overlap onto the adjoining RCC members as approved by Engineer-in-charge.
Internal Walls (Dry Area)			
S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	All partition works other than structural walls	AAC block partition walls as per DSR'23 Item No. 6.5, 6.38 and 6.47 and CPWD Specifications 2019 with upto date correction slips as per the drawings.	Fiber mesh shall be provided at junction of concrete and block masonry.
Internal Walls (Wet Area)			

S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	All partition works other than structural walls	Brick work in toilets shall be of common burnt clay F.P.S. brick as per DSR'23 Item No. 6.1.1, 6.5 and 6.13.1 and CPWD Specifications 2019 with upto date correction slips as per the drawings.	Fiber mesh shall be provided at junction of concrete and block masonry.
Schedule (Civil) No. 2			
Schedule of Flooring			
S. No.	ROOM/ SPACE/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	Basement Parking & Driveways, Podium / ground floor level, ramp and other similar area as per approved drawings.	Tremix- Cement concrete as per DSR'23 Item No. 16.75	Road marking strips shall be provided as per DSR'23 Item No. 16.62 and as per approved drawings.
2.	Living/dining area, all bedrooms, dressing room, Pooja Room, Office, Study Room, Servant Room, kitchen, Residential welfare office and other area as per Drawings.	800 mm x 800 mm Full body homogenous vitrified tiles as per DSR'23 Item No. 11.41.3	800 mm x 800 mm Full body homogenous vitrified tiles with 100 mm high skirting as per DSR'23 Item No. 11.47 shall be provided at locations of Full body homogenous vitrified tiles flooring or as per approved drawings.
3.	Service Rooms, Meter Room, Control Room, Security room, Pump room, Electrical Panel room, Store Room, HVAC room, and other area as per	25 mm thick Kota stone slab flooring as per DSR'23 Item No. 11.26.1.	20 mm thick Kota stone slab skirting 150 mm high as per DSR'23 Item No. 11.27 shall be provided at locations of Kota Stone flooring or as per approved drawings.

	approved drawings.		
4.	All Balconies.	150x1200 mm Glazed Vitrified tiles Matt/Antiskid finish as per approved drawings. Glazed Vitrified tiles in floor (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS:15622, of approved brand & manufacturer, in all colours and shade, shall be laid on 20 mm thick cement mortar 1:4 (1 cement: 4 coarse sand) jointing with grey cement slurry @3.3 kg/sqm including grouting the joints with white cement and matching pigments etc. The tiles must be cut with the zero chipping diamond cutter only . Laying of tiles will be done with the notch trowel, plier, wedge, clips of required thickness, levelling system and rubber mallet for placing the tiles gently and easily.	Dado of 150 mm x 1200 mm full body anti-skid vitrified tiles up to a height of 150 mm on balcony parapet wall and 1200 mm on remaining walls as per approved drawings. Glazed Vitrified tiles in skirting/ dado shall be fixed with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3 mm thickness.
5.	Lobby, entrance lobby, lift lobbies, common circulation space of building, Kids bicycle space and other area as per Drawings.	18 mm thick Polished Granite stone slab Flooring of colour Black, Cherry/Ruby Red or equivalent as approved by Engineer-in-charge as per DSR'23 Item No. 11.56.1	Exposed edges of granite at all locations shall be finished with molding / edge champhering with high gloss finish.
6.	Stilt floor	Anti-skid/ Matt finished vitrified parking tile (minimum thickness of 12 mm) of size not less than 400x400 shall be laid on 20mm thick base of cement mortar 1:4 (1 cement : 4 coarse sand) in all shapes & patterns including grouting the joints with white cement mixed with matching pigments etc. complete as direction of Engineer-in-Charge.	
7.	Terrace Floor.	Heat Resistant Terrace tiles of size 300 mm x 300 mmx 20 mm as per DSR'23 Item No. 12.55.	
8.	Lift Lobby and other area as per	18 mm thick Polished Granite stone slab of colour Black, Cherry/Ruby Red or equivalent. Polished Granite stone slabs 18 mm thick in	Full-height polished granite stone cladding shall be provided up to the underside

	approved drawings.	risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar 1:3 (1 cement: 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.	of the beam or up to the false ceiling level, whichever is applicable or as per approved drawings.
9.	All Staircase	18 mm thick flamed finish Granite stone flooring of colour Jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent as per DSR'23 Item No. 11.55.1	Exposed edges of granite at all locations shall be finished with molding / edge champhering with high gloss finish. Treads and risers shall be provided in single piece of stone. Treads shall have non slippery grooves or strips near edges. Provide double nosing on the exposed face of each tread using an additional granite slab of 18 mm thick, securely fixed to the underside with approved adhesive, in accordance with the approved design and drawings.
10..	All Staircase Riser/ Dado	18 mm thick Polished Granite stone slab of colour Black, Cherry/Ruby Red or equivalent. Polished Granite stone slabs 18 mm thick in risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar 1:3 (1 cement: 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.	1500 mm high Polished Granite Dado shall be provided. Dado edge shall be properly secured in the wall with suitable locking arrangement. A double-moulded polished granite beading shall be provided at the top of the 1500 mm high dado, formed by fixing two granite stone slabs back-to-back with approved adhesive, in accordance with the approved design and drawings.
11.	Granite Work Sills of windows/ ventilators, facias, ledge wall tops,	18 mm thick gang saw cut, mirror polished, premoulded and prepolished, machine cut granite shall be provided as per DSR'23 Item No. 8.2.2.	Exposed edges of granite at all locations shall be finished with moulding / edge

	parapet wall top and similar locations, granite top over RCC kerb wall of height 150 mm in balconies.		chamfering with high gloss finish.
12.	Toilets / Bath Rooms/Kitchens walls as per Drawings.	600 x 1200 Glazed Vitrified Tile Providing and laying 600 x 1200 Glazed Vitrified wall tiles (thickness to be specified by manufacturer), with water absorption less than 0.08 % and conforming to I.S. 15622, of approved make, in all colours & shade, in walls, skirting, riser of steps, with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3 mm thickness.	Wall tile in toilets shall be provided up to false ceiling or up to beam bottom. Wall tile in kitchen shall be provided above kitchen platform up to cabinet bottom on all counter walls as per approved drawing.
13.	UG Tank Wall	600 x 600 Glazed Vitrified Tile Providing and laying 600 x 600 Glazed Vitrified wall tiles (thickness to be specified by manufacturer), with water absorption less than 0.08 % and conforming to I.S. 15622, of approved make, in all colours & shade, in walls, skirting, riser of steps, with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3 mm thickness.	
14.	UG Tank Floor, Toilets / Bath Room/Changing rooms and other area as per drawings.	600 x 600 Glazed Vitrified Tile antiskid/matt finish as per DSR'23 Item No. 11.41A3.1.	
15.	Kitchen countertop	Providing and fixing minimum 18 mm thick engineered quartz stone countertop of approved make, colour and shade, comprising not less than 90% natural quartz, machine cut to the required size and shape with polished top surface and exposed edges finished with machine-polished bullnose/bevel/chamfer profile as directed by the Engineer-in-Charge.	The countertop shall be fixed over the prepared base using approved polymer-based adhesive/epoxy, with all joints finished neatly using colour-matched epoxy. The item shall include cutting, edge polishing, making holes/openings for sink, mixer taps, plumbing and electrical fittings, notching,

			rounding of corners, sealing of joints with approved silicone sealant wherever required, and all labour, tools, plants, materials, handling, loading, unloading, carriage, wastage, and incidental works complete as per the directions of the Engineer-in-Charge
16.	Indoor games Area, Kids play area & yoga Room	38 mm thick wood block flooring of first class teak wood laid over 25 mm thick leveling layer of cement concrete 1:2:4 as per as per DSR'23 Item No. 11.34 .	
17.	Badminton Court / Multipurpose Hall.	Sprung wooden floor with PVC/vinyl badminton mat over self levelled IPS flooring as per particular specifications.	
18.	GYM	EPDM Rubber Flooring above IPS Flooring as per particular specifications.	Cement concrete flooring shall be done as per DSR'23 Item No. 11.4.
19.	As per accessibility requirement and as per approved drawings.	Tactile tile as per DSR'23 Item No. 16.90.	

Schedule (Civil) No. 3

Schedule of doors windows, ventilators including fittings, fixtures and glazing details				
Doors				
S. No.	ROOM/ SPACE/ LOCATIONS	Size	DESCRIPTION OF ITEM/ BRIEF SPECIFICATION	REMARKS
1.	Main door, Bedrooms, Study room, Stores, Office room, Pooja room, Servant room and other similar locations in quarters/ community center/ ancillary buildings as per approved drawings.	35 mm thick decorative type flush door shutters of sizes as per approved drawings	35 mm thick decorative type flush door shutters of sizes as per approved drawings shall be provided as per DSR'23 Item No. 9.20.1. Flush door shall be fixed with second class teak wood door frame as per DSR'23 Item No. 9.1.1 with wooden moulded beading / Architrave of 2nd class teak wood of width up to 125 mm and as per approved design & drawings.	Flush Door shutters shall be fixed with door frames using SS Ball Bearing hinges of approved size by Engineer-in-charge or as shown in approved drawings. Flush Doors shall be provided with all fittings in SS 304 grade as per inventories detailed in tender document/ approved drawings.
2.	Plumbing shafts, toilets and other similar locations as per approved drawings	30 mm thick solid decorative type WPC flush door shutters of sizes as per approved drawings.	30 mm thick solid decorative type WPC flush door shutters of sizes as per approved drawings shall be provided as per DSR'23 Item No. 26.88.1. WPC shutters shall be fixed with WPC door frame as per DSR'23 Item No. 26.86.2 with all necessary fittings in SS 304 grade as per inventories detailed in tender document/ approved drawings.	Flush Door shutters shall be fixed with door frames using SS Ball Bearing hinges of approved size by Engineer-in-charge or as shown in approved drawings.

3.	All staircases, Lift Lobbies and as per approved drawings.	Glazed fire resistant door shutters of 120 minutes Fire rating	Glazed fire resistant door shutters of 120 minutes Fire rating of sizes as per approved drawings shall be provided as per DSR'23 Item No. 9.162. Fire resistant door frame shall be of sizes as per approved drawings shall be provided as per DSR'23 Item No. 9.161. Fixed frame for fire resistant glazed partition if required shall be provided of sizes as per approved drawings shall be provided as per DSR'23 Item No. 9.163. Glazing in fire resistant door shutters, fixed panels & partitions etc. shall be provided of sizes as per approved drawings shall be provided as per DSR'23 Item No. 9.164.	All necessary Fire door fittings (Fire Rated) as per approved drawings/ manufacturer specifications/ required as per NBSC 2026, shall be provided along with Fire Doors and shutters.
4.	Electric shaft, LV shafts, fire hydrant shaft, HVAC shafts, and other similar locations as per approved drawings.	Aluminium Louver door	Polyester Powder Coated Aluminium louvered door complete with aluminium frame, louvers, hardware, and accessories, of approved design and color, as per the approved drawings and as per DSR'23 Item No. 21.1.	
5.	All Balcony door & Kitchen Utility balcony.	uPVC 3-Track sliding door /casement door in sizes as indicated in approved drawings.	Factory-fabricated uPVC 3-Track sliding door /casement door shall be provided as per approved drawings and as per DSR'23 Item No. 9.147. All necessary Fittings shall be provided and fixed as indicated in the approved drawings and as per DSR'23 Item No. 9.149,9.150, 9.152 & 9.153.	Factory made 3-track high quality uPVC Doors with LOW-E-DGU glasses and SS wire mesh shutter. All side hung doors shall be fixed with door frames using zinc coated SS 304 grade 3-D hinges. uPVC doors shall be provided and fixed with

				complete set of SS 304/uPVC fittings. uPVC sections shall be of wooden finish (Laminates). Doors along with glazing shall be designed for wind loads applicable to the area/location as per relevant IS codes.
6.	Main entrance lobby community centre.	Automatic Sensor based sliding Frameless glass door with 12mm thick Toughened clear glass with Air curtain and all hardware.	Automatic Sensor based sliding Frameless glass door shall be provided as per particular specifications and as per approved design & drawings.	
7.	All Handicapped Toilets.	UPVC Sliding Door	Providing and fixing factory made lead-free uPVC single track sliding door comprising multi-chambered uPVC extruded profiles conforming to EN 12608, reinforced with galvanized steel sections of required size and thickness as per CPWD Specifications. The frame and shutter shall be mitre cut and fusion welded to form rigid, weather-tight joints as per approved design & drawings.	The door shall be single track, single sliding shutter, designed specifically for Accessible Toilet, ensuring unobstructed movement and ease of operation. The shutter shall slide smoothly without projecting into the circulation space. The frame shall be fixed to the masonry/RCC opening with SS 304 fasteners, plastic packers and approved anchor screws. The gap between the frame and the wall shall be filled with approved backer rod and weatherproof neutral cure silicone sealant to ensure a watertight and neat finish.
8.	Dispensary entry at ground floor,	uPVC glazed Partitions	uPVC glazed Partitions and doors (sliding/ casement) shall	The floor spring shall be capable of supporting the

	Yoga Room, Indoor Game & kids play area in community center.	with uPVC glazed doors door.	be provided as per approved drawings and DSR'23 Item no. 9.147 including all required fittings. Glazing shall be of minimum 6 mm thick toughened glass or as indicated in the approved drawings.	specified door weight and shall be fixed in a properly formed recess with cement concrete/non-shrink grout as required. All exposed hardware shall be of SS 304 grade with satin/matt finish.
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Windows/ Ventilators					
S. No.	ROOM/ SPACE/ LOCATIONS	Size	SILL LEVEL	DESCRIPTION OF ITEM/ BRIEF SPECIFICATION	REMARKS
1.	All window openings as per approved drawings	uPVC 3-Track/casement window in sizes as indicated in approved drawings.	As mentioned in approved drawings.	Factory-fabricated uPVC 3-Track/Fixed window/ Ventilators shall be provided as per approved drawings and as per DSR'23 Item No. 9.147. All necessary Fittings shall be provided and fixed as indicated in the approved drawings and as per DSR'23 Item No. 9.148, 9.149, 9.150, 9.151 & 9.153.	Stainless Steel (Grade 304) wire gauze shutters shall be provided to all external openable windows. The wire mesh shall be woven from 0.50 mm diameter SS 304 wire with 1.40 mm nominal aperture, securely fixed in the shutter frame complete with all necessary hardware and accessories. All window glazing shall comprise Low-E Double Glazed Units (DGU) conforming to the approved energy performance requirements and the criteria for achieving GRIHA 5-Star Rating. The DGU glass shall generally conform to the specifications of DSR 2023, Item

					No. 25.3. However, if any change in glass specifications is required to meet the approved thermal performance parameters or GRIHA 5-Star requirements, the Contractor shall provide the same without any extra cost to the Department.
2.	All Ventilator openings in Toilet/Bath as per approved drawings	uPVC Fixed ventilator with louvers.	As mentioned in approved drawings.	Factory-fabricated uPVC Ventilators shall be provided as per approved drawings and as per DSR'23 Item No. 9.147	The fixed glazed portion shall be fitted with 8 mm thick clear frosted glass (or as specified) secured with EPDM gaskets, glazing beads, and approved hardware. The louver portion shall consist of adjustable/fixed uPVC louvers fitted with glass or uPVC louver blades, complete with operating mechanism (where adjustable), and all necessary accessories.

Fittings and Fixtures			
S. No.	ROOM/ SPACE/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	Main door, Bedrooms, Study room, Stores, Office room, Pooja room, Servant room and	Flush Door shutters shall be fixed with door frames using SS Ball Bearing hinges of approved size by Engineer-in-charge or as shown in approved drawings.	Door Fittings.

Correction... Nil Deletion... Nil Insertion... Nil Overwriting... Nil AE (C) (P) AE(E) (P) EE(C)-I

	other similar locations in quarters/community center/ ancillary buildings as per approved drawings.	Flush Doors shall be provided with all fittings in SS 304 grade as per inventories.	
2.	Plumbing shafts, toilets and other similar locations as per approved drawings	WPC shutters shall be fixed with WPC door frame as per DSR'23 Item No. 26.86.2 with all necessary fittings in SS 304 grade as per inventories.	In toilet door Sliding latch from outside and baby latch with indicator from inside will be provided.
3.	All staircases, Lift Lobbies and as per approved drawings.	All necessary Fire door fittings (Fire Rated) inventories detailed P-.... as per approved drawings/ manufacturer specifications/ required as per NBSC 2026, shall be provided along with Fire Doors and shutters	Door Fittings.
4.	Electric shaft, LV shafts, fire hydrant shaft, HVAC shafts, and other similar locations as per approved drawings.	Polyester Powder Coated Aluminium louvered door fitted, as per the approved drawings and with all necessary fittings in SS 304 grade as per inventories.	Door Fittings.
5.	All Balcony door & Kitchen Utility balcony.	All necessary Fittings shall be provided and fixed as inventories detailed P-.... indicated in the approved drawings and as per DSR'23 Item No. 9.149,9.150, 9.152 & 9.153	Door Fittings.
6.	Main entrance lobby community center.	All necessary Fittings shall be provided and fixed as inventories detailed indicated in the approved drawings and as per particular specification.	Door Fittings.
7.	All Handicapped Toilets.	All necessary Fittings shall be provided and fixed as inventories detailed indicated in the approved drawings and as per particular specification.	Door Fittings.
8.	Dispensary entry at ground floor, Yoga Room, Indoor Game & kids play area in community center.	All necessary Fittings shall be provided and fixed as inventories detailed indicated in the approved drawings and as per DSR'23 Item No. 9.149,9.150, 9.152 & 9.153	Door Fittings.

9.	All window openings as per approved drawings	All necessary Fittings shall be provided and fixed as indicated in the approved drawings and as per DSR'23 Item No. 9.148, 9.149, 9.150, 9.151 & 9.153	Window Fittings.
10.	All Ventilator openings in Toilet/Bath as per approved drawings	All necessary Fittings shall be provided and fixed as indicated in the approved drawings as shown in inventories.	Window Fittings.
11.	All windows and doors in all rooms except Kitchen, Toilets in community center.	Providing and fixing manually operated Roller Blinds of approved colour and shade, complete with all accessories, comprising extruded aluminium roller tube of minimum 38 mm diameter with powder-coated aluminium bottom rail, heavy-duty clutch mechanism, endless bead chain, mounting brackets, end caps, fixing screws, fasteners and all necessary hardware, complete as required. The blind fabric shall be premium quality polyester/PVC screen fabric or polyester blackout fabric (as specified in the schedule), conforming to the following minimum requirements:	Roller Blinds as per particular specification.
12.	All windows and doors in all rooms except Kitchen, Toilets in community center.	Providing and fixing Stainless Steel curtain rod of dia 25 mm having wall thickness of 1.25mm with two chromium plated brass brackets fixed with C.P. brass screws and PVC sleeves etc., wherever necessary complete.	Curtain Rod
13.	All types of door & window as indicated in approved drawings.	All types of door & window shall be fitted in SS 304 grade /UPVC fittings as per inventories detailed in tender document/ approved drawings. Any other required fittings as per approved drawings shall be provided to make the Door & window functional without any extra cost.	All necessary Fire door fittings (Fire Rated) as per approved drawings/ manufacturer specifications/ required as per NBCS 2026, shall be provided along with Fire Doors and shutters

Schedule (Civil) No. 4

Schedule of Internal Finishing including Painting, Wall Paneling, Dado, False Ceiling.			
Plastering			
S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	All internal areas walls/ ceilings	Internal finishing with 6 mm thick self curing/ curing free ready mix plaster of approved brand on RCC surface and 12mm self curing/ curing free ready mix plaster of approved brand over masonry as per DSR'23 Item No. 13.119 and as per CPWD specifications 2019 with upto date correction slips.	Fiber mesh shall be provided over the AAC wall surface before plaster, extending with the specified overlap onto the adjoining RCC members as approved by Engineer-in- charge. Necessary drip course shall be provided in chhajjas, balcony, projecting roof, beams etc.
(B) Painting			
S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	All internal areas walls/ ceilings	White cement based putty of average thickness 1 mm as per DSR'23 Item No. 13.80 & Wall painting with premium acrylic emulsion paint of interior grade, as per DSR'23 Item No 13.83.2 and as per CPWD specifications 2019 with upto date correction slips.	

(C) False Ceiling

S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	All Toilet/Bath/Kitchen/Change rooms Areas as per approved drawing.	Metal Tiled false ceiling of size 595x595, as per DSR'23 Item No 12.52.2 and as per CPWD specifications 2019 with upto date correction slips.	
2.	All rooms & corridors in community center except Toilet/Kitchen/Multipurpose Hall.	Decorative gypsum false ceiling with combination of open cell ceiling as per approved design and pattern .	Decorative gypsum false ceiling shall be provided as per DSR'23 item no 12.45.3 and Open cell ceiling shall be provided as per particular & manufactures specification.
3.	All rooms & corridors in R.D Bungalow except Toilet/Kitchen/Servant room/pooja room.	Decorative gypsum false ceiling shall be provided as per DSR'23 item no 12.45.3 as per approved design and pattern.	
4.	Multipurpose Hall/Badminton court in community center.	Providing and fixing 12.5 mm thick fully Perforated Gypsum Board tile made from plasterboard having glass fibre conforming to IS: 2095 part I, of size 595x595 mm as per DSR'23 item no 12.52.4	

Schedule (Civil) No. 5 Schedule of cub boards, wardrobe, kitchen cabinets/ modular kitchen/ modular laboratory tables/ platforms etc.			
S. No.	ROOM/ SPACE/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	Wardrobes/ shelves/ cabinets/ modular kitchen in rooms/ kitchens/ other similar locations as shown in approved drawings	Wardrobes/ shelves/ cabinets shutters as per DSR'23 Item No. 9.168. Boxes, shelves, racks, almirah, cupboard and drawer etc. as per DSR'23 Item No. 9.169. Necessary fittings of Wardrobes/ shelves/ cabinets in SS Grade 304 as per DSR'23 Item No. 9.170, 9.171, 9.172, 9.173 & 9.174. Any other required fittings as per approved drawings shall be provided in SS Grade 304 without any extra cost.	All Wardrobes/ shelves/ cabinets shall be factory made as per approved drawings and with prior approval of Engineer-in-charge.

Schedule (Civil) No. 6

Schedule of External Finishing including painting, cladding structural glazing			
Finishing/ Facade			
S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	All external faces of building and other similar locations as per approved drawings	External finishing with 12/15 mm thick self curing/ curing free ready mix plaster of approved brand on RCC surface and over masonry as per DSR'23 Item No. 13.119 and as per CPWD specifications 2019 with upto date correction slips.	Fiber mesh shall be provided over the AAC wall surface before plaster, extending with the specified overlap onto the adjoining RCC members as approved by Engineer-in-charge. Necessary drip course shall be provided in chhajjas, balcony, projecting roof, beams etc.
2.	Structural Glazing on external elevations as per approved drawings.	Structural Glazing work shall be executed as per DSR'23 Item No. 25.1, 25.2, 25.3, 25.4, 25.5 & 25.6 and as per approved drawings.	The design of Structural glazing as per applicable wind loads/ IS codes shall be vetted from IIT/ NIT or as decided by Engineer-in-charge. The vetted drawing shall further be approved by Engineer-in-charge before execution at site. Nothing extra shall be paid on account of this. All glazing shall be Low-E Double Glazed Units (DGU) conforming to the approved energy performance requirements and the criteria for achieving GRIHA 5-Star Rating. The DGU glass shall generally conform to the specifications of DSR 2023, Item No. 25.3. However, if any change in glass specifications is required to meet the approved thermal performance parameters or GRIHA 5-Star requirements, the Contractor shall provide

			the same without any extra cost to the Department.
(B) Painting			
S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	All external faces of building and other similar locations as per approved drawings.	External finishing with high quality acrylic modified resin based texture of Dholpur/Red sand stone Pattern with anti algae and UV resistance properties to be applied as per DSR'23 item no. 22.24a and as per CPWD specifications 2019 with upto date correction slips.	

Schedule (Civil) No. 7

Schedule of internal water supply & sanitary installation including fittings, fixtures.			
Water Supply Line			
S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	Pipeline from tank distribution line to Over Head Water Tank (exposed on wall)	Dual piping system shall be provided with G.I pipe complete with G.I. fittings and clamps, including cutting and making good the walls etc. including control valve, pressure release valve, NRV as per approved design and drawings. G.I. pipe and fittings shall be provided and installed as per approved drawings, CPWD specifications, and DSR'23 Item No. 18.10, 18.11, 18.12, 18.13, 18.14, 18.17, 18.18, 18.19 & 18.20.	The pipes shall be fixed with G.I. frame and u bolt which will keep the G.I. pipes minimum 30mm away from the wall. G.I Pipes shall be painted with synthetic enamel paint as per DSR 2023 item no 13.61.1 and as per CPWD specifications 2019 with upto date correction slips. G.I Pipes embedded in ground shall be painted with black anti-corrosive bitumastic paint as per DSR 2023 item no 13.65 and as per CPWD specifications 2019 with upto date correction slips.
2	Internal piping - Exposed on walls (loop line on terrace and down-take supply pipes)	Dual piping system shall be provided with G.I pipe complete with G.I. fittings and clamps, including cutting and making good the walls etc. including control valve, pressure release valve, NRV as per approved design and drawings. G.I. pipe and fittings shall be provided and installed as per approved drawings, CPWD specifications, and DSR'23 Item No. 18.10, 18.11, 18.12, 18.13, 18.14, 18.17, 18.18, 18.19 & 18.20.	The pipes shall be fixed with G.I. frame and u bolt which will keep the G.I. pipes minimum 30mm away from the wall. G.I Pipes shall be painted with synthetic enamel paint as per DSR 2023 item no 13.61.1 and as per CPWD specifications 2019 with upto date correction slips.
3.	Internal piping - Concealed work	Chlorinated polyvinyl chloride (CPVC) pipes, having thermal stability for hot & cold-water supply, including all CPVC plain & brass	

		threaded fittings, including fixing the pipe with clamps at 1.00 m spacing including jointing of pipes & fittings with one step CPVC solvent cement including cutting chase and making good the walls etc. Item shall be executed as per approved drawings, CPWD Specifications, and DSR'23 Item No. 18.8.	
Sanitary Line			
S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	Soil & waste pipes and fittings as per approved drawings.	Soil, waste, vent pipes and fittings shall be hubless centrifugally cast-iron epoxy coated inside & outside as per IS : 15905 as per DSR'23 item no. 17.35.1.3 with all necessary fittings as per functional requirement and as per CPWD specifications 2019 with upto date correction slips. Cost of all type of fittings & fixtures are inclusive for making the complete system functional.	The vertical pipes shall be fixed with GI frame and u bolt and horizontal pipes, traps and fittings shall be ceiling suspended and supported on GI frame work and u bolt which shall be covered by providing metal false ceiling tiles.

(C) Wash basin/Kitchen sink/Toilet fittings & fixtures.

S. No.	TOILET/ KITCHEN/ AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	All Toilet/Bath/Kitchen Areas as per approved drawing.	Below mentioned sanitary fittings shall be provided and fixed as per approved drawings, Schedule of Sanitary & C.P. Brass Fittings/ Fixtures to be provided in each Toilet/ WASH/ Kitchen given in tender document at Page-..... The schedule of fixtures provided in the tender documents is indicative and shall not be considered exhaustive. The Contractor shall provide and install all additional fittings, fixtures, accessories, supports, connectors, traps, valves, fasteners, sealants, and other incidental materials necessary for the complete, safe, leak-proof, and satisfactory	

		functioning of the plumbing and sanitary installations, whether or not specifically listed in the schedule. The quoted rates shall be deemed to include the cost of supplying, fixing, testing, commissioning, making good all damages, and completing the installation in all respects. No extra payment shall be made for any item required for the proper functionality and completion of the sanitary installation as per the approved drawings, specifications, relevant Indian Standards, and the directions of the Engineer-in-Charge.	
(A)	EWC Toilets	Rimless, blind installation wall hung WC with UF soft close slim seat cover, hinges, fixing accessories and accessories set size: 375x520x400 mm white vitreous china European type wall hung water closet of size 375x520x400 mm rimless shape including concealed cistern with 39mm drainage l-bend pipe with gasket & installation kit (suitable for EWC) dual flush fitting including soft close seat cover, and cistern fittings, nuts, bolts and gasket. The design of EWC shall be such that the rack bolts /studs and trap are not visible i/c hand shower (health faucet) with 8mm dia. 1 meter long flexible tube & wall hook with N.R.V. (back flow preventer) with CP brass 2-way bib cock with wall flange. Note:- The dimensions of the EWC shall have a permissible tolerance of ± 25 mm..	As Per CPWD/ Manufacturers specification.
(B)	Wash Basins	Semi-Recessed Vitreous China Wash Basin of approved make and shade complete with 15 mm dia CP brass single lever basin mixer of approved make, 32 mm dia CP brass bottle trap with internal partition, 32 mm dia CP brass waste coupling with overflow, 15 mm dia CP brass angular stop cocks with wall flanges (2 Nos.), braided hoses with CP brass nuts, all necessary brackets, supports, screws, anchor fasteners, cutting and making good the walls/counter, sealing with approved silicone sealant.	As Per CPWD/ Manufacturers specification.

(C)	Concealed Diverter (mixer)	Concealed Single Lever Diverter Set comprising concealed forged brass body with 40 mm ceramic disc cartridge and top push-button diverter assembly, complete with single lever exposed parts kit consisting of operating lever, cartridge sleeve, wall flange with seals, button sleeve and push button in chrome finish, 160 mm long wall-mounted shower arm with wall flange, 120 mm dia round single-flow overhead shower having stainless steel face plate and ABS body in chrome finish with Rubit easy-clean nozzles, bathtub spout with wall flange in chrome finish, complete with all internal and external fittings, fixing accessories.	As Per CPWD/ Manufacturers specification.
(D)	Connecting Hose Pipe	450mm long braided hoses for geyser of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(E)	Paper Holder	Toilet roll holder with stainless steel flap of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(F)	Soap Dispenser	Soap dispenser with glass bottle and metallic holder of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(G)	Soap dish Holder	Soap dish holder of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(H)	Tumbler Holder	Tumbler holder of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(I)	Overhead Towel Rack	Towel rack 600mm long without lower hangers, stainless steel of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(J)	Towel Rod	Single towel rail 600mm, stainless steel of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(K)	Towel Ring	Towel ring round with round flange of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(L)	Coat Hook	Robe hook (2 Nos. on each door) of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(M)	Grab Bar Vertical	Grab bar 680 mm long, satin of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(N)	Grab Bar Vertical Swing	Grab bar vertical swing, satin of approved model or equivalent	As Per CPWD/ Manufacturers specification.

(O)	Kitchen sink with drain board and Sink Mixture	Kitchen sink with drain board as per DSR'23 Item No 17.10.1.2 and as per CPWD specifications 2019 with upto date correction slips.	Sink mixture as Per CPWD/ Manufacturers specification.
(P)	Corner Glass Shelf	Corner Glass Shelf comprising 8 mm thick toughened clear glass with polished edges, complete with chrome-plated brass/stainless steel wall mounting brackets, concealed fixing arrangement, stainless steel screws, wall plugs, and all necessary accessories of approved model or equivalent	As Per CPWD/ Manufacturers specification.
(Q)	Mirror	450 x 600 mm mirror shall be fixed with the shutter of modular cabinet above wash basins or as indicated in approved drawings.	As Per CPWD/ Manufacturers specification.
(R)	All floor traps in toilet, Kitchen, balcony	Square flat cut cockroach trap of stainless steel grade 304 of dimension 6x6 inch or as per approved drawings.	As Per CPWD/ Manufacturers specification.
(S)	C. P. Brass Fittings	Required pillar cocks, angle cocks, 2way bib cocks, health faucet, long body bib cocks, towel ring, hot & cold-water mixer, along with other miscellaneous fittings like bottle trap, waste couplings etc. shall be as per Schedule of Sanitary & C.P. Brass Fittings/ Fixtures to be provided in each Toilet/ WASH/ Kitchen given in tender document at Page-..... and as per approved drawings. (the list is indicative only. However, the contractor has to provide all fixtures and fittings for functional suitability). All fittings shall be single lever with quarter turn and complying to green norms. All CP brass fittings/ bathroom accessories shall be of single brand and of the same series. In case of accessories not available in same series, the decision of the Engineer-in-Charge shall be binding.	As Per Particular & Manufacturers specification
(W)	Shower/Bath enclosure	Providing and fixing factory-manufactured Shower/Bath Enclosure wall-to-wall/corner type, up to 2000 mm width and 2000 (+ 50) mm height, comprising 8 mm thick clear toughened (tempered) safety glass conforming to relevant standards, complete with stainless steel profiles, chrome-plated brass/stainless steel hardware, rollers, hinges,	As Per CPWD/ Manufacturers specification.

		handles, magnetic door seals, PVC/EPDM water seals, wall channels, and all necessary accessories.	
(X)	Urinal with sensor kit	Providing and fixing first quality wall hung vitreous china urinal white colour, complete with automatic infrared sensor-operated concealed flushing system, fixing accessories, waste outlet, all necessary fittings and accessories, of Jaquar or equivalent approved make.	As Per CPWD/ Manufacturers specification.
(Y)	Urinal Partition	Providing and fixing curved shaped frameless urinal partition manufactured from 10 mm thick frosted toughened (tempered) safety glass, of size 900 mm (Height) × 450 mm (Width), complete with heavy-duty SS 304/chrome-finished wall mounting brackets/patch fittings, fixing accessories, stainless steel fasteners, anchor bolts, neoprene/EPDM gaskets and approved silicone sealant.	As Per CPWD/ Manufacturers specification.

Schedule (Civil) No 8

Schedule of External water supply & sanitary installation including fittings, fixtures.			
(A) Water Supply Line			
S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1	Pipeline from tank distribution line to Over Head Water Tank (exposed on wall)	Dual piping system shall be provided with G.I pipe complete with G.I. fittings and clamps, including cutting and making good the walls etc. including control valve, pressure release valve, NRV as per approved design and drawings. G.I. pipe and fittings shall be provided and installed as per approved drawings, CPWD specifications, and DSR'23 Item No. 18.10, 18.11, 18.12, 18.13, 18.14, 18.17, 18.18, 18.19 & 18.20.	The pipes shall be fixed with G.I. frame and u bolt which will keep the G.I. pipes minimum 30mm away from the wall. G.I Pipes shall be painted with synthetic enamel paint as per DSR 2023 item no 13.61.1 and as per CPWD specifications 2019 with upto date correction slips. G.I Pipes embedded in ground shall be painted with black anti-corrosive bitumastic paint as per DSR 2023 item no 13.65 and as per CPWD specifications 2019 with upto date correction slips.
2	Rain water pipes and fittings as per approved drawings.	Rain water pipes and fittings shall be unplasticised Rigid PVC rain water pipes c as per IS : 5382 as per DSR'23 item no. 12.41.1.3, 12.42, 12.43 & 12.44 with all necessary fittings as per functional requirement and as per CPWD specifications 2019 with upto date correction slips	

Sanitary Line			
S. No.	AREAS/ LOCATIONS	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1	Soil & waste pipes and fittings as per approved drawings.	Soil, waste, vent pipes and fittings shall be hubless centrifugally cast-iron epoxy coated inside & outside as per IS : 15905 as per DSR'23 item no. 17.35.1.3 with all necessary fittings as per functional requirement and as	

		per CPWD specifications 2019 with upto date correction slips.	
2	RCC storm & drain Pipes as per approved drawings.	Providing, laying and jointing RCC Non-Pressure (NP-3) pipes of approved diameter below ground and below cement concrete (CC) pavement, including excavation, laying to line and level, jointing, testing, refilling, compaction, disposal of surplus earth, restoration of pavement wherever required, and all incidental works complete, in accordance with CPWD Specifications 2019 with up-to-date correction slips and as directed by the Engineer-in-Charge. The NP-3 pipe shall be provided as per DSR'23 Item No. 19.35 and as shown in the approved drawings.	
3	Surface drain as per approved drawings	The Surface drain as per approved sections and drawings using FPS Burnt Clay brick/ CC/ Plaster/ Neat Punning in Basement/ Podium/ Ground covered with Steel Fiber Reinforced Concrete drain cover.	
4	Valves	Following types of control and other valves shall be provided in distribution grid, supply mains etc. As per local bye laws, NBCS 2026, CPWD specifications 2019 with upto date correction slips and sound engineering practice at easily accessible locations for operation and maintenance Bronze/ forged brass ball valve (screwed) confirming to is standards complete Butterfly valves (80mm and above) shall be of centric disc construction with single piece body of cast iron with disc of CF 8 stainless steel with nitrile seat, stem shall be stainless steel and shall conform to PN 10/16 rating and shall be provided with suitable matching flanges Non-return valve (80mm and above) shall be cast iron dual plate non-return valve of PN 10/16 rating with ductile iron disc and SS 304 spring& hinge pin	

		Ball valves (65 mm and above) shall be lever operated, screwed type of gun metal ball valve of PN 10/16 rating as per is:318 with SS ball and SS stem with mild steel lever. Non-return valve (65mm and below) shall be gun metal non-return valve of pn 10/16 rating (class 2) as per is:778 with screwed ends. Special type of control valves like, pressure reducing valves (prv) and solenoid valves as per requirement	
5	Chambers for: - Valves & Fire hydrants	Chambers of required size and shape shall be constructed as per CPWD Specifications, DSR'23 Item No. 19.30 & 19.31 and as per approved drawings with suitable heavy duty SFRC manhole covers.	
6	Thrust blocks	Thrust block shall be of cement concrete i/c necessary excavation, centering and shuttering etc. Shall be provided at locations specified as per direction of the engineer - in - charge.	
7	Puddle flanges	Galvanized iron (110 gsm minimum) puddle flanges of 60 cm length with flange on one / both ends and welded to mild steel plate (6mm thick) in the centre etc. Complete as directed by engineer-incharge.	
8	UG sump	RCC tanks shall be RCC of specified grade of required capacity and as per approved design including required fittings like ball valve (brass) high/ low pressure with plastic floats, inlet, outlet, scour, over flow pipe, vent pipe inside SS ladder, mosquito proof covers, outside MS ladder etc. Separate overhead RCC shall be constructed for each building with separate horizontal/ vertical compartments for domestic and fire requirements. Separate underground RCC tank for storage of treated water received from STP for use in flushing / horticulture be provided. MS ladder for terraces, lift room shall be galvanised MS with the size of MS bar shall	

		not be less than 16 mm and thickness of MS flat shall not be less than 10 mm or isa 50506.	
9	Disinfection	All water supply lines and water tanks shall disinfected. Disinfection to be done using bleaching powder @ 0.5gm/litre of water and cleaned with fresh water operation to be repeated minimum 3 times as per CPWD Specifications with upto date correction slips or method approved by the Engineer-in-Charge	
10	Manholes	Manholes of required size and shape shall be constructed as per CPWD Specifications, and as per approved drawings with suitable heavy duty SFRC manhole covers.	

Schedule (Civil) No 9

Schedule of Waterproofing on terraces, toilet slabs, lift pits, basement rafts & walls, water tanks, UG sumps, OHTs and any other liquid retaining structures.

S. No.	LOCATION	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	Below Raft Foundation	Fully bonded weldable HDPE sheet Water Proofing Membrane (the fully bonded weldable HDPE sheet waterproofing membrane shall be provided above PCC, having following typical properties: Peel adhesion to concrete > 1100 N/m (as per ASTM d 903). Elongation (HDPE film)> 400% (ASTM d 411). Tensile strength>25mpa. (ASTM d 411) Thickness: 1.5mm composite thickness, HDPE thickness not less than 0.9mm (ASTM d 3767). Puncture resistance > 1000 n (ASTM E 154), Dimensional Stability: <1% (ASTM D 836) Resistance to hydrostatic head >70 m (ASTM d 5385 modified). Joint strength at overlaps (Lap peel) ASTM D1876: >14 N/mm Water Vapor Transmission: < 0.1 g/24 h.m2 ASTM E 96, Water Absorption: 0.5% ASTM D 570	Integral Crystalline admixture as per DSR'23 Item No. 22.22 shall be added to RCC of Raft, Retaining wall, UG tank, and other similar water retaining structures as approved by Engineer-in-Charge.
2.	Retaining wall	1.2mm thick fully bonded self-adhesive HDPE waterproofing membrane over RCC surface, including overlaps, corner treatment and all accessories complete. Waterproofing membrane shall have following typical properties: Watertightness (no lateral migration) according to ASTM D 5385 mod. (bar): pass at 7 bar	Graded filter media of approved size and gradation shall be provided on the outer face of the retaining walls, extending continuously from the top of the raft foundation up to the finished ground level, over the completed waterproofing and protection layer. A perforated HDPE/PVC drain pipe, minimum 100 mm diameter (unless otherwise specified),

		Hydrostatic Resistance (ASTM D5385) : Minimum 70 m head of water Peel Adhesion to Concrete (ASTM D903) : Minimum 880 N/m Elongation at Break (ASTM D411) : Minimum 500% Tensile Strength (ASTM D411) : 27 ± 2 N/mm² Dimensional Stability (ASTM D1104 / Equivalent) : Maximum 0.5% Lap peel adhesion (ASTM D 1876) (N/m): ≥ 90 Termination of retaining wall waterproofing: waterproofing on retaining wall shall be terminated by using aluminum termination flashing/termination bar mechanically anchored at membrane terminations including sealing with single component hybrid polymer sealant having high elasticity, UV resistance, weather resistance and superior adhesion to concrete and metal substrates complete as per approved details. Protection Layer – Providing and fixing minimum 8 mm thick HDPE dimpled protection/ drainage board over completed waterproofing membrane to protect the membrane from mechanical damage during backfilling operations, including necessary overlaps and fixing arrangements complete.	shall be laid at the bottom of the filter media along the entire length of the retaining wall. The perforated pipe shall be fully wrapped with a non-woven geotextile filter fabric of approved quality to prevent the ingress of soil particles while allowing free drainage of groundwater. The pipe shall be laid to the required gradient to ensure positive drainage. The perforated drain pipe shall discharge into one or more collection/sump chambers of internal size not less than 1.0 m × 1.0 m, or as indicated in the approved drawings. The chambers shall be constructed complete with RCC base slab, walls, cover slab, heavy-duty cover, access ladder/steps (where required), and all associated fittings. Suitable pumping arrangements shall be provided separately as specified, to enable the removal of accumulated groundwater from the collection chamber and thereby prevent hydrostatic pressure, water seepage, or dampness in the basement structure.
3.	RCC skin wall along Diaphragm Wall	1.2mm thick fully bonded self-adhesive HDPE waterproofing membrane over RCC surface, including overlaps, corner treatment and all accessories complete. Waterproofing membrane shall have following typical properties: Watertightness (no lateral migration) according to ASTM D 5385 mod. (bar): pass at 7 bar	Above Diaphragm wall, waterproofing specifications mentioned above in Sl. No. 2 shall be followed with proper integration of HDPE membrane.

		Hydrostatic Resistance (ASTM D5385) : Minimum 70 m head of water Peel Adhesion to Concrete (ASTM D903) : Minimum 880 N/m Elongation at Break (ASTM D411) : Minimum 500% Tensile Strength (ASTM D411) : 27 ± 2 N/mm² Dimensional Stability (ASTM D1104 / Equivalent) : Maximum 0.5% Lap peel adhesion (ASTM D 1876) (N/m): ≥ 90 Termination of retaining wall waterproofing: waterproofing on retaining wall shall be terminated by using aluminum termination flashing/termination bar mechanically anchored at membrane terminations including sealing with single component hybrid polymer sealant having high elasticity, UV resistance, weather resistance and superior adhesion to concrete and metal substrates complete as per approved details.	
4	UG sump wall	Kota Stone Water-proofing shall be done as per DSR'23 Item No. 22.2 on the outer side of RCC wall towards basement. On the other walls Waterproofing as detailed above in Sl. No. 2 & 3 shall be followed. treatment shall be done as applicable and as required on terraces, sunken slabs, toilet slabs, lift pits, basement rafts & walls, water tanks, UG sumps, OHTs and any other liquid retaining structures as per Schedule given below. Water stops shall be provided in construction joints of liquid retaining structures.	
5.	Toilets, Lift Pits, Balcony Area	Providing & applying 2 components, solvent free, liquid applied elastomeric seamless hybrid polyurea membrane coating @ 1.6 kg/sqm, using high pressure two components spray/brush equipment, to	

		form a minimum system thickness of 1.5 mm in two or more alternative coats.	
6.	Terrace areas	Applying two component high solids content cold applied pure polyurethane liquid elastomeric seamless waterproofing membrane, insulation layer: spray applied an average minimum 75mm thick GRIHA enlisted CFC & HCFC polyurethane foam, on top of polyurethane foam, applying single component, elastomeric 100% pure polyurethane coating free from bitumen & tar, the coating shall be applied with a total consumption of minimum 1.5 kg/sqm in two coats and shall be applied on the entire horizontal surface extending up to 300mm above the FFL on the vertical surface as per the methodology. It shall be followed by laying 150 GSM geotextile (non-woven polyester) over the entire membrane on horizontal areas maintaining proper overlaps. Providing 100 mm average thick M-25 grade pp fiber reinforced concrete screed mixed with crystalline admixture. Top surface shall be provided with heat resistant tiles of approved make and specifications as per directions of the Engineer-in-Charge.	Heat resistant tile shall be provided after waterproofing.
7.	Podium Slab	Polyurea waterproofing system shall be done as per DSR'23 Item No. 22.27 and 22.28, and as indicated in the approved drawings.	
8.	Over Head Tank/ inside UG tank	First step shall be treatment to concrete defects like construction joints, cold joints, honeycombs & porous concrete. All construction joints, honeycombs, cold joints, of concrete shall be treated by hacking and opening the affected area till sound concrete, fixing nozzle and grouting the same, under pressure with cement slurry mixed with iwsp non shrink additive of approved make and sealing all the construction joints with styrene butadiene latex. Wall and slab joint / construction joint treatment:-	

After the entire surface preparation has been completed on the mother slab, all the wall and slab joints / construction joints to be treated with joint tapes having minimum tensile elongation more than 300% of size 25m x 200mm fixed in place with flexible cementitious waterproofing slurry with quick curing and waterproofing. Apply 1st coat of waterproofing slurry on the wall – slab joint and immediately place the tape over it and press it into the still wet slurry with steel trowel to ensure adhesion and release any trapped air. In the same manner the entire wall – slab joints / construction joints to be treated on the whole area. The water/pipe outlets to be treated in the same manner. As per original manufacturer's specifications all over the entire horizontal and upto full height vertical surface.

Waterproof coating:-

After the entire surface preparation has been done, pre wetting of the entire concrete surface and providing and application of the 1st coat of approved make flexible cementitious waterproofing slurry with quick curing and waterproofing with a mason's brush. After the 1st coat has sufficiently dried now apply the 2nd coat of water proof slurry. The total consumption of the product should be as per manufacturer specification for two coat. The product should have a tensile elongation of 120%, tensile strength of 1mpa, adhesion strength of 2mpa, crack bridging capacity of 2mm as per En 1062-7 complete as per manufacturer's specifications and approved by Engineer-in-Charge. After completion of the above said applications, the waterproofed coating should be left to air cure for minimum of 48 hours. Care should be taken that during this curing period walking or any other activities should be avoided on it. Ponding test can be done after air curing to check for any leakages.

		Providing and laying of protection plaster 20mm thickness with 1:4 cement and sand mortar as per approved specification admixed with integral waterproofing compound as per original manufacturer's specifications. To prevent the waterproof coating from getting damaged. The waterproofing system should be applied directly by the manufacturer with 10 years of complete system warranty against leakage. Laying slope making and protection with 40mm avg. Thick of m25 grade fibrated screed and applying waterproof plastering with cm 1:4 of thickness 20mm admixed with integral waterproofing compound as per original manufacturer's specifications.	
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Schedule (Civil) No 10**Schedule of Railings and Grills****(A) Railings**

S.NO.	LOCATION	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	Staircase/ Ramp	Factory made stainless Steel (Grade 304) knock down (no site welding) railing including all fittings, fixtures, hardware, anchor fastener, etc. required for complete the railing Works.	
2.	Balcony	1200 mm high railing with SS handrail and toughened laminated glass over 150 mm high RCC kerb wall as per drawing and particular specification.	

(B) Grills

S.NO.	LOCATION	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	Rooms at Ground floor	SS grill in grade 304 as per approved drawings.	

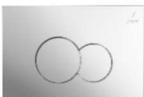
Façade/ Jali of shafts

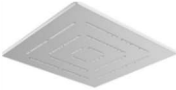
S.NO.	LOCATION	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	Elevations of buildings/ shafts as shown in approved drawings.	GFRC Jali shall be provided and fixed as per particular specifications/ Manufacturer's specifications.	

Parapet wall on terrace

S.NO.	LOCATION	DESCRIPTION OF ITEM/ BRIEF SPECIFICATIONS	REMARKS
1.	Terrace or other locations as per approved drawings..	1500 mm high RCC parapet wall or of size and shape as per approved drawings in grade M30 shall be provided..	

Schedule of Sanitary & C.P. Brass Fittings/Fixtures to be provided in each Toilet/ Wash/Kitchen

Sr. No	JAQUAR			KOHLER		
	Product	Product Code	Photo	Product	Product Code	Photo
1	Conceal Cistern	JCP-CHR-2400FS		MECHANICAL IN TANK WITH FULL FRAME	33931IN-M-0	
2	Control Plate	JCP-CHR-152415		RIVIERA IWT FACEPLATE MECHANICAL -CP	28476IN-M-CP	
3	Wall Mounted WC	LAS-WHT-91953BIUF SM		MODERN LIFE EDGE WALL HUNG W/C SEAT	K-2779IN-O20217I N-S-0	
4	Semi Recessed wash basin	JDS-WHT-25503		FOREFRONT SQUARE SEMI-RECESSED LAVATORY	98930X-1-0	
5	Waste Coupling	ALD-CHR-705L130		GRID DRAIN W/OVERFLOW HOLE	45432IN-CP	
6	Disable Wall Mounted WC	DIS-WHT-93951UF		NA	NA	
7	Disable wash basin	DIS-WHT-93801		NA	NA	

8	Grab bar Vertical Swing	WAC-SAP-BG0800CS N		CRUZ BATH ENTRY GRIP	10701D-CP	
9	Grab bar 680 mm Long	WAC-SAP-BR0600CS N		NA	NA	
10	Toilet Paper Holder	AKP-CHR-35753PS		PAPER/TOISSUE HOLDER	5633IN-CP	
11	CP Brass Two way bib cock	KUP-CHR-35041PM		JULY 2-WAY BIB TAP	K-16094IN-4-CP	
12	Bottle Trap	ALD-CHR-769L300X1 90			75823IN-CP	
13	Health Faucet	ALD-CHR-577		CUFF HEALTH FAUCET	98100IN-CP	
14	Concealed diverter	ALD-CHR-079N		AQUA TURBO 230 MANUAL VALVE	75201IN-CP	
15	Expose part Single lever wall Mixer	KUP-CHR-35079NKP M		RECESSED BATH & SHOWER AT230 TRIM	K-38939IN-4FP-CP	
16	Spout	SPJ-CHR-35463PM		ENGAGE BATH SPOUT W DIVERTER	33996IN-CP	
17	Shower Rose	OHS-CHR-1605		Single function organic showerhead in polished chrome	36211IN-CP/73199 IN-CP	

18	Arm	SHA-CHR-455L450		STATEMENT WALL MOUNT SHOWERHEAD ARM	26318IN-CP/16346IN-CP	
19	Hand Shower	HSH-CHR-1657		HAND SHOWER	16359IN-A-CP	
20	Tube	SHA-CHR-549D8		SHOWER HOSE, 1.5 M	12067IN-CP	
21	Wall Bracket	SHA-CHR-555		HANDSHOWER BRACKET	9040IN-CP	
22	CP Brass Soap dish	AKP-CHR-35731P		COMPLEMENTARY SQUARE SOAP DISH	25068IN-CP	
23	CP Brass Towel Rod	AKP-CHR-35711PS		COMPLEMENTARY SQUARE 610 MM SINGLE TOWEL	25065IN-CP	
24	CP Brass Towel Ring	AKP-CHR-35721P		TOWEL RING	5631IN-CP	
25	CP Angle Valve	KUP-CHR-35053PM		JULY ANGLE VALVE	80154IN-4AV-CP	
26	Basin Mixer	KUP-CHR-35011BPM		FORE ARC SINGLE LAV FAUCET WO DRAIN	27479IN-4ND-CP	

27	Liquid Soap dispensar	AKP-CHR-35735P		CRUZ SOAP DISPENSER WITH HOLDER	10712D-CP	
28	Glass shelf-corner	ACN-CHR-1173		GLASS SHELF	5636IN-CP	
29	Braided hoses	ALD-CHR-805B			—	
30	towel rack 600mm Long without lower hangers but 3 hooks	ACN-CHR-1181FHS		610mm towel shelf in polished chrome	K-17529T-CP	
31	Curved shaped urinal partition with frosted glass Glass: 8mm / 10mm Finish: Chrome	JSE-CHR-110UC450 X		Currently we don't have standard codes but we have this, will quote at the time of requirement	NA	
32	Wall To Wall Shower Enclosure With One Fixed Glass And One Sliding Door -2 Part.	JSE-ACR-OPTSDR15 20X		SINGULIER 1D1P-S	39059in-shp	
33	Urinal With Sensor Kit, Spreader And Fixing Accessories Set, Size:360X350X710 mm	URS-WHT-13267S		TEND® URINAL, REAR INLET	20713IN-ER-0	
34	Sink Mixer with Regular Swinging Spout (Wall Mounted Model) With Connecting Legs & Wall Flanges	LYR-CHR-38309		JULY WM KITCHEN MIXER	20591IN-4-CP	

LIST OF APPROVED MAKE OF MATERIALS (Civil Work)

Specification/brands names of materials (Refer materials, whichever are applicable for the scope of work) and finishes approved by the **NIT** approving authority are listed below. However approved equivalent material and finishes of any other specialized firms may be used, in case it is established that the brands specified below are not available in the market but only after approval of the alternate brand by the **NIT** approving authority. (See also condition of contract):-

SI. No	Items	Approved Makes / Brands
1	Cement (PPC/OPC)	ACC/ Ultratech/ Ambuja cement/ NUVOCO/J.K. Cement/Dalmia
2	White Cement	J.K. White / Birla White / Ultratech
3	Reinforcement Steel	Tata steel/ SAIL / RINL /JSPL / JSW
4	Structural Steel	Tata / SAIL / RINL /JSPL / JSW
5	Stainless Structural Steel	Jindal / SAIL / Tata Steel /JSW
6	Welding Rods	Esab / Bohler / Advani Oerilikam / D&H / ADOR
7	Steel Nut & Bolts	Hilti / Bosch / Fischer
8	Admixtures, Plasticizers	FOSROC/ SIKA/ BASF / CICO
9	Water proofing compound	FOSROC/ SIKA/ Pidilite/ MYK/ MAPEI
10	Crystalline Water proofing compound	Penetron/Xypex/Vendex/Asian Paints/Fairmate/ MAPEI
11	Polysuphide sealant	FOSROC / Pidilite / BASF/ SIKA/Choksey
12	Weather Silicon Sealant	Dow Corning / Wacker / GE Silicones
13	Modular Expansion Joint	Herculas /CS / Vexcolt /Devin / Sainfield/ Z Tech. 3R Joints & seals
14	Autoclaved Aerated Cement blocks	Aerocon (HIL Ltd.) / Ultratech/Krish/ Siporex / Magicrete / Biltech / Finecrete
15	Polymer Modified Adhesive for AAC Blocks	MYK / Ferrouscrete / Ultratech / Aerocon / Ardex Endura/ Finecrete/ NEWCRETE
16	Tile and Stone Adhesive & Grouting Compound	Fosroc / Ferrouscrete / ArdexEndura / MYK/ Pidilite/ NEWCRETE
17	Laminate and veneers	Greenlam / Duro / Merino / Century
18	Flush Doors / Plywood /Veneers	Green / Merino / Century/ Duro
19	Block Board	Green / Merino / Century/ Duro

Sl. No	Items	Approved Makes / Brands
20	UPVC Window/Door	FENESTA / REHAU/ SAINT GOBAIN, PRANAV DOOR AND WINDOWS
21	Frameless Glass Doors with SS patch fittings	SAINT GOBAIN/ MODI GUARD/ ASAHI/Kich
22	Stainless steel mortice lock, ball bearing hinges, hanging floor door stopper, magic eye) for doors (non-fire rated), SS Hinges	Dorma / Hafele / Geze / AssaAbloy / Hettich/ GODREJ/Kich
23	Stainless steel sliding door bolts, tower bolts, handles for doors (non- fire rated)	Dorma / Hafele / Geze / AssaAbloy / Hettich/ GODREJ/Kich
24	Hydraulic Door Closer	Dorma / Hafele / Geze / AssaAbloy / Hettich/ GODREJ
25	Modular Kitchen Accessories	Hettich / Hafele / Godrej
26	Auto sensys hinges (Stainless Steel)	Hafele / Geze / Hettich / Godrej
27	False Ceiling (Metal)	Armstrong /Dexune /Hunter Douglas/ Hi-Steel/Bollard/Diamond ceiling/New Age/Knauf
28	U Baffle Aluminium Panel Ceiling	Hunter Douglas / SAS / Lindner / Gordon Inc. /Hi-Steel/Bollard
29	Dash Fasteners / Anchors	Hilti / Bosch / Fischer / Canon/ WUERTH
30	Clamp System for Stone Cladding	Hilti / Bosch / Fischer
31	Float/ frosted glass, mirror glass	Saint Gobain/ Modiguard/ Asahi
32	Structural glazing, skylight	Saint Gobain/ Modiguard/ Asahi
33	Fire-Rated Glass	Saint Gobain / SCHOTT/ PILKINGTON
34	Hermetically sealed performance glass, Toughened glass	Saint Gobain/ Modiguard/ Asahi
35	Fire Check Door	Shakti Hormann /Navaire/ Saint Gobain/Becker/Iclean/ Tata Praves
36	Fire rated door hardware fitting	Geze / Dorma / Hafele
37	FRP door frames and shutter	Ashish Industries / JAYNA / SIMBA
38	SS Drapery rod	Vista / Hunter Doglus / Mac
39	Roller Blinds for windows	Hunter Douglas / Vista / Mac
40	Stainless Steel Railings (knock down)	Q railing / D-line / Ozone
41	Vitrified Tiles	Kajaria / Somany/ NITCO/RAK

Sl. No	Items	Approved Makes / Brands
42	Glazed / Ceramic Tiles	Kajaria / Somany/ NITCO/RAK
43	Aluminium Sections	Jindal / Hindalco
44	Gypsum Plaster	Saint Gobain (Gyproc)/Ferrous Crete/ Ultratech / Asian Paints/WESTERN/Dudhi
45	Wall putty (white cement based)	Birla Wall Care Putty / JK Wall /Papers Wall Putty/WESTERN /NEWCRETE
46	P.O.P. Putty	Sakarni / Adhar Shree / JK / Ashirwad
47	Epoxy Primer and Paints / Wood Primer/ Steel Primer	Akzonobel India (ICI Dulux) / Kansai Nerolac / Asian Paints
48	1 st Quality Acrylic Distemper	Asian Paints (Tractor Aqua Lock Paint) / Kansai Nerolac (Nerolac Acrylic)/ ICI-Dulux
49	Premium Acrylic Emulsion Paints (Interior)	Asian Paints (Royale Luxury Emulsion)/ Nerolac : Impression/ ICI-Dulux: Velvet touch
50	Synthetic Enamel Paint	Asian Paints (Apeolite Premium gloss enamel)/ Nerolac : Synthetic Hi gloss/ICI-Dulux: Goss Synthetic enamel
51	Premium Acrylic Smooth Exterior Paint with silicon additive	Asian Paints (Apex Ultima)/ Nerolac : XL Total/ ICI-Dulux: Weather Shield max
52	Melamine Polish	Kansai Nerolac / Asian Paints/ Timber stone melamine coating
53	Fire Paint	Asian Paints/Promat/ICI-Dulux
54	Polyster Powder Coating	ICI-Dulux / Kansai Nerolac / Asian Paints
55	Centrifugally Cast (Spun) Iron Pipes & Fittings	Neco / Saint Gobain / BIC /Hepco /SKF/RPMF
56	Centrifugally Cast (Spun) Iron Pipes Class (LA) Pipe	Neco / Tata / HEPSCO/SKF/Jindal
57	UPVC Pipes & Fittings	Supreme / Finolex / Jain irrigation /Ashirwad/Skipper/ ASTRAL/Prince
58	G. I. pipes	Tata/ Jindal (Hissar)/SAIL
59	G. I. pipe Fittings	Zoloto / Jindal (Hissar)/Unik /KS
60	SS water supply pipes and fittings	Rampart / Jindal / J-Press
61	Stainless Steel Sinks	Neelkanth / Nirali / Jayna

Sl. No	Items	Approved Makes / Brands
62	CP Brass Fittings	Jaquar/Kohler / Grohe
63	Vitreous China Fittings	Toto / Kohler / Grohe /Jaquar
64	HDPE Pipes	Jain Irrigation / ORIPLAST / Dutron / Reliance/Supreme/Vectus/ASTRAL
65	Ball Valves	Zoloto / Leader / Audco / Schell
66	Non return Valves	Zoloto / Leader / Audco / Kirloskar
67	Butterfly Valves	Audco / Advance / Schell / Kirloskar
68	Water Meter	Zoloto / Leader / Audco
69	SS Floor Grating	Jayna / Chilly / Nirali / Euronics/ Kohler
70	Interlocking precast C.C. paver blocks / Kerb Stone / Grass Paver	K.K. Manhole/ NITCO / Unistone / NTC / Ultra Tiles/ PARMESHWARI
71	Factory made wooden frames and wire gauge shutters	D.S. Doors / Jain Wood Industries /Orion Doors by modern wood tech industry
72	Polycarbonate Sheet	Danpalon / Coxwell / Lexan
73	GRC Jali	Unistone / Birla White/Sanderson Theme Constructions
74	Insulation	UP Twiga / Lloyd / Rock Wool
75	Acoustic treatment for walls, ceiling	Acoustics First/ Oceanz Acoustics/ Acoustical Solution Inc./ Armstrong/ Hunter Douglas/ Eophon/ Dexune/ ANAKON/ Bollard
76	Toilet Cubicles	Green/ Marino / Century
77	Soap Dispenser	Kohler / Jaquar / Grohe
78	Extruded Polystyrene Board Insulation (XPS Board)	Dow Building Solutions / Owens Corning / Isofoam
79	Reinforced Soil Walls	Maccaferri / Terre Armee
80	Engineered wooden Floor	Century/ Green/Duro
81	Sports Floor	Vinyl Flooring/Armstrong/LG/Tarkett
82	Laminated wooden Flooring	Armstrong/Rosselle/Green/ Century/Duro

Sl. No	Items	Approved Makes / Brands
83	Machine Moulded Wire Cut Bricks (Exposed Quality)	PIONEER/BHARAT BRICKS
84.	Curtain Rods	VISTA/MAC/HUNTER DOUGLAS /Euronics
85.	Curtain Fabric	VISTA/MAC/HUNTER DOUGLAS/Euronics
86.	Fire Curtain	SAINT GOBAIN/ COLT/ KGG
87.	Anti-termite Chemical	Central Insecticide Board approved Chemical/Specialised agency should be member of IPCA. Pest Control India Ltd.
88	Epoxy	Fosroc/Sika/BASF/Cipy/NEWCRETE/MYK
89	EPDM Waterproofing Membrane	Carlisle/Fire Stone/Soprema/MAPEI
90	Formwork Release Agent	BASF/Fosroc/Sika
91	Non-Shrink grout	Fosroc/Sikka/BASF
92	Non metallic grout floor hardener	Fosroc/ BASF/McBauchmie/MYK
93	Bitumen	Shalimar tar products/Mathura oil refinery
94	Oil Bound Distemper	Nerolac/Asian/ ICI-Dulux
95	Cement Paint	Snowcem Plus/Nerolac/Ultratech
96	Other Paints and primer	Nerolac/Asian/ ICI-Dulux
97	Textured Coating/Paint	Timberstone Melamine Coating
98	Polyurethane Paint	MRF/ Nerolac/Asian/ ICI-Dulux
99	Silicon Water repellent solution	GE Bayer Silicon/ Bal/ Dow Corning/ Endura/ BASF
100	Heat Resistant Tile	Thermatek / Somany/ Kajaria/ PARMESHWARI ENTERPRISES
101	PVC Vinyl Flooring	Polyflor/ Ger Floor/ Armstrong
102	Cement Concrete tiles	Unistone/ Dazzle/ Eurocon/ NITCO/ PARMESHWARI ENTERPRISES
103	MDF Grade-I as per IS- 12406 & Ecomark	Century/ Merino/ Green ply
104	Adhesive for wood work	Dunlop/ Fevicol/ Pidilite
105	Pre-Laminated Particle Board	Century/ Marino/ Green Ply

Sl. No	Items	Approved Makes / Brands
106	Paver Block	PARMESHWARI ENTERPRISES/ Ultratech/ K. K. Manhole
107	Wax Polish	Mansion/ Reckitt & Colman
108	Polyurethane sealant	MBT/ Fosroc/ Pidilite/Cipy
109	Polyethylene Board, Back Up Rod	Supreme Industries
110	Furniture hardware	Hettich/ Dosrest/ Ebco/ Hafelle/ Godrej/ Oceanz Acoustics/ KQuinette/ Eurotech/HOF/ Fetheline
111	Water Stopper	Fixopan/ Caliplast
112	Aluminium composite Panel	Alucobond/ Renobond/ Alstrong
113	Asphalt Emulsion	STP/ Karnak Chemical Corporation. /PRATISHTHA PRAGATI PETROCHEM(PPP)/VIZCOL
114	Expansion Fastener	Hilti/ Fischer/ Canon
115	Stainless Steel	Salem/ Sail/ Jindal/Tata
116	Anchor fastener, Anchor bolts	Hilti/ Fischer/ Canon/ Armstrong
117	Gypsum Partition & Gypsum Ceiling with frame	Saint Gobain/ Lafarge/WESTERN/Knauf/Diamond ceiling
118	Electrodes	Advani-Overlikon/ ESAN/ Dwekam
119	Mineral Fibre false ceiling	Armstrong/ AMF/ANAKON/Bollard/Knauf
120	Steel Door (General)	Herman Shakti Met-Dor/ Sen Harvic/ Welcome Doors/ AGEW/ Multiwin
121	Acoustical Wooden Door	Sukri/ Promat/ Navair
122	Rolling Shutter	Shivam/ Milestones/ Rama/ Prakash
123	Self-drilling Screws	Builtex/ Roofix/ Hilti
124	Logo, Signs, Name plates	D-Line/ Sign Sutra/ Creative Concepts/ Kingsign Publicity Services
125	Aluminium fittings	Hardwyn/ Hettich/ Hafele/ Crown/ Nulite/ Mccoy
126	Acoustical paneling	Anutone/ Absound overseas/ Armstrong/ Bose/ANAKON
127	Modular Toilets cubical	Merino / Century/ Greenlam.

Sl. No	Items	Approved Makes / Brands
128	Glass Mosaic tiles	Palladium/GND/ Mridul
129	Acoustical False Ceiling	Anutone/ Armstrong/ Absoundoverseas/ ANAKON/ Bollard/ Knouf
130	Patch Fitting/ Spider Fitting	D-Line/ Hettich/ Dorma/ Hafele
131	Foam Concrete	Valifoaalifoam/AE Foam
132	Raised/False Access Flooring	Unifloor/ Unitile LG Floor.
133	Curing compound	Fosroc/ Sika/ Cico BASF
134	Inherent Fire Retardant Fabric	Trevira CS fabric of RSWMLtd.
135	Fire retardant paint	Nullifier/Signum/Godrej
136	Fire rated vision Panels	Pilkington/Schott/ Ferilite/ Saint Gobain
137	Fire rated hardware	Dorma/BeckerFS/Assaabloy/DORSET
138	Aluminium Coating/ Anodizing	NationalCoater/NationalColours/Prince Coater
139	Rebarring Chemical	Hilti/ 3M India/ Fischer/ Birla
140	Fire Sealant	Hilti/ 3M India/ Birla Fischer/ Raven
141	Intumescent Fire Seals/Door Jamb Seals	Marshall/Raven
142	Parallel Threaded Couplers (Compliant to IS:16172:2014)	Dextra/ Halfen Moment/ G-Tech
143	Extruded Polystyrene Board	Supreme/ Ownes corning/ Shalimar
144	Duco Paint	Asian/ Mrf
145	Geofabric	Ovilite/ Virendera Textiles
146	Drain Cell	Ovilite/ Virendera Textiles
147	Synthetic Court	Sports Master/ Ebaco
148	Concrete Grass Pavers	Pave Espania/K K Manhole
149	Metal Baffle F/Ceiling	Hunter Douglas/ Armstrong/ Hi-steel/NewAge/ Bollard /Knauf
150	Wooden Perforated F/Ceiling	Anutone/ Armstrong/ANAKON/Bollard/Knauf

Sl. No	Items	Approved Makes / Brands
151	Acoustical Wooden Slats	Armstrong/ Anutone/ANAKON
152	S.S. PVD Finish Railing	Fabrinox/ Art Glass
153	Sports PVC Floor	Armstrong/ LG/ Tarkett
154	Profiled Metal Sheets	Tata BlueScope/ JSW
155	Calcium Silicate Ceiling	Aerolite/ Ramco/ Hilux
156	Gypsum Board Ceiling	Saint Gobain/WESTERN/Knauf
157	Metallic Grid Ceiling	Armstrong/ Hunter Douglas/ANAKON/Bollard/ Knauf
158	Acoustical Cloud Ceiling	Anutone/ Earcon/ Armstrong
159	Acrylic Solid Surface	Corian/ LG/ Haney
160	Glass Wool Insulation/Cross linked polyethylene insulation	Owen corning/ UP Twiga/ Lloyds/Paramount
161	PVC Corner & EDGE Beading	Arpitha/ Adhere Bonds Coats pvt. Ltd. / Dural Trims & Profile pvt. Ltd.
162	Tensile roof fabric	Mehler Technologies / Serge Ferrari
163	Modular furniture works	Godrej/ Steelcase/ Haworth/ featherlite
164	Concealed Cistern	JAQUAR / GEBERIT/GROHE/KOHLER
165	Auto Urinal Flush System	JAQUAR / GROHE/KOHLER
166	Hand Drier	DURAVIT / KOHLER/Euronics
167	GI Pipe Sealant	HENKEL – LOCTITE 55 / SUPERBOND / SEAL TITE
168	GI/MS Pipe Protection Wrapping & Coating	IWL – PYPKOTE / RUScTECH – COATEK/ KIMPL
169	D.I. Pipes & Fittings	ELECTRO STEEL / SURA ENTERPRISE / JAI BALAJI INDUSTRIAL LTD. / JAINSONS
170	CPVC Pipes and Fittings	SUPREME / Finolex/Astral/Prince/Aashirwad
171	RCC Pre-Fabricated Manholes	INDIAN HUME PIPE / JAIN SPUN/ PRAGATI CONCRETE UDYOG
172	Centrifugal Cast Iron Hubless Pipe IS: 15905	SKF / NECO / BIC/HEPCO / RPMF
173	CI LA Pipes and Fittings (IS: 1536)	NECO / ELECTRO STEEL/ CALCUTTA

Sl. No	Items	Approved Makes / Brands
		/ JINDAL SUPREME
174	CI Manhole Covers & Frames (Double Seal)	NECO / RAJ IRON FOUNDRY/BIC/ AGRA / KARTAR / GMGR
175	Sluice Valves	KIRLOSKAR / SANT / ZOLOTO / CASTLE
176	Motorized Butterfly Valve	HONEYWELL / LEHRY / ZOLOTO/ CASTLE
177	Check Valve – Dual Plate	ADVANCE / LEHRY / ZOLOTO/ CASTLE
178	Cast Iron Non Return Valve	ADVANCE / LEHRY / ZOLOTO/ CASTLE/Leader
179	NRV-Ball type – Sewage Application	DANFOSS / ZOLOTO / AUDCO/ CASTLE
180	Pressure Reducing Valve	LEHRY / HONEY WELL / DANFOSS/ CASTLE
181	Air Release Valve	CIM / ZOLOTO / RB/ CASTLE
182	Ball Float Valve	ZOLOTO / ESSETI / RBM/ CASTLE
183	Air Vent	CIM / ADVANCE / HONEYWELL
184	Y Strainer CI	EMERALD / SANT / SKS/ CASTLE
185	Backflow Preventer	NORMEX / KESSEL / ACO
186	Drinking Water Cooler/RO Unit	BLUE STAR / VOLTAS / OASIS/Eureka Forbes
187	Butterfly Valve	ZOLOTO / AUDCO / KIRLOSKER/ CASTLE
188	Pre-Fabricated HDPE Manholes	SUPREME / VECTUS / SANGIR
189	Mechanical Seal	BURGMANN / SEALOL / LEAK PACK
190	Supporting Material for piping	HILTI / FISHER/ MUPRO
191	Floor Drain Fixture & Channel Gratings	JAYNA / KESSEL / ACO
192	Modular Rain Water Harvesting	ASHWATH INFRATECH / SHREE GANGA BORING / RETAS ENVIRO
193	Irrigation Equipment	JAIN IRRIGATION / KISAN / FINOLEX
194	PVC Water tank	SINTEX / SUPREME / VECTUS/VOLGA
195	SS Pipe	JINDAL / APL APOLLO / GEBERIT
196	SOUND ISOLATION & VIBRATION TREATMENT FOR CEILING:	BSW/ OCEANZ ACOUSTICS/ REGUPOL

Sl. No	Items	Approved Makes / Brands
197	DOUBLE SKIN INSULATED ROOFING SYSTEM:	MULTICOLOR/ KIRBY/ TIGER STEEL
198	CARPET FLOORING:	BLOOMSBURG/ OCEANZ ACOUSTICS/ STANTON
199	POLY-SULPHIDE SEALANT	PIDILITE/ TUFFSEAL/ SIKKA/ FOSROC
200	DAMP PROOF MATERIAL	IMPERMO/ DURASEAL/ ACCO-PROOF.
201	LOCKS/LATCH	GODREJ/ HARRISON/ LINK/DORSET
202	WIRE MESH	STERLING ENTERPRISES/TRIMURTY WELDED MESH.
203	PRELAMINATED PARTICLE BOARD	GREEN PLY/MARINO/ CENTURY.
204	PVC DOOR FRAME/SHUTTER	DUROPLAST/Rajshri/ ALEX / BLACK COBRA/ POLYLINE
205	GLASS FRP DOOR SHUTTERS	DUROPLAST/ CACTUS
206	S.S. STAIRCASE RAILING	CONNECT ARCHITECTURAL PRODUCTS PVT.LTD/ JINDAL STAINLESS STEEL LTD. / ICICH INDUSTRIES/ ESSAR
207	GLASS RAILING	KICH, ART AND GLASS, PRANAV DOOR AND WINDOWS, SAINT GOBAIN
208	SMOKE SEAL STRIP	PROMAT/ASTRO FLAME.
209	TEMPERED GLASS	PILKINTON/ SAINT GOBAIN/ ASAHI
210	EPDM GASKET	HANU/ANAND.
211	CHEQUERED TERRAZO TILES	NITCO / BHARAT/ PODDARPARMESHWARI ENTERPRISES.
212	Glass Fibre Reinforced Gypsum (GRG) False Ceiling Tiles	Diamond Ceilings/Saint Gobain/Knauf
213	Cover Block	Conbextra/ Nuvoco/Astra
214	WPC door & shutter	ECHON/ Greenply/ Century
215	Gym equipment	Life Fitness/ Precor/ Hammer Strength
216	Furniture	Godrej/ Durian/ Rockworth

Preference to PPP-M – II Policy (Make in India):

- (i) The Government has issued public procurement policy (Preference to Make in India) vide Ministry of Commerce and Industry Development of industrial policy and promotion (PPS) vide order No. P-45021/2/2017-PP BE-II dated 28.05.2018, to —Encourage Make in India and to promote manufacturing and

production of Goods and services in India with a view to enhancing income and employment. CPWD has decided to implement this policy.

- (ii) The agency shall submit list of makes of materials proposed to be used on the work from local suppliers (as defined in the above order dated 28.05.2018) along with local content as specified below for approval of the department, out of the approved makes kept in the tender.
- (iii) The department will be approving only makes of the materials having a minimum local content of 50% for use on this work, out of the preferred make list.
- (iv) The minimum local content of 50% is considered for the complete item including labour component. The agency shall obtain the certificate for all items except for sundry items.
- (v) All wood products like flush door shutter, Plywood, Particle board, frame etc. shall be procured from fully owned factory of the manufacturer and not from Joint-Venture or Outsourced plant.
- (vi) In Case of non-availability of material in the preferred make list, Prior approval of the Engineer-in-Charge shall be taken for material of another make.

PART-C

(E&M Works Scope & Additional Conditions)

Name of Work :Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh, Distt-Patna, Bihar. [SH: Construction of 66 Nos. Residential Units (56 Nos. Grade B & C Quarters, 8 Nos. Grade D & E Quarters, 01 No. Grade F Quarter, and 01 No. RD Bungalow), along with a Community Centre for Officers comprising Doctor's Room, Gym/Health Club, Multipurpose Hall/Badminton Court, Yoga Room, Indoor Games Room, and Kids' Play Area, and Service Buildings (VCB Room, HT Metre Room, Panel Room, Security Post, etc.), including Basement for Parking, Water Tank with Pump Rooms, Electrical Panel Room, STP Area, Water Softening Area, and Stilts, along with all Development Works for Civil, E&M, Horticulture, and Services on EPC (Mode-III) basis.]

GENERAL TERMS & CONDITIONS FOR ALL ELECTRICAL & MECHANICAL COMPONENTS

1. GENERAL

- 1.1 The EPC contractor shall do the supply, installation, testing and commissioning of all Electrical & Mechanical services required to be provided in the said scheme & as detailed in the NIT. The work shall be executed as per scope & specifications of E&M works given hereafter in respective Components / part of the scheme or sub-head including drawings. **If any services/ work required to make the building/ scheme habitable & functional, including the statutory compliance, is not specifically mentioned in the scope of services, the same is deemed to be included within the scope of this tender and nothing extra shall be paid on this account.**
- 1.2 The scope of works also covers the checking of drawings for E & M schemes, Inventories of Fittings, Fixtures, E & M Equipment etc. and corrections, if any and approval of the same from the Engineer-in-Charge, before commencement of work. The contractor shall submit shop drawings of various E& M services mentioned in the tender as per the requirement of sites before execution of work for approval.
- 1.3 The bidder shall obtain necessary approval from respective local bodies / CFO/lift inspector etc. as applicable in respect of electrical & mechanical services which require approval before commencement of execution of work at site. During execution, if the local bodies / CFO etc. require a modification, the same shall be executed without any extra cost. Finally, after execution, obtaining approvals /NOCs / clearances from local bodies / CFO etc. shall be the responsibility of the successful bidder for which nothing extra is payable, in case any modification/extra work is required the same shall be done by the contractor without any extra cost. **All statutory fees/charges required for obtaining clearances from CEA/ Local Bodies if required shall be paid by the contractor which shall be reimbursed by the department after receipt of proper documents.**

2. CONFORMITY & APPLICABILITY WITH STATUTORY ACTS, RULES, STANDARDS AND CODES as amended upto date:

- i) CPWD General Specifications for Electrical Works Part I Internal – 2023.
- ii) CPWD General Specifications for Electrical Works Part II External – 2023
- iii) CPWD General Specifications for Electrical Works Part III (Lift & Escalators) – 2003
- iv) CPWD General Specifications for Electrical Works Part IV Substation – 2013
- v) CPWD General Specifications for Electrical Works Part V Wet Riser & Sprinkler System – 2020
- vi) CPWD General Specifications for Electrical Works Part VI Fire Detection and Fire Alarm System – 2018
- vii) CPWD General Specifications for Electrical Works Part VII DG Sets – 2013
- viii) CPWD General Specifications for Heating Ventilation & Air Conditioning (HVAC) – 2024
- ix) SP 7:2026 - National Building Construction Standards 2026 (NBCS 2026)
- x) Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026
- xi) National Electrical Code of India – 2023
- xii) Energy Conservation Building Code of India – 2017
- xiii) Barrier Free and Accessibility 2014
- xiv) Space for Electrical and Mechanical services in building – 2013

- xv) Quality Assurance Policy and Checking List of E & M services – 2016
 - xvi) CPWD Guidelines for sustainable Habitat – 2014
 - xvii) Manual on Accessible in Environment – 2019
 - xviii) Green rating manual 2021
3. In the case of discrepancy between the scope of work, specifications given in bid documents, CPWD specifications mentioned in bid documents and / or the drawings, following order of preference shall be observed.
 - i) Scope of work/Additional specifications given in bid documents or CPWD specifications mentioned in schedule A to F of bid documents whichever is stringent.
 - ii) Enclosed drawings.
 - iii) SP 7:2026 (NBCS 2026).
 - iv) Indian standard specifications of BIS.
 - v) Manufacturer's standard practice/Specifications
 - vi) International Standards.
 - vii) As per sound engineering practice as approved by the Engineer-In-Charge.
 4. All the equipment shall be delivered with (i) Manufacturer's Test certificate, (ii) Manufacturer's technical catalogues (iii) Installation/ Instruction manuals (iv) O& M manual. The bidder shall submit three sets of these documents and list of equipment's installed stating make, model, serial number etc. as required.
 5. The design layout plans/drawings/ other documents pertaining to E & M services shall have to be submitted for evaluation & approval, within timeline defined in the Milestone of work.
 6. Scaffoldings & all T & P required for execution, testing and commissioning of work shall have to be arranged by the contractor at his own cost. Nothing shall be paid extra on this account.
 7. **Undertaking from OEM for specialized E&M works:**
The specialized associate agency shall submit an undertaking from the OEM regarding.
 - a) **That OEM will unconditionally support technically throughout the execution of contract as well as for Maintenance/ Comprehensive Maintenance Contract for the useful life of the system.**
 - b) **The OEM will provide all the spares required for healthy functioning of the equipment for at least useful life of the system from the date of completion of the project.**
 8. The bidder shall also submit three sets of "As-Built drawings" of all E&M works as per directions of Engineer-in-Charge. All such "Completion/ As Built" drawings of all services shall have a unique ERP generated identified number (called the ERP Drawing/Document Number or EDN) through the Collaboration Tool of CPWD ERP. This EDN shall be in addition to the drawing/document number presently being written on drawings/documents and will be written/ stamped/embedded clearly on the drawing/document by the drawing/ document approving authority. All such "Completion/ As Built" drawings of services shall be uploaded in pdf format only on the Collaboration Tool for issue and transmittal along with unique EDN as issued by ERP unit. The "Completion/ As Built" drawings of all services shall not be considered valid without EDN and without uploading and transmittal on ERP Collaboration Tool.

9. Procedure for approval of materials, shop floor drawings and commencement of work:

Within the time specified in the table of milestone of the contract, the contractor shall submit following documents for approval of the Engineer in charge:

- (i) List of makes & model numbers of all items of equipments and accessories of each sub head of work to be used. Sample of materials wherever desired by Engineer in charge or required.
- (ii) Technical data sheet of the equipments to be supplied.
- (iii) Three copies Shop floor drawings of each Component/sub work separately for approval.
- (iv) Prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable, and update the model to LOD 500 as-built at completion. Agency shall submit 01 set of all types of E&M services design and drawings of Electrical work to the Engineer-in-Charge for necessary scrutiny and getting necessary observations/ corrections/ approval through Collaboration Tool of CPWD ERP. After final approval, these structural design, E&M services design and drawings shall be authenticated as “Good for Construction” by concerned Engineer-in-Charge. All such “Good for Construction” Drawings/Design/Documents shall have a unique ERP generated identifier number called the ERP Drawing/Document Number or EDN through Collaboration Tool of CPWD ERP. The “Good for Construction” Drawings/ Design/ Documents shall not be considered valid without EDN and without uploading and transmittal on ERP Collaboration Tool. The access shall be given to the EPC agency on the ERP Collaboration Tool of CPWD for needful.

It is the responsibility of the tenderer to get the makes, models, technical specifications and shop floor drawings approved from the department before placing of order.

10. Inspection before dispatch:

No equipment shall be dispatched out from the manufactures premises before such tests are conducted and test result recorded. These test certificates shall be given along the supply of equipment's. The Engineer In-charge shall, if he so desires inspect and witness the pre-delivery tests. For this purpose, the contractor shall give the 15 days' advance notice and arrange for such inspection of the department. Department shall bear the expenses of boarding and lodging including fare its officials for inspection. However, the inspection shall be done at the discretion of the department without any cost implication. All routine tests as per CPWD specifications shall be conducted before dispatch of equipment's and ROUTINE TEST & TYPE TEST Certificates for equipment's shall have to be submitted by the Contractor. The following equipments at least shall be offered for inspection before dispatch:

- a) All major equipments such as Transformer, DG set, HT Panel, LT Panel with incomer as ACB or MCCB more than 200amp., APFC Panel, rising mains/ bus duct, poles (if quantity is more than 100 nos.) Wires, Cables.
- b) Ventilation/ pressurization fan.
- c) Pumps, Fire fighting pumps, STP etc.

- d) AC system, Lift etc. or any such material/ item/ equipment as directed by Engineer-in-Charge shall be tested at manufacturers premises.

Prior to dispatch, all equipments shall be adequately protected & insured for the whole period of transit, storage and erection against corrosion and incidental damages etc. from the effect of vermin, sunlight, rain, heat and humid climate.

11. **Quality of material and workmanship:**

All parts of the equipment shall be of such design, size and material so as to function satisfactorily under all rated conditions of operation. All components of the equipments shall have adequate factor of safety. The work of fabrication and assembly shall conform to sound engineering practice and on the basis of "Fail Safe Design". The mechanical parts subject to wear and tear shall be easily replaceable type. The construction of the equipments shall be such as to facilitate easy operation, inspection, maintenance and repairs. All connections and contacts shall be designed to minimize risk of accidental short circuits caused by animals, birds and vermin etc. All identical items and their component parts should be completely interchangeable including spare parts.

12. **Inspection and testing at site:**

- (i) The installation shall be subject to necessary inspection during every stage of erection, by the Engineer In-charge or his authorized representative. The successful bidder shall provide all facilities and assistance for the purpose.
- (ii) Testing shall be carried out for the completed installation, in the presence of and to the satisfaction of the Engineer-in charge by the contractor. All required test results shall be recorded and submitted to the department. All instruments and facilities necessary for the tests shall be provided by the agency without any extra cost.

13. **Completeness of work:**

- i) The installations shall be completed in all respects and put in to operation even where certain details have not been mentioned / left out in these specifications. Any discrepancy may be brought out in pre-bid meeting.

All E&M services such as Internal and External Electrical installations, Fire fighting Sprinkler and Fire Extinguisher system, Fire Alarm System, PA system and LED Directional /Exit Signage for Central Battery System, Lifts, Sub Station, Diesel Engine driven generating set and UPS, CCTV surveillance system, Intercom system, Solar Photo Voltaic Power Generation System, Sewage Treatment Plant, Boom barrier, HVAC System inclusive IBMS etc. shall be declared as completed after completion of trial run of 1 month or completion of whole work whichever is later. However, maintenance of these installations during the **DLP period of 36 months shall be carried out by the agency at his own cost. DLP / Warranty period of all works /machines/ equipment shall commence from date of completion of complete work (project).**

- ii) All electrical & mechanical fittings / fixture / appliance to be provided for the work should have 5- star rating of BEE, where BEE certification is available.
- iii) CPWD specifications are available on CPWD website "cpwd.gov.in". The department shall not be responsible for the lack of knowledge and also the consequences thereof

to the Contractor. The information and data mentioned in the tender document have been furnished in good faith and for general information and guidance only. If the data or information furnished in tender document is different from data/ drawing after Preparation of architectural drawings, design approved for construction, The Engineer-in-Charge in no case shall be held responsible for the accuracy there of and/ or interpretations or conclusion drawn there from by the Contractor. All consequences in this regard shall be borne by the Contractor and no claim from the contractor, whatsoever, shall be entertained by the Department. It is presumed that the Contractor has satisfied himself for all possible contingencies, situations, bottlenecks and acts of coordination, which may be required between different agencies.

14. Incidental charges:

All incidental charges of any kind including insurance, cartage, storage, wastage and safe custody of material etc. shall be borne by the Contractor.

15. Quality assurance:

The Contractor shall make available, on request from the Department, for record, copies of invoices, challans, cash memos, receipts and other certificates, if any, vouchers towards the quantity and quality of various materials procured and the same shall be kept on record. These shall also provide information on the name of the manufacturer, manufacturer's product identification, manufacturer's instructions, warning, date of manufacturing and test certificates from manufacturers for the product for each consignment delivered at site, shelf life, if any, for the department to ensure that the material have been procured from the approved source and of the approved quality, as directed by the Engineer-in-Charge. Day to day account of receipt of such material shall be maintained at site of work. Nothing extra shall be payable on this account.

16. Storage of materials:

Storage and safe custody of all materials shall be the sole responsibility of the Contractor. Nothing extra shall be payable on this account. The arrangement of storage space shall be the responsibility of the contractor.

17. Quality control and testing of materials:

- (i) None of the material/ items/ equipment etc supplied shall be more than six months old from date of supply at site. Copy of GST Gate Pass/ Invoice/ Shipment/ Custom Clearance certificate/ details(in case of imported equipment) shall be submitted to prove the date of manufacture & genuineness of the equipment/ machines supplied.
- (ii) All the material to be used on works shall bear ISI certification mark unless otherwise the make is specified in the item or special conditions appended in this tender document. In case ISI mark material or the materials mentioned in the tender documents are not available, decision of Engineer-in-charge, which shall be final and binding, the material to be used shall conform to CPWD specifications applicable for this tender or IS Code. In such cases Engineer-in-charge shall satisfy himself about the quality of such material and give his approval in writing. All materials to be used on the site of work should be got approved from Engineer-in-charge before its use on work.

- (iii) If the department desires to send any samples of materials for testing in an accredited laboratory, the Contractor at his own expense shall supply all materials, labour for preparing and testing samples as required by the Engineer-in-Charge. The testing shall be carried out in the presence of the representative of the Engineer-in-Charge. The transportation and testing charges shall also be borne by the contractor. The Engineer in charge may waive the condition regarding testing if the quantity of the materials required for the work is small, subject to submission of related test certificates from the OEM. In all cases proof of procurement of materials from authentic manufacturers shall be provided by the contractor to the entire satisfaction of Engineer-in-charge. All materials equivalent to the one specified should be got approved by the Engineer-in-charge before using the said materials in the work.
 - (iv) The testing plan for quality control for material/equipment shall be as per CPWD Quality Assurance Policy and checklist for E&M services-2016 (Details are in **“Quality Assurance Manual”** listed below).
18. No foreign exchange shall be made available by the department for importing (purchase) of equipments, plants, machinery, materials of any kind. No delay and no claim of any kind shall be entertained from the Contractor on account of variation in the foreign exchange rate and/or any Custom duties/charges or any other levies.
 19. The contractor shall take into account the element of wastage(s) those are likely to be there in all elements of the work and quote his rate, taking that into account. The contractor shall study all the items from the point of view of wastage(s), which are likely to take place.
 20. Water and power supply required for construction, testing & commissioning shall have to be arranged by the contractor at his own cost.
 21. The description of E &M service & specifications is given in general but they are not exhaustive i.e. does not mention all the incidental works required to be carried out for complete execution of the work. The work shall be carried out in accordance with true intent and meaning of the specifications and the drawings taken together, regardless of whether the same may or may not be particularly shown on the drawings and/ or described in the specifications, provided that the same can be reasonably inferred there from. There may be several incidental works, which are not mentioned in the contract document/specifications but will be necessary to complete the item in all respect. All these incidental works which are not mentioned, but are necessary to complete the work shall be deemed to have been included in the overall amount quoted by the contractor for various components of work. No adjustment of rates shall be made for any variation in quantum of incidental works due to variation/ change in actual working drawings. Also, no adjustment of rates shall be made due to any change in incidental works or any other deviation in such element of work (which is incidental to the items of work and are necessary to complete such items in all respects) on account of the directions of Engineer-in-charge. Nothing extra shall be payable on this account.
 22. The scope of works also covers the preparation of layout plans, drawings for E&M schemes and approval of the same from the respective local bodies Fire Officer/Lift Inspector etc. before the commencement of work. During execution, if the local bodies etc. require a modification, the same shall be executed without any extra cost. Finally, after execution, approvals/NOCs/clearances from local bodies etc. shall be there's possibility of successful

bidder for which nothing extra is payable. In case any modification/extra work is required by the local bodies necessary for approvals/NOCs/clearances, the same shall be got executed and nothing extra shall be paid on this account. All statutory fees / charges required for obtaining clearances from Fire Officer/Lift Inspector/CEA / Local Bodies shall be paid by the contractor.

23. Supervision of work:

The Contractor shall depute Site Engineers & skilled/qualified workers as required for the work as per the documents required in NIT. The contractor shall submit organization chart along with details of engineers and supervisory staff. It shall be ensured that all decision-making powers shall be available to the representatives of the Contractor at site itself to avoid any likely delays on this account. The Contractor shall also furnish list of persons for specialized works to be executed for various items of work. The Contractor shall identify and deploy key persons having qualifications and experience in the similar and other major works, as per the field of their expertise. If during the course of execution of work, the Engineer-in-Charge is of the opinion that the deployed staff is not sufficient or not well experienced, the Contractor shall deploy more staff or better experienced staff at site to complete the work in desired quality and in stipulated time limit.

24. Defect Liability Period:

DLP / Warranty period for all equipments shall be guaranteed for a period of 3 (Three) years from the date of complete of total work (project) against unsatisfactory performance and/or break down due to defective design, workmanship of material. The equipments or components, or any part thereof, so found defective during guarantee period shall be forthwith repaired or replaced free of cost, to the satisfaction of the Engineer-in-Charge. In case it is felt by the department that undue delay is being caused by the contractor in attending the defect / fault removed, the same will be got done by the department at the risk and cost of the contractor. The decision of the Engineer-in-Charge in this regard shall be final. The firm will be required to attend to the breakdowns calls as and when required from RBI authority. However, the RBI authority shall carry out daily routine maintenance and operation after handing over the Building/Equipments to RBI authority in working conditions.

25. Indemnity:

The successful tenderer shall at all times indemnify the department, consequent upon this contract. The successful tenderer shall be liable, in accordance with the Indian Law and Regulations for any accident occurring due to any cause and the contractor shall be responsible for any accident or damage incurred or claims arising thereof on the department during the period of erection, construction and putting into operation the equipments and ancillary equipment under the supervision of the Contractor in so far as the latter is responsible. The successful tenderer shall also provide all insurance including third party insurance as may be necessary to cover the risk. No extra payment would be made to the Contractor on account of the above.

26. Co-operation With Other Agencies:

The successful tenderer shall ensure proper coordination between various associatecontractor executing the work of different E&M services in the construction of buildings, if any, and exchange freely all technical information so as to make the execution of thiswork/contract smooth. No remuneration should be claimed from the department for such technical cooperation. If any unreasonable hindrance is caused to other agencies and

any completed portion of the work has to be dismantled and re-done for want of cooperation and coordination by the tenderer during the course of work, such expenditure incurred will be recovered from the successful tenderer if the restoration work to the original condition or specification of the dismantled portion of the work was not undertaken by the tenderer himself.

27. Approval from local authorities:

- a) The Consultant engaged by the EPC Contractor shall submit all requisite details and undertake liaison and coordination with the respective agencies for obtaining NOCs/approvals for the 11/33 kV electrical substation and DG sets, approval of electrical load, release of sanctioned load, load sanction for each flat/premises, and net-metering approval for the grid-connected rooftop solar PV power plant from the local electricity supply agency. Similarly, the Consultant shall obtain NOCs/approvals from the Pollution Control Board and/or any other statutory authority, as may be required. The EPC Contractor shall assist the Consultant and provide all necessary details, documents, drawings, and other information required for obtaining such approvals from the concerned authorities. The EPC Contractor shall also comply with all requirements and conditions imposed by the concerned authorities.
- b) The contractor shall coordinate with service provider such as BSNL/AIRTEL/Jio for providing telephones/ broad bands connection.
- c) Any fee payable to the concerned authorities, as may be required for obtaining such approvals from local authorities/agencies such as PMDA, PMC, CEA, SBPDCL, etc., shall be paid by the Consultant/EPC Contractor, as applicable. The fees so paid shall be reimbursed by the Department upon submission of the relevant supporting documents, including payment receipts. The role of the Department shall be limited to signing the applications, drawings, documents, etc., on behalf of the Owner, wherever required, for submission to the concerned authorities for obtaining the requisite approvals.

28. Care of the Building:

- Care shall be taken by the contractor while handling and installing the various equipments and components of the work to avoid damage to the building. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost. He shall also remove at his cost all unwanted and waste materials arising out of the installation from the site of work.
29. Foundation of all equipment's as per recommendations of OEM, Anti vibration isolators etc as required shall be provided.
 30. Tables and chairs etc. required for installing/placing any Hardware like computer/software including providing any facility for operation of such devices shall be provided by the contractor free of cost.
 31. Minor building works necessary for installation of equipment's, foundation, trench for fuel line & cable, making of opening/ core cutting in walls or in floors and restoring them to their original condition/finish and necessary grouting etc. as required shall be done by the agency free of cost.
 32. All support for exhaust & water pipes, chimney, bus trunking, cables, anti- vibration pads etc. as required shall be provided necessary.

33. All electrical work and neutral earthing, body earthing, control and instrument wiring, required for any E&M equipment shall be as per good engineering practice, CPWD specifications and NEC 2023.
34. Scaffoldings & any other T&P required for execution, testing and commissioning of work shall be arranged by the contractor and is included in the cost of work tendered by the contractor.
35. Being high-rise building, fire compartmentation (horizontal and vertical) is very important. Hence contractor shall provide fire barriers/sealants of suitable fire rating by using foam concrete/chemicals to close all horizontal and vertical openings in shafts/walls after providing service lines.
36. After handing over of the building/campus, the cost of day-to-day consumable materials, such as HSD oil and lubricating oil for DG sets, raw materials/consumables required for operation of the STP, etc., shall be borne by the RBI Authority.
37. Drawings/ documents to be furnished on completion of installation: Five sets of as built laminated drawings as detailed below in respect of each Component shall be submitted by the Contractor while handing over the installation to the department. Out of these sets one set each in respect of work of electric substation, firefighting systems, D G Set, lift, external lighting, CCTV, LAN, Intercom system, Solar system etc. shall be laminated on a hard base for display in the respective control room/equipment room/machine room. These drawings shall have comprises:
 - (i) Installation drawings giving complete details of all the equipment are including their foundation.
 - (ii) Single line diagram and layout of all electrical control panels giving switchgear ratings and their disposition, cable feeder sizes and their layout.
 - (iii) Control wiring drawings with all control components and sequence of operation to explain the operation of the control circuit.
 - (iv) Plumbing layout drawings giving sizes and length of all the pipe sand the size sand locations of all types of valves and accessories in case of firefighting systems and water supply pumping systems.
 - (v) Completion plans indicating general layout of the building, location of main switch board and distribution boards, indicating the circuit numbers controlled by distribution boards, position of all points and their controls, types of fittings etc. in respect of internal and external electrical installation.
 - (vi) Manufacturer's technical catalogues of all equipment's and accessories.
 - (vii) Operation and maintenance manual of all major equipment's, detailing all adjustments, operation and maintenance procedure.

In addition, soft copy of all above drawings shall also be submitted by the contractor.

The work has to be carried out as per GFC drawings in conjunction with additional conditions given herein on the basis of "Whichever is Richer (Stronger)"

The Similar Work Experience of E&M Services

1. The similar work experience for determining the eligibility of Associate agencies as prescribed at Bid Documents –“Information and Instructions for Bidders for e-bidding” is as given below:
2. For Each E&M Works, the composite contractor shall have to associate with other agency, who fulfils the following requirements. Joint ventures for associate agencies are not accepted. Should have satisfactorily completed the works as mentioned below during last 7 years ending previous day of last date of submission of bid:

S.No.	Components of Specialized Works & Approx. Cost	Eligibility Criteria	Definition of similar work
i	SH: C-1 Internal & External Electrical and UPS (ECPT= Rs. 11.68 Crore)	CPWD Enlisted Contractor in appropriate class & Category (B&R) having valid electric license.	
ii	SH: C-2 Fire fighting, Sprinkler and Fire Extinguisher system (ECPT= Rs. 3.06 Crore)	3 similar works, each of value not less than @ 40% of ECPT of this component OR 2 similar works, each of value not less than @ 60% of ECPT of this component OR 1 similar work, each of value not less than @ 80% of ECPT of this component	Similar work shall mean “SITC of water based Firefighting system comprising Wet Riser with Sprinkler System and down comer in the buildings”.
iii	SH: C-3 Fire Alarm System, PA system and LED Directional / Exit Signage (ECPT= Rs. 1.56 crore)	3 similar works, each of value not less than @ 40% of ECPT of this component OR 2 similar works, each of value not less than @ 60% of ECPT of this component OR 1 similar work, each of value not less than @ 80% of ECPT of this component	Similar work shall mean “SITC of Automatic fire alarm system and public address system”.
iv	SH: C-4 Lifts (ECPT = Rs. 3.22 Crore)	Eligibility criteria for Original Equipment Manufacturer as per CPWD Lift Works OM dated 28.09.2020 enclosed in Lift subhead under part C (Revision-3)	Similar work shall mean “SITC of lifts”.
v	SH: C-5 Sub-Station (ECPT=Rs. 2.96 Crore)	3 similar works, each having a value of not less than 40% of the ECPT of this component with a minimum individual sub-station capacity of 1000 kVA; OR 2 similar works, each having a value of not less than 60% of the ECPT of this component with a minimum individual sub-station capacity of 1000 kVA; OR	Similar work shall mean “SITC of Sub-Station Equipments”.

		1 similar work, having a value of not less than 80% of the ECPT of this component with a minimum individual sub-station capacity of 1000 kVA.	
vi	SH: C-6 Diesel Engine Driven Generating Set. (ECPT= Rs. 84.36 Lakh)	3 similar works, each of value not less than @ 40% of ECPT of this component with a minimum individual DG capacity of 200 KVA. OR 2 similar works, each of value not less than @ 60% of ECPT of this component with a minimum individual DG capacity of 200 KVA. OR 1 similar works, each of value not less than @ 80% of ECPT of this component with a minimum individual DG capacity of 200 KVA.	Similar work shall mean "SITC of DG set".
vii	SH: C-7 CCTV & Surveillance system (ECPT= Rs. 47.65 Lakh)	3 similar works, each of value not less than @ 40% of ECPT of this component OR 2 similar works, each of value not less than @ 60% of ECPT of this component OR 1 similar works, each of value not less than @ 80% of ECPT of this component	Similar work shall mean "SITC of CCTV System".
viii	SH: C-8 Intercom System (ECPT= Rs. 52.25 Lakh)	3 similar works, each of value not less than @ 40% of ECPT of this component OR 2 similar works, each of value not less than @ 60% of ECPT of this component OR 1 similar works, each of value not less than @ 80% of ECPT of this component	Similar work shall mean "SITC of Centralized Intercom System".
ix	SH: C-9 Solar Photo Voltaic Power Generation (ECPT= Rs. 76.25 Lakh)	3 similar works, each of value not less than @ 40% of ECPT of this component OR 2 similar works, each of value not less than @ 60% of ECPT of this component OR 1 similar works, each of value not less than @ 80% of ECPT of this component	Similar work shall mean "SITC of Solar Photo Voltaic Power Generation system".
x	SH: C-10 Water Supply Pumping / Dewatering System (ECPT = Rs. 9.84 Lakh)	3 similar works, each of value not less than @ 40% of ECPT of this component OR 2 similar works, each of value not less than @ 60% of ECPT of this component OR 1 similar works, each of value not less than @ 80% of ECPT of this component	Similar work shall mean "SITC of water-supply pumping systems comprising borewell / open-well submersible pumps, dewatering pumps, associated panels, controls, cabling,

			piping, valves and accessories”.
xi	SH: C-11 Sewage Treatment Plant - 50 KLD, MBBR Technology (ECPT = Rs. 36.49 Lakh)	3 similar works, each of value not less than @ 40% of ECPT of this component OR 2 similar works, each of value not less than @ 60% of ECPT of this component OR 1 similar works, each of value not less than @ 80% of ECPT of this component	Similar work shall mean “SITC of Sewage Treatment Plant using MBBR Technology”.
xii	SH: C-12 Boom Barrier (ECPT = Rs. 3.65 Lakh)	3 similar works, each of value not less than @ 40% of ECPT of this component OR 2 similar works, each of value not less than @ 60% of ECPT of this component OR 1 similar works, each of value not less than @ 80% of ECPT of this component	Similar work shall mean “SITC of Boom Barrier”.
xiii	SH: C-13 VRF/VRV, Ventilation and Pressurization (ECPT = Rs. 1.42 crore)	3 similar works, each of value not less than @ 40% of ECPT of this component OR 2 similar works, each of value not less than @ 60% of ECPT of this component OR 1 similar works, each of value not less than @ 80% of ECPT of this component	Similar work shall mean “SITC of VRF/VRV, ventilation and pressurization system”.
xiv	SH: C-14 Façade Lighting (ECPT = Rs. 41.20 Lakh)	3 similar works, each of value not less than @ 40% of ECPT of this component OR 2 similar works, each of value not less than @ 60% of ECPT of this component OR 1 similar works, each of value not less than @ 80% of ECPT of this component	Similar work shall mean “SITC of Façade lighting work”.

3. The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to previous day of last date of submission of bid. The composite category contractor is also eligible to carry out himself/herself any or all of these works without associating any specialized agency provided: -

a) The firm fulfils the prescribed eligibility criteria respectively for these work(s).

Or

- b) The firm directly procures the equipment of approved make from manufacturer and get it installed from authorized agency/service provider of the manufacturer or specialized agency as per criteria mentioned in NIT.

The composite contractor and the associated agencies shall give required affidavit to confirm their association. Tender accepting authority may approve change of associate in case it is required during the currency of the contract.

Note: The main contractor/agency has to submit details of such agency to be associated/manufacturer or their authorized service provider to the Engineer-in-charge within

prescribed time. The associated agency shall be approved by Engineer-in-charge. In case the main contractor intends to change associated agency/agencies during the operation of the contract, he shall obtain prior approval of Engineer-in-charge. The new agency/agencies shall also have to satisfy the laid down eligibility criteria mentioned above. In case Engineer-in-charge is not satisfied with the performance of any agency, he can direct the main contractor to change the agency executing such items of work and this shall be binding on the contractor.

4. Approval of the specialized agencies for each specialized work shall be obtained from the Engineer-in-Charge within prescribed time. Even if, such specialized items of work shall be executed by the specialized agencies at later date the work shall be deemed to be executed by the tenderer for all purposes and the responsibility of the quality of items of works executed etc. shall continue to be that of the tenderer only.
5. The associate agency shall submit the willingness to get associated with the main contractor for execution of the E&M component of works in wholesome manner and as per the conditions set out in the MOU to be entered into, between the one who is awarded the work and the associate eligible electrical contractor/ manufacturer or their authorized service provider. (Format of willingness and MOU is given below)
6. In support of the eligibility conditions of the proposed associated electrical contractor, copy of their registration documents, Electrical Contractor's License, GST documents, eligibility documents duly attested by Main contractor shall be submitted to the Engineer-in-Charge for deciding the eligibility. Such associate electrical contractor will certify that they are not debarred as on the day of application for sale of tender.
7. In the event of the concerned E&M agency not performing satisfactorily or failure of associate/ sub-contractor to complete the E&M work, the main contractor on the written direction of the department, shall remove the Associate/sub-contractor deployed on the work and shall submit name of new associate who fulfils the conditions mentioned in NIT to execute the leftover work without any loss of time or variation in cost to the department in this regard. Such associates shall also enter into Agreement with the main tenderer shall meet all the guarantee for the equipment already supplied for which payment has been released by the department in part. If any equipment supplied for the work, during the currency of the earlier Associate/sub-contractor and paid partly by the department becomes redundant/not in a position to be installed and commissioned and put to beneficial use due to change in agency for execution of E&M work, the main contractor shall be liable for replacement of the equipment(s) at no cost to Department. No change of Electrical Contractor will be allowed without prior approval of the Engineer-in-Charge.
8. The main contractor shall be responsible and liable for proper and complete execution of the E&M works and ensure coordination and completion of both civil and electrical work.
9. The associate agency shall attend the inspection of the work by the Engineer-in-Charge as and when required.
10. The agencies executing the electrical work should have valid license for LT/HT as applicable.

Quality Assurance Plan & Checklist for E&M Services

Main contractor/ Associate Agency shall submit the required quantity of material as sample for testing from Govt./ Approved Private Laboratory.

The decision on testing shall be as per E&M quality checklist of CPWD vide OM no. 51(4)/CE(E)/CSQ/2016/293(H) dated 31/03/2016 as applicable or as per direction of E-in-C and shall be binding on contractor.

Contractor shall submit the required size and quantity of samples for the testing.

Department shall send the samples to the testing laboratory & the test results shall directly come to department however, the cost of all testing shall be borne by the Contractor.

Annexure- A

A- Internal EI								
Stage /SI no	Material / Process	Standard Applicable/ Test Required to be Done	Total Qty (each type) reqd. in agreement or lot size whichever is less	Whether Proof of Dispatch required	Whether Manufacturer's test certificates required	Sample Size	Location of Test	
							At manufacturer works	At third Party Lab.
1	LT Panels with ACB	CPWD specs. part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit ratings etc.	Any	Y	Y	100%	Y	N
2	LT Panels with incomer of more than 200 A	CPWD specs. part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit ratings etc.	Up to 2	Y	Y	0	N	N
			>2 and < 10	Y	Y	1	Y	N
			>10	Y	Y	2	Y	N
3	Rising Main and Bus Trunking	CPWD specs part IV/QA Plan	Length upto 500 mtr	Y	Y	10% length and fittings	N	N
			Length > 500 mtr	Y	Y	10% length and fittings	Y	N
4	Rigid MS Conduit	IS 9537 Pt I & 2	up to 2500 mtr	Y	N	N	N	N
			>2500 mtr	Y	Y	1 piece of 1 mtr for every 1000 mtr	N	Y

Stage / SI no	Material / Process	Standard Applicable/ Test Required to be Done	Total Qty (each type) reqd. in agreement or lot size whichever is less	Whether Proof of Dispatch required	Whether Manufacturer's test certificates required	Sample Size	Location of Test	
							At manufacturer works	At third party Lab.
5	Rigid PVC Conduit	IS 3419 :1989	up to 2500 mtr	Y	N	N	N	N
			>2500 mtr	Y	Y	1 piece of 1 mtr for every 1000 mtr	N	Y
6	Cable Tray	CPWD Spec. Part-I/II: Check for perforation area, paint/Galvanising thickness and Material Composition	Length upto 500 mtr	Y	Y	N	N	N
			Length > 500 mtr	Y	Y	One piece for every 500 Mtr	N	Y
7	DWC/ Corrugated HDPE Pipe	IS 14930 , Check for thickness, material, Mechanical Strength and smoothness	Length upto 500 mtr	Y	N	N	N	N
			Length > 500 mtr	Y	Y	One piece for every 500 Mtr	N	Y
8	Wire	IS 694:1990	up to 10000 mtr	Y	N	N	N	N
			>10000 mtr	Y	Y	1 piece for every 10000 mtr or less	N	Y

Y Stands Yes

B- Street /Compound Lighting								
Stage /SI no	Material / Process	Standard Applicable/ Test Required to be Done	Total Qty (each type) reqd. in agreement or lot size whichever is less	Whether Proof of Dispatch required	Whether Manufacturer's test certificates required	Sample Size	Location of Test	
							At manufacture works	At third Party Lab.
1	LT Panels with ACB	CPWD specs. part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit ratings etc.	Any	Y	Y	100%	Y	N
2	LT Panels with incomer of more than 200 A	CPWD specs. part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit ratings etc.	Up to 2	Y	Y	0	N	N
			>2 and < 10	Y	Y	1	Y	N
			>10	Y	Y	2	Y	N
3	Poles	Whether in conformity with tender specs	up to 100	Y	Y	N	N	N
			>100	Y	Y	2%	Y	N
4	LT Cable	IS 1554 Part 1	up to 2500 mtr	Y	N	N	N	N
			>2500 mtr	Y	Y	1 piece for every 2500 mtr	N	Y
5	DWC/ Corrugate d HDPE Pipe	IS 14930 , Check for thickness, material, Mechanical Strength and smoothness	Length upto 500 mtr	Y	N	N	N	N
			Length > 500 mtr	Y	Y	One piece for every 500 Mtr	N	Y
6	Fittings	Whether in conformity with tender specs	>100	Y	Y	NA	N	N

C- Sub Station, DG Set, UPS

Stage / SI no	Material / Process	Standard Applicable/ Test Required to be Done	Total Qty (each type) reqd. in agreement or lot size whichever is less	Whether Proof of Dispatch required	Whether Manufacturer's test certificates required	Sample Size	Location of Test	
							At manufacture works	At third Party Lab
1	HT Panel	CPWD specs part IV/QA Plan: CT ratio and accuracy Class should be invariably checked	Any	Y	Y	1	Y	N
2	HT Panel: metering and protection devices	Check CT ratio and accuracy Class , Relays and Meters	Any	Y	Y	1	Y	N
3	LT Panels with ACB	CPWD specs. part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit ratings etc.	Any	Y	Y	1	Y	N
4	LT Panels with incomer of more than 200 A	CPWD specs. part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit ratings etc.	Up to 2	Y	Y	0	N	N
			>2 and < 10	Y	Y	1	Y	N
			>10	Y	Y	2	Y	N
5	Capacitor Panel	CPWD specs part IV/QA Plan: Check for type of capacitors used, operation of relay, settings. Change the load and its type and check functionality	Any	Y	Y	1	Y	N
6	Rising Main and Bus Trunking	CPWD specs part IV/QA Plan.	Length upto 500 mtr	Y	Y	10% length and fittings	N	N
			Length > 500 mtr	Y	Y	10% length and fittings	Y	N

Stage / SI no	Material / Process	Standard Applicable/ Test Required to be Done	Total Qty (each type) reqd. in agreement or lot size whichever is less	Whether Proof of Dispatch required	Whether Manufacturer's test certificates required	Sample Size	Location of Test	
							At manufacture works	At third Party Lab
7	Cable Tray	CPWD Specs. Part I/II: Check for perforation area, paint/Galvanising thickness and Material Composition	Length upto 500 mtr	Y	Y	N	N	N
			Length > 500 mtr	Y	Y	One piece for every 500 Mtr	N	Y
8	DWC/ Corrugated HDPE Pipe	IS 14930 , Check for thickness, material, Mechanical Strength and smoothness	Length upto 500 mtr	Y	N	N	N	N
			Length > 500 mtr	Y	Y	One piece for every 500 Mtr	N	Y
9	Transformer	CPWD Specs. Part IV/QA Plan: Physical verification of accessories as per agreement and Routine tests as per IS:2026/IS 11171:1985(whichever applicable), with particular attention to losses meeting ECBC norms / as per agreement, Type test certificate for exact same design for impulse withstand and short circuit withstand shall be made available by Manufacturer , Temperature rise test of one transformer of each design shall be done. Copies of the certificate for pressure test, test for bushings shall be supplied to the department.	Any	Y	Y	100%	Y	N

Stage /Sl no	Material / Process	Standard Applicable/ Test Required to be Done	Total Qty (each type) reqd. in agreement or lot size whichever is less	Whether Proof of Dispatch required	Whether Manufacturer's test certificates required	Sample Size	Location of Test	
							At manufacture works	At third Party Lab
10	DG set	Load testing as per CPWD specs	Any	Y	Y	100%	Y	N
11	UPS	Load testing and operation logic as per CPWD specs , Check for input and output power quality as per agreement	Any	Y	Y	100%	Y	N
12	HT Cable	IS 1554 Part II	Up to 500 mtr.	Y	Y	I	N	N
			>500 mtr	Y	Y	1 Piece for every 500 mtr	N	Y
13	LT Cable	IS 1554 Part I	up to 2500 mtr	Y	N	N	N	N
			>2500 mtr	Y	Y	1 piece for every 2500 mtr	N	Y

Y* Tested for its capacity at AHRI Certified test bed (either at manufacturer's work or at Third Party)

QUALITY ASSURANCE PLANS

Internal Electrical Installations:

- i) The detailed instructions on safety procedures given in BIS code no. 5216:1982 "Code of safety Procedures and Practices in Electrical works" shall be strictly followed.
- ii) Safety procedures given in Chapter 10 of CPWD General Specifications for Electrical works Part-1(Internal) shall be followed.
- iii) Safety recommendation as per Central Electricity Authority Regulations, 2010.
- iv) The materials shall be tested from 3rd Party laboratories are conduit, wires, cables etc.
- v) Providing and fixing of conduit work as per CPWD Specifications
- vi) No. of wires in one conduit shall be ensured as per CPWD Specifications.
- vii) Colour coding of the wires to be ensured.
- viii) Lugs and thimbles at cable/ wire ends in switch boxes as per CPWD Specifications.

- ix) Labelling of switch boxes shall be ensured.
- x) Termination of earth terminals in earth pits, switch box, DBs and accessories to be ensured. Earth chamber to be constructed and proper marking to be done.
- xi) A comprehensive schematic diagram is prepared starting from the main board up to the final DBs. All such boards are duly marked and numbered.
- xii) The pre-commissioning testing of the installation shall be carried out such as
Insulation resistance test.
Polarity test of switch.
Earth continuity test.
Earth electrode resistance test.
- xiii) All the tests at site shall be carried out for the completed installations, in the presence of and to the satisfaction of the Engineer in Charge by the contractor. All the test results shall be recorded and copy of the same shall also be submitted to the Department.
- xiv) On completion of an electrical installation (or an extension to an installation), a certificate shall be furnished by the electrical contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as given in Appendix “E” of CPWD General Specifications for Electrical Works Part-1(Internal) in addition to the test certificate required by the local electric supply authorities.
- xv) Contractor shall keep constant liaison with the local municipal authority, Fire service Department of Bihar, Central Electricity authority, National Green Tribunal, Bihar Power Distribution Company Limited Pollution Control Board, Bihar and all other statutory authorities etc, whose approvals and permissions are required before, during course of execution and after execution of the work. Contractor shall make all expenses related to these approvals and shall be responsible for time bound approvals. No extension of time shall be given if the approvals are delayed on the side of the contractor. Any payment made by contractor to statutory authorities shall be reimbursed on production of the vouchers.

**MEMORANDUM OF UNDERSTANDING [M.O.U] BETWEEN Main CONTRACTOR
AND ASSOCIATE CONTRACTOR
(Separate for each specialize work)**

1] M/S [Name of the firm with full address]

Enlistment Status (if applicable)

Valid upto:

[Henceforth called the main contractor]

And

2] M/S [Name of the firm with full address]

Enlistment Status (if applicable)

Valid upto:

[Henceforth, called Associate eligible electrical contractor/ manufacturer or their authorized service provider]

Name of Work:-Specify the E&M Services.

We state that M.O.U. between us will be treated as an agreement and has legality as per Indian Contract Act (amended up to date) and the department (CPWD) can enforce all the terms and conditions of the agreement for execution of the above work. Both of us shall be responsible for the execution of work as per the agreement to the extent of this MOU allows. Both the parties shall be paid consequent to the execution as per agreement to the extent this MOU permits.

We have agreed as under:

- (i) The associate eligible electrical contractor/ manufacturer or their authorized service provider shall be liable for disciplinary action if he failed to discharge the action(s) and other legal action as per agreement besides forfeiture of the security deposit.
- (ii) All the material, machinery and equipment's, tools and tackles required for execution of the electrical works as per agreement shall be the responsibility of the associate eligible electrical contractor/ manufacturer or their authorized service provider.
- (iii) The site staff required for the electrical work shall be arranged by the associated contractor as per terms and conditions of the agreement.
- (iv) The associate eligible electrical contractor/ manufacturer or their authorized service provider shall sign the supplementary agreement with RBI for the useful life defined in CAMC Component.
- (v) All the material, machinery and equipment's, tools and tackles required for CAMC of the electrical works as per agreement shall be the responsibility of the manufacturer or OEM or their authorized service provider.
- (vi) The site staff required for the CAMC work shall be arranged by the associated contractor as per terms and conditions of the agreement.

Signature of main contractor

Signature of associate
eligible electrical contractor/
manufacturer or their authorized service provider

Date: date:

Place: Place:

Countersigned by Executive Engineer

WILLINGNESS CERTIFICATE
(Separate for each specialize work)

Name of Work: Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh, Distt-Patna, Bihar. [SH: Construction of 66 Nos. Residential Units (56 Nos. Grade B & C Quarters, 8 Nos. Grade D & E Quarters, 01 No. Grade F Quarter, and 01 No. RD Bungalow), along with a Community Centre for Officers comprising Doctor's Room, Gym/Health Club, Multipurpose Hall/Badminton Court, Yoga Room, Indoor Games Room, and Kids' Play Area, and Service Buildings (VCB Room, HT Metre Room, Panel Room, Security Post, etc.), including Basement for Parking, Water Tank with Pump Rooms, Electrical Panel Room, STP Area, Water Softening Area, and Stilts, along with all Development Works for Civil, E&M, Horticulture, and Services on EPC (Mode-III) basis.]

I hereby give my willingness to work as associate eligible electrical contractor/manufacturer or their authorized service provider for the above-mentioned work. I will execute the work as per specifications and conditions for the agreement and as per direction of the Engineer-in-charge. Also I will employ full time technically qualified supervisor for the works. I will attend inspection of officers of the department as and when required. I shall also sign the supplementary agreement for CAMC with RBI for providing the CAMC services for the prescribed period.

Date:

Signature
of associate eligible electrical
contractor/manufacturer or
their authorized service provider

SH: C-1**INTERNAL & EXTERNAL ELECTRICAL INSTALLATION****1.1 Scope of work :-**

- 1.1.1 It includes planning and electrification of entire internal Electrical as well as external Electrical installation as per enclosed marked drawings attached with bid documents including all materials, manpower, testing, inspections, obtain approval from competent authority central, state, local bodies and commissioning in all respects for successful operation/ utilization in true sense and handed over to end user in complete shape and to be maintained up to defect liability period as mentioned in the bid documents. However, bidder has to check the drawings and design and get corrected if any and take approval of drawings and materials from Engineer-in-charge of E&M components before execution of work.
- 1.1.2 The wiring of all the buildings proposed in this work i/c lift shaft, machine room wirings and entire external electrifications i/c power distribution to each block/ buildings/ utilities complete as required as per manner mentioned in respective specification of Component and as per Drawing enclosed along with Bid document.
- 1.1.3 All wiring shall be carried in recessed Heavy duty PVC conduit (ISI marked) having **Cross- Linked Halogen Free Flame Retardant (HFFR) Copper conductor (class-2) wires / cables (ISI marked) wires / cables (ISI marked)** of suitable size i/c earthing wire. The wiring shall be carried out as per CPWD Specification. The switch-socket, and other accessories shall be modular type and to be installed on G.I. modular boxes of required modules.
- 1.1.4 TV wiring (RG-6) Cable, Cat- 6A Cable /telephone cable shall also be Cross- Linked Halogen Free Flame-Retardant Copper conductor (class-2) as required for EPABX / Data networking cable shall be drawn in suitable size heavy duty PVC conduit. Wherever required, hot Dip Galvanized GI Cable trays (perforated) cable tray / DLP trunking may also be used. Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.
- 1.1.5 All internal as well as external light shall be LED type, based on required lux level and design and specification mentioned in the respective Component. Ceiling fans, exhaust fans etc. should be of highest star rating, wherever available. However, Ceiling fans should be regulator type BLDC, 5-star rating and ISI marked.
- 1.1.6 Normal power from metering panel to each Quarter, shall be brought by suitable size copper conductor submain wiring to respective Double Door TPN MCB distribution boards of required size.
- 1.1.7 Service connection to each building/ block shall be provided by using suitable size aluminium conductor Cross- Linked Halogen Free Flame Retardant armoured cable of 1.1 kV grade and terminated in cubical type panel board as per requirement. Power supply to

- each panel provided at each block shall be fed directly from substation main LT panel / Feeder Pillar.
- 1.1.8 In each residential building/blocks, power to each quarter shall be distributed through suitable size **Cross- Linked Halogen Free Flame Retardant (HFFR) Copper conductor (class-2) wires / cables (ISI marked)** through Meter panel.
 - 1.1.9 In each block, there shall be cubical type metering panelboard, for normal power supply having required size/capacity switchgears, and space for installed pre-paid energy meter according to numbers of quarters in each residential building/block.
 - 1.1.10 In each block, there shall be another cubical type panel board having required size/capacity switchgears, for essential power supply to common area lighting such as corridor, lift lobby, staircase, lifts etc. and DB for UPS power supply. Common area lighting and lifts power consumption shall be metered separately.
 - 1.1.11 The bidder shall submit the design of street light to achieve the lux level and uniformity as per standards. Street Lighting shall be done by using minimum 60 W LED fittings on 6 Mtrs. long GI Octagonal pole, power shall be fed from nearest essential feeder pillar by using suitable size armoured cable of 1.1 kV grade having Cross- Linked Halogen Free Flame Retardant aluminium conductor. 20% of street light shall be of hybrid type solar street light.
 - 1.1.12 Garden/landscape lighting shall be provided by using LED bollard light / compound light on marked location on LOP. All out-door pole shall be of Hot deep galvanizing and decorative MS Pole.
 - 1.1.13 Stage lighting shall be done by using LED fitting i/c cable, cable tray, cat walk, controlling system as per requirements. No special lighting arrangement has considered for stage lighting.
 - 1.1.14 Façade lighting shall be provided on Community Centre. Design should be done through professional light designer. The façade lighting shall be done to highlight the architectural features of building and illuminate the façade. The expert designer shall prepare simulation or any other method to prepare the design for approval of the competent authority. In all cases, lux level shall be maintained.
 - 1.1.15 10% of the cost of LED fittings as per purchase bill / GST invoice will be kept with the department as guarantee money and will be released after guarantee period of 05 years is over including defect liability period.
 - 1.1.16 Lightning protection device/ system shall be provided on required location as per design and shall be grounded by suitable size and type earth electrode.
 - 1.1.17 All electrical installation (internal as well as outdoor, equipment's) shall be earthed by suitable size earthing electrode.
 - 1.1.18 All external power distribution shall be done by using suitable size Cross- Linked Halogen Free Flame Retardant aluminium conductor cable of 1.1 kV grade from LT panel or feeder pillar. The cable shall be drawn through underground DWC HDPE pipe and should be provisions of cable chamber in suitable location as per design and drawing.
 - 1.1.19 All common area lighting in stilt and other areas shall have Astronomical timer and day light/ occupancy sensor as deemed fit for saving of energy.
 - 1.1.20 The scope shall also include the guarantee/warranty of the entire installation and all equipment and accessories supplied by the Contractor, for a period as specified by the respective OEM or the Defect Liability Period (DLP), whichever is higher. The scope shall also include the submission of all requisite test reports/certificates for the materials and products used in the project, including packing materials and all green products, as required under the specifications and applicable standards.

1.1.21 For installation of split-type AC units in each quarter, insulated copper piping of suitable diameter and power cables from the indoor unit location to the outdoor unit location shall be provided and laid at appropriate recessed locations as per approved drawings by Engineer-in-charge. Further, UPVC drain piping of suitable diameter shall be provided and laid from the indoor unit location to a suitable drain point for proper drainage of condensate water.

1.2 Internal electrical installation: -

The work shall be carried out as per CPWD General Specifications of Electrical Works Part- I (Internal) 2023, Part-II (External) 2023, Part-IV (Sub-station) 2013 as amended upto date, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026.

1.2.1. Amenities (Electrical) and Light point /Fan point, Fittings etc. shall be as per inventory and marked drawings.

ABSTRACT																									
NAME OF WORK:- RD HOUSE, RBI PATNA, PATNA																									
Sr no.	Description	FAN POINT	LIGHT POINT	1No. 6A SWITCH + 1No. 6A SOCKET	1No. 16A SWITCH + 1No. 16A SOCKET	2No. 6A SWITCH + 2No. 6A SOCKET forTV	16A GYSER POINT	TV POINT (RJ11)	AC POINT	DATA POINT	BELL POINT	VIDEO DOOR PHONE	TELEPHONE	1200 MM CEILING FAN	900 MM CEILING FAN	BULK HEADLIGHT	MIRROR LIGHT LED 10 WATT	LED LIGHT 18WATT	LED DOWN LIGHT 15 WATT (BALCONY)	LED DOWN LIGHT 15 WATT (STAIRCASE)	WARDROBE LIGHT (10W)	WALL LIGHT (BRACKET) 10	4' LED 20 W LUMINAIRS (Tube Light)	EXHAUST FAN	chandler
1	GROUND FLOOR																								
	Master bedroom	1	2	3	2	1		1	1	1			1	1								1	1		
	toilet+Dress	0	5	2			1										1	2			1			1	
	Bed bedroom	1	2	3	2	1		1	1	1			1	1								1	1		
	toilet+Dress	0	4	2				1									1	2						1	
	Kitchen+Utility+Store	2	7	6	7		1								2			6						1	
	DRAWING ROOM	0	3	3	2	1		1	1				1									1	2		1
	DINING ROOM +corridor	1	11	1	1									1				9				1	1		
	SERVANT ROOM	1	1	1	2									1									1		
	SERVANT TOILET+ change	0	3				1											2						1	
	office	1	2	1	1				1	1			1	1								1	1		
	3 toilet	0	9														3	3						3	
	Entrance	0	7								1	1						6							
	BALCONY	0	6																6						
	TOTAL	7	62	22	17	3	4	3	4	3	1	1	4	5	2	0	5	30	6	0	1	5	7	7	
2	FIRST FLOOR																								
	Master bedroom	1	2	3	2	1		1	1	1			1	1								1	1		
	toilet+Dress	0	5	2			1										1	2			1			1	
	Bedroom	1	2	3	2	1		1	1	1			1	1								1	1		
	toilet+Dress	0	4	2			1										1	2						1	
1	Study Room	1	2	2	1				1	1				1								1	1		
	CORRIDOR	0	9															9							
	Pooj Room	0	1															1							
	TOTAL	3	25	12	5	2	2	2	3	3	0	0	2	3	0	0	2	14	0	0	1	3	3	2	0
3	MUMTY +Terrace	0	14													14									1
4	GARRAGE		2																				2		
	TOTAL FOR RD HOUSE	10	103	34	22	5	6	5	7	6	1	1	6	8	2	14	7	44	6	0	2	8	12	9	

Name of Work :- Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh, Distt-Patna, Bihar.

QUANTITY ABSTRACT - GRADE D & E																												
Sr no.	Description	FAN POINT	LIGHT POINT	TWIN CONTROL LIGHT POINT	1No. 6A SWITCH + 1No. 6A SOCKET	16A SOCKET (500 W)	1No. 16A SWITCH + 1No. 16A SOCKET	2No. 6A SWITCH + 2No. 6A SOCKET	16A GYSER POINT	TV POINT (RJ11)	AC POINT	DATA POINT	BELL POINT	VIDEO DOOR PHONE	TELEPHONE	1200 MM CEILING FAN	900 MM CEILING FAN	BULK HEADLIGHT	MIRROR LIGHT LED 10 WATT	LED LIGHT 18WATT	LED DOWN LIGHT 15 WATT (BALCONY)	LED DOWN LIGHT 15 WATT (STAIRCASE)	WARDROBE LIGHT (10W)	WALL LIGHT (BRACKET) 10	4' LED 20 W LUMINAIRS (Tube Light)	EXHAUST FAN	chandler	2'x2' LED PANELS
	STILT FLOOR																											
	STAIRCASE(1+2)	0	2	2																		4						
	LIFT LOBBY 2 Nos.	2	5													2						5						
	LIFT 3NOS.	0	3			3												3										
	CORRIDOR	0	4																		4							
	Resi.welfare office	3	8		3		3				2	3			1	3												8
	TOILET	0	3		1														1	1						1		
	GYM	6	13		4		4				4	1				6												13
	PASSAGE	0	14																		14							
	TOTAL	11	52	2	8	3	7	0	0	0	6	4	0	0	1	11	0	3	1	1	18	9	0	0	0	1	0	21
	FLOOR-1																											
	Drawing +Entry Foyer	2	5		3		1	1		1	1		1			2								2	1		1	
	Dining+lobby	2	6		3		2	1		1	1		1	1	1	2								3	2			
	Master bedroom	2	3		4		2	1		1	1					2				1				1	1			
	toilet+Dress	0	5		2				1										1	2				1		1		
	Guest room	1	2		3		3	1		1	1					1								1	1			
	toilet+Dress	0	4		2				1										1	2						1		
	Balcony	0	5																		5							
	Bedroom room	1	2		3		3	1		1	1					1								1	1			
	toilet+Dress	0	4		2				1										1	2						1		
	Study Room	1	2		2		1				1	1				1								1	1			
	Common Toilet	0	3		1				1										1	1						1		
	Kitchen+Utility+Store	2	7		6		7		1							2				6						1		
	Balcony		6																		6							
	STAIRCASE(1+2)	0	2	2																		4						
	LIFT LOBBY 2 Nos.	2	5													2						5						
	LIFT 3NOS.	0	3			3												3										
	CORRIDOR	0	4																		4							
	Space for Bicycles	0	2																		2							
	TOTAL FOR 1 FLOOR	13	70	2	31	3	19	5	5	5	6	1	2	1	1	11	2	3	4	14	17	9	1	9	7	5	1	
	TOTAL FOR 8FLOORS	104	560	16	248	24	152	40	40	40	48	8	16	8	8	88	16	24	32	112	136	72	8	72	56	40	8	
	9TH FLOOR																											
	Drawing +Entry Foyer	2	5		3		1	1		1	1		1			2								2	1		1	
	Master bedroom	2	3		4		2	1		1	1					2				1				1	1			
	toilet+Dress	0	5		2				1										1	2			1			1		
	Bedroom room	1	2		3		3	1		1	1					1								1	1			
	toilet+Dress	0	4		2				1										1	2						1		

QUANTITY ABSTRACT - GRADE D & E																												
Sr no.	Description	FAN POINT	LIGHT POINT	TWIN CONTROL LIGHT POINT	1No. 6A SWITCH + 1No. 6A SOCKET	16A SOCKET (500 W)	1No. 16A SWITCH + 1No. 16A SOCKET	2No. 6A SWITCH + 2No. 6A SOCKET	16A GYSER POINT	TV POINT (RJ11)	AC POINT	DATA POINT	BELL POINT	VIDEO DOOR PHONE	TELEPHONE	1200 MM CEILING FAN	900 MM CEILING FAN	BULK HEADLIGHT	MIRROR LIGHT LED 10 WATT	LED LIGHT 18WATT	LED DOWN LIGHT 15 WATT (BALCONY)	LED DOWN LIGHT 15 WATT (STAIRCASE)	WARDROBE LIGHT (10W)	WALL LIGHT (BRACKET) 10	4' LED 20 W LUMINAIRS (Tube Light)	EXHAUST FAN	chandler	2'x2' LED PANELS
	Balcony	0	5																		5							
	Bedroom room	1	2		3		3	1		1	1					1								1	1			
	toilet+ Dress	0	4		2				1										1	2						1		
	Staircase	0	1	1																		2						
	Toilet	0	3		1				1										1	1						1		
	Kitchen+Utility+Store	2	7		6		7	1									2			6						1		
	Living Area +lobby	2	4		3		2				1		1	1	1	2								2	1			
	Balcony	0	4																		4							
	servant room+ toilet	1	3		2		1		1							1			1						1	1		
	STAIRCASE(1+2)	0	2	2																		4						
	LIFT LOBBY 2 Nos.	2	5													2						5						
	LIFT 3NOs.	0	3			3												3										
	CORRIDOR	0	4																		4							
	Space for Bicycles	0	2																		2							
	TOTAL	13	68	3	31	3	19	4	6	4	5	0	2	1	1	11	2	3	5	14	15	11	1	7	6	6	1	
	10th Floor (V)																											
	Bedroom room	1	2		3		3	1		1	1					1								1	1			
	toilet+ Dress	0	4		2				1										1	2						1		
	Staircase	0		1																		1						
	Study Room	1	2		3		2				1	1				1								1	1			
	TOILET	0	3		1				1										1	1						1		
	lobby	1	3		2		1				1					1								2	1			
	Office	1	3		3		1				1	1	1		1	1							1	1				
	STAIRCASE(1+2)	0	2	2																		4						
	LIFT LOBBY 2 Nos.	2	5													2						5						
	LIFT 3NOs.	0	3			3												3										
	CORRIDOR	0	4																		4							
	Space for Bicycles	0	2																		2							
	TOTAL	6	33	3	14	3	7	1	2	1	4	2	1	0	1	6	0	3	2	3	6	10	0	5	4	2	0	0
	TERRACE																											
	STAIRCASE(1+2)	0	2	2																		4						
	LIFT LOBBY 2 Nos.	2	5													2						5						
	LIFT 3NOs.	0	3			3												3										
	CORRIDOR	0	4																		4							
	Space for Bicycles	0	2																		2							
	open Terrace	0	6															6										
	TOTAL FOR TERRACE	2	22	2	0	3	0	0	0	0	0	0	0	0	0	2	0	9	0	0	6	9	0	0	0	0	0	0
	GRAND TOTAL FOR 1 TOW	136	735	26	301	36	185	45	48	45	63	14	19	9	11	118	18	42	40	130	181	111	9	84	66	49	9	2

		ABSTRACT OF QUANTITIES																										
		NAME OF WORK:- B & C GRADE BUILDING, PATNA																										
Sr no.	Description	FAN POINT	LIGHT POINT +BELL POINT	LIGHT POINT W/O control	TWIN CONTROL LIGHT POINT	1No. 6A SWITCH + 1No. 6A SOCKET	16A SOCKET (500 W)	1No. 16A SWITCH + 1No. 16A SOCKET	2No. 6A SWITCH + 2No. 6A SOCKET for TV	16A GYSEY POINT	TV POINT (R11)	AC POINT	DATA POINT	BELL POINT	VIDEO DOOR PHONE	TELEPHONE	1200 MM CEILING FAN	900 MM CEILING FAN	BULK HEADLIGHT	MIRROR LIGHT LED 10 WATT	LED LIGHT 18WATT	LED DOWN LIGHT 15 WATT (BALCONY)	LED DOWN LIGHT 15 WATT (STAIRCASE)	WARDROBE LIGHT (10W)	WALL LIGHT (BRACKET) 10	4' LED 20 W LUMINAIRS (Tube Light)	EXHAUST FAN	chandler
	FLAT-1																											
	Lobby +Drawing+Dining	3	8			4		4	1		1	1		1	1	1	3								3	4		1
	Kitchen+Utility+Store	2	7			6		7	1									2			6						1	
	Study Room	1	2			3		2				1	1				1								1	1		
	TOILET	0	3			1				1										1	1						1	
	Balcony	0	1																			1						
	Bed Room-1	1	2			5		2	1		1	1					1	1							1	1		
	Toilet+Dress	0	5			2				1										1	2			1			1	
	Bed Room-2	1	2			4		2	1		1	1					1	1							1	1		
	Toilet+Dress	0	3			1				1										1	1						1	
	Balcony	0	5																			5						
	TOTAL FOR 1 FLAT	8	38	0	0	26	0	17	3	4	3	4	1	1	1	3	6	2	0	3	10	6	0	1	6	7	4	1
	TOTAL FOR 56 FLATS	448	2128	0	0	1456	0	952	168	224	168	224	56	56	56	168	336	112	0	168	560	336	0	56	336	392	224	56
	COMMON AREA																											
	STAIRCASE (1+2)		2		2																		4					
	LIFT LOBBY 2 Nos.	2	5														2					5						
	LIFT 4Nos.		4				4												4									
	CORRIDOR		7																			7						
	TOTAL	2	18	0	2	0	4	0	0	0	0	0	0	0	0	0	2	0	4	0	0	7	9	0	0	0	0	0
	TOTAL FOR 14TH FLOOR	28	252	0	28	0	56	0	0	0	0	0	0	0	0	0	28	0	56	0	0	98	126	0	0	0	0	0
	TOTAL FOR TOWER	476	2380	0	28	1456	56	952	168	224	168	224	56	56	56	168	364	112	56	168	560	434	126	56	336	392	224	56
	TERRACE FLOOR	0	27	2		4													24			5						
	GRAND TOTAL FOR TOWER	476	2407	0	30	1456	60	952	168	224	168	224	56	56	56	168	364	112	80	168	560	434	131	56	336	392	224	56

Name of Work :- Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh, Distt-Patna, Bihar.

		QUANTITY ABSTRACT - COMMUNITY CENTER														
Sr no.	Description	FAN POINT	LIGHT POINT	TWIN CONTROL LIGHT POINT	1No. 6A SWITCH + 1No. 6A SOCKET	1No. 16A SWITCH + 1No. 16A SOCKET	16A SOCKET (500W)	GYSEY POINT	COMPUTER POINT	BELL POINT	TELEPHONE	1200 MM CEILING FAN	BULK HEADLIGHT	MIRROR LIGHT LED 10 WATT	LED DOWN LIGHT 15W WATT	LED DOWN LIGHT 18WATT
	GROUND FLOOR															
	PART A															
1	Entrance		2												2	
2	Reception	1	6		1	1		1		1	1				6	
3	Toilet/Pantry		4		3	2									3	
4	She toilet		7		1			1						1		
5	He Toilet		6		1			1						1		
6	Stair		2	2											4	
7	Lifts 2nos		2				2						2			
8	lift Lobby	1	2									1			2	
9	Creche	2	6		2	1						2			6	
10	Gym	18	36		7	5					18					
		0														
	PART B		0													
1	ENTRY		1												1	
2	Reception & Waiting	1	7		2			1		1	1				7	
3	Doctor room/ Toilet	1	6		2	1		1	1	1	1				1	
3	Stair		1											1		
4	Toilet		3										1		1	
5	Drinking Water				1	1									1	
5	H.Toilet		3										1		1	
6	Dressing room		1												1	
7	Pharmacist & medicine room	1	3		2	1		1	1	1	1				1	

QUANTITY ABSTRACT - COMMUNITY CENTER																									
Sr no.	Description	FAN POINT	LIGHT POINT	TWIN CONTROL LIGHT POINT	1No. 6A SWITCH + 1No. 6A SOCKET	1No. 16A SWITCH + 1No. 16A SOCKET	16A SOCKET (500W)	GYSER POINT	COMPUTER POINT	BELL POINT	TELEPHONE	1200 MM CEILING FAN	BULK HEADLIGHT	MIRROR LIGHT LED 10 WATT	LED DOWN LIGHT 15W WATT	LED DOWN LIGHT 18WATT	DOWNLIGHTER 40W	4' LED 34 W LUMINAIRES (Tube Light)	HANGING D/L 60W	2'X2' LED PANEL 25W	150W FLOOD LIGHT	STREET LIGHT	EXHAUST FAN	CHANDLER	PIR SENSORS
7	ROOM WITH MEDICINE ROOM	1	4		2	1			2		1	1				4									
8	IT console room	1	4		1	2			1			1				4									
9	Care taker / Toilet	2	8		2	1			1			2				7							1		
9	Co-operative store	4	7		1	2			1	1	1	4					7								
10	Care taker store	2	8		2							2				8									
11	He servants Toilet		6		1									1		4							1		
11	She servant Toilet		6		1									1		4							1		
12	Lobby		4												4										
13	Lift		1				1						1												
13	Stair		1												1										
	TOTAL	35	148	2	32	18	3	2	9	3	6	35	3	6	12	71	0	43	0	6	0	0	9	0	2
	FIRST FLOOR																								
	PART A																								
1	Entrance.DOUBLE HEIGHT		1																					1	
2	PORCH		14													14									
3	H toilet		11		1			1						2		8							1		1
4	She Toilet		7		1			1						1		5							1		1
6	Stair		2	2											4										
7	Lifts 2nos		2				2						2												
8	lift Lobby	1	2									1			2										
9	Bedminton court		48		7	9											32				16				
	PART B																								
1	Engineer's office	2	7		2	2			1	1	1	2				2				4			1		

QUANTITY ABSTRACT - COMMUNITY CENTER																										
Sr no.	Description	FAN POINT	LIGHT POINT	TWIN CONTROL LIGHT POINT	1No. 6A SWITCH + 1No. 6A SOCKET	1No. 16A SWITCH + 1No. 16A SOCKET	16A SOCKET (500W)	GYSER POINT	COMPUTER POINT	BELL POINT	TELEPHONE	1200 MM CEILING FAN	BULK HEADLIGHT	MIRROR LIGHT LED 10 WATT	LED DOWN LIGHT 15W WATT	LED DOWN LIGHT 18WATT	DOWNLIGHTER 40W	4' LED 34 W LUMINAIRS (Tube Light)	HANGING D/L 60W	2'X2' LED PANEL 25W	150W FLOOD LIGHT	STREET LIGHT	EXHAUST FAN	CHANDLER	PIR SENSORS	
2	Store maintenance	2	6		2	1			1	1	2							6								
3	Stair		1	1											2											
4	Corridor		9												9											
5	Store	2	4		1	1			1	1	2						4									
6	He Lockers	1	6		1						1					6										
7	She Lockers	1	6		1						1					6										
8	Waiting cum rest room	3	6		2	4					3						6									
9	Pantry		1		1	1										1		6								
10	Toilet		3											1		1							1			
11	Servant She toilet		6		1									1		4							1		1	
12	Servant he toilet		6		1									1		4							1		1	
13	Lobby		4												4											
14	Lift		1				1						1													
15	Stair		1												1											
	TOTAL	12	154	3	21	18	3	2	3	1	3	12	3	6	22	51	32	16	0	4	16	0	6	1	4	
	SECOND FLOOR																									
	PART A																									
1	Lobby	4	11		2	2						4			2			9								
2	Stair		2	2											4											
3	Lifts 2nos		2				2						2													
4	lift Lobby	1	2									1			2											
5	H toilet		11		1			1						2		8							1		1	
6	She Toilet		7		1			1						1		5							1		1	
	PART B																									
1	Yoga room	6	12		1	1			1			6								12						

QUANTITY ABSTRACT - COMMUNITY CENTER																										
Sr no.	Description	FAN POINT	LIGHT POINT	TWIN CONTROL LIGHT POINT	1No. 6A SWITCH + 1No. 6A SOCKET	1No. 16A SWITCH + 1No. 16A SOCKET	16A SOCKET (500W)	GYSER POINT	COMPUTER POINT	BELL POINT	TELEPHONE	1200 MM CEILING FAN	BULK HEADLIGHT	MIRROR LIGHT LED 10 WATT	LED DOWN LIGHT 15W WATT	LED DOWN LIGHT 18WATT	DOWNLIGHTER 40W	4' LED 34 W LUMINAIRS (Tube Light)	HANGING D/L 60W	2'X2' LED PANEL 25W	150W FLOOD LIGHT	STREET LIGHT	EXHAUST FAN	CHANDLIER	PIR SENSORS	
2	Indoor games room	8	15		2	2			2			8								15						
3	Kids Play area	8	14		1	2			1			8								14						
4	Corridor		29												29											
5	Lobby		4												4											
6	Lift		1				1						1													
7	Stair		1												1											
	TOTAL	27	111	2	8	7	3	2	4	0	0	27	3	3	42	13	0	0	9	41	0	0	2	0	2	
	THIRD FLOOR																									
1	Common Lobby	30	60		10	8						30						60								
2	Stair		2	2											4											
3	Lifts 2nos		2				2						2													
4	lift Lobby	1	2									1			2											
5	OPEN TERRACE		12										12													
6	Stair		1	1											2											
	TOTAL	31	79	3	10	8	2	0	0	0	0	31	14	0	8	0	0	60	0	0	0	0	0	0	0	
	GRAND TOTAL	105	492	10	71	51	11	6	16	4	9	105	23	15	84	135	32	119	9	51	16	0	17	1	8	

Note:- For Computer Point 2X6A Switch & Socket Should be use.

Name of Work :- Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh, Distt-Patna, Bihar.

QUANTITY ABSTRACT -STILT FLOORS																	
Sr no.	Description	FAN POINT	LIGHT POINT	LIGHT POINT W/O control	TWIN CONTROL LIGHT POINT	1No. 6A SWITCH + 1No. 6A SOCKET	1No. 16A SWITCH + 1No. 16A SOCKET	1200 MM CEILING FAN	BULK HEAD LIGHT	LED DOWN LIGHT 12WATT + 1 WATT	4' LED 34 W LUMINAIRS (Tube Light)	TOP POST 25W	STREET LIGHT	SPIKE MOUNTED LIGHT	ROUND FLOOD LIGHT	WALL LIGHT	UP-DOWN DOWNLIGHTER
1	TOWER B& C	2	12	36	4	4	4	2	4	10	36						
2	COMPOUND LIGHTING											48	22	14	20	24	16
	TOTAL	2	12	36	4	4	4	2	4	10	36	48	22	14	20	24	16

Name of Work :- Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. G.C-4, Lohianagar, Kankarbagh, Distt-Patna, Bihar.

QUANTITY ABSTRACT- BASEMENT														
Sr no.	Description	FAN POINT	LIGHT POINT	LIGHT POINT W/O control	TWIN CONTROL LIGHT POINT	1No. 6A SWITCH + 1No. 6A SOCKET	1No. 16A SWITCH + 1No. 16A SOCKET	EV CHARGING POINT	1200 MM CEILING FAN	BULK HEADLIGHT	LED DOWN LIGHT 13.5 WATT + 1 WATT	STEP LIGHT	4' LED 34 W LUMINAIRS (Tube Light)	4' LED 34 W LUMINAIRS WITH SENSOR
	BASEMENT													
	Pump room	5	4	6		1	3		5				10	
	Water softening Plant	3	2	4		2	3		3				6	
	Stair		12		7						19			
	Lift Lobbies	4	6	4					4		10			
	Lifts		10			10				10				
	Ramps		13	13								26		
	Corridor		3	3		1					6			
	STP room	2	1	1		1	2		2				2	
	panel room	5	6	4		1	2		5				9	1
	Parking HALL		75	224			7	11					223	76
	TOTAL	19	132	259	7	16	17	11	19	10	35	26	250	77

** In addition to above inventory, 2 Nos plug point for modem and router at suitable height but control switch at convenient height at central location of each flat.

Note: The light point /Power point / Data Point /TV Point given in the above inventory shall be minimum it can be increased as per site / functional requirement and the contractor has to execute accordingly nothing extra will be paid on this account.

1.2.2Scale of Amenities (Electrical):

In each lift Shafts and Electrical Shaft in each building/block)

SN	Description	Location	Qty.
1	Power Points (15-amp, 6 pins socket)	In each floor level of lift shaft in suitable location, each lift machine room of each lift and Electrical shaft.	1 No.
2	10 Watt Bulk Head	In each floor level of in each lift shaft in suitable location and Electrical shaft.	1 No.
3	18/20W LED batten light fitting with LED tube having PVC body and aluminium heatsink	In each Lift Machine Room of each lift.	1 No.
4	18/20 W LED Industrial type box type(retrofit) fitting with LED tube having PVC body and aluminium heatsink.	It should be done with 4x10 sq mm copper cable, loop in system in surface heavy duty PVC conduit for maintenance purposes.	4 Nos.
5	Wiring of lift shaft	It should be done with 3x4 sq mm copper wire, loop in system in surface heavy dutyPVC conduit for maintenance purposes.	Lot
6	Heavy duty Exhaust	In each Lift Machine Room of each lift shaft.	4 Nos.

Note: The above list indicates minimum amenities to be provided. However, while execution of work the agency shall follow the quantity as per approved drawings or as directed by Engineer-in-charge.

1.2.3 Scale of all Electrical Amenities: -

In common areas, Community Centre, stilt floor, lift lobby and passages etc as per marked drawings and as required to achieve the desired lux level. Similarly, landscape lighting, compound lighting, street lighting, flood lighting, façade lighting etc also as per marked drawings and as required to achieve the desired lux level.

1.3 VALUES OF ILLUMINATION AND TYPE OF LIGHTING FIXTURE

Sr. No.	Area / Space	Range of Average Illumination in Lux	Type of Lamps/ Luminaries preferred
1	Lift Lobby	150-200-300	Surface / recessed type LED Down lighter
2	Lifts	100-150	Surface / recessed LED Down lighters
3	Lift machine room	200	4 ft LED batten and Tube
4	Corridor, Passage way, Stairs	100-150	Surface / recessed LED Down lighters
5	Escape lighting	As per NBCS requirement	Surface / recessed type LED fixtures
6	Service/ Utility Areas such as Electrical Power Supply & Distribution Room, Pump Room etc.	100-150-200	4 ft LED batten and Tube
7	Store Room	50-100-150	4 ft LED batten and Tube
8	Car Parking Area	40	4 ft LED batten and Tube
9	Ramp and corners	40	4 ft LED batten and Tube & Outdoor pathway light in recess
10	Entrance and exits of car parking	50-100-150	LED post top lantern
11	Road / Street / Jogging track	25	LED post top lantern
12	Compound lighting	15	LED street lights
13	Garden, Water Bodies & Landscape lighting	As per Aesthetical Consideration	LED post top lantern,
14	Badminton court	300-500	Flood LED light

15	Gymnastic room	150-200	4 ft LED batten and Tube
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1.4 Specifications for wiring :

- 1.4.1 The wiring shall be carried out in recessed heavy duty PVC conduit (ISI marked) of suitable size as per cpwd specification and as per direction of Engineer-in-charge .
- 1.4.2 **Cross Linked polyethylene (XLPE) HFFR Fire Grade (Halogen-Free Flame Retardant)** insulated Copper conductor multi-stranded single core cables 650 V grade will be used for points, circuit & sub-main wiring. All flexible copper wires used shall have Class 2 copper conductor satisfying the resistance requirements of NEC 2023 Part 1 Section 17, Annex B.
Minimum size of wiring:
- Light Wiring: 1.5sq. mm.
 - Power Wiring: 4.0 sq mm.
 - Power circuit rated: More than 1KW, size as per calculation.
- 1.4.3 In multi standard cables shall be terminated on the ends with copper lugs/ thimbles of suitable size.
- 1.4.4 Earth wire as per CPWD specification for electrical work, part-I(Internal-2023), shall be drawn along with other wire in recessed/ surface heavy duty PVC conduit system.
- 1.4.5 'Power' wiring shall be kept separate and distinct from light wiring, from the level of circuits, i.e., beyond the branch distribution boards. Conduits for light/power wiring shall be separate.
- 1.4.6 Conduit carrying submain will not carry circuit/point wiring. Similarly, conduit carrying circuit wiring will not carry submain/point wiring. Conduit carrying point wiring will not carry submain/circuit wiring.
- 1.4.7 Essential/non-essential/UPS distribution each will have a completely independent and separate distribution system starting from the main, switchboard upto final wiring for each system. As for example, conduit carrying non-essential wiring shall not have essential or UPS wiring.
- 1.4.8 Wiring for essential and UPS supply will have their own conduit system. No mixing of wiring is allowed.
- 1.4.9 No switchboard will have more than one source of incoming supply. More than one incoming supply will be allowed only at main board with proper safety and interlocking so that only one source can be switched on at a time.
- 1.5 **Capacity of Circuits: -**
- 1.5.1 Lighting circuit shall feed light/fan/call bell points. Each circuit shall not have more than 800 W connected load or more than 20 points whichever is less as because of introduction of LED lights, load on lighting circuit gets reduced drastically.
- 1.5.2 Power circuit in non-residential building will have only one outlet per circuit. However, in non-residential building for computer points 3 nos. 6A outlet sockets can be feed through power circuit.
- 1.5.3 Each power circuit in residential building can feed following outlets:
- Not more than 2 Nos. 16A outlets.
 - Not more than 3 Nos. 6A outlets.
 - Not more than 1 No.16A and 2 Nos. 6A outlets.
 - Independent circuit each to feed Geyser, AC Outlet and Kitchen oven, washing machine outlets.

1.5.4 Heavy Duty PVC conduit wire(s) carrying capacity.

Maximum Number of PVC Insulated 650/1100 V grade Aluminium/ Copper Conductor Cable conforming to IS 694:2018												
Nominal cross-sectional area of conductor in sq.mm	20 mm		25 mm		32 mm		38 mm		51 mm		64 mm	
	S	B	S	B	S	B	S	B	S	B	S	B
1	2	3	4	5	6	7	8	9	10	11	12	13
1.50	5	4	10	8	18	12	-	-	-	-	-	-
2.50	5	3	8	6	12	10	-	-	-	-	-	-
4	3	2	6	5	10	8	-	-	-	-	-	-
6	2	-	5	4	8	7	-	-	-	-	-	-
10	2	-	4	3	6	5	8	6	-	-	-	-
16	-	-	2	2	3	3	6	5	10	7	12	8
25	-	-	-	-	3	2	5	3	8	6	9	7
35	-	-	-	-	-	-	3	2	6	5	8	6
50	-	-	-	-	-	-	-	-	5	3	6	5
70	-	-	-	-	-	-	-	-	4	3	5	4
Note:												
(1) The above table shows the maximum capacity of conduits for a simultaneous drawing in of cables.												
(2) The columns headed 'S' apply to runs of conduits which have distance not exceeding 4.25 m between draw in boxes and which do not deflect from the straight by an angle of more than 15 degrees. The columns headed 'B' apply to runs of conduit, which deflect from the straight by an angle of more than 15 degrees.												
3) Conduit sizes are the nominal external diameters.												

1.5.5 Fire Survival (FS) cables shall be used where integrity of electric supply is important especially to save human life and where electric supply is required for evacuation operation during the fire instances. These cables are designed to withstand temperatures from 650°C to 950°C and for period upto 180 min along with additional protection against mechanical shock and water splash. The fire survival cable shall be used at following location as given below and additional requirement, if any as mentioned in SP 7:2026 (NBCS 2026) as amended up to date, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026 and NEC 2023: -

<u>Application of FS cable</u>			
For more details, refer Annex A of IS 17505(Part 1): 2020			
Sl No.	System Description	Cable Fire Rating Required (°C)	Time for which System should Withstand (Minutes)
(i)	Fire pumps FS	FS (950/FWS)	180
(ii)	Pressurization	FS (950/FWS)	180
(iii)	Smoke venting including its ancillary systems, such as dampers and actuators	950	60
(iv)	Fire-fighting shaft (staircase, lift, lift lobby)	FS (950/FWS)	180
(v)	Fireman's lifts (including all lifts)	FS (950/FWS)	180
(vi)	Exit signage lighting	950	120
(vii)	Emergency lighting	950	120
(viii)	Fire alarm system		
(a)	Conventional (zone-based system)	650	60
(b)	Intelligent addressable system	650	60
(ix)	Public address (PA) system (related to emergency voice evacuation and annunciation)	650	60
(x)	Magnetic door hold-open devices	650	60
(xi)	Lighting in fire command center and security room	FS (950/FWS)	180

1.5.6 All switches, sockets, AC point with MCB connected Socket outlets, phone socket, Data sockets, stepped type electronic fan regulators (two module), bell push and accessories shall be of modular type. The mounting boxes shall be of G.I. 16 SWG thick matching with modular products. **Mounting boxes and accessories shall be of the same make as that of the plate type switches and accessories.** The modular switch, socket etc should have metallic plate, should be shrouded and should produce low sound on switching.

1.5.7 **Intercom/Telephone:** Wiring for Intercom/telephone inside the quarters, shall be terminated in suitable size of G.I. Junction box and telephone/intercom socket, according to inventory/ marked drawings enclosed with this bid, other end of wiring shall be terminated in krone box installed at ground floor/Stilt floor of service shaft of each block/ building and main armoured telephone cable shall be drawn from the EPBAX room to the Krone box of each building. The wiring shall be suitably tagged/mentioned the location. The wiring of telephone cable shall be done with surface/recess 25 mm dia. heavy duty PVC conduit and with 1 pair telephone cable. The drawing of incoming telephone cables from

outside of boundary up to EPBAX room is not covered in the scope of this tender. However, provision of R.C.C. HUME pipe/ DWC HDPE pipe not less than 300 mm diameter shall be laid underground from entry gate to control/ EPBAX room.

1.5.8 T.V and Data: Modulator Socket for TV and data shall be provided in GI of box of suitable location as per inventory and marked drawings. Data and cable TV wiring will be done with CAT-6A cable in heavy duty 25 mm PVC conduit and brought to the box at central location inside the flat/ Buildings, Community Centre and other approved common/service buildings and other locations as required during execution at site, to house modem and splitter with 2 Nos. 6A socket outlet at suitable height with control switch at convenient accessible location. 1 No. PVC conduit will be laid from the box inside flat to ELV shaft and then upto ONT/FTTH box at stilt floor/Ground floor. CAT-6A cable for data and Coaxial cable for TV will be laid from the box in the flat upto MDF box by EPC contractor, however, optical fibre cable up to ONT/FTTH box and upto will be provided by the service provider of "FTTH". In shaft sufficient nos of blank conduits shall be laid, so that at least 4 Nos FTTH service provider can be provided their services according to occupant's choices.

1.5.9 Provision of DWC HDPE pipe not less than 300 mm diameter shall be laid underground from entry gate to each blocks/ building so that different service provider can draw their cable easily. There should have suitable size under R.C.C. chamber of suitable size within 10 Mtr distance, however, in front of each block/ building so that FTTH can be drawn easily.

1.5.10 Specification of Modular Switches and socket: -

- Suitable for 240V, AC, with normal gap constructions, Flush type, Screw type terminal, IP20.
- Current carrying plastic parts of Nylon (PA6) with glass fibres up to 16A.
- Non-Flammable insulating parts & very high Insulating resistance after Humidity test.
- Marked with IS 3854:1997.
- Snap fit with Modular Plates very easy to install.
- Arrow marking for correct orientation with plate.
- Double rocker mechanism to prevent visible spark.
- Bimetal Silver contact tips for less spark & longer life.
- Fire retardant and UV stabilized.

The modular sockets shall be as per following/ have features mentioned below: -

- 240V, AC, Flush type, Screw type terminal, Shuttered.
- Polycarbonate material thickness ~1.5 mm to 2.5 mm.
- Non-Flammable insulating parts & very high Insulating resistance after Humidity test.
- 6A, 6/16A Socket market with ISI, as per IS1293:2019.
- Snap fit with Modular Plates easy to install.
- Brass current carrying parts.
- Fire retardant and UV stabilized.

Minimum Warranty: -

- i. Electro Mechanical Wiring Device: 10 (Ten) Years.
- ii. Cable Management Solution (uPVC products): 10 (Ten) Years.

While laying conduits for fire alarm system, sufficient junction outlets for detectors as required are to be provided as per approved drawing and direction of the Engineer-in-Charge.

1.6 Internal Luminaries: -

- 1.6.1 All LED indoor lighting fixtures (IP20 or better and IK02) in metallic housing should have following parameters and shall be selected as per minimum illumination requirement as per SP 7:2026 (NBCS 2026) (amended up to date) and lux level mentioned above.
- 1.6.2 Wherever light fittings are proposed to be provided on the false ceiling, the respective light/fan point wiring will have to be brought up to the terminal of the light fittings / fans by the contractor.

Note: The firm will be required to provide items/material as per the specifications indicated herein. The department reserves the right to accept items/materials with richer specifications as available in the market/ with manufacturer due to technological upgradations/ model updation, without any extra cost implication with the approval of Engineer in charge. The model shown below are indicative only. The bidder should get the approval of luminaries before placing order.

1.7 Technical Specification for LED Luminaires.

1.7.1 Technical Specification for downlighter, panel light & Bulkhead

Sl. No	Technical parameters	LED Down Light Surface/recess Square/Circular Downlighter. (Integral)	Surface/recessLED panel(2”X2”) down light (Integral)	LED bulkhead fittings (Integral)
				
i	Wattage	12 to 18W	30-32 W	9-10W
ii	Luminaire Housing	Die-CastAluminum/ extruded aluminium with high quality frosted/ Anti-glare diffuser	Powder coated CRCA /aluminum housing with high quality frosted Prismatic/anti-glare diffuser	Die-CastAluminum with optical poly carbonate diffuser
iii	LightSource	SMD LED Chip	SMD LEDChip	SMD LEDChip
iv	OperatingVol tageRange	140–270V	140–270V	180–260V
v	PowerFactor	≥0.95	≥0.95	≥0.95
vi	RatedVoltage	220V-240V	220V-240V	220V-240V
vii	SurgeVoltage	Up to 2.5 kV.	Up to 2.5 kV	Up to 2kV.

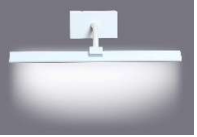
viii	LED Life span&Luminaires photometric Data	IESLM79 and IESLM80 respectively	IESLM79 and IESLM80 respectively	IESLM79 and IESLM80 respectively
ix	LED chip efficiency	Minimum 135 Lm/W	Minimum 150 Lm/W	Minimum 120 Lm/W
x	Luminaire efficacy	Not less than 120 lumen/W	Not less than 140 lumen/W	Not less than 90 lumen/W
xi	Lumen Maintenance	Minimum 70% up to 50000 hrs. (indoor application)	Minimum 70% up to 50000 hrs. (indoor application)	Minimum 70% up to 50000 hrs. (indoor/outdoor application)
xii	Driver efficiency	≥85%	≥85%	≥85%
xiii	Beam Angle	Not less than 120 degree (indoor application)	Not less than 120 degree (indoor application)	Not less than 120 degree (indoor application)
xiv	IP Protection Level	minimum IP-20	minimum IP-20	minimum IP-65
xv	Harmonic Distortion (THD)	For indoor application ≤10%,	For indoor application ≤10%	≤10%
xvi	LED make	NICHIA/OSRAM/SEOUL/PHILIPS LUMILEDS/LED NIUM/CREE/BRIDGELUX	NICHIA/OSRAM/SEOUL/PHILIPS LUMILEDS/LED NIUM/CREE/BRIDGELUX	NICHIA/OSRAM/SEOUL/PHILIPS LUMILEDS/LED NIUM/CREE/BRIDGELUX
xvii	Colour temperature	As per site requirement	As per site requirement	As per site requirement
xviii	CRI	≥80	≥80	≥80
xix	Junction temperature	Maximum 85° C	Maximum 85° C	Maximum 85° C
xx	Environment consideration	RoHS Compliant	RoHS Compliant	RoHS Compliant
xxi	Safety	Should pass High Voltage Dielectric test of 1.5 KV as per IS:10322	Should pass High Voltage Dielectric test of 1.5 KV as per IS:10322	Should pass High Voltage Dielectric test of 1.5 KV as per IS:10322
xxii	Test Certificate	LM79	LM79	LM79

xxiii	Standard Warranty	5years	5years	5 years
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1.7.2 Technical Specifications of Indoor and Outdoor lights proposed in this work :

i	LED tube. Light Fittings	1 x18/ 20 W	LED surface mounted Batten light of following body material and construction as per IS : 10322 with driver (Replaceable) as per the requirement with Driver efficiency >85%, Operating voltage AC 140- 270 Volt, frequency 50/60 hz, Operating temp range -5 0C to 40 0C, internal surge protection of 2.5 KV with Short & Open circuit protection ,THD < 10% , P. F.≥0.95, IP20, CRI >80, Flicker free (flicker should be below 5 %), life time (LED,Driver& electrical circuitry), of minimum 50000 Burning Hours with 70% of initial Lumen maintained till life ends, CCT 3000°K / 4000°K / 5700°K /6500°K (As per ANSI Bin), SDCM(Standard Deviation Colour Matching) <3, Maximum power consumption should not more than the specified rating and Fixture shall be of relevant BIS standard. Manufactures Word Mark/ Name Engraved/Embossing/ Screen printing on housing. complete in all respect i/c external connections with 1.5 sq.mm FRLS/HFFR, PVC insulated copper conductor single core cable and earthing etc. as required with Minimum 5 year OEM warranty. System lumen efficacy ≥120 <135 lm/Watt output . LM79 & LM80 Test report and all testing required for LED fixtures as per BIS shall be submitted. Shape size and CCT shall be as approved by Engineer-in-Charge as per requirement. (Thermal management: heat sink of aluminium housing such that LED junction temperature shall not rise above 90°C).	
		36W	LED surface mounted Batten light of following body material and construction as per IS : 10322 with driver (Replaceable) as per the requirement with Driver efficiency >85%, Operating voltage AC 140- 270 Volt, frequency 50/60 hz, Operating temp range -5 0C to 40 0C, internal surge protection of 2.5 KV with Short & Open circuit protection ,THD < 10% , P. F.≥0.95, IP20, CRI >80,	

			Flicker free (flicker should be below 5 %), life time (LED, Driver & electrical circuitry), of minimum 50000 Burning Hours with 70% of initial Lumen maintained till life ends, CCT 3000°K / 4000°K / 5700°K / 6500°K (As per ANSI Bin), SDCM (Standard Deviation Colour Matching) <3, Maximum power consumption should not more than the specified rating and Fixture shall be of relevant BIS standard. Manufactures Word Mark/ Name Engraved/Embossing/ Screen printing on housing. complete in all respect i/c external connections with 1.5 sq.mm FRLS/HFFR, PVC insulated copper conductor single core cable and earthing etc. as required with Minimum 5 year OEM warranty. System lumen efficacy ≥ 120 <135 lm/Watt output. LM79 & LM80 Test report and all testing required for LED fixtures as per BIS shall be submitted. Shape size and CCT shall be as approved by Engineer-in-Charge as per requirement. (Thermal management: heat sink of aluminium housing such that LED junction temperature shall not rise above 90°C)	
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		34W	4ft Linear robust LED IP20 batten with inbuilt MICROWAVE SENSOR having minimum system lumen output of 4000 lumens. The minimum system efficacy should not be less than 120 lm/w @6500K. The luminaire shall have a rated system lifetime of 50,000 burning hours at L70B50. The luminaire should have a color temperature of 6500K and CRI>80, SDCM<=5. The luminaire shall meet IP20 rating with THD < 10% and PF > 0.95. The Luminaire should have 4KV surge for better protection against voltage fluctuation/spikes. The luminaire housing should made of polycarbonate extrusion with a High Transmittance PC Diffuser. The total power consumption should not exceed 34W (including driver). Manufacturer shall have inhouse lab approved by NABL or Ministry of Science of Govt of India. Luminaire manufacture shall provide LM79 and LM80 report from NABL/UL accredited lab & LM80 report issued by LED manufacturer. Both the fixture and Driver should be of same make & must have separate BIS approval and the certificates must be submitted for record	
ii	Mirror light	9W	Energy efficient 9 watts LED mirror light, warm white, made out of premium material is used for longer life, reliability and adjustable multiple angles with chrom/ brass finish. Water proof moisture anti-fog Anti-corrosion anti-rust. Operating Voltage: 220-240, 50 Hz, single A.C. supply.	
iii	LED Step Light (Outdoor)	5-6 Watt	Housing Die cast Aluminium, IP66. (Integral) Operating Temperature -10°C to 50°C 50 lm/W L225 x W82 x H30mm	

iv	LED Step Light (Indoor)	2Watt	Housing Die cast Aluminium, IP20. (Integral) Operating Temperature -10°C to 40°C 50 lm/W L225 x W82 x H30mm Housing Die cast Aluminium, IP20. (Integral) Operating Temperature -10°C to 40°C 50 lm/W L225 x W82 x H30mm	
v	Wall bracket (For Grade-B & C)	5 Watt	Decorative Wall mounted bracket light with Mild Steel & Chrom (SS) finish along with 1 Light opal glass with chrome finish SS wall lamp base E27, suitable for indoor and Fixture high 310mm x W130mm..	
vi	Wall bracket (For Grade – D & E)	5Watt	Decorative Wall mounted bracket light with Mild Steel & Nickel (SS) finish along with 2 Light opal glass with Nickel finish SS wall lamp base E27, suitable for indoor and Fixture Size (LXWXH) 120X210X290mm.	
vi	Wall bracket (For RD Banglow)	5 Watt	Decorative Wall mounted bracket light with Mild Steel & Chrome (SS) finish along with 2 Light Frosted glass with Chrome finish SS wall lamp base E27, suitable for indoor and Fixture Size (LXWXH) 270X130X225mm	
vii	Wall bracket (For RD Banglow)	5 Watt	Decorative Wall mounted bracket light with Mild Steel & Chrome (SS) finish along with 2 Light opal glass with Chrome finish SS wall lamp base E27, suitable for indoor and Fixture Size (LXWXH) 120X130X235mm	
viii	Chandelier (For RD Banglow & Community centre)		8 Light champagne opal glass with chrome finish chandelier (Productcode: KCH-CHR-MD150330028A) of Depth :730 mm and Height:1200 mm with weight of 12 kg and lamp: E14 LED 4 W x 8 including all the necessary accessories as per the design, specification and the approval	

ix	Pendant Light (for Grade B&C, D&E)		Decorative ceiling suspended pendant light fitting, Jaquar make Model DPN-CHR-MD160020053B or approved equivalent, comprising 3 Nos. clear glass shades with rose gold mesh and chrome finish, complete with G9 LED lamps 5W × 3.	
x	Pendant Light (for RD Bungalow)		Decorative ceiling suspended pendant light fitting, Jaquar Model DPN-RDG-SL00FRD3E27 or approved equivalent, comprising 3 Nos. frosted glass shades with rose gold finish, complete with 3 Nos. E27 LED lamps of 7W each	
xi	Video Door Phone (Standalone) (Officers' Quarters only)		• Indoor: In-build power supply. • 7 colour LCD Hi definition. • 12 polyphonic ringtones. • Automatic image capturing with internal flash. • Monitor to monitor calling facility. • Outdoor: Hi-Cleaner CMOS colour camera. • 4-wires connectors. • Support locks control. • 56 degree viewing angle. • Metal Housing. • Automatic Image Capturing with internal flash memory card, water & vandal proof.	
xii	Aviation obstruction light (LED)		• Die-cast aluminum housing with red polycarbonate dome for better illumination. • Integral driver. • Supper flux 5mm 302 nos LEDs incorporated. • Ingress Protection: IP65 • Protection against short-circuit. • Protection against surge. • Wide operating input voltage range 100 – 270 VAC • 80% energy saves compared to conventional aviation light. • Longer life time 50,000Hrs.	

1.7.3 Provisions for following equipments should be kept for installation as per requirements:

i	Electric geyser 25 Ltrs capacity suitable for 230 V, 50 Hz, A.C. Supply.	Suitable size recess wiring directly from MCB DB to locations indicated in marked drawings for Geyser shall be provided and shall also be terminated in modular type socket duly controlled by MCB in each quarter and Community Centre/other approved location etc as required. Necessary plumbing work shall be carried out by civil contractor. The scope of this work includes supply, installation, testing and commissioning of Electric geyser 25 Ltrs capacity for the 66 Grade B & C, D, E & F quarters and RD bungalow in each toilet and suitable capacity geyser in each kitchen.
ii	Electric Kitchen Chimney suitable for 230 V, 50 Hz, A.C. Supply.	Suitable size recess wiring directly from MCB DB to locations indicated in marked drawing in kitchen shall be provided for Electric Kitchen Chimney and shall also be terminated at modular type socket duly controlled by MCB. The scope of this work includes supply, installation, testing and commissioning of 66 Nos. Electric Kitchen Chimneys for the 66 Grade B & C, D, E & F quarters and RD bungalow.
iii	Domestic Water purifier suitable for 230 V, 50 Hz, A.C. Supply.	Suitable size recess wiring and modular type switch socket (6/16A) shall be provided to kitchen of each quarter/other locations indicated in marked drawings for domestic water filter. Necessary plumbing work shall be carried out by civil contractor. This scope also includes Commercial grade RO water purification system and shall be installed at community center building as per direction of Engineer-in-charge,
iv	LED type decorative Chandelier fitting suitable for 230 V, 50 Hz, A.C. Supply.	Electrical point wiring shall be provided location provided in marked drawing for LED type Decorative Chandelier fittings. This NIT does not have provisions of LED type Decorative Chandelier fittings; however, it shall be installed later on.

All lighting fixtures shall be LED type with colour temperature of 3000/ 4000/ 4500/ 6000 K as per site requirement as approved by the Engineer-In-Charge.

In addition to the drawing all lights of staircase, parking area, street and compound shall be controlled by astronomical time switch. There shall be arrangement of bypass switch so that in case of failure of time switch, the light can be operated after by passing the same.

1.7.4 Technical Specifications of different type fans to be used in this project according to marked drawings:

<u>TECHNICAL SPECIFICATION OF BLDC FAN</u>			
Sl. No.	Parameters	Specification	
i	Sweep	1200 mm	900 mm
ii	Rated Voltage	220-240V, a.c.	220-240V, a.c.
iii	Rated Frequency	50 Hz	50 Hz

iv	Full Load Wattage	Not more than 28 Watt	Not more than 28 W
v	Full Load Speed	350 RPM (Tolerance as IS : 374-2019)	380 RPM
vi	Air Delivery	Not less than 210 m ³ /min.	Not less than 130 m ³ /min.
vii	Power Factor	Not less than 0.90.	Not less than 0.90.
viii	Motor Type	BLDC	BLDC
ix	Wiring materials	Copper	Copper
x	Winding Temperature Rise	Not more than 75°C	Not more than 75°C
xi	Class of Insulation	Class B	Class B
xii	Insulation Resistance	More than 2 M Ohms	More than 2 M Ohms
xiii	Service Value	Not less than 7.0 m ³ /min/w	Not less than 5.1 m ³ /min/w
xiv	Bearing Type	Double ball bearing	Double ball bearing
xv	Total Harmonic Distortion	Less than 10%	Less than 10%
xvi	High Voltage Protection	Shall withstand 1.5 Kv, 50 Hx AC between current carrying and non current carrying metal parts without any flash over for 1 minute.	
xvii	Speed Control	Remote or Electronic regulator.	Regulator or remote
xviii	Star rating	BEE 5 Star rating.	BEE 5 star rating
xix	ISI marking	IS : 374: 2019 + A1 : 2022.	IS : 374: 2019
xx	Surge Protection	Upto 4 KV.	
xxi	Nos of blade	3 Nos.	3 Nos.
xxii	Materials of blade	Metallic (Aluminium)	Metallic (Aluminium)
xxiii	Degree of protection	IPX0	

All Type Exhaust Fan should be high star rated and conforming to relevant BIS. Provision of Exhaust fans as per marked drawing and inventory.

1.7.5 MCB DB:

- 1.7.5.1 All distribution boards shall be PPI (Per Phase Isolation) double door type, having IK 9 protection. Essential & non-essential MCB DBs shall be separate and MCB of suitable capacity shall be provided. Sufficient no. of spares MCB shall also be provided.
- 1.7.5.2 The rupturing capacity of the MCB's shall be 10 KA. The MCB's shall be ISI marked. The make of MCB, RCCB/ ELCB (100 M/amp)/ SPD etc. shall of the same as that of MCB DB.
- 1.7.5.3 In vertical DBs used for power distribution, the main incomer shall be MCCB (breaking capacity 16 KA up to 125 A and 25 KA for more than 125 A to 250 A with thermal magnetic release). All MCCBs shall be with Ics =100% of Icu rating only.

1.7.6 Cable:

- 1.7.6.1 Power supply to lift equipment, lift machine and shaft lighting shall be feed using suitable **Cross Linked polyethylene (XLPE) insulation and HFFR/LSZH outersheath Fire Grade aluminium conductor cable of 1.1 KV grade.**
- 1.7.6.2 Cable tray shall be horizontal/vertical type and made of perforated hot dipped Galvanized Iron of suitable sizes (galvanization thickness i.e. average mass of zinc coating shall not be less than 65 microns for 2 mm thick & 50 microns for 1.6 mm thick as per IS standard) with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with G.I. suspenders including G.I. bolts & nuts, etc. as required. Suitable size as per site conditions shall be used with thickness 1.6 mm for cable trays with width $\leq$ 300 mm & thickness 2 mm for cable trays with width $>$ 300mm.
- 1.7.6.3 The breaking capacity of MCCB for all types of panel boards except DBs shall be as per CPWD General Specifications for Electrical Works Part-IV (Sub stations)- 2013 as amended and corrected up to date and substation sub head of this bid documents.
- 1.7.6.4 For details of LT panels, feeder pillar, Meter panels etc. please refer substation sub head of this bid documents.
- 1.8 Meter boards (meter cubicles) with suitable MCB/ MCCB as incomer, outgoing SPN / TPN MCBs, connections, interconnections with suitable size copper conductor cables as mentioned above shall be provided. Pre-paid/Postpaid (preferably) smart electric meter shall be installed by the SBPDCL.

CABLING																							
Sr. No.	Description	11 KV HT XLPE AL. AR. CABLE 150 Sqmm 3 Core	11 KV HT XLPE AL. AR. CABLE 120Sqmm 3 Core	XLPE AL. AR. CABLE 300 Sqmm 3.5 Core	XLPE AL. AR. CABLE 240 Sqmm 3.5 Core	XLPE AL. AR. CABLE 185 Sqmm 3.5 Core	XLPE AL. AR. CABLE 150 Sqmm 3.5 Core	XLPE AL. AR. CABLE 120 Sqmm 3.5 Core	XLPE AL. AR. CABLE 95 Sqmm 3.5 Core	XLPE AL. AR. CABLE 70 Sqmm 3.5 Core	XLPE AL. AR. CABLE 50 Sqmm 3.5 Core	XLPE AL. AR. CABLE 35 Sqmm 3.5 Core	XLPE AL. AR. CABLE 25 Sqmm 4 Core	XLPE AL. AR. CABLE 16 Sqmm 4 Core	XLPE AL. AR. CABLE 10Sqmm 4 Core	XLPE AL. AR. CABLE 10Sqmm 3Core	XLPE ALAR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 25Sqmm 4 Core	XLPE COPPER AR. CABLE 16Sqmm 4 Core	XLPE COPPER AR. CABLE 10 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 3 Core	XLPE COPPER AR. CABLE 2.5 Sqmm 8 Core
1	G.O SWITCH TO METER PANEL COMMON SERVICES PANEL-2	1 R																					
2	FROM HT METER TO VCB 11KV PANEL	1 R																					
3	VCB PANEL TO CSS-1, CSS-2		2 R																				
4	CSS-1 TO MAIN LT PANEL COMMON SRVICES PANEL-1			6 R																			
5	CSS-2 TO MAIN LT PANEL COMMON SRVICES PANEL-2			6 R																			
6	11KV FROM G.O SWITCH TO CSS NO-3 FOR RESIDENTIAL SEVICES		1 R																				
7	CSS-3 TO MAIN LT PANEL			6 R																			
8	DG-1 250 KVA TO COMMON SERVICES PANEL-2				2 R																		1 R
9	DG-2 250 KVA TO COMMON SERVICES PANEL-2				2 R																		1 R
10	DG-3 250 KVA TO COMMON SERVICES PANEL-2				2 R																		1 R
11	COMMON SERVICES PANEL-2 TO 3 no's CAPACITOR PANEL				3 R																		
12	COMMON SERVICES PANEL-2 TO NON SSENTIAL PANEL COMMUNITY CENTRE						2 R																
13	SOLAR PANEL SYSTEM TO MAIN LT PANEL							2 R															
14	MAIN LT PANEL-1 NORMAL SUPPLY TO REGIONAL DIRECTOR									2 R													
15	COMMON SERVICES PANEL-2 TO AC PANEL				4 R																		
16	MAIN LT PANEL -1TO B&C RISING MAIN PART -I				4 R																		

CABLING																								
Sr. No.	Description	11 KV HT XLPE AL. AR. CABLE150 Sqmm 3 Core	11 KV HT XLPE AL. AR. CABLE 120Sqmm 3 Core	XLPE AL. AR. CABLE 300 Sqmm 3.5 Core	XLPE AL. AR. CABLE 240 Sqmm 3.5 Core	XLPE AL. AR. CABLE185 Sqmm 3.5 Core	XLPE AL. AR. CABLE 150 Sqmm 3.5 Core	XLPE AL. AR. CABLE 120 Sqmm 3.5 Core	XLPE AL. AR. CABLE 95 Sqmm 3.5 Core	XLPE AL. AR. CABLE 70 Sqmm 3.5 Core	XLPE AL. AR. CABLE 50 Sqmm 3.5 Core	XLPE AL. AR. CABLE 35 Sqmm 3.5 Core	XLPE AL. AR. CABLE 25 Sqmm 4 Core	XLPE AL. AR. CABLE 16 Sqmm 4 Core	XLPE AL. AR. CABLE 10Sqmm 4 Core	XLPE AL. AR. CABLE 10Sqmm 3Core	XLPE ALAR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 25Sqmm 4 Core	XLPE COPPER AR. CABLE 16Sqmm 4 Core	XLPE COPPER AR. CABLE 10 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 3 Core	XLPE COPPER AR. CABLE 2.5 Sqmm 8 Core	
17	MAIN LT PANEL -1TO B&C RISING MAIN, PART -II)				4 R																			
18	MAIN LT PANEL -1TO D&E RISING MAIN,						3 R																	
19	COMMON SERVICES PANEL-2 TO EV CHARGING PANEL						2 R																	
20	COMMON SERVICES PANEL-2 TO ESSENTIAL PANEL (D & E)											2 R												
21	COMMON SERVICES PANEL-2 TO ESSENTIAL PANEL (B& C)										2 R													
22	COMMON SERVICES PANEL-2LTO POWER DB BASEMENT												1 R											
23	COMMON SERVICES PANEL-2 TO STREET LIGHT F. PILLER-I													2 R										
24	COMMON SERVICES PANEL-2O MOTORISED GATE (GATE-1)													2 R										
25	COMMON SERVICES PANEL-2TO VENTILATION PANEL - 1								2 R															
26	COMMON SERVICES PANEL-2 TO FIRE FIGHTING PANEL (2RX60)										2 R													
27	COMMON SERVICES PANEL-2TO UPS SYSTEM																	2 R						
28	COMMON SERVICES PANEL-2 TO LIGHTING DB IN BASEMENT												2 R											
29	COMMON SERVICES PANEL-2TO STREET LIGHT F. PILLAR-II													2 R										
30	COMMON SERVICES PANEL-2TO MOTORISED GATE (GATE-1I)													1 R										

CABLING																								
Sr. No.	Description	11 KV HT XLPE AL. AR. CABLE 150 Sqmm 3 Core	11 KV HT XLPE AL. AR. CABLE 120 Sqmm 3 Core	XLPE AL. AR. CABLE 300 Sqmm 3.5 Core	XLPE AL. AR. CABLE 240 Sqmm 3.5 Core	XLPE AL. AR. CABLE 185 Sqmm 3.5 Core	XLPE AL. AR. CABLE 150 Sqmm 3.5 Core	XLPE AL. AR. CABLE 120 Sqmm 3.5 Core	XLPE AL. AR. CABLE 95 Sqmm 3.5 Core	XLPE AL. AR. CABLE 70 Sqmm 3.5 Core	XLPE AL. AR. CABLE 50 Sqmm 3.5 Core	XLPE AL. AR. CABLE 35 Sqmm 3.5 Core	XLPE AL. AR. CABLE 25 Sqmm 4 Core	XLPE AL. AR. CABLE 16 Sqmm 4 Core	XLPE AL. AR. CABLE 10 Sqmm 4 Core	XLPE AL. AR. CABLE 10 Sqmm 3 Core	XLPE AL. AR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 25 Sqmm 4 Core	XLPE COPPER AR. CABLE 16 Sqmm 4 Core	XLPE COPPER AR. CABLE 10 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 3 Core	XLPE COPPER AR. CABLE 2.5 Sqmm 8 Core	
31	COMMON SERVICES PANEL-2 TO STP NEAR (GATE-I)										1 R													
32	COMMON SERVICES PANEL-2 TO VENTILATION PANEL - II								2 R															
33	MLP-1 RESIDENTIAL PANEL RD HOUSE TO									1 R														
34	MLP-1 RESIDENTIAL PANEL PANEL TO 2 EV CHARGING STN.-1										1 R													
35	FROM MAIN LIFT PANEL TO D&E LIFT PANEL (2RX80)																2 R							
36	FROM MAIN LIFT PANEL TO B&C LIFT PANEL																2 R							
37	FROM MAIN LIFT PANEL TO COMMUNITY LIFT PANEL																	2 R						
38	D&E LIFT PANEL TO LIFT NO-7																			1 R				
39	D&E ESSENTIAL SERVICE PANEL TO FIRE FIGHTING											1 R												
40	D&E ESSENTIAL SERVICE PANEL TO WATER LIFTING PUMP D&E												1 R											
41	D&E ESSENTIAL SERVICE PANEL TO LIGHTING DB IN STILT D&E													1 R										
42	D&E ESSENTIAL SERVICE PANEL TO TERRACE SPN DB IN D&E															1 R								
43	D&E LIFT PANEL TO LIFT NO-8																			1 R				
44	D&E LIFT PANEL TO LIFT NO-9																			1 R				
45	D&E LIFT PANEL TO LIFT NO-10																			1 R				
46	D&E ESSENTIAL SERVICE PANEL TO G. FLOOR TPN DB-1 IN D&E														1 R									

CABLING																								
Sr. No.	Description	11 KV HT XLPE AL. AR. CABLE 150 Sqmm 3 Core	11 KV HT XLPE AL. AR. CABLE 120 Sqmm 3 Core	XLPE AL. AR. CABLE 300 Sqmm 3.5 Core	XLPE AL. AR. CABLE 240 Sqmm 3.5 Core	XLPE AL. AR. CABLE 185 Sqmm 3.5 Core	XLPE AL. AR. CABLE 150 Sqmm 3.5 Core	XLPE AL. AR. CABLE 120 Sqmm 3.5 Core	XLPE AL. AR. CABLE 95 Sqmm 3.5 Core	XLPE AL. AR. CABLE 70 Sqmm 3.5 Core	XLPE AL. AR. CABLE 50 Sqmm 3.5 Core	XLPE AL. AR. CABLE 35 Sqmm 3.5 Core	XLPE AL. AR. CABLE 25 Sqmm 4 Core	XLPE AL. AR. CABLE 16 Sqmm 4 Core	XLPE AL. AR. CABLE 10 Sqmm 4 Core	XLPE AL. AR. CABLE 10 Sqmm 3Core	XLPE AL. AR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 25 Sqmm 4 Core	XLPE COPPER AR. CABLE 16 Sqmm 4 Core	XLPE COPPER AR. CABLE 10 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 3 Core	XLPE COPPER AR. CABLE 2.5 Sqmm 8 Core	
47	D&E ESSENTIAL SERVICE PANEL TO 9TH.FLOOR TPN DB-II IN D&E													1 R										
48	B&C ESSENTIAL PANEL TO FIRE FIGHTING PANEL										1 R													
49	B&C ESSENTIAL PANEL TO WATER LIFTING PUMP													1 R										
50	B&C ESSENTIAL PANEL TO STILT LIGHTING														1 R									
51	B&C ESSENTIAL PANEL TO G. FLOOR B&C TPN DB-I (UP TO 7TH FLOOR)														1 R									
52	B&C ESSENTIAL PANEL TO 10TH.FLOOR TPN DB- II (UP TO 14TH)														1 R									
53	B&C ESSENTIAL PANEL TO SPN DB TARRECE															1 R								
54	B&C LIFT PANEL TO LIFT -3																			1 R				
55	B&C LIFT PANEL TO LIFT -4																			1 R				
56	B&C LIFT PANEL TO LIFT -5																			1 R				
57	B&C LIFT PANEL TO LIFT -6																			1 R				
58	ESSENTIAL PANEL COMMUNITY CENTRE TO WATER LIFTING MOTOR																				1 R			
59	ESSENTIAL PANEL COMMUNITY CENTRE TO G. FLOOR TPN DB																			1 R				
60	ESSENTIAL PANEL COMMUNITY CENTRE TO 1st.FLOOR TPN DB																			1 R				
61	ESSENTIAL PANEL COMMUNITY CENTRE TO 2nd.FLOOR TPN DB																			1 R				
62	ESSENTIAL PANEL COMMUNITY CENTRE TO TARRECE TPN DB																			1 R				

CABLING																							
Sr. No.	Description	11 KV HT XLPE AL. AR. CABLE 150 Sqmm 3 Core	11 KV HT XLPE AL. AR. CABLE 120Sqmm 3 Core	XLPE AL. AR. CABLE 300 Sqmm 3.5 Core	XLPE AL. AR. CABLE 240 Sqmm 3.5 Core	XLPE AL. AR. CABLE 185 Sqmm 3.5 Core	XLPE AL. AR. CABLE 150 Sqmm 3.5 Core	XLPE AL. AR. CABLE 120 Sqmm 3.5 Core	XLPE AL. AR. CABLE 95 Sqmm 3.5 Core	XLPE AL. AR. CABLE 70 Sqmm 3.5 Core	XLPE AL. AR. CABLE 50 Sqmm 3.5 Core	XLPE AL. AR. CABLE 35 Sqmm 3.5 Core	XLPE AL. AR. CABLE 25 Sqmm 4 Core	XLPE AL. AR. CABLE 16 Sqmm 4 Core	XLPE AL. AR. CABLE 10Sqmm 4 Core	XLPE AL. AR. CABLE 10Sqmm 3Core	XLPE ALAR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 25Sqmm 4 Core	XLPE COPPER AR. CABLE 16Sqmm 4 Core	XLPE COPPER AR. CABLE 10 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 3 Core	XLPE COPPER AR. CABLE 2.5 Sqmm 8 Core
63	ESSENTIAL PANEL COMMUNITY CENTRE TO 2 NO UDB(SPN)																					1 R	
64	LIFT PANEL COMMUNITY CENTRE TO LIFT-1																			1 R			
65	LIFT PANEL COMMUNITY CENTRE TO LIFT-2																			1 R			
66	LIFT PANEL COMMUNITY CENTRE TO LIFT-11																			1 R			
67	COMMON SERVICES PANEL-2 TO EV CHARGING STATION PANEL										1 R												
68	NON ESSENTIALPANEL COMMUNITY CENTRE TO G. FLOOR POWER DB													1 R									
69	NON-ESSENTIAL PANEL COMMUNITY CENTRE TO 1ST FLOOR POWER DB													1 R									
70	NON-ESSENTIAL PANEL COMMUNITY CENTRE TO 2NDFLOOR POWER DB													1 R									
71	NON-ESSENTIAL PANEL COMMUNITY CENTRE TO TERRACE FLOOR POWER DB														1 R								
72	STREET LIGHT FEEDER PILLAR -1TO STREET LIGHT POLES														1 R								
73	STREET LIGHT FEEDER PILLAR -1TO POST TOP LAMPS																1 R						
74	STREET LIGHT FEEDER PILLAR -2 TO STREET LIGHT POLES														1 R								
75	STREET LIGHT FEEDER PILLAR -2 TO POST TOP LAMPS																1 R						

CABLING																							
Sr. No.	Description	11 KV HT XLPE AL. AR. CABLE 150 Sqmm 3 Core	11 KV HT XLPE AL. AR. CABLE 120Sqmm 3 Core	XLPE AL. AR. CABLE 300 Sqmm 3.5 Core	XLPE AL. AR. CABLE 240 Sqmm 3.5 Core	XLPE AL. AR. CABLE 185 Sqmm 3.5 Core	XLPE AL. AR. CABLE 150 Sqmm 3.5 Core	XLPE AL. AR. CABLE 120 Sqmm 3.5 Core	XLPE AL. AR. CABLE 95 Sqmm 3.5 Core	XLPE AL. AR. CABLE 70 Sqmm 3.5 Core	XLPE AL. AR. CABLE 50 Sqmm 3.5 Core	XLPE AL. AR. CABLE 35 Sqmm 3.5 Core	XLPE AL. AR. CABLE 25 Sqmm 4 Core	XLPE AL. AR. CABLE 16 Sqmm 4 Core	XLPE AL. AR. CABLE 10Sqmm 4 Core	XLPE AL. AR. CABLE 10Sqmm 3Core	XLPE ALAR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 25Sqmm 4 Core	XLPE COPPER AR. CABLE 16Sqmm 4 Core	XLPE COPPER AR. CABLE 10 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 4 Core	XLPE COPPER AR. CABLE 6 Sqmm 3 Core	XLPE COPPER AR. CABLE 2.5 Sqmm 8 Core
76	EV CHARGING PANEL (LOCATED IN BASEMENT) TO B & C, D&E, EV STATIONS 1,2,3,4,5,6											1 R											
77	UPS TO L V SERVICES 4NO. DB ON DIFFERENT LOCATIONS																				1 R		
78	MAIN ESSENTIAL PANEL TO UPS (FEEDER -2)											1 R											
79	BASEMENT LIGHTING PANEL TO 6WAY, 6 NO DB'S																1 R						

1.9 Earthing

Earthing system comprising of earth electrode, earth conductor, earth bus, protective conductor etc. for buildings shall be carried out as per provision laid down in CPWD General Specifications for Electrical Works Part-I (Internal), 2023 corrected up to date. The earthing system should be designed such as to maintain earth resistance as specified in above specifications. Earth resistance shall be checked / tested in harsh climatic conditions. Following types of earth electrode shall be used in this works (tentative):

Sl. No.	Type of installation / Equipment's	Earth Electrode	Earth Strip from earth Electrode to Equipment's/ body.
i.	1250 KVA CSS (For Neutral earthing)	Copper Plate 2 sets for each transformer = 6	32 mm x 5 mm copper strip.
ii.	1250 KVA CSS (Body Earthing of Transformer)	Copper Plate 2 sets for each transformer = 6	32 mm x 5 mm copper strip.
iii.	D.G. Set (Neutral earthing)	Copper Plate 2 sets for each D.G. Set = 6	25 mm x 5 mm copper strip.
iv.	D.G. Set (Body earthing)	Copper Plate 2 sets for each D.G. Set = 6	25 mm x 5 mm copper
v	UPS - 3 Nos. x 20 kVA (60 kVA total)	Copper Plate 2 sets for each UPS = 6 sets	25 mm x 5 mm copper strip
vi.	Main L.T. panel (Essential)	G.I. Plate 2 sets for each	25 mm x 5 mm G.I. strip.
vi	Main L.T. panel (non-essential)	G.I. Plate 2 sets for each	25 mm x 5 mm G.I. strip.
viii.	Outdoor Power Distribution	G.I. Plate 2 sets for each	25 mm x 5 mm G.I. strip.

Sl. No.	Type of installation / Equipment's	Earth Electrode	Earth Strip from earth Electrode to Equipment's/ body.
	Feeder Pillar	Feeder Pillar.	
ix	Tower b&C=8, D&E=4	G.I. Plate 4 sets for each.	25 mm x 5 mm G.I. strip.
x.	STP Panel	Mtc. FREE CHEMICAL EARTHING COPPER BONDED 14mm/14.2mm Dia 2 for each	25 mm x 5 mm G.I. strip.
xi	Main AC panel	G.I. Plate 2 sets for AC Panel	25 mm x 5 mm G.I. strip.
xii	G.O switch =1	G.I. Plate 2 sets	25 mm x 5 mm G.I. strip.
xiii	Fire Fighting Panel	G.I. Plate 2 sets	25 mm x 5 mm G.I. strip.
xiv	G.O switch =2	G.I. Plate 2 sets	25 mm x 5 mm G.I. strip.
xv	Essential & Non –Essential panel RD house	Mtc. FREE CHEMICAL EARTHING COPPER BONDED 14mm/14.2mm Dia 2 for each	25 mm x 5 mm G.I. strip
xvi	Lifts 12no	Mtc. FREE CHEMICAL EARTHING COPPER BONDED 14mm/14.2mm Dia 2 for each	Coppwer Wire 8SWG
xvii	For Rising Main B&C=2no, D &E=1	G.I. Plate 2 sets for each.	25 mm x 5 mm G.I. strip
xviii	Lift Panel=3 no	Mtc. FREE CHEMICAL EARTHING COPPER BONDED 14mm/14.2mm Dia 2 for each	25 mm x 5 copper strip
xix	Feeder Pillar Street light	Mtc. FREE CHEMICAL EARTHING COPPER BONDED 14mm/14.2mm Dia 2 no for each	Coppwer Wire 6SWG
xx	Electric Vehical Charging Panel	Mtc. FREE CHEMICAL EARTHING COPPER BONDED 20mm Dia2 sets for each	25 mm x 5 mm G.I. strip
xxi	G.I poles frostreet Light& compound light	G.I. Pipe 4 sets	G.I Wire 6SWG
xxii	HT metering Panel 11KV Common services	Copper Plate 2 sets for each	25 mm x 5 mm copper strip.
xxiii	VCB panel Normal Supply	Copper Plate 2 sets for each	25 mm x 5 mm copper strip.
xxiv.	Lightening arrestor (B&C= 6, D&E= 4, Community Centre=4)	Not less than 4 Sets G.I. Plate for each block.	25 mm x 5 mm G.I. strip.

Metallic body of all the equipments shall be earthed confirming CPWD specifications for Electrical works (Part-I), Internal 2023 corrected up to date.

Armoring of cables shall be connected to equipments and panel at both the ends. 2 Nos. 50 mm X 5 mm GI strips shall be provided in requirement room for body earthing.

After completing the work, necessary test results as envisaged in CPWD General Specifications Part-I (Internal)- 2023 corrected up to date, CPWD General Specifications Part-II (External)- 2023 corrected up to date & Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026, shall be recorded and submitted to the department. The results shall be within the permissible limits. Test report forms duly signed by authorized person along with completion layout drawing for obtaining electric connections (energy meters) from Power Distribution Company by the contractor shall be given to the allottee on demand.

1.10 Lightning Arrestor:

- 1.10.1 Lightning conductor shall be provided for building as per CPWD General Specifications for Electrical Works Part-I (Internal)- 2023 as amendment up to date.
- 1.10.2 Lightning arrestor system comprising of Air terminations, Down Conductors, Joint and bonds, testing joints, Earth termination, and earth electrode for buildings shall be carried out as per provision laid down in CPWD General Specifications for Electrical Works Part-I (Internal), 2023 corrected up to date.
- 1.10.3 Lightning arrestor system should be designed considering different principles, parameter mentioned in CPWD specifications, frequency of lightning/thunder storms on those particular areas in past, local data's, height of nearest buildings, trees, Overhead tanks etc.

1.11 EV Charger system

SITC of 08 nos Three phase AC EV charging system with minimum power capacity of 22 kw having minimum two nos of charging Gun. SITC of 02 nos Three phase DC fast EV charging system with minimum power capacity of 24 kw and above having minimum two nos of charging Gun. The entire EV charger shall have separate power control switch for operation i/c cabling work and earthing as per recommendation of OEM. All EV charger system shall be equipped with the online payment system. All EV charging system shall be installed in the basement area of the building.

Three phase AC EV charging system -Park bay AC Charger (Mode -3) Power Level 2: Normal Power ~11kW/ 22 kW, 3 phase 415VAC(-40% to +20%), Frequency:50 Hz +/-5%, output supply: 240 Volt AC, Operational temperature range : -25 to 55 °C (outdoor), -5 to 55 °C (Indoor), RH upto 95%, Charging .Device as per IS-17017-1 EV-EVSE ISO-15118 for Smart Charging, Infrastructure Socket as per IS-17017-2-2, Vehicle Connector as per IS-17017-2-2 Vehicle Inlet/ Connector As per EV manufacturer, suitable for 4 wheelers. Indoor use: at least IP42; Outdoor use: at least IP 54. Mechanical Strength: protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262. O/L, S/C protection. Insulation Resistance > 1 M Ω . Cable Length: 7.5. RCD having a rated residual operating current not exceeding 30 mA; Separate RCD for multiple outputs. Telecommunication port of the EV supply equipment according to IS 13252 (Part 1): 2010. OCPP (Open charge point protocol) 1.6J upgradable to ocpp 2.0. Device Should follow 17017 series of IS codes in general and the installation of the system shall comply with relevant IS Codes.

Three phase DC fast EV charging system - Parkbay DC Charger (Mode-3) Power Level 2: Normal Power ~24KW and above, 3 phase 415VAC(-40% to +20%), Frequency:50 Hz +/-5%, output supply: DC 12/24 Volt, Operational temperature range : -25 to 55 0C (outdoor), -5 to 55 0C (Indoor), RH upto 95%, Charging Device as per Device/protocol: IS-17017-23, EV-EVSE Communication as per IS-17017-24, ISO-15118, Infrastructure Socket as per IS-17017-2-2/3, Vehicle Connector as per IS-

17017-2-3 Vehicle Inlet/Connector As per EV manufacturer, suitable for 4 wheelers. Indoor use: at least IP42; Outdoor use: at least IP54. Mechanical Strength: protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262. O/L,S/C protection. Insulation Resistance > 1 M Ω . Cable Length: 7.5 m. RCD having a rated residual operating current not exceeding 30 mA; Separate RCD for multiple outputs. Telecommunication port of the EV supply equipment according to IS 13252 (Part 1) : 2010. OCPP (Open charge point protocol) 1.6J upgradable to ocpp 2.0. Device Should follow 17017 series of IS codes in general and the installation of the system shall comply with relevant IS Codes. Device Should follow 17017 series of IS codes in general and the installation of the system shall comply with relevant IS Codes. Cable size for tapping will be decided as per the incoming switches of SMDB and included in scope of work.

1.12. External electrical installation:

- 1.12.1 Service Connection to each building (i/c pump house/ STP room/ Guard house/ RD Bungalow/Community centre and other installation) / street lighting/ compound / garden lighting shall be provided underground cable of 1.1 KV grade aluminium conductor cable lying of various sizes of UG cables incoming to the building, GI/DWC HDPE pipe of following sizes shall be provided. Brick masonry chambers of suitable size with suitable cover shall be provided wherever required and at suitable intervals.
- 1.12.2 Underground cables of size up to size of 35 sq.mm (up to 2 run of cables)- 100 mm dia. Underground cables of size exceeding 35 sq.mm but not exceeding 120 sq.mm (up to 2 run of cables) - 150 mm dia.
- 1.12.3 Underground cables of size exceeding 120 sq.mm but not exceeding 300 sq.mm (up to 2 run of cables) - 200 mm dia.
- 1.12.4 The street lighting/ compound / garden lighting shall be done as per marked drawing enclosed with this bid documents.
- 1.12.5 Service connection cable entry in Building/Block should be done through RCC pipe of suitable size and road crossing of cable should be done through suitable size "C" class G.I. pipe.
- 1.12.6 Wherever any type of cable required shall be provide without any extra cost.

1.13 WATER SUPPLY / DEWATERING PUMPING - REFER SH: C-10

1.13.1 All borewell, open-well / transfer and dewatering pump sets, their starter/control panels, piping, valves, accessories, controls and associated works are covered under SH: C-10. These items shall not be duplicated under SH: C-1.

Under SH: C-1, only the electrical feeder / power supply interface up to the designated C-10 pump control panels, as indicated on the approved SLD/cable schedule, shall be included. No duplicate payment or duplicated scope shall arise between C-1 and C-10.

1.13.2 Covered under SH: C-10 - Water Supply Pumping / Dewatering System.

1.14 Street Lighting:

- 1.14.1 LED Street light fittings shall be provided on 6 Mtr long GI Octagonal pole by 1 Mtr long GI over hang bracket wire shall be done copper wire of size 3 x 1.5 sq.mm up to loop box provided inside the pole.

- 1.14.2 Power to street light shall be feed from nearest essential feeder pillar through UG cable and terminated loop box MCB. Location Street lighting is provided on tender drawings.
- 1.14.3 20% of total LED street light shall be hybrid type solar light.
- 1.14.4 The photo, model and other parameter are indicative only but the bidder to design to achieve the lux level, functional requirements and aesthetic of the building/campus. Details of Pole and LED street light is tabulated below:

DATASHEET FOR OCTAGONAL POLE		
i.	OCTAGONAL POLE	
	Material construction of Shaft	Hot Rolled Steel Plate as per 15 2062/BS EN 10025 or Equivalent.
	Grade of Steel	Hot Rolled Steel Plate as per IS 2062/BS EN 10025 Or Equivalent.
	Thickness	To be decided as per height of pole and site condition, however, not less than 3 mm thicks.
	No. of longitudinal welds/section	One. They shall be continuously tapered with single longitudinal welding. There shall not be any circumferential welding. The welding of pole shaft shall be done by Submerged Arc Welding (SAW) process. The base plate shall be fillet welded to the pole shaft at two locations i.e. from inside and outside.
	Length of pole	7000 mm. 8000 mm.
	Cross section of Pole	Octagonal (8-sided polygon)
	Base diameter and top diameter (A/F)	As per structural design calculations, however, not less than 70 mm x 135 mm. As per structural design calculations, however, not less than 100 mm x 200 mm.
	Metal protection treatment for Pole Section	Hot Dipped Galvanized, as per BS EN ISO 1461
	Height of door	500 mm (approximate) height at the elevation of 500 mm from the base plate. The pole shall be adequately strengthened at the location of door to compensate for the loss in section. Hight of the door may be decided considering site conditions and length of pole.
	Door type	The door shall be hinged type and shall be flush with the exterior surface and shall have suitable locking arrangement. There shall also be suitable arrangement for the purpose of earthing.

	Mounting of switchgears	Provision should be provided in the bottom compartment to mount PVC /Bakelite sheet along with connectors for cable looping and single pole MCB to isolate individual luminaire.	
	Dimension of base plate	As per structural design calculations, however, not less 200 mm x 200 mm.	As per structural design calculations, however, not less 275 mm x 275 mm.
	Thickness of base plate	As per structural design calculations, however, not less than 12 mm.	As per structural design calculations, however, not less than 16 mm.
	Grade of Steel for Base Plate	As per IS 2062	
	Luminaries mounting bracket	The galvanized over hang Luminaries mounting bracket of 1000 mm long suitable diameter shall be provided along with the Octagonal Poles of 7000 mm. for installation of the luminaries.	The galvanized frame made out from GI channel of suitable size to accommodate 4 nos Flood light Luminaries. The frame work should be adjustable in different angle according requirement to obtain maximum illuminations and easy for maintenance.
ii.	FOUNDATION BOLTS		
	Number of foundation bolts	As per structural design calculations, however, not less than 4 Nos in both poles. (M16)	As per structural design calculations, however, not less than 4 Nos in both poles. (M20)
	PCD of foundation bolts	As per structural design calculations however, not less than 200 mm.	As per structural design calculations however, not less than 275 mm.
	Bolt length	As per structural design calculations with J-Bolt, however, not less than 600 mm.	As per structural design calculations with J-Bolt, however, not less than 700 mm.
iii.	MATERIALS PROTECTION		
	Metal protection treatment for Pole	Sigle Hot Dop Galvanized.	
	Thickness of Galvanization	As per BS-1461 (Average- 70 microns to 85 Microns)	
	Applicable Standards	Design of Poles is as per BSEN-40-N	
iv.	FOUNDATIONS		
	Foundation	Suitable size RCC foundation shall be provided as per site conditions and as per manufacturer recommendations.	

<u>LED STREET LIGHT DATA SHEET</u>		
Sr. No.	Parameters	LED Street light
i.	Wattage/Type	Minimum 70-72 W LED Luminaire 
ii.	Luminaire Housing	Die Cast Aluminum housing with high quality antiglare diffuser.
iii.	Light Source	SMD LED Chip
iv.	Operating Voltage Range	140–270V
v.	Power Factor	≥ 0.95
vi.	Rated Voltage	220V-240V
vii.	Surge Voltage	Up to 10kV
viii.	LED Life span & Luminaire photometric data	IES LM 79 and IES LM 80
ix.	Luminous flux	7500
x.	Luminaire efficacy	Not less than 125 lumen/W.
xi.	Lumen Maintenance	Minimum 70% up to 50000 hrs. IEC compliant.
xii.	Driver efficiency	$\geq 85\%$
xiii.	Beam Angle	Not less than 120 degrees
xiv.	IP Protection Level	minimum IP-66
xv.	Harmonic Distortion (THD)	$< 10\%$
xvi.	LED make	NICHIA/OSRAM /SEOUL/PHILIPS LUMILEDS/LEDNIUM /CREE/BRIDGELUX
xvii.	Colour temperature	5700 K
xviii.	CRI	≥ 70
xix.	Junction temperature	Maximum 85° C
xx.	Environment considerations	ROHS Compliant
xxi.	Safety	Should pass High Voltage Dielectric test of 1.5 KV as per IS:10322
xxii.	Test Certificate	LM79
xxiii.	IK	Not less than IK07.
xxiv.	Standard Warranty	5 years
xxv.	Installation	Fitting Shall be installed on 6 Mtrs. long GI octagonal pole with 1Mtrs. long over hang GI bracket.

<u>SOLAR LED STREET LIGHT DATA SHEET</u>		
Sr. No.	Parameters	All in one Hybrid Solar Street light (Hybrid).
i.	Type	Minimum 60W Solar LED Street light Luminaire, having fixed diming profile. 
ii.	Luminaire Housing	The luminaire shall have excellent heat dissipation and also Lens for efficient light distribution. The front cover is composed of weather resistant, UV stabilized polycarbonate. The front cover is tightly secured with the housing to ensure that the luminaire has an ingress protection of IP65. The luminaire shall have a smart self-diagnosis feature with LED indicators for battery charging, deep discharge and Load cut off indication visible from ground in day light.
iii.	Light Source	SMD LED Chip
iv.	Operating Voltage Range	180–260V
v.	Power Factor	≥ 0.95
vi.	Rated Voltage	220V-240V
vii.	Surge Voltage	Up to 10kV
viii.	LED Life span & Luminaire photometric data	IES LM 79 and IES LM 80
ix.	Wattage	Not more than 60 Watt.
x.	Luminaire efficacy	Not less than 180 Lm/W (Lumen output not less than lumens).
xi.	Lumen Maintenance	Minimum 70% up to 50000 hrs. (indoor application)
xii.	Driver efficiency	$\geq 85\%$
xiii.	Beam Angle	Not less than 120 degrees
xiv.	IP Protection Level	minimum IP-65
xv.	Harmonic Distortion (THD)	$\leq 10\%$
xvi.	LED make	NICHIA/OSRAM /SEOUL/PHILIPSLUMILEDS /LEDNIUM /CREE/BRIDGELUX
xvii.	Colour temperature	5700 K
xviii.	CRI	≥ 80
xix.	Junction temperature	Maximum 85° C
xx.	Environment considerations	ROHS Compliant

xxi.	Safety	Should pass High Voltage Dielectric test of 1.5 KV as per IS:10322
xxii.	Test Certificate	LM79
xxiii.	IK	Not less than IK 08
xxiv.	Standard Warranty	5years
xxv.	Battery life	2000 Cycle
xxvi.	Charge Controller	The luminaire shall have a highly efficient, integrated microprocessor based MPPT charge controller with driver mounted on the same board to minimize power loss. This intelligent power management system shall maximize the overall system efficacy to Minimum 140 lumens/watt.
xxvii.	Diming Profile	The charge controller shall be supplied with a preconfigured dimming profile that shall dim the luminaires late at night to further increase the autonomy of the system. Dusk to Dawn Dimming Profile should be for first one hour on motion at 100 % , without motion at 25 % , next 4 hours on motion 40 % & without motion 25 % . Next 6 hours 25 % Fix , rest of night on motion 40 % without motion 25 % Dusk and dawn detection shall be through voltage generated from the solar panel, and it should be configurable.
xxviii.	Controller Efficiency	The Controller Efficiency shall be > 90%. The Controller shall meet the relevant IEC codes.
xxix.	Protection	The controller shall have inbuilt protection features: protection against battery overcharge and deep discharge condition, protection should be provided against battery and Panel reverse polarity, over current protection, Protection for reverse flow of current through the PV module(s) should be provided, ON/OFF switch to be provided to prevent discharge of battery during storage / before Installation.
xxx.	SOLAR MODULE	SOLARCELL Premium grade Mono crystalline silicon type (only source of energy) SOLARMODULE POWER 170WpMONO SOLARMODULECONSTRUCTION 3.2mm low Iron tempered glass with lowre flection characteristics and IP65 rated. COMPLIANCE STANDARDS IEC61215 for design; IEC61701(Salt mist corrosion test) performance and IEC61730 (Safety classI&II) CE
xxxi.	Compliance Standards	The Compliance Standards shall be IEC 61215 For Design; & IEC 61730 (Safety Class I & II).
xxxii.	Life Cycle	2000 cycles for LiFe Po4 based systems–typically>6years~1000 cycles for Lithium based systems–typically>3years
xxxiii.	BATTERY	Rechargeable Lithium Ferro Phosphate chemistry (LiFePo4) batterypack BATTERY PACK VITALS 12.8V,54Ah (LiFePO4) BATTERY PACK SAFETY Inbuilt with BMS module (for accidental short circuit, over discharge, over charge, over temperature) BATTERY PACKCONSTRUCTION Designed for long system life and high reliability. BATTERY PACKFEATURES Ultra lowself discharge of<2%per month with temperature-20°Cto50°C
xxxiv.	Batthey life	2000 Cycle.
xxxv.	Battery Back-up	24 Hrs.
xxxvi.	Installation	Fitting Shall be installed on 6 Mtrs. long GI octagonal pole directly with bracket.
FACADE LIGHTING		(The Facade Lighting shall be provided on Community Centre)
Façade light shall be designed and drawing through professional lighting designer by proving high energy efficient luminaries. The design shall be done to highlight the architectural features of		

building and façade of the building. The design and drawing should be got approved before purchasing materials and execution at site.

GATE LIGHT TECHNICAL DATA SHEET

	Gate light		40w LED Post Top Light with Top Canopy powder coted Spun & Dia cast Aluminium housing with Dia 400mm x H 440mm and Black PU Paint with Transparent PC Diffuser & Optic-V with integral constant current driver input operating voltage range 140V – 270V 50Hz AC supply, Operating temperature range -10°C-to 50°C, pre wired upto the terminal block. System lumen output ≥ 4000 lumens with luminaire efficacy $\geq 100\text{lm/W}$ lumen maintenance of 70% at the end of 50000 burning hours, CCT of 3000K, PF≥ 0.95, CRI≥ 70, THD$<10\%$, surge protection of $\geq 10\text{kV}/5\text{KA}$ external and IP≥ 65 & IK07 protected with 60mm pole mounting. LM 79 report to be submitted for luminaire from NABL accredited lab and LM 80 for LED source issued by LED manufacture. LED shall have reverse polarity, open and short circuit protection
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TECHNICAL DATA SHEET OF LANDSCAPE LIGHTING

	Bollard		• Cylindrical bollard luminaire is made in parts comprising of: a) Spun aluminium dome shaped top cover. b) cylindrical opal acrylic diffuser for pleasant light output. c) Seamless GI pipe bottom housing the control gear for 9W LEDs. • Luminaire is available with color temperature: Warm White (WW): 3000K $\pm 250\text{K}$. • Lux level should not be less than 900 lux. • CRI > 70. • Luminaire is provided with a die-cast base plate and fixing holes for directly mounting on the concrete pedestal. • Luminaire is wired with inbuilt driver with 4.5kV surge protection. • Finish: Powder coated. • IP: 66 and IK: 07. • Operation voltage: 220-240, 50 Hz. • Minimum height not less than 500 mm, pipe outer diameter not less than 80 mm and base dia not less than 130 mm. Warranty: - 5 Years.
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	LED Spike light		8W LED SPIKE LIGHT luminaire with compact, aesthetic, Aluminium Die Cast with Matt Grey with Aluminium Anodized Reflector and Transparent Tempered Glass Diffuser and in built electronic driver with 2.5kV surge protection, lumen maintenance of 70% at the end of 50000 burning hours with constant current driver output operating range 100V – 270V, 50Hz AC supply, 2Way 10 Amps GFP mains connector, high efficiency COB LED mounted on black anodised aluminium heat sink for effective heat dissipation with front maintainable with vandal resistant toughened glass giving access to driver and LED conforms to IS 10322, special high efficiency optical grade UV stabilized engineering plastic reflector, Beam Angle 36°, with a nominal system lumen output of 550 lumens , Power factor >0.9 or higher. The luminaire shall meet IP65 rating.
SPORTS AREA LIGHTING (Outdoor Basket Ball Court)			
Sl. No.	Description	Image	Specification
i.	Sports Lighting		LED Flood light luminaire 90W (IP66), BIS certified with a body of high pressure diecast aluminium, (IK07). Impact resistant Polycarbonate Lenses on 1-3w LED Chip & Metal Core Printed Circuit Board..Bracketsuitable for a wall, ground or high mast mounting and pre-cabled as required.Overall luminous efficiency of 130lm/W at correlated colour temperature(CCT) of 5700K (optional 3000K & 4000K), colour rendering index (CRI) >70and L70 rated lifetime of 50,000 hours.auto Cut-Off @ >300 V/AC and Under Voltage Protection <110V/AC, Reverse Polarity & Short Circuit ProtectioElectrical Class I, rated voltage 240Vac, Power Factor ≥ 0.95, with BIS certified potted driver having internal surge protection of 4/4 kV and an additional surge protection device (SPD) of10/10 kV from 100W and above (in both Common & Differential Modes

SPORTS AREA LIGHTING (Indoor Badminton Court)			
ii.	Sports Lighting		LED Flood light luminaire 90W (IP66), BIS certified with a body of high pressure diecast aluminium, (IK07). Impact resistant Polycarbonate Lenses on 1-3w LED Chip & Metal Core Printed Circuit Board..Bracketsuitable for a wall, ground or high mast mounting and pre-cabled as required.Overall luminous efficiency of 130lm/W at correlated colour temperature(CCT) of 5700K (optional 3000K & 4000K), colour rendering index (CRI)>70and L70 rated lifetime of 50,000 hours.auto Cut-Off @ >300 V/AC and Under Voltage Protection <110V/AC, Reverse Polarity & Short Circuit ProtectioElectrical Class I, rated voltage 240Vac, Power Factor ≥ 0.95, with BIS certified potted driver having internalsurge protection of 4/4 kV and an additional surge protection device (SPD) of10/10 kV from 100W and above (in both Common & Differential Modes

Provisions for SITC of Electrical Vehicles Charging facilities shall be in the scope of work as per requirements at the RBI colony. And Power infrastructure, such as electrical panel, DB's, cables etc should be provided at indicated locations on drawing, so that, Electrical Vehicles Charging station can be installed as and when required. The cost of electrical infrastructure is included in the scope of this contract. Nothing extra on this account shall be payable to the contractor.

During design of power distributions (Cable size), volage drop for feeders shall not exceeded 2% at design load. Volage drop for branch circuit should not be exceed 3% at design load (As per ECBC requirements).

RISING MAINS TABLE

Sr. No	Building	Rising Main Length (mtr)	Rising Main Capacity	End Feed Unit	Tap off Box (125A)	Quantity	Units
1.	Grade B & C	100.80	800A,50KA, C for 1sec	800A,50KA for 1 sec	56	2	each
2.	Grade D & E	37.50	400A,25KA, C for 1 sec	400A,30KA for 1 sec	11	1	each
3.	RD Bungalow	-	-	-	-	-	-
4.	Community Center	-	-	-	-	-	-

Rising Main & Bus Trunking.

Sandwich Type Rising Mains for use on 3 phase 4 wire 415 volts, 50Hz A.C. supply with metal clad enclosure having IP-54 rating after fixing the tap off boxes and all accessories, made of 1.6mm thick steel sheet duly powder coated in convenient sections complete with 4 Nos aluminium bus bars having current density of 130 A/ sq cm at nominal current rating, necessary joints, elbow joints & expansion joints and bends, fire barrier at each floor, provision of tapping at every metre, adopter box and copper flexible for joints, continuous earthing with 2 Nos aluminium strip of suitable size (one on each side) including, G.I. clamping brackets, suspenders, angle iron bracket, steel fasteners, connecting to earthing system etc. as required.

Tap off Box

Plug In/ tap off box on the existing Air Insulated Compact Type bus trunking/ rising mains for use on 3 phase 4 wire 415 volts, 50Hz A.C. supply made with 1.6mm thick sheet steel enclosure (IP54) duly powder coated with provision of MCCB/ACB (but without MCCB/ACB) complete etc. as required.

End feed Unit:

End Feed Unit for the existing Air Insulated Compact Type bus trunking/ rising mains for use on 3 phase 4 wire 415 volts, 50Hz A.C. supply made with 1.6mm thick steel sheet enclosure (IP54) duly powder coated with provision of MCCB/ACB (but without MCCB/ACB) complete with necessary joints including clamping brackets, angle iron bracket, steel fasteners, connecting to earthing system etc. as required

SH: C-2**FIRE FIGHTING, SPRINKLER, FIRE EXTINGUISHER SYSTEMS****2. Fire Fighting System: -**

2.1 The work shall be carried out as per CPWD General Specifications for Wetriser & Sprinkler System (Part-V) 2020 as amended and corrected upto date, CPWD General Specifications of Electrical Works Part-I 2023 as amended and corrected up to date, Part-II (External) 2023as amended and corrected upto date, relevant Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026,ISstandard, SP 7:2026 (NBCS 2026) amended and corrected up to date, NFPA 2013, IBC (International Building Code).Contractorwillenablethe consultant for obtaining fire NOC, rectify the defects and shortcomings, if any, pointed by the CFO and arrange inspection/ testing of the scheme asrequiredforthis purpose. The contractor shall follow the following guidelines while designing and executing the work:

2.2 Scope of work include design , drawing, fabrication of system i/c supply of different motor pump set having higher efficiency highest BEE star rating, Electrical fire pump, Diesel Engine for fire pump, Sprinkler pump,piping networks and its necessary accessories, valves, hydrant (Internal & external),Hose pipe, Hose reel, GM Branch pipe, nozzle, fire service inlet, fire service connections, fire brigade draw out collecting head, Air vessels, orifice plate, pressure gauge, pressure meter, automatic sprinkler systemi/c piping, nozzle, sprinkler piping of required diameter as per drawing, alarm system for wet riser as well as for sprinkler system, control system, Electrical Panel, cabling, earthing etc. complete as required to make the system fully functional, testing & commissioning, approval from state fire department, handing over to client department in working conditions. In addition to above, portable fire extinguisher (ABC and CO²) type is also included in scope of work.

2.3 Provisions of automatic sprinkler system has been proposed at the following locations:

Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.

Sl. No.	Name of Building/ Block	Nos. of floor	Sprinkler System proposed
i.	Basement	1	As per SP 7:2026 (NBCS 2026) with fire curtain compartmentalisation.

2.4 Details of Fire Fighting system to be installed at different blocks (indicative):

Sl. No.	Name of Building/ Block	Nos. of floor	System proposed		Terrace Tank (Ltrs.)		Terrace Pump (LPM) (1 W +1 S)		Fire Service inlet
			Wet riser cum downcomer system	Downcomer system	5000	25000	900 LPM		
i.	Grade B & C	B+S +14	1	-		1	1	1	1
ii.	GRADE D & E	B+S +10	1	-		1	1	1	1
iii.	Community centre	G+3	1	-		1	1	1	1

2.5 Details of pump (indicative) to be installed for firefighting and sprinkler system:

Sl. No.	Description of the Pump	Qty	Discharge (in lpm)	Head (in Meters)
i.	Main electric driven fire pump shall be horizontal split casing for Wet Riser system.	1	2280	110
ii.	Main electric driven fire pump shall be horizontal split casing for sprinkler system.	1	1620	Suitable head
iii.	Standby Diesel Engine Driven Pump shall be horizontal split casing for wet riser and sprinkler system.	1	2280	110
iv.	Jockey/Pressurization Pump for hydrant system shall be electric Driven Horizontal Type, multistage.	1	180	110
v.	Jockey/Pressurization Pump for sprinkler system shall be electric Driven Horizontal Type, multistage.	1	180	Suitable head
vi.	Terrace Pump shall be electric Driven Horizontal split casing Type (1w + 1s)	12	900	Suitable head

vii.	Dewatering pump	1	Suitable discharge	Suitable head
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Note: Quantity and capacity mentioned above are tentative and minimum, it may be very as per actual design.

- 2.6 The distribution pipe and range pipe in the sprinkler system be laid as per the relevant IS code and CPWD Specification Part V (Wet Riser & Sprinkler system) 2020 as amended and corrected upto date.
- 2.7 The provision of sleeves in the beam shall be kept for running the distribution range pipe if required.
- 2.8 The air Vessel for sprinkler and wet riser shall be provided as per specification.
- 2.9 Each sprinkler zone shall have one flow switch.
- 2.10 In each floor of buildings/ blocks (from Stilt/Ground Floor to Terrace), there shall have internal fire hydrant and external hydrant shall be provided as per marked drawings.

2.11 Internal Hydrant:

Internal hydrant shall be connected with each riser (wet riser as well down comer) at every floor. Each internal hydrant should consist following at every floor/terrace of each building/ block.

- i) 63mm dia. Single-headed, cast-iron body, gun metal landing valve ISI marked conforming to IS 5290 (type A) with blank gun metal cap and chain as required – 2 nos.
- ii) First Aid hose reel along with drum and bracket, 1 no. 20 mm nominal internal dia. water hose thermoplastic (textile reinforced type- as per IS: 12585), 30 M long, 20 mm nominal internal dia. gun metal globe valve and nozzle, Heavy duty G.I. pipe and socket to connect riser).
- iii) Hose pipe 63mm dia. 15 mtr. Long rubber lined woven jacketed hose pipe ISI marked type- A (Reinforced Rubber Lined) confirming to IS 636 having Male Female Gun metal coupling- 2 Nos.
- iv) 63 mm dia. Gun metal Branch pipe with 20 mm (nominal internal dia.) Gun metal Nozzle conforming to IS: 903 suitable for instantaneous connection - 1 no.
- v) All above components shall be housed in Electrical shaft of each floor and should be covered with fire rated material door.

2.12 External (Yard) Hydrant:-(As per marked drawings enclosed with bid documents).

Each external hydrant should consist of the following:-

- i) 63mm dia. Single-headed, cast-iron body, gun metal external valve ISI marked conforming to IS 5290 (type A) with blank gun metal cap and chain – 1 no.

- ii) Connection from ring main with 80mm dia. heavy duty GI pipe 1 Mtr. long.
- iii) Butterfly valve of PN 1.6 rating gun metal, ISI marked conforming to 13092, 80 mm dia.-1 No.
- iv) Hose pipe 63mm dia. 15 mtr. Long rubber lined woven jacketed hose pipe ISI marked type-A (Reinforced Rubber Lined) conforming to IS 636 having Male Female Gun metal coupling-2 Nos.
- v) 63 mm dia. Gun metal Branch pipe with 20 mm (nominal internal dia.) Gun metal Nozzle conforming to IS:903-1 no.
- vi) All above components shall be housed in a suitable size MS cabinet made from 2 mm thick sheet with glass panel on front.

2.13 Components like landing valve, hose coupling, branch pipes, Fire Brigade Inlet Connection (FBIC) etc. shall be ISI marked and made of Gun metal.

2.14 Fire Service inlet: - In order to facilitate feeding of water in the system by fire service department, a 2/3-way 63 mm diameter collecting head shall be provided and connected with each riser/down comer and the ring main with non-return valve and butterfly/slucice valve. This should be located at a place where fire brigade tender can reach easily.

2.15 Fire Service connection: It is for feeding water to underground storage tank by fire tankers. The static water storage tank shall be provided with a fire brigade collecting head with 4 number 63 mm diameter instantaneous male inlets arranged in a valve box at a suitable point at street level. If tank is not approachable for the fire tenders, the fire brigade collecting head shall be connected to the static tank by a suitable fixed galvanized iron pipe (Heavy duty) not less than 150 mm in diameter to discharge water into the tank when required.

2.16 Fire Brigade draw out collecting head: Each of the static water storage tanks shall also be provided with a fire brigade draw out collecting head with 63 mm diameter instantaneous male draw out arranged in a valve box at a suitable point at street level. This draw out shall be connected to galvanized iron pipe (Heavy duty) of 100 mm diameter with foot valve arrangement in the tank.

2.17 Air Vessel :

The air vessels shall be made of 250 mm dia., 8 mm thick MS sheet, 1200 mm in height with air release valve on top and flanged connection to riser, drain arrangement with 25mm dia. gun metal wheel valve, pressure gauge and other required accessories and painting with synthetic enamel paint of approved shade. The air Vessel for sprinkler and wet riser shall be provided as per specification.

2.18 Pressure gauge :

100 mm dia. pressure gauge of range 0 - 10 kg/sq.cm conforming to IS - 3624 having Burdon tube of stainless steel 310 in cast aluminium, stove enameled, black weather proof case outer, screwed aluminium bezel and complete with necessary U type stainless

steelsiphon tube and cock including providing and fixing suitably painted angle iron support to the tube.

2.19 Level indicator:

Electronic type water level indicator with LED panel mounted specified complete with probes & all control wiring etc.

2.20 Auto Airvent:

Auto Air vent shall be provided for risers, suitable for pressure not less than 15 Kg/Sq.cm.

2.21 Pipe Work:

Pipe shall be of the following material.

- (i) 'C' Class Heavy Duty MS Pipe conforming to IS 1239/Class -II of IS: 3589.
- (ii) 'C' Class Heavy Duty MS Pipe conforming to IS 1239/Class -II of IS: 3589, for sizes greater than 200 mm. These pipes shall be factory rolled and fabricated from minimum 7 mm thick MS sheet for pipes upto 350 mm dia.
- (iii) MS/GI / Cadmium plated steel nuts, bolts, washers shall be used.
- (iv) All the MS / GI accessories such as tees / elbows / reducers / couplings / unions / bends / flanges etc. shall be heavy class. Fixing of pipes shall be as per CPWD specification as amended.
- (v) All riser pipe diameter shall not be less than 100 mm dia. and all ring main shall not be less than 150 mm dia.

2.22 Butterfly valve:

Butterfly valves shall be Flanged Type of PN-1.6 with CI body & SG Iron disc duly ISI marked conforming to IS 13095 including rubber gasket, flanges, nuts, bolts and washers & other accessories complete as required. Butterfly valve shall be used for pipes of sizes 40 mm to 150 mm.

2.23 Sluice Valve:

Sluice valve shall be double flanged of rating PN 16 with non-rising spindle, bronze / gun metal sheet, ISI marked complete with nuts, bolts, washers, gaskets, confirming to IS: 780. Sluice valve shall be used for pipes of sizes above 150 mm.

2.24 Non-return valve:

- i. Non-return valves shall be dual plate type confirming to IS: 5312
- ii. The valve shall be PN 16 pressure rating.

2.25 Strainer:-

'Y' Pot Strainer shall be of PN-1.6, CI body, Flanged Type with bolted cover & strainer fabricated out of 1.6 mm thick stainless-steel sheet with 3 mm dia. Holes.

2.26 Main Fire Pump (Automatic):

- i) Horizontal split casing, multistage, centrifugal pump shall be of cast iron body and bronze impeller with stainless steel shaft, mechanical seal to ensure a minimum pressure of 3.5 kg/sq.cm. at highest and farthest outlet. (The pump should be capable of delivering 150 % rated discharge at a head not less than 65% of the rated head).

- ii) Suitable HP, SQ cage induction motor, TEFC, synchronous speed 1500 RPM, suitable for operation on 415volts, 3 phase 50Hz.AC with IP55 protection for enclosure, horizontal foot mounted type with Class-'F' insulation, conforming to IS-325 fitted and coupled on a common base frame along with coupling guard.
- iii) Foundation of Pumps & Electrical motor shall be constructed as per the requirement/ recommendation of manufacturer.

2.27 Main sprinkler Pump (Automatic):

- i) Horizontal split casing, multistage, centrifugal pump shall be of cast iron body and bronze impeller with stainless steel shaft, mechanical seal to ensure a minimum pressure of 3.5kg/sq.cm. at highest and farthest outlet. (The pump should be capable of delivering 150 %rated discharge at a head not less than 65% of the rated head).
- ii) Suitable HP, SQ cage induction motor, TEFC, synchronous speed 1500 RPM, suitable for operation on 415volts ,3phase 50Hz. AC with IP55 protection for enclosure, horizontal foot mounted type with Class-'F' insulation, conforming to IS-325 fitted and coupled on a common base frame along with coupling guard.
- iii) Foundation of Pumps & Electrical motor shall be constructed as per the requirement/ recommendation of manufacturer.

2.28 Diesel Engine Fire Pump (automatic):

- i) Horizontal split casing, multistage, centrifugal pump shall be of cast iron body and bronze impeller with stainless steel shaft, mechanical seal to ensure a minimum pressure of 3.5kg/sq.cm. at highest and farthest outlet. (The pump should be capable of delivering 150 %rated discharge at a head not less than 65% of the rated head).
- ii) The engine shall be multi-cylinder/vertical 4 stroke cycle, water cooled, developing suitable BHP at the operating speed of 1500 rpm to drive the fire pump. Continuous capacity available for the load shall be exclusive of the power requirement of auxiliaries of the diesel engine, and after correction for altitude, ambient temperature and humidity of Patna, Bihar.
- iii) The Engine shall be complete with auto starting mechanism 12/24 Volts electric starting equipment, Diesel Tank, exhaust pipe extended up to 1m. outside pump house duly insulated with 50 mm. thick glass wool with 1.0 mm. thick aluminum sheet cladding, residential silencer, instruments and protection as per specification, stop solenoid for auto stop in the event of fault with audio indication, painted with post office red color etc. as required and coupled on a common base frame along with coupling guard.
- iv) The engine shall be suitable for cold starting for which suitable heaters shall be provided in lubricating oil.

- v) The engine shall develop full load within 15 seconds from the receipt of signal to start. The diesel engine shall conform to BS649/IS10002 amended up to date.
- vi) Engine Accessories- The engine shall be complete with all accessories as per CPWD specification.
- vii) The high torque D.C motor charged by battery shall initiate automatic start of diesel. The battery shall hold adequate retainable charge to provide starting power for the diesel engine.
- viii) Foundation of Pumps & Electrical motor shall be constructed as per the requirement/recommendation of the manufacturer.
- ix) The fuel tank shall be of welded steel construction (3.0 mm thick) and capacity sufficient to allow the engine to run on full load for at least 8 hours.
- x) Engine instrumentation shall include the following:
 - a. Lub. Oil pressure gauge.
 - b. Lub.Oil temperature gauge.
 - c. Water temperature gauge.
 - d. Tachometer.
 - e. Hourmeter.
- xi) Engine protection devices shall include the following:
 - a. Low Lub.Oil pressure.
 - b. High Lub.Oil temperature.
 - c. High cooling water temperature.
 - d. Overspeed shutdown.
- xii) Engine Exhaust Pipes shall be MS pipe and sized in accordance with the manufacturer's recommendations.
- xiii) A stainless-steel flexible connection shall be provided between the engine exhaust outlet and the exhaust pipe. An exhaust silencer shall be provided as required to satisfy the acoustic requirements.
- xiv) Necessary float and boost charger shall be incorporated in the control section of power and control panel, to keep the battery under trim condition. Voltmeter to indicate the state of charge of the batteries shall be provided.

2.29 Jokey / Pressurization pump (Automatic for wet riser system): -

- i) Horizontal type, multistage, centrifugal pump of cast iron body and bronze impeller with stainless steel shaft, mechanical seal with flow and head as per SP 7:2026 (NBCS 2026) and CFO requirement conforming to IS:1520.
- ii) Suitable HPSQ cage induction motor TEFC type suitable for operation on 415 volts, 3 phase 50 HZ. AC with IP 55 class of protection for enclosure, horizontal foot mounted type with Class-F insulation, conforming to IS: 325, fitted and coupled on a common base frame along with coupling guard.

- iii) Foundation of Pumps & Electrical motor shall be constructed as per the requirement/recommendation of manufacturer.

2.30 Jokey / Pressurization pump (Automatic for Sprinkler system):

- i) Horizontal type, multistage, centrifugal pump of cast iron body and bronze impeller with stainless steel shaft, mechanical seal with flow and head as per SP 7:2026 (NBCS 2026) and CFO requirement conforming to IS:1520.
- ii) Suitable HPSQ cage in duction motor TEFC type suitable for operation on 415 volts, 3phase 50 HZ. AC with IP 55 class of protection for enclosure, horizontal foot mountedtype with Class-F insulation, conforming to IS: 325, fitted and coupled on a common base framea long with coupling guard.
- iii) Foundation of Pumps & Electrical motor shall be constructed as per the requirement/recommendation of manufacturer.

2.31 Terrace pump (Automatic):

- i) Horizontal type, multistage, centrifugal pump of cast iron body and bronze impeller with stainless steel shaft, mechanical seal with flow and head as per SP 7:2026 (NBCS 2026) and CFO requirement conforming to IS:1520.
- ii) Suitable HPSQ cage induction motor TEFC type suitable for operation on 415 volts,3phase 50 HZ. AC with IP 55 class of protection for enclosure, horizontal foot mountedtype with Class-F insulation, conforming to IS: 325, fitted and coupled on a common base frame along with coupling guard.
- iii) Foundation of Pumps & Electrical motor shall be constructed as per the requirement/recommendation of manufacturer.

2.32 All panel will be type tested as per standard IEC 61439- 1 & 2 ed3. All panel board shall have RS 485 port MODBUS, BACnet, LON compatible.

2.33 Fire Fighting Pump Control Panel (Power to be fed from essential Panel Board):

- i) The panel shall be cubicle type totally enclosed, fully compartmentalized with IP 42degree ofprotection class and fabricated from CPRI approved manufacturer with 2 mm thick CRCA sheet powdercoated with 7tank process and shall be equipped with suitable rating of 4 pole ACB/MCCB as incomer, Bus bars, digital type Multifunction meter withsuitable CTs to measure parameters like current, voltage, frequency, wattage, powerfactor, KWH, KVA, etc.as per drawing approved byEngineer—in—charge. **This panel shall be fed from essential power supply panel (DG Set) according to suggestion of Bihar Fire and Emergency Service Station, Bihar.**
- ii) Suitable rating Out going MCCBs &starters, relays, Contactors of required rating, digital type ammeter, CTs, push buttons, LED type indicating lamps and control components shall be provided on each compartment of the pump control panel for the following pump
 - (a) Main Fire pump - 1no. (for wet riser)
 - (b) Main Fire pump - 1 no. (for sprinkler)
 - (c) DG operate Fire Pump (for wet riser) – 1 No.

- (d) Jockey pump (for ring main/wet riser system)-1 No.
 - (e) Jockey pump (for Sprinkler system)-1 No.
 - (f) Terrace Pump- 2nos. for each buildings.
 - (g) Dewatering pump- 2 No.
- iii) All MCCBs shall be provided with Rotary handle on the front door.
 - iv) The breaking capacity of MCCB for all types of panel boards except DBs shall be as per CPWD General Specifications for Electrical Works Part-IV (Substations)-2013 and specification provide in Component- substation. The rated service breaking capacity should be equal to rated ultimate breaking capacities ($I_{cs}=I_{cu}$). Where I_{cs} is service breaking capacity and I_{cu} is ultimate breaking capacity. MCCBs above 250A shall be provided with microprocessor release with suitable fault level with adjustable O/L, S/C, protection and upto 250A with Thermal Magnetic release of suitable fault level having adjustable settings for O/L and S/C.
 - v) Detachable Gland Plates made of 3 mm thick CRCA sheet, complete with required number and sizes of knock out shall be provided at top & bottom of the panel board for incoming and outgoing cables as required.
 - vi) The panels shall be manufactured with separate bus bar chamber isolated from unit feeder chambers and cable alleys. The height of the panel shall be as per the drawing but not more than 2300 mm and operating levers, handle etc. of highest unit shall not be more than 1.7 meters. shall be prepared by agency and got approved from the Engineer-in-charge before fabrication is taken up.
 - vii) The bus bars shall be of four strip Aluminium with a current density of 130A/sq.cm. The busbars will be insulated with heat shrinkable sleeves and properly supported. All live parts shall be shrouded by means of acrylic / steel / FRP sheets to ensure no accidental contact with live parts during maintenance and provide simultaneous inspection. The busbars will be adequately insulated and protected to prevent accidental contact during operation and maintenance.
 - viii) Internal Wiring of the panel shall be with Cross- Linked HRFR copper conductor 1100- Volt grade with ISI marked stranded cables of approved make.
 - ix) 2 Nos. 20x3 mm copper strip for LT panel up to 400 Amp. capacity or 2 Nos. 20x5 mm copper strip for LT panel of higher capacity shall be fixed all around the panel connected to 2 Nos. earth bus copper strips connected to incoming earth conductors.
 - x) Earthing terminals shall be fitted to each enclosure, suitable for internal and external connection to enable the exposed conductive parts of the protective conductor.
 - xi) Cable terminals shall be suitable for the number, size and type of cables as indicated. Adequate spacing shall be allowed for spreading of cable tails to avoid stress on the insulation or terminals; if necessary, extension boxes shall be fitted to standard enclosures. Terminals for neutral conductors for three phase and neutral circuits shall be the same size as for phase conductor, except where reduced section neutral cable cores are indicated.
 - xii) All the Motor control panel components should be as per the OEM recommended type 2 co-ordination chart.

Control System:

- i) The System shall be designed for operation automatically so that as and when water is drawn from the system through any hydrant/sprinkler/water curtain, the pumps will operate automatically and feed water into the system. However, once a Fire Pump start working, it will be stopped only manually (except jockey pump) or on account of any fault or non-availability of power supply to electrical pumps or low water level inUG/Terrace tank.
- ii) Facility shall also be provided for manual operation. A selector switch for auto/manual selection shall be provided in each pump. The Control system shall be designed to provide the following sequence of operation:
 - a) The Pressurization Pump shall maintain pressure in the system and shall operate only on account of slow pressure loss. In case of the sudden pressure loss the Pressurization Pump shall not operate. The pump shall start when the water pressure in the system falls to a pre-set value (about 0.35 kg/cm² below normal system pressure) and shut down when the system pressure reaches the set value. Both limits shall be adjustable.
 - b) Main Electric Fire Pump shall operate on account of sudden pressure loss. So long as Main Electric Fire Pump is working, other Fire Pumps will not operate. The pump shall start when the water pressure falls to a pre-set value in the system (about 1 kg/cm²)
 - c) The Diesel Fire Pump will start on sudden pressure loss, only in case supply to Main Electric Fire Pump is not available or within a pre-set time the Main Electric Fire Pump fails to start or fail during operation. No other pump will be working when Diesel Engine Fire Pump is in operation. Audio-Visual Alarm shall be available to indicate failure of Main Electric Fire Pump.
 - d) A three attempts starting facility will be provided for diesel pump.
 - e) If within a pre-set time, the standby pump also fails to start or fails to develop pressure, the stand by pump shall also be shut down and locked out. An audio-visual alarm indication shall be given at the control panel.
- iii) The terrace pumps will start on sudden loss of pressure only when both the fire pumps have either failed to start or exhausted water.
- iv) Hydrant and sprinkler fire pumps shall operate independently according to the demand of their respective systems. The main electric hydrant pump and main electric sprinkler pump may operate simultaneously when both systems demand flow/pressure. Operation of one fire pump shall not inhibit the required operation of another fire pump. Jockey pumps shall maintain normal system pressure and shall start/stop automatically within the approved pressure band. Main fire pumps, once automatically started on genuine fire demand, shall continue to run until manually stopped from the designated fire-pump control location, subject to the approved fire strategy and statutory requirements. The diesel-engine standby fire pump shall start automatically upon failure/non-start of the designated electric fire pump or loss of its electrical supply, as per the approved cause-and-effect matrix. Low-water conditions shall generate alarm/annunciation;

automatic shut down/interlocking of life-safety fire pumps shall only be as specifically permitted by the approved statutory fire scheme and OEM safety requirements.

- v) Water level in UG and terrace tanks shall be monitored and in case of low water level, pumps connected with the tank shall not operate (even on manual mode) or stop operation as the case may be. An audio-visual alarm shall be given at the control panel.
- vi) The System Controller shall be designed to operate the fire pumps with interlocking and fault indication as brought out above. Annunciation window provided in the panel shall indicate following faults:
 - a. Low water level in UG Tank
 - b. Low water level in Terrace Tank
 - c. Main Pump failed to start
 - d. Main pump failed during operation
 - e. Diesel Pump failed to start
 - f. Diesel Pump failed during operation
 - g. Supply to main pump failed
 - h. Supply to pressurization pump failed
 - i. Sprinkler Pump failed to start
 - j. Sprinkler Pump failed during operation
- vii) Deluge Valve triggered by a detection device, at which point the valve opens to release the extinguishing agent.
- viii) Suitable sensors, differential pressure switches, monitors etc. shall be provided at respective location. The control system shall be operational on 24 Volt DC batteries. Engine starting Battery chargers shall be provided to ensure that the batteries remain charged all the time. Batteries shall be sealed maintenance free type.

2.34 Terrace Pump Control Panel (Power to be fed from essential Panel Board):

- i) The panel shall be cubicle type totally enclosed, fully compartmentalized with IP 42 degree of protection class and fabricated from CPRI approved manufacturer with 2 mm thick CRC A sheet powder coated with 7 tank process and shall be equipped with suitable rating of 4 pole MCCBs as incomer, Bus bars, digital type Multifunction meter with suitable CTs to measure parameters like current, voltage, frequency, wattage, power factor, KWH, KVA, etc. as per drawing approved by Engineer-in-charge.
- ii) Suitable rating Out going MCCBs & starters, relays, Contactors of required rating, digital type ammeter, CTs, push buttons, LED type indicating lamps and control components shall be provided on each compartment of the pump control panel for the following pump
 - (a) Pump - 2 nos. (1 no. working + 1 standby).
 - (b) Flushing pump for solar panel flushing.
- iii) All MCCBs shall be provided with Rotary handle on the front door.

- iv) The breaking capacity of MCCB for all types of panel boards except DBs shall be as per CPWD General Specifications for Electrical Works Part-IV (Substations)-2013 and specification provide in package-Substation. The rated service breaking capacity should be equal to rated ultimate breaking capacities ($I_{cs}=I_{cu}$). Where I_{cs} is service breaking capacity and I_{cu} is ultimate breaking capacity. MCCBs above 250A shall be provided with microprocessor release with suitable fault level with adjustable O/L, S/C, protection and upto 250A with Thermal Magnetic release of suitable fault level having adjustable settings for O/L and S/C.
- v) Detachable Gland Plates made of 3 mm thick CRCA sheet, complete with required number and sizes of knock out shall be provided at top & bottom of the panel board for incoming and outgoing cable as required.
- vi) The panels shall be manufactured with separate busbar chamber isolated from unit feeder chambers and cable alleys. The height of the panel shall be as per the drawing but not more than 2300 mm and operating levers, handle etc. of highest unit shall not be more than 1.7 meters. Depth of the panel shall not be less than 300mm and width of the panel will be given in the particulars of panel specifications or as per actual site conditions. Shop drawings shall be prepared by agency and got approved from the Engineer-in-charge before fabrication is taken up.
- vii) The bus bars shall be of four strip Aluminium with a current density of 130A/sq.cm. The busbars will be insulated with heat shrinkable sleeves and properly supported. All live parts shall be shrouded by means of acrylic / steel / FRP sheets to ensure no accidental contact with live parts during maintenance and provide simultaneous inspection. The busbars will be adequately insulated and protected to prevent accidental contact during operation and maintenance.
- viii) Internal Wiring of the panel shall be with PVC insulated Cross- Linked HRFRC copper conductor 1100-volt grade with ISI marked stranded cables of approved make.
- ix) 2 Nos. 20x3 mm copper strip for LT panel up to 400 Amp. capacity or 2 Nos. 20x5 mm copper strip for LT panel of higher capacity shall be fixed all around the panel connected to 2 Nos. earth bus copper strips connected to incoming earth conductors.
- x) Earthing terminals shall be fitted to each enclosure, suitable for internal and external connection to enable the exposed conductive parts of the protective conductor.
- xi) Cable terminals shall be suitable for the number, size and type of cables as indicated. Adequate spacing shall be allowed for spreading of cable tails to avoid stress on the insulation or terminals; if necessary, extension boxes shall be fitted to standard enclosures. Terminals for neutral conductors for three phase and neutral circuits shall be the same size as for phase conductor, except where reduced section neutral cable cores are indicated.
- xii) All the Motor control panel components should be as per the OEM recommended type 2 co-ordination chart.

Control System:

- i) The System shall be designed for operation automatically so that as and when water is drawn from the system through any hydrant/First Aid Hose reel, the pumps will operate automatically and feed water into the system in case of down comer system.
- ii) Facility shall also be provided for manual operation. A selector switch for auto/manual selection shall be provided in each pump.
- iii) The terrace pumps will start on sudden loss of pressure only when both the fire pumps have either failed to start or exhausted water where wet riser cum down comer system provided.
- iv) Hydrant and sprinkler fire pumps shall operate independently according to the demand of their respective systems. The main electric hydrant pump and main electric sprinkler pump may operate simultaneously when both systems demand flow/pressure. Operation of one fire pump shall not inhibit the required operation of another fire pump. Jockey pumps shall maintain normal system pressure and shall start/stop automatically within the approved pressure band. Main fire pumps, once automatically started on genuine fire demand, shall continue to run until manually stopped from the designated fire-pump control location, subject to the approved fire strategy and statutory requirements. The diesel-engine standby fire pump shall start automatically upon failure/non-start of the designated electric fire pump or loss of its electrical supply, as per the approved cause-and-effect matrix. Low-water conditions shall generate alarm/annunciation; automatic shut down/interlocking of life-safety fire pumps shall only be as specifically permitted by the approved statutory fire scheme and OEM safety requirements.
- v) A push button shall be provided at the entrance of building to stop terrace pump manually.
- vi) Water level in terrace tanks shall be monitored and in case of low water level, pumps connected with the tank shall not operate (even non manual mode) or stop operation as the case may be. An audio-visual alarm shall be given at the control panel.
- vii) The System Controller shall be designed to operate the fire pumps with interlocking and fault indication as brought out above. Annunciation window provided in the panel shall indicate following faults:
 - a. Low water level in Terrace Tank
 - b. Supply to pressurization pump failed
- viii) Suitable sensors, differential pressure switches, monitors etc. shall be provided at respective location. The control system shall be operational on 24 Volt DC batteries. For engine starting Battery chargers shall be provided to ensure that the batteries remain charged all the time. Batteries shall be sealed maintenance free type.

2.35 Orifice plate:

Orifice plates shall be of 6mm. thick stainless steel with orifice of required size in between flange and landing valve of external/internal hydrant to reduce pressure to working pressure of 3.5kg/cm² complete as required.

2.36 Installation Control valve:

Control Valve shall consists of cast iron body and brass/bronze working parts comprising of water motor alarm, bronze seat clapper, and clapper arm, hydraulically driven mechanical gong bell to sound continuous alarm when the wet riser, sprinkler system activates, pressure gauge, emergency releases, strainer, pressure switch, check valve complete with drain valve and bypass, test control box, ball valves, M S pipe of required size, flanges, orifice plate, gasket etc. of size 150 mm dia. complete as required.

2.37 Pressure Switch:

The pressure switches shall be employed for starting and shutting down operation of pumps automatically. The Pressure switch shall be diaphragm type; it shall be suitable for line pressures up to 15 kg/cm². The switch shall be suitable for consistent and repeated operations without change in values. The enclosure shall be of aluminum and pressure element and wetted parts shall be of stainless steel.

2.38 The area to be protected by sprinkler is divided into various zones. For detecting operation of sprinkler in a zone, flow switches are provided which are wired to an annunciation panel installed in the Fire Control Room. In the event of operation of sprinkler(s) in an affected area. The annunciation panel will give audio-visual alarm and indicate the affected zone. This arrangement will be independent of fire alarm system.

2.39 Flow switch:

Flow switch shall have a paddle made of flexible material of the width to fit within the pipe bore. The terminal box shall be mounted over the paddle/pipe through a connecting socket. The switch shall be potential-free in either N.O. or N.C. operation of a single sprinkler head. The terminal box shall have connections for wiring to the Annunciation Panel. The seat shall be of stainless steel. The flow switch shall have IP55 protection. It should operate even with the flow of one sprinkler bursting.

2.40 Sprinkler Head:

Sprinkler Head pendant / Upright or side wall shall be rated at 680 centigrade (minimum) with quartzoid bulb 15 mm dia. Complete with brackets, twin plate sliding rosette as per specification complete.

2.41 Flexible drops of stainless-steel metallic pipe:

Flexi drops shall be UL listed 25 mm dia. Stainless steel metallic pipe of length 1000 mm to 1500 mm (as per the requirement of site condition) long with accessories as required (Wherever required).

2.42 Pipe Sizing and Design: - Sprinkler heads shall be connected with pipe lines permanently charged with water. Depending upon location of sprinkler heads and site conditions, sprinkler heads may be connected with range and distribution pipes. The pipes connecting the sprinkler heads are to be sized depending upon number of sprinkler heads and arrangement of their connection. Various pipes connecting the sprinkler heads are termed as below:

- (a) Range Pipe
- (b) Distribution Pipe
- (c) Main Distribution Pipe
- (d) Riser.

2.43 Sizes of pipes are to be calculated from various tables and hydraulic calculations given in IS: 15105.

2.44.1 The distribution pipe and range pipe in the sprinkler system shall be laid as per the relevant IS code and CPWD Specification Part V (Wet Riser & Sprinkler system) 2020 as amended and corrected upto date.

2.44.2 The provision of sleeves in the beams shall be kept for running the distribution range pipe if required.

TABLE-A

**RANGE PIPE NOMINAL SIZES FOR VARIOUS PIPE LAYOUTS
IN MODERATE/ORDINARY HAZARD INSTALLATIONS**

	Range Pipe Layout	Pipe Nominal Bore (mm)	Maximum Number of Sprinklers to be fed by Pipe of size listed
A	(1) Range(s) at remote end of each distribution pipe spur in end feed layout:		
	(i) Last two ranges in two end-side layout	25	1
		32	2
	(ii) Last three ranges in three end-side layout	25	2
		32	3
	(2) Last range in all other layout	25	2
		32	3
		40	4
B	All other ranges in case of 1(i), 1(ii) & (2) above	25	3
		32	4
		40	6

TABLE-B

**DISTRIBUTION PIPE NOMINAL SIZE
IN MODERATE/ORDINARY HAZARD INSTALLATIONS AND
MAXIMUM NUMBER OF SPRINKLERS**

Distribution pipes Pipe Layout	Type of Layout	Distribution Pipe Nominal (mm)	Maximum Number of Sprinklers to be fed by Pipe of size listed
(a) At extremities of the installation	Two end side layouts	32	2
		40	4
		50	8
		65	16
(b) Last three ranges	All other layouts	32	3
		40	6
		50	9
		65	18
Between design points and the Installation Control Valve	All	To be calculated as per 10.4.4 (b) of IS 15105	

2.45 Components of Sprinkler System: -The following types of valves are used in the installations:

- (a) Stop Valves**
- (b) Test Valves
- (c) Drain Valves
- (d) Flushing Valves
- (e) Check Valves
- (f) Installation Control Valves
- (g) Pre action valves
- (h) Subsidiary valves

The location of the above valves shall be as under:

2.45.1 Test Valve: - For testing the hydraulic alarm or electric alarm by drawing water from the down stream side, the test valve shall be connected downstream of the water flow alarm.

2.45.2 Drain Valve: - For drainage of the system, a drain valve 50 mm diameter shall be provided downstream of the Installation Control Valve or any subsidiary stop valve. A common valve can perform the functions of test and drain. The outlet shall be connected with a 50 mm diameter G.I. drain pipe along with riser pipes.

2.45.3 Flushing Valve: - If the water used for sprinkler is not potable, flushing valves shall be provided at the end of a distribution pipe. The valve size shall be the same as the distribution pipe. Valve outlet shall be fitted with a brass plug and extended to not more than 3 m above floor.

2.45.4 Check Valve: -A Check valve shall be provided where more than one water supply is available, and the same shall be fitted on each water supply pipe.

2.45.5 Subsidiary Stop Valve: -A subsidiary stop valve, which shall be of the same diameter as the pipeline in which they are fitted, shall be provided to control water supply to sprinklers of highly sensitive areas like computer rooms.

2.45.6 Installation Control Valve (ICV): - A sprinkler installation shall be fitted with a suitable Installation Control Valve to control the water supply to the installation. The valve set shall comprise of:

- (a) a main stop valve.
- (b) an alarm valve.
- (c) a water motor alarm.

The alarm valve shall be fitted immediately downstream of the main stop valve of each building/block and before any connection is taken off to supply any part of the installation.

The Installation Control Valve shall be placed externally in the vicinity of the main entrance of the building protected at an easily accessible place so that the alarm bell sound is heard by the inhabitants/passers-by. The valve shall be secured open by a pad locked or rivetted strap and protected against impact damage.

If there are genuine constraints in locating the Installation Control Valve outside the buildings, this may be located inside the building in the vicinity of main entrance (subject to approval of authorities concerned). Installation Control Valve in such cases, shall be located away from any exposure to damage and personnel shall be normally

available in the vicinity of the location to get alerted by alarm operation. Also, electrically operated sirens interfaced with the opening of the alarm valve of ICV, shall be provided outside the building. In no case, Installation Control Valve shall be provided inside basement or inside pump room.

A plan of the risk with the position of Installation Control Valve shall be placed in a conspicuous location. A location plate shall be fixed near the Installation Control Valve bearing the following words in raised letters:

2.46 SPRINKLER ALARM VALVE: -

Water motor alarm: Water motor alarm shall be provided very close to the alarm valve. Strainer shall be fitted between the alarm valve and the motor nozzle connection. The water outlet shall be positioned so that any flow of water can be seen. The alarm device shall provide audibility level of 85 dB above the back ground noise level.

2.47 Pressure Gauges: -

Pressure gauges shall be provided immediately after and below each fire alarm valve.

2.48 SPRINKLER ANNUNCIATION PANEL AND ALARM: -

Electrically operated alarm shall be provided for indication of operation of the sprinkler in an area. Water flow switches shall be installed in main distribution pipes which shall be wired to the sprinkler annunciation panel. In the event of operation of a sprinkler, the flow switch will operate and give a signal to the annunciation panel to indicate the operation of the sprinkler in the area. This will initiate an electrically operated alarm. The system shall be independent of the fire alarm system and compatible with BMS. Necessary potential-free contacts for use in BMS should be provided.

2.49 Spare Sprinklers to be kept in Stock: -

A stock of spare sprinklers shall be maintained in the premises so that prompt replacement is possible after the operation/damage of sprinkler heads. The spares shall be kept in an easily accessible location under conditions where the temperature does not exceed 38°C. In respect of stocking spare sprinkler heads, the guidelines of CPWD specification shall be followed. Spanners or wrenches for the sprinklers shall also be kept along with the spare sprinklers in readiness.

2.50 Test assembly: -

Test assembly complete with test valve, sight glass sectional drain valve, union; necessary piping, threading, jointing & with corrosion resistant orifice all complete shall be provided as per drawing.

2.51 Testing: As per CPWD specifications as amended upto date.

2.52 Portable Fire Extinguishers:

Type of Portable Fire Extinguisher to be used: -

2.52.1 CO2 type Fire extinguisher IS: 15683-2006-4.5Kg.

2.52.2 ABC Dry Powder fire extinguisher IS: 15683-2006-6 Kg & 9 kg capacity.

2.52.3 Details of minimum numbers Portable Fire Extinguisher to be installed at different blocks/ bldgs:

Sl. No.	Name of Building/ Block	Nos. of floor	Each floor*			Each Block/ Bldg.*		
			Dry Powder type		CO2 type	Dry Powder type		CO2 type
			6 Kg	9 Kg	4.5 kg	6 Kg	9 Kg	4.5 kg
a.	Grade B & C	B+S+14	2	-	2	30	0	30
b.	GRADE D & E	B+S+10	2	-	2	22	0	22
c.	Community centre	G+3	10	-	10	30	0	30
d.	RD BUNGLOW	B+G+1	2	-	2	4	0	4
e.	BASEMENT	B	30	-	30	30	0	30
F.	Sub-station building i/c HT, LT, DG Set etc	1	-	6	6	6	4	6
G.	Fire Pump Room	1	-	1	-	1	-	1
H.	Water pump Room	1	1	-	1	1	-	1
I.	Water Filtration room	1	1	-	1	1	-	1

* Quantities mentioned above is tentative and may be varied according to design and as per requirement at site.

2.53 Specification for Fire Extinguishers:

Sl. No.	Type of Extinguisher	Capacity	Specification	Accessories
1.	CO2 type	4.5 Kg	Conforming to IS: 15683.	Complete with delivery hose horn, wheel type release valve, locking arrangement, operation manual and bracket. Operating Temperature: - 30°C to +60°C.
2.	Powder Fire Extinguisher (Gas Cartridge)	06 Kg & 09 Kg.	ISI marked conforming to IS: 15683:2006 IS 4308 marked ABC powder IS 4947 ISI marked Gas Cartridge.	Complete with squeeze grip release valve, discharge pipe, locking arrangement, operation manual and bracket. Operating Temperature: -30°C to + 60°C.
3.	Clean Agent (Stored Pressure) Ceiling mounted.	4 Kg	ISI marked IS: 15683	The extinguisher filled with HFC 236FA Clean Agent Gas. Complete with squeeze grip release valve, locking arrangement, pressure gauge, operation manual and bracket. Complete in all respect. Operating Temperature: -30°C to + 60°C

2.54 Fire bucket with stand:

4Nos. as per IS2546 shall be installed at following places: -

- i) Sub-station Rooms.
- ii) LT Panel room, HT meter room, DG Set Room.

2.55 Highly Electric resistant insulated mat:

Insulated mat, 1 meter wide and 2 mm thick rated for 3.3 KV capacity one side having anti skid as per IS:15652/2006 (ISI marked) etc. as per specification complete as required.

2.55.1 Danger Plate – As per CPWD Specification.

2.55.2 Safety instruction chart in word duly framed and laminated (size not less than 1.20 sq.m).

2.55.3 First Aid Box as approved by St. John Ambulance Brigade/ Indian Red Cross conforming to IS 2217: 1963.

2.56 Power Cable: -

2.56.1 All the incoming cables to Fire-fighting control panel & outgoing cables to equipment's shall be in the scope of work.

- i) The Power cable shall be **Cross- linked XLPE insulated armored aluminum conductor cable of 1.1 KV grade**. Power cable shall be of 2 core for single phase, 4 core for size upto and including 25 sqmm and 3½ core for size higher than 25 sqmm for 3 phase.
- ii) The Power cable size shall be selected to meet the load of starting and running current of the equipment and shall be as approved by the engineer-in-charge.
- iii) Cable shall be installed on approved perforated GI cable tray in pump room.

2.57 Earthing: -

2.57.1 Metallic body of all the equipments shall be connected by two separate earth conductors by two nos. 6mm dia. Copper wire from the earth station of the installation confirming CPWD specifications for Electrical works (Part-I), Internal 2023 as amended and corrected up to date. For details of earthing please refer **Component-IEI** of this bid. Armoring of cables shall be connected to equipments and panel at both the ends.

SH: C-3

3.Addressable Fire alarm system & Public Address System

- 3.1** The Work shall be carried out as per CPWD General Specifications for Fire Detection and Alarm System (Part-VI) 2018 as amended and corrected up to date, CPWD General Specifications of Electrical Works Part-I 2023 corrected up to date, Part-II (External) 2023 as amended and corrected up to date, relevant Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026, IS standard, NFPA-72, SP 7:2026 (NBCS 2026) amended up to date and complete as required as per site and local by-laws.
- 3.2** The Scope of work shall consist of Planning designing as enclosed drawing, supplying, installation, testing & commissioning of addressable fire detection & alarm system & public addressable system. The work shall also include getting the drawings approval from local fire authority, if require. The scope of work also includes to enable the consultant for obtaining fire NOC and arrange inspection/ testing of the scheme as required for this purpose. It also includes to rectify the defects or comply the observations if any given by CFO till the approval received from the CFO. System provided in following building and as per marked drawing attached with bid documents. For tender and eligibility purposes, the complete Public Address / emergency voice evacuation system described under this Component is deemed included within the C-3 ECPT and the EPC lump-sum scope; no separate extra payment shall be admissible for the PA system.

Sl. No.	Name of Building/ Block	Detectors to be provided in this Area
1	GRADE D & E	Entire Area
2	GRADE B & C	Entire Area
3	Community centre	Entire Area
4	Basement parking	Entire Area
5	Electrical rooms	Entire Area

- 3.3** Power supply to fire detection and public address system equipment's shall be given through fire survival cables as mentioned in Component- IEI. All major components of the fire alarm system shall be products of a single manufacturer as per the list of approved makes and shall conform to the requirements of EN 54/VDS/UL approved and be designed according to Fire Alarm Systems CODE OF PRACTICE FOR SYSTEM DESIGN, INSTALLATION AND SERVICING.

Scope of work shall include FAS and PAS for Grade B & C residential buildings, Grade D & E residential building, Grade F residence, RD Bungalow, Community Centre and Basement comprising of following:

Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall

be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.

- (i) Supplying, Installation, Testing and Commissioning of, PA system, FFT, MCP, Hooter etc.as per CPWD specifications.
- (ii) Providing suitable compatibility in the Main Fire Alarm Control Panel for hard wire Integration of Public Address System (PA system should not be in built in Fire alarm panel).
- (iii) Providing Public Address System with Audio Amplifiers, speakers & required wiring. The system shall be used for public announcements, evacuation, playing music building-wise as a whole and floor-wise independently. The system shall also be capable to use as car call system (for cars parked in Basement and stilt/common parking areas).
- (iv) BackgroundMusicSystem.
- (v) There will be a public-address system for use from building Control Rooms/Reception lobby at Ground Floor to address the Basement and other specific common areas as per approved drawings.
- (vi) Electrical works, including Cabling, Earthing etc.for the installation.
- (vii) TherequiredPCandprintersformonitoringthesystem.
- (viii) Integration of FAS with Smoke Ventilation & pressurization fans, Lifts, sprinkler monitoring panel, HVAC in Community Centre rooms, water levels of Fire water tanks and as required.
- (ix) Emergency assist pullkits required for all washrooms.
- (x) Addressable fire alarm system should be networked with all residential buildings/blocks in a networked master-slave architecture.
- (xi) Gettingnecessaryapprovalfromlocalfireofficerafter completion of work.
- (xii) Anyotheritemrequiredtomakefirealarmandpublicaddresssystemasper approved plan/ scheme functional, but is not specifically mentioned in this scope.

3.4 Detail system requirements:

The work shall be carried out as per CPWD specification for Fire Alarm and Public Address System. Detectors, manual call points, spot indicators and PA system shall be installed at locations as per the requirements of the local fire authority, SP 7:2026 (NBCS 2026) and CPWD specifications, as required. The type of detector to be installed shall be decided as per the utility and as per the direction of the Engineer-in-Charge, based on the requirements of the local fire authority, SP 7:2026 (NBCS 2026) and CPWD specifications. Electrical rooms shall be provided with heat and smoke multi-detectors.

- (i) The FAS shall be integrated to the following Mechanical, Electrical & Low Voltage Services for required at site functioning as required.

- a. Air Conditioning-VRFSystem
 - b. Ventilation and/or Pressurization System
 - c. Public address system/Voice Evacuation System
 - d. Lifts
 - e. Fire-fighting system
 - f. Gas based flooding system in Sub Station & LT Panels
 - g. Any other service as per the directions of the Engineer-in-charge or RBI authorized persons and.
- (ii) In the event of a fire alarm, but not in a fault condition, in addition to other activities described in the CPWD Specifications, all lifts initiated through the system shall automatically be returned to Main landing or Ground Floor.
 - (iii) FAS shall have an emergency voice alarm & communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported.
 - (iv) Gas leak detectors should be provided to each apartment.
 - ~~(v)~~ Microprocessor based modular intelligent manual fire alarm control panels shall be compatible with detectors used for connecting and monitoring the fire detectors and other devices. The panel shall have redundancy by providing additional CPU so that in case of failure of one CPU other takes over and system remain fully functional. The system shall feature hot-swappable loop cards with fault indication LEDs on each loop card, dedicated sounder circuit card upgradable up to 6 output ports

3.5 Description of items/ Particular Technical Specifications:

- (i) Intelligent Detectors: As per CPWD specification.
- (ii) Manual Call Points (Resetting Type): As per CPWD specification.
- (iii) Main Fire Alarm Control Panel compatible with detectors: As per CPWD specification.
- (iv) Low/High Intensity Hooters activated from the Panel: As per CPWD specification.
- (v) Fire Fighter's talk back system in each staircase.

3.6 The different component of fire alarm system shall be capable of functioning as per details below:

3.6.1 Detailed Description of The System and Components of Fire Alarm Control Panel (FACP)

Main control and indicating panel (C & I Panel) & Public Address System:

Sr.No.	Minimum Specification
1	A large interactive 7-inch LED touch screen capable of accessing the comprehensive range of programming and operating functions of the FACP through its touch screen.
2	The panel must have a minimum of 144 inbuilt Fire Zone LED indicators.
3	Each loop shall support a maximum of 324 Addressable Intelligent devices per loop, with a maximum loop length of 2 km of 2core 1.5mm ² screened fire resistant cable.
4	An event log showing at least the 10,000 events. (Each Fire, Fault, Cause & Effect and Panel Operation)
5	The control panel shall provide a minimum 2 sounder circuits operating at 24V dc with a maximum capacity of 500mA per circuit.
6	The Fire Alarm Control Panel shall have Cyber Security Features.
7	Loop Card shall have separate LED indication for communication failures and errors in loop cards.
8	A CAN/IP based computer communication option shall be available.
9	Simple menu driven functions with passcode protection shall allow users to access extensive range of software-based features.
10	An inbuilt 40-character thermal printer operating through a window. There shall also be option to enable the printer when the door is closed.
11	The control panel shall provide a minimum 2 sounder circuits operating at 24V dc with a maximum capacity of 500mA per circuit.
12	The system shall provide a secure networking facility to indicate a remote zone number and remote zone text across the network.
13	The Fire Alarm Control Panel must have inbuilt Surge Protector Card to protect from sudden surge.
14	This shall transmit to its repeater panel if any, signal of alarm of fault and of fire.
15	The system shall include an Integral sealed lead acid battery and charger, with the ability to provide a minimum of 24 hour back up in normal operation and half an hour full alarm load in the event of supply mains failure.

(i) All the sectors/zones connected to this panel shall be continuously monitored.

- (ii) Audio-visual alarm shall be provided in this panel to show the ZONE affected by fault in its wiring system or by fire. Such an alarm should be separate for fault and fire conditions.
- (iii) This shall be complete with necessary circuitry for providing power supply to the entire FAS/AFAS drawing power from the mains/standby battery.
- (iv) This shall transmit to its repeater panel if any, signal of alarm of fault and of fire.
- (v) This shall be so designed that the audio alarm activation and silencing shall be as indicated in Section-5 (Part-A). SECTION - 4 CONTROL AND INDICATING PANELS & PA SYSTEM 19 FIRE DETECTION AND ALARM SYSTEM-2018
- (vi) Public Address System shall be provided to enable transmission of announcements and instructions to the occupants in each zone in the event of a fire.
- (vii) The power rating and frequency response shall be as per the requirements of the individual installation.

Sector/zonal Panel:

- (i) A sector panel shall be provided where there is more than one zone in a floor under the control of a C&I panel, and zonal panel is not required in that floor. A zonal panel shall be provided where there is only one zone in that floor.
- (ii) The sector/Zonal panel shall provide visual indication of the ZONE where a fault or fire has occurred. (See also 4.4.3) Audio alarm in this panel shall be provided, where specified in tender specifications.
- (iii) This panels shall transmit to the C&I panel, alarm signals from any of the trigger devices and the wiring connected to it.

(iv) **Repeater panel:**

Sr.No.	Minimum Specification
1	All indications, both visual and audio as shown on the C&I panel shall be indicated in repeater panel, where provided.
2	The power supply to operate the repeater panel shall be drawn from the C&I panel.

3	The Repeater Panel shall have 7-inch interactive multi-touch color display with a clear and intuitive interface for monitoring fire, fault and disablement status.
4	Repeater panels shall be suitable for wall mounting which shall display all the parameters occurring on the fire alarm control panel. It shall connect to any of the fire panel in the network.
5	It incorporates both fire and fault relay outputs, supports up-to 10,000 historical events records and allows configuration import/export and software upgrades via USB.
6	The repeater panel shall replicate the main panel indications and shall be accessed only authorized users through password.
7	The repeater panel shall have operating of 24V voltage with IP rating of IP 30.

A repeater panel where provided shall duplicate the alarm indications (audio as well as visual) of the C&I Panel

The fire alarm panel shall operate 240V $\pm$ 10% 50Hz. The FACP shall also be provided with a dedicated standby power supply system (battery and charger) capable of maintaining the system for a period of not less than 24 hours after failure of ac power supply after which sufficient battery shall remain to provide full load operation for at least 30 minutes in line with IS 2189.

3.7 AUTOMATIC FIRE DETECTORS&DEVICES

General features common to all detectors:

- (i) The LED should be visible from a 360 deg view.
- (ii) **Maintenance:** All detectors shall be fitted either with plug-in system or bayonet type connections only, from the maintenance and compatibility point of view.
- (iii) **Construction:** The components of the detectors must not be damaged by static overvoltage.
- (iv) Fault isolators shall be provided separately as per OEM requirements.

3.7.1 Smoke, Temp, CO, Beam, Multi Criteria Detectors:

Governing Specifications:

- (i) Heat Detectors shall conform to IS-2175 - 1988 or BS-5445 (EN 54) Part 5 – 1977(VdS/LPCB approved) or NFPA72 (UL/ULC/FM approved) amended upto date.
- (ii) Smoke Detectors shall conform to IS-11360-1985 or BS 5446 Part I-1977 & Part VII – 1985 (VdS/LPCB approved) or NFPA72 (UL/ULC/FM approved) amended upto date.
- (iii) For other detectors/devices relevant IS or BS (EN 54) (VdS/LPCB approved) or NFPA 72 (UL/ULC/FM approved) amended upto date
- (iv) Detector shall have 360° visibility LED using light pipe technology.

- (v) Detector shall be capable of transmitting pre alarm and alarm signals in addition to the normal, trouble and need cleaning information.
- (vi) Detector shall be possible to program control panel activity to each level.

3.7.2 Manual Call Box:

Constructional requirements:

- (i) These shall be complete with all electronic components and circuitry for a safe addressable device. Optional Polycarbonate covers shall also be available if required. The manual call point shall have inbuilt microprocessor to ensure a response time of less than 3 seconds. The unit shall incorporate a key operation facility for testing purposes and a specially designed film fitted over the glass to prevent fragmentation when broken or it should be pull/push type or designed for use with a resettable element.
- (ii) The call box shall be of 1.5mm thick welded sheet steel or 3mm thick cast aluminium. The front face shall have a glass area designed to break by a steady application of pressure or by impact. Suitable arrangement like scratching by a diamond bit shall be incorporated in the frangible element so that when it breaks upon application of pressure by a finger, it does not hurt the finger.
- (iii) The frangible element shall keep a push button pressed inside such that in the event of breaking of the frangible element, the push button is released to actuate an alarm in the control panel. The push button shall be partly depressed so as not to hinder breaking of the frangible element.
- (iv) The call box shall have suitable knock out for termination of a 20mm conduit. This shall also have suitable provision for being fixed on surface or semi recessed in wall.
- (v) Where sheet steel is used for call box, this shall be thoroughly cleaned off dust, dirt, grease and rust if any and two coats of anti rust primer shall be given both inside and outside followed by two coat of synthetic enamel paint in signal red colour or epoxy or powder coated after seven tank process.
- (vi) In the case cast aluminium body for a call box, the surface shall be neatly finished with red colour paint as in above.
- (vii) The words 'FIRE' shall be printed on the front of the call box in face of window.
- (viii) The glass surface shall be minimum 30 sqcm in area and glass thickness shall not exceed 2 mm.

Installation requirement: -

- (i) Manual call boxes shall be installed at a height of 1400mm above the floor level.
- (ii) They shall be installed at easily accessible, well illuminated and conspicuous position, preferably in a contrasting background so that they are easily noticed from either direction. They should be semi-recessed so as to project minimum 10mm from wall surface.
- (iii) They shall be installed free from obstructions and shall not themselves obstruct exit way.

- (iv) It shall be located on escape routes at (inside or outside) each floor to escape stairs preferably near entry to staircases at various level.
- (v) It shall be located such a way that, no person in the premises needs to travel more than 30 meters to reach a manual call point to give an alarm.
- (vi) Where necessary, the travel distance may be reduced to less than 30 meters e.g. where there is difficulty in access or in potentially dangerous risk areas.

3.7.3 Response Indicators

Remote Response Indicator shall be installed outside the areas normally kept closed to identify the detectors response even if the room is locked. These indicators shall be able to indicate the status of the corresponding detectors in these areas.

3.7.4 Sounders in a FAS/AFAS shall be of the following types:

- (i) Panel sounders.
- (ii) Fire alarm sounders. These in turn comprise of low intensity and high intensity Sounders. These shall be provided as specified in the schedule of work. The sounders for fire alarm should be electronic hooters/horns/electric bell

Specification requirements:

Sounders:

- (i) Hooter shall be provided for both panel sounders and fire alarm sounders. Bell may be provided as low intensity fire alarm sounders, only where so specified.
- (ii) The frequency of sound from sounders shall lie in the 500-1000 Hz band. The sound level shall be at least 65dB(A) or 5 dB (A) above any other noise likely persists for a period longer than 30 second at any part of the building. Sounders with a level greater than 120 DB(A) shall not be provided.
- (iii) The sound shall be continuous although the frequencies and amplitude may vary and of the same characteristics from the fire alarm sounders in a building. Coded fire alarm signalling from sounders shall not be provided which may cause hearing damage.
- (iv) 'Fault alarm' and 'Fire alarm' in a panel sounder shall be distinctly different.

3.7.5 Interface Unit:

These shall be used to provide interfacing facilities triggering into the fire alarm system from 3rd party equipment and going out from the fire alarm system to other 3rd party equipment. They shall be suitable to allow 'voltage-free' connection of voltage free from (or to) other services required to be interfaced with fire alarm system, e.g. interfacing with AHU's, BMS, FM200 System, Elevators, and Pressurization Fans etc. They shall be of safe addressable type. All inputs and outputs are to provide the facility to be fully monitored for cable faults.

Installation requirements:

- (i) Low intensity fire alarm sounders may be installed on surface of ceiling, suspended from ceiling or recessed in flush with the ceiling, depending on the construction of the sounder and ceiling height.

(ii) These shall be installed at a height not lower than 2.4m except when recessed in a false ceiling of lower height. In such cases the sounders shall be recessed at false ceiling level.

(iii) When installed flush with a false ceiling these shall match the ceiling surface. Necessary provisions for frame work to accommodate the sounders shall be made in the ceiling in advance.

(iv) High intensity sounders shall be mounted on substantial supports. Provisions for terminating the electrical wiring cables shall be such as not to permit entry of rain water through the wiring conduits or cable runs.

3.7.6 Fire Fighter's Phone system: Complete in all respects shall be provided with jacks at all landings of all staircase.

Sr.No.	Minimum Specification
1	The Fire Fighting Communication System shall have real-time coordinating between the fire command and field command center and field locations during emergency.
2	The Fire Fighting Communication System shall support up to 16 lines with call conferencing, long distance & automatic fault supervision.
3	The Fire Fighting Communication System shall have keypad-driven control, event log facility and flexible line management.
4	The Fire Fighting Communication System shall have facility to integrate with BMS and public-address system.
5	The Fire Fighting Communication System shall have minimum 3.2-inch multi line LED display.
6	The Fire Fighting Communication System shall store event log up to 999 histories.
7	The Fire Fighting Communication System shall have LAN port for networking or RS 485 communication interface.
8	The contractor shall provide firefighter's telephone handsets for use with the firefighter's telephone jack stations. The telephone handsets shall be red in color and have 1.3m coiled cord.

a. Public Address/Voice Alarm System

PA System shall be provided in residential buildings, Community Centre, Basement and other site areas as required. Speakers in the Ceiling/Wall shall be provided in corridors, Lift lobbies and other common areas, in outdoor areas speakers shall be installed on GI poles as per CE/NFPA/UL/SP 7:2026 (NBCS 2026)/relevant IS codes. Box type speakers shall be provided in the entrance lobby.

(i) Horn type speaker shall be provided in the basement, outdoor and site areas.

(ii) Recessed speakers in the false ceiling areas.

- (iii) Proper zoning is to be done considering the user requirement, critical areas & floor etc. Basement/common levels serving each residential building shall be connected to the respective building fire-alarm/public-address zone.
- (iv) Control consoles shall be in each fire control room with goose-neck microphone.
- (v) System shall have the facility to make announcement on Buildings/Blocks and all outdoor areas simultaneously or on individual areas.
- (vi) Automatic as well as manual announcement system in fire affected Zones shall be provided.
- (vii) Pre-recorded standard announcement messages shall be stored in memory for auto announcement. System shall be capable to record fresh messages also for future use.
- (viii) Media player shall be provided for playing content/music etc.
- (ix) Wiring shall be done using twin twisted tinned copper wire in the heavy-duty PVC conduit.
- (x) The system shall be integrable with Fire alarm panel and with the BMS also.
- (xi) Standby amplifier shall be provided for PA System in each rack.
- (xii) Facility for Car haler system shall be provided at Basement/Ground Floor.

i. Digital Integrated System Manager/controller

Sr.No.	Minimum Specification
1	The system shall be fully Digital based.
2	The voice alarm controller is innovated with DSP (digital signal processor) to ensure its hi-fi audio performance and superior signal processing in case of commercial announcement and emergency evacuation.
3	The system Controller shall have capability to control up to 120 zones by cascaded more router.
4	The system controller shall have dual power supply inputs and power supplies.
5	The system controller shall be rack mountable (1U).
6	Each controller / Router built-in 6 / 8 zone speaker outputs, rated power output at 500W.
7	Each zone voice alarm controller shall be pre-set through the supplied software over microphone number, zone number, zone loading, speaker monitoring, fire alarm mode, ALERT/EVAC message zone output, AC/DC etc, then synchronized the setting to master controller and router.
8	The system shall have Customized alert, evacuation & business message stored at SD card.
9	The system shall have AB speaker line surveillance to avoid any speaker line failure.
10	The system shall be Support 32 units of remote paging microphone.

11	The system shall be Support external connection of fireman microphone.
12	The system shall have auto broadcasting EVAC and alert 256 voice messages to pre-set zones.
13	The system controller shall be certified for EN 54-16 and marked for CE and be compliant with the RoHS directive.

b. Power Amplifier

Sr. No.	Minimum Specification
1	The single channel pure power amplifier shall be fully compatible to connect to the system.
2	The amplifier shall adapt the maximum output power of each amplifier channel to its connected loudspeaker load, with free assignable output power per channel for a total maximum of 480 watt per amplifier, supporting 70V or 100V operation with direct drive capability and outputs that are galvanically insulated from ground.
3	The amplifier shall have 70-100V constant pressure output and 4-16 Ohms output, balanced, no grounding
4	The amplifier shall have 4 Pcs LED indicators for status display.
5	The amplifier shall have Protection for short-circuit, over heat and over load.
6	The amplifier channels shall have with limiter function, music without distortion.
7	The system shall have series amplifiers of high output is available
8	Enclosure Ingress protection: IP 30

c. Desktop Call Station

Sr. No.	Minimum Specification
1	The Remote microphone or call station of voice evacuation system shall have EN54-16 certified.
2	It shall have 12 Zones buttons with busy and working indicator.
3	The desktop call station shall accept optional call station extensions.
4	It shall provide control and routing of live speech calls, stored messages and music with volume control per zone.

5	The talk button shall have a PTT or lock type pre-set by the dip switch on the rear of microphone.
6	The microphone is 24V DC powered by the controller.
7	The remote microphone unit is fully real time monitored.
8	Line input: 350 mV, 10kOhm
9	Signal to Noise Ratio (SNR): > 70 dBA
10	Total Harmonic Distortion + Noise (THD+N) < 1 % at RMS, 1KHZ
11	Ingress protection: IP 30
12	Frequency Response: 80Hz – 16KHz

d. Box speakers

i. Ceilings peaker

- a. 6W Metal Ceiling Speaker with 6/3/1.5W taps.
- b. A flush mounting full range ceiling loud speakers suitable for both speech and music reproduction. The speaker assembly consists of a single piece, 6 W loudspeaker and frame with a 100 V matching transformer mounted on the back. BS-5839-8, EN 54-24 and EN 60849 compliant.

Parameters	Values
Max power	9 W
Rated power	6 W
Power taps @ 100V	6W / 3W / 1.5W
Sound pressure level at 6W/1W (4kHz, 1 m)	92dB/88dB
Frequency range (-10dB)	60 Hz - 15 kHz
Color	White
Rated input voltage	100 V / 70 V
Material	ABS
Connection	Plastic terminal blocks/ Push terminals
Parameters	Values

ii. Horn Loudspeaker.

15W Horn Loudspeaker with IP66 protection

A Wall Mount Horn loudspeaker High Efficiency Drivers with 23W (Max. Power) Wide Opening Angle, Excellent speech Reproduction, Simple Power Setting, Water-And Dust Protected to IP66, Versatile Mounting Bracket.

Technical Specifications are as follows:

Parameters	Values
Maximum power	23 W
Rated power	15 W (15,7.5,3.75 W)
Sound pressure level at 15 W/ 1 W (1 kHz, 1 m)	105 dB
Effective frequency range (-10 dB)	500 Hz to 3.5 kHz
Rated voltage	100 V
Color	White
Rated input voltage	100 V / 70 V

Note: The agency shall provide the following for the work related to the Integrated Building Management system.

- (i) The Manual Fire Alarm Panel shall be with inbuilt ethernet port and shall be mounted in a separate Panel having all necessary OFC infrastructure including ethernet to OFC convertor so as to connect the PLC Panel to the OFC network
- (ii) The Fire Alarm OEM shall provide access to Integrated Smart Platform Contractor of its proprietary/ open data base having all monitoring parameters as per the scope of work. Additionally in case the OEM is required to provide its own platform for web- based monitoring as per the tender terms and conditions, API too shall be made available to the Integrated Smart Platform Contractor.

ADDRESSABLE EMERGENCY LIGHTING AND EXIT SIGNAGE (NBCS 2026 REQUIREMENTS): -

The scope under SH: C-3 shall include complete supply, installation, testing and commissioning of the addressable emergency/escape lighting and illuminated exit-direction signage system for all residential blocks, RD Bungalow, Community Centre, basement, stilts and common/service areas. The system shall comply with SP 7:2026 - National Building Construction Standards 2026 (NBCS 2026), Part F - Fire and Life Safety, Clause 3.5.6, relevant Indian Standards, CPWD specifications, Fire NOC requirements and approved GFC drawings. The system shall include addressable emergency luminaires, maintained exit/directional signs, central battery/central monitoring emergency lighting panel as applicable, monitored final circuits, fire-survival cabling, control/monitoring accessories, supports, terminations, labels, testing and all incidental works required for a complete and operational life-safety installation.

- a) The addressable exit, exit access and exit-discharge systems shall remain continuously illuminated. Illumination shall cover corridors, passageways, staircases, stair landings, changes in level/direction and all fire exits forming part of the means of egress.
- b) Addressable Emergency lighting shall be supplied from a source independent of the normal lighting supply. For this project, emergency lighting/exit signage shall be fed through the dedicated emergency/central battery/central monitoring.
- c) The emergency/escape lighting system shall clearly identify escape routes, provide adequate illumination for safe movement to and through fire exits, and ensure that manual call points and firefighting equipment along the escape route are readily visible and locatable.
- d) At floor level, illumination on the centreline of an escape route shall be not less than 10 lux. For escape routes up to 2 m wide, at least 50 percent of the route width shall receive not less than 5 lux. In assembly areas such as the multipurpose hall/badminton or similar spaces, reduced illumination during performances shall in no case be less than 2 lux where permitted by NBCS 2026.
- e) The layout and circuiting shall be arranged so that failure of any single emergency lighting luminaire does not leave any required area in darkness or impair the remaining emergency lighting system.
- f) Emergency lighting shall automatically become effective within 5 seconds of failure of the normal lighting supply and shall maintain the required illumination for not less than 90 minutes.
- g) Emergency/escape luminaires shall be provided at, or within approximately 2 m horizontally of, each corridor intersection; each exit and exit door; each change in direction; each staircase so that every flight receives direct emergency light; each change in floor level; outside each final exit; each manual fire alarm call point; firefighting equipment; and locations necessary to illuminate exit and safety signs.
- h) Emergency luminaires and signs shall be positioned so that they are clearly visible and protected against accidental/mechanical damage. Escape-route luminaires/signs shall be mounted at suitable locations and, where mounted high, at not less than 2 m above floor level unless the approved design requires a lower mounting to ensure visibility.
- i) Exit passageway and staircase lighting shall also be connected to the alternative/emergency supply. Change over arrangements shall prevent simultaneous connection of normal and standby sources to the same circuit. Double-throw/automatic changeover arrangements shall be provided at the designated emergency lighting/service panel as applicable.

- j) The emergency lighting system shall be capable of routine inspection and functional testing. The central battery/emergency lighting panel shall provide circuit status, charger/battery status and fault indication/monitoring where applicable. Periodic testing and maintenance provisions shall be included to ensure continued serviceability.
- k) Exit signs shall be provided so that no point along an exit-access corridor/path is more than 30 m from a visible exit-direction sign. Directional exit signs shall be provided at every change in direction and wherever the route to the exit is not immediately apparent.
- l) Addressable Exits and routes leading to exits shall be clearly marked by continuously illuminated signs on an independent emergency circuit/alternative source. Exit signs shall be GREEN and shall comply with the graphic/symbol requirements of the relevant Indian Standards and Fire Authority requirements.
- m) Illuminated arrow signs indicating the escape route shall be provided at suitable wall/ceiling locations. Each floor/stair landing shall have a prominent floor-number identification board. Photoluminescent markings shall also be provided at internal hydrant boxes and other locations required by the Fire Authority.
- n) Emergency lighting and exit-signage wiring shall use fire-survival cable of the rating and duration specified elsewhere in Part-C for life-safety services. Cables, junction boxes, supports, terminations and circuit segregation shall maintain the required circuit integrity and fire-survival performance.
- o) The emergency lighting and exit-signage system shall be coordinated with the Fire Alarm System, public-address/voice-evacuation system, IBMS and essential power distribution for monitoring and life-safety operation. Maintained exit signs shall remain illuminated under normal as well as emergency conditions.
- p) Before procurement, the contractor shall submit emergency lighting calculations, lux-level/coverage layout, circuiting and load calculations, central battery/UPS autonomy calculations, equipment data sheets, shop drawings and coordinated BIM/GFC drawings for approval. Final testing shall include mains-failure simulation, automatic changeover time, 90-minute endurance test, lux verification, signage visibility, fault monitoring and complete functional demonstration to the Engineer-in-Charge/Fire Authority.

Approved makes for Emergency Lighting and Exit Signage: Ekavis / Eaton / AWEX / ABB, NBCS 2026 requirements and approval of the Engineer-in-Charge.

3.10.2 EXIT SIGN BOARD I/C ELECTRIC SIGNAGE: -

- i. The work shall be carried out as per CPWD General Specifications for Wet riser & Sprinkler System (Part-V) 2020 as amended up to date, CPWD General Specifications of Electrical Works Part-I 2023, Part-II (External) 2023 as amended up to date, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026.
- ii. The signboards & signages shall be of following types: -

3.10.2.1 LED Directional / Exit Signage for Central Battery System: -

The signage shall be an LED edge-lit emergency directional sign, rated at 3 W, comprising a laser-etched transparent acrylic panel with single-sided or double-sided illumination with flashing feature in exit luminaires & should be integrated with fire alarm system, complete with printed graphics, logo, directional arrow, and text as specified. The luminaire shall be designed for operation on the Central Battery System (CBS) and shall be suitable for operation on the monitored emergency lighting circuit supplied from the central

battery system. The luminaire shall be compatible with the specified central battery system output voltage and shall incorporate the necessary electronic control gear for normal and emergency operation. The luminaire shall not contain any integral battery, battery charger, or self-contained emergency conversion module. The complete control gear shall be housed in a robust powder-coated metal enclosure mounted along the top of the signage. The signage shall be suitable for continuous (maintained) operation and shall provide uniform illumination of the laser-etched graphics during both normal mains operation and emergency operation when supplied by the central battery system. The signage shall be used to indicate important locations and escape routes, including but not limited to Fire Hydrant, Staircase, Exit, Lift, Fire Lift, Refuge Area, Drinking Water, and other directional or identification signs as indicated on the approved drawings. The signage shall be suitable for wall mounting, ceiling mounting, or suspended installation and shall be supplied complete with all mounting accessories, brackets, suspension kits, interconnecting cables, and termination accessories as required. The complete unit shall be supplied, installed, tested, and commissioned, fully integrated with the Central Battery System, and shall comply with the applicable requirements of EN 60598-2-22, EN 1838, IEC 60364-5-56, and relevant project specifications, complete in all respects.

i. Ceiling Mounting Illumination

Luminous flux:	250 lm
luminous flux at the end of the rated duration (ELBF):	100%
Housing material:	PC, Aluminium
Housing Colour:	White RAL 9016
Glow wire test @:	850°C
Supply voltage:	220-240V AC, 50/60Hz // 176 - 275V DC
Power consumption incl. LED supply:	8.0VA / 3.9W
Protection class:	IP41 luminaire, IP20 Driver housing
Permissible ambient temperature:	-20°C to + 40°C
Light source:	1 x 2W High Power LED
Dimensions:	D= 80mm, W=44mm Cut-out: 64-68mm

ii. Single Sided / Double Sided Exit Signages

Viewing distance	20m
Illumination of pictogram	L white: >500 cd/m ² , ratio's and uniformity acc. to EN1838
luminous flux at the end of the rated duration (ELBF):	100%
Housing material:	PC, PMMA
Housing Colour:	Light grey RAL 7035
Glow wire test @:	850°C
Supply voltage:	220-240V AC, 50/60Hz // 176 - 275V DC

Power consumption incl. LED supply:	4.0VA / 1.9W
Protection class:	IP40
Permissible ambient temperature:	-20°C to + 40°C
Light source:	LED strip
Dimensions LED Pictogram	L = 226, H = 134, W = 13
Dimensions incl. wall mounting set	L = 226, H = 134, W = 36

Instruction and informative signage: -

- i. Fire safety instructions in Hindi, English (separate three plates) in 2 mm thick SS (Grade: 304) metal plates of size 600 mm × 400 mm with inscription at each floor near lift lobby.
- ii. DO, DON'T DO lift safety instruction in 2 mm thick SS (Grade: 304) metal plates of appropriate and approved size with inscription at each floor near lift lobby.
- iii. Electrical Safety Precaution plates in 2 mm thick SS (Grade: 304) metal plates of appropriate and approved size with inscription at each floor near lift lobby.

SH: C-4**LIFT****4. Passenger lifts, Goods cum Passenger lift:**

- 4.1 The work shall be carried out as per CPWD General Specifications for Electrical Works Part-I (Internal) 2023 as amended and corrected up to date, Part-II (External) 2023 as amended and corrected up to date, Part-III (Lifts & Escalators)-2003 as amended and corrected up to date, and Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026.
- 4.2 The Scope of work includes drawings, designs, fabrications, testing, inspection as may be necessary before dispatch, dispatch, delivery at the site, installation, testing, commissioning, inspections from the competent authority and handing over to the client in fully working condition **and carrying out a comprehensive maintenance contract as mentioned in Component No.15 (Maintenance Contract Component).**
- 4.3 The Contract or shall enable the consultant to obtain NOC for the erection of the lift before commencement of work and a license for operation of lifts on its completion from the Lift Inspector, Patna, Bihar or any appropriate authority appointed by the Govt in this regard. The work shall be deemed to be completed only after receiving NOC from the Authority mentioned above. Statutory fee if any shall be paid by the contractor. Enabling all liaising work, arranging inspection of the local body shall be within the scope of the contractor.
- 4.4** The work will be executed as per the general arrangement drawing and detailed fabrication drawings as submitted by OEM, duly approved by the Engineer-in-charge. The equipment will be ordered only after approval of drawings from the Engineer in Charge. Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.
- 4.5 Equipment will be inspected at the manufacturer's premises (within India) before dispatch to the site. The Engineer-in-Charge or his authorized representative may witness such inspection. The contractor shall give sufficient advance notice regarding the date of inspection to the department. The cost of the representative's visit to the factory will be borne by the department.
- 4.6 Lift shafts, Machine room wiring and power distribution, power supply cable shall be done as per CPWD General Specifications for Electrical Works Part -I (Internal) 2023 and local body requirements it shall be provided under Component – I of the tender.

- 4.7 Earthing and loop earthing as per CPWD General Specifications for Electrical Works Part-I Internal 2023 and Lifts & E
- 4.8 escalators-2003 as amended and corrected up to date and provided under Component – I of the tender.
- 4.9 All the lifts shall be procured from one manufacturer only.**
- 4.10 All the lifts shall be:
- i) Regenerative Elevators
 - ii) Gearless traction Elevators
 - iii) Machine-room traction Elevators.
 - iv) Lift panel must be compatible with integrated B.M.S. The control system supports standard protocols used in building technology, including BACnet, OPC server/client, Modbus etc.
- 4.11 Following Lifts includes drawings, designs, fabrications, inspection as may be necessary before dispatch, dispatch, delivery at site, installation, testing, commissioning and handing over to client in fully working condition after NOC of Lift Inspector, Patna Bihar

Sl. No.	Name of Building/ Block	No. of Floor	Lift proposed		
			8 Passenger / Capsule Lift	13 Passenger	20 Passenger cum Bed Lift
i.	RD BUNGLOW	G+1	01 Capsule Lift		
iii.	GRADE D & E	B+G+10	01 Capsule Lift	02	01
v.	GRADE B & C	B+S+14		03	01
vii.	COMMUNITY CENTRE	B+G+3	02 (8 Passenger)	01	

- 4.12 The following minimum specifications are required for the machinery and equipment. These specifications are minimum indicative and shall be suitably enhanced to meet the requirements, and all lift shafts must be RCC (Reinforced Cement Concrete) of suitable fire rating.

4.13 Passenger Lift with machine room:

Sr.No.	Description	Requirement
1	Type of lift	Passenger Lift
2	Number of lifts required	2 Nos.
3	Load: number of Persons	8 Passengers (544 Kg)
4	Rated Speed	1.0 mps
5	Travel in meters	17.55 mtrs. (For Community Centre, B+G+3 floors). (Covering all landings)
6	Number of floors Served	5 Nos. floors - For Community Centre
7	Inside size of lift well	2000mm (width) x 1900 mm (Depth)
8	Pit Depth	1600 MM
9	Over Head	4800 MM
10	Position of machinery	Directly above lift well in Lift machine room
11	i) Type of control	Microprocessor-based AC variable voltage variable frequency
	ii) Type of operation	Microprocessor based simplex selective collectivewith/ without attendant.
12	Car entrance door	
(a)	Number	1 No.
(b)	Size	(i) Door Height – 2400 mm (ii) Width – 900 mm
(c)	Type of doors	Horizontal sliding center opening automatic power operated doors. Stainless steel (SS 304) 1.5 mm thick with scratch-proof hairline finish design with multi-beam sensor covering the full height of the door.
(d)	Car open in front only	Yes
(e)	Fire resisting rating	Shall have fire resistance rating of not less than 1 Hour.
13	Lift car	
(a)	Inside car size	1500 mm (width) X1500 mm (Depth), However, variation in car inside dimensions shall be within the minimum and maximum floor area limits specified in IS 14665 (part 3 / sec 1) with amendments or as per the standard design of manufacturer's subject to SP 7:2026 (NBCS 2026) and local authority.
(b)	Construction design	CPWD General Specification for Electrical Works Part-III (Lifts & Escalators)-2003
(c)	Interior Finish	
	i) Panels	Shall be Stainless Steel (SS 304) 1.5 mm thick with scratch-proof hairline finish design.

	ii) Flooring	Shall be recessed anti-skid granite stone of suitable thickness, the weight of the granite shall be considered while designing the lift.
	iii) Ceiling	Stainless Steel Sheet (SS 304) with a hairline finish or any approved design.
	iv) Lighting	Shall be 'LED' lights with a uniform illumination level of 150lux, on floor level approximately.
	v) Ventilation	It shall be cross-flow blower with louver.
14	Type of signal system	i. Digital floor position indicator in the car and at all landings, TFT / LED type.
		ii. Travel direction indicator in the car and at all landings (to be provided in the car operating panel & at landing operating panels / above landing doors)
		iii. Gongs and visual indication on all landings for the arrival of the car
		iv. Overload warning audio and Visual Indicator inside the car. The lift should not start on overload
		v. Battery-operated alarm bell and Emergency light
		vi. Car operating panel with fade-proof Luminous buttons in the car and with the intercom
		vii. Luminous hall Buttons at all landings and inside the car with Braille language signage.
		viii. Firemen's switch at the ground floor
		ix. Floor announcement in the car.
15	Landing entrance	
(a)	Location of landing entrance in different floors	All doors on the same side
(b)	Number	2 Nos. floors- For RD Bungalow 12 Nos. floors- For Grade D & E 05 Nos. floors- For Community Centre
(c)	Size	2400 mm x 900 mm
(d)	Type of doors	Horizontal sliding centre-opening opening automatic power-operated doors. Stainless steel (SS 304) 1.5 mm thick with scratch-proof hairline finish design.
(e)	Lift in use/lift out of order sign	Lift out of order indication shall be built with a floor position indicator.
(f)	Landing Door Fire rating	Shall have a fire rating of not less than 1 Hr
16	Electric supply	i) Power 400/415 volts, AC, 3-phase 50 Hz 4 wire system

		ii) Lighting 230 V AC 50 Hz
		iii) The entire lift equipment should be suitable for operation at +10% to -20% of the rated supply voltage
17	Is neutral wire available for control circuit	Yes
18	Emergency supply	i. Inverter backup with trickle/boost charges arrangement for at least 30 minutes with maintenance-free batteries for emergency light, alarm bell and intercom system
		ii. An automatic rescue device in case of mains failure shall be provided.
19	Door Close Safety	Full height Infrared light curtain door safety.
20	Controller panel	The controller panel shall be of suitable steelgauge, having a Suitable inbuilt ventilation system. A clear floor space of at least 900 mm x 1200 with no obstruction placed to prevent a wheelchair user from reaching it.
21	Firemen lift	i. All the lifts shall be used as a fire lift.
		ii. Firemen's switch for the fire lift shall be provided at the ground floor to enable the fire service personnel to ground the lift in case of an emergency
		iii. The word 'fire lift' shall be conspicuously displayed in fluorescent paint on all the fire lifts' landing doors at the ground floor.
22	Intercom System	Inter communication shall be provided for communication between the lift car, the respective machine room & lift lobby/control/security room. Note: The Intercom in the lift car shall be a press & speak type
23	Hand Rail	i) Slip-resistant with round ends. Rail shall be a circular section of 38 - 50 mm diameter. It shall be able to bear a weight of 250 kg
		ii) Place of height of 800 mm to 900 mm from the floor level. It is fixed on both sides and at the rear of the lift.
		iii) Hand Rail bar should be constructed such that there are no open ends to cause hooking when used by passengers. If the end of a handrail directly faces a doorway, it shall be returned to the wall

24	Automatic rescue device	i. ARD should monitor the normal power supply in the main controller and shall activate Rescue operations within ten seconds of normal power supply failure. It should bring the elevator to the nearest floor at a slower speed than the normal run. While proceeding to the nearest floor, the elevator will detect the zone and stop. After the elevator has stopped, it automatically opens the doors and parks with the door open. After the operation is completed by the ARD the elevator is automatically switched over to normal operations as soon as normal power supply resumes.
		ii. In case the normal supply resumes during ARD in operation, the elevator will continue to run in ARD mode until it reaches the nearest landing and the doors are fully opened. If the normal power supply resumes when the elevator is at the landing, it will automatically be switched to normal power operation.
		iii. All the lift safeties shall remain active during the ARD mode of operation
		iv. The battery capacity should be adequate to operate the ARD at least seven times a day. Provided the duration between usage is at least 30 minutes and battery shall be maintenance-free with 3 3-year free replacement guarantee.
25	CCTV System	i) Provisions for the installation of 1 no. IP based Dome camera should be kept in the lift car and the lift machine room (Camera and cabling shall be provided by the CCTV provider under CCTV Component).
26	Mirror	The provision of a mirror on the wall of the lift car opposite the lift door. The mirror should not extend below 900 mm from the lift floor to avoid confusing people with visual impairments.

4.14 13 Passenger Lift with machine room:

Sr.No.	Description	Requirement
1	Type of lift	Passenger Lift
2	Number of lifts required	6 Nos.
3	Load: number of Persons	13 Passengers (884 Kg)
4	Rated Speed	1.5 mps
5	Travel in meters	37.25mtrs. (For D & E, B+S+10 floors). (Covering all landings) 47.30mtrs. (For B & C, B+S+14 floors). (Covering all landings) 17.55mtrs. (For Community Centre, B+G+3 floors). (Covering all landings)
6	Number of floors Served	12 Nos. floors - For Grade D & E 16 Nos. floors - For Grade B & C 5 Nos. floors - For Community Centre
7	Inside size of lift well	2600mm (width) x 1900 mm (Depth)
8	Pit Depth	1600 MM
9	Over Head	4800 MM
10	Position of machinery	Directly above lift well in Lift machine room
11	i) Type of control	Microprocessor-based AC variable voltage variable frequency
	ii) Type of operation	Microprocessor based simplex selective collectivewith/ without attendant.
12	Car entrance door	
(a)	Number	1 No.
(b)	Size	(iii) Door Height – 2400 mm (iv) Width – 900 mm
(c)	Type of doors	Horizontal sliding center opening automatic power operated doors. Stainless steel (SS 304) 1.5 mm thick with scratch-proof hairline finish design with multi-beam sensor covering the full height of the door.
(d)	Car open in front only	Yes
(e)	Fire resisting rating	Shall have fire resistance rating of not less than 1 Hour.
13	Lift car	
(a)	Inside car size	1500 mm (width) X1500 mm (Depth), However, variation in car inside dimensions shall be within the minimum and maximum floor area limits specified in IS 14665 (part 3 / sec 1) with amendments or as per the standard design of manufacturer's subject to SP 7:2026 (NBCS 2026) and local authority.

(b)	Construction design	CPWD General Specification for Electrical Works Part-III (Lifts & Escalators)-2003
(c)	Interior Finish	
	i) Panels	Shall be Stainless Steel (SS 304) 1.5 mm thick with scratch-proof hairline finish design.
	ii) Flooring	Shall be recessed anti-skid granite stone of suitable thickness, the weight of the granite shall be considered while designing the lift.
	iii) Ceiling	Stainless Steel Sheet (SS 304) with a hairline finish or any approved design.
	iv) Lighting	Shall be 'LED' lights with a uniform illumination level of 150lux, on floor level approximately.
	v) Ventilation	It shall be cross-flow blower with louvre.
14	Type of signal system	i. Digital floor position indicator in the car and at all landings, TFT / LED type.
		ii. Travel direction indicator in the car and at all landings (to be provided in the car operating panel & at landing operating panels / above landing doors)
		iii. Gongs and visual indication on all landings for the arrival of the car
		iv. Overload warning audio and Visual Indicator inside the car. The lift should not start on overload
		v. Battery-operated alarm bell and Emergency light
		vi. Car operating panel with fade-proof Luminous buttons in the car and with the intercom
		vii. Luminous hall Buttons at all landings and inside the car with Braille language signage.
		viii. Firemen's switch at the ground floor
		ix. Floor announcement in the car.
15	Landing entrance	
(a)	Location of landing entrance in different floors	All doors on the same side
(b)	Number	12 Nos. floors - For Grade D & E 16 Nos. floors - For Grade B & C 5 Nos. floors - For Community Centre
(c)	Size	2400 mm x 900 mm
(d)	Type of doors	Horizontal sliding centre-opening opening automatic power-operated doors. Stainless steel (SS 304) 1.5 mm thick with scratch-proof hairline finish design.
(e)	Lift in use/lift out of order sign	Lift out of order indication shall be built with a floor position indicator.

(f)	Landing Door Fire rating	Shall have a fire rating of not less than 1 Hr
16	Electric supply	i) Power 400/415 volts, AC, 3-phase 50 Hz 4 wire system
		ii) Lighting 230 V AC 50 Hz
		iii) The entire lift equipment should be suitable for operation at +10% to -20% of the rated supply voltage
17	Is neutral wire available for control circuit	Yes
18	Emergency supply	i. Inverter backup with trickle/boost charges arrangement for at least 30 minutes with maintenance-free batteries for emergency light, alarm bell and intercom system
		ii. An automatic rescue device in case of mains failure shall be provided.
19	Door Close Safety	Full height Infrared light curtain door safety.
20	Controller panel	The controller panel shall be of suitable steelgauge, having a Suitable inbuilt ventilation system. A clear floor space of at least 900 mm x 1200 with no obstruction placed to prevent a wheelchair user from reaching it.
21	Firemen lift	i. All the lifts shall be used as a fire lift.
		ii. Firemen's switch for the fire lift shall be provided at the ground floor to enable the fire service personnel to ground the lift in case of an emergency
		iii. The word 'fire lift' shall be conspicuously displayed in fluorescent paint on all the fire lifts' landing doors at the ground floor.
22	Intercom System	Intercommunication shall be provided for communication between the lift car, the respective machine room & lift lobby/control/security room. Note: The Intercom in the lift car shall be a press & speak type
23	Hand Rail	i) Slip-resistant with round ends. Rail shall be a circular section of 38 - 50 mm diameter. It shall be able to bear a weight of 250 kg
		ii) Place of height of 800 mm to 900 mm from the floor level. It is fixed on both sides and at the rear of the lift.
		iii) Hand Rail bar should be constructed such that there are no open ends to cause hooking

		when used by passengers. If the end of a handrail directly faces a doorway, it shall be returned to the wall
24	Automatic rescue device	i. ARD should monitor the normal power supply in the main controller and shall activate Rescue operations within ten seconds of normal power supply failure. It should bring the elevator to the nearest floor at a slower speed than the normal run. While proceeding to the nearest floor, the elevator will detect the zone and stop. After the elevator has stopped, it automatically opens the doors and parks with the door open. After the operation is completed by the ARD the elevator is automatically switched over to normal operations as soon as normal power supply resumes. ii. In case the normal supply resumes during ARD in operation, the elevator will continue to run in ARD mode until it reaches the nearest landing and the doors are fully opened. If the normal power supply resumes when the elevator is at the landing, it will automatically be switched to normal power operation. iii. All the lift safeties shall remain active during the ARD mode of operation iv. The battery capacity should be adequate to operate the ARD at least seven times a day. Provided the duration between usage is at least 30 minutes and battery shall be maintenance-free with 3 3-year free replacement guarantee.
25	CCTV System	i) Provisions for the installation of 1 no. IP based Dome camera should be kept in the lift car and the lift machine room (Camera and cabling shall be provided by the CCTV provider under CCTV Component).
26	Mirror	The provision of a mirror on the wall of the lift car opposite the lift door. The mirror should not extend below 900 mm from the lift floor to avoid confusing people with visual impairments.

4.15. Bed Lift with machine room:

Sr. No.	Description	Requirement
1	Type of lift	Passenger Lift
2	Number of lift required	2 Nos.
3	Load: number of Persons	20 Passengers cum Bed lift (1360 Kg)
4	Rated Speed	1.5 mps
5	Travel in meters	37.25mtrs. (For D & E, B+S+10 floors). (Covering all landings) 47.30mtrs. (For B & C, B+S+14 floors). (Covering all landings)
6	Number of floors Served	12 Nos. floors - For Grade D & E 16 Nos. floors - For Grade B & C
7	Inside size of lift well	3000mm (width) x 2300 mm (Depth)
8	Pit Depth	1600 MM
9	Over Head	4800 MM
10	Position of machinery	Directly above the lift well in the machine room.
11	i) Type of control	Microprocessor-based AC variable voltage variable frequency
	ii) Type of operation	Microprocessor-based simplex selective collectivewith/ without attendant.
12	Car entrance door	
(a)	Number	1 No.
(b)	Size	(i) Door Height – 2400 mm (ii) Width – 1000 mm
(c)	Type of doors	Horizontal sliding center opening automatic power power-operated doors. Stainless steel (SS 304) 1.5 mm thick with scratch-proof design, hairline finish with multi-beam sensor covering the full height of the door.
(d)	Car open in front only	Yes
(e)	Fire resisting rating	Shall have a fire resistance rating of not less than 1 Hour.
13	Lift car	
(a)	Inside car size	2000 mm (width) X 1500 mm (Depth), However, variation in car inside dimensions shall be within the minimum and maximum floor area limits specified in IS 14665 (part 3 / sec 1) with amendments or as per the standard design of the manufacturer's subject to SP 7:2026 (NBCS 2026) and local authority.

(b)	Construction design	CPWD General Specification for Electrical Works Part-III (Lifts & Escalators)-2003
(c)	Interior Finish	
	i) Panels	Stainless Steel Sheet (SS 304) with a hairline finish or any approved design.
	ii) Flooring	Shall be recessed anti-skid granite stone of suitable thickness; the weight of the granite shall be considered while designing the lift.
	iii) Ceiling	Stainless Steel Sheet (SS 304) with a hairline finish or any approved design.
	iv) Lighting	Shall be 'LED' lights with a uniform illumination level of 150lux, on floor level approximately.
	v) Ventilation	It shall be a cross-flow blower with louver.
14	Type of signal system	i. Digital floor position indicator in the car and at all landings, TFT / LED type.
		ii. Travel direction indicator in the car and at all landings (to be provided in the car operating panel & at landing operating panels / above landing doors)
		iii. Gongs and visual indication on all landings for the arrival of the car
		iv. Overload warning audio and Visual Indicator inside the car. The lift should not start on overload
		v. Battery-operated alarm bell and Emergency light
		vi. Car operating panel with fade-proof Luminous buttons in the car and with the intercom
		vii. Luminous hall Buttons at all landings and inside the car with Braille language signage.
		viii. Firemen's switch at the ground floor
		ix. Floor announcement in the car.
15	Landing entrance	
(a)	Location of landing entrance in different floors	All doors on the same side
(b)	Number	12 Nos. floors - For Grade D & E 16 Nos. floors - For Grade B & C
(c)	Size	2400 mm x 1000 mm
(d)	Type of doors	Horizontal sliding centre-opening automatic power-operated doors. Stainless steel (SS 304) 1.5 mm thick with scratch-proof hairline finish design.
(e)	Lift in use/lift out of order sign	Lift out of order indication shall be built with the floor Position indicator.

(f)	Landing Door Fire rating	Shall have a fire rating of not less than 1 Hr
16	Electric supply	i) Power 400/415 volts, AC, 3 phase 50 Hz 4 wire system
		ii) Lighting 230 V AC 50 Hz
		iii) The entire lift equipment should be suitable for operation at +10% to -20% of the rated supply voltage
17	Is neutral wire available for control circuit	Yes
18	Emergency supply	i. Inverter backup with trickle/boost charges arrangement for at least 30 minutes with maintenance-free batteries for emergency light, alarm bell and intercom system
		ii. An automatic rescue device in case of mains failure shall be provided.
19	Door Close Safety	Full height Infrared light curtain door safety.
20	Controller panel	The controller panel shall be of suitable stainless steel gauge, having a Suitable inbuilt ventilation system. A clear floor space of at least 900 mm x 1200 with no obstruction placed to prevent a wheelchair user from reaching it.
21	Firemen lift	i. All the lifts shall be used as a fire lift.
		ii. Firemen's switch for the fire lift shall be provided at the ground floor to enable the fire service personnel to ground the lift in case of an emergency
		iii. The word 'fire lift' shall be conspicuously displayed in fluorescent paint on all the fire lifts' landing doors at the ground floor.
22	Intercom System	Intercommunication shall be provided for communication between the lift car, the respective machine room & lift lobby/control/security room. Note: The Intercom in the lift car shall be a press & speak type
23	Hand Rail	i) Slip-resistant with round ends. Rail shall be a circular section of 38 - 50 mm diameter. It shall bear a weight of 250 kg
		ii) Place of height of 800 mm to 900 mm from the floor level. It is fixed on both sides and at the rear of the lift.
		iii) Hand Rail bar should be constructed such that there are no open ends to cause hooking

		when used by passengers. If the end of a handrail directly faces a doorway, it shall be returned to the wall
24	Automatic rescue device	i. ARD should monitor the normal power supply in the main controller and shall activate Rescue operations within ten seconds of normal power supply failure. It should bring the elevator to the nearest floor ii. In case the normal supply resumes during ARD in operation the elevator will continue to run in ARD mode until it reaches the nearest landing and the doors are fully opened. If normal power supply resumes when the elevator is at the landing it will automatically be switched to normal power operation. iii. All the lift safeties shall remain active during the ARD mode of operation iv. The battery capacity should be adequate so as to operate the ARD at least seven times a day. Provided the duration between usage is at least 30 minutes and battery shall be maintenance Free with 3 years free replacement guaranty.
25	CCTV System	i) Provisions for installation of 1 no. IP based Dome camera should be kept in lift car and lift machine room (Camera and cabling shall be provided by the CCTV provider under CCTV Component).
26	Mirror	The provision of the mirror on the wall of the lift car opposite the lift door. The mirror should not extend below 900 mm from the lift floor to avoid confusing people with visual impairments.

4.16 Capsule Lift:

2 Nos. total - 1 No. for Grade D & E and 1 No. for RD Bungalow. Both capsule lifts shall be machine-room type. Capacity, rated speed, travel, shaft size, pit, overhead, car dimensions and architectural finishes shall be as per approved architectural/lift drawings and OEM technical submittal, subject to approval of CPWD and Architect. All other safety, accessibility, fire-service, ARD, intercom, CCTV and control requirements of this Lift Component shall apply.

4.17 General Features:

- i) All lift machine shall be installed in the Machine Room above the lift shaft.
- ii) All lifts shall have Automatic Rescue Devices.

- iii) All elevators will have AC variable voltage variable frequency drives with microprocessor-based control panel.
- iv) Overload protective device which will make the car inoperative when overloaded.
- v) Emergency car lighting shall be through maintenance free battery complete with rectifier/charger.
- vi) Emergency light of adequate illumination level shall be provided in all elevator cars. Its hall be operated by self- contained nickel-cadmium batteries having with self-maintained trickle charger. The battery shall be able to maintain the full illumination continuously for a period not less than two hours.
- vii) Efficient Lifts & Escalators:
 - a) Regenerative lifts
 - b) Gearless traction elevators
 - c) With Machine-room traction elevators
- viii) Submeter for lifts
- ix) Braille and audio assistance in lifts for visually impaired people. Elevator call buttons designed to be within reach of wheel chair occupants.

4.18 Provision of barrier free design:

4.18.1 Appropriate provision shall be made for all people to travel vertically within the buildings conveniently and independently to other stories and to make use of all the facilities. Hence, all the lifts shall be barrier-free.

4.18.2 Special Requirements for barrier-free Lifts.

- i) Every floor of a building shall be accessible by a lift which shall fully comply with all the obligatory design requirements as stipulated in this section and have direct access to the main lift lobby.
- ii) Lifts shall have handrails at the rear and both sides of the car. (Rear side handrail not required in Passenger/Bed/Goods Lift.).
- iii) The top of the gripping surface of the handrails shall be at a height of 850 mm–950 mm, with a space of 30 mm–50 mm between the handrails and the wall.

4.18.3 Lift Doors:

- i) Lift car doors and landing doors shall be of the horizontally sliding type, power-operated and automatically controlled.
- ii) An audible signal shall be provided to signify the closing of the doors to alert persons.
- iii) A detection device shall be provided to re open the lift doors in the event of hitting any obstacle.
- iv) The detection device shall be positioning edata height of between 500 mm to 600 mm above the floor of the lift car.

4.18.4 Lift Control Buttons:

- i) Essential lift control buttons, including floor numbering buttons, emergency alarm pushbutton and door opening push button in the lift car shall not be less than 900 mm and not more than 1200 mm above the floor of the car.
- ii) Lift call buttons shall be at such a height that all lifts shall not be less than 900 mm and not more than 1200 mm above the floor of the finished floor level of the lift hall.
- iii) Call button panels should be provided on both sides of door openings
- iv) Provision of a secondary control panel for over-spilt floor numbering buttons is always acceptable.
- v) All lift control buttons shall have a minimum dimension of 20 mm.
- vi) Braille and audio assistance in the lift for visually impaired people. Elevator call buttons are designed to be within reach of wheelchair occupants. Braille and tactile markings shall be placed either on or to the left of the control buttons.
- vii) Such Braille and tactile markings shall be in Arabic numerals and/or symbols. Tactile markings shall have a minimum dimension of 15 mm high and be raised 1 mm minimum.
- viii) The tactile marking of the push buttons for the main entrance floor shall be identified with a symbol in a star shape.
- ix) The emergency alarm push button shall be in a tactile bell shape.

4.18.5 Emergency Call Button in Lifts:

- 4.18.5.1 An emergency alarm push button together with a buzzer, an indication light for acknowledgement and an intercom shall be provided in each lift car and be connected to the building management office or the caretaker's office..
- 4.18.5.2 The building management office or the caretaker's office shall be equipped with a buzzer, indication light(s) (one for each lift) and an intercom connected to the lift car(s). The indication light for acknowledgement shall be in the form of a blinking light adjacent to the intercom speaker and a notice. When the light blinks, it indicates your emergency call has already been received.
- 4.18.5.3 Please be patient and wait for the rescue. "In English and Hindi shall be provided next to the blinking light..
- 4.18.5.4 This system shall be powered by an emergency electricity supply system in the event of power failure.

4.18.6 Other Design Considerations.

- 4.18.6.1 Lift doors systems should be designed to allow adequate time for the passage of persons with disability and the elderly.

- 4.18.6.2 The use of visually and acoustically reflective wall surfaces can cause discomfort for persons with visual and hearing impairment.
- 4.18.6.3 For lifts of the size that do not allow a wheelchair user to turn around within the lift car, a mirror should be installed with the bottom edge to be set at 900 mm above the floor level in the lift car to facilitate a wheelchair user in reversing and to see which level the lift has reached.
- 4.18.6.4 Where planning allows, lift cars may be provided with opposing doors to allow wheelchair users to leave without having to turn over themselves.
- 4.18.6.5 The OEM shall provide a potential-free contact in each lift controller for monitoring of the floor position of the lift through IBMS. A necessary converter shall also be provided for monitoring of the lift through IBMS and other infrastructure.

Note: The contractor should offer at least 3 Nos. makes of lift, the approval of one make will be given by the Engineer-in-Charge.

Make of lift

- 1) The lift manufacturer company shall comply the following criteria as per DG's circular:



केंद्रीय लोक निर्माण विभाग
कार्यालय ज्ञापन

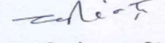
सं.- महानिदेशक/अधीक्षण अभियंता(वै)टास/पीपीपी-एम आई आई आर्डर/22
निर्माण भवन, नई दिल्ली दिनांक 28.09.2020

विषय: Eligibility Criteria for Lift Works (Revision-3)

Eligibility Criteria for Lift Works (Revision-2) in CPWD notified vide OM No. महानिदेशक/अधीक्षण अभियंता(वै)टास/ पीपीपी-एम आई आई आर्डर/ 17 dated 20-04-2020 is hereby revised and notified as enclosed, since the list of designated labs or certifying agencies has not been issued by the Bureau of Indian Standards yet. This supersedes all earlier issued eligibility criteria for lift works. This shall come into force with effect from the date of issue of this order.

This issues with the approval of DG, CPWD.

अनुलग्नक: यथोपरि


(डी के तुलानी)
अधीक्षण अभियंता (वै)
तकनीकी अनुप्रयोग एवं मानक

फाइल नं ई-9077096/30(1)/लिफ्ट- बैठक/मु. अभि. सी एस क्यू (वै)/2017 से जारी

सेवा में, (केवल केंद्रीय लोक निर्माण विभाग की वेबसाइट के माध्यम से)

सभी विशेष महानिदेशकों, अतिरिक्त महानिदेशकों, के. लो. नि. वि., प्रमुख अभियंता, लो. नि. वि., दिल्ली, सभी मुख्य अभियंताओं, मुख्य अभियंता एवं कार्यकारी निदेशकों, अधीक्षण अभियंताओं, अधीक्षण अभियंता एवं परियोजना निदेशकों, कार्यपालक अभियंताओं, कार्यपालक अभियंता एवं वरिष्ठ प्रबंधकों, के. लो. नि. वि. को सूचनार्थ एवं आवश्यक कार्रवाई हेतु।

Eligibility Criteria for Lift Works

1. The lift manufacturer shall comply with BIS standards, duly certified by the manufacturer itself.
2. The manufacturer shall be compliant with the Public Procurement (Preference to Make in India) Order, 2017 (as amended from time to time), issued by the Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry.
3. The experience of successful completion of similar works shall be as per the CPWD Works Manual/SoP.
4. The manufacturer shall furnish an undertaking regarding the availability of spares for the entire expected life of the lift, i.e. 15 to 20 years.
5. The complete lift installation, including its components, safety devices, various types of controls, etc., testing, inspection, operation & maintenance shall conform to relevant Codes, Standards, Codes of Practices, guidelines, safety rules, inspection manual(s), and rules issued by the Bureau of Indian Standards, as amended up to the last date of receipt of tenders.
6. Quality standards shall conform to the latest IS/ISO 9001:2015.
7. The downtime of installed lifts being maintained by the manufacturer shall not be more than 8 hours (average) in case of minor faults and 7 days (average) in case of major faults during the last financial year.

SH: C- 5**Sub-station and Sub-station Equipment's**

- 5.1.1 The work shall be carried out as per CPWD General Specifications for Electrical Works (Part-IV- SUB STATION) 2013 CPWD General Specifications for Electrical Works Part-I (Internal 2023, Part-II (External) 2023 as amended and corrected up to date, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026 shall be the latest norms as modified by Government of India on the date of execution.
- 5.1.2 The Sope of work of outdoor Compact Sub-Station incorporating dry-type transformer shall include in two parts:- Residential and Common Non-Residential.
- 5.1.2.1 Residential (Part-A):- The total Electric load works out 1239.75KVA for which independant 11KV supply will be taken from Electricity Deptt. Two number Compact Sub-stations out door type have been proposed with 1250 kVA dry-type cast-resin transformers. 'No' DG backup is proposed for Residential areas but for essential / Common services DG backup is proposed in Part-B. A 3-way 11KV HT VCB Panel is proposed to feed 2 no CSS. The main LT Panel will be kept in Basement Panel room along with 2 no Capacitor Panel of 400KVAR each. All the outgoing cables will run on cable trays in the basement from LT Panel to individual towers/buildings as per requirements according to the cables schedule attached. Independent Energy meters for each flats will be installed by the Electricity Deptt. In the Electrical Duct fed through MCCB in the tap of box of rising mains.
- 5.1.2.2 Common Services Essential & non-essential services (Part-B):- The total electric load works out to 1108.54 kVA, for which an independent 11 kV connection will be taken from the electricity department after providing the 11 kV HT metering panel. One compact sub-station of 1250 kVA is proposed along with 3 Nos. DG sets of 250 kVA each. The 1250 kVA compact sub-station shall be provided with a dry-type cast-resin transformer complete with OLTC and RTCC panel. All compact sub-stations under this work shall be provided with dry-type cast-resin transformers complete with the specified protection, temperature monitoring and ventilation arrangements. The main panel for common services will be kept in the basement panel room along with the capacitor panel. XLPE aluminium armoured cables shall run on cable trays / in HDPE pipes, as applicable, from the common-services main panel to individual essential and non-essential service panels. The detailed SLDs of panels are attached.

Cable from 11KV terminal pointor 11 KV SBPDCL terminal point at RBIncampus to substation provided by the contractor inthe RBI campus is in the scope of the EPC contractor.

5.1.3 Load calculation: -

NAME OF WORK:- RBI, DISTT-PATNA, BIHAR.				
ELECTRIC LOAD FOR COMMON SERVICES only				
S no	Description	Total Electrical load in KW	Power factor @0.9, kVA	Efficiency @85%,kVA
1	COMMON SERVICES AREA ESSENTIAL PART B-I (DG BACKUP)	409.97	455.52	535.90
2	COMMON SERVICES AREA NON ESSENTIAL PART B-II (NORMAL SUPPLY)	386.20	429.11	504.84
	TOTAL for PART B (I +II) KVA	796.17		1040.74
3	CONSIDERING FUTURE EXPANSION	50.00	55.56	65.36
	TOTAL LOAD	846.17		1106.10
		KW		KVA
1	HENCE, TO BEAR A TOTAL LOAD OF 1106.10KVA, COMPACT SUB-STATION HAS OF 1250KVA= 1 NO			
2	FOR ESSENTIAL SERVICES PART B-I, TO BEAR A TOTAL LOAD OF 538.34KVA, DG SETS OF 250KVA = 3 NO			

RBI PATNA,BIHAR					
LOAD SHEET FOR RESIDENTIAL AREA (PART-A)					RESIDENTIAL (NORMAL SUPPLY)
NORMAL SUPPLY					
S no	Description	unit	Electrical load KW	Total Electrical load KW	Remarks
1	Grade B & C	56	15.286	856.016	Detailed sheet attached
2	Grade D & E	8	18.579	148.631	Detailed sheet attached
3	Grade F (9TH)	1	18.600	18.600	Detailed sheet attached
4	Grade F VOF (10th)	1	8.541	8.541	Detailed sheet attached
5	Regional Director bungalow	1	22.000	22.000	Detailed sheet attached
TOTAL LOAD in KW				1053.789	
CONSIDERING , OVERALL LOAD FACTOR@0.9, TOTAL LOA				948.410	KW
CONSIDERING POWER FACTOR @0.9 KVA CAPACITY				1053.789	KVA
CONSIDERING EFFICIENCY @ 85%,THE KVA CAPACITY				1239.752	
				KVA	
HENCE, TO BEAR A TOTAL LOAD OF 1239.75 KVA, SUB-STATION OF 1250KVA , PROPOSED REDUNDANCY COMPACT SUB-STATION OF 1250KVA SUBSTATION					COMPACT FOR = 1 NO = 1 NO TOTAL COMAPCT = 2 NO

Summary of Electrical Load per Flat						
GRDAE - B & C (RESIDENTIAL SUPPLY)						
S.NO	Description	QTY	WATT	Connected load (KW)	Diversity Factor	Maximum Demand
1	Essential Load (Light Load)					
a)	MIRROR LIGHT 10W	3	10	0.030	0.7	0.021
b)	BRACKET LIGHTS	6	10	0.060	0.7	0.042
c)	LED DOWNLIGHTER 18W	10	18	0.180	0.7	0.126
d)	4' BATTEN 34W	7	20	0.140	0.7	0.098
e)	LED DOWNLIGHTER 15W	6	15	0.090	0.7	0.063
f)	CEILING FAN	8	40	0.320	0.7	0.224
g)	EXHAUST FAN	4	40	0.160	0.7	0.112
h)	6A SOCKET	26	100	2.600	0.5	1.300
2	POWER LOAD					
a)	16A SOCKET	17	1000	17.000	0.5	8.500
b)	GEYSER POINT	4	1500	6.000	0.4	2.400
3	AC LOAD	4	2000	8.000	0.3	2.400
	TOTAL					15.286
						KW

Summary of Electrical Load per floor						
Grade D & E (RESIDENTIAL SUPPLY)						
S.NO	Description	QTY	WATT	Connected load (KW)	Diversity Factor	Maximum Demand
1	(Light Load)					
a)	MIRROR LIGHT 10W	4	10	0.040	0.7	0.028
b)	BRACKET LIGHT	9	10	0.090	0.7	0.063
c)	LED DOWNLIGHTER 15W	11	15	0.165	0.7	0.116
d)	LED DOWNLIGHTER 18W	14	18	0.252	0.7	0.176
f)	4' BATTEN 20W	7	20	0.140	0.7	0.098
g)	CEILING FAN	11	40	0.440	0.7	0.308
h)	EXHAUST FAN	5	40	0.200	0.7	0.140
i)	6A SOCKET	31	100	3.100	0.5	1.550
2	POWER LOAD					
a)	16A SOCKET	19	1000	19.000	0.5	9.500
b)	GEYSER POINT	5	1500	7.500	0.4	3.000
3	AC LOAD	6	2000	12.000	0.3	3.600
	TOTAL					18.579
						KW

Summary of Electrical Load 9TH FLOOR						
GRADE -F (RESIDENTIAL SUPPLY)						
S.NO	Description	QTY	WATT	Connected load (KW)	Diversity Factor	Maximum Demand
	9TH FLOOR					
1	(Light Load)					
a)	MIRROR LIGHT 10W	5	10	0.050	0.7	0.035
b)	BRACKET LIGHT	12	10	0.120	0.7	0.084
c)	LED DOWNLIGHTER 15W	9	15	0.135	0.7	0.095
	LED DOWNLIGHTER 18W	14	18	0.252	0.7	0.176
d)	4' BATTEN 20W	6	20	0.120	0.7	0.084
f)	CEILING FAN	11	40	0.440	0.7	0.308
g)	EXHAUST FAN	6	40	0.240	0.7	0.168
h)	6A SOCKET	31	100	3.100	0.5	1.550
2	POWER LOAD					
a)	16A SOCKET	19	1000	19.000	0.5	9.500
b)	GEYSER POINT	6	1500	9.000	0.4	3.600
3	AC LOAD	5	2000	10.000	0.3	3.000
	TOTAL					18.600
						KW

Summary of Electrical Load 10TH FLOOR						
GRADE F(RESIDENTIAL SUPPLY)						
S.NO	Description	QTY	WATT	Connected load (KW)	Diversity Factor	Maximum Demand
	10TH FLOOR					
1	(Light Load)					
a)	MIRROR LIGHT 10W	2	10	0.020	0.7	0.014
b)	BRACKET LIGHT	5	10	0.050	0.7	0.035
c)	LED DOWNLIGHTER 15W	1	15	0.015	0.7	0.011
d)	LED DOWNLIGHTER 18W	3	18	0.054	0.7	0.038
e)	4' BATTEN 20W	4	20	0.080	0.7	0.056
f)	CEILING FAN	4	40	0.160	0.7	0.112
g)	EXHAUST FAN	2	40	0.080	0.7	0.056
h)	6A SOCKET	14	100	1.400	0.7	0.980
i)	COMPUTER POINT	2	100	0.200	0.7	0.140
2	POWER LOAD					
a)	16A SOCKET	7	1000	7.000	0.5	3.500
b)	GEYSER POINT	2	1500	3.000	0.4	1.200
3	AC LOAD	4	2000	8.000	0.3	2.400
	TOTAL					8.54
						KW

Summary of Electrical Load						
RD BUNGLOW (RESIDENTIAL SUPPLY)						
S.NO	Description	QTY	WATT	Connected load (KW)	Diversity Factor	Maximum Demand
1	Essential Load (Light Load)					
a)	MIRROR LIGHT 10W	7	10	0.070	0.7	0.049
b)	BRACKET LIGHT	8	10	0.080	0.7	0.056
c)	LED DOWNLIGHTER 15W	6	15	0.090	0.7	0.063
c)	LED DOWNLIGHTER 18W	44	18	0.792	0.7	0.554
d)	4' BATTEN	12	20	0.240	0.7	0.168
e)	HANGING LIGHT 20W	2	20	0.040	0.7	0.028
g)	CEILING FAN	10	40	0.400	0.7	0.280
h)	EXHAUST FAN	9	40	0.360	0.7	0.252
i)	6A SOCKET	34	100	3.400	0.5	1.700
2	POWER LOAD					
a)	16A SOCKET	22	1000	22.000	0.5	11.000
b)	COMPUTER SOCKET	1	100	0.100	0.5	0.050
c)	GEYSER POINT	6	1500	9.000	0.4	3.600
3	AC LOAD	7	2000	14.000	0.3	4.200
						22.000
						KW

5.2 VACUUM CIRCUIT BREAKER

- 5.2.1 The HT Panel board shall be of indoor type, having the incoming sectionalization and outgoing switchgear as per IEC 62271-100, IEC 62271-200, and IEC 62271-1 (superseding the earlier reference to IEC 60056 / IEC 2300 / IEC-100, which have been withdrawn/renumbered under the current IEC 62271 series). The degree of enclosure protection shall be IP-4X & IP-5X.
- 5.2.2 All panels assembled to form a board shall be suitable for 800 Amps. (rated current, amended from 2000 Amps to align with the BOQ item) and suitable for operation on 11 KV (operating) / 12 KV (rated voltage class), 3 phase, 3 wire, 50 Hz system.
- 5.2.3 The equipment shall be suitable for operation in tropical climate considering design ambient temperature of 40°C. Temperature rise shall be as per IEC 62271-200.

Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.

- 5.2.4 The HV Panel Board shall be metal clad, indoor, floor mounting, free standing type. It shall be totally enclosed, dust, damp and vermin proof, of Air Insulated (AIS) construction throughout — enclosure, bus bars and switchgear compartment.
- 5.2.5 All the HV compartments shall be tested for Power Frequency withstand voltage of 28 KV rms (1 minute) and Lightning Impulse withstand voltage of 75 KV peak — the correct IEC 62271-200 insulation levels for a 12 KV rated voltage class system (amended from the previously stated 70 KV rms / 170 KV peak, which correspond to a 36 KV class system and were inconsistent with the 11 KV/12 KV system specified elsewhere in this document).
- 5.2.6 The circuit breaker shall be tested for cable charging and capacitor duty for minimum "C2" category of latest IEC 62271-100.

5.2.7 General Construction

- Separately earthed compartments shall be provided for circuit breakers, bus bars, relay & instruments, CT & PT and cable boxes, fully and effectively segregating these from one another so that a fault in any one compartment does not cause damage to equipment(s) in other compartment(s).
- The housing shall be of bolted construction to ensure a compact and rigid structure, presenting a neat and pleasing appearance. The sheet steel used should not be less than 2 mm thick.
- The panels shall be bolted together to form a continuous flush front switchgear suitable for front operation of board and for extension at both ends.

- The circuit breaker shall be designed so as to have class E2 (circuit breaker with extended electrical endurance) of electrical endurance, and class M2 (circuit breaker with extended mechanical endurance, mechanically type tested for 10,000 cycles) of mechanical endurance, as defined by IEC 62271-100.
- The complete assembly shall be Internal Arc Classified IAC AFLR 25 kA for 0.1 sec (100 ms), per the BOQ item, confirming that personnel on the front (F), lateral (L) and rear (R) accessible sides remain protected in the event of an internal arc fault.

5.2.8 General Design Aspects

The HV panel board shall be designed such that the switchgear, instruments, relays, bus bars, small wiring etc. are arranged and mounted with due consideration for the following: -

- Facility for inspection, maintenance and repairs of testing terminals and terminal boards for ease of external connection.
- Minimum noise and vibrations. Risk of accidental short circuits and open circuits. Secured and vibration proof connections for power and control circuits.
- Risk of accidental contact and danger to personnel due to live connections.
- Mountings at approachable height.

5.2.9 Circuit Breaker — General Arrangements

The circuit breaker panels shall be complete with the following:

- Racking in / Racking out mechanism.
- Isolating plugs and sockets.
- Mechanical inter-locks and safety shutters.
- Mechanical ON/OFF indicator.
- Minimum of 4 NO and 4 NC Auxiliary contacts directly operated by the circuit breaker. Additional NO & NC contacts can be provided with auxiliary contactors.
- Anti-condensation space heaters suitable for operation on 230V, single phase 50 Hz A.C. for each panel.
- Suitable tripping/control arrangement.
- Mechanical counter to assess the total number of operations of the breaker.

5.2.10 Type

The circuit breaker shall be of horizontal isolation, horizontal draw-out pattern, having one (1) VCB incoming (INC) and two (2) outgoing (OG) VCB, per the BOQ item.

5.2.11 Breaker Truck

The breaker carriage shall be fabricated from steel, providing a sturdy vehicle for the circuit breaker and its operating and tripping mechanism. The carriage shall be mounted on wheels, moving on guides, designed to align correctly and allow easy movement of the circuit breaker and for removing the carriage for inspection and maintenance purposes. Vacuum interrupters shall be hermetically sealed and shall be designed for minimum contact erosion, fast recovery of dielectric strength, maintenance-free vacuum interrupter, suitable for auto-reclosing. The drive mechanism shall preferably be provided

with facility for pad locking at any position namely "Service", "Test" and "Fully Isolated". It should be possible to test the circuit breaker for its operation without energizing the power circuit in the "Test" position. The contacts shall be made only after the breaker is inserted into service position. Interlocking should prevent contacts from being disconnected if the circuit breaker is moved from the service position.

5.2.12 General Features

5.2.12.1 — Single break contacts are provided in sealed vacuum interrupter.

5.2.12.2 — The circuit breaker shall be continuously rated for 800 Amps., with 12 KV rated voltage class (11 KV operating), rated short-time withstand current of 26.3 KA for 3 sec, and Internal Arc Classification IAC AFLR 25 KA for 0.1 sec — amended from the original "800 Amps. with 33 KV voltage rating and 31.5 KA", which was inconsistent with the 11 KV/12 KV system specified elsewhere in this document and did not reflect the BOQ's arc/short-time ratings.

5.2.12.3 — Operating Mechanism: The operating mechanism shall be one of the following as specified — Manually operated spring charged / motor wound spring charged, with both mechanical and electrical release for closing. The operating mechanism shall be trip-free.

5.2.12.4 — External auxiliary supply shall be made available for charging motors & heater operation.

5.2.13 Bus Bar Section

The switchboard shall be single bus bar pattern with Air Insulated, encapsulated bus bars housed in a separate, segregated compartment, per the BOQ item (Air Insulated metal enclosure containing Air Insulated Bus bar).

Material

The bus bars shall be of high conductivity electrolytic Aluminium, rated for a minimum current of 800 Amps. The bus bars shall be sized for carrying the rated and short-circuit current (26.3 kA / 3 sec) without over-heating. Maximum bus bar temperature shall not exceed 95°C.

5.2.14 Current Transformer

General Requirements

Accommodation shall be provided in the circuit breaker panel to mount one set of three numbers dual core, dual ratio CTs for metering and protection purposes, sized to suit the 800 A panel rating. Access to the CTs for cleaning, testing or changing shall be from the front, back or top of the panel.

Rating

Dual core & dual ratio, suitable rating CTs of burden not less than 15 VA with 5 Amps secondary. CT ratio shall be compatible with the loading pattern on the HV side and the 800 A panel rating. The CTs shall conform to relevant Indian Standards. The design and construction shall be robust to withstand thermal and dynamic stresses during short circuits corresponding to the 26.3 kA / 3 sec system fault level. Secondary terminals of CTs shall be

brought out suitably to a terminal block which will be easily accessible for testing and terminal connections. The protection CTs shall be of accuracy class 5P10 of IS 2705-Part III-1992. The metering CTs shall conform to the metering ratio and accuracy class 0.5 of IS 2705-1992 for incomer and class 1 for outgoing panels.

5.2.15 Voltage Transformer

A voltage transformer of burden not less than 100 VA and of proper ratio as specified shall be provided at the incoming panel, rated for the 11 KV operating / 12 KV rated system voltage. The accuracy class for the VT shall be class 0.5 as per IS 3156 Parts I to III for incomer and class 1 for outgoing panels. The transformer shall be of cast epoxy resin construction. It shall be fixed/withdrawable type. MCBs of suitable ratings shall be provided on both HV and LV sides.

5.2.16 Protection and Tripping Arrangement

The relays shall be microprocessor-based Numerical Relays, communicating over both Modbus and IEC 61850 protocols (per the BOQ item), providing the full protection function suite listed in Clause 5.2.17. Tripping relay shall be used for the tripping signal to the Shunt Trip Coil of the Circuit Breaker; indication light operating through control supply for closing and tripping shall be 110 Volts D.C. through a Power Pack. 230 Volts single-phase A.C. supply shall also be available for the operation of the spring-charging motor and cubicle space heater. Wattage of closing and tripping coils shall be within 250 watts. Auxiliary supply shall be suitably distributed along with switchgear in loop-in-loop-out fashion.

5.2.17 Relays

The numerical relays shall be microprocessor-based, self-diagnostic, with event/fault recording and dual-protocol communication (Modbus RTU/TCP and IEC 61850 MMS/GOOSE), and shall provide the following protection functions, each independently adjustable in pickup and time settings — amended from the original generic "O/L, E/F and S/C protection" .

ANSI Code	Protection Function
50 / 51	Phase Overcurrent (Instantaneous / Definite-Time)
67	Directional Phase Overcurrent
50N / 51N	Ground Fault Overcurrent (Instantaneous / Definite-Time)
67N	Directional Ground Fault Overcurrent
50SG / 51SG	Sensitive Ground Fault Overcurrent
46	Negative Sequence Overcurrent
37	Phase Undercurrent
51V	Voltage-Dependent (Voltage-Restrained/Controlled) Overcurrent
21N	Ground Admittance
27	Under voltage
59	Over voltage

ANSI Code	Protection Function
47	Negative Phase Sequence Overvoltage
64REF	Low Impedance Restricted Earth Fault (Differential)

Overcurrent relay elements (50/51, 50N/51N) shall have adjustable current settings from 50% to 200% (phase) and 10% to 40% or 20% to 80% (earth fault), as applicable. All relays shall be of manual reset type and shall have an LED indicator which indicates operation for each function, resettable only by manual operation. The number and application of relays per panel (incomer/outgoing) shall be as specified in Clause 5.2.27, Item 17.

Numerical relay have following tools for fault Diagnostics;

1. Fault record at base five fault with cause, time stamping.
2. Event record to store 500 sequences of events with 1ms resolution.
3. Disturbance records store at least five disturbance records save forces with at least 2 second duration.
4. Self diagnostic feature to monitor reading of hardware and software.

5.2.18 Small Wiring

The small wiring shall be carried out with minimum 1.5 sq. mm FRLS/HFFR insulated copper conductor cables. CT wiring shall be done with minimum 2.5 sq. mm wires with colour code: RYB, Grey for auxiliary DC circuits and Black for auxiliary AC circuits. The wiring shall be securely fixed and neatly arranged to enable easy tracing of wires. Identification tags shall be fitted to all wire terminals to render identification easy and to facilitate checking in accordance with IS 375. Necessary terminal blocks and cable entries shall be provided for RTD relay wiring, power supply etc. All wiring shall be neatly routed, and groups of wiring shall be securely fixed by clips so that wiring can be checked without necessity of removing the clamps. Wiring between fixed and moving portions of the panel shall be run in flexible tubes, mounted to avoid any damage due to mechanical movements. Ferrules with number shall be provided on both ends of the wiring.

5.2.19 Power Pack

Power Pack shall be suitable for 2 panels. It shall be a DC Power Pack, constant voltage / constant current type, self-powered, protected from overcharging, short circuit & fuse at input, input voltage 230V / 110V AC $\pm$ 20% and output voltage 24V DC with 7AH Sealed Maintenance Free (SMF) Battery.

Parameter	Value
Type	CVCC (Constant Voltage Constant Current)
Rated Input Voltage	230 V AC
Input Voltage Tolerance	170 V to 270 V
Rated Input Frequency	50 Hz
Input Frequency Tolerance	$\pm$ 5%

Parameter	Value
Output Voltage (AC mode)	26.0 Volts
Output Voltage (DC mode)	24.0 Volts
Battery	12V, 7AH x 2
Output Current	0–10 Amps (for Tripping)
Recharge Time	8–10 hrs (condition-dependent)
Protections	Over-charge and low-battery, electronically controlled
Indications	AC-ON, DC-ON, Charger Fail
Ventilation	Air cooled

5.2.20 Metering Instruments & Panel Accessories (Digital)

Metering

Energy metering shall be done on the incomer(s).

Voltage Selection Scheme

Where a bus coupler is incorporated and only one incomer feeder (out of two available) is intended to be operated at a time, a VT Transfer Relay shall be incorporated to provide necessary potential for metering. This will be necessary when energy metering is done on individual feeders or where VT supply is used for trip circuits. Alternatively, PTs shall be provided on both bus sections (incomers) with individual metering on each incomer.

Instrument Panels

The instrument panel shall form part of the housing. Relays, meters and instruments shall be mounted as per general arrangement drawings submitted by the tenderer, preferably of flush-mounting type at a maximum height of 1800 mm.

Instrumentation

- A voltmeter of class 1.5 accuracy as per IS 1248 shall be provided at each incomer panel, with selector switch, calibrated for the specified ranges.
- Energy meters of class 1.0 conforming to IS 722 (Part IX) and power factor meter of class 2 accuracy shall be provided.
- Ammeter of suitable range, class 1.5 accuracy as per IS 1248, shall be provided at both incomer and outgoing panels along with necessary selector switches.
- A multifunction meter with dual RJ-45 Ethernet port, supporting Modbus TCP, shall be provided per Clause 5.2.27, Item 18(c), consistent with the BOQ's "metering equipment" requirement.
- Lamp indication for ON/OFF (red/green) of switchgear, panel illuminating lamp, mechanical spring-charged status indication, tripping-at-fault indication lamp, healthy trip-supply indication lamp.
- Separate MCBs shall be provided for lamps, heaters, voltmeters and other instrumentation on each panel.

- Where there is more than one incomer and bus section, these shall be castle-key interlocked as per the interlocking scheme.

5.2.21 Cable boxes shall be situated in a compartment at the rear/side of the housing as specified.

5.2.22 Provision for top/bottom or such other side entry shall be made as per requirement with sufficient headroom for cable termination. 3 mm thick removable gland plate shall be provided for cable termination.

5.2.23 The earthing of the breaker body and moving portion shall be so arranged that the earthing of the non-current-carrying structure to the frame earth bar is completed well before the main circuit breaker plugs enter the fixed housing sockets.

5.2.24 The entire panel board shall have a common tinned G.I. earth bar of size not less than 50 mm x 6 mm with 2 earth terminals for effectively earthing the metallic portion of the panels.

5.2.25 The installation work shall cover assembly of panels, lining up, grouting the units etc. In the case of multi-panel switchboards, after connecting up the bus bar, all joints shall be insulated with HV insulation tape or an approved insulation compound. A common earth bar shall be run preferably at the back of the switchboard, connecting all sections to the earth system. All protection, indication & metering connections and wiring shall be completed. Where a trip-supply battery is installed, the unit shall be commissioned, completing initial charging of the batteries. All relays, instruments and meters shall be mounted and connected with appropriate wiring. Calibration checks of units as necessary and required by the licensee, such as CTs, VTs, Energy Meters, etc., shall be completed before pre-commissioning checks are undertaken.

5.2.26 Testing and Commissioning The procedure for testing and commissioning of relays shall be in general accordance with good practice. Commissioning checks and tests shall include, in addition to checking of all small wiring connections, relay calibration and setting tests by secondary injection and primary injection methods, verification of every protection function listed in Clause 5.2.17 (50/51, 67, 50N/51N, 67N, 50SG/51SG, 46, 37, 51V, 21N, 27, 59, 47, 64REF) and confirmation of communication over both Modbus and IEC 61850 protocols. Primary injection testing shall be preferred for verifying relay operation through the CTs. Before the panel board is commissioned, provision of safety items — namely fire extinguishers, rubber mats and danger boards — shall be ensured. In addition, all routine megger tests shall be performed.

Checks and tests shall include the following:

- Operation checks and lubrication of all moving parts.
- Interlock function checks.
- Continuity checks of wiring, fuses etc. as required.
- Insulation tests.
- Trip test and protection gear tests (including all listed numerical relay protection functions and both communication protocols).

- The complete panel shall be tested with 5000 V megger for insulation between poles and poles to earth. Insulation test of secondary of CTs and VT to earth shall be conducted using 500 V megger.
- Any other tests as may be required by the Licensee / Inspector shall be conducted.
- Any other test required by the consignee / inspecting officer.

5.2.27 Technical Data / Specification of H.T. VCB Panel

sno	Parameter	Specification
1	Type of panel	Indoor, metal clad, floor mounting, free standing, totally enclosed, fully interlocked, dust, damp and vermin proof, Air Insulated construction, having one (1) incoming sectionalisation & two (2) outgoing switchgears as per IEC 62271-1/-100/-200.
2	Draw-out mechanism	Horizontal isolation, horizontal draw-out pattern, having one (1) VCB incoming and two (2) outgoing VCB.(For Residential Block) Horizontal isolation, horizontal draw-out pattern, having one (1) VCB incoming and two (1) outgoing VCB.(For Common Services)
3	System type	3 phase, 3 wire
4	Rated system voltage	11 KV (Operating) / 12 KV (Rated Voltage Class) — amended from 33 KV
5	Current rating	800 Amps.
6	Frequency	50 Hz
7	Short-time withstand current (STC)	26.3 KA for 3 sec — amended from 31.5 KA
8	Basic Insulation Level (BIL)	12 KV / 28 KV (rms) / 75 kVp — amended from 36 KV / 70 KV (rms) / 170 kVp
9	Internal Arc withstand (IAC AFLR)	25 KA for 0.1 sec (100 ms) — amended from an unspecified 1 sec duration
10	Design ambient	40°C
11	Vacuum Circuit Breaker	Spring-charging motor rated 230 V AC; tripping coil and closing coil at 110 V DC. One (1) incomer and two (2) outgoing(For Residential Block) Spring-charging motor rated 230 V AC; tripping coil and closing coil at 110 V DC. One (1) incomer and one (1) outgoing(For Common Services)
12	Bus bar material	Aluminium, Air Insulated
13	Bus bar cross-section (each phase)	Sized for 800 Amps. rated current, per manufacturer standard
14	Bus bar hardware grade	As per manufacturer standard and relevant IS

sno	Parameter	Specification
15a	Current Transformers — Incoming Panel	Suitable current rating as per manufacturer, class 0.5/5P10 of IS 2705-Part III (amended up to date), burden not less than 15 VA with 5 Amps secondary — 3 Nos.
15b	Current Transformers — Outgoing Panel	Suitable current rating as per manufacturer, class 0.5/5P10 of IS 2705-Part III (amended up to date), burden not less than 15 VA with 5 Amps secondary — 3 Nos. for each outgoing panel.
16	Potential Transformers	3 phase, 3 limb type, class 0.5/3P (as per IS 3156 Parts I to III), burden not less than 100 VA (draw-out type) — 3 Nos. for each incoming panel.
17a	Relays — Incoming Panel (Numerical, dual protocol)	1 No. Numerical relay with Modbus & IEC 61850 communication, providing 50/51, 67, 50N/51N, 67N, 50SG/51SG, 46, 37, 51V, 21N, 27, 59, 47 and 64REF protection functions.
17b	Relays — Outgoing Panel (Numerical, dual protocol)	2 Nos. (1 per outgoing feeder). Numerical relay with Modbus & IEC 61850 communication, providing the applicable protection functions from the same suite (50/51, 67, 50N/51N, 67N, 50SG/51SG, 46, 37, 51V, 27, 59, 47, 64REF as applicable to a feeder relay).
17c	Master Trip Relay	1 No. for incoming panel and 1 No. for each outgoing panel.
17d	Auxiliary Relay	2 Nos. for outgoing panel.
18a	Digital Ammeter	1 No. for incoming panel and 1 No. for each outgoing panel.
18b	Digital Voltmeter	1 No. for incoming panel.
18c	Multifunction meter with 2x RJ-45 Ethernet port	1 No. for incoming panel and 1 No. for each outgoing panel.
19	Earth bar material	Aluminium
20	Size of earth bar	Suitable size according to system proposed and manufacturer standard (with extension outside, both sides)
21	Enclosure protection	IP-4X (body) & IP-5X (as applicable per clause 5.2.1)
22a	Terminal arrangement — Incoming side	Suitable size air-insulated cable termination box for termination of 11 KV grade, 3-core XLPE insulated armoured aluminium HT cable (size per BOQ cable schedule) through indoor heat-shrinkable kit (double run, with 1 No. standby) — amended from 33 KV cable rating.
22b	Terminal arrangement — Outgoing side	Suitable size air-insulated cable termination box for termination of 11 KV grade, 3-core XLPE insulated armoured aluminium HT cable (size per BOQ cable schedule) through indoor heat-shrinkable kit (double run,

sno	Parameter	Specification
		with 1 No. standby) per outgoing panel — amended from 33 KV cable rating.
23	Communications	BMS-compatible; RS485/Ethernet port (or 2x LC front Ethernet port); relays and metering shall support both Modbus and IEC 61850 (MMS/GOOSE) protocols
24	Thermal Monitoring	Thermal Monitoring shall be fitted on HV field cable/busbar connections, the monitoring shall be done by a battery less sensor that communicates wirelessly using zig bee green power protocol.
25	Arc FLASH Protection system with Active Arc Flash protection	Ultra fast Arc Flash detection & Tripping operating time should be less than 10ms & high speed trip output of upto 2ms. Light + overcurrent (AND LOGIC)-secure fault discrimination & prevent in all operation due to external light optical arc sensor shall be provided in the busbar, circuit breaker & cable compartment. Zone selective protection enabling tripping only the faulted feeder on section of arc location.

5.3 COMPONENT / COMPACT SUB-STATION — 1250 KVA (TYPE-TESTED HV/LV PREFABRICATED SUBSTATION)

5.3.1 General

The sub-station shall be a type-tested, factory-assembled, compact/Component HV/LV sub-station conforming to IEC 62271-202, comprising an 11 kV indoor SF6-insulated Ring Main Unit (RMU), a 1250 kVA dry-type cast-resin distribution transformer with On-Load Tap Changer (OLTC) and RTCC panel, and an integral LT panel, all housed within a single, type-tested enclosure. The offered Component sub-station shall be as per the latest IEC 62271-202; only routine tests shall be conducted at the manufacturer's works during inspection, and any special/type test required in addition shall be conducted at extra cost, as clarified in the BOQ item.

The Component sub-station shall additionally comply with the following Indian Standards, as amended up to date, applicable to its constituent equipment:

- IS 2026 (Part I to V) — Power Transformers.
- IS 10028 (Part I, II & III) — Code of Practice for Selection, Installation and Maintenance of Transformers.
- IS 2099 — Bushings for Alternating Voltages above 1000 V.
- IS 2705 — Current Transformers.
- IS 11171 — Specification for Dry-Type Power Transformers, as amended up to date.

- IEC 60076-11 — Power Transformers, Part 11: Dry-Type Transformers, as amended up to date.
- IEC 62271-1 / -100 / -200 / -202 — High-voltage switchgear, circuit breakers, metal-enclosed switchgear and Component sub-station standards, as applicable to the RMU and overall Component.

5.3.2 HT Switchgear — Ring Main Unit (RMU)

The HT switchgear shall be an 11 kV, indoor type, 1-way, non-extensible, SF6-gas-insulated Ring Main Unit (RMU), comprising:

- 1 No. manually operated Vacuum Circuit Breaker (VCB), in a stainless-steel gas tank, complete with accessories.
- Self-powered Overcurrent & Earth Fault (O/C & E/F) IDMT protection relay, requiring no external auxiliary supply for operation.
- Manual push buttons for closing/tripping of the VCB.
- SF6 gas pressure manometer, for visual monitoring of gas pressure and hence dielectric/interruption integrity.
- Padlocking facility on the operating mechanism, for safe isolation during maintenance.
- IP67 degree of protection for the SF6 gas tank.
- Series trip arrangement.
- Operating handle, Voltage Presence Indicating System (VPIS), and a manometer-integrated earthing switch.

The RMU shall be capable of terminating the incoming HT supply cable of 1 run x 1 core x 300 sq.mm unarmoured aluminium XLPE cable, 11 kV grade.

5.3.3 Transformer

The transformer shall be 1250 kVA, 11/0.433 kV, Dyn11 vector group, 3-phase, 50 Hz, dry-type cast-resin construction, air natural (AN) cooled, copper wound and suitable for continuous indoor service within the compact sub-station enclosure. The transformer shall conform to IS 2026, IS 11171 and IEC 60076-11, as amended up to date, and shall be complete with all accessories, temperature monitoring, protection, earthing and termination arrangements required for a complete installation.

- Winding material: 99.9% pure electrolytic grade copper.
- Insulation system: Cast-resin dry-type insulation, minimum Class F or higher as per the approved manufacturer design, conforming to IS 11171 / IEC 60076-11. The complete insulation system shall be suitable for the specified ambient and service conditions.
- Temperature rise: Winding temperature rise shall be within the limits specified in IS 11171 / IEC 60076-11 for the offered insulation class and cooling arrangement.

Embedded temperature sensors shall provide independent alarm and trip functions for each phase, with settings as recommended by the OEM and approved by the Engineer-in-Charge.

- Construction: The transformer shall be ventilated dry-type cast-resin construction with encapsulated HV windings and suitably insulated LV windings, rigidly braced against short-circuit forces, complete with a protective enclosure and natural-air ventilation suitable for installation within the compact sub-station. No liquid dielectric system shall be used.

5.3.4 On-Load Tap Changer (OLTC) and RTCC

The transformer shall be provided with an On-Load Tap Changer (OLTC) on the HV winding, with tapping range of +5% to -10% of rated voltage in steps of 2.5% each, or as finally approved, complete with motor drive mechanism, local/remote selector, raise/lower control, electrical and mechanical interlocks, tap-position indication and all accessories. A Remote Tap Changer Control (RTCC) panel shall be provided for automatic/manual voltage regulation and remote tap control, complete with AVR relay, annunciation, indication and communication interface with IBMS/BMS. The complete OLTC and RTCC scheme shall be as per approved OEM design, applicable standards and approved protection/control philosophy.

5.3.5 Terminal Markings & Connections

Relevant provisions of IS 2026 (Part IV) shall be applicable for terminal markings and connections.

5.3.6 Fittings and Accessories - Dry-Type Cast-Resin Transformer

The dry-type transformer shall be complete with all fittings, accessories, protection and monitoring devices necessary for safe and reliable operation, including cast-resin windings, winding temperature monitoring, alarm/trip contacts, protective enclosure, ventilation, lifting lugs, rollers, OLTC/RTCC, neutral terminal, body earthing terminals, terminal shrouds/cable boxes and removable access panels.

- Cast-resin encapsulated HV windings and suitably insulated LV windings, complete with rigid mechanical bracing.
- Digital winding temperature monitoring unit with suitable temperature sensors embedded in the windings.
- Alarm and trip contacts for winding over-temperature, with provision for remote indication / BMS interface.
- Winding temperature indication for all three phases, with alarm/trip settings and fan control where forced-air cooling is provided.

- Suitable protective enclosure, anti-condensation arrangement and ventilation provisions as required for the installation environment.
- Lifting lugs.
- Bi-directional / unidirectional rollers, as specified.
- Rating and terminal marking plate, as per Clause 5.3.9.
- On-Load Tap Changer (OLTC) with motor drive mechanism, local/remote controls, position indication and RTCC panel as per Clause 5.3.4.
- Additional neutral brought out separately on a bushing, for earthing.
- Earth terminals (2 Nos.) for body earthing.
- Removable inspection covers/panels and provisions for safe access, cleaning and maintenance.
- The transformer shall be completely oil-free; no insulating oil filling or oil-handling accessories shall be applicable.
- Suitable terminal shrouds / cable-box arrangements and removable access panels shall be provided for safe access to HV/LV terminations, sensors and routine maintenance points.
- HT and LT terminal/cable-box terminations as specified in Clause 5.3.7.
- Necessary hardware, clamps, lugs etc. for HV/LV terminations.

5.3.7 Terminal Arrangement

- a) H.T. Side: The RMU shall have a suitable-size air-insulated cable termination facility for the incoming 11 kV grade, 1 run x 1 core x 300 sq.mm, unarmoured aluminium XLPE cable (earthed system). Interconnection between the HT RMU and the transformer shall be by 1 Set of 1 core x 3 run x 95 sq.mm, XLPE insulated, aluminium single-core cable.
- b) L.T. Side: The transformer LT side shall have a suitable-size air-insulated flange-type termination arrangement to interconnect with the integral LT panel via aluminium bus bar, sized for the transformer's full-load current at 0.433 kV.

5.3.8 Integral LT Panel (Transformer Output Panel)

The Component sub-station shall include an integral LT panel dedicated to the 1250 kVA transformer output, distinct from the downstream building "Main LT Panel" described in Clause 5.4, comprising:

- Incomer: 1 No., 2000 A, 4-Pole Air Circuit Breaker (ACB), 50 kA breaking capacity, Electronic Draw-Out (EDO) microprocessor release, with protection functions O/C (Overcurrent), S/C (Short Circuit) and E/F (Earth Fault) via LSIG (Long time, short time, Instantaneous, Ground fault) protection curve, 6 A release.

- Multifunction meter, Class 1.0 accuracy (e.g., EM6400NG or equivalent), with LED display, Total Harmonic Distortion (THD) up to the 15th harmonic, and RS-485 communication port.
- T-N-C selector switch.
- Phase indication lamps: Red (R-phase), Yellow (Y-phase), Blue (B-phase), LED type, 230 V AC.
- ON indication lamp: Red, 230 V AC. OFF indication lamp: Green, 230 V AC. Trip indication lamp: Amber, 230 V AC.
- 1 No. Current Transformer, 2000/5 A ratio, Class 1.0, 15 VA, resin cast / nylon cast construction.
- 3 Nos. Single-Pole MCB, 6 A, 10 kA, C-curve. 4 Nos. Double-Pole MCB, 6 A, 10 kA, C-curve.
- CT shorting links and neutral link, complete with all accessories.

The following accessories shall additionally be provided within the panel: CFL lamp 230 V AC with holder; space heater with thermostat control; door limit switch, 6 A, 1 C/O; 6 A SP MCB, 10 kA, C-curve; 6 A DP MCB, 10 kA, C-curve; neutral link; 6 A, 240 V, 3-pin power socket and switch; toggle switch (ON/OFF), 6 A.

5.3.9 Main Bus Bar

Main aluminium bus bar (100% rated neutral), 2500 A, 4-pole (with 100% neutral), duly insulated with colour-coded heat-shrinkable sleeves, and supported on SMC/DMC bus bar supports and insulators.

5.3.10 Enclosure

The complete Component sub-station (RMU + Transformer + LT Panel) shall be housed in a factory-built, type-tested enclosure, offered in either of the following constructions as specified:

- Indoor Type: Floor mounted, MS CRCA sheet, 1.6 mm / 2 mm thickness, with 3 mm gland plate, duly powder coated in Siemens Grey shade (RAL 7032), complete with panel locks and PU gaskets on doors; dust and vermin proof, with structural reinforcement.
- Outdoor Type (alternative): Galvanised sheet steel construction, powder coated (RAL 7032, Siemens Grey), with IP54 degree of protection for the HT & LT switchgear compartments and IP34 degree of protection for the transformer compartment. Each compartment shall be provided with its own door and pad-locking arrangement, and a compartment illumination lamp with door-operated switch for the MV & LV compartments.

Panel accessories shall include door hinges, protection covers, panel name plate, feeder name plates, and hardware (nuts, bolts, plain and spring washers) for bus bar and panel construction, along with panel shrouding accessories.

5.3.11 Interconnection & Earthing

Interconnection between the HT RMU section, transformer and LT section shall be by aluminium bus bar and aluminium cable, comprising 1 Set of inter connection between the HT switchgear and transformer using 1 core x 3 run x 95 sq.mm XLPE aluminium single-core cable, and interconnection between the transformer and LT switchgear using aluminium bus bars. Internal earthing connections, including the transformer neutral, shall be by 50 mm x 6 mm aluminium strips.

5.3.12 Rating Plates

A rating plate of weatherproof material, bearing the data specified in the relevant clause of IEC 60076, shall be provided for the transformer; corresponding rating/nameplate data shall be provided for the RMU and LT panel as per their respective standards.

5.3.13 Joints and Gaskets

All gaskets used for making gas-tight and oil-tight joints shall be of proven, oil-resistant material.

5.3.14 Parallel Operation

Where two or more Component sub-stations/transformers are required to operate in parallel, the transformers shall have the same percentage impedance, same voltage ratio, same vector group and phase sequence.

5.3.15 Tests

5.3.15.1 Tests at Works

The offered Component sub-station is as per the latest IEC 62271-202. Only routine tests shall be conducted at the manufacturer's works during inspection; any special test required in addition to routine tests shall be conducted at extra cost, per the BOQ item's technical notes. All routine and other tests prescribed in IEC 60076 (for the transformer) and IEC 62271-200/-202 (for the RMU and Component assembly) shall be carried out at the manufacturer's works before dispatch, in the presence of an inspecting officer, and copies of test certificates furnished to the department. A copy of the type test certificate for impulse with stand and short-circuit withstand, conducted on the same type/design of transformer and RMU, shall be furnished for record; where no such test exists for the exact design/type offered, one unit shall be subjected to the relevant type test in consultation with the Inspector, at the firm's cost.

5.3.15.2 Tests at Site

In addition to tests at the manufacturer's premises, all relevant pre-commissioning checks and tests conforming to IS 10028 shall be carried out before energization, including the following, to be done particularly before cable jointing or connecting the bus bar:

- a) Insulation test between HV and earth, and HV to LV, with a 5000 V megger.

- b) Insulation test between LV and earth with a 500 V megger.
- c) All test results shall be recorded and reports submitted to the department.

5.3.15.3 Installation and Commissioning

The Component sub-station shall be installed in accordance with IS 10028, Code of Practice for Installation and Maintenance of Transformers. Necessary support channels/foundation shall be provided as per the manufacturer's foundation drawing. The Component sub-station shall be moved to its location and correctly positioned; wheels/rollers, where provided, shall be either locked or fitted with wheel stoppers. Wiring of devices shall be carried out as per approved drawings.

5.3.16 Technical Notes & Clarifications

- The offered Component sub-station is as per the latest IEC 62271-202; only routine tests shall be conducted at the manufacturer's works during inspection. Any special test required in addition shall be conducted at an extra cost.
- Any change to the above technical offer during the execution stage will have delivery and price implications, based on technical feasibility.
- The offer is based strictly on the BOQ; if any other Single Line Diagram (SLD), make list or technical specification is found to differ, the price shall be revised accordingly.
- Type test and special test shall be conducted at an extra cost only, if required beyond routine works testing.
- A separate cable box and marshalling box are not applicable to this Component sub-station.

5.3.18 Technical Data / Specification of 1250 kVA Component Sub-Station**(A) HT Switchgear — Ring Main Unit (RMU)**

#	Parameter	Specification
1	Type	Indoor, 1-way, non-extensible, SF6-insulated Ring Main Unit (RMU)
2	Circuit breaker	1 No. manually operated Vacuum Circuit Breaker (VCB), in stainless steel tank
3	Rated voltage	11 kV
4	Protection relay	Self-powered O/C & E/F IDMT relay
5	Operation	Manual push buttons for closing/tripping; series trip provided
6	Gas tank protection	IP67, tank material SS304 with 2.5mm thickness
7	Indication / Interlocks	SF6 gas pressure manometer; Voltage Presence Indicating System (VPIS); manometer-integrated earthing switch; padlocking facility
8	Cable termination capability	1 Run x 1 Core x 300 sq.mm Unarmoured Aluminium XLPE Cable
9	Internal Arc	21kA/ 1sec AFLR for tank & cable compartment.

(B) Transformer — 1250 kVA, 11/0.433 kV

#	Parameter	Specification
1	Type	Dry-type cast-resin distribution transformer with On-Load Tap Changer (OLTC) and RTCC
2a	HV Winding Rating	1250 kVA
2b	LV Winding Rating	1250 kVA
3	Winding material	99.9% pure electrolytic grade copper
4	Insulation class	Class F or higher insulation system, suitable for cast-resin dry-type transformer
5	Thermal stability of insulating materials in service	As per IS 1180 / IEC 60076
6a	Rated no-load voltage — HV winding	11 kV
6b	Rated no-load voltage — LV winding	0.433 kV
7	Rated frequency	50 Hz (+/- 5%)
8	Number of phases	Three
9a	Connection — HV winding	Delta
9b	Connection — LV winding	Star
10	Vector group	Dyn11

#	Parameter	Specification
11	Reference ambient temperature	40°C
12	Impedance	As per manufacturer standard / IS 2026 (to be confirmed at award stage)
13a	Winding temperature rise	As per IS 11171 / IEC 60076-11 for the offered insulation class and approved design.
13b	Not applicable for dry-type transformer.	Not applicable for dry-type transformer.
14a	Tap changer type	On-Load Tap Changer (OLTC) with RTCC
14b	Tap range	+5% to -10%
14c	Number of steps	7 positions, in steps of 2.5% each
15	Cooling	AN (Air Natural), with AF provision where required by approved design
16	Losses	Guaranteed no-load and load losses shall comply with applicable statutory energy-efficiency requirements and relevant IS/IEC provisions for dry-type transformers. The bidder shall submit guaranteed loss data and supporting type-test certificates for the offered transformer.
17a	Terminal arrangement — HT side	Suitable air-insulated cable termination arrangement (at the RMU) for 11 kV grade, 1 run x 1 core x 300 sq.mm unarmoured aluminium XLPE cable
17b	Terminal arrangement — LT side	Suitable arrangement for aluminium bus bar termination to the integral LT panel
18	Sealing / tank construction	Cast-resin dry-type construction, without insulating oil, conservator or breather; complete with protective enclosure

(C) Integral LT Panel — Transformer Output

#	Parameter	Specification
1	System	415/433 V (approx. 0.433 kV secondary), 3 Phase, 4 Wire, 50 Hz
2	Incomer	1 No., 2000 A, 4-Pole ACB, 50 kA, EDO microprocessor release, LSIG protection (O/C, S/C, E/F), ZSI, 4CO Aux Contact.
3	Metering	Multifunction meter with RMS and Energy parameter measurement, V, A, F, KW, KVA, KAVR, KWH, KVARH, KAVH, Class 1.0, LED display, THD up to 15th harmonic, RS-485 port
4	Selector switch	T-N-C voltmeter selector switch
5	Indication lamps	Phase R/Y/B — LED, 230 V AC; ON — Red; OFF — Green; Trip — Amber

#	Parameter	Specification
6	Current Transformer	2000/5 A, Class 1.0, 15 VA, resin cast / nylon cast
7	MCBs	3 Nos. SP 6 A, 10 kA, C-curve; 4 Nos. DP 6 A, 10 kA, C-curve
8	Main bus bar	2500 A, 4-Pole (100% Neutral), Aluminium, insulated with colour-coded heat-shrinkable sleeves, on SMC/DMC supports
9	Accessories	CT shorting links, neutral link, CFL lamp with holder, space heater with thermostat, door limit switch, power socket & switch, toggle switch

5.11 AUTOMATIC FIRE SUPPRESSION FOR ELECTRICAL SUB-STATION PANELS ETC. (HT, ALL LT PANEL, METER PANEL, APFC PANEL):

The system shall be a pre-engineered, in cabinet FK-5-1-12 or equivalent compound system and shall provide and extinguishing concentration of no less than 1.3 times the minimum extinguishing concentration of fire source within the enclosure.

UL/FM approved extinguishing agent (F-5-1-12) clean agent filled in a PESO approved filling station and agent filled in stored pressure type cylinder with DLP valve assembly with automatic valve, push in connector for tube, safety burst disc at 28 bar and mounting bracket, end of the adopter and low-pressure switch for mounting system activation. Container as per IS 7285 stored pressure type fitted with pressure gauge, UV resistance, Operating pressure 15 Bar, Hydraulic pressure tested to 250 Bar pressure 305Bar, Red power coated. The gas extinguishing system be UL/LPCB approved.

UL certified linear pneumatic heat detection tube for automatic fire detection & suppression system made by special modified polyamide (PA), colour red RAL300, burst temperature 100 deg "C" to 140 deg "C", inner diameter 4mm, outer diameter 6mm. Pressurized with dry nitrogen at 15 Bar pressure with all necessary fittings & supports.

Master control unit with audio visual alarm control panel (IP54 third party rating), 2 NO/NC potential free relay contact for main fire alarm/ BMS/SCADA integration. Gas discharge LED indicator, battery LED indicator, system status LED indicator, AC power ON LED indicator.

The In-cabinet Fire suppression system shall be manufactured, assembled and supplied from company with the following certifications and procedures ISO9001:2015, 14001:2015, 45001:2018 registered companies. All certifications must be current and available upon request.

Bidder should have UL listed/PESO approved filling plant for quality assurance. Procedure in accordance with UL/LPCBV follow up audit requirements. Manufacturer's original test certificate clearly mentioning the serial number of cylinders being supplied and site detail is required. The cylinders being supplied should be DOT/CE approved and a certificate with regards to the same is required to be submitted. The system shall be supplied by authorized distributor and contractor shall submit authorization letter from Manufacturer.

SH: C– 6A

D.G. SETS

- 6.1 The work shall be carried out as per CPWD General Specifications for Electrical Works Part-VII (DG SETS-2013), CPWD General Specifications for Electrical Works Part-IV (SUBSTATION) 2017, CPWD General Specifications for Electrical Works Part-I (Internal) 2023, Part-II (External) 2023, as amended and corrected up to date. Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026, shall be the latest norms as modified by Government of India on the date of execution.
- 6.2 The Scope of works includes Essential Load calculation, designs for distribution, 3 Nos. 250 KVA DG set with AMF panel, fabrications of synchronizing panel, testing, inspection as may be necessary before dispatch, dispatch, delivery at site, installation, testing, commissioning, inspections from competent authority and handing over to client in fully working condition
- 6.3 The Contractor shall be required to obtain NOC from appropriate authority. The work shall be deemed to be completed only after receiving NOC from CEA & any other local body and rectification if any pointed out by the authority. Enabling all liaison work/ arranging inspection of local body or statutory body shall be within scope of the contractor.
- 6.4 Capacity of DG set shall be 3 Nos. 250 KVA DG set with AMF panel.
- 6.5 Following essential load shall be connected to DG set supply.

S no	Description
1	Common services of Grade B & C
	Water lifting pump B & C
	Fire Fighting motor B & C
2	Common service of Grade D & E
	Water lifting pump D & E
	Fire Fighting motor D & E
3	Basement Light Load
4	STP Load
5	Mechanical Ventilation
6	Fire Fighting
7	Compound/Street lighting
8	Motorised Gates
9	UPS load including community centre
10	Lift load
11	Pump Panel

- 6.6 The D.G. Sets shall be kept in the space specified on drawings on suitable foundations and connected to the synchronizing/common-services panel by suitable XLPE insulated LT armoured aluminium cables. For each 250 kVA DG set, the tender cable schedule shall provide minimum 2 runs of 3.5-core x 240 sq.mm XLPE insulated aluminium armoured cable to the designated common-services/synchronizing panel, together with 1 run of 8-core x 2.5 sq.mm copper control cable. Final cable sizing shall be verified by the contractor through approved load, voltage-drop, short-circuit and derating calculations before procurement. The incomers of the panels shall be properly electrically and mechanically interlocked with each other and with the bus coupler to prevent unintended paralleling/short-circuit.
- 6.7 The outgoings of synchronizing Panel will be connected to the main LT panel with the help of sandwich type aluminium busduct.
- 6.8 The DG set shall be silent type with acoustic enclosure and as per latest CPCB norms at the date of execution.
- 6.9 The height to the exhaust pipe shall be as per CPWD specification and CPCB norms modified by Government of India on the date of execution.
- 6.10 Suitable size MS structure with RCC foundation shall be provided for supporting the exhaust pipes. The MS structure shall be designed from the structural Engineer.
- 6.11 Brief technical details of 3(Three) Nos, 250 KVA silent DG set, as per latest CPCB norms modified by Government of India on the date of execution. Silent type Diesel Generating set having Prime Power Rating of 250 KVA 415 Volts at 1500 RPM, 0.8 lagging power factor at 415V suitable for 50 Hz, 3 phase system and consisting of the followings:
- i) Synchronous alternator- rated at 250 KVA , 415 volts at 1500 RPM, 3 phase 50 Hz, Self-excited, screen protected, self-regulated, brush less alternator, Horizontal foot mounted in single bearing construction with SPD Pen closure, IP-23 protection and H class of insulation.
 - ii) Diesel Engine—The engines shall be direct injection multi cylinder, vertical, 4 stroke cycles, water cooled, turbo charged diesel engine developing suitable BHP for giving a prime power output of 250KVA at 0.8 P.F. at the load terminals of the respective alternators (exclusive of the power requirements of auxiliaries driving power from the engine) (as per ISO 8528 part-I).
 - iii) The engines shall be capable for delivering specified prime power rating at variable loads for PF of 0.8 lag with 10% overload available in excess of specified output for one hour after every 12 hours. The average load factor of the engine over period of 24 hours shall be 0.85 for prime power output. The engines shall conform to BS 5514/ BS 649/ IS 10000/ ISO: 3046 amended upto date.
 - iv) The engines shall be fitted with all the accessories as per CPWD General Specifications for Electrical Works Part-VII (DGSETS-2013) as amended and corrected upto date.
 - v) Engine mounted Instrument Panel shall be as per manufacturer standard with digital display for indication of various parameters etc.
 - vi) In addition to the daily fuel service tank provided by the OEM in the DG set canopy as per the Manufacturer's standard, a fuel tank of minimum 990 litres capacity, fabricated out of 3 mm thick MS sheet, complete with all standard accessories and fuel piping between fuel tank and daily service tank with GI heavy-duty (Class 'C')

pipes of suitable diameter, complete with valves, level indications & accessories, etc., as required as per specifications.

- vii) Dry exhaust system with residential type exhaust silencer with catalytic converter shall be provided.
- viii) 12 V/24 V DC starting system with suitable nos. of batteries (25 plates, 180 Amp. Hour capacity, lead-acid type) or as per OEM standard shall be provided.
- ix) Acoustic and weatherproof enclosure as per CPCB norms, as applicable at the date of execution, with arrangement for fresh air intake for cooling of the engine & alternator, suitable extraction fan discharging hot air into the atmosphere as per specification shall be provided.
- x) Synchronization panel with bypass system complete with relays, timers, set of CTs for metering & protection and multifunction meter to indicate currents, phase and line voltages, frequency, KVA, power factor, KWH & provision for overload, short circuit, restricted earth fault, under-voltage control, control cabling from AMF panel to diesel engine and elsewhere if required, all complete and interlocking, including the following:
- xi) Suitable rating Four Pole MCCB with rotary handle conforming to CPWD General Specifications for Electrical Works Part-IV (Substations)-2013, as amended and corrected up to date, and Component sub-station this bid for each DG set.

6.12 Terminal Boxes:

Terminal boxes shall be suitable for terminating multiple nos. of required-size UG cables. The terminal box shall be suitable to withstand the mechanical and terminal stresses developed due to any short circuit at the terminals.

6.13 Earthing system:

Earthing system including type & selection of earth electrodes, earth conductor, earth bus and protective conductors etc shall be as per CPWD General Specification for Elect. Works (Part-II Internal) 2023 as amended and corrected up to date.

6.14 Cabling

Power cabling from MCCB near alternator to main panel shall be done with multiple numbers of required size Cross-linked XLPE insulated LT armoured Aluminium cable and shall be as approved by engineer-in-charge. Multi core armoured copper cable of 1.1 KV grade shall be used for inter connecting the engine controls with the switch gear and other equipment's.

6.15 Foundation

The Genset along with acoustic enclosure shall be installed on suitable CC foundation as per the OEM design. Genset should be mounted on AVM's pad inside the enclosure.

6.16 Acoustic enclosure:

The enclosure shall be out door type and to reduce the sound level as per CPCB norms as modified by Government of India on the date of execution and CPWD General Specifications for Electrical Works Part-VII (DG SETS-2013) as amended and

corrected up to date. The enclosure shall be provided by the OEM as per CPCB certification and corrected up to date on the date of execution.

6.16.1 The canopy will enclose the following items inside:

- i) Diesel Engine.
- ii) Alternator.
- iii) ControlPanel.
- iv) Starting Battery.
- v) Daily service fuel tank.
- vi) MCCB (FourPole)of suitable capacity.
- vii) Other accessories so that the DG set with all items and accessories could be placed in open space without any other requirement of Diesel Generator room suitable to with stand all weather conditions.

6.16.2 Adequate ventilation shall be provided to meet total air requirement. Suitable numbers and sizes of ventilation fans complete with necessary auto-start arrangement shall be provided as per the manufacturer's design. It shall also be provided with auto-stop arrangement to stop the fan after 5 minutes of the stopping of D.G. sets. There should be a provision of DC emergency light operated automatically with door opening. The inside of the enclosure shall be illuminated by the LED tube with the help of PVC insulated FRLS copper conductor wiring in recess/surface conduit suitable for single-phase AC supply and shall be operated automatically with door opening as well as manually. To avoid re-circulation of hot air, durable sealing shall be done between radiator and canopy. The acoustic enclosure should be suitable for cable connection. Such arrangements on acoustic enclosure should be waterproof and dust-proof, conforming to IP-65 protection.

6.17 DGControlPanel

DG control panel shall be manufacturer standard and shall provide the following minimum operational requirements. Control panel must be BMS compatible and it should have RS485 port with ModBus / Bacnet / LON interface protocol:

6.17.1 Automode:

- i) A line voltage monitor shall monitor supply voltage in each phase. When the mains supply fails completely or falls below set value variable between 80% to 95% of the nominal value on any phase, the monitor module shall actuate startup of diesel engine. To avoid initiation due to momentary drips or system disturbance, a time delay adjustable between 0.5 to 5 seconds shall be incorporated in the startup module.
- ii) A three-attempt starting facility shall be provided with the sequence, 6 seconds ON, 5 seconds OFF, 6 seconds ON, 5 seconds OFF, and 6 seconds ON, if at the end of the third attempt the engine does not start, engine shall be locked out to start. A master timer shall be provided for the function. Suitable adjustment timers be incorporated which will make it feasible to vary independently ON-OFF setting periods from 1–10 sec. An audio-visual alarm shall be given.
- iii) Suitable adjustment timers shall be incorporated which will make it possible to vary independently ON-OFF setting periods from 1 second to 10 seconds. If on

starting the alternator does not build up voltage after the first or any start, as the case may be, further starting attempts will not be made and the starting facility will be reset.

- iv) Once alternator has built up voltage, signals shall be provided to each of the alternator circuit breaker and mains circuit breakers as required. The Mains supply circuit breaker shall open before the alternator circuit breaker closes. System provided in the logic panel shall check and ensure that all the engine oil pump etc. are running and healthy. In case of any fault in engine auxiliaries, the system shall automatically stop the DG set and audio-visual alarm shall be given.
- v) When the mains supply is restored and is healthy as sensed by the line voltage monitor, the load shall be transferred automatically to mains by providing signals to mains and alternator circuit breakers as required. The alternator supply circuit shall open before mains circuit breaker closes.
- vi) The diesel alternator set reverts to standby mode for next automatic operation.

6.17.2 Manual mode:

- i) Under manual mode it shall be possible for the operator to start the generator by 'Pressing the (START) push button.
- ii) Three attempt starting facility shall also be operative for the startup function.
- iii) Alternator and mains circuit breakers "CLOSE" and "TRIP" operations as required shall be manual by pressing the appropriate push button on the panel "closure shall be feasible only after alternator has built up voltage. If the load is already on "MAINS" pressure on "CLOSE" button shall be ineffective.
- iv) Engine shut down other than due to fault shall be manually by pressing a "STOP" button, in manual mode.

6.18 Test mode

- i) When under "TEST" mode, pressure on "TEST" button shall complete the startup sequence simulation and start the engine. The simulation will be that of mains failure.
- ii) Engine shall build up voltage, but the set shall not close alternator circuit breaker when the load is on the mains. Monitoring performance of voltage/frequency etc. should be feasible without supply to load.
- iii) If during "TEST" run the power supply has failed, the load shall automatically get transferred to alternator.
- iv) Bringing the mode selector to auto position shall shut down the sets as per the required sequences. Suitable rating Four Pole MCCB (as per SLD) for 250 KVA DG set conforming to CPWD General Specifications for Electrical Works Part-IV (Sub stations) - 2013, as amended and corrected up to date, shall be provided for each DG set in coming side (one no. each in synchronization panel) fitted with interlocked door, automatic safety shutters, mechanical ON/OFF, independent electrical and manual closing mechanism and one No. four pole MCCB for 250 KVA DG set (as per SLD) load current electrically operated horizontal draw-out type with microprocessor release with short circuit, overload & earth fault protection fitted with interlocked door, automatic safety shutters, mechanical ON/OFF, independent electrical and manual spring closing mechanism, service/test/isolated position indicators and frame earthing contact in outgoing of synchronization panel.

- a) Control system equipment and components such as PLC, relays, contactors, timers, etc., both for automatic operation on mains failure as well as for manual operation.
- b) Suitable capacity 4-strip heat-shrinkable sleeved aluminium busbars (100% neutral).
- c) Necessary controls for testing the generating set's healthiness, with test mode and with load on mains.
- d) Necessary instruments and accessories such as multi-function meter/Load Manager in all incoming feeders to read Voltage, Current, power factor, KW, KWH, Frequency, etc.
- e) LED-type indication lamps, MCBs, terminal blocks, push buttons, control switches, etc., as required in all incoming feeders.
- f) Battery charger with trickle and boost selection.
- g) Cable terminals shall be suitable for the number, size and type of cables as per design loads. Adequate spacing shall be allowed for spreading of cable tails to avoid stress on the insulation or terminals.
- h) All internal wiring, connections, etc., as required.
- i) Terminals for neutral conductors for three-phase and neutral circuits shall be the same size as for phase conductor, except where reduced-section neutral cable cores are indicated.

6.19 Automation failure operation

- i) Operation of DG Sets shall be monitored and controlled by PLC panel. In case of mains failure, this logic panel shall control auto changeover from mains to DG Sets supply and interlocking the MCCBs/ACBs, auto load management functions along with annunciation for alternate control and protection. The logic panel shall be provided with a total manual override facility.
- ii) The logic panel shall be complete with all Auxiliary Relays, Timers, Contactors, Programmable logic controller of approved make, control wiring with not less than 1.5 sq. mm. 1.1 KV grade FRLS PVC insulated copper conductor wires, etc. The PLC-based logic panel shall ensure providing suitable software interlocks.

6.20 Automatic start & stop of Engine.

The system should come in operation after sensing of grid failure and automatically start & stop of engine depending on pre-defined load setting on the PLC. The automatic start & stop of engine, backup protection and sequence of operation shall be as described in Chapter 3 of CPWD General Specifications for Electrical Works Part-VII (DG SETS-2013)).

6.21 Synchronizing cum PLC panel.

Synchronization panel shall be cubical type LT panel suitable for 415 V, 3 Phase, 4 Wire, 50 Hz AC supply system, fabricated in compartmentalized (preferably) design from CRCA sheet steel of 2 mm thick for frame work and covers, 3 mm thick for gland plates, i/c cleaning & finishing complete with 7-tank process for powder coating in approved shade, having suitable capacity extensible type 4 strip (4 pole) aluminium alloy bus bars of high conductivity, DMC/SMC busbar supports, with short circuit

withstand capacity of 31 MVA for 1 Sec., bottom base channel of MS section not less than 100 mm × 50 mm × 6 mm thick, fabrication shall be done in transportable sections, entire panel shall have a common copper earth bar of size 25 mm × 5 mm at the rear with 2 Nos. earth studs, solid connections from main bus bar to switch gear with required size of Al. bus bars and control wiring with sq. mm. PVC insulated copper conductors/cable, cable alleys, cable gland plates in two half, i/c providing following switchgears.

- a. Suitable rating Four Pole MCCB for 250 KVA load current with rotary handle conforming to CPWD General Specifications for Electrical Works Part-IV (Substations)-2013, as amended and corrected up to date, shall be provided for each DG set in incoming side (one no. each in synchronization panel), fitted with interlocked door, automatic safety shutters, mechanical ON/OFF, independent electrical and manual closing mechanism and frame earthing contact in outgoing of synchronization panel.
- b. Control system equipment and components such as PLC, relays, contactors, timers, etc., both for automatic operation on mains failure as well as for manual operation.
- c. Suitable capacity 4-strip heat-shrinkable sleeved aluminium busbars (100% neutral).
- d. Necessary controls for testing the generating set's healthiness, with test mode and with load on mains.
- e. Necessary instruments and accessories such as multi-function meter/Load Manager in all incoming feeders to read Voltage, Current, power factor, KW, KWH, Frequency, etc.
- f. LED-type indication lamps, MCBs, terminal blocks, push buttons, control switches, etc., as required in all incoming feeders.
- g. Battery charger with trickle and boost selection.
- h. Cable terminals shall be suitable for the number, size and type of cables as per design loads. Adequate spacing shall be allowed for spreading of cable tails to avoid stress on the insulation or terminals.
- i. All internal wiring, connections, etc., as required.
- j. Terminals for neutral conductors for three-phase and neutral circuits shall be the same size as for phase conductor, except where reduced-section neutral cable cores are indicated.

6.22 Automation failure operation

- i) Operation of DG Sets shall be monitored and controlled by PLC panel. In case of mains failure, this logic panel shall control auto changeover from mains to DG Sets supply and interlocking the MCCBs/ACBs (as per SLD), auto load management functions along with annunciation for alternate control and protection. The logic panel shall be provided with a total manual override facility.
- ii) The logic panel shall be complete with all Auxiliary Relays, Timers, Contactors, Programmable Logic Controller of approved make, control wiring with not less than 1.5 sq. mm. 1.1 KV grade FRLS PVC insulated copper conductor wires, etc. The PLC-based logic panel shall ensure providing suitable software interlocks.
- iii) The PLC panel shall have all necessary OFC infrastructure, i/c contact, etc., to connect to PLC load to OFC network. The PLC load should have programmed and wired such network operation and DG set for the common control switch shall be possible.

6.23 Automatic start &stop of Engine.

The system should come in operation after sensing of grid failure and automatically start & stop the engine depending on the pre-defined load setting on the PLC. The automatic start & stop of engine, backup protection and sequence of operation shall be as described in Chapter 3 of CPWD General Specifications for Electrical Works Part-VII (DG SETS-2013)

6.24 DG set shall be installed with stack formation. For structural details, please follow the drawing and as per manufacturer's guidelines.

6.25 The emission limits of DG sets shall be as per Gazette Notification GSR 804 (E) dated 03-11-2022 of Ministry of Environment and Climate Change (The Environment (Protection) Third Amendment Rules 2022).

6.26 The factory inspection, trial run, running-in period, safety measures and statutory clearances shall be as per CPWD specification for DG Set 2013 and amended up to date.

6.27 Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.

COMPONENT C – 6B

ONLINE UPS System

- 6B.1 The scope of work covers providing 3 Nos. online UPS systems, each of 20 kVA capacity, giving an aggregate installed UPS capacity of 60 kVA, with not less than 30 minutes battery backup for ELV services and emergency lighting loads in the residential buildings/blocks, Grade F residence, RD Bungalow, Community Centre, Basement and other locations indicated on approved drawings. Each UPS shall be suitable for 415 V AC, 3 Phase + Neutral + Earth input and 415 V AC, 3 Phase + Neutral output, 50 Hz, true online double-conversion operation, complete with rectifier, inverter, static bypass, maintenance bypass, battery charger, external VRLA/SMF battery bank and battery rack, and shall be compatible with the approved IBMS/BMS interface.
- 6B.2 The contractor shall submit load estimation sheets to provide online uninterrupted power supply to the following area and other installations under the scope of work. Capacity of UPS shall be decided on the basis of load calculations. UPS backup will be provided for common area ELV load and 15% lighting of common area at each floor for avoiding a total blackout situation as emergency lighting in all common areas.
- 6B.3 Following critical load shall be connected to UPS Supply.
- a) L V load (CCTV, EPBAX, Networking, Fire Alarm System, BMS etc.)
 - b) Light Load Community Centre Including Computer Pts.
- Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.
- 6B.5 The online UPS system shall comprise 3 Nos. independent / modular true-online double-conversion UPS units of 20 kVA each (total installed capacity 60 kVA), each with minimum 30 minutes battery backup at full rated load. Input and output shall be 415 V, 3 Phase + Neutral + Earth, 50 Hz. The UPS shall be DSP/microprocessor controlled, IGBT/PWM based, with input power factor ≥ 0.99 , output power factor up to unity, input THDi $< 3\%$, output voltage regulation $\pm 1\%$, static bypass, maintenance bypass, EPO, battery circuit protection and all protections for overload, short-circuit, over-voltage, deep discharge and over-temperature. Each UPS shall have its own suitably sized battery bank and power/control cabling, complete as required.

SH: C-7
CCTV SYSTEM

7.1 SCOPE OF WORK

Scope of work involves design, drawing, supply, installation, testing and commissioning of suitable number of Day / Night IR IP Based cameras in all the buildings at entrance gates, lift lobby and staircase of Ground/ Stil/ Basement/common area floor of each residential building/block, inside of the lift car, around the boundary wall, entrance gates, club, campus etc. at suitable intervals and all the main gates, with suitable mounting arrangement (on Wall/ Powder coated MS poles in a Vandal Proof Housing) etc complete as required to make system fully functional. It will be the responsibility of the vendor/bidder to make the entire system fully functional as per the specifications. Vendor/bidder shall consider any equipment/devices required to make the system functional if not mentioned herewith.

The scope also included guaranty/warranty of entire installation and equipment's/accessories supply by them as per OEM.

7.2 The work shall be carried out as CPWD General Specifications of Electrical Works Part-I 2023 corrected up to date, Part-II (External) 2023 as amended and corrected up to date, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026, IS standard, good engineering practice.

7.3 Details of area were proposed to install CCTV system: -

Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.

Sl. No.	Name of Building/ Block	Area to be covered by CCTV system
1	RD BUNGLOW	Entrance & common circulation space of Ground/ First floor
2	GRADE D & E	Entrance & common circulation space of Ground/ Stilt/ typical floor
3	GRADE F	Entrance & common circulation space as per approved architectural/CCTV layout.
4	GRADE B & C	Entrance & common circulation space of Ground/ typical floor
5	COMMUNITY CENTRE	Entrance & common circulation space of Ground/ typical floor

6	BASEMENT	Entrance & common circulation space of Basement
7	Outdoor area (Boundary and campus)	Entire outdoor and along boundary wall.
8	All buildings having lifts	Inside each lift car and each lift machine room.

7.4 (a) IP Based CCTV System for Building Security with PTZ, Motorized Varifocal Cameras, cabling, to Monitor and supervise the entire area for security purpose, as well as record and inform officials on unwanted, untoward incidents. It is also essential to have recorded videos/images to be stored for minimum 180 days of all critical areas to facilitate investigations of reported incidents. The hardware required for the system including servers VMS & Recording, CCTV VMS software license, Workstations with latest configuration Desktop PC, Monitors, CAT-6 /CAT-6A, Web smart managed POE switches, Patch Cable to connect the camera to nearest POE enabled LAN point, Cables, connectors, conduits, power supplies etc. OFC Backbone up to core switch and suitable racks in CCTV control room.

a) A Closed-Circuit Television (CCTV) system is a surveillance system used to capture and transmit video streams to a Control Centre for real-time monitoring and for recording. The main purpose of a CCTV system is to enhance the security in the areas where it is installed. The recordings are useful to the security service and even security bodies in case of a security event or incident in the facilities.

7.5 IP BASED CCTV SPECIFICATIONS

7.5.1 Dome Camera (Indoor Type)

Sr. No.	Hardware	Comply (Yes/No)
1.	Camera shall utilize high sensitivity 5-Megapixel CMOS sensors with 1/2.7 Sensor”, 5MP Progressive Scan CMOS Sensor and Active Pixel count Effective Pixels 2880(H)x1620(V)	
2.	Minimum Illumination Colour 0.003lux @ F1.6(AGC ON); B/W 0 lux @ IR ON	
3.	Camera shall have automatic shutter	
4.	Camera shall integrate 2.8mm/3.6mm Lens, F No. 1.6	
5.	Camera shall have IRIS Control: Fixed/Auto	
6.	Camera shall integrate IR cut filter with auto switch Day/ Night/ Auto/ Image/ Schedule)	
7.	IR distance shall be up to 30m-40m	
8.	Camera shall have Output PAL/NTSC adjustable	
9.	Camera shall offer WDR up to 120dB, (Off/On, WDR coefficient Range)	

10.	Camera shall support to adjust Image Setting Brightness, Contrast, Sharpness, Saturation, Colour, and 3D DNR noise reduction	
11.	Camera shall offer BLC/HLC modes of backlight compensation.	
12.	Camera shall support to Automatic Gain Control, Automatic White Balance, Anti-Flicker, Mirror & Corridor mode	
13.	Camera shall have Digital Zoom feature	
	Smart Event	
14.	Camera shall offer intelligent analysis functions Human Detection, Face detection, Line Crossing Detection, Crowd Density, Tripwire, Object Removed, Object Left Behind	
15.	Camera shall support Motion Detection Support (8 level)	
16.	Camera shall offer event Trigger Schedule Linkage: Capture, email, FTP upload.	
	Audio & Video Encoding	
17.	Camera shall offer H.265+/H.265/H.264+/H.264 Encoding image compression format.	
18.	Camera shall offer the following resolution streams: Mainstream@30fps 5MP (2880x1620), 4MP (2560x1440), 3MP (2304x1296), 1080P (1920x1080), 720P (1280x720), Substream@30fps 720P (1280x720), VGA (640x480), QVGA (320x240), Third stream@30fps VGA (640x480), QVGA (320x240)	
19.	Camera shall offer CBR/VBR bit rate control, bit rate is between 256kbps-8Mbps suitable for different image quality and fluency requirements.	
	Network Function	
20.	Camera shall support the following protocols: TCP/IP, HTTP, DHCP, DNS, DDNS, RTP/RTSP, SMTP, NTP, UPnP, SNMP, HTTPS, FTP	
21.	Camera shall conform to the ONVIF Profile S, G, T.	
22.	Camera shall support Authorized username and password, HTTPS with a password, AES Encryption for the password, RTSP Validation	
23.	Camera shall offer Up to 4 area privacy masks.	
24.	Camera shall support setting Character Overlay (OSD) Title, time, and date overlay.	
25.	Camera shall support setting Unicast and Multicast Streaming.	
26.	Camera shall support General Function like User Authentication, IP address filtering, Complicated password	
27.	Camera shall offer Built In web server with an interactive Graphical User Interface	

28.	Camera shall support UPnP, ONVIF Discovery Interface	
	Interface	
29.	Camera shall integrate 1*RJ45 10M/100M Ethernet Port.	
30.	Camera shall support Built-in-mic	
31.	Camera shall support standard 256G Micro SD card storage.	
	General	
32.	Camera shall have Power Supply PoE(802.3af)/DC 12V±10% with Power Consumption 4W-5.5W (IR ON), 2W-3W (IR OFF)	
33.	Camera shall offer IP67 Weather resistant Protection Complaint with IK10	
34.	Operating Conditions shall be -35 °C ~ 60 °C Humidity 95% or less (non-condensing)	
35.	Camera shall integrate 1 reset button.	
	Certifications & Standards	
36.	Camera shall have the following Certifications: CE, BIS: ER01, FCC, ROHS and REACH.	

7.5.2 Fixed Type Bullet Camera Specification:

Sr. No.	Hardware	Comply (Yes/No)
1.	Camera shall utilize high sensitivity 5 Megapixel CMOS sensors with 1/2.7 Sensor”, 5MP Progressive Scan CMOS Sensor and Active Pixel count Effective Pixels 2880(H)x1620(V)	
2.	Minimum Illumination 0.003Lux @ (F1.6, AGC ON); 0 Lux with IR	
3.	Camera shall have automatic shutter	
4.	Camera shall integrate 2.8mm/3.6mm Lens, F No. 1.6.	
5.	Camera shall integrate IR cut filter with auto switch (Day/Night/Auto/Image/Schedule)	
6.	IR distance shall be up to 30m.	
7.	Camera shall offer WDR up to 120dB, (Off/On, WDR coefficient range)	
8.	Camera shall support to adjust Image Setting Brightness, Contrast, Sharpness, Saturation, Colour, and 3D DNR noise reduction	
9.	Camera shall offer BLC/HLC modes of backlight compensation.	
10.	Camera shall support to Automatic Gain Control, Automatic White Balance, Anti-Flicker, Mirror & Corridor mode	
11.	Camera shall have Digital Zoom feature	
	Smart Event	
12.	Camera shall offer intelligent analysis functions Human Detection, Face detection, Line Crossing Detection, Crowd Density, Tripwire, Object Removed, Object Left Behind	

13.	Camera shall support Motion Detection Support (8 level)	
14.	Camera shall offer event Trigger Schedule Linkage: Capture, email, FTP upload.	
	Audio & Video Encoding	
15.	Camera shall offer H.265+/H.265/H.264+/H.264 Encoding image compression	
16.	Camera shall offer the following resolution streams: Mainstream@30fps - 5MP (2880x1620), 4MP (2560x1440), 3MP (2304x1296), 1080P(1920x1080) 720P(1280x720), Sub stream@30fps - 720P(1280x720), VGA (640x480), QVGA (320x240) Third stream@30fps – VGA(640x480), QVGA(320x240)	
17.	Camera shall offer CBR/VBR bit rate control, bit rate is between 256kbps-8Mbps suitable for different image quality and fluency requirements.	
	Network Function	
18.	Camera shall support the following protocols: TCP/IP, HTTP, DHCP, DNS, DDNS, RTP/RTSP, SMTP, NTP, UPnP, SNMP, HTTPS, FTP	
19.	Camera shall conform to the ONVIF Profile S, G, T.	
20.	Camera shall support Authorized username and password, HTTPS with a password, AES Encryption for the password, RTSP Validation	
21.	Camera shall offer Up to 4 area privacy masks	
22.	Camera shall support setting Character Overlay (OSD) Title, time, and date overlay.	
23.	Camera shall support setting Unicast and Multicast Streaming.	
24.	Camera shall support General Function like User Authentication, IP address filtering, Complicated password	
25.	Camera shall offer Built In web server with an interactive Graphical User Interface	
26.	Camera shall support UPnP, ONVIF Discovery Interface	
	Interface	
27.	Camera shall integrate 1*RJ45 10M/100M Ethernet Port.	
28.	Camera shall support Built-in microphone	
29.	Camera shall support standard 256G Micro SD card storage.	
	General	
30.	Camera shall have Power Supply PoE(802.3af)/DC 12V±10% with Power Consumption 4W-5.5W (IR ON) ,2W-3W (IR OFF)	
31.	Camera shall offer IP67 Weather resistant Protection Complaint with IK10.	
32.	Operating Conditions shall be -35 °C ~ 60 °C Humidity 95% or less (non-condensing)	
33.	Camera shall integrate 1 reset button.	
	Certifications & Standards	
34.	Camera shall have the following Certifications: CE, BIS: ER01, FCC, ROHS and REACH.	

7.5.3 Motorized Varifocal Type Bullet Camera Specification

Sr. No.	Hardware	Comply (Yes/No)
1.	Camera shall utilize high sensitivity 5Megapixel CMOS sensors with 1/2.7 Sensor”,5MP Progressive Scan CMOS Sensor and Active Pixel count Effective Pixels 2880(H)x1620(V)	
2.	Minimum Illumination 0.003Lux @ (F1.6, AGC ON); 0 Lux with IR	
3.	Camera shall have automatic shutter	
4.	Camera shall integrate 2.8-12mm Lens.	
5.	Camera shall have IRIS Control: Fixed/Auto	
6.	Camera shall integrate IR cut filter with auto switch (Day/ Night/ Auto/ Image/ Schedule)	
7.	IR distance shall be up to 50m-60m	
8.	Camera shall have Output PAL/NTSC adjustable	
9.	Camera shall offer WDR up to 120dB, (Off/On, WDR coefficient range)	
10.	Camera shall support to adjust Image Setting Brightness, Contrast, Sharpness, Saturation, Colour, and 3D DNR noise reduction	
11.	Camera shall offer BLC/HLC modes of backlight compensation.	
12.	Camera shall support to Automatic Gain Control, Automatic White Balance, Anti-Flicker, Mirror & Corridor mode	
13.	Camera shall have Digital Zoom feature	
	Smart Event	
14.	Camera shall offer intelligent analysis functions, Human Detection, Face detection, Line Crossing Detection, Crowd Density, Tripwire, Object Removed, Object Left Behind	
15.	Camera shall support Motion Detection Support (8 level)	
16.	Camera shall offer event Trigger Schedule Linkage: Capture, email, FTP upload.	
	Audio & Video Encoding	
17.	Camera shall offer H.265+/H.265/H.264+/H.264 Encoding image compression	
18.	Camera shall offer the following resolution streams: Mainstream@30fps - 5MP (2880x1620),4MP (2560x1440) 3MP (2304x1296), 1080P(1920x1080) 720P(1280x720), Sub stream@30fps - 720P(1280x720), VGA (640x480), QVGA (320x240) Third stream@30fps - VGA (640x480), QVGA (320x240)	
19.	Camera shall offer CBR/VBR bit rate control, bit rate is between 256kbps-8Mbps suitable for different image quality and fluency requirements.	
	Network Function	
20.	Camera shall support the following protocols: TCP/IP, HTTP, DHCP, DNS, DDNS, RTP/RTSP, SMTP, NTP, UPnP, SNMP, HTTPS, FTP	
21.	Camera shall conform to the ONVIF Profile S, G, T.	

22.	Camera shall support Authorized username and password, HTTPS with a password, AES Encryption for the password, RTSP Validation	
23.	Camera shall offer Up to 4 area privacy masks	
24.	Camera shall support setting Character Overlay (OSD) Title, time, and date overlay.	
25.	Camera shall support setting Unicast and Multicast Streaming.	
26.	Camera shall support General Function like User Authentication, IP address filtering, Complicated password	
27.	Camera shall offer Built In web server with an interactive Graphical User Interface	
28.	Camera shall support UPnP, ONVIF Discovery Interface	
	Interface	
29.	Camera shall integrate 1*RJ45 10M/100M Ethernet Port.	
30.	Camera shall support Audio port: 1 input (RCA), 1 output (RCA) & Alarm port: 1 input, 1 output	
31.	Camera shall support standard 256G Micro SD card storage.	
	General	
32.	Camera shall have Power Supply PoE(802.3af)/DC 12V±10% with Power Consumption 7W-9W (IR ON), 3W-4W (IR OFF)	
33.	Camera shall offer IP67 Weather resistant Protection Complaint with IK10	
34.	Operating Conditions shall be -35 °C ~ 60 °C Humidity 95% or less (non-condensing)	
35.	Camera shall integrate 1 reset button.	
	Certifications & Standards	
36.	Camera shall have the following Certifications: CE, BIS: ER01 , FCC, ROHS and REACH.	

7.5.4PTZ Camera

Sr. No.	Hardware	Comply yes/No
1.	Camera shall utilize high sensitivity 5-Megapixel CMOS sensors with 1/2.7" Progressive Scan CMOS Sensor, and Active Pixel count Effective Pixels 2592(H)x1944(V)	
2.	Minimum Illumination Color: 0.003 Lux @ (F1.6, AGC ON), B/W:0 Lux with IR	
3.	Camera shall integrate automatic shutter: 1/5 s to 1/20000 s	
4.	Camera shall offer WDR up to 120dB, (Off/On, WDR coefficient range)	
5.	Camera shall integrate IR cut filter with auto switch (Day/Night/Auto/Image/Schedule)	
6.	IR distance shall be up to 200m	
	Lens	

7.	Camera shall integrate Focal Length of 4.5mm to 140mm, Max. F1.6 with Field of View: H:55° to 2.3° (wide-tele), V:41.6° to 1.7° (wide-tele), D:67.9° to 2.8° (wide-tele).	
8.	Camera shall offer 31X Optical Zoom	
	PTZ	
9.	Camera shall offer 360° pan Range, Pan speed: configurable from 0.6° to 200°/s; preset speed: 200°/s	
10.	Camera shall offer -10° to 90° (auto flip) Tilt Range, Tilt speed: configurable from 0.6° to 90°/s, preset speed 100°/s	
11.	Camera shall offer 255 Preset positions, 1 Patrols and 4 Patterns	
12.	Camera shall support Park Action: Watch position/ Area Scan /Horizontal 360°scan/ Cruise	
13.	Camera shall support 3D positioning & Power Off Memory	
	Video	
14.	Camera shall deliver Max. Image Resolution: 2592(H)x1944(V)	
15.	Camera shall offer the following resolution streams: Primary Stream: 30fps(2592x1944/2592x1520/2048x1536/2304x1296/1920x1080/1280x960/1280x720); Secondary Stream: 30fps (1280x720/640x480/320x240); Third Stream: 30 fps (640x480/320x240).	
16.	Camera shall offer H.265+/H.265/H.264+/H.264/MJPEG image compression format.	
17.	Camera shall offer CBR/VBR bit rate control, bit rate is between 8Kbps~8Mbps, suitable for different image quality and fluency requirements.	
18.	Camera shall support to adjust Image Setting: Brightness/Contrast/Saturation/Sharpness/Color	
19.	Camera shall support G.711a/G.711u Audio Compression	
	Network Function	
20.	Camera shall support the following protocols: IPv4/IPv6, HTTP, HTTPS, FTP, SMTP, UPnP, SNMP, DNS, DDNS, NTP, RTSP, RTP, TCP/IP, UDP, DHCP, PPPoE	
21.	Camera shall offer Built In web server with an interactive Graphical User Interface for IE, Chrome, Firefox, Safari browser.	
22.	Camera shall support setting Unicast and Multicast Streaming.	
23.	Camera shall integrate 1*RJ45 10M/100M Ethernet Port.	
	System	
24.	Camera shall support standard 256G Micro SD / SDHC / SDXC card storage.	
25.	Camera shall offer BLC, HLC, and WDR modes of backlight compensation.	
26.	Camera shall support to Automatic Gain Control, Automatic White Balance, Anti-Flicker, Mirror.	
27.	Camera shall support 3D DNR noise reduction.	
28.	Camera shall offer Up to 4 area privacy masks	

29.	Camera shall support Audio port: 1 input , 1 output & Alarm port : 1 input, 1 output	
	Events	
30.	Camera shall offer intelligent analysis functions including Human Detection, Vehicle Detection, Line Crossing Detection, Perimeter Intrusion Detection. etc	
31.	Camera shall support Event Action of Upload to FTP, send email, trigger alarm output, trigger recording.	
32.	Camera shall support Auto Tracking	
33.	Camera shall support Basic Events: Motion detection, alarm input and output	
34.	Camera shall conform to the Onvif (Profile S, Profile G, Profile T), Http API.	
	General	
35.	Working Condition: Temperature: -30°C~60°C / Humidity: 0~95%(non-condensing)	
36.	Camera shall have Power Supply DC 12V/POE+ with Power Consumption 22W MAX	
37.	Camera shall offer IP66 Weather resistant Protection Complaint with IK10	
	Certification	
38.	Camera shall have the following Certifications: CE, BIS: ER01 , FCC, ROHS and REACH.	

7.5.5 ANPR CAMERA

Sr. No.	Hardware	Comply (Yes/No)
1.	Camera shall utilize high sensitivity 5Megapixel CMOS sensors with 1/2.7 Sensor”,5MP Progressive Scan CMOS Sensor and Active Pixel count Effective Pixels 2880(H)x1620(V)	
2.	Minimum Illumination 0.003Lux @ (F1.6, AGC ON); 0 Lux with IR	
3.	Camera shall have automatic shutter	
4.	Camera shall integrate 5-50mm Lens.	
5.	Camera shall have IRIS Control: Fixed/Auto	
6.	Camera shall integrate IR cut filter with auto switch (Day/ Night/ Auto/ Image/ Schedule)	
7.	IR distance shall be up to 80m & Warm Light up to 30m	
8.	Camera shall have Output PAL/NTSC adjustable	
9.	Camera shall offer WDR up to 120dB, (Off/On, WDR coefficient range)	
10.	Camera shall support to adjust Image Setting Brightness, Contrast, Sharpness, Saturation, Colour, and 3D DNR noise reduction	
11.	Camera shall offer BLC/HLC modes of backlight compensation.	

12.	Camera shall support to Automatic Gain Control, Automatic White Balance, Anti-Flicker, Mirror & Corridor mode	
13.	Camera shall have Digital Zoom feature	
	Smart Event	
14.	Camera shall offer intelligent analysis functions Vehicle detection, automatic number plate detection, manage white/black lists, and trigger real-time alerts for blacklist or rule violations. The system generates detailed ANPR reports with searchable data, snapshots	
15.	Camera shall support Motion Detection Support (8 level)	
16.	Camera shall offer event Trigger Schedule Linkage: Capture, email, FTP upload.	
	Audio & Video Encoding	
17.	Camera shall offer H.265+/H.265/H.264+/H.264 Encoding image compression	
18.	Camera shall offer the following resolution streams: Mainstream@30fps - 5MP (2880x1620), 4MP (2560x1440) 3MP (2304x1296), 1080P (1920x1080) 720P (1280x720), Sub stream@30fps - 720P (1280x720), VGA (640x480), QVGA (320x240) Third stream@30fps - VGA (640x480), QVGA (320x240)	
19.	Camera shall offer CBR/VBR bit rate control, bit rate is between 256kbps-8Mbps suitable for different image quality and fluency requirements.	
	Network Function	
20.	Camera shall support the following protocols: TCP/IP, HTTP, DHCP, DNS, DDNS, RTP/RTSP, SMTP, NTP, UPnP, SNMP, HTTPS, FTP	
21.	Camera shall conform to the ONVIF Profile S, G, T.	
22.	Camera shall support Authorized username and password, HTTPS with a password, AES Encryption for the password, RTSP Validation	
23.	Camera shall offer Up to 4 area privacy masks	
24.	Camera shall support setting Character Overlay (OSD) Title, time, and date overlay.	
25.	Camera shall support setting Unicast and Multicast Streaming.	
26.	Camera shall support General Function like User Authentication, IP address filtering, Complicated password	
27.	Camera shall offer Built In web server with an interactive Graphical User Interface	
28.	Camera shall support UPnP, ONVIF Discovery Interface	
	Interface	
29.	Camera shall integrate 1*RJ45 10M/100M Ethernet Port.	
30.	Camera shall support Audio port : 1 input (RCA), 1 output (RCA) & Alarm port: 1 input, 1 output	
31.	Camera shall support standard 256G Micro SD card storage.	
	General	
32.	Camera shall have Power Supply PoE(802.3af)/DC 12V±10% with Power Consumption DC12V:max 8.27W; POE(48V): max 10.27W	
33.	Camera shall offer IP67 Weather resistant Protection Complaint with IK10	
34.	Operating Conditions shall be -35 °C ~ 60 °C Humidity 95% or less (non-condensing)	

35.	Camera shall integrate 1 reset button.	
	Certifications & Standards	
36.	Camera shall have the following Certifications: CE , FCC, ROHS and REACH.	

7.5.6 Network Video Recorder

128 Channel Network Video Recorder Specification		
Sr. No.	Hardware	Comply (Yes/No)
	Recording Server shall have 128 Channel video input.	
2	Recording Server shall be Embedded Linux	
3	Recording Server shall support following bandwidth - Incoming 960 Mbps & Outgoing 700 Mbps	
4	Recording Server shall support Video Output: HDMI Output: 4(4K+4K+4K+2K), 1024*768, 1280*720, 1280*1024, 1440*900, 1920*1080, 2560*1440, 3840*2160/EDID	
5	Recording Server shall offer the following recording resolution streams Video Resolution: 12MP,8MP,5MP, 3MP, 2MP (1080P),1.3MP (960P),1.0MP (720P)	
6	Recording Server shall support schedule base snapshot, manual snapshot	
7	Recording Server shall support Motion Detection	
8	Recording Server shall offer Camera Supported intelligent analysis functions including Face Detection, Human Detection, Vehicle Detection, Face detection, Line Crossing Detection, Crowd Density, Object Removed, Object Left Behind, Perimeter Intrusion Detection, Video Tampering	
	AUDIO	
9	Recording Server shall integrate Audio input 1 CH port.	
10	Recording Server shall integrate Audio output 1 CH port.	
	Video Recording and Playback.	
11	Recording Server shall support 1-30fps Video Frame Rate.	
12	Recording Server shall have Record Mode: Continuous, Schedule, Motion Detection, Alarm, Smart Event, Event (Motion Detection, Alarm, Smart Event).	
13	Recording Server shall offer 16 CH max sync playback.	
14	Recording Server shall be able to playback according to different types, including Playback Mode Instant playback, Local video, local image.	
15	Recording Server shall support Record Search Time, calendar, channel search, and event search, (ANR, regular video, motion detection video, alarm video, intelligent detection video).	
16	Recording Server shall support following Video Playback: Start, stop, normal play, back play, frame by frame forward, full screen, Fast forward / backward (2x, 4x, 8x,16x), Slow forward (1/2x, 1/4x,	

	1/8x,1/16x), Add custom/ Default Tag, digital zoom, video clip, sub stream/main-stream, playback video bar.	
	Storage and Backup	
17	Recording Server Should have 16 *SATA HDD (3.5") & up to 12TB capacity for each HDD with RAID0, RAID1, RAID5, RAID6, RAID10.	
18	Recording Server Should support e-SATA x 1	
19	Recording Server Should have S.M.A.R.T info feature to check health of HDD, temperature, and status.	
20	Recording Server shall offer Local, Network HDD NFS, SMB/CIFS.	
21	Recording Server shall offer USB mobile hard disk, U disk, network backup Method.	
22	Recording Server Should support FTP for uploading alarm video.	
23	Recording Server shall ANR Support Smart IPC (with SD card) ANR	
	Function	
24	Recording Server shall support the following protocol: IPv4, IPv6, TCP/IP, HTTP, HTTPS, DDNS, RTMP, SMTP(SSL), SNMP, DHCP, PPPoE, UPnP, NTP, P2P, FTP.	
25	Recording Server shall support ONVIF Profile Support.	
27	Recording Server shall support Mobile Surveillance Support Apple, Android & Internet Explorer Support IE, Chrome.	
28	Recording Server shall Digital Zoom support.	
29	Recording Server shall have IPC timing Manual/auto/timing/reconnect timing.	
30	Recording Server shall support the following Event Actions: pre and post recording, send email, show message, FTP upload video or screenshot, Cloud upload video or screenshot, full screen, voice prompts, Alarm output trigger, PTZ linkage.	
31	Recording Server Should support combination of different events for effective alarm trigger and response.	
32	Recording Server Shall have exception alarms on event type of no space on disk, disk error, video loss.	
33	Network Detection monitoring, Utilization of total and used bandwidth, IP filter with blacklist and whitelist.	
34	Recording Server Shall support video cover privacy mask both on live and recording up to 4 areas.	
35	Recording Server shall have User Management User add, delete, modify, permission management, support.	
36	Recording Server Shall be able to trigger PTZ presets on any camera AI event.	
37	Recording Server shall support Security Mode Authorized username and password, HTTPS with password, RTSP Validation.	
38	Recording Server should Manage IPC Support IPC centralized management, including IPC parameter configuration, information export and import, real-time information acquisition and upgrade.	

39	Recording Server shall have Statistics of events for face recognition, vehicle & human, cross count and heat map.	
	Network Interface	
40	Recording Server shall integrate 2 X RJ45 10M/100M/1000M adaptive Ethernet port.	
41	Alarm Input 16 CH alarm input & Alarm Output 4 CH alarm output.	
42	Recording Server shall integrate 1* RS485,1* RS232 & USB2.0*2 & USB3.0*1 .	
	General	
43	The power supply shall be AC 230V SMPS, ATX 250W) & Consumption without HDD 20W	
44	Operation Temperature: -10°C~+50°C (14°F ~ 122°F) Humidity: Less than 90%RH .	
	Certifications & Standards	
45	Recording Server shall have the following Certifications: CE, BIS, FCC, ROHS and REACH.	

7.5.7 VMS Software Server Specification:

S.No.	Technical Specifications	Comply Yes/No
	System and Management:	
1	The VMS Workstation shall support the display of camera feeds. It shall not limit the number of users that can log in, and no additional cost shall be charged for more user logins. The VMS Workstation shall support seamless video operations in one software program, including live view, playback, parameter settings, and video export, minimizing the need to switch between programs and reducing operational complexity.	
2	Each VMS Workstation shall serve as a portal to log into the system, allowing access to all system functions based on user permissions. The VMS Workstation shall support on-map device queries, including shortcuts, enabling users to refine on-map devices by keywords such as "abnormal" status.	

3	The VMS Workstation shall support complete PTZ controls, allowing movement of the PTZ camera lens in eight directions and to preset points, with ePTZ (zoom in/out) capabilities. It shall provide an overview of all connected devices, including VMS Database Servers, VMS Workstations, NVRs, VMS Conductors, VMS Videowalls, Archive Servers, Failover Servers, and cameras. Detailed information, such as connection status and IP addresses, shall be available. Additionally, the VMS Workstation shall allow users to export the list of all connected cameras to a *.CSV file.	
	Video Monitoring:	
1	The VMS Workstation shall support a video monitor with a tree of connected devices to simplify camera retrieval from a large group of cameras. This tree of connected devices shall include a query field to refine the devices displayed. Queries shall be possible using one or more keywords, such as device type, device name, associated string, IP address, status, etc. The query results will be shown in a list. For example, users can query cameras using a combination of the camera brand "A" and camera status "abnormal."	
2	The VMS Workstation shall support PTZ controls, allowing users to drag a video up, down, left, or right with a mouse to move the camera lens accordingly. Users can also zoom in and out of video images using the mouse wheel. Additionally, the VMS Workstation shall support advanced PTZ functions, enabling users to save a preset point and move the camera lens to it.	
3	The VMS Workstation shall support hardware-accelerated decoding using GPU and Intel Quick Sync to reduce CPU load and enhance display performance, allowing more live videos to be displayed. It shall also support multi-monitor display to maximize the number of videos displayed simultaneously. Furthermore, the VMS Workstation shall support video touring, with user-definable intervals between videos ranging from 1 to 100 seconds.	
4	To facilitate quick camera retrieval in large video installations, the VMS Workstation shall support e-maps with the following features:	
a	GIS maps powered by OpenStreetMap.	
b	Facility maps based on building floor plans, supporting JPEG and PNG formats.	
c	Both GIS and Facility Maps are loadable with linked graphics of cameras, allowing users to double-click a camera graphic to open a video player for live streaming or playback.	

d	GIS and Facility Maps are loadable with hyperlinks that open other associated maps. Camera-linked graphics can be easily added to the map by dragging and dropping from the camera tree onto a GIS map, with the exact latitude and longitude automatically calculated and logged by the system.	
e	The ability to place camera-linked graphics on a GIS map by defining the exact latitude and longitude.	
f	Freely placeable text boxes on maps to provide operational information, with user-definable text box sizes and background colours.	
g	User-definable on-map display of the FOV width and HFOV angle of a camera.	
h	User-definable on-map camera-linked graphics.	
i	User-definable options for streaming live video directly in a pre-defined video player on the map or popping up a video player upon double-clicking, including the size and position of the video player.	
j	Maps loadable with linked graphics of cameras connected to different NVRs.	
5	The VMS Workstation shall support VMS Videowalls with the following features:	
a	Auto-discovery and quick import of videowall monitors in the network, allowing users to push content by dragging and dropping. Users can customize video layouts and push them to videowall monitors by dragging and dropping. The onscreen location and size of a videowall monitor thumbnail can be adjusted to reflect the real situation. One VMS Videowall server shall support four videowall monitors.	
b	The ability to push a pre-defined video layout or a series of touring video layouts to a specific videowall monitor using drag and drop.	
c	Prompt application of user operations to VMS Videowalls, including video playback and panoramic de-warping of live stream and playback video, de-warped to a 2x2 quad view.	

	Alarm Management and Retrieval:	
1	The VMS Workstation will pop up a video with relevant information when an emergency alarm is launched. It will support e-maps with an alarm list covering the alarms launched by all the connected NVRs. Double-clicking an alarm on this list will highlight the relevant camera-linked graphic at the center of the map, allowing users to click to stream live video or play back video.	
2	The VMS Workstation will support alarm searches by time, camera, alarm priority, and/or alarm type. Search results will be displayed in a list. Clicking a result from this list will automatically pop-up alarm information and auto-play the alarm video. Additionally, the VMS Workstation will allow users to export these search results to a *.CSV file.	
	Video Playback & Export:	
1	The VMS Workstation shall support video playback with the following features:	
i	The video played back shall be overlaid with timestamps and camera ID numbers.	
ii	Dragging the timeline to a specific time point will play back the video from that time point.	
iii	The video played back shall support zooming in without additional software. The playback controls shall include forward/backward playback, pause, go to the next/previous frame, and go to a specific date and time.	
iv	The playback speeds shall include 1x, 2x, 4x, 8x, and 16x.	
2	A video layout shall let users simultaneously stream live videos and play back videos from one or more cameras. These videos, whether streamed or played back, shall not affect each other. In a video layout, videos can be brought to different points in time to allow quick video retrieval or picture comparison.	
3	The VMS Workstation shall support snapshots in *.JPG format.	
4	The VMS Workstation shall support the following video export features:	
i	Simultaneously exporting multiple videos with user-definable start and end times.	
ii	Automatic video export based on user-defined schedules.	

iii	The formats for video export shall include *.MKV, *.MP4, and *.AVI. The exported AVI shall be promptly playable on any workstation without additional video decoders.	
iv	The exported video shall support text overlays, such as camera names and timestamps, with additional export date/time information. The position and font size of text overlays shall be user-defined. The positions for text overlays shall not be limited to the four corners but shall be user-definable by specifying the number of pixels to offset up and down (X-axis) and left and right (Y-axis).	
v	The VMS Workstation shall support password protection for exported videos.	
5	The VMS Workstation shall support video export to HDDs and network drives.	
6	The VMS Workstation shall support "bookmarks" for users to document events/alarms with video clips, video image snapshots, video layout snapshots, text comments, alarm information, etc., with simple drag-and-drop functionality. Multiple bookmarks shall be supported in the system.	
7	The VMS Workstation shall let users export multiple bookmarks to a folder, along with an auto-generated PDF file and a video player. The PDF file shall contain information on each bookmark, including associated information and hyperlinks to attached videos/snapshots/files. The attached video shall be promptly playable without additional software installation.	
8	Bookmarks shall be logged in the VMS Database Server, so they are accessible and manageable from any VMS Workstation a user logs in from.	

7.5.8. VMS Workstation Minimum Hardware Specifications:

S.No.	Technical Specifications	Comply (Yes/No)
1	CPU: Intel Core i9 14 th Gen Processor	
2	Minimum Memory: 128GB DDR5 RAM	
3	Operating System: Windows/Ubuntu	
4	Network Interface: 2 x 10/100/1000 Mbps GbE LAN ports	
5	Display Outputs: Supports a minimum of 3 displays	
6	The VMS Workstation shall support system restoration to factory defaults via VHD (Virtual Hard Disk)	

S.No.	Technical Specifications	Comply (Yes/No)
7	16GB Graphics card	
8	2x1TB Storage	

7.5.955" Full HD LED Display Monitor (To be installed in the control room).

Sr. No.	Parameter	Minimum Specification
1	Display:	LED Panel Type
2	Screen Size:	55" (Diagonal)
3	Panel:	DIRECT LED
4	Resolution (HxV):	3840 x 2160 pixels or better
5	Brightness:	400 cd/m2 or better
6	Viewing Angle:	178 degrees or better
7	CONNECTION TERMINAL:	
8	VIDEO IN:	BNC x 1
9	HDMI IN:	HDMI x 3
10	Speaker Out:	External Speaker Jack (Side), 20W (10W x 10W)
	CONTROL TERMINAL:	
11	LAN:	RJ45 x 1
	System Requirements:	
12	Operating System version/Platform	Android 11 or better
13	RAM/ROM	2GB/16GB
14	Airplay/Miracast	Inbuilt
15	Bluetooth	Yes
16	Hotel Mode with Customised Logo	Yes
17	Display should be capable to run content in offline mode	Yes
	ELECTRICAL:	
18	Power Requirements:	110-127 V AC, 50Hz/60Hz, 120 V AC 50/60HZ
19	Power Consumption:	Less than 150 W
	MECHANICAL:	
20	Display only (WXHxD):	47.9" X 27.1" X 4.8"
		(1236 x 718.2 x 89.9 mm)

Sr. No.	Parameter	Minimum Specification
21	Temperature:	32°F to 104°F(0 to 40 degrees C)
22	Humidity (Non condensation):	20% to 80% (Non condensation)

7.5.10 Readers

S No.	Product Specifications	Comply (Yes/No)
1	Mobile and physical credential technologies compatible, including Bluetooth LE, NFC and RFID.	
2	To be used in combination with controller or BLU Enet Door Controller	
3	Connection to the door controller: 4 wires.	
4	Simplify network infrastructure with the latest advancements in BLU Enet wireless technology capabilities and connectivity for cloud access control and mobile applications.	
5	Maximum distance the door controller and the wall reader 400m1 using a twisted pair cable.	
6	Robust design to withstand the harshest of conditions, making it an ideal choice for environmentally exposed locations.	
7	Includes tamper to monitor if the wall reader has been opened.	

Master Controller-

S No.	Product Specifications	Comply (Yes/No)
1	Online IP based door controller	
2	Two wall reader connection that can be configured as 2 different doors or one door reader in and reader out locking.	
3	Anti Pass-back mode available by connecting 2 wall readers and set up as one door.	
4	4 relay outputs.	
5	6 inputs to connect	
6	Door detector, request to exit switch (RTE), office switch.	

S No.	Product Specifications	Comply (Yes/No)
7	2 different tampers:	
8	One tamper input	
9	And one tamper switch.	
10	Door monitoring and tamper monitoring via contacts input (intrusion alarm and door left opened alarm).	
11	Virtual network capable through Software Virtual Network technology.	
12	All communications the carrier and the wall reader are encrypted and secure.	
13	The maximum cable length the door controller and the wall reader is up to 400 meters (Depending on the cable).	
14	Connection to the wall reader using 4 wire connection, twisted pair.	
15	Power consumption: 12V DC 400mA (without XS4 2.0 readers), supplied by an adaptor.	

Slave Controller-

S No.	Product Specifications	Comply (Yes/No)
1	8 relay outputs.	
2	4 inputs (not used in offline mode)	
3	2 different tampers:	
4	1 tamper input (not used in offline mode)	
5	1 tamper switch (not used in offline mode).	
6	The maximum cable length the first and the last expansion unit on the RS485 BUS is 300 meters.	
7	Connection to the controller using 4 wire connection, twisted pair.	
8	Power consumption: 12V DC 1400mA, supplied by an adaptor.	
9	Maximum output relay load: 2A-30Vdc (resistive load).	

Software-

S No.	Product Specifications	Comply (Yes/No)
1	Cardholder management for an enterprise grade smart access experience, delivering seamless, keyless building experiences to users.	
2	Dynamic key delivery ensures new keys are generated to access a specific space for a specific length of time.	
3	Event Synchronization enables security management teams to gather, visualize, and share data from multiple sources.	
4	Integrated physical access control, video surveillance, intrusion alarms, building systems, business systems, and more: On Guard provides a complete view of security and enables intelligent responses.	

S No.	Product Specifications	Comply (Yes/No)
5	Operational efficiency and real-time monitoring that helps optimize facility management and powerful monitoring of OnGuard alarms, video, cardholder data, and external content in one unified client, reducing operational costs.	
6	Wire-free smart SVN stand-alone locking solutions to any door connected to the On Guard platform. This feature is especially valuable for doors that are not possible to wire or require a retrofit, extending the reach of secure access control to previously challenging locations or access points.	
7	Monitoring and programming functions. Import/export utility, occupancy limit, alarm masking groups / basic intrusion functionality, system overview tree, monitor zones, alarm / event mappings.	

N Coder-

S No.	Product Specifications	Comply (Yes/No)
1	Ease of use, with a fast, simple programming tool for RFID credentials that puts the set-up, modification, and invalidation of physical smart RFID credentials at their fingertips.	
2	Compatible with a wide range of RFID cards technologies.	
3	Connectivity with the latest smart access control technology, leveraging our best-in-class SVN data-on-card, BLUE net Wireless and Justin Mobile technologies.	
4	Enhanced security guaranteed, using highly secure encrypted algorithm to process and encode keycards.	
5	Standards-compliant reader/encoder with SAM data are not stored in the device to ensure secure key management technology system.	
6	Enhanced security guaranteed, using highly secure DESFire smart card technology to process and encode keycards.	
7	Connection to the PC: USB or Ethernet simplifying power source requirements and allowing for easy connectivity to the existing security infrastructure.	

Hardware –

S No.	Product Specifications	Comply (Yes/No)
1	Operating System: Windows 7, Windows 10, Windows 11, or macOS 11.6 and later CPU: Intel® Core™ i5-4590 @ 3.3 GHz or higher Memory: Minimum of 4 GB (8 GB or 16 GB is recommended for high camera count monitoring) Graphics Card: NVIDIA GT 730 with 4 GB or higher Including 21" Screen, Keyboard Mouse.	

NOTE: The firm will be required to provide items/material as per the specifications indicated herein. The department reserves the right to accept items/materials with richer specifications as available in the market/ with manufacturer due to technological up gradations/ model up-dation, without any extra cost implication with the approval of Engineer in charge.

SH: C- 8**CENTRALIZED INTERCOM SYSTEM****8.0 Centralized intercom System:**

8.1 The work shall be carried out as per CPWD General Specifications for Electrical Works Part-I (Internal 2023, Part-II (External) 2023 as amended, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026.

8.2 SCOPE OF WORK

Scope of work involves design, drawing, supply, installation, testing and commissioning of One (01) number intercom connection in each flat, lift lobby/common areas, security cabins serving each residential building and main security at main gate, CCTV control room, caretaker room, Dispensary Room, Pump room, Sub-station etc. complete as required to make system fully functional. It will be the responsibility of the vendor/bidder to make the entire system fully functional as per the specifications. Vendor/bidder shall consider any equipment/devices required to make the system functional if not mentioned herewith. The system should be capable to communicate to each flat to flat, and flat to securities and control rooms. The scope of work also included guaranty/warranty of entire installation and equipment's/ accessories supply by them as per OEM.

8.3 System requirement:

Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.

8.3.1 The system shall be capable of working in a suitable ventilated non-air-conditioned environment as well as A C environment.

8.3.2 The environment conditions limit:

a. Temperature—0 to 50Deg.C

b. Humidity —0 to 95%

8.3.3 The System must be based on latest micro control based/digital technology using pulse code modulation/time division multiplex in (PCM/TDM).

- 8.3.4 The EPABX shall be able to handle analogue/digital trunk inter face as per National /International standard.
- 8.3.5 The cabinet design shall provide for adequate ventilation to dissipate heat due to energyloss.
- 8.3.6 The equipment shall be capable of working under the following line & junction limits as under: -
 - a) Extension loop resistance of 600 ohms for system.
 - b) Junction loop upto1800 ohms.
 - c) Insulation lower limit 20K ohms
- 8.3.7 Tone and Ringing System shall provide standard tone sand ringing current in the public telephone network
- 8.3.8 There shall be protection EPABX system from high voltage, current transient lightening occurring on junction line so the exchange etc.
- 8.3.9 Minimum 400 analog users with suitable Operator console

8.4 Inter com System Features

- 8.4.1 Visit confirmation
- 8.4.2 Vendor call
- 8.4.3 Customized massages(8to10)
- 8.4.4 Call facilities from flat to flat for all buildings/blocks, flat to security.
- 8.4.5 Emergency call with voice message
- 8.4.6 Caller ID to all terminals.
- 8.4.7 Security watchdog.
- 8.4.8 Auto call back.
- 8.4.9 Flexible numbering.
- 8.4.10 Paging to parking area.
- 8.4.11 Unlimited conference. It shall be possible for an extension user (up to a minimum number of 10 to talk to each other at the same time on a conference circuit.
- 8.4.12 Call tracing.
- 8.4.13 Call blocking
- 8.4.14 Call Forwarding:
- 8.4.15 Privacy of call: Full privacy of conversation shall be available on all calls whether established directly or by the attendant.
- 8.4.16 Do not disturb.

8.4.17 Panic button (optional to occupant).

8.4.18 Extension to extension dialing: It shall be possible to establish internal calls automatically by dialing any number with out assistance of the attendant.

8.4.19 Battery back-up. The battery shall be lead acid as per IS-1652 for 10(Ten) hours back-up for 100% load with suitable rack.

8.5 Telephone instruments:

The instrument shall be having following minimum features:

8.5.1 Tone/pulse switchable

8.5.2 LED indication.

8.5.3 In ringing volume control

8.5.4 Redial.

8.5.5 Flash.

8.5.6 Mute.

8.5.7 Pause.

8.5.8 Caller ID

8.6 Display:

Tri colour digital display system of same make shall be provided along with Intercom.

8.7 Telephone Cable & Cabling;

A. Armoured jelly filled cable

8.7.1 Armoured jelly filled cable of approved make to be laid in suitable size pipe buried underground for connections between residential buildings/blocks and main gate security.

8.7.2 Armoured jelly filled cable of approved make to be laid in wire mesh type tray of approved make if it is in surface of the wall of building.

8.7.3 The number of pairs of the Armoured jelly filled cable should be 20% more than the actual requirement.

8.7.4 Proper identification tag with crimping at both ends of each pair of cable including for spares and should be ready for use.

8.7.5 Proper coordination with the agency laying the pipes for telephone cable to be done by the intercom work executing agency.

B. Telephone Cable

- i) Suitable pair 0.5mm dia. FRLS PVC insulated annealed copper conductor, unarmoured telephone cable of approved make shall be drawn in existing heavy class PVC conduit in side the building.

- ii) Proper identification tag with crimping at both ends of each pair of cable including for spares and should be ready for use
- iii) Proper coordination with the agency laying the conduit pipes for telephone cable to be done by the intercom work executing agency.

C. Junction boxes

- i) Telephone junction boxes of approved make with locking arrangement and shall be of IP65 rating.
- ii) The boxes should have required number of krone terminal with 10% spares.

D. Earthing

All metal enclosures, conduits, junction/pull boxes/ Cabinets shall be grounded in compliance of CPWD General Specifications for Electrical Works Part-I (Internal 2023)

SH: C- 9**SOLAR PHOTO VOLTAIC POWER GENERATION**
GRID INTERACTIVE SOLAR PHOTO VOLTAIC POWER
GENERATION**9.1.1 Scope of work:**

The scope of work includes manufacturing as per drawings enclosed with bid documents, testing, supply, installation and commissioning of Grid connect solar generating system the grid connects solar photovoltaic (SPV) system of suitable capacity as mentioned in specification, by optimum utilization of the available Roof Top areas, including liaison with state electricity board, net metering 'will be done as per (Net Metering for Rooftop Solar Systems) rules amended up to date and other related rules and code, as applicable , conversation system and successful commission and handed over to client in good working conditions. The scope of works also included guaranty/warranty of entire installation and equipment's/ accessories supply by them as per OEM etc. as required.

9.1.2 Adequate capacity of SPV modules, PCUs, Junction boxes etc. to ensure generation of power as per design estimates. This will be done by applying liberal de-rating factors for the array and recognizing the efficiency parameters of PCUs, conductor losses, system losses, site conditions etc. Details of proposed generative capacity each building/ block are tabulated below: -

Sl. No.	Name of Building/ Block	Grid Interactive Solar Photovoltaic Power Generation	
		Solar Photovoltaic Collectors proposed (Nos.)	Power Generation (kWp) (Each module 545 Wp minimum)
1	RD BUNGLOW	As per approved shadow-free rooftop layout	As per approved layout
2	GRADE D & E	As per approved shadow-free rooftop layout	As per approved layout
3	GRADE B & C	As per approved shadow-free rooftop layout	As per approved layout
4	COMMUNITY CENTRE	As per approved shadow-free rooftop layout	As per approved layout
Total		246 Nos. minimum	134.00 kWp minimum (246 x 545 Wp), i.e. not less than 134 kWp

- 9.1.3 Use of equipment and systems with proven design and performance that have high availability track record under similar service conditions.
- 9.1.4 Selection of the equipment and adoption of plant layout to ensure ease of maintenance.
- 9.1.5 Strict compliance with proven and approved quality assurance (QA) systems and procedures during different stages of the project, starting from sizing, selection of make, shipment, storage (at site), during erection, testing and commissioning.
- 9.2** Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.
 - 9.2.1 System design shall have protection mechanism, so that any disturbance from the grid will not cause any damage to the equipment of the Solar Power Plant.
 - 9.2.2 The basic and detailed engineering of the plant shall aim at achieving high standards of operational performance. SPV power plants should be designed to operate satisfactorily in synchronization with the grid within permissible limits of voltage and frequency fluctuation conditions. It is also extremely important to safeguard the system during major disturbances, internal and external surge conditions while ensuring safe operation of the plant.
 - 9.2.3 Shadow-free plant layout with optimum tilt and orientation to ensure minimum losses and to maximize generation by using less area.
 - 9.2.4 Higher system voltage and lower current options to be followed to minimize ohmic losses.
 - 9.2.5 Selection of PCUs with proven reliability and minimum downtime. Ready availability of requisite spares.
 - 9.2.6 The designed array capacity STC shall be suitably determined to meet the proposed/guaranteed generation output at the point of interconnection by the contractor in his bid. Bidders shall design the plant and equipment in order to have a sustainable life of 25 years with minimum maintenance efforts.
 - 9.2.7 The specifications provided with this bid document are guidelines only and generic; any design provided in this document is only meant as an example. The contractor must submit a detailed design philosophy document for the project to meet the functional requirements based upon their own design, in line with the above. The bidders are advised to visit the site and satisfy themselves before bidding.
 - 9.2.8 Standards and Codes for Photovoltaic Modules**

The following standards & codes shall be complied with latest amendments:

- i) Standard Description IEC 61215-1:2016 Ed.1 Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test requirements.
- ii) IEC 61215-1-1:2016 Ed.1: Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-1: Special requirements for testing of crystalline silicon photovoltaic (PV) modules.
- iii) IEC 61215-1-2 Ed.1: Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-2: Special requirements for testing of thin-film Cadmium Telluride (CdTe) based photovoltaic (PV) modules.
- iv) IEC 61730-1:2016 Ed.2: Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction.
- v) IEC 61730-2:2016 Ed.2: Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing.
- vi) IEC 61701:2011 Ed.2: Salt mist corrosion testing of photovoltaic (PV) modules (Applicable for coastal and marine environment)).
- vii) IEC 62716:2013 Ed.1: Photovoltaic (PV) modules – Ammonia corrosion testing.
- viii) IEC TS 62804-1:2015 Ed.1: Photovoltaic (PV) modules – Test methods for detection of potential-induced degradation – Part 1: Crystalline silicon (under conditions of 85°C/85% RH for minimum 192 hours).
- ix) As per the Solar Photovoltaics, Systems, Devices and Components Goods (Requirements for Compulsory Registration) Order, 2017.

9.2.9 PV Modules used in the grid connected solar power projects shall be registered with BIS and bear the Standard Mark notified by the Bureau of Indian Standards. Further, PV Modules should have been included in the ALMM list as per MNRE Approved Models and Manufacturers of Solar Photovoltaic Modules (Requirements for Compulsory Registration) Order, 2019

9.2.10 Technical Requirements: -

9.2.10.1 Parameter Specification

9.2.10.1.1 Solar Photo Cell type: Mono-crystalline.

9.2.10.1.2 Module Efficiency: $\geq 17.5\%$ for Mono-crystalline, rated power at STC, Non-negative serialised module capacity shall be 545 Wp minimum. Solar module and solar cells should be of same manufacturer.

9.2.10.1.3 Temperature coefficient of power: Not less than $-0.40\%/^{\circ}\text{C}$, say should not be -0.50% .

9.2.10.1.4 Solar Cells, Solar Modules and all other components should be ALMM (Approved List of Models and Manufacturers), a list maintained by the Ministry of New and Renewable Energy (MNRE) in India.

9.2.11 Component Specifications

- i) The glass used to make PV modules shall be toughened low iron glass with transmittance above 90%. The module glass shall not be less than 3.8 mm for 72-cell modules and 2 mm for 60-cell modules. In case of glass-glass modules, glass thickness on each side shall be minimum 2 mm. It shall be anti-glare, laminated with symmetric structure, i.e. heating plates on both sides.
- ii) The backsheet used in the PV modules shall be of three-layered structure of fluoromide, hot and UV resistant, and shall have the following properties:

Parameter	Value
Material thickness	≥ 300 micron
Water vapour transmission	< 2 g/m ² /day
Partial discharge test voltage	≥ 1000 V / 1500 V
Elongation at break	$> 20\%$
Dimensional strength with encapsulant	> 70 N/cm
Interlayer adhesion strength	> 5 N/cm

The Engineer-in-Charge reserves the right to check the above parameters and their characteristics.

- iii) The encapsulant used for the PV modules should be UV resistant and PID resistant in nature. No yellowing of the encapsulant with prolonged exposure shall occur.

Parameter Value: Content $\geq 75\%$; Volume resistivity $> 1 \times 10^{15}$ Ω .cm; Peeling strength through glass > 60 N/cm³. The selected, used for sealing of PV modules shall have excellent moisture resistance, protection against electrical insulation, breakdown voltage age > 15 kV/mm and high elongation strength. Edge tapes for sealing are not allowed.

- iv) The module frames shall be made of anodized Aluminium, which shall be electrically & chemically compatible with the structural material used for mounting the modules. It is required to have provision for earthing connection to the earth terminal. The anodization thickness shall not be less than 15 microns.
- v) The material used for junction boxes shall be UV resistant to avoid degradation during module life. The degree of protection of the junction boxes shall be at least IP67. Minimum number of bypass diodes and number of IEC 62852 / EN 50521 certified MC4 compatible connectors with appropriate length of IEC 62930 / EN 50618 certified 4 sq. mm. multicore cables shall be provided. The cable lengths shall be in accordance with the PVM module wiring strategy and adequate to ensure that the cable bending radius standard is not exceeded.
- vi) Each PV module shall be provided with a barcode which is embedded inside the module lamination and shall contain the following information. Barcode scanner and database of the module containing the following information shall also be provided.
 - a) Name of the manufacturer of PV Module.
 - b) Name of the manufacturer of Solar cells.
 - c) Type of cell: Mono/Poly.
 - d) Month and year of manufacture (separately for solar cells and module).
 - e) Country of origin (only made in India).
 - f) I-V curve of the module.

- g) Peak Wattage, Im and Vm, FF for the module.
- h) Unique Serial No. and Model No. of the module.
- i) Date and year of obtaining IEC PV module qualification certificate.
- j) Name of the test lab issuing IEC certificate.
- k) Other relevant information traceability of solar cells and modules as per IS 09000 series.

9.2.12 Warranty

- 9.2.12.1 PV modules must be warranted within line degradation rate of output power except for the first year (maximum 3% including LID) and shall guarantee 80% of the initial rated power up to and beyond 25 years.
- 9.2.12.2 The modules shall be warranted for a minimum of 10 years against all material/manufacturing defects and workmanship.

9.2.13 Approval

- 9.2.13.1 The Contractor shall provide Guaranteed Technical Particular (GTP) data sheet and Bill of Materials (BOM) of the module that is submitted for approval along with the data sheets of each component. The component data sheets shall contain all the information of the substantiated component for component specifications mentioned above.
- 9.2.13.2 The Contractor shall provide test certificates corresponding to the standard mentioned above along with complete test reports for the proposed module.
- 9.2.13.3 The Contractor shall submit a detailed Manufacturing Quality Plan (MQP) for the PV module with list of checks/test performed during internal inspection, product inspection and dispatch and Component.
- 9.2.13.4 The Contractor shall obtain the approval of the proposed module make & model prior to manufacturing/inspection call.

9.2.14 Manufacturing and Inspection

- 9.2.14.1 The Contractor shall inform the module manufacturing schedule to the Engineer-in-Charge at least 15 (Fifteen) working days before the start of proposed schedule.
- 9.2.14.2 The Engineer-in-Charge reserves the right for inspection of material at manufacturing works before the start of manufacturing. Proof of procurement of components as per the approved B.O.M. mentioning manufacturer name, manufacturing date, etc. Relevant test certificates shall be submitted during material inspection for verification.
- 9.2.14.3 The Manufacturing shall start only after the clearance by the Engineer-in-Charge.
- 9.2.14.4 The Manufacturing shall start only after the clearance by the Engineer-in-charge.
- 9.2.14.5 The cells used for module shall be free from all defects like deep scratches, breaks, printing defects, discoloration of top surface, etc. Only Class A solar cells shall be used.
- 9.2.14.6 The modules shall be uniformly laminated without any lamination defects.
- 9.2.14.7 Current binning shall be employed by the manufacturer in each module. In all cases not exceed 0.1 A. Different colour codes shall be provided for the module as per the classification of different flows. Maximum three colours of bins will be allowed for each module rating.

- 9.2.14.8 Pre-dispatch inspection of modules shall be performed as per direction of Engineer-in-Charge.

9.2.15 Transportation, Handling, Storage and Installation

- 9.2.15.1 Transportation, handling, storage and installation of modules shall be in accordance with the manufacturer manuals so as not to breach warranty conditions. The Standard Operating Procedure (SOP) for the same shall be shared by the Contractor prior to dispatch.
- 9.2.15.2 The manufacturing, dispatch and stacking of materials should be timely planned with site preparedness, so that after being delivered, the installation and commissioning of plant should take place immediately.
- 9.2.15.3 The stacking of modules, in any case, shall be stacked as per the manufacturer's recommendation only and shall be covered with tarpaulin sheet.

9.2.16 String Monitoring Unit

9.2.16.1 Standard vs and Codes

Standard/Code	Description
IEC 60529	Enclosure Ingress Protection
IEC 62262	Enclosure Impact Protection
IEC 60269	Fuse
IEC 61643-11	Surge Protection Device
IEC 62852 or EN 50521	Solar cable connector
IEC 60695-2-11	Fire hazard testing

9.2.16.2 Construction

- a) SMU enclosure shall be made of UV-resistant, fire-retardant, thermoplastic material. Enclosure degree of protection shall be at least IP65 and mechanical impact resistance shall be at least IK08.
- b) Not more than two strings can be connected in parallel to a single input of SMU. One pair input terminal along with connector shall be provided for each SMU.
- c) Every SMU input shall be provided with fuses on both positive and negative sides. The rating of fuses shall be selected such that it protects the modules from reverse current overload. The fuses shall be "gPV" type conforming to IEC 60269-6.
- d) DC switch disconnector of suitable rating shall be provided at SMU output to disconnect both positive and negative sides simultaneously.
- e) Type-II surge protective device (SPD) conforming to IEC 61643-11 shall be connected between positive/negative busbar.
- f) MC4 connector conforming to IEC 62852 or EN 50521 shall be provided at each SMU input. Cable gland (double compression metallic) of suitable size for DC cables shall be provided at the SMU output.

- g) UV-resistant printed cable ferrules for solar cables & communication cables and punched/embossed aluminium tags for DC cables shall be provided at cable termination points for identification.

9.2.17 Warranty

The SMU Unit shall be warranted for minimum of 5 (five) years against all material/manufacturing defects and workmanship.

9.2.18 Tests

- a) Routine tests and acceptance tests for the assembled unit shall be as performed as per standard practice and code after submittal of detailed plant to be approved by the Engineer-in-Charge.

9.2.19 Cables

- a) Cable used for module interconnections shall also be referred as solar cable.
- b) Solar cable outer sheath shall be flame retardant, UV resistant and black in colour. Solar cable with positive polarity should have marking of red line on black outer sheath.
- c) DC cables shall be single core, armoured, Flame-Retardant Low Smoke (FRLS), PV Outer sheath conforming to IS 7098-I. DC cable with positive polarity should have marking of red line on black outer sheath.
- d) In addition to manufacturer's identification on cables as per relevant standard, following markings shall also be provided over outer sheath:
 - (i) Cable size and voltage grade
 - (ii) Word 'FRLS' at every metre
 - (iii) Sequential marking of length of the cable in metres at every metre.
- e) Cables shall be sized based on the following considerations:
 - (i) Rated current from module
 - (ii) The average voltage drop in the cables (Module to Inverter) shall be limited to 1.5% of the rated voltage. The Contractor shall provide voltage drop calculations in excel sheet.
 - (iii) Short circuit withstand capability
 - (iv) De-rating factor according to laying pattern

9.2.20 The cables (Solar and DC) shall be warranted for minimum of 5 (Five) years against all material/manufacturing defects and workmanship.

9.2.21 Routine test and acceptance test requirements shall be as per IEC 62930/EN 50618 for solar cables and IS 7098-1 for DC cables.

9.2.22 Installation

9.2.22.1 PV Array Configuration:

- a) The solar array shall be configured in multiple Nos. of sub-arrays, providing optimum DC power. The bidders shall submit their own design indicating configuration of PCU and respective subarrays. Hot-dip galvanized MS mounting structures may be used for mounting the modules/panels/arrays. Each structure should have angle of inclination as per site conditions to take maximum insolation. However, to accommodate more capacity, the angle inclination may be reduced until the plant meets the specified performance ratio requirements.
- b) The PV modules should be mounted on a space frame made of material suitable to the climate of Patna, Bihar. These can be aluminium structures/GI/MS powder-coated of adequate strength and appropriate design, which can withstand load of modules and high wind velocities up to 150 km per hour.
- c) The array structure shall be so designed that it will occupy minimum space without sacrificing output from the SPV panels.
- d) Regarding civil structure, the bidder needs to take care of the load-bearing capacity of the roof and/or arrange suitable structures based on the quality of roof. The total load that structure (when installed with PV modules) on terrace should be less than 60 kg/m². Suitable civil work for installation of the structure is to be done by the EPC contractor. Civil structures should be neat & clean, with proper alignment and rounding in shape with emphasis on proper routing and there should not be leakage, seepage nor after installation of plant. Alternative roof mounting structure can be used.

9.2.22.2 Module Mounting Structure:

- a) The mounting structure would be designed to sustain wind loading of up to 200 Kmph and shall be protected by using eco-friendly anti-corrosion structure. The contractor shall get design the structure from the expert in the field and get vetted from the reputed institute and submit to the Engineer-in-Charge for approval before placing the order. The entire structure including array will be earthed to an independent pit with redundant paths. The hardware shall be made of Stainless-Steel material or as per manufacturer standard.
- b) The mounting structures shall be so designed to withstand the speed for the wind zone of the location where a PV system is proposed to be installed. It may be ensured that the design has been certified by a recognized Lab/Institution in this regard.
- c) Suitable fastening arrangements such as grouting and calnings should be provided to secure the installation against the specific wind speed.
- d) The mounting structure steel shall be as per latest IS 2062:1992 and galvanization of the mounting structure shall be in compliance of latest IS 4759.
- e) Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts. Necessary protection towards rusting needs to be provided either by anodization.
- f) The fasteners used should be made up of stainless steel. The structure shall be designed to allow easy replacement of any module. The array structure shall be so

designed that it will occupy minimum space without sacrificing the output from the SPV panels.

- g) Regarding civil structures, the bidder needs to take care of the load-bearing capacity of the roof and need arrange suitable structures based on the quality of roof. Civil structure and construction are in the scope of bidder.
- h) The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m².
- i) Cable installation shall be as per IS 1255.
- j) Only terminal cable joints shall be accepted. No cable joint to joint two cable ends shall be accepted.
- k) Solar cables shall be provided with UV-resistant printed ferrules and DC cables shall be provided with punched/embossed aluminium tags. The marking shall be done with good quality letter and numbers of proper sizes so that the cables can be identified easily.
- l) Cable terminations shall be made with properly crimped lugs and passed through cable glands at the entry & exit point of the cubicles. Bimetallic lugs shall be used for connecting Cu busbar and Al cable service-versa. Solar cables, where exposed to direct sunlight, shall be laid through Double Wall Corrugated (DWC) HDPE conduits. The size of the conduit or pipe shall be selected on the basis of 40% fill criterion. Solar cables shall be aesthetically tied to Module Mounting Structure using UV resistant cable-ties suitable for outdoor application.
- m) A.C and D.C cables shall be kept separate.

9.2.22.3 Power Conditioning Unit

Standards and Codes: Power Conditioning Unit (PCU) shall comply with the specified edition of the following standards and codes.

- a) The efficiency of MPPT shall not be less than 97% & shall be designed to meet the Solar PV Array capacity control to extract maximum energy from solar array and provide 415 VAC, 3-phase, 50 Hz to synchronize with local grid. Other specifications shall be as per current BIS standards/MNRE Standards.
- b) It shall also have user-friendly LCD display for programming and viewing online parameters such as DC power input, DC input voltage, DC current, AC power output, AC voltage and AC current and power factor and suitable for monitoring through the BMS system.
- c) The PCU shall be single-phase static solid-state type power conditioning units/string inverters suitably connected & synchronized to give three-phase supply output. Both AC & DC lines shall have suitable fuses/MCBs and contactors to allow safe start-up and shut-down of the system. Fuses/MCBs used in the DC circuit should be DC rated. The PCU shall have provision for input and output isolation.

d) The technical specification are as follows: AC side

Nominal AC power	per Manufacturer design
Output AC Voltage	330V/ 415 with a variation + 10% at nominal voltage
Frequency	50 c/s (Hz) +5%
Total Harmonic Distortion	<3%
Total frequency protection	Yes
Under Voltage Protection	Yes

PV Power	As per Manufacturer design
Maximum DC Voltage	As per Manufacturer design
MPPT voltage range	As per Manufacturer design
Maximum DC current	As per string rating
DC over voltage protection	Yes
DC Voltage ripple	<3%
Minimum Efficiency (CE)	>95%
Ambient temperature range	0-50oC
Humidity (non condensing)	30-95%
Degree of protection	IP21 for internal units and IP 65 for outdoor units
Dimensions approx. (HXWXD)	As per Manufacturer design
Weight	As per Manufacturer design

DC side:Other Features

Recommended LCD Display on Front Panel	Accurate displays on the front panel:
	DC input voltage
	DC current
	AC Voltage (all 3 phases, in case of 3 phase)

9.2.23 BALANCE OF SYSTEM (BoS) ITEMS/ COMPONENTS:

- The BoS items/ components of the SPV power plants/ systems deployed under the work must conform to the latest edition of IEC/ equivalent BIS standards as specified below:

BoS Item/ component	Applicable IEC/ equivalent BIS standard	
	Standard Description	Standard Number
Power conditioner/ Inverters*	Efficiency Measurements Environmental Testing	EN61000-6-3 EN 50178
MPPT units*	Design Qualification Environmental Testing	EN 50178 UL 1741 CSA 107.1
Cables	General test and measuring methods PV C insulated cables for working voltage up to and including 1100V-Do-UV resistant for outdoor installation	IEC60189 IS694/IS1554 IS/IE C69947

Switches/Circuit Breakers/Connectors	General Requirements Connectors– Safety	IS/IEC60947 part I, II & III, EN 50521
Junction Boxes/Enclosures	General Requirements	IP65 (for outdoor)/IP21 (for indoor) IEC62208
SPV System Design	PV Stand-alone Systems Design verification	IEC61215 IEC 61730 IEC61701
Installation Practices	Electrical Installation of buildings requirements for SPV power supply systems	IEC61730

Must additionally conform to the relevant national/ international electrical safety standards.

SPECIFICATIONS FOR SPV PANEL

S. No.	Description	As per NIT
1	Max. output (P _{max}) as per STC	545 Wp minimum at STC (no negative tolerance)
2	Voc/ Isc	As per approved OEM datasheet for the offered 545 Wp module
3	MPP Voltage (V _{mP}) V	As per approved OEM datasheet for the offered 545 Wp module
4	MPP current (I _{mp}) A	As per approved OEM datasheet for the offered 545 Wp module
5	Open circuit voltage (Voc) V	As per approved OEM datasheet for the offered 545 Wp module
6	Normal operating cell temperature	44 + 2o C
7	Module dimensions (LxWxH) Appx.	As per manufacturer
8	PV Module type	Mono Crystalline
9	No. of PV cells per Module	As per manufacturer
10	Min. efficiency of module	18%
11	Solar module frame material	Aluminum
12	Weather resistant junction	IP65
13	Glass	Toughened
14	Glass iron content	Low Iron
15	Glass transmissivity	High transmissivity
16	Frame	Anodized aluminium
17	Encapsulation	Ethyl Vinyl Acetate (EVA)
18	Tri laminate back surface	Tedlar/ Polyester
19	By-pass diode	To be provided
20	Standard	IEC 61215 / IS 14286 & IEC 61730 Part 1 & Part 2
21	Performance guarantee	10 years of 90% power output, 25 years of 80% power output, 10 years against manufacturing defects.

9.2.24 SPECIFICATIN OF SOLAR INVERTER (GRID TIED)

S.No	Description	AsperNIT
1	Type	Gridtied
2	Max.DCArrayInputVoltage	1000V
3	DCvoltage tolerance	- 20%+15%oftheDCarrayinputvoltage inSr.No.1above
4	Typeofsolarchargecontroller	MPPTbasedsolarchargecontro ller
5	SwitchingDevice	MOSFET/IGBTbased
6	Continuousinverteroutputrating	50KWporabove
7	Outputwaveform	PureSinewaveoutput
8	Totalharmonicdistortion	<3%withresistiveload
9	NominalACOutputvoltageandfrequenc y	415V,3phase,50Hz
10	Outputfrequency	50Hz+0.5Hz
11	Gridfrequencytolerance	+3%
12	Gridfrequencysynchronizationrange	+Hz
13	No-Loadlosses	<1%
14	Powerfactor	>0.9
15	PCUefficiency	>97%atnominalvoltage&power
16	Noiselevel	<57db
17	Certifications	IEC61727,CE,IEC62109-1,IEC 62109-2
18	Idlecurrent	<4%ofratedcapacity
19	Regulation	Lineregulationandloadregul ation-2%
20	Overloadfeatures	150%foroneminute
21	Cooling	Forcedaircoolingwithtemperaturecon trolledcooling
22	OperatingTemperature	(-)20oCto50oC
23	RelativeHumidity	95%Maximum
24	LED/LCDDdisplay	Indication'sdisplayshallindicatesyste mfunctionalparametersand protectionfunctionalindicators.
25	DataMonitoranddisplaycontrols	RS485,EthernetorRS232connect ivity
26		InputoverVoltage Low/HighFrequency ShortCircuit Under/overoutputvoltage OverTemperature Gridinputundervoltage/overvoltage withautorecovery DCdisconnectdevice DCreversepolarity AntiIslandingprotectionasperthestan dard
27	EnclosureProtectionSafety	IP65(foroutdoor)
		Galvanicisolationatinput& outputthroughtransformer
28	Warranty	10 years.

9.1.30 Technical Particulars of Energy Meters

S.No	Description	As per NIT
1	Application IS	IS13779 or IS14679 depending upon Accuracy of meters.
2	Accuracy Class Index	0.5 or better up to 650V
3	Display	LCD
4	Power factor range	Zerolag-unity-zerolead
5	Display parameters	Display parameters: LCD test, kWh import, kWh export, MD in kW export, MD in kW import, Date & Time, AC current and voltages and power factor (Cumulative kWh will be indicated continuously by default & other parameters through push-button)
6	Power Consumption	Less than 1 Watt & 4 VA in Voltage circuit and 2 VA for Current circuit
7	Frequency	50Hzwith+/-5%variation
8	MDRegistration	Meter shall store MD in every 30 min. period along with date & time. At the end of every 30 min., new MD shall be compared with previous MD and store whichever is higher and the same shall be displayed. b) It should be possible to reset MD automatically at the defined date (or period) or through MRI. c) Manual MD resetting using sealable push button is optional
9	Memory	Non-volatile memory independent of battery backup, memory should be retained up to 10 years in case of power failure.
10	Climaticconditions	As per IS: 13779 or IS: 14697 for climatic conditions. b) The meter should function satisfactorily in India with high-end temperature as 50°C and humidity up to 95%
11	Insulation	A meter shall withstand an insulation test of kV and impulse test at 8 kV
12	Connectivity	The meter shall have an Ethernet/RS485 communication port for communicating with the BMS.

- a) IEC 61683 Ed. 1 : Photovoltaic systems - Power conditioners - Procedure for measuring efficiency
- b) IEC 62109-1 Ed. 1 : Safety of power converters for use in photovoltaic power systems - Part 1: General requirements
- c) IEC 62109-2 Ed. 1 : Safety of power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters
- d) IEC 61000-6-2 Ed. 2 : Electromagnetic compatibility (EMC) - Part 6-2: Generic standards – Immunity standard for industrial environments.

- e) IEC 61000-6-4 Ed. 2.1 : Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
- f) IEC 62116 Ed. 2 :Utility-interconnected photovoltaic inverters - Test procedure of islanding prevention measures
- g) IEC 61727:2004 Ed. 2 : Photovoltaic (PV) systems - Characteristics of the utility interface IEC 60068-2- 1:2007 Environmental testing - Part 2-1: Tests - Test A: Cold
- h) IEC 60068-2-2:2007: Environmental testing - Part 2-2: Tests - Test B: Dry heat
- i) IEC 60068-2-14:2009 :Environmental testing - Part 2-14: Tests - Test N: Change of temperature
- j) IEC 60068-2-30:2005 : Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)

9.1.31 CEA Technical Standards for Connectivity to the Grid Regulations 2007 with 2013 Amendment. As per the Solar Photo voltaic Systems, Devices and Components Goods (Requirements for Compulsory Registration) Order, 2017, Inverters used in the grid connected solar power projects shall be registered with BIS and bear the Standard Mark as notified by the Bureau of Indian Standards.

9.1.32 Technical Requirements

Parameter Specification Rated AC power As per design Maximum input voltage 1000 V / 1500 V Rated AC output voltage As per design Tolerance on rated AC output voltage +/-10%, Rated frequency 50 Hz, Operating frequency range 47.5 Hz to 52 Hz, Power factor control range 0.9 lag to 0.9 lead, efficiency Minimum 98%, Maximum loss in Sleep Mode 0.05% of rated AC power, Total Harmonic Distortion Less than 3% at 100% load, Degree of protection IP 20 (Indoor)/IP 54 (Outdoor).

- 9.1.32.1 The rated/ name plate AC capacity of the PCU shall be AC power output of the PCU at 50°C.
- 9.1.32.2 Maximum power point tracker (MPPT) shall be integrated in the PCU to maximize energy drawn from the Solar PV array. The MPPT voltage window shall be sufficient enough to accommodate the output voltage of the PV array at extreme temperatures prevailing at site.
- 9.1.32.3 The PCU output shall always follow the grid in terms of voltage and frequency. The operating voltage and frequency range of the PCU shall be sufficient enough to accommodate the allowable grid voltage and frequency variations.

9.1.33 Construction

- 9.1.33.1 Power Conditioning Unit (PCU) shall consist of an electronic three phase inverter along with associated control, protection, filtering, measurement and data logging devices.
- 9.1.33.2 Every DC input terminal of PCU shall be provided with fuse of appropriate rating. The combined DC feeder shall have suitably rated isolators for safe start up and shut down of the system.
- 9.1.33.3 Type-II surge protective device (SPD) conforming to IEC 61643-11 shall be connected between positive/ negative bus and earth.
- 9.1.33.4 In case external auxiliary power supply is required, UPS shall be used to meet auxiliary power requirement of PCU. It shall have a backup storage capacity of 2 hours.
- 9.1.33.5 Circuit Breaker of appropriate voltage and current rating shall be provided at the output to isolate the PCU from grid in case of faults.
- 9.1.33.6 All the conducting parts of the PCU that are not intended to carry current shall be bonded together and connected to dedicated earth pits through protective conductor of appropriate size. DC negative terminal shall be grounded.
- 9.1.33.7 PCU front panel shall be provided with LCD/ LED to display all the relevant parameters related to PCU operation and fault conditions. It shall include, but not limited to, the following parameters.
 - (i) DC input power (ii) DC input voltage (iii) DC input current (iv) AC output power (v) AC output voltage (all the 3 phases and line) (vi) AC output current (all the 3 phases and line) (vii) Frequency (viii) Power Factor

9.1.34 Operating Modes :

Operating modes of PCU shall include, but not limited to, the following modes. These operating modes and conditions for transition are indicative only. The Contractor shall provide the detailed flow chart indicating the various operating modes and conditions for transition during detailed engineering.

- 9.1.34.1 Standby Mode The PCU shall continuously monitor the input DC voltage and remain on Standby Mode until it reaches the pre-set value.
- 9.1.34.2 MPPT Mode When the input DC voltage is above the pre-set value and AC grid connection conditions are fulfilled, the PCU shall enter into MPPT mode.
- 9.1.34.3 Sleep Mode When the AC output power/DC input voltage decreases below the pre-set value for pre-set time delay, the PCU shall switch into Sleep Mode.

9.1.35 Protection Features:

- 9.1.35.1 The PCU shall provide protection against the following type of faults, among others.
 - (i) DC/AC over current (ii) DC/AC over voltage (iii) DC reverse polarity (iv) DC earth fault (v) AC under voltage (vi) AC under frequency/over frequency (vii) Islanding (viii) Over temperature (ix) Lightning surges

9.1.36 Grid Support Functions:

- 9.1.36.1 Active power regulation The PCU shall be able to limit the active power exported to the grid based on the set point provided through PCU front control panel. The PCU shall also be able to automatically limit the active power after an increase in grid frequency above a pre-set value. The ramp rate shall be adjustable during operation and start-up after fault. The applicability of the requirement shall be as per CEA regulation and compliance.
- 9.1.36.2 Reactive power control The PCU shall be able to inject /absorb reactive power to/ from the grid based on the set point provided through PCU front control panel. The same shall be performed automatically with adjustable ramp rate based on dynamic changes in grid voltage or reactive power reference.
- 9.1.36.3 Voltage Ride Through The PCU shall remain connected to the grid during temporary dip or rise in grid voltage as per the LVRT and HVRT requirements of CEA Technical Standards for Connectivity to the Grid Regulations. The PCU shall also be able to inject reactive power during the period of voltage dip.

9.1.37 Warranty of PCU:

The complete Power Conditioning Unit shall be warranted for minimum of 5 (five) years against all material/ manufacturing defects and workmanship.

9.1.38 Tests of PCU:

9.1.38.1 Type Test:

All the type test certificates as per the standards mentioned above shall be submitted for approval. The tests should have been conducted at a test laboratory compliant with ISO 17025 for testing and calibration and accredited by an ILAC/IECEE member signatory. Laboratory accreditation certificate or weblink along with scope of accreditation shall also be submitted. It is the responsibility of the Contractor to substantiate the compliance for CEA Regulations using test reports.

9.1.38.2 Routine Test:

Routine tests and acceptance tests shall be as per the Quality Assurance Plan (QAP) approved by the Employer.

9.1.39 AC Cables:

Standards and Codes All AC Cables shall conform to the following standards and codes.

- 9.1.39.1 Crosslinked polyethylene insulated PVC sheathed cables, Part 1: For working voltage up to and including 1100 V IS 7098.

- 9.1.39.2 All AC cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses develop under steady state and transient operating conditions.
- 9.1.39.3 Only terminal cable joints shall be accepted. No cable joint to join two cable ends shall be accepted. However, cable joints may be allowed if the route length is more than maximum available drum length subject to Employer's approval.
- 9.1.39.4 In addition to manufacturer's identification on cables as per relevant standard, following marking shall also be provided over outer sheath. (i) Cable size and voltage grade (ii) Word 'FRLS' at every meter (iii) Sequential marking of length of the cable in meters at every meter
- 9.1.40 Cables shall be sized based on the following considerations: (i) Rated current the equipment (ii) Maximum voltage drop in LT cable (from inverter to inverter transformer) shall be limited to 0.5% of the rated voltage. For HT cables , maximum voltage drop shall be limited to 0.5 % of the rated voltage. The Contactor shall provide voltage drop calculations in excel sheet. (iii) Short circuit withstand capability as per design for 1s. (iv) De-rating factors according to laying pattern.
- 9.1.40.1 All cables shall be warranted for minimum of 5 (Five) year against all material/ manufacturing defects and workmanship.
- 9.1.40.2 Testing- Routine test and acceptance tests requirements shall be as per relevant standards for all cable sizes.
- 9.1.40.3 Cable terminations shall be made with properly crimped lugs and passed through cable glands at the entry & exit point of the cubicles. Bimetallic lugs shall be used for connecting Cu bus bar and Al cables or vice-versa.
- 9.1.40.4 All AC cables shall be provided with punched/embossed aluminium tags. The marking shall be done with good quality letter and numbers of proper size so that the cables can be identified easily.

9.1.41 Earthing of PV array field

Standards and Codes Earthing system shall comply with latest revisions and amendments of the relevant IEC standards and IS codes and Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026, up to date.

9.1.42 General Requirements

- i) All PV Modules, Module Mounting Structures (MMS) and String Monitoring Unit (SMU) structures in the PV array field shall be bonded to the earthing system by two distinct connections.
- ii) Each PV Module frame shall be earthed using copper wire of sufficient cross section. The copper wire shall be connected to the earth hole provided in the module frame using suitable arrangement in line with the manufacturer recommendation. The earthing arrangement shall use stainless washers to prevent galvanic corrosion between aluminum frame and copper wire. In order to achieve effective earthing, serrated washers shall be employed to penetrate the anodization layer of the module frame.
- iii) Continuous copper earthing wire shall be run to connect a group of modules and both ends of the loop shall be bolted to the DC earth grid using bimetallic

- lugs and stainless-steel fasteners. The copper earthing wire shall be routed in such a way to avoid physical contact with the module aluminium frame.
- iv) The connection between MMS and DC earth grid shall be bolted or welded. Portion of the MMS which undergoes welding at site shall be coated with two coats of cold galvanizing and anti-corrosion paint afterwards.
 - v) Earth electrodes of the DC earth grid shall be uniformly distributed throughout the PV array field so that optimum earth resistance is offered to leakage current flowing from any module frame or MMS.
 - vi) SMU equipment earthing point shall be connected to the DC earth grid using flexible copper cable of sufficient cross section as recommended by the manufacturer. The connection with the DC earth grid shall be done using suitable bimetallic lugs and stainless-steel fasteners.

9.1.43 PCU Earthing

- 9.1.43.1 DC negative bus bar of the PCU shall be earthed to avoid Potential Induced Degradation (PID). DC negative bus bar and PCU equipment earth shall be bonded to the PCU earth bus and connected to earth electrodes through flexible copper cable of sufficient cross section as mentioned by the manufacturer. The interconnection of PCU earth electrodes with DC earth grid shall be as per PCU manufacturer recommendation.
- 9.1.43.2 Tests On completion of installation, continuity of earth conductors and efficiency of all bonds and joints shall be checked. Earth resistance at earth terminations shall be measured and recorded.
- 9.1.43.3 The earth plate shall be provided to facilitate its identification and for carrying out periodical inspection.

9.1.44 Lightning Protection System:

Lightning Protection System (LPS) for entire building against lightning strokes shall be provided as per drawing.

Conventional lightning protection system shall be provided. The systems include conductor grid at roof level with multiple down conductors connecting to main grid at ground level with earth pits.

Good Quality of Coordinated SPD protection is provided in all Electrical & Electronic services. Especially it equipment, cameras, & Lift room equipment.

9.1.45 METERING AND GRID CONNECTIVITY

- 9.1.45.1 Metering and grid connectivity of the roof top solar PV system under this scheme would be the responsibility of the Bidder in accordance with the prevailing guidelines of the concerned power supply company (SBPDCL) and / or CEA (if available by the time of implementation).

9.1.46 Grid Islanding:

In the event of a power failure on the electric grid, it is required that any independent power-producing inverters attached to the grid turn off in a short period of time. This

prevents the DC- to-AC inverters from continuing to feed power into small sections of the grid, known as “Islands.” Powered Islands present a risk to workers who may expect the area to be unpowered, and they may also damage grid-tied equipment. The Rooftop PV system shall be equipped with islanding protection. In addition to disconnection from the grid (due to islanding protection) disconnection due to under and over voltage conditions shall also be provided. A manual disconnect 4-pole isolation switch beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance. This switch shall be locked by the utility personnel.

9.1.47 Plant performance evaluation

The successful bidder shall be required to meet minimum guaranteed generation with Performance Ratio (PR) at the time of commissioning and related Capacity Utilization Factor (CUF) as per the GHI levels of the location during the O&M period. PR should be shown minimum of 75% at the time of inspection for initial commissioning and acceptance. Minimum CUF of 13% should be maintained for a period of 5 years . The bidder should send the periodic plant output details to user for ensuring the CUF. The PR will be measured at Inverter output level during peak radiation conditions.

The “Capacity Utilization Factor” (CUF) means the ratio of the actual output from a solar plant over the year (kWh) to the maximum possible output from it for a year (kWh) under ideal conditions $CUF = \text{Actual Plant Output in kWh over the year} / (\text{Installed Plant Capacity in kW} \times 365 \times 24)$.

Monthly CUF: $\text{Monthly Plant out in kWh} / (\text{installed plant capacity in kW} \times \text{number of days in a month} \times 24)$.

During grid failure or power outage due to any reason, the SPV system stops generating. Any instances of grid failure/power outage needs to be mentioned in the monthly report and those instances need to be authorized by local supply company and user. Then the period will be excluded in calculation of CUF.

9.1.48 Completion of work:

- Work will be treated commissioned and completed after evaluation of performance for 15 days after receipt/intimation of contractor in this regard. All parameters will be checked as per code, practices and tender documents.

Contractor shall provide details schematic layout of Solar Photo Voltic Power Generation system as per available of the terrace space and taken approval from the Engineer-in charge before supplying of solar module panel and allied accessories.

SH: C-10**WATER SUPPLY PUMPING / DEWATERING SYSTEM**

- 10.1 The work shall be carried out as per CPWD General Specifications for Electrical Works Part-I (Internal) 2023 and Part-II (External) 2023, as amended up to date, the Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023 including amendments up to 2026, relevant BIS codes, approved PE/BOQ, GFC drawings and local bye-laws.
- 10.1.1 Scope of work shall comprise the pump systems specifically provided in the approved PE/BOQ: (a) 3 Nos. borewell submersible pump sets (2 working + 1 standby) under Development E&M; (b) 3 Nos. open-well submersible pump sets (2 working + 1 standby); (c) 8 Nos. automatic dewatering submersible pump sets (4 working + 4 standby); and (d) 2 Nos. complete borewell submersible pumping systems under the Bore Wells for Water Supply sub-head. The scope includes starters/control panels, service cables, GI piping and fittings, valves/NRVs, safety rope, controls, earthing, foundations/supports and all accessories required for complete operation. A separate hydropneumatic booster package is not included unless specifically provided in the approved BOQ/GFC drawings with an approved cost provision.
- 10.1.2 Pump head, discharge, motor rating, pipe size and valve sizes shall be finalized from the approved water-yield report, hydraulic calculations, GFC drawings and OEM recommendations. The selected duty point shall provide the required flow and head with adequate margin without increasing the approved quantities unless specifically sanctioned.
- 10.1.3 The contractor shall prepare and submit coordinated pump-room / borewell / dewatering layouts, equipment GA drawings, foundation/support details, piping schematic, panel/control schematic and cable schedule for approval before procurement or execution.
- 10.1.4 Pump layouts shall provide adequate access, isolation, drainage and clearances for operation and maintenance.
- 10.1.5 Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.

10.1.6 Pump sets shall operate automatically through level/float/pressure controls, as applicable to the approved system, with manual override and all required protections.

10.2 PUMPS

10.2.1 Borewell and open-well submersible pump sets shall be three-phase, 415 V, energy-efficient, multistage units of approved make, selected for the approved duty point. Each set shall be complete with motor, starter/control panel, dry-run/single-phasing/overload protection, submersible cable, valves, NRV, GI delivery piping, safety arrangement, testing and commissioning.

10.2.2 Dewatering pumps shall be 8 Nos. submersible units arranged 4 working + 4 standby, suitable for automatic operation from basement catch pits. Minimum motor rating shall be 2 HP or higher as established by the approved dewatering duty calculation. Each pump shall be complete with level controls, panel/starter, cabling, delivery piping, NRV/isolating valve and accessories.

10.2.3 The 2 Nos. borewell pumping systems under the Bore Wells for Water Supply sub-head shall be complete submersible pump-motor systems of the approved duty, with starter panel, submersible cable, valves, clamps, top plate, earthing and all accessories as included in the PE.

SNo	Description of the Pump	Qty	Discharge (inl pm)	Head (in Meters)
1	Domestic pump (for officers' quarters)	1Set (1W+2S)	Suitable	Suitable
2	Domestic pump (for Staff quarters)	1Set (1W+2S)	Suitable	Suitable
3	Flushing pump from ultra-filtering unit (for officers' quarters)	1Set (1W+2S)	Suitable	Suitable
4	Flushing pump from ultra-filtering unit (for staff quarters)	1Set (1W+2S)	Suitable	Suitable
5	Gardening pump from water softener unit (for officers' quarters side)	1 set (1W+2S)	Suitable	Suitable
6	Gardening pump from water softener unit (for staff quarters side)	1set (1W+2S)	Suitable	Suitable
7	TREATED WATER TRANSFER pump	1set (1W+2S)	Suitable	Suitable
8	RWHT pump	1set (1W+2S)	Suitable	Suitable

10.2.4 Treated-water transfer pumps forming an integral part of the STP process/package shall be covered under SH: C-11 and shall not be duplicated under C-10.

10.2.5 All pump motors shall be minimum IE3 energy-efficient class wherever applicable and shall comply with relevant IS/IEC standards.

10.3 Motor control panel: -

- i) The panel shall be cubicle type totally enclosed, fully compartmentalized with IP 42 degree, as per IEC 61439 Part-I & Part-II, ed-3. All the starter components of motor control panel should be OEM recommended type-2 co-ordination chart. Of protection class and fabricated from CPRI approved manufacturer with mm thick CRCA sheet

- powdercoated with 7 tank process and shall be equipped with suitable rating of 4pole MCCB s as incomer, Busbars, digital type multi-function meter with suitable CTs to measure parameters like current, voltage, frequency, wattage, powerfactor, KWH, KVA, etc. as per drawing approved by Engineer-in-charge.
- ii) Suitable rating Outgoing MCB/MCCBs (where rating is more than 40 Amp, then MCCB to be used) conforming to CPWD General Specifications for Electrical Works Part-IV (Sub stations)-2013, as amended and corrected up to date & starters, relays, contactors, timers, single phasing preventer, and any other control gears of required rating for smooth operation and safety of pump set, digital type ammeter, CTs, push buttons, LED type indicating lamps and control components shall be provided in each compartment of the pump control panel.
 - iii) All MCCBs shall be provided with Rotary handle on the front door. Detachable Gland Plates made of 3 mm thick CRCA sheet, complete with the required number and sizes of knock-out, shall be provided at top & bottom of the panel board for incoming and outgoing cables as required.
 - iv) The panels shall be manufactured with separate busbar chamber isolated from unit feeder chambers and cable alleys. The height of the panel shall be as per the drawing but not more than 2300 mm and operating levers, handle etc. of highest unit shall not be more than 1.7 meters. Depth of the panel shall not be less than 300 mm and width of the panel will be given in the particulars of panel specifications or as per actual site conditions. Shop drawings shall be got approved from the Engineer-in-Charge before fabrication is taken up.
 - v) The busbars shall be of four strip aluminium with a current density of 130 A/sq. cm. The busbars will be insulated with heat-shrinkable sleeves and properly supported. All live parts shall be shrouded by means of acrylic/steel/FRP sheets to ensure no accidental contact with live parts during maintenance and provide simultaneous inspection. The busbars will be adequately insulated and protected to prevent accidental contact during operation and maintenance.
 - vi) Internal wiring of the panels shall be with Cross-Linked Polyethylene insulation HRFR copper conductor 1100-volt grade with ISI marked stranded cables of approved make.
 - vii) 2 Nos. 20 × 3 mm copper strip for LT panel up to 400 Amp. capacity or 2 Nos. 20 × 5 mm copper strip for LT panel of higher capacity shall be fixed all around the panel, connected to 2 Nos. earth bus copper strips connected to incoming earth conductors.

10.4 G.I. pipes

G.I. pipes of Class C (heavy class) ISI marked conforming to IS:1239 and of approved make, hot-dip galvanized to Grade 1 of IS:4736-1968, including accessories such as GI hot-dip tees/elbows/reducers/couplings/unions/bends/flanges, etc., and fixing with suitable GI brackets and hangers as per CPWD specifications, amended shall be provided.

10.5 Valves

10.5.1 Ball Valve.

Forged brass ball valves, screwed type, conforming to IS:554 shall be used for pipe size up to 50 mm dia. The body, bonnet and stem of the valve shall be of forged brass conforming to IS:6912, GR.F.LB. The test pressure of the valves shall be for Shell: 25 kg/cm²g and Seat: 16 kg/cm²g.

10.5.1 Butterfly valve.

Butterfly valves shall be Flanged/16 with SG Iron body & SG Iron disc duly ISI marked conforming to IS 13095, including rubber gasket, flanges, nuts, bolts and washers & other accessories complete as required. Butterfly valve shall be used for pipes of sizes more than 50 mm dia. The pressure rating of the valves shall also be cross-checked with the design requirement

10.5.2 Solenoid valve

Stainless steel body, orifice, Flange/ thread, Plunger, motorized, spring etc. with coil voltage AC 200 to 230 Volt 50 Hz, voltage tolerance +10% to -15%, protection class IP 65 or more, coil insulation class-F with desired size and pressure rating. The pressure rating of the valves shall also be cross checked with the design requirement.

10.5.3 Non-return valve: -

Non-return valves shall be PN-16 with CI body & SG Iron disc.

10.5.4 Strainer:

'Y' Strainer shall be of PN-16, CI body, Flanged/thread Type with bolted cover & strainer fabricated out of brass/ stainless steel sheet with 3 mm dia. Holes.

10.5.5 Isolating valve : -

Isolation valves, also known as shut-off or stop valves, are designed Brass body to completely stop the flow of fluids or gases in a piping system. They are typically used for directing process media, for emergency shut-down, or for facilitating safe maintenance, with desired size and pressure rating and temperature ratings, end connections and actuation methods.

10.6 Power Cable:

10.6.1 The Power cable shall be Cross- linked XLPE insulated armoured Aluminium/ Copper conductor cables 1100 V grade. Power cable shall be of 2 core for single phase, 4 core for size upto and including 25 sqmm and 3 ½ core for size higher than 25sqmm for 3phase.

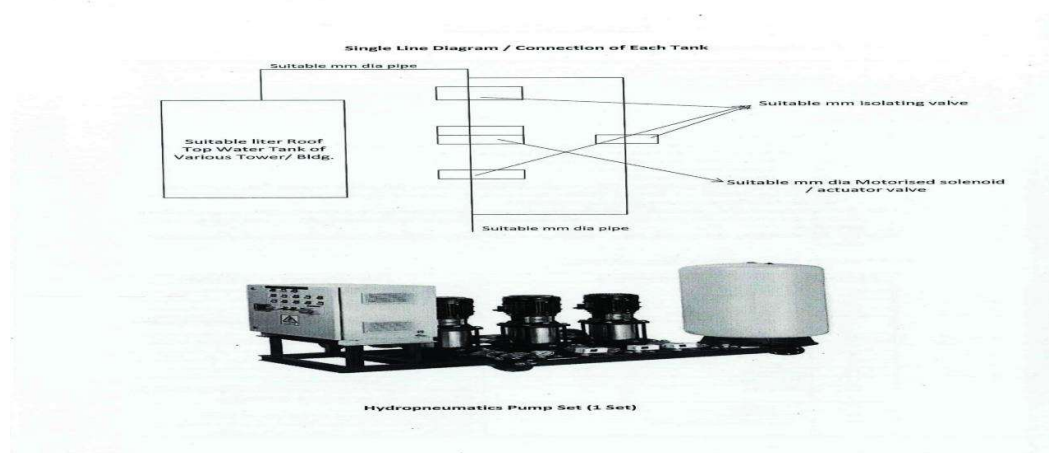
10.6.2 The Power cable sizes shall be selected to meet the load of starting and running current of the equipments and shall be approved by Engineer-in-Charge.

10.6.3 Cable shall be installed on approved perforated GI cable tray in pump room, which is part of scope of the work.

10.7 Earthing: -

10.7.1 Metallic body of all the equipments shall be connected by two separate earth conductors by two nos. 6 mm dia. copper wire from the earth station of the installation, confirming CPWD specifications for Electrical Works (Part-I), Internal 2023, as amended and corrected up to date.

10.7.2 Armoring of cables shall be connected to equipments and panel at both the ends.



SH: C – 11 SEWAGE TREATMENT PLANT (STP) — 50 KLD, PRE-FABRICATED STEEL BODY COMPONENT UNIT, MBBR TECHNOLOGY

11.1 The scope of the Sewage Treatment Plant (STP) shall consist of providing all labour, materials, equipment, appliances, and technology as specified and required to supply, install, test and commission a pre-fabricated, steel body, Component-type STP, complete with foundation, interconnecting piping, supports of all types, lighting arrangements, treated water pumps, drain sump pumps, puddle flanges, fresh air provision, exhaust fan etc., ready for operation as per the drawings, flow diagram, and this specification. The scope of work also includes statutory approvals from government bodies/agencies. The scope of work shall include a DLP period of 12 Months from the date of handing over of the plant. It also includes training two personnel for one month on day-to-day operations and preventive maintenance of the installation. The scope of work shall also include all dosing materials as required for three years, and submission of water test reports (before and after) from a NABL-accredited Lab.

The plant capacity shall be 50 KLD (50 m³/day). The STP shall be a pre-fabricated, steel body, Component-type unit running on MBBR (Moving Bed Biofilm Reactor) technology. The adopted 50 KLD capacity shall be the tender design basis, corresponding to the approved PE water-demand calculation sewage flow of approximately 44.99 KLD, with suitable capacity margin. The complete MBBR process, tertiary treatment, UF system, treated-water handling, equipment and pre-fabricated steel tank modules described herein are included in the STP package.

- 11.1.1 The scope of work is limited to inside the campus.
- 11.1.2 STP systems shall be compatible with IBM systems.
- 11.1.3 All pump-motor sets used in the STP system shall be energy-efficient, BEE star-marked.

Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.

- 11.1.4 The agency shall obtain the NOC/test report from the Bihar State Pollution Control Board before handing over the STP.
- 11.1.5 The STP shall be a pre-fabricated, factory-manufactured, steel body Component unit — all process compartments (screening, equalization, anoxic, aeration/MBBR, secondary clarification, sludge holding and chlorine contact) shall be housed within

factory-fabricated mild steel (MS) tank modules, minimizing site civil works to foundation/plinth construction only. Refer Clause 11.5 for the complete pre-fabricated steel body construction specification.

11.2 Process

The treatment process shall comprise the following stages:

- a) Physical treatment: Manual/mechanised Coarse & Fine bar-screening.
- b) Primary treatment: Oil & Grease Trap, with grit removal integrated within the bar screen compartment.
- c) Equalization Tank: Flow equalization with air mixing.
- d) Anoxic Tank: Anoxic conditioning with mechanical agitation, for nitrogen removal.
- e) Biological treatment: Aeration with MBBR bio-carrier media, through VFD-controlled blowers.
- f) Solids-liquid separation: Gravity Secondary Clarifier, with settled biomass withdrawn as waste sludge.
- g) Disinfection: UV unit with SS housing and auto operation.
- h) Chlorination system: Stainless steel auto-feed, PLC-based system.
- i) Sludge digestion: Bio-digester, anaerobic digestion with dual chamber.
- j) Sludge dewatering: Filter press with auto chipper.
- k) UF Polishing (flushing-water reuse stream): SS/PVC skid-mounted Ultra-Filtration system with auto backwash, dedicated to the flushing-water reuse stream.
- l) Sodium Metabisulfite (SMBS) Dosing: Auto feed through PLC, MOC-SS, for dechlorination ahead of the UF polishing skid.
- m) pH Correction: Stainless steel unit, vertical mounted.
- n) OLMS (Online Monitoring System): BOD, COD, TSS, pH.

11.2.1 The biodegradable detergent will be discharged into the Sewage Treatment Plant. The Agency shall provide special stainless-steel equipment as a salt neutralizer and FeCl_3 (Ferric Chloride) for phosphate removal and precipitation, of minimum capacity 5 percent of plant capacity, and de-foaming agent.

11.2.2 Performance Criteria

11.2.3 Design Basis of Raw Sewage

11.2.4 Design Data:

Sl. No.	Parameter	Characteristics of Influent
1	Estimated daily flow	50 m ³ /day
2	Discharge period	20 hrs/day

Sl. No.	Parameter	Characteristics of Influent
3	Average flow	2.5 m ³ /hr
4	Peak factor	4
5	Peak flow	10 m ³ /hr

11.2.5 Inlet Sewage Characteristics:

Sl. No.	Parameter	Characteristics of Influent
1	pH	6.5 – 8.0
2	BOD (5 days at 20°C)	250 – 300 mg/l
3	COD	600 – 800 mg/l
4	Suspended Solids	200 – 400 mg/l
5	Oil & Grease	40 – 50 mg/l
6	Total Nitrogen	30 – 35 mg/l

11.2.6 Treated Sewage Characteristics:

Sl. No.	Parameter	Characteristics of Effluent (after treatment)
1	pH	6.5 – 8.5
2	BOD (5 days at 20°C)	< 5 mg/l
3	COD	< 50 mg/l
4	Suspended Solids	< 10 mg/l
5	Oil & Grease	< 1 mg/l
6	Total Nitrogen	< 10 mg/l
7	Coliform	Nil

11.3 Process Flow Diagram

Screen Chamber (Coarse + Fine Bar Screens) → Oil & Grease Trap → Equalization Tank (with air mixing) → Anoxic Tank (with agitator) → Aeration / MBBR Tank (bio-carrier media, blower aeration) → Secondary Clarifier (gravity settling) → UV Disinfection → Chlorine Contact Tank → Treated Water Tank → [flushing-water stream] UF Polishing Skid → SMBS Dosing → pH Correction → Reuse Distribution (Flushing / Irrigation). Waste sludge from the Secondary Clarifier is routed to the Sludge Holding Tank → Anaerobic Bio-Digester → Filter Press → Sludge Disposal.

11.4 Technical Data Sheet

11.4.1 Bar Screen — Coarse

Make	Fabricated
Qty	1 No.
Pore Size	12 mm
MOC	SS 304
Operation	Manual

11.4.2 Bar Screen — Fine

Make	Fabricated
Qty	1 No.
Pore Size	6 mm
MOC	SS 304
Operation	Manual

11.4.3 Sewage Transfer Pump (Equalization Tank to Anoxic/Aeration-MBBR Tank)

Qty	2 Nos. (1 Working + 1 Standby)
MOC	Cast Iron
Type	Monoblock (Self-priming)
Seal	Mechanical Seal (Cartridge type)
Flow Rate	10.0 m ³ /hr
Head Range	10 – 12 metre
Motor Power	1.5 HP / 1.1 kW
Motor Efficiency, Phase/Volt	IE 2, Three Phase / 415 Volt
Motor Class	F, with IP 55 Enclosure

11.4.4 Anoxic Mixer (Agitator)

Qty	1 No.
Rod Length	0.8 metre
MOC	SS
Stroke Speed	50 – 60 RPM
Motor Power	0.5 HP / 0.37 kW
Motor Efficiency, Phase/Volt	IE 2, Three Phase / 415 Volt

11.4.5 Common Blower for Equalization Tank, Anoxic/Aeration-MBBR Tank and Sludge Holding Tank

Qty	2 Nos. (1 Working + 1 Standby)
Air required — Equalization Tank	8 Nm ³ /hr

Air required — Anoxic/Aeration-MBBR Tank (incl. carrier fluidization)	20 Nm ³ /hr
Air required — Sludge Holding Tank	5 Nm ³ /hr
Total Air Required	35 Nm ³ /hr
Each Blower Capacity	40 Nm ³ /hr
Head of Blower	0.3 – 0.4 kg/cm ²
Blower Motor Power	2.0 HP / 1.5 kW
Blower Type	Regenerative (side-channel) / Twin-lobe root blower
Motor Efficiency, Phase/Volt	IE 2, Three Phase / 415 Volt

11.4.6 Manual Fine Screen (Bypass/Emergency)

Make	Fabricated
Qty	1 No.
Pore Size	3 mm, Punched Hole Screen
MOC	SS 304
Operation	Manual

11.4.7 MBBR Media (Moving Bed Bio-Carriers)

Media Type	HDPE, structured/wheel-type bio-carrier (e.g., K3 type or equivalent)
Specific Surface Area	Not less than 650 m ² per m ³ of carrier
Fill Ratio	50% of the effective Aeration/MBBR tank volume
Hydraulic Retention Time (HRT)	Minimum 5 hours at peak flow
Carrier Retention Screen	SS 304 / PP wedge-wire or perforated screen at tank outlet, to retain carriers within the tank

11.4.7A Secondary Clarifier

Type	Rectangular, hopper-bottom, gravity settling
Surface Overflow Rate (SOR)	Not exceeding 1.0 m ³ /m ² /hr at peak flow
Minimum Surface Area	10 m ²
Side Water Depth	3.0 metre
Detention Time	Minimum 3 hours at peak flow
Construction	Pre-fabricated MS tank with SS/FRP hopper internals, scum baffle and effluent weir
Sludge Withdrawal	Manual/pneumatically operated sludge withdrawal valve to Waste Sludge Transfer Pump

11.4.8 Waste Sludge Transfer Pump (Secondary Clarifier to Sludge Holding Tank)

Qty	2 Nos. (1 Working + 1 Standby)
MOC	Cast Iron

Type	Self-Priming, Coupled
Seal	Mechanical Seal (Cartridge type)
Flow Rate	2.0 m ³ /hr
Head Range	8 – 10 metre
Motor Power	1.0 HP / 0.75 kW
Motor Efficiency, Phase/Volt	IE 2, Three Phase / 415 Volt

11.4.9 Treated Water Transfer Pump (Secondary Clarifier / UV Outlet to Treated Water Tank)

Qty	2 Nos. (1 Working + 1 Standby)
MOC	Cast Iron
Type	Self-Priming Monoblock
Seal	Mechanical Seal (Cartridge type)
Flow Rate	10.0 m ³ /hr
Head Range	10 – 12 metre
Motor Power	1.5 HP / 1.1 kW
Motor Efficiency, Phase/Volt	IE 2, Three Phase / 415 Volt
Motor Class	F, with IP 55 Enclosure

11.4.10 UF Polishing Skid — CIP/Backwash Pump (Flushing-Water Stream)

Qty	2 Nos. (1 Working + 1 Standby)
MOC	SS Casing, SS Impeller & SS Shaft
Type	Monoblock (non-submersible)
Seal	Mechanical Seal (Cartridge type)
Flow Rate	1.5 m ³ /hr
Head Range	10 – 12 metre
Motor Power	0.5 HP / 0.37 kW
Motor Efficiency, Phase/Volt	IE 2, Three Phase / 415 Volt

11.4.11 Drainage Sump Pumps

Qty	2 Nos. (1 Working + 1 Standby)
MOC	SS Casing, SS Impeller & SS Shaft
Type	Submersible
Flow Rate	6.0 m ³ /hr
Head Range	12 – 15 metre
Motor Power	1.0 HP / 0.75 kW
Motor Efficiency, Phase/Volt	IE 2, Three Phase / 415 Volt

Note: Pump motor power may vary as per manufacturer's actual performance data.

11.4.12 UF Polishing Skid — CIP Chemical Tank

Qty	1 No.
Tank MOC	LLDPE (Linear Low-Density Polyethylene) — 100 Ltr

11.4.13 Hypo Dosing System (UF Skid Maintenance Cleaning)

Qty (Pumps & Tank)	1 No.
Dosing Pump Capacity	0 – 3 LPH
Pump Type	Diaphragm
Motor Power	0.5 kW
Dosing Tank Capacity	100 Litres
Dosing Tank MOC	LLDPE

11.4.14 Citric Acid Dosing System (UF Skid Maintenance Cleaning)

Frequency	Once a year, or as required
Dosing Pump Make	Milton Roy or equivalent
Qty (Pumps & Tank)	1 No.
Dosing Pump Capacity	0 – 3 LPH
Pump Type	Diaphragm
Motor Power	0.5 kW
Dosing Tank Capacity	100 Litres
Dosing Tank MOC	LLDPE

11.4.15 Poly Electrolyte Dosing System (Sludge Thickening)

Dosing Pump Make	Milton Roy or equivalent
Qty (Pumps & Tank)	1 No.
Dosing Pump Capacity	0 – 3 LPH
Pump Type	Diaphragm
Motor Power	0.25 kW
Dosing Tank Capacity	100 Litres
Dosing Tank MOC	LLDPE

11.4.16 Filter Press Feed Pump — Screw Type

Qty	2 Nos. (1 Working + 1 Standby)
Type	Screw Pump
Pumping Fluid	Sludge
Suction Head	Flooded
Flow Rate	0.5 m ³ /hr
Head Range	40 – 50 metre
MOC	Cast Iron

Suction & Delivery Position	Top / End
Motor Power	0.75 HP / 0.55 kW
Motor Efficiency, Phase/Volt	IE 2, Three Phase / 415 Volt

11.4.17 Waste Activated Sludge Handling — Filter Press

Qty	1 No.
Type of Filter Press	Plate type
Plate Dia x Height	12" x 12" inch
Max. Permissible Load	150 Ltr
Make of Unit	PP
Motor Power	0.5 HP / 0.37 kW

11.4.18 Instrumentation List

#	Instrument	Location(s)	Qty.
11.4.18.1	Pressure gauges	At discharge of all pumps & blowers	Not less than 8 Nos.
11.4.18.2	Level switches	One each at: Equalization Tank, Anoxic/Aeration-MBBR Tank, Secondary Clarifier, Treated Water Tank, Sludge Holding Tank, UF CIP Tank, Chlorine Dosing Tank, Poly-electrolyte Dosing Tank	Not less than 8 Nos.
11.4.18.3	Flow meter	At Treated Water Transfer Pump discharge line	Not less than 1 No.
11.4.18.4	Pressure switch	At UF Polishing Skid permeate line, at Blower discharge	Not less than 2 Nos.
11.4.18.5	UF feed pressure gauge	At UF Polishing Skid feed line	Not less than 1 No.
11.4.18.6	Air Rotameter	At Blowers outlet header	Not less than 1 No.

11.4.19 Electrical Equipment

MCC — non draw-out type	1 No.
Power cabling, Instrument cabling, control cabling & cable trays	1 Lot
MCC Control panel for PLC	1 No.
PLC — non-redundant, Make: Delta or equivalent	1 No.
Pneumatically operated valves, if required	1 Lot

11.4.20 The panel shall be compatible with IBM systems.

11.4.21 The panel shall have a multi-function energy meter.

11.5 Pre-Fabricated Steel Body Construction

11.5.1 General

The STP shall be supplied as a factory-fabricated, shop-tested, steel body Component unit. All process compartments — Bar Screen Chamber, Oil & Grease Trap, Equalization Tank, Anoxic Tank, Aeration/MBBR Tank, Secondary Clarifier, Sludge Holding Tank and Chlorine Contact Tank — shall be housed within mild steel (MS) tank modules of welded plate construction, separated by internal MS baffle/partition walls, mounted on a common structural steel base skid. The Treated Water Tank shall be supplied as a separate pre-fabricated MS (or modular sectional panel type) tank. The complete Component unit shall be supplied in factory-fabricated modules, sized for standard road transportation, and field-assembled/bolted together at site using factory-matched flanged joints, minimizing site work to foundation construction, module positioning, interconnection and commissioning.

11.5.2 Material of Construction & Plate Thickness

- Tank shell (side wall) plates: Mild Steel, IS 2062 Grade E250 (or equivalent), minimum 5 mm thickness.
- Tank base/bottom plates: Mild Steel, IS 2062, minimum 6 mm thickness.
- Internal baffle/partition wall plates: Mild Steel, IS 2062, minimum 4 mm thickness.
- Roof/top cover plates: minimum 5 mm thick MS chequered plate in walkway/access areas; minimum 4 mm thick plain MS plate in non-walkway areas.
- Structural base skid: fabricated from ISMC/ISMB rolled steel channels/beams, sized to suit the tank loading and lifting/transport requirements, epoxy painted.
- Actual plate thickness for each compartment shall additionally be verified against hydrostatic and structural design calculations by the manufacturer and shall not be less than the minimum thicknesses specified above.

11.5.3 Fabrication

- All plate joints shall be full-penetration welded as per IS 816 / IS 9595, by qualified welders using approved welding procedures.
- Each tank/compartment shall be hydrostatically tested for leak-proofness at the manufacturer's works prior to dispatch, and re-checked for leak-tightness after field assembly and before commissioning.
- All internal and external welds shall be ground smooth and free of sharp projections, slag or weld spatter.

11.5.4 Corrosion Protection

- Internal surfaces in contact with sewage/sludge (Bar Screen Chamber, Oil & Grease Trap, Equalization Tank, Anoxic Tank, Aeration/MBBR Tank, Sludge Holding Tank): 3-coat anti-corrosive lining system comprising anti-corrosive epoxy primer, high-build epoxy intermediate coat and epoxy/vinyl-ester top coat, suitable for continuous immersion in

raw/treated sewage and resistant to hydrogen sulphide (H₂S) attack, minimum total Dry Film Thickness (DFT) 300 microns.

- Internal surfaces of the Secondary Clarifier, Chlorine Contact Tank and Treated Water Tank: SS 304 cladding, or the same 3-coat epoxy lining system specified above, as offered by the manufacturer.
- External surfaces: shot-blasted to Sa 2.5 finish, zinc-rich epoxy primer coat followed by polyurethane (PU) top coat, in the shade specified by the Engineer-in-Charge, suitable for continuous outdoor exposure.
- All fasteners, brackets and structural steel members shall be hot-dip galvanized or equivalently corrosion-protected.

11.5.5 Accessories

- Manholes: minimum 500 mm dia. circular, or 600 mm x 600 mm square, bolted cover with EPDM gasket — minimum 1 No. per compartment for inspection and maintenance access.
- Lifting lugs: minimum 4 Nos. per transportable module, designed for direct crane lifting.
- Vent pipes/pressure relief fittings on enclosed compartments, particularly the Anoxic Tank and Sludge Holding Tank, to prevent gas accumulation.
- Name plate indicating capacity, compartment identification, manufacturer's name, and date of manufacture, fixed on each module.
- Ladder/step arrangement and safety railing for access to roof-mounted equipment and manholes.

11.5.6 Tank Compartment Schedule

Sl. No.	Description	Effective Capacity	Qty.
11.5.6.1	Bar Screen Chamber (with integrated grit removal)	Sized for 10 m ³ /hr peak flow	1
11.5.6.2	Oil & Grease Trap	≈3.4 m ³	1
11.5.6.3	Equalization Tank	≈20 m ³ (8-hr HRT at average flow)	1
11.5.6.4	Anoxic Tank	≈10 m ³ (1-hr HRT at peak flow)	1
11.5.6.5	Aeration / MBBR Tank	≈50 m ³ (5-hr HRT at peak flow, MBBR carrier zone)	1
11.5.6.6	Secondary Clarifier	≈31.5 m ³ (10.5 m ² surface area, SOR ≤ 1.0 m ³ /m ² /hr)	1
11.5.6.7	Chlorine Contact Tank	≈5 m ³ (30-min detention at peak flow)	1
11.5.6.8	Sludge Holding Tank	≈10 m ³	1
11.5.6.9	Treated Water Tank (separate pre-fabricated module)	≈50 m ³ (approx. 1-day storage of treated flow)	1
11.5.6.10	UF Polishing Skid (compact SS/MS skid, flushing-water stream)	As per Clause 11.4.10	1

11.5.7 Foundation

The Component unit shall be installed on a plain/reinforced concrete plinth or raft foundation (minimum M20 grade concrete), designed and constructed as per the manufacturer's General Arrangement (GA) and foundation loading drawings. The foundation shall be levelled and provided with anchor fastener/foundation bolt pockets as required for securing the Component unit's structural base skid.

11.6 Other Items

11.6.1	1.1 For air distribution — MS C class (ISI marked). 1.2 Size — as per requirement. 1.3 Make — as per approved make. 1.4 For all other units — UPVC SCH 40 & 80 (ISI marked). 1.5 Size — as per requirement. Make — as per approved make.	1 Lot
11.6.2	1.6 Valves (ISI marked). 1.7 Size — as per requirement. 1.8 Make — as per approved make. 1.9 Size — as per requirement. 1.10 Make — As per approved make valves.	1 Lot
11.6.3	Motor for pumps and blowers.	1 Lot

11.7 Termination Points

S. No.	Description	Interface Point
1	Raw Sewage	At Bar Screen of Equalization Tank
2	Treated Sewage Water	Up to Final Treated Water Tank
3	Backwash & drain of Filters and tanks	Up to the drain trench below each equipment
4	Sludge from STP	Up to Filter Press
5	Electrical power	At Incomer Isolator, MCC
6	All cables for Power & Control	Within plant's boundary
7	Earthing	Earthing lugs for equipment shall be provided at individual equipment

11.8 Ultra Violet Treatment and Chlorination

Wastewater shall be passed through the UV unit for disinfection; the entire unit shall be housed in a stainless-steel chamber. An auto-chlorinator shall be provided, metered into the effluent by an electric dosing pump, paced according to the sewage inflow. The effluent shall be retained in the baffle-walled chlorine contact tank for a minimum of 30 minutes for effective disinfection prior to discharge.

11.8.1 Chlorination System

A chlorinator system (SS) with a capacity of not less than 30 min average flow detention shall be attached to the settling tank. Chlorine feed system shall be furnished as a complete Component assembly for installation in the plant room, including base plate, electronic positive displacement type chemical feed pump, fiberglass solution tank, suction and discharge tubing and fittings, operated through PLC. Each chlorine solution dosing pump shall achieve a residual not exceeding 1 mg/l in the treated effluent. Solution feed pump capacity: maximum 1 l/hr, operating on 50 Hz supply. Fiberglass solution tank capacity: not less than 50 litres, including a suction

line fitted with strainer. Control shall be by compound loop (flow-proportional and residual-measuring). The feed pump shall be of variable-speed, positive-displacement, solenoid-driven diaphragm metering type, with construction material suitable for the corrosive service.

11.8.2 UV System

UV system for disinfection shall utilize high-purity quartz sleeves and high-output UV lamps. UV Reactor MOC shall be SS316L, sized for a peak flow of 10 m³/hr. System shall be designed to provide a UV dose of 600 J/m² at UVT of 65% and TSS less than 10 mg/L. System shall deliver a 4-log reduction of coliforms and provide a TC count of less than 200 CFU/100 ml. The electrical control system shall utilize high-frequency electronic ballasts and provide efficiency of more than 90%. The reactor vessel shall utilize internal baffles to ensure turbulent, plug flow. The UV intensity monitoring system shall be designed in accordance with the German DVGW W294 standard / US standard; the sensor shall be of dry type, removable without system shutdown.

11.9 Online Monitoring System (OLMS)

The system shall follow the principle of attenuation to receive data with an accuracy of 0.24% at a compensation of turbidity of 530 nm, with the following: Compatibility of system — Modbus Remote Terminal Unit (RTU) / analog interface, RS485/RS232; Source temperature — 4°C to 104°C; Minimum measurement time — 4 sec or better; T90 response time — 4 sec or better; Sample collection — automatic; Sample platform — 300 mm x 239 mm (SS) / as per OEM; Sample suction — 80 mm (SS); Process chamber — dia. not less than 245 mm, height 870 mm; Channels — not less than 2 (BOD, COD, TSS, pH), RS485-compatible.

11.10 Installation

The Component unit shall be accurately installed to correct dimensions, alignments and levels, all as indicated on the final shop/GA drawings. Each module shall be lifted and positioned on the prepared foundation as per the manufacturer's installation procedure, aligned, levelled and anchored to the foundation bolts. Inter-module flanged/bolted joints shall be assembled with gaskets as recommended by the manufacturer, and each joint pressure/leak tested after assembly. All pumps, blowers and rotating machinery shall be mounted on flat steel packing pieces of thickness suitable to take up variations in level, aligned and levelled, with base plates packed with grout after the machinery has been run and checked by the Engineer-in-Charge for stability and vibration.

11.11 Maintenance Facilities

Permanent work platform and catwalk shall be designed and provided by the Agency for access to elevated equipment on the Component unit. The catwalk and platform for access shall allow a minimum width of 1000 mm, with railings and guards designed for safe personnel movement, including provision for gaining access and to accommodate maintenance personnel. Hand railing and guards shall be designed and provided by the Agency around all tank compartments and manholes to allow safe movement of personnel. Waterproof power sockets required for servicing

shall be provided by the Agency, at numbers and locations proposed by the Agency and approved by the Engineer-in-Charge. The design of all permanent work platforms, hand rails etc. shall be submitted to the Engineer-in-Charge for approval; the loading and fixing method of lifting facilities shall also be submitted for approval and checking within 4 weeks of award of Contract or receipt of letter of intent.

- All Manhole Covers shall be minimum 5 mm M.S. chequered plate encased with 1 mm thick aluminium sheet.

11.1 Testing and Hand Over

The performance of the system shall be demonstrated by taking hourly samples of the raw sewage and final effluent over a twelve-hour period. Samples shall be taken at periods approximating the flow rates specified for the plant (Clause 11.2.4). The samples shall be combined and a 5-day BOD test run, the results of which must verify the capacity of the treatment plant prior to acceptance.

11.13 Training

Training facilities/courses shall be provided to ensure the employer's staff may acquire full knowledge and appreciation of all aspects — day-to-day operation, breakdown and routine maintenance, and fault diagnosis of all plant, equipment and systems. Training to the employer's staff shall be held as appropriate at the Agency's or manufacturer's premises and on site. A detailed syllabus for each training course, and the timing of the courses, shall be submitted for approval; the Agency shall recommend the desirable qualifications and experience of trainees to optimally benefit from the courses. All consumables required for one year of plant operation shall be supplied at the time of handover.

11.14 Electrical Installation

As per CPWD General Specifications for Electrical Work, Part-I (Internal) 2023, Part-II (External) 2023, and Part-IV (Sub-station).

11.15 Interconnecting Pipe & Valves

Description	For connection & interconnection, as per design
Pipe	UPVC pipes and accessories (ISI marked)
Diameter of Pipe	100 mm dia. (ISI marked); 80 mm dia. (ISI marked); 65 mm dia. (ISI marked); 50 mm dia. (ISI marked)
Valves (Diameter)	100 mm dia. (ISI marked); 80 mm dia. (ISI marked); 65 mm dia. (ISI marked); 50 mm dia. (ISI marked)

11.16 Testing of Treated Water During DLP

During the Defects Liability Period (DLP), the treated water shall be tested once every fortnight. The test shall be carried out at an NABL-accredited Lab, and the test report shall be submitted to the RBI Engineer.

SH: C- 12
Boom Barrier

12.1 Boom Barrier:

12.1.1 The work shall be carried out as per CPWD General Specifications for Electrical Works Part- I (Internal 2023, Part-II (External) 2023 as amended, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026, BIS/IEC/CEA and as per directions of Engineer-in-charge.

12.1.2 The scope of work include design, drawing, supplying, erection & installation, testing and commissioning of Boom Barrier system complete with necessary foundation, labor and other necessary accessories to making the work fully functional.

The scope also includes Electromechanical boom barrier with all accessories upto 6 meter length; consisting of a fixed housing and a movable arm; in two pieces without central support, electrically operated from security/guard- room through push buttons and remote-control; Barrier Housing Unit: Powder Coated; Boom: Powder Coated White RAL 9010m or approved color with Red reflective strips having IP 44 (Barrier Body) & IP 67; All Aluminium Housing with Base frame in SS-304 for high protection against corrosion; Operator console, necessary hardware, software, Power and control cabling etc. as required. The scope also includes handing over to client in working conditions.

The scope of works also included guaranty/warranty of entire installation and equipments/ accessories supply by them as per OEM etc. as required

Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.

12.1.3 In all the entry points of campus Boom barriers are to installed. In the day/ night time, boom barriers at entry would be open and would close only when security/guard push the button or remote-control after verification from guard room.

12.1.4 System requirement: -

(i) The environment conditions limit:

(ii) Temperature – 0 to 50 Deg. C

12.1.4.1 Humidity – 0 to 95%

12.1.5 It will be the responsibility of the vendor/bidder to make the entire system fully functional as per the specifications. Vendor/bidder shall consider any equipment / devices required to make the system functional if not mentioned herewith.

- 12.1.6 All equipment and materials used shall be standard components that are regularly manufactured and used in the system. All systems and components shall have been thoroughly tested and proven in actual use.
- 12.1.7 The Automatic Boom Barrier has been designed on the following minimum parameters which are summarized below: -

TECHNICAL SPECIFICATIONS

Technical specification for Boom Barrier			
Sr.No.	Details	Specification	Remark
1	Design	Reliable gear motor and sturdy steel case, Boom Barrier has been carefully tested to ensure its correct functioning both in very cold and very hot climate and its functional compatibility.	
2	Functionality	Interfaces for Opening, Closing and Stopping	
3	Technology	Micro Controller Based Boom Barrier controller with Logic for Motor, Safety Sensors and Loop detector etc. The Boom Arm is lifted up by 360 degree gearbox.	
4	Housing material	Mild Steel Powder coated	
5	Housing Aesthetic	Corrosion Free : Dry finishing process that uses finely ground particles of pigment and resin that are electrostatically charged and sprayed onto Housing	
6	Protection	All Housing and internal parts are be rust & corrosion free metals and alloys of high strength with suitable Epoxy coating.	
7	Material of Boom Arm	The new wind-resistance Arm is extruded aluminium with octagonal profile. White painted with red reflective stickers	
8	Boom Arm types	Straight / Telescopic	
9	Boom arm Dimension	100mm*45mm*1.5mm	
10	Boom Arm Length	2.5 mtr / 3 mtr / 4.5 mtr / 6 mtr	
11	Boom Arm Speed	1 sec / 3 sec / 6 sec	
12	Housing Height	925 mm approx.	
13	Housing Width	335 mm approx.	
14	Housing Length	290 mm approx.	
15	Power Supply	230V±10%, 110V±10%, 50/60HZ	
16	Control Circuit operating voltage	12 V DC	
17	Nominal power Consumption	50 W in Standby condition < 300 W in operating condition	
18	Intelligence	PIC 8-bit CMOS FLASH Microcontrollers Controller based with High performance RISC CPU.	
19	Display	2 * 7 segment display	

20	Safety Logic Control	An advanced system for reversing boom arm on obstacle	
21	Spring type	Compression spring, the compression spring can avoid accidents caused by broken spring due to great force	
22	Mode of Operation	Normally closed	
23	BoomArm Rest	Available in 4.5 mtr and 6 mtr	
24	Wireless control	RF remote control, specially for carrying security guards.	
		Wireless Push Button, specially for security cabind	
25	Remote control distance	≥30m	
26	Access Control Integration	Potential free inputs for both entry and exit operation. Functions seamlessly after integration with any third party access control systems through NO input.	
27	Interface	RS485 Communication module	
28	MTBF	10 Million Cycles	
29	MTTR	30 Min	
30	Accessories included	Clutch key	
		Receiver	
		Remote Controller (2 pieces)	
		Boom Rest(Available in 4.5 mtr and 6 mtr)	
		Wireless Push Button	
		Foundation bolts * 4	
31	Optional accessories	Photcell safety sensor	
		Photcell safety sensor Stand * 2	
		Vehicle Loop detector	
		UHF Reader	
		UHF Reader Controller	
		Windshield tags	
		Traffic light	
32	Fail lock / Safe	In case of power failure Boom Barrier can be configured either fail safe or fail locked mode. Advanced manual clutch key provided for fail safe operation.	
33	Hold Open Time	Is adjustable from 3 to 59 seconds	
34	Power failure	In case of power failure, using advanced manual clutch key the boom Arm can be opened.	
35	Wind Resistance Capacity	Upto 30km/H	
36	Duty Cycle	100% , Barriers works 24 Hrs*7 *365 days without any resting time.	

37	Ambient Operating Temperature	- 45° to +75° C	
38	Relative humidity	≤90%	
39	Net Weight	60 Kg*	
40	Protection	IP 54	
41	Certification	CE	

SH: C-13

VRV/VRF, VENTILATION AND PRESSURIZATION SYSTEM

- 13.1 The work shall be carried out as per CPWD General Specifications for HVAC System 2024 as amended and corrected up to date, CPWD General Specifications of Electrical Works Part-I 2023 corrected up to date, Part-II (External) 2023 as amended and corrected up to date, Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023, as amended up to date, including the Amendment Regulations, 2026, IS standard. Contractor will enable the consultant for obtaining fire NOC and arrange inspection/ testing of the scheme as required for this purpose.
- 13.2 The scope of work includes heat load calculation, design, providing, installation, testing and commissioning of HVAC system with ducting, ventilation in community hall, dispensary, caretaker room, Community Centre, fire control room, CCTV rooms, Server Room, etc. Work includes not only the items exclusively defined hereunder but also any other item required to commission and complete the work as per site requirements, good engineering practice or as required under the codes or by local/statutory authorities.
- 13.3 The capacities indicated are minimum capacities, and any rating/capacities required over and above the indicated capacity shall be provided by the contractor at his own expense & nothing extra shall be paid on this account.
- 13.4 Area/Rooms to be air-conditioned using VRV/VRF Split System, and the capacities and equipment selection are as mentioned in Annexures.
- 13.4 AIR CONDITIONING SYSTEM: -**
Before execution of any work under this Component, the Contractor shall submit complete OEM technical submittals, equipment data sheets, design/selection calculations where applicable, shop drawings and General Arrangement (GA) drawings for approval of the Engineer-in-Charge, CPWD and Architect. All E&M services shall be coordinated through superimposed shop drawings showing clearances, levels, shafts, openings, sleeves, supports, access and interfaces with civil/structural/architectural works. The Contractor shall prepare coordinated BIM models/drawings progressively from LOD 200 through LOD 400 before execution/fabrication as applicable and shall update the model to LOD 500 as-built at completion. No equipment shall be ordered and no work shall be executed until the applicable OEM technical submittal, GA/shop drawings and coordinated/superimposed drawings have been approved.

13.4.1 Basis of Design:

OutdoorDesignConditions:		AsperASHRAE2021
Summer		
DryBulbTemp.	47.0deg.C(116.6 degF)	
WetBulbTemp.	27.8deg. C(82.04 degF)	
Monsoon		
DryBulbTemp.	33.3deg. C(91.94 degF)	
WetBulbTemp.	29.5 deg.C(85.1degF)	

Inside Design Conditions:	
Air-conditioned Areas (Detailed given below)	Summer&Monsoon: $-23.0 \pm 1 \text{ degC}$ ($73.4 \pm 2 \text{ degF}$) (RH) 55% (Design Value–No Control)
Lighting Load	Asper ECBC-2017
Equipment Load	Asper the uses of the Area
Occupancy	Asper the Architectural plan
Fresh Air	Asper SP 7:2026 (NBCS 2026)/ISHRAE-2017
Ventilation	Asper NBCS-2026/ISHRAE-2017

13.5 Building Construction Data: - Asper the Architectural and civil specifications.

13.6 Brief of Air-conditioning Work: -

13.6.1 **VRF system:** - Air Conditioning system with Air-cooled Variable Refrigerant flow (VRF System) with Inverter-based D.C Twin Rotary / Scroll modular compressor (**Heat Pump type- cooling in summer & monsoon while heating in winter**) with R-410 refrigerant. The make of the compressor shall be of the same as OEM. The VRF units shall be able to deliver 100% capacities at AHRI conditions till ambient temperature of 47.0 deg C.

13.6.2 Latest BEE guideline for AC system/ECBC/GRIHA/AHRI, whichever guideline is more stringent shall be followed based on the GRIHA star rating requirement of the building. Min. COP of ODU at AHRI Conditions shall be not less than 3.7 at Full Load.

13.6.3 The VRF System outdoor unit shall have an operating range from (-) 5°C to 52°C in Cooling Mode, and the OEM shall submit a catalogue for VRF unit, mentioning the same. In case of one IDU fails or stops working for any reason during the running of the system, the VRF System must have a provision or capability to bypass so that the whole circuit is not affected.

13.6.4 Various types of Indoor units referred to in equipment selection summary sheet. Cassette units, ductable units, high wall units and modular DX AHUs with communication kit, required sensors etc. shall be provided as per specific need of each area keeping in mind for individual's temperature controls (Thermostat) for each area.

13.6.5 All standard VRF units shall have high lift drain pump to lift the condensate water properly.

13.6.6 Insulated Refrigerant piping network, ref. not in its insulation, communication kits (wherever required) & expansion valves shall be provided complete in all respect. Thickness of piping will be as per CPWD HVAC specification. Closed-cell Nitrile rubber insulation of required thickness shall be provided.

13.6.7 Suitable size insulated drain pipe (heavy duty CPVC) shall be provided in proper slope.

- 13.6.8 Intelligent centralized push-button controller compatible with BMS for a complete VRF system shall be provided (dedicated for each community building) for controlling (ON/OFF, scheduling, lock/unlock, swing control, temperature setting, error detection) all indoor units and monitoring of corresponding outdoor units from one central location.
- 13.6.9 Complete electrical work, inclusive of panels, cables, cable tray etc. shall be provided.
- 13.6.10 Fresh air to conditioned spaces shall be provided as per NBC requirements.
- 13.6.11 All modular DX AHU will have two-stage filtration, i.e. one set of 50 mm thick prefilter section equivalent to MERV-8 & second set of high-efficiency Electronic Air cleaner/Electrically charged filter section. Filter efficiency is a minimum equivalent to MERV-14 rating.
- 13.6.12 For VRF standard ductable units, micro electrostatic filter (EAC) is to be provided.
- 13.6.13 All modular DX AHU & VRF units: Duct-mounted advanced oxidation plasma cell system/UVGI system/Needlepoint, Tube Type & Carbon Brush Type Bi-polar Ionisation technology for indoor air quality shall be provided.
- 13.6.14 Duct shall be factory fabricated from galvanised steel sheets of various thicknesses ranging from 24 gauge to 18 gauge according to duct sizes and in accordance with CPWD Specifications. Site-fabricated ducts shall be provided except for critical pieces like connection pieces, collar pieces, reducers, offset pieces etc.
- 13.6.15 All types of Air terminals like Grilles/Diffusers/ VCD/ drum louvres/ slot diffuser/ jet nozzle etc. shall be provided as per the design requirements.
- 13.6.16 Fire dampers with actuators as per requirements shall be provided and shall be hooked up to fire alarm system.
- 13.6.17 All types of Air terminals like Grilles/Diffusers/VCD/drum louvers/slot diffuser/jet nozzle etc. shall be provided as per the design requirements.
- 13.6.18 In case of one IDU fails or stops working for any reason during the running of the system, the VRF System must have provision or capability to bypass so that the whole circuit should not get affected.
- 13.6.19 Acoustic (Fiberglass) insulation will be provided on AHU room walls/ceiling or any other way to reduce AHU noise.
- 13.6.20 **DX Split unit:-**
- All control rooms (UPS room, fire control room, CCTV rooms, Server Room etc.) shall be provided with DX split units (Hi-wall type/ductable/cassette) with inverter technology BEE 5 star rated in N+1 combination (24*7)

Caretaker, dispensary, doctor room & engineer room etc. shall be provided with DX split units Hi-heat pump type (Hi-wall type/ductable/cassette) with inverter technology BEE 5 star rated.

NOTE:

- (i) Ensure that all the refrigerant & insulation used in the building for HVAC systems are CFC and HCFC free.
- (ii) All indoor and outdoor units shall have a minimum warranty of 3 years (in DLP). Bidders are requested to quote accordingly.

13.7 MECHANICAL VENTILATION SYSTEM:

Scope covers planning, design, supply, installation, testing and commissioning of the complete mechanical ventilation system, basement smoke extraction system, normal ventilation and specific exhaust systems, and pressurization of lift lobbies, lift wells and staircases as required by SP 7:2026 (NBCS 2026), Fire NOC requirements and local bye-laws. For avoidance of doubt, the C-13 ECPT includes the 120 HP VRF/VRV system provided in the PE together with the complete pressurized mechanical ventilation/smoke-extraction scope and all required staircase/lift-lobby/lift-well pressurization fans, ducts, dampers, controls, cabling, panels and accessories. No separate extra payment shall be admissible for these systems.

Minimum Ventilation Rates shall be as per given Table below & bidders shall quote accordingly.

Area Description	Air Change Per Hour (ACPH)
Smoke Exhaust (in case of emergency)	12
Toilets	Min. 12
Pantry Exhaust	15
Store Exhaust/ Fresh Air	6
UPS Battery Room	CFM based on UPS capacity & manufacturer recommendation
Pump Room (UGT/FIRE) /ESS (LT Panel room etc.) & service rooms	20
STP, ETP & Garbage room	30
Kitchen	40 ACPH or minimum requirement by BOH
Pressurization	As per SP 7:2026 (NBC 2026), Vol. 1, part IV- Table-6
Lift Well Pressurization	Mechanically pressurized to maintain 50 Pa.
Lift Lobby Pressurization	Mechanically pressurized for maintaining 25 to 30 Pa or naturally ventilated

Staircase Pressurization	Mechanically maintaining ventilated	pressurized 50 Pa or naturally	for
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The system consists of axial fans/ Inline Fan/ Propeller fans/ Cabinet fan/ scrubber etc., GSS ductwork, fresh /exhaust air grills, louvers etc. shall be provided.

13.8 TECHNICAL SPECIFICATION FOR VRF/VRV AC SYSTEM

13.9.1 SCOPE

The scope of this tender comprises supply, erection, testing and commissioning of **inverter technology based Scroll Type VRV/VRF system (Heat Pump type)** for air conditioning conforming to these specifications/explanatory note. The contractor shall calculate equipment capacity based upon design parameters specified for the system design & submit shop drawings accordingly to verify all the quantities and sizes of refrigerant pipe, fitting, cables, control cable, pipes, insulation, indoor units and outdoor units etc. before installation to avoid any shortfall or surplus. The tenderer shall also include all necessary civil work and MS framework for the installation of outdoor and indoor units in a VRF-based air conditioning system. The work includes the refrigerant gas & its charging for proper & specified functioning of the air conditioning system. The scope of work of the contractor shall also include:

- (i) Cutting of wall and floors/ceiling.
- (ii) Making holes.
- (iii) Sleeves.
- (iv) Foundations

Civil work & MS frame work for indoor and outdoor units related to VRF equipments, all cuttings should be properly finished as existing surrounding. The scope of work in tender schedules also includes designing of complete air-conditioning system based on inverter technology based Scroll VRF air conditioner with air cooled outdoor units system capable of cooling and heating (reverse cycle) as per individual or season requirement, suitable for operation 415 V, 3 Phase, 50 Hz AC electric supply. The outdoor units shall have both cooling, consisting of one/multiple outdoor unit with single circuit of refrigerant piping and multiple indoor units of various types. Each indoor unit should have capability to cool as per seasonal weather changes.

The lay-out of refrigerant piping is to be designed in such a way so that it should not disturb the aesthetic of the building/room, inadvertent damage in the route of pipe should not occur in future & optimum length of pipe line for efficient air conditioning. After completion of the work, four sets of "As erected/commissioned drawing" of activities listed above shall be submitted. Suitable size GI cable tray shall be provided for laying of cables and refrigerant piping wherever required for indoor and outdoor units.

13.9.2 Outdoor Unit

- (i) The outdoor unit shall be factory assembled, weatherproof casing (material of casing shall be vendor's standard design), constructed from heavy gauge GI sheet steel panels and coated with baked enamel finish. The outdoor unit shall be completely factory

wired, tested with all necessary controls & filled with first charge of refrigerant before delivering at site.

- (ii) The inverter technology based on Scroll/twin rotary type VRF equipment should be capable so that refrigerant piping between indoor units and outdoor unit shall be extendable up to 225 m of equivalent length with maximum height difference between outdoor & indoor unit of 90 m & level difference between two indoor units shall be maximum up to 15 m. All the outdoor units comprising of multiple modules should have all inverter type compressor in each module.
- (iii) The outdoor unit shall be factory tested and filled with first charge of refrigerant before delivering at site. Any extra refrigerant filling for proper cooling shall be done by the contractor only without any extra cost whatsoever.
- (iv) It should also be provided with duty cycling for D.C inverter Scroll/Twin rotary compressors capable of changing the 'rotating speed of compressor by inverter controller to follow variation in cooling & heating loads & switching starting sequence for better stability and prolonging equipment life.
- (v) The unit shall be provided with its own microprocessor control panel with provision for integration with the building management system for Air-conditioning system.
- (vi) The machine must have a sub-cool feature to use coil surface more effectively through proper circuit bridge so that it prevents the flushing of refrigerant from long piping due to this effect, thereby achieving energy savings.
- (vii) The outdoor unit should have a low noise level and should not be more than 67 dB(A) at normal operation at a horizontal distance of 1 mtr when measured at 1.5 m vertical distance from ground level.
- (viii) The outdoor unit should be fitted with low-noise aero spiral design fan with aero fitting grill for spiral discharge airflow to reduce pressure loss and should be fixed with DC/AC fan motor for better efficiency.
- (ix) In case of trouble occurs in an indoor unit(s), the continuous operation of system should be possible.
- (x) The outdoor unit shall be designed in such a way that cleaning of drain Pan should be easy & inspection/ replacement of compressor should be easy.
- (xi) The condensing unit shall be designed to operate safely when connected to multiple fan coil units.
- (xii) The outdoor units shall be provided in such a fashion that these do not affect the overall aesthetics and ambience of the building. If required these units shall be suitably camouflaged to give good aesthetic look

13.9.2.1 **Compressor:**

The compressor in inverter-based D.C. Twin Scroll/twin rotary System shall be highly efficient. The system should respond efficiently in accordance to the variation in cooling or heating load requirement. Each outdoor unit shall have more than one compressor.

All outdoor units shall have multiple steps of capacity control to meet load fluctuation and indoor unit individual control. All parts of compressor shall be sufficiently lubricated stock. Forced lubrication may also be employed. Oil heaters

shall be provided in the compressor casing or as per manufacturer standard equipment.

13.9.2.2 Oil Recovery system

Unit shall be equipped with an oil recovery system to ensure stable operation with long refrigerant piping lengths. The system must be provided with oil balancing circuit to avoid poor lubrication.

13.9.2.3 Refrigerant Circuit

(i) The refrigerant circuit shall include liquid and gas shut-off valves and a solenoid valve at condenser end. The equipment must have inbuilt refrigerant stabilization control for proper refrigerant distribution.

(ii) All necessary safety devices shall be provided to ensure the safe operation of the system.

13.9.2.4 Heat Exchanger

The heat exchanger shall be constructed with copper tubes mechanically bonded to aluminium/copper fins to form a cross-fin coil. The aluminium/copper fins shall be covered by anticorrosion resin film.

The unit shall be provided with necessary number of direct driven low-noise level propeller type fans arranged for vertical discharge. Each fan shall have a safety guard

13.9.2.5 Safety Devices

All necessary safety devices shall be provided to ensure safe operation of the system. Following safety devices shall be part of outdoor unit: high pressure switch, fuse, fan drive overload protector, fusible plug, crankcase heater, overload relay, overload protection for inverter-based technology & digital-based technology.

13.10 Indoor Units

All indoor units as specified shall have, in general, noise levels less than 46 dB. For critical applications, noise levels below these limits may, however, be specified during the design stage.

- (i) Each unit shall have electronic control valve to control refrigerant flow rate respond to load variation of the room.
- (ii) The address of the indoor unit shall be set automatically or through central controller in case of individual and group control.
- (iii) The fan shall be dual suction, aerodynamically designed, Turbo, multi-blade type, statically and dynamically balanced to ensure low noise and vibration-free operation of the system. The fan shall be direct-driven type, mounted directly on motor shaft having support from housing.
- (iv) The cooling coil shall be made of seamless copper tubes and have continuous aluminium/copper fins. The fins shall be spaced by collars forming an integral part. The tubes shall be staggered in the direction of airflow. The tubes shall be hydraulically/mechanically expanded for minimum thermal contact resistance with fins. Each coil shall be factory tested at 21 kg/sq. m air pressure under water.
- (v) Indoor unit shall have cleanable type filter fixed to an integrally moulded/moulded plastic frame. The filter shall be slide-in type, insertable

type. It shall be possible to clean the filters either with compressed air or water.

- (vi) Each unit shall have Electronic control expansion valve for variable refrigerant flow effect.
- (vii) Each indoor high wall unit shall be with corded/cordless remote controller as standard features. The controller shall be able to change fan speed as per requirement of indoor units: Ceiling mounted cassette type unit/High wall type/ductable type (as specified in tender drawings).

13.10.1

IndoorUnit:

- (i) **Cassette type:** Supply, installation, testing and commissioning of 4-way flow VRV/VRF Cassette Type Indoor ceiling mounted unit equipped with synthetic washable media pre-filter, fan section with low noise fan/dynamically balanced blower, multispeed motor, coil section with DX Copper coil, electronic expansion valve, outer cabinet, drain pump, grill, necessary supports, vibration isolation, cordless remote control, suitable for operation on single phase 230 V $\pm$ 10%, 50 Hz AC supply, complete, as required.
- (ii) **Highwalltype:** Supply, installation, testing and commissioning of VRV/VRF High wall type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan/dynamically balanced blower, multispeed motor, coil section with DX copper coil, electronic expansion valve, outer cabinet, cordless remote control, drain pan, necessary accessories etc., suitable for operation on 230 V $\pm$ 10%, 50 Hz, single phase AC supply, complete as required.
- (iii) **Ductable type** (High/Medium Static Ductable type): Supply, installation, testing and commissioning of external static pressure VRF/VRV ceiling mounted ductable type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan/dynamically balanced blower, multispeed motor, coil section with DX copper coil, electronic expansion valve, corded remote control, outer cabinet, vibration isolators, drain pan, other necessary supports etc., suitable for operation on single phase AC supply 230 V $\pm$ 10%, 50 Hz complete as required.

13.10.2 **Ref-netJoints/Header Joints**

The system shall use V-Joint/ Ref-net separation refrigeration pipe joints and headers in the appropriate orientation to enable the correct distribution of refrigerant. The Distribution Joints should be factory insulated with pre-formed sections of Expanded Polystyrene/Equivalent

a) Refrigerant Piping with insulation and with UV protection coating

1. Refrigerant piping for the air-conditioning system shall be up to 19.1 mm dia. of soft seamless copper tubes & for above 19.1 mm dia. the pipe material shall be of hard seamless copper tubes with the pipe material being hard-drawn copper pipe. Forged copper fittings shall be used for the refrigerant piping. The refrigerant piping arrangements shall be in accordance with good engineering practices as applicable to the air-conditioning industry, and shall include charging connections, suction line insulation and all other items normally forming part of proper refrigerant circuits except Y joint/separation tubes.

2. Before joining any copper pipe or fittings, their internals shall be thoroughly cleaned by passing a clean cloth via wire or cable through their entire length. The piping shall be continuously kept clean and dirt etc. while constructing the joints. Subsequently, it shall be thoroughly blown out using nitrogen gas.
3. After completion of installation of the refrigerant piping, the refrigerant piping system shall be pressure tested using nitrogen gas at a suitable pressure as specified by OEM (Original Equipment Manufacturer). Pressure shall be maintained in the system for 48 hours. The system shall then be evacuated to vacuum of not less than 700 mm Hg and held for 24 hours.
4. The supplier of air-conditioning system shall choose sizes as designed and erect proper interconnections of the complete refrigerant circuit.
5. The suction line pipe size and the liquid line pipe sizes shall be selected according to the manufacturer's specified diameter. All refrigerant pipes shall be properly supported and anchored to the building/structure using steel hangers, fasteners, brackets and supports which shall be fixed to the building/structure by means of inserts or expansion shields or anchor fasteners of adequate size and number to support the load imposed thereon.
6. The refrigerant piping should be laid in such a way that it should not distort the interior of the room. Wherever the refrigerant pipe shall be laid across the room, it should be laid in a concealed manner. All associated minor Civil Engineering works (like chasing on wall, ceiling & re-plastering & repainting etc.) related with the above items are included in the scope of work. The above scope does not include false ceiling wherever required.
7. To protect Nitrile rubber insulation of outdoor installed copper piping from degradation due to ultra violet rays and atmospheric condition, it shall be covered with polyshield coating of at least two coats of resin and hardener (Poly Bond make or equivalent). Fibre glass tape shall be helically wound with adequate overlap & coated with two coats of resin with hardener to give smooth & plain finish.
8. Entire liquid and suction refrigerant pipe lines including all fittings, valves and strainer bodies, etc. shall be insulated as per DSR (items for VRF/VRV air conditioning system) – 2019 Part-I.
9. UV protection coating on existing copper pipes (with insulation) shall be done with the help of Starbond and 7 mm cloth etc. UV protection coating shall be done on all the pipes irrespective of size of pipes.

b. PUSH BUTTON TYPE based central controller

The contractor should provide Push button type based central controller for controlling (ON/OFF, scheduling, lock/unlock, swing control, temperature setting, error detection, filter detection) all indoor units (256) and monitoring of corresponding outdoor units from one central location. PC-based central controller should be BMS (like Bacnet, Lan works, Modbus) compatible. It must show the status of all indoor units along with outdoor unit.

c. Drain Piping duly insulated

The drain pipe connection of each fan coil unit to the main header should be 25 mm dia./32 mm dia. as required. The header pipe should be of 50 mm dia./40 mm dia./32 mm dia. as required. The drain-pipe should be heavy PPR pipe, ISI marked and conforming to relevant IS, complete with fittings as required, whereas the connection of the fan coil unit to the PPR pipe should be with flexible braided pipe. The drain piping should be insulated with 6 mm thick tubular nitrile rubber insulation.

For proper drainage of condensate, U trap shall be provided in the drain piping wherever required. Drainage arrangement shall be concealed as far as possible. If it is not possible due to some technical constraint, then all pipe supports shall be prefabricated and pre-painted slotted angle supports, properly installed with clamps. The condensate drain pipe arrangement for disposal of condensate water shall be made in such a way that there should not be any leakages of condensate water inside rooms as well as in the route of drain water pipeline & water should be discharged in the ground/rain water harvesting system at the location jointly decided with Engineer-in-Charge of work or his representative. All associated Civil Engineering works, if required, as per requirement at site in above connection, like making chase in the wall & restoring it to original shape by re-plastering & repainting, etc. are included in the scope of work. The arrangement of drain-pipe shall be made in such a way that it should not affect the aesthetic of the building as well as is maintenance friendly & easily accessible.

d. Various Sizes PVC Insulated Copper Conductor Wiring Cables

Cross-Linked Halogen Free Flame-Retardant Copper conductor (Class-2) cables (ISI marked) multi-stranded sheathed copper conductor wiring cable for working voltage up to & including 1100 Volts, ISI marked conforming to IS 694/1990 (Latest Version). Wiring of installation shall be in conformity with IS 732/1989 (Latest Version), IS 4648/1968 (Latest Version)

e. DOUBLE SKIN AIR HANDLING UNITS

The air handling units shall be double skin construction, draw through / blow through type comprising of various sections, pre filters (MERV-8), EAC (Electrically charged filter) filter section, coil section and fan section, mixing box with volume control dampers, (wherever the return air and fresh air are ducted) as per approved shop drawings.

f. CASING

Double skinned panels shall be 40mm thick made of galvanized steel, pressure injected with PUF insulation (density 38 kg/cum) between both inner and outer skin shall be fixed to 1.5 mm thick aluminium alloy twin box section structural framework with stainless steel screws. Outer sheet of panels shall be made of galvanized pre-coated sheet of minimum 0.8mm and inner sheet of 0.8 mm plain G.I. Sheet.

The entire framework shall be mounted on an aluminium alloy or galvanized steel (depending on size) channel base as per manufacturer's recommendation. The panels shall be sealed to the frame work by heavy duty O'ring gaskets held captive in the framed extrusion. All panels shall be detachable or hinged. Hinges shall be made of die cast

aluminium with stainless steel pivots, handles shall be made of hard nylon and be operational from both inside and outside of the unit. Units supplied with various sections shall be suitable for onsite assembly with continuous foam gasket. All fixing and gaskets shall be concealed.

Units shall have a hinged, quick-opening access door in the fan section and also in the filter section where filters are not accessible from outside. Access doors shall be double-skinned.

Condensate drain pan shall be fabricated from 1.25 mm thick stainless steel sheet externally insulated with 10mm thick closed cell polyethylene foam insulation or nitrile rubber or PUF with necessary dual slope to facilitate fast removal of condensate. Necessary supports will be provided to slide the coil in the drain pan with all corners welded. It shall be isolated from bottom floor panel through 25mm heavy duty TF expanded polystyrene or polyurethane foam.

AHU panels shall be factory-fitted with pressure ports for DPT installation. The number and size of these shall be confirmed at the AHU technical approval stage. In case an opening is to be made in AHU panel, the same shall be with C-channel all around to prevent entry of PUF into air stream. The channels shall be cut at 45 degrees at the corners to avoid overlap. Material for the channel shall be the same as that of the internal skin of AHU.

Rubber grommets shall be provided at all entry points into AHU such as coil connection, cable entry etc. The same shall be double-lip tight-fitting to prevent air leakage.

All access doors shall be outward opening. For doors provided downstream of the fan, especially in high-static AHUs, additional clamps shall be provided along the periphery of door to maintain constant pressure and ensure proper sealing.

Water-resistant marine light with power cabling shall be included

Micro switch along with wiring for the Door shall be provided such that fan motor shall stop upon opening the door.

g. THERMAL BREAK PROFILE

AHUs shall be provided with thermal break profile as required. Panels and thermal break profiles for all AHUs shall be designed and assembled in such a way that there shall not be any condensation on AHU with conditions of 35 degree C and 92% RH (AHU surrounding conditions) at designed operating conditions inside the AHU.

h. DAMPER

Dampers shall be opposed blade type. Blades shall be made of double skinned airfoil aluminium sections with integral gasket and assembled within a rigid extruded aluminium alloy frame. All linkages and supporting spindles shall be made of aluminium or nylon, turning in teflon bushes. Manual dampers shall be provided with a bakelite knob for locking the damper blades in position. Linkages shall be extended wherever specified for motorised operation. Damper frames shall be sectionalized to minimise blade warping. Air leakage

through dampers when in the closed position shall not exceed 1.5% of the maximum design air volume flow rate at the maximum design air total pressure.

i. MIXIN GBOX

AHU's requiring mixing boxes as per duct design which shall be complete with fresh and return air dampers.

j. MOTOR AND DRIVE FAN

Fan motors shall be IE-3 efficiency class and shall be $415 \pm 10\%$ volts, 50 cycles, three phases, totally enclosed fan-cooled class F, with IP-55 protection. Motors shall be especially designed for quiet operation and motor speeds shall not exceed 1440rpm. Drive to fan shall be provided through 'V' belt-drive arrangement. Belts shall be of the oil-resistant type. Minimum efficiency of shall not be below 75%.

Fans shall be DIDW centrifugal, backward curved (for FM AHU)/forward curved (for CS AHU), aerofoil blades. Fan casing shall be made of galvanized steel sheet. Fan wheels shall be made of galvanized steel. Fan shaft shall be ground C-40 carbon steel and supported in self-aligning Plummer block operating at less than 75% of first critical speed, grease-lubricated bearings. Fan wheels and pulleys shall be individually tested and precision-balanced dynamically.

Motors shall be mounted inside the AHU casing on slide rails for easy belt tensioning, and be totally enclosed, fan cooled, to be class 'F' insulation. Motors shall drive heavy duty V-belt, constant pitch, drive selected at 110% of motor horsepower.

Both fan and motors assemblies shall be mounted on a deep section aluminium alloy base frame.

Isolation shall be provided from the unit casing by combination spring and rubber anti-vibration mounts and flame-retardant, waterproof neoprene-impregnated flexible connection on the fan discharge.

Height of CSAHU should not be more than 750 mm.

k. COOLING COILS/HEATING COIL

DX coils selections (Thickness, size and rows) as per VRF manufacturer recommendations. Coils with sine wave aluminium fins firmly bonded to copper tubes assembled in stainless steel frame. Face and surface areas shall be such as to ensure rated capacity from each unit and such that the air velocity across the coil shall not exceed 155 meters per minute. The coil shall be pitched in the unit casing for proper drainage. The DX/VRF coil shall have copper refrigerant liquid/gas connections brought outside the AHU casing by minimum 150 mm or as recommended by the approved VRF manufacturer, complete with suitable flare/brazed joints, service access and insulation as required. Fin spacing shall be 11 to 13 fins per inch (4 - 5 fins per cm).

In case AHU has multiple coil stacked one above another, intermediate drain tray of SS 304 (18 gauge) shall be provided so that upper level of coil drains into this drain tray. SS 304 piping shall be provided from this drain tray upto main bottom tray.

Computerized cooling coil selection out put shall be submitted. Coil rating shall be as per AHRI-410. Each AHU shall be provided with complete AHU communication Kit including DX- Type electronic expansion valve, AHU kit or any other attachment or device to make it complete and functional with the VRV outdoor unit and central controller.

1. FILTERSECTION (For all AHUs/TFA/HRW, below filter section to be provided):

Pre Filter

Each unit shall be provided with a 50mm thick factory assembled filter section containing washable synthetic type air filters having anodized aluminum frame. The media shall be supported with High Density polyethylene (HDPE) mesh on one side and aluminium mesh on the other side. Filter banks shall be easily accessible and designed for easy withdrawal and replacement of filter cells. Filter bank framework shall be fully sealed and constructed from GSS. The efficiency of the filters shall be 90% down to particle size of 10 microns (MERV-8) in AHU's, as per IS 7613, and ASHRAE 52.1. Filters face velocity shall not exceed 500 Feet per Minute. Filters shall fit so as to prevent by-pass.

13.11 Electronic Air Cleaner Filter (MERV-14/15)

Highly efficient electronic air filtration system (Electrostatic precipitation) with low pressure drops. All units shall be fitted with a true electronic air cleaner system (complete with charging section and collector section) to be installed before the cooling coils. Other forms of air filtration systems such as charged media filters, dielectric media filters, or ionizers (which do not have second stage collector plates) shall not be acceptable. The electronic air cleaner (EAC) shall be capable of removing particulates as small as 0.01 microns including microscopic haze particles, smoke, dust, mold spores and bacteria.

Central Air Cleaner, a hybrid air purification system, should improve the indoor air quality by reducing harmful pollutants like particulate matter PM- 10, PM 2.5, allergens, pollen, smoke, bacteria, pathogens based on Electrostatic precipitation technology. It should be a monobloc structured unit specifically designed for integration in Return Air path of the AHU, to centrally capture the pollutants. It should be equivalent to MERV14/15 efficiency. It should be within built provision to connect to BMS. The product has to be certified as a green product by any of the Green Building councils across the world. The central air cleaner units must have a valid ANSI/ASHRAE 52 test report to verify filtration efficiency. Ozone level of units provided must be within the acceptable limit of 0.05ppm. The units shall have local LEDs at each individual unit to indicate when the units are up for wash/malfunctioning.

Codes and Standards: ASHRAE 52.1 — Gravimetric and Dust Spot procedures for testing Air Cleaning Devices. IS 7613 — Methods of testing panel type Air filters for HVAC.

13.11.1.1 FILTER ASSEMBLY

The housing shall be made from extruded aluminium sections. All joints shall be sealed airtight and shall be made free of all burrs and sharp edges.

The filter loading mechanism shall be sliding type or front loading type. The locking mechanism shall be a spring loaded, toggle type mechanism with a bolt and thrust assembly which shall thrust the filter evenly against the sealing flange of the housing when it is installed.

13.11.1.2 ISOLATORS

Vibration isolators shall be provided with all air handling units. Vibration isolators shall be cushy foot mounting type. Minimum vibration isolation efficiency shall be 90% and certificate of vibration isolator shall be provided by Contractor.

13.11.1.3 PAINTING

Shop coats of paint that have become marred during shipment or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with paint to match the finish over the adjoining shop painted surface.

13.11.1.4 NOISE CONTROL

Air Handling Units shall be selected for the lowest operating noise level of the equipment. Fan performance rating, power consumption, and sound power data with operating points clearly indicated shall be submitted by the tenders along with technical submittals for approval and verified at the time of testing and commissioning of the installation. The sound level within the AHU room shall be less than 75 dB at a distance of 2 meter from AHU.

13.11.1.5 CONNECTIONS

Piping Piping installation requirements are specified in other sections. The Drawings indicate the general arrangement of piping, valves, fittings, and specialties. The following are specific connection requirements:

Arrange piping installations adjacent to units to allow unit servicing and maintenance. Connect piping to air-handling units with flanges enabling easy removal of the coil. Connect condensate drain pans using 50 mm (2-0 inch) minimum, insulated G.I. pipe and extend to nearest floor drain. Construct deep trap (depth as per detail) at connection to drain pan and install cleanouts at changes in direction.

Duct installations and connections are specified in other sections. Make final duct connections with flexible connections.

Electrical Connections: The following requirements apply:

Electrical power wiring is specified in Section Electrical.

Temperature control wiring and interlock wiring is specified in Section "Electrical Control systems."

Grounding: Connect unit components to ground in accordance with the Indian Electrical Code.

13.11.2 TESTING

Cooling capacity of various Air handling units shall be computed from the measurements of air flow and dry and wet bulb temperatures of air entering and leaving the coil. Flow measurements shall be by a calibrated rotating vane anemometer and temperature measurements by accurately calibrated mercury-in-glass thermometers. Computed ratings shall conform to the specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current, whereas, noise level at various locations within the conditioned spaces shall be measured by a sound pressure level meter.

13.12 FANS

13.12.1 SCOPE

The scope of this section comprises the supply, erection, testing and commissioning of centrifugal, axial, in-line and propeller type fans conforming to these Specifications and in accordance with the requirement of system design.

13.12.2 TYPE

Centrifugal, in-line, propeller fans and Axial fans shall be of the type as approved of design/ engineer in charge.

13.12.3 CAPACITY

The air-moving capacity of fans shall be as shown on approved shop Drawings approved by Engineer-In-charge in consultation with NBCC.

13.12.4 CENTRIFUGAL FAN

Centrifugal fan shall be DIDW/SISW Class I construction, Arrangement 3 (i.e. bearings on both the sides) for DIDW/SISW fans, complete with squirrel-cage induction motor, V-belt drive, belt guard and vibration isolators. Direction of discharge/rotation and motor position shall be as per the Approved-for-Construction shop drawings.

- a. Housing shall be as per OEM standard design and shall be of airtight Permalock construction. It shall be rigidly reinforced and supported by structural angles. Housing

- for fan size bigger than 1250 mm dia. shall be made out of continuously welded heavy gauge steel and will be made in split casing.
- b. 18 gauge galvanized wire mesh inlet guards of 5 cm sieve shall be provided on both inlets. Housing shall be provided with standard cleanout door with handles and neoprene gasket. Rotation arrow shall be clearly marked on the housing.
 - c. Fan wheel shall be backward-curved, non-overloading type. Fan wheel and housing shall be statically and dynamically balanced. For fans up to 450 mm dia., fan outlet velocity shall not exceed 550 metre/minute. For fans above 450 mm dia., the outlet velocity shall be within 610 metre/minute. High static pressure fan speed shall be as per manufacturer.
 - d. Shaft shall be constructed of steel, turned, ground and polished.
 - e. Bearings: Shall be of the sleeve/ball-bearing type mounted directly on the fan housing. Bearings shall be designed especially for quiet operation and shall be of the self-aligning, oil/grease-pack pillow block type.
 - f. **Motor:** Fan motor shall be high energy efficient (IE-2) and suitable for $415 \pm 10\%$ volts, 50 cycles, 3 phase AC power supply, squirrel-cage, totally enclosed, fan-cooled motor, provided with Class F insulation, and of approved make. Motor shall be designed especially for quiet operation. The fan and motor combination selected for the particular required performance shall be of the most efficient (smallest horsepower), so that sound level is lowest.
 - g. Drive to fan shall be provided through belt with adjustable motor sheave and a standard belt guard. Belts shall be of the oil-resistant type.
 - h. **Vibration Isolation:** MS base shall be provided for both fan and motor, built as an integral part, and shall be mounted on a concrete foundation through vibration isolators. The concrete foundation shall be at least 15 cm above the finished floor level, or as shown in approved-for-construction shop drawings.
 - i. Centrifugal fans shall be shaft-driven external belt drive and motor.
 - j. Fan shall conform to AMCA Standard 211 and 311. Fan must be tested in accordance with ANSI/AMCA Standard 210-99 and AMCA Standard 300-96 in an AMCA-accredited laboratory. Fans shall be certified to bear the AMCA label for air and sound performance.

13.12.5 AXIAL FLOW FAN

GENERAL:

- a. Fans shall be of the type, size, arrangement and capacity as shown on the drawings.
- b. Unless specified, fan performance rating data shall be tested in accordance with AMCA Standard 210-85 (Air Moving and Conditioning Association).
- c. A computer printout of fan performance rating corresponding to the AMCA-licensed data, with corrected ratings for altitude and temperature, fan operating speed, bearing life, etc. shall be submitted for approval.
- d. All fans shall be dynamically trim-balanced to ISO 1940 or AMCA 204/3-G2.5 quality grade after assembly. A computer printout with the vibration spectrum analysis shall be attached to the fans..
- e. Fan motors shall comply in all respects with continuous rating in accordance with IS/IEC34 or equivalent. Motor bearings shall be of ball or roller type, grease or lubricant sealed for life. Fan and drive shall be earthed to prevent accumulation of static charge.

- f. Fans shall be installed at staircase or lobby where fresh air intake is free from any obstruction and shall be energized only by fire alarm system. Fan shall be of Axial Flow Fan. Protective grille at the suction of the fan is required.
- g. Fans for elevated temperature (Smoke Extraction Fans) with components rated for high temperature (250°C, 2 Hrs) service, with belt drive assemblies exposed to the airstream are not acceptable.
- h. For Smoke Extraction Fans where motor is in the air stream with electrical/electronic temperature limit switch for motor protecting shall not be used.
- i. Fan should be of G.S.S. The steel sheet should be JFE Galva zinc (Base metal cold rolled), JIS G3302, SGCC with Z22 (minimum coating weight on both sides @ 220 g/m²) zinc coating & Zero Spangle, skin passed, chromated and dry or powder coated MS casing.
- j. If fan is open to atmosphere, fans shall be with pure polyester powder coating for minimum thickness of 60 microns.
- k. Fan shall be AMCA certified for Air performance and Fan Efficiency Grade (Min FEG 71, lesser is not acceptable).
- l. Thickness of Axial fan's casing shall be as per OEM standard design.
- m. Smoke and heat exhaust fans are required to be in compliance with the CE/UL labelled/'BS EN 12101-3:2015'. This requires the fan to be subjected to a rated temperature of 250°C for a rated duration of 120 minutes.

13.13 For Pressurization and other services:

- a. Outlet velocity of the fans should not exceed 16m/s.
 - b. RPM as per OEM best selection to meet efficiency and noise criteria.
 - c. Sound level for fans should not exceed 80 DB(A)@ 3meter (Room Condition).
- Except following specifications, rest of the specification shall be as per specifications mentioned in CPWD Specifications for HVAC works – 2017 amended up to date.

13.14 BRIEF:

- a. Single Piece Long Casing (Motor should completely be accommodated inside the fan casing) Axial Fans shall be licensed to bear the AMCA Seal.
- b. To achieve the minimum and equal clearance between the blade tips and casing, tube casing shall maintain its roundness by means of using one piece of sheet metal with 90° edges flanging up.
- c. Fan motor base support shall be properly secured (locked and sealed) to the fan housing and be of adjustable type to have precise control of motor shaft central position as well as running clearance between blade tips and casing. Motor (kW/HP) shall be able to be changed or upgraded at site without changing fan housing or ducting construction.
- d. Fans supplied shall be complete with factory-fabricated mounting bracket (ceiling or foot mounted) and suction/discharge matching flanges as accessories.
- e. All hubs shall be cast Aluminium or Aluminium alloy (Grade LM2) unless for Smoke Extractor Fans where high temperature (250°C/2 Hrs) air is expected, then Aluminium alloy or steel fan impeller blades are required. Otherwise, impeller blade material with Polypropylene (PP), Glass-reinforced Polypropylene (PPG) and Glass-reinforced

Polyamid (PAG), to provide self-balancing, anti-static, anti-sparking characteristic is preferable.

- f. Running clearance between blade tips and casing shall not exceed 1% of the impeller diameter and 2% for smoke spill high temperature fan where mechanical expansion coefficient is different from normal ambient temperature. Fan manufacturer shall provide the fan assembled with the same clearance between blade tips and casing of the tested prototype. Note that the air performance and pressure loss are greatly affected by this clearance.
- g. Impellers shall be secured to the drive shaft by a key and keyway. Axial location shall be provided by a collar or shoulder on the drive shaft together with a retaining washer and screw fitted into a tapped hole at the end of the shaft and locked in position. Blades shall be secured in place to the angle setting by setscrews, locking nuts or setting pins.
- h. Fan motor shall be totally enclosed and external terminal box of at least IP55 shall be provided.
- i. All fans after assembly shall be dynamically trim-balanced to ISO 1940 or AMCA 204/3-G2.5 quality grade. A computer printout with vibration spectrum analysis shall be attached to the fans.
- j. For vanes Axial, Fan Casing should be provided with Special Designed Integral Straightening Vanes to reduce turbulence, provide high performance & low noise level.
- k. Motor shall be as per high energy efficient (IE-2), totally-enclosed, fan-cooled standard round frame, constant speed, continuous duty, single winding, suitable for 415 +10% volts, 50 cycles, 3 phase AC power supply, provided with Class 'F'/'H' insulation with IP54/IP55 protection. Motor shall be specially designed for quiet operation. For lowest sound level, fan shall be selected for maximum efficiency or minimum horsepower. Motor conduit box shall be mounted on exterior of fan casing and lead wires from the motor to the conduit box shall be protected from the air stream by enclosing in a flexible metal conduit/vanes.
- l. The Axial Fan Blades shall be of Cast Aluminum or Aluminum alloy of aerofoil design for high efficiency and high static pressure. The blades shall be joined together on cast aluminum hub.
- m. The mounting ring shall be of CRCA/sheet steel with steel brackets to connect the frame, with the Fan/Motor assembly. Rubber mounts shall be provided between the mounting frame and the mounting brackets.
- n. In case of fire the exhaust fans & motor shall be suitable for operation at minimum 250 deg C for 2 hours & shall be CE/UL labelled /EN certified.
- o. Fan blades shall be as per OEM standard design.

13.14.1.1 Accessories: The following accessories shall be provided with all fans

- a. Fire rated Canvas flexible connection as required.
- b. Gravity Louver.
- c. Bird Screen.
- d. Vibration isolation: The assembly of fan and motor shall be suspended from the slab by vibration isolation suspension of rubber-in-sheet type.
- e. TP isolator of suitable capacity with its enclosure shall be provided.

- f. Nuts, bolts, shims etc .as required for the grouting of the equipment.
- g. Fanshallbefactoryassembledandshippedwithallaccessoriesfactorymounted.

13.14.2 PROPELLER FAN

Propeller fan shall be direct-driven, multiple blade type, mounted on a steel mounting plate with orifice ring.

- a. Mounting Plate shall be of steel construction, square with streamlined venturi inlet (reversed for supply applications) coated with baked enamel paint or with min. 220 gsm zinc coating. Mounting plate shall be of standard size depending upon the fan size as per OEM. Orifice ring shall be correctly formed by spinning or stamping to provide easy passage of air without turbulence and to direct the air stream.
- b. Fan Blades shall be constructed of aluminium or steel. Fan hub shall be of heavy welded steel construction with blades bolted to the hub. Fan blades and hub assembly shall be statically and dynamically balanced at the manufacturer's works.
- c. Shaft shall be of steel, accurately ground and shall be of ample size for the load transmitted and shall not pass through first critical speed through the full range of specified fan speeds.
- d. Motor shall be energy efficient standard (easily replaceable) permanent split capacitor or shaded pole for small sizes, totally enclosed with pre-lubricated sleeve or ball bearings, designed for quiet operation as per approved design for $220 \pm 10\%$ volts, 50 cycles single phase power supply/ $415 \pm 10\%$ volts, 50 cycles three phase power supply.
- e. **Accessories:** The following accessories shall be provided with propeller fan:
 - i. Wire guard on inlet side and bird-screen at the outlet.
 - ii. Fixed or gravity louvers built into a steel frame at the outlet.

13.14.3 INLINE FANS

a) Circular Inline Fans

Circular inline Centrifugal duct fan shall be a straight through radial fan. It should be compact. Motor shall be energy efficient.

The fan shall cope with high pressure and long duct runs, whilst still operating at an acceptable sound level.

The circular inline fans should be moisture resistant and should be approved for installing in humid or damp environments. The fans should be rated IP-44 when installed in a duct system. The casing should be manufactured from pre-galvanized steel. Automatic thermo-contact shall open up if the temperature within the motor windings becomes excessive. Fan should be equipped with external rotor single phase asynchronous motor.

b) Cabinet Inline Fans (Above 1000 CFM capacity)

The cabinet of the cabinet inline fans should be manufactured in galvanized steel & shall be with insulated housing for lower noise levels. The mounting brackets and access panel should be fitted as per manufacturer standard. The impeller of the fans should be with high efficiency forward/backward curved DIDW/SISW type. The scroll of the fans should be fabricated with galvanized sheet steel. The motor of the fans shall be squirrel cage induction type with bearings sealed for life. The motor shall be energy efficient suitable for single phase electrical supply. The cabinet of the fan shall be of double-skin construction with acoustically lined with 25 mm glass wool with

perforated GI sheet from inside. Fan noise level shall not be more than 60 dBA at 3 meters distance in hemispherical reverberant room conditions.

13.14.4 PERFORMANCE DATA

All fans shall be selected for the lowest operating noise level. Capacity ratings, power consumption, with operating points clearly indicated, shall be submitted and verified at the time of testing and commissioning of the installation.

13.14.5 TESTING

Capacity of all fans shall be measured by an anemometer. Measured air flow capacities shall conform to the specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current.

13.14.6 INSTALLATION

- i) The EPC Contactor shall supply all required bolts, base frame (wherever required), vibration isolators any other accessories and shall assure that the components are placed securely in proper position.
- ii) Vibration isolators shall be provided with an efficiency of not less than 80%.

13.14.7 Duct Insulation & Duct Lining

13.14.7.1 SCOPE

The scope of this section comprises the supply and application of insulation conforming to these Specifications.

13.14.7.2 MATERIAL

(i) **Mat finished Al foiled Closed cell Elastomeric Nitrile Rubber**

Closed cell Elastomeric Nitrile Rubber, having a uniform density not less than 40–60 Kg/cu.m. and with a 'K' value in the range of 0.035 watt/meter Kelvin to 0.039 watt/meter Kelvin for temperature ranging from 0 degree C to 40 degree C respectively.

Material shall have temperature range of –40 degree C to +105 degree C for pipe insulation & –10 degree C to +60 degree C for duct insulation.

The insulation material shall be fire rated for Class 0 as per BS 476 Part 6: 1989 for fire propagation test and for Class 1 as per BS 476 Part 7, 1987 for surface spread of flame test. Water vapour permeability shall be not less than 0.024 per inch (2.48×10^{-13} Kg/m.s.Pa i.e. $\mu > 7000$: Water vapour diffusion resistance) as per IS/EN 12086 & EN 13469.

All joints shall be sealed properly with adhesive, which shall provide similar vapour barrier as the original insulating material. 19 mm thick insulation to be provided over duct inside building and 25 mm thick insulation for exposed ducts

13.15 Duct Insulation Application

Duct insulation shall be applied as follows :

- a) Apply CPRX compound of Shalimar Tar Products over the surface after cleaning the ducts.
- b) Measurement of surface dimensions shall be taken properly to cut insulation sheets to size with sufficient allowance in dimension.
- c) Material shall be fitted under compression & no stretching of material shall be permitted. A thin film of adhesive, as specified, shall be applied on the back of the insulating material sheet & then on the metal surface. When adhesive is tack dry, insulating material sheet shall be placed in position & pressed firmly to achieve a good bond. All longitudinal & transverse joints shall be sealed properly.
- d) Apply PVC packing straps at regular intervals of 450 mm onto GI corners.

13.16 Duct Lining

Open cell Nitrile rubber - 12 mm thick insulation for VRF/Ductable split while 25 mm thick insulation for modular DX AHU.

13.17 AHU ROOM ACOUSTIC:-

Product: GLASS WOOL ACOUSTIC BOARD

Density: 70-80 Kg/cu.m

Thickness: 25mm

Lamination: One Side Aluminium Foil and Other side Black Glass Cloth

Size: 2.5m x 1.2 m

The insulation should conform to non-combustibility, Class-P (not easily ignitable), Class 1 (surface spread of flame NIL), and Class 'O' rating as per BS 476 standards.

13.18 Installation guidelines:

- 1) The surface shall be cleaned and friction fixed in 610 mm × 610 mm frame of 25 × 25 × 18 mm made out of 22G thick GI sheet U-shaped channel or else it can be installed on the wall with screw bit.
- 2) If wall surface is smooth, it is preferred to install acoustic board with screw bit.
- 3) The Acoustic board should be placed in such a way that black glass cloth is visible from inside the AHU/Plant room. Complete as required and as per specifications.

13.19 Air Distribution

a) SHEET METAL WORK AND INSULATION:

This section comprises of supply, fabrication, installation and testing of all sheet metal ducts and supply, installation, testing and balancing of grilles, registers and diffusers, in accordance with these specifications and the general arrangements shown on the drawings.

13.20 DUCT MATERIAL

All ducts shall be fabricated from galvanized steel sheets of the following thickness:

Duct Type	Gauge	Thickness
Round Ducts	20 Gauge	1.00 mm thickness
Rectangular ducts up to 750 mm	24 Gauge	0.63 mm thickness
Rectangular ducts greater than 750 mm and up to 1500 mm	22 Gauge	0.80 mm thickness
Rectangular ducts greater than 1500 mm and up to 2250 mm	20 Gauge	1.00 mm thickness
Rectangular ducts greater than 2250 mm	18 Gauge	1.25 mm thickness

13.20.1 DUCT FABRICATION

All Galvanized ducts shall be factory fabricated from lock form grade galvanized sheet steel zinc coated conforming with IS: 277, coating grade 120 or aluminium sheets conforming to ISS: 737-1955 (wherever aluminium ducts are specified) and installed in a workmanlike manner, generally conforming to IS: 655-1963 (Revised). Round exposed ducts shall be die formed for achieving perfect circle configuration.

Ducts shall be straight and smooth on the inside with neatly finished joints. All joints shall be made airtight by applying sealant during the assembly of the ductwork. Sealing of the seams shall be accomplished by using approved sealant. Transverse joints shall be made using sponge rubber sulphur-free foam rubber gasketing (3 mm thick and 20 mm wide). All exposed ducts within conditioned spaces shall have only slip joints and no flanged joints. The internal ends of slip joints shall be made in the direction of air flow.

Changes in dimensions and shape of ducts shall be gradual. Curved elbows, unless otherwise approved, shall have a center line radius equal to one and half times the width of the duct. Air turns shall be installed in all abrupt elbows and shall consist of curved metal blades or vanes, arranged to permit the air to make the turns without appreciable turbulence.

All ducts shall be rigid and shall be adequately supported and braced where required, notwithstanding seams, bracing to be as per IS: 655-1963, tees or angles of ample size to keep the duct true to shape and to prevent buckling, vibration or breathing.

All sheet metal connections, partitions and plenums required to confine the flow of air to and through the filters and fans, shall be constructed out of 18-gauge galvanized steel sheet, thoroughly stiffened with 25 mm × 25 mm × 3 mm angle iron braces and fitted with all necessary doors, to give access to all parts of the apparatus. Doors shall not be less than 45 cm × 45 cm in size.

Volume control dampers wherever indicated on the drawings shall be installed as a minimum. The final duct design may call for additional volume control dampers based on final duct configuration.

13.20.2 DUCT INSTALLATION

All ducts shall be installed generally as per the drawings and in strict accordance with approved shop drawings prepared by the Contractor.

The contractor shall provide and neatly erect all sheet metal work as may be required to carry out the intent of these specifications and drawings. This work shall meet with the approval of the Engineer-in-Charge in all its parts and details.

All necessary allowances and provisions shall be made by the contractor for beams, pipes, or other obstructions in the buildings, whether or not the same are shown on the drawings. Where it becomes necessary to avoid beams or other structural work, plumbing or other pipes, and/or conduits, the ducts shall be transformed, divided or curved to one side, the required area being maintained as approved or directed by the Engineer-in-Charge.

If a duct cannot be run as shown on the drawing, the contractor shall install the duct between the required points by any path available, subject to the approval of the Engineer-in-charge.

All duct work shall be independently supported from building elements or as required by the Engineer-in-charge. All horizontal ducts shall be rigidly and securely supported, in an approved manner, within hangers formed of MS rods and angle iron under ducts not greater than 2 meter centres. All vertical duct work shall be supported by structural members at each floor.

Ducting on top of the ceiling shall be supported from the slab above, or from beams, after obtaining approval of the Engineer-in-charge. In no case shall a duct be supported from the ceiling hangers or be permitted to rest on a hung ceiling.

All metal work in dead or closed down spaces shall be erected in time to occasion no delay to other contractors in the building.

All ducts shall be totally free from vibration under all conditions of operations. Whenever duct work is connected to fans, that may cause vibrations in the duct, ducts shall be provided with two flexible connections located close to the unit in mutually perpendicular directions. Flexible connection shall be constructed of fire-resistant flexible double canvas sleeves at least 10 cm long, secured properly and bolted at both ends. Sleeve shall be made smooth and the connecting ductwork rigidly held by independent supports on both ends. The flexible connection shall be suitable for pressures at the point of installation.

The two mating flanges of the ducts being joined with each other shall be made airtight by providing 3 mm thick, 20 mm wide sulphur-free foam rubber gasket on mating flanges.

13.20.3DAMPERS

All dampers shall be of Galvanised iron construction with louver dampers of robust construction and tightly fitted. The design, method of handling, and control shall be suitable for the location and service required.

Dampers shall be provided with suitable links, levers and quadrants as required for their proper operation; control or setting devices shall be made robust, easily operable and accessible through suitable access doors in the ducts. Every damper shall have an indicating device clearly showing the damper position at all times.

Dampers shall be placed in ducts and at every branch of supply air duct connections, whether or not indicated on the drawings, for the proper volume control and balancing of the system.

All the dampers at grille collars shall be of extruded aluminium construction with louver dampers of robust construction and tightly fitted.

13.20.4 FIRE DAMPERS

The ducts shall be provided with approved fire damper of at least 1 1/2 hours fire rating as shown on the drawing.

Dampers shall be provided with suitable links, levers and quadrants as required for their proper operation; control or setting devices shall be made robust, easily operable and accessible through suitable access doors in the ducts. Every damper shall have an indicating device clearly showing the damper position at all times.

Fire damper blades shall be single-piece folded type high-strength galvanised steel construction. In normal position these blades shall remain parallel to air stream providing maximum air passage and preventing passing air currents from creating noise or chatter. The blades shall be held in position through a non-spring-return motor.

Access doors are required at all damper locations and wherever indicated on the drawings. All access doors to be fabricated of the same material as the ductwork and shall have a minimum of two hinges. Hinges shall be zinc plated, pins shall be of brass. Minimum dimension of the door shall be 300 × 300 mm where duct sizes permit.

In case of fire, the signal from the smoke detector/thermister shall be utilised to close the fire damper as well as the AHU/High Static ductable Unit.

Fire damper sleeves and access doors shall be provided within the ducts in accordance with the manufacturer's recommendations.

Rates being quoted for shall include fire dampers, wiring etc. as required

13.21 SUPPLY AIR REGISTERS

Supply air registers shall be of approved make and of aluminium construction with individually adjustable bars. Supply air registers shall be double deflection type, with removable key-operated volume control dampers. The outer frame should be made out of 20-G and louvers of 24-G.

All registers shall be selected in consultation with the Engineer-in-Charge. Different spaces shall require horizontal or vertical face bars, and different width of margin frames.

All registers shall have a soft, continuous rubber gasket between the periphery of the register and the surface on which it has to be mounted. The effective area of the registers shall not be less than 80 percent.

Registers shall be adjustable pattern as such grill bar shall be pivotable to provide pattern with 0 to 100 degree horizontal arc and up to 30 degree deflection up or down. Bars shall hold deflection settings under all conditions of velocity and pressure.

Bars longer than 45 cm shall be reinforced by a set-back vertical member.

Registers shall be given a rust-inhibiting prime coat and factory-applied powder-coated finish of approved colour.

13.22 SUPPLY AIR DIFFUSERS

Diffusers shall be of approved make and of Aluminium construction, square/rectangular in shape with flush fixed pattern or adjustable flow pattern. Diffusers for different spaces shall be selected in consultation with the Engineer-in-Charge.

All supply air diffusers shall be equipped with removable key-operated volume control dampers. Anti-smudge ring may be required in specific applications. The outer shell and diffusing assembly shall be made out of 18 and 24G respectively.

a) OUTSIDE AIR LOUVERS

Exhaust/Fresh air louvers of 80 mm thick high performance (55% free area) drainable fixed louver type powder-coated Aluminium frame and blades. Mullions to be sliding interlock type with integral internal drain. Jamb and mullion drains to be open on front face in order to direct water away from inside of louver. Blades to be one-piece extrusions with gutters design to catch and direct water to jamb and mullion drains. Fasteners to be aluminium. Louvers to have framed 13 mm mesh removable mill finish aluminium bird screens.

b) TESTING AND BALANCING

After completion of the installation of the complete air distribution system, all ducts shall be tested for air leaks. Before painting the interiors, air distribution system shall be allowed to run continuously for 48 hours for driving away any dust or foreign material lodged within ducts during installation.

The entire air distribution system shall be balanced using approved anemometer. Air quantities at the fan discharge and at various outlets shall be identical to, or less than 5 percent in excess of, those specified and quoted. Leakage in each air distribution system shall be within 3 percent so that supply air volume at each fan shall be identical to, or no greater than 3 percent in excess of, the total air quantity measured at all supply outlets served by the fan. Branch duct adjustments shall be made by volume or splitter dampers. Dampers shall be permanently marked after air balance is complete so that these can be restored to their correct position if disturbed at any time.

c) EYE BALL JET* DIFFUSER

Jet diffusers shall be designed to handle high air flow rates and provide relatively long throws which makes them particularly suitable for conditioning of large spaces such as halls, auditoria, terminal buildings. The diffusers shall be versatile in application by virtue

of the novel “reversible and rotatable” core design which allows the air jet to be adjusted for both pattern and deflection. Units may be mounted individually or in banks in bulkhead arrangements or directly into stub ducts.

Units shall be constructed from aluminium spinings supported on a studding and spacer assembly. The core may be rotated through 180 degrees to expose either a straight or diffused core assembly. In addition, the diffuser spigot may be rotated within the mounting plate (if supplied) to enable a full 360-degree adjustment, by releasing the tension bolts.

It should have following Features:

- Simple and effective air diffusion for large spaces.
- Long throw characteristics.
- High air handling capacity.
- Easy to install and adjust.
- Reversible core to produce long throw jet or short throw diffuser patterns.
- Core rotatable through 360 degrees for “eyeball” jet direction.
- Jet may be deflected off axis by up to 15 degrees.

The JET NOZZLE shall be aerodynamically designed powder-coated aluminium construction double-skin eyeball type with double flap butterfly damper, mounted on steel face plate suitable for sidewall installation. Nozzle shall be deep drawn in one single pcs with discharge nozzle and face cover ring crimped on nozzle base to avoid the misplacing of ring problem.

The Nozzle shall be housed in a specially designed housing with a mounting flange with holes for fastening the nozzle and aesthetic trim ring with snap-locking arrangement to cover fasteners and give blemish-free appearance. The colour shade shall be as desired by Architect.

Type – jet nozzle eyeball

Draft length – 30 mtr (as per requirement)

Deflection – 0 to 40 degree.

Type of finish – powder coated

Noise level – 30 NC

Housing – aluminium finish with snap-locking face ring

13.23 FLEXIBLE DUCTING

Insulated/uninsulated flexible duct should be IS/UL with double lamination of tough polyester which encapsulates steel helix wire forms the airtight inner core, double-layer core wrapped in a multiple thickness of fiberglass wool with R Value 4.2, Green Guard certification of fiberglass wool must. Reinforced and sheathed in a rugged and durable tridirectionally reinforced metalized polyester jacket. Flexible duct connections should be made as per IS/UL 181 listing procedure with proper flexible right forming brace connection allowing right connections for flexible duct into energy efficient, and strapping the flexible duct connections with flexible duct strap ties.

Flexible Canvass Connections (For Fans, AHU setc.)

Flexible canvas connections to isolate vibrations produced by Air handling units, Axial Flow fans and other air moving equipment when these are to be connected to air ducts

wherever specified. Canvas connections shall be of the same cross-sectional area as the mating fan inlet/outlet or duct section.

Ductwork connections to the fan inlets/outlets shall be concentricity aligned so that the flexible connections are not subjected to any strain.

Flexible Duct connector shall be tested and certified in accordance with BS 476 Part 7 for Class 1 and NFPA-701 from NABL accredited lab.

13.24 VAQ STATION (DEMAND CONTROL VENTILATION SYSTEM)

Demand control ventilation system for controlled fresh air based on CO₂ demand shall have heavy gauge extruded aluminium of 1.5 mm nominal thickness complete with Zero leakage (aero foil construction) extruded aluminium profile volume control damper, Rapid Average Pitot tube; Air Flow Straightener (Honey-comb Patterned) with Motorized Assembly for Dampers with programmable single space DCV Controller combined with integrator; differential pressure sensor; & step-down transformer of 24V.

IVAQ system shall communicate through Modbus, BACnet & LAN open protocol provide signal to VSD of air handle/fan section unit. The system should complete in all respect including control panel/integrator, CO₂ sensor, thermostat, actuator, all wiring, conduiting between sensor, actuator and to connect with VSD shall be included.

DCV system shall be interlocked & controlled with BMS system. Indoor air quality monitor having temperature and humidity sensor; carbon dioxide sensor; capacitive touch button with large display; 3.3V power supply and wired control port.

13.25 SPLIT AIR CONDITIONING UNITS WITH INVERTER TECHNOLOGY)

13.25.1 Scope

The scope of this section comprises the supply, erection, testing and commissioning of Air-Cooled Split Units conforming to these specifications.

13.25.2 Type

The Split Units (Cassette/Hi-Wall/ductable) shall be BEE 5-star rating (applicable as on date of supply of item) consist of Inverter compressor, motor, air cooled condenser, integral refrigerant piping and wiring, all mounted on a steel frame.

13.25.3 Indoor unit to be installed for Split Unit within building, shall be housed in insulated cabinet consisting of cooling coil, blower with motor, filter & insulated drain pan. Split unit must deliver specified capacity after taking into account losses due to piping length & site conditions.

13.25.4 Capacity

The refrigeration capacity of split unit shall be as per actual requirement worked out by EPC Contractor.

13.25.5 Compressor and Motor

Compressor shall be inverter type and shall have dual pressure stat, and an operating oil charge. The motor shall be suction gas cooled and shall be sealed against dirt and moisture. The motor shall be suitable for $415 \pm 10\%$ volts or $230 \pm 10\%$ volts, 50 Hz, A.C. supply.

13.25.6 Refrigerant Piping and Controls

Refrigerant piping and fittings interconnecting compressor condenser shall be all copper and valves shall be brass / gunmetal construction. The refrigerant used shall be ozone friendly HFC R410A/ R-32 or green refrigerant.

13.25.7 Casing

The indoor & outdoor units shall be sectionalized/cabinet construction. Indoor units shall be consisting of fan section, coil section, filter section, and drain pan. Outdoor unit shall consist of condenser coil, fan & compressor. The compressor shall be mounted with the outdoor units. Each section shall be constructed of thick sheet steel, all welded/bolted construction, adequately reinforced with structural members and provided with sufficient access panels for proper lubrication and maintenance.

Base panel shall be constructed of fabricated steel structure provided with an under frame suitably braced. Drain pan shall extend under coil and fan sections with drain connections. Removable panels in fan and coil sections shall provide access to all internal parts.

13.25.8 Fan Motor and Drive

Fan motor shall be suitable for $415 \pm 10\%$ volts or $230 \pm 10\%$ volts, 50 Hz, A.C. supply, single phase. Motors shall be provided with permanent capacitor. Motors shall be especially designed for quiet operation.

13.25.9 Fan

Fan wheels and housing shall be fabricated from heavy gauge steel. Fan wheels shall be of double-width, double inlet forward-curve, multi-blade type enclosed in a housing and mounted on a common shaft. Fan housing shall be made of die-formed steel sheets with streamlined inlets to ensure smooth airflow into the fans. Fan shaft bearing shall be oil/grease lubricated. All rotating parts shall be dynamically balanced individually, and the complete assembly shall be statically and hydraulically balanced.

13.25.10 Cooling Coil

Cooling coils shall be of fin and tube type having aluminium fins firmly bonded to copper tubes assembled in zinc-coated steel frame. Face and surface areas shall be such as to ensure rated capacity from each unit and air velocity across each coil shall not exceed 100 meters per minute.

The coil shall be pitched in the unit casing for proper drainage. Each coil shall be factory-tested at 21 Kg. per sq. cm air pressure under water. Water coils shall be designed for a maximum working pressure of 10 kg/sq.cm. Tube shall be mechanically/hydraulically expanded for minimum thermal contract resistance with fins. The number of fins per cm. shall be 4 to 5.

13.26 Vibration Isolators

The indoor and outdoor units shall be provided with ribbed rubber pad vibration isolators.

13.26.1 Painting

Shop coats of paint that have become marred during shipment or erection shall be cleaned off with mineral spirits, then coated with enamel paint to match the finish over the adjoining shop-painted surface.

13.26.2 Performance Rating

The unit shall be selected for the lowest operating noise level.

ULTRA VIOLET GERMICIDAL IRRADIATION (UVGI) SYSTEM

Ultra Violet Germicidal Irradiations, (UVGI) System to be installed inside the AHU/Duct for Improvement of Indoor Air Quality and/or Energy Saving (when installed inside the AHU's) as per Specifications. The Average Life of UV lamps shall be 12000 hrs.

The UVGI System shall consist of UV lamps, parabolic reflector (Reflector only in case of AHU mounting) with its mounting assembly and control panel. The Control Panel shall be mounted outside the AHU and should consist of ballast, hour meter, MCB (or disconnect switch), Indicating Light. The Prices to include inter-connected wiring (UV resistant) between the UVGI lamps and its panel.

The UVGI System should be designed to achieve at least 90% kill rate per pass of all airborne bacteria and virus. The design intensity of the lamps should be based on wavelength 254 nm. It should be ensured the lamp should not perform at ultra-low wavelength 180 nm or lower, to ensure no uncontrolled and unmodulated ozone is put out by the lamp.

UV lamp shall be fabricated out of special high transmission Quartz Glass and of the high output. UV lamp shall not produce ozone or other secondary contamination and to substantiate this the lamps shall be tested by an approved Indian lab for output performance of 254 nm. Lamp manufacturer to submit the certificate from this lab. The lamp shall be high output type and should not be lower than 800 mA.

The EPC contractor shall submit the Coil Size and CFM for AHU mounted application and Duct size with CFM for Duct mounted application. The length of straight duct should be provided by the Contractor at site

COMPREHENSIVE AIR PURIFICATION SYSTEM

To improve Indoor air quality by using combination of Needle point, Tube Type & Carbon Brush Type Bi-polar Ionization technology, which produces a natural Bio Climate rich in positive and negative ions. The Needle Point and Carbon Brush type Bipolar Ionizers should not have any consumables and should have a life of 10 years.

System should be fitted with Fine Filter Media with very less static drop acceptable up to 5 mm wg of Initial pressure drop wherever requires, along with indoor Air quality

monitor to measure Air quality parameters including PM2.5, PM 10, TVOC, CO2, Humidity and Temperature.

This monitor should be a 3 tier architecture including sensor Hardware, secure cloud infrastructure, monitoring apps including dashboard, Android/iOS apps, wherever requires. Project design should meet standard ASHRAE 62.1 IAQ Procedure for energy saving.

System should kill microorganism and pathogens, remove odour, VOC and reduce dust particle/particulate matter/PM2.5/PM 10. The product should be UL/Intertek listed. Product should have minimal or negligible pressure drop & low power consumption. Product should have UL 867 and UL 2998 certification (for zero ozone emission).

ELECTRICAL INSTALLATION: Refer detailed Electrical specifications and as per CPWD specification.

Heat Load Calculations — Community Centre

Heat loads were computed floor-wise for all air-conditioned spaces in the Community Centre using CLTD/CLF methodology, considering occupancy, lighting (1 W/sqft), equipment loads and fresh-air requirement per ASHRAE 62.1. Summary by floor:

Floor	AC Area (sqft)	Occupancy (persons)	Summer Load (TR)	Monsoon Load (TR)	Fresh Air (CFM)
Ground Floor (Gym, Creche, Reception, Doctor Rm, etc.)	4,876	77	26	23	1,086
First Floor (Multipurpose Hall/Badminton, Engineers Office, etc.)	3,590	148	30	29	1,551
Second Floor (Yoga, Indoor Games, Kids Play, Lobby, etc.)	4,595	56	28	27	1,601
Grand Total	13,061	281	84	79	4,237

In This Project Only community Hall to be air conditioned, below is the heat load calculation.

S.NO	CONDITIO NED SPACE	ACTUAL AIR CONDITIONED AREA	Unit Type	CFM/Unit	TR/Unit	Qty.	Total TR	Power/Unit (KW)	Phase (1 or 3)	Total Power (KW)	Location
1.0	Ground Floor										
1.1	Gym/Health Club	1968	Floor Mounted AHU	4500	10.00	1	10.00	2.20	3	2.20	AHU Panel
1.2	Creche	295	Ceiling Mounted Cassette Type Unit	812	1.60	1	1.60	0.35	1	0.35	At Indoor Unit
1.3	Reception/ Lobby (Double Height)	649	Ceiling Mounted Ductable Type Unit	1377	4.01	1	4.01	0.35	1	0.35	At Indoor Unit
1.4	Lift Lobby	112	Ceiling Mounted Cassette Type Unit (compact)	318	0.80	1	0.80	0.15	1	0.15	At Indoor Unit
1.5	Doctor Room	219	Ceiling Mounted Cassette Type Unit	459	1.02	1	1.02	0.15	1	0.15	At Indoor Unit
1.6	Reception/ Waiting Area	465	Ceiling Mounted Ductable Type Unit	883	2.50	1	2.50	0.35	1	0.35	At Indoor Unit
1.7	Dressing Room	34	Ceiling Mounted Cassette Type Unit(compact)	318	0.80	1	0.80	0.15	1	0.15	At Indoor Unit
1.8	Pharmacist And Medicine Room	132	Ceiling Mounted Cassette Type Unit(compact)	318	0.80	1	0.80	0.15	1	0.15	At Indoor Unit
1.9	Room	120	Ceiling Mounted Cassette Type Unit(compact)	318	0.80	1	0.80	0.15	1	0.15	At Indoor Unit
1.1	Co-Oprative Store	499	Ceiling Mounted Ductable Type Unit	883	2.50	1	2.50	0.35	1	0.35	At Indoor Unit
1.1	Care Traker	279	Ceiling Mounted Cassette Type Unit	600	1.28	1	1.28	0.15	1	0.15	At Indoor Unit
1.1	IT Console Room	104	Ceiling Mounted Cassette Type Unit	600	1.28	1	1.28	0.15	1	0.15	At Indoor Unit
	Total	4876									

S.NO	CONDITIO NED SPACE	ACTUAL AIR CONDITIONED AREA	Unit Type	CFM/Unit	TR/Unit	Qty.	Total TR	Power/Unit (KW)	Phase (1 or 3)	Total Power (KW)	Location
2.0	First Floor										
2.1	Multipurpose Hall/Badminton (Double HT)	2545	Floor Mounted AHU	10000	25.00	1	25.00	5.50	3	5.50	AHU Panel
2.2	Lift Lobby	115	Ceiling Mounted Cassette Type Unit(compact)	318	0.80	1	0.80	0.15	1	0.15	At Indoor Unit
2.3	Corridor	129	Ceiling Mounted Cassette Type Unit(compact)	318	0.80	1	0.80	0.15	1	0.15	At Indoor Unit
2.4	Engineers Office	307	Ceiling Mounted Cassette Type Unit	600	1.28	1	1.28	0.15	1	0.15	At Indoor Unit
2.5	Waiting Cum Rest Room	494	Ceiling Mounted Cassette Type Unit	812	1.60	2	3.20	0.15	1	0.30	At Indoor Unit
0.0	Total	3590									
3.0	Second Floor										
3.1	Lobby	626	Ceiling Mounted Ductable Type Unit	883	2.50	2	5.00	0.35	1	0.70	At Indoor Unit
3.2	Yoga Room	761	Ceiling Mounted Ductable Type Unit	883	2.50	2	5.00	0.35	1	0.70	At Indoor Unit
3.3	Lift Lobby	115	Ceiling Mounted Cassette Type Unit(compact)	318	0.80	1	0.80	0.15	1	0.15	At Indoor Unit
3.4	Indoor Game Room	872	Ceiling Mounted Ductable Type Unit	883	2.50	2	5.00	0.35	1	0.70	At Indoor Unit
3.5	Kids Play Area	771	Ceiling Mounted Ductable Type Unit	883	2.50	2	5.00	0.35	1	0.70	At Indoor Unit

S.NO	CONDITIO NED SPACE	ACTUAL AIR CONDITIONED AREA	Unit Type	CFM/Unit	TR/Unit	Qty.	Total TR	Power/Unit (KW)	Phase (1 or 3)	Total Power (KW)	Location
3.6	Corridor	1450	Ceiling Mounted Ductable Type Unit	2400	6.36	2	12.72	0.76	1	1.52	At Indoor Unit
	Total	4595					91.99			15.37	
	Grand Total	13061									

C-14: - Façade Lighting

1. All facade, architectural and sports lighting fixtures shall be LED type and suitable for external/outdoor applications. The luminaires shall be complete with integral/suitable drivers, mounting brackets, fixing arrangements, interconnecting cables, weatherproof/waterproof connectors and all other accessories necessary for proper and safe operation. Façade lighting fixtures shall be RGB/RGBW type, wherever specified, and shall be capable of dynamic colour-changing operation through DMX/Ethernet-based control. Beam angles shall be selected as narrow, medium, wide or asymmetric, as required by the design and site conditions.
2. The luminaires shall have robust aluminium construction with suitable corrosion-resistant/powder-coated finish and shall be suitable for the specified ambient temperature conditions. Outdoor fittings shall have minimum IP65 protection and suitable impact protection, wherever specified. LED fittings shall have a minimum L70 rated life of 50,000 burning hours at the specified operating temperature and power factor of not less than 0.90. The fittings shall be suitable for operation on 100–270 V AC, 50 Hz supply, wherever applicable. Sports lighting shall be designed and positioned to achieve the specified illumination level with uniform distribution and minimum glare to the users.
3. All lighting fixtures, accessories, control equipment, cables and associated installation works shall comply with the latest applicable CPWD General Specifications for Electrical Works – External (2023), relevant BIS/IS standards, applicable safety requirements and manufacturer's recommendations, as amended up to the date of execution. The complete system shall be properly aligned, focused, tested and commissioned to achieve the required lighting performance, colour effects and uniformity, as applicable, to the satisfaction of the Engineer-in-Charge.

LIST OF ACCEPTABLE MAKES FOR ELECTRICAL AND MECHANICAL COMPONENTS

Name of Work: - Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh, Distt-Patna, Bihar. [SH: Construction of 66 Nos. Residential Units (56 Nos. Grade B & C Quarters, 8 Nos. Grade D & E Quarters, 01 No. Grade F Quarter, and 01 No. RD Bungalow), along with a Community Centre for Officers comprising Doctor's Room, Gym/Health Club, Multipurpose Hall/Badminton Court, Yoga Room, Indoor Games Room, and Kids' Play Area, and Service Buildings (VCB Room, HT Metre Room, Panel Room, Security Post, etc.), including Basement for Parking, Water Tank with Pump Rooms, Electrical Panel Room, STP Area, Water Softening Area, and Stilts, along with all Development Works for Civil, E&M, Horticulture, and Services on EPC (Mode-III) basis.]

SN	List of Materials	Approved Make.
Component - 1 (Internal Electrical Installation and UPS)		
1	Cross- Linked Halogen Free Flame-Retardant Copper conductor (class-2) cables (ISI marked)	Havells/ KEI/RR Kabel/Polycab
2	Cross- linked XLPE insulated LT& HT Armoured Aluminium/ Copper cable	Havells/ KEI/RR Kabel/Polycab
3	Cable (Control, Signal & COMMUNICATION, PA system)	Havells/ KEI/RR Kabel/Polycab
4	Heavy Duty MS conduit and accessories (ISI marked)	AKG /BEC/STEEL KRAFT/ATUL
5	PVC Conduit and accessories (ISI Marks)	AKG /BEC/NORPACK/ATUL
6	Modular Type Switch/Socket /Fan Regulator/Telephone Socket/ TV Socket/ Bell Push and GI Boxes etc (Same make GI Box and wiring accessories)	Legrand (Arteor) / Schneider (Zencelo)/Honeywell (Orna) / LK (Englaze) /C&S (Elusio)/ ABB (Millenium)
7	MCB/RCBO/Isolator /RCCB	Siemens/ABB/LK/C&S/Schneider/ Legrand
8	MCB DB's (Same make MCB DB and MCB's)	Legrand (Ekinox-3)/Siemens (Betagard)/LK (Exora) /Schneider (Acti-9) /C&S (Epitome)/ ABB(Itus)
9	MCCB's	Siemens (3VA)/ ABB (XT)/LK (Dsine)/ Schneider Electric (CVS with ETS6)/ C&S (Winbreak)/ Legrand (DPX3).
10	ACB's	Legrand (DMX3)/ Siemens (3WT) / LK (Omega -U power) / ABB (Emax2) / C&S (AHA) /Schneider (MTZ)
11	GI Hot Deep Cable trays (perforated/wire mesh)	BEC / RMCON/Apex/Slotco/Steelways/Pilco /AKG /Legrand

SN	Listof Materials	Approved Make.
12	DLP Trucking / Floor Trunking (UPVC / GI)	Legrand/ Schneider/ Honeywell/ OBO-Betterman
13	Video Door Phones	Legrand/ Honeywell-MK/ Havells/ Panasonic/Godrej/Schneider
14	LED indoor light fitting like LED tube/LED Panel light / Bulkhead/ LED strip	Philips /Jaquar/ Wipro/Havells / Lighting Technology/Leksa Lighting
15	LED Wall Bracket	Philips / Jaquar/Wipro/Havells / Lighting Technolog/Leksa Lighting
16	LED outdoor light fitting.	Philips / Wipro /Jaquar/ Bajaj/Havells/Trilux/ Lighting Technology/K-Lite/ Leksa Lighting
17	Solar LED light fitting.	Philips/Havells/Jaquar/ Wipro /Leksa Lighting
18	LED Bollard light fitting.	Philips/Havells/Jaquar/ Wipro/K-Lite/Ligman/ Leksa Lighting
19	Occupancy sensor for Light Control	ABB/Honeywell/Schneider/Siemens/Hager/Lutron/ Jaguar.
20	Decorative Ornamental Powder Coated metallic pole and fittings	Bajaj/ Havells/ Jaquar/Philips/K-Lite
21	G.I. Octagonal Pole	Bajaj / Transrail / Valmont/Crompton/Jaguar/Philips / K-Lite
22	Chandelier Lights	Jaquar/Philips/Wipro/Hybec/LT
23	Ceiling Fan (BLDC) & Exhaust fan	Usha/Havells/Orient/Bajaj/CG Power
24	Call Bell	Anchor /LK /CONA/ Havells
25	Co-axial TV cable/Telephone / Cat 6,6A / Control Cable	RR Kabel/KEI / Polycab / Legrand
26	Horizontal /Vertical Geyser BEE 5 Star Rated	Jaquar/ Usha/Havells/Crompton/ Racold
27	Weather proof Junction box	Hensel/ OBO Bettermann/ Cape Spelsberg/ Rittal/ Anchor/ Havells/ Schneider/ABB
28	DWC HDPE PIPE	Finolex/ REX /Ashirvad Precision/ Supreme / Astral/Duraline /Gemini
29	Raceway	Legrand/Honeywell/OBO-Betterman/Schneider
30	Cable lugs & Glands	Comet/Dowells/Gripwel/Raychem
31	Exit Signage	Ekavis / AWEX /Eaton / Cooper / Mr. Lite
31	Aviation Obstruction Light	Any reputed make having ICAO (International Civil Aviation Organization) and FAA (Federal Aviation Agency) compliance/Bajaj
32	Batteries for UPS	Exide/AmaraRaja/Amron or as per OEM Standard
33	UPS	Schneider/ABB/Vertiv/Numeric/Eaton/riello
34	SMF battery	Exide / Amaron / Schneider/Panasonic
35	Battery Mounting Rack	As per OEM of UPS
36	EV Charging	LK/Siemens/ABB/Legrand
37	Electrical Kitchen Chimney	Faber/ Elica/ Kaff/ Bosch
38	Gyser	Havells/Racold/Aosmith/Venus
Component-2 (Fire Fighting system, Spinkler)		
1	Fire Pumps	Grundfos/Kirloskar/Wilo/Mather &Platt/KSB
2	Pressurization (JockeyPump)	Grundfos/Kirloskar/Wilo / Mather &Platt/KSB

SN	List of Materials	Approved Make.
3	Diesel Engine for Fire Pump	Cummins/ KOEL/ Caterpillar/Perkins/Ashok Leyland/ Mather & Platt/ Greaves
4	Terrace Pump	Grundfos/Kirloskar/Wilo/Mather & Platt/KSB
5	Electric Motors	Siemens/Kirloskar/Crompton/ ABB/Bharat Bijlee/ Mather&Platt/ Stamford.
6	Anti-Vibration Mounting	Resistoflex / Dunlop / Easy flex / Vimpa Flexionics
7	Starters	Siemens/LK/ABB/Schneider/Merlin Gerin/BCH
8	Sluice Valve (ISI marked)	SANT/Kirloskar/Advance/Audco/ Zoloto
9	Gunmetal-Gate Valve/NRV (ISI marked)	Leader/Kirloskar/Advance/Audco/ Zoloto
10	CI Sluice Valve (ISI marked)	Leader/Kirloskar/Advance/Audco/ Zoloto
11	Valves/Check Valves (ISI marked)	Leader/Kirloskar/Advance/Audco/ Zoloto
12	Butterfly Valve/ Air Release Valve (ISI marked)	Leader/Kirloskar/Advance/Audco/ Zoloto/ Schneider
13	Y-type Strainer	Emerald/SANT/Kartar/Leader/Advance/Audco/ Zoloto
14	GI Pipes/ MS Pipes	Jindal (Hissar)/TATA/Sail (ISI Marked)
15	Pressure gauge	HGuru/Fiebig / Danfoss/ Indfoss / Emerald
16	Hydrant Valve	Safex/Minimax /CeaseFire/Tyco/Newage
17	Branch Pipe	Safex/Minimax /CeaseFire/Tyco/Newage
18	Drum of Hose Reel	Safex/Minimax /CeaseFire/Tyco/Newage
19	Hose Coupling	Safex/Minimax /CeaseFire/Tyco/Newage
20	Fire Hose Pipe/ Hose Box	Safex/Minimax /CeaseFire/Tyco/Newage
21	First-AID Rubber Reel	Safex/Minimax /CeaseFire/Tyco/Newage.
22	First Aid Hose Reel	Safex/Minimax /CeaseFire/Tyco/Newage.
23	2way/4way FBC	Getech/Safe Guard /Omex/Life Guard.
24	Sprinkler Heads	NewAge/Minimax /CeaseFire/ Fire shield/ Tyco/HD.
25	Alarm Control Valve	HD/Omex/Viking/Tyco
26	Anchor Fastener	Fischer/Hilti/OBO
27	Fire Extinguisher	CeaseFire / Fire shield / Minimax/ Safex/G Tech
28	Pressure Switch	System Sensor/ Indfoss/Danfoss / Honeywell / Viking/ Schneider.
29	LED signage	Ekavis / Eaton / AWEX / ABB/Hochiki /Cooper
30	Pipe protection pypcoat (Aw4) wrapping	IWL/ Taxa/ Mac-polycoat
Component-3 (Automatic Fire Alarm System, PA System, Emergency Lighting & Exit Signage)		
1	Manual/ Conventional/ Automatic Smoke Detectors/ optical cum Thermal Detectors/ Thermal Detectors/ Manual call Points/ Main Fire Alarm Control Panel with	NOTIFIER/ BOSCH/ GAMEWELL(USA) /SIEMENS Desigo

SN	List of Materials	Approved Make.
	Battery Backup/Repeater panel/Mimic Panel/ Monitor Module / Control Module/ Response indicator/ Low Intensity Hooters	
2	Public address components like amplifiers, gooseneck microphone, speakers	NOTIFIER/ BOSCH/ GAMEWELL(USA) /SIEMENS Desigo
3	Speaker cable	Krystal / JAD/ Belden/ DAC/ Monster
4	Wall Mount Rack	Valrack / Rittal/APC/APW / Legrand
5	Emergency Lighting and Illuminated Exit / Directional Signage including central battery compatible emergency luminaires and exit signs	Ekavis / Eaton / AWEX / ABB/Hochiki /Cooper
Component- 4 (LIFT)		
1	Lift	OTIS/Schindler/ KONE/ Johnson/ Thyssenkrupp/Mitshubishi
2	Capsule Lift	RICARDO/BIRLA/Stiltz
Component- 5 (Sub-station)		
1	Transformer/CSS	ABB/ Crompton Greaves/ Schneider/Siemens /Volamp
2	HT Panel (OEM Only)	ABB/Schneider-Electric/ Siemens /LK
3	TTA -LT Panel (with Internal Arc) (OEM or Licensed Channel Partner of OEM Design) (Channel partner shall be authorized by OEM for this work, if TTA Panel is provided by Channel partner	Siemens(Siepan 8PU) /Legrand(XL3)/ LK(Energys)/ABB(ArtuK) /C&S (CX)/Schneider (Blockset)
4	PTTA -LT Panel, meter panel for building blocks Synchronization Panel / APFC Panel/ Fire Fighting Panel Outdoor feeder pillar, Floor panels etc.	Electro Allied Product (EAP)/SPC private electro tech/Adlec/Tricolite/Milestone/Aaravika Engineering Works.
5	APFC Relay/Reactor/Thyristor module	LK / Siemens/Schneider Electric/ ABB
6	Capacitor	LK /Legrand /Siemens/ABB/ Schneider
7	MCCB's	Same make as subhead Component-I
8	ACB's	Same make as subhead Component-I
9	Sandwich bus duct and accessories (Rising Main/ Bus-duct)	Schneider / Legrand/ LK/ABB / Siemens
10	Bus coupler	Same make as ACB
11	Rubber Mat	Tata rubber/padam prabhu/Voltech India/ Jyoti/ Vardhman
12	Multi function meter/Digital Ammeter/ Voltmeter	Schneider/Conzerve /LK/ Sceure/AE/ ABB/ Siemens
13	Selector Switches	Kaycee/ LK/AE/Legrand/Salzer/ Rass Control/ C&S/ Schneider

SN	List of Materials	Approved Make.
14	Current Transformer, Potential transformer	AE/Kappa/LK/ ABB/Siemens
15	Indicating Lamp/Push Button/LED	LK /Raas Control/Schneider/ C&S/ ABB/Siemens
16	Contactors, Relays, Timer	LK /Siemens/ABB/Siemens/ Schneider
17	Lugs/Thimble	Dowell's/Comet/Braco /Raychem / Johnson
18	Cable Gland/Termination	Dowell's/Comet/Braco /Raychem / Johnson
Component - 6 (D. G. set)		
1	Diesel engine	Cummins/KOEL/Caterpillar/ Perkins /Escorts Kubota
2	Alternator	Stamford/LeroySomer/CromptonGreaves/ Kirloskar/ Cooper
3	AMF panel	OEM / OEA of Diesel engine
4	Acoustic Enclosure	OEM / OEA of DGSet
5	Anti Vibrations Mountings	Resisto flex / Dunlop / Easy flex / Vimpa Flexionics / Emerald.
6	Batteries for DG set	Exide/AmaraRaja/Amron or as per OEM Standard
Component – 7 (CCTV Surveillance System & Access Control)		
1	All Type Network Camera	Pelco /Bosch / Axis /Avigilon /Honeywell Enterprises
2	NVR & VMS SOFTWARE/ Recording Server (These all items shall be of same make)	Pelco /Bosch / Axis Avigilon /Honeywell Enterprises
3	All hardware's for CCTV Surveillance system (These all items shall be of same make)	Pelco /Bosch / Axis /Avigilon /Honeywell Enterprises
4	Professional Display	Panasonic / Sony/LG / Samsung
5	OFC cable	Siemon / Systimax / Beldon / Molex / Panduit / Derwiser / Legrand
6	OFC Patch Cord and LIU	Siemon / Systimax / Beldon / Molex / Panduit / Derwiser / Legrand
7	Cat 6A / CAT 6 UTP cable	Siemon / Systimax / Beldon / Molex / Panduit / Derwiser / Legrand
8	Patch Panel	Siemon / Systimax / Beldon / Molex / Panduit / Derwiser / Legrand
9	CAT6A /Cat 6 UTP Patch Cord	Siemon / Systimax / Beldon / Molex / Panduit / Derwiser / Legrand
10	I/O Box and Face Plate	Siemon / Systimax / Beldon / Molex / Panduit / Derwiser / Legrand
11	Wall Mount Rack	Valrack / Rittal/APC/APW /Legrand
12	POE switches Layer 2/3	Cisco/Juniper/Arista/Alcatel / Netgear /Nexus/ Legrand
13	Wi-Fi Access Point	Cisco/Juniper /Nexus/ Netgear
14	Workstation	IBM / Lenovo / Dell / HP
15	Access Control	Salto/Allegion/Schlage/Latch/Ingersoll
16	Reader/Controller/Software	Salto/Allegion/Schlage/Latch/Ingersoll
17	HDMI cable / Splitter	ATEN/EXTRON/ BELDEN/ Krystal/JAD Audio / Legrand

SN	Listof Materials	Approved Make.
Component – 8 (Centralized Intercom System)		
1	Intercom System	Crystal / Polycomm / ALCATEL / Cisco / Avaya / Tadiran
2	Telephone instrument	BEETEL /BPL/ ORPAT/ PANASONIC
3	Telephone junction boxes	MDF/Krown jewel/Malson/GE/ADC krone
4	Armoured jelly filled cable	Finolex /RR Kabel /APAR/KENTER
5	Corded Telephone Instrument	Beetel M71N/ BPL (Model: F1002-GSM) / ALCATEL (Model: T56) / PANASONIC (Model: Kxtsc 62 sxw)
6	Speaker cable	Krystal / JAD/ Belden/ DAC
7	Digital Amplifiers	Crown/Behringer/ Dynacord/Yamaha/British Acoustics /Martin Audio
8	Speaker	JBL/Behringer / Bosch/BOSE/ British Acoustics /Martin Audio
Component – 9 (Solar Photovoltaic Power Generation)		
1	Solar cell and solar module (MNRE approved)	Tata power solar system / B.H.E.L / Waaree Energies Pvt. Ltd./ Vikram Solar Pvt. Ltd. / Adanisolar (MNRE Approved)
2	ACDB & DCDB	As per OEM
3	String combiner Box (S.C.B)/ String Monitoring Box	Solaris/Geeyssys/ Hensel/ Syntex / Hensel / Statcon
4	Data Logging system with remote monitoring	Statcon / Solaris / Dataglen / Aeron / Vortex or As per OEM
5	P.C.U (Power Conditioning Unit)(Solar inverter)	Waaree/KACO (Siemens) / Ingeteam Delta / Polycab/ ABB / Hitachi / Havells/ Panasonic
6	Lightning Arrestor	JMV / Electro power / Stemon/ ABB/ Schneider
7	Solar Water Heater	Racold / Tata solar/ Bosch/ V-Guard – MNRE Approved solar panel
8	Insulation of Hot Water Pipes	K-Flex/ Armaflex/ Thermaflex
9	Material for structure	Tata/Jindal Hissar/Sail
Component – 10 (Domestic And Flushing Water Pumps)		
1	Water Supply / Dewatering Pump Sets	Grundfos/ Kirloskar / Mather & Platt (Wilo)/ KSB
2	Motorized Solenoid Valve	Advance/ Honeywell/ Belimo/ Danfos
3	Butterfly Valve/ Balancing Valve/ Isolation Valve/ Gate Valve/ Non-Return Valve etc. all other Valves	Kirloskar/Advance/Audco/ Zoloto/Castle
4	Liquid Level Controllers/ Indicators	Minilac/ Radar/ Advance/ Famac/ Switzer
5	PLC system	Beckhoff / Allen Bradley (Rockwell) / ABB/ Mitsubishi/ Schneider
Component – 11 (Sewage Treatment Plant)		
1	GI/MS/SS pipes (IS: 1239 and IS:3589)	TATA/Jindal Hissar/ SAIL
2	GI/MS/SS pipes Fittings	Pot/Unik
3	PVC Pipe Sch80/Sch40	Astral/Supreme/Finolex
4	GM/ForgedBrassBallValves	Intervalve /Audco/Sant
5	Sluice Valves	Kirlosakar/Ivc/Sant/Leader/Audco

SN	Listof Materials	Approved Make.
6	ButterflyValve	Audco/Intervall/Bray/Sant
7	Wafer Type Check Valve	Advance/Intervall/Bray/Sant
8	MultiportValve	Pharer (U.S.A)/Flack (U.S.A)/Initiative/Aventura
9	IsolationBall/Gate/GlobeValve	Sant/Hawa/Honeywell/Lehry
10	AirReleaseValve	Sant/Watts/Studor/Honeywell
11	Y Strainer	Honeywell/ Emerald/Sant/Vtm/Audco (LK)/Kirloskar
12	SubmersiblePumps	Grundfos/Xylem/Wilo/Ebara/Pullen/KSB
13	Sludge/Process Pumps for MBBR STP and other pumps	Johnson/Wilo/Ebara/Grundfos/KSB
14	Mixer	Wilo/Grundfos/Xylem
15	ClearWaterPumps&HSCFPumps	Grundfos/Xylem/Suzler/Kirloskar
16	Centrifuge	AlfaLevel/Hiller/Humbolt/ADINOTechnologies
17	MechanicalSeal	Burgmann/Sealol
18	AntiVibrationMounting	Dunlop/Resistoflex/Easyflex
19	PressureGauge	Waree/Baumer/Ashcroft
20	WaterMeter (MechanicalType)	Actaris.Capstan–Woltman/Kranti / Thermokon
21	ElectromagneticFlowMeter	Emerson/E&H/Siemens/Jumo / Thermokon
22	PressureTransmitter	Siemens/Emerson/E&H/Jumo / Thermokon
23	DOTransmitter	Emerson/ABB/E&H/Hach / Thermokon
24	TurbidityTransmitter	Emerson/ABB/E&H/Hach/ Thermokon
25	LevelSwitch/controller	Pune Techtrol/Nolta/ Jumo / Thermokon
26	LevelIndicator	Levcon/Pune Techtrol/cirrus / Thermokon
27	Paints	AsianPaints/Berger/ICI/Jotun
28	F.R.P Pressure Vessel	Pentair/Structural/EquivalentFabricated
29	UVunit	AlfaUV/Wallance&Tiernan/Aquatech/Sukrut Purovyan
30	MBBR Media	Toray/GE/Kubota/Ovivo/Hydronautics/Coke Membrane/ Alfalaval
31	DosingPumps	Milton Roy/prominent/grundfos
32	MSEP FilterVessel	OEM Fabricated
33	MechanicalScreen	Ovivo/Aquaseptence/Jash/Auric
34	HDPETanks	Reno/Sintex/Infra
35	AirDiffusers	Ovivo/OTT/EDI
36	AirFlowRotameter	Eurekaind/Aster/Tansa
37	HDPE Pipe	Noble/Reliance.
38	FilterPress	Pharma/Royal/Thorat/Sachin/ADINOTechnologies
39	ScrewPumps/Filter Press feed pumps	Rotomac/Alfa/Roto/Minimax/Helyflow
40	Agitator	Remi/Fluidyme
41	AirCompressor	IngersolRand/ELGI
42	ElectricalActuatorsValves	Cair/Jonson/Auma/Honeywell
43	AirBlower	Aerzen/IngersolRand/TMVT/Everest/Beta
44	WeldingRods	AspermakelistofFirefightingSH-4
45	Fasteners	Hilti/Fisher/Wurth
46	Online Monitoring	PrathamEnviro/Siemens/Hach/PotenceControls/ Schneider
47	Non-Return Valve (RefluxValve/Check Valve)	IVC/R&DMultiples/HAWA/Kirloskar

SN	List of Materials	Approved Make.
48	Ductile Iron pipe & Fittings	Jindal/Electrotherm/Electrosteel/TATAMitaliks
49	Expansion Bellow	Precise Engineers/B.D Engineers
50	Motor	Siemens/Kirloskar/Crompton/ ABB/As per OEM standard
51.	STP Vendor	ION Exchange/Thermax/Eureka forbes/Wipro/B.S.Enviro/VENZA
Component – 12 (Boom Barrier)		
1	Boom Barrier	Motwane /Dorma Kaba /Gunnebo / Magnetic
Component - 13 (HVAC System - VRF/VRV, Ventilation & Pressurization)		
1	VRF System	Hitachi/ Daikin/Mitsubishi/ O-General / LG
2	Indoor Units	Hitachi/ Daikin/Mitsubishi/ O-General / LG
3	TFU	Hitachi/ Daikin/Mitsubishi/ O-General / LG.
4	Copper Tubes/ Pipe	Mexflow/ Rajco/ Mandev Tubes/ Jindal Refrigeration
5	Electronic Filter	Honeywell / Purovyan / Ruks
6	Nitrile Rubber	Armaflex/ Aflex / K-Flex / Aerocell
7	UPVC/ CPVC AC Drainage Pipe	Oriplast/ Finolex/ Supreme/Prince/ Astral (ISI Marked)
8	GI Pipe	Tata/ Jindal Hissar/Sail (ISI Marked)
9	AHU	Zeco/Edgtech/Humidin /Luftech
9	Auto air Vent with stop valve	Rapid cool/ Anergy/ Honeywell/ Johnson & Control
11	Grill/ Diffuser / Fire Dampers / Louvers / Volume Control Damper / Duct Damper	Humidin/ System air/ Trio/ Dynacraft / Air Flow/ Conair/ Carryaire
11	Motorized Fire Damper	Humidin/System air/ Mapro/ Airmaster/ Conair/ Carryaire
12	Volume Control Damper, Fresh/ Exhaust air Louver	Humidin/System air/ Mapro/ Airmaster/ Conair/ Carryaire /FanAir
13	Actuator for Fire Damper	Siemens/ Honeywell/ Belimo/ System air
14	Cabinet Type Centrifugal Fans / Tube & Vane Axial Fans	Kruger / Greenheck / Nicotra / FanAir /Humidin
15	In-line Fans	Kruger / Greenheck / Nicotra / Ostberg / Carryaire/ FanAir /Humidin
	Propeller fans	Crompton / Khaitan / GE Alstom / Bajaj / GE / Carryaire / Kruger / Nicotra/ FanAir /Humidin
16	Pressurized/ Expansion Tank / Air Separator	Anergy/ Emerald/ Rapid Cool/ KEPL
17	GI Sheet for Ducting	Tata/ Sail/ Jindal Hissar
18	Pre-fabricated Duct	Zeco/Rollastar / Ductofab
19	CO / CO2 Sensor	Danfoss/ Honeywell/ Johnson & Control/ Belimo
Component - 14 (Façade Lighting)		
1.	Façade light	Philips/color kinetics/ Iguzzini /Leksa Lighting/Ligman

Note:-All the above sub-heads

1. The particular make and model under Preferred Makes shall be acceptable only if they comply to all the particular specifications, item of work and other conditions of the Contract.
2. The bidder should thoroughly read the approved make of materials (Civil & Electrical) before quoting the rate.
3. For any item not covered in the above list, the contractor shall get the samples and make approved from the Department's E-in-C before the supply is made.
4. In general, no change in brand/make from those mentioned in preferred Makes will be entertained. However, in case of non-availability of all brands and/or absolute necessity for the interest of the work, equivalent makes/products/materials having similar specifications/quality, decided as per sole discretion of the E-in-C of the department, may be considered for use in the work only after prior approval of the competent authority.
5. Decision of the E-in-C of the department on approval/disapproval of any make/brand from Approve Makes or equivalent makes/materials shall be final, binding and not arbitrable.

COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT (CAMC)

NAME OF WORK : - Demolition of existing structures and re-construction of residential buildings for the officers of Reserve Bank of India on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh, Patna, Bihar; construction of 66 residential units comprising 56 Grade B & C quarters, 8 Grade D & E quarters, one Grade F quarter and one RD Bungalow, together with Community Centre, basement and stilt parking, service buildings, associated development works and Civil, E&M and horticulture services on EPC (Mode-III) basis.

CAMC COMPONENTS AND CORRESPONDING MAIN-WORK SUBHEADS

COMPONENT	SYSTEM	REFERENCE
01	Fire detection, fire alarm, PA / voice evacuation, emergency lighting and exit signs	C-3
02	Lifts including passenger, service and capsule lifts as installed	C-4
03	HT/LT substation, transformers, switchgear and power-distribution equipment	C-5
04	3 nos. 250 kVA silent diesel generator sets and associated controls	C-6
05	IP CCTV and surveillance	C-7
06	Centralised EPABX / intercom and video door phone	C-8
07	134 kWp rooftop grid-interactive solar photovoltaic installation	C-9
08	UPS system, battery banks and associated power-control equipment	Part-C UPS schedule
09	50 KLD MBBR sewage-treatment plant	C-11
10	VRV/VRF air conditioning, AHUs and package ventilation	C-13

The quantities, locations, capacities, makes, approved performance parameters and equipment inventory shall be those installed under the accepted main EPC work, as evidenced by the signed system-wise asset register and commissioning dossiers. The CAMC scope is limited to the systems enumerated herein and shall not be construed as an unpriced comprehensive O&M contract for the entire campus.

1. GENERAL AND COMMERCIAL CONDITIONS

1.1 Interpretation and scope

- 1.1.1** The successful EPC tenderer (“Main Contractor”) shall provide for continuous upkeep and maintenance of the ten specialist systems listed on the cover by their respective OEMs, original system integrators or duly OEM-authorized service providers (“Service Providers”). Reserve Bank of India (“Bank”) is the Employer for the post-DLP CAMC; “Engineer-in-Charge” (E-in-C) means the officer designated under the main agreement or the person authorised by the Bank for post-handover technical administration.
- 1.1.2** The Service Provider shall undertake all-inclusive preventive, routine and breakdown maintenance, troubleshooting, testing, adjustments, cleaning, lubrication, calibration, repair, reconfiguration and replacement of defective equipment, components, assemblies, cards, cabling, software and hardware forming part of the covered system. All labour, supervision, attendance, tools, calibrated instruments, transport, access equipment, manufacturer diagnostics, normal consumables and necessary incidentals shall be included in the quoted CAMC charge, except electrical energy, input water and DG diesel fuel furnished by the Employer.
- 1.1.3** Scheduled visits, emergency visits and any number of breakdown calls shall be attended without additional service-call charges. Parts removed on replacement shall be inventoried and handed over to the Bank against acknowledgment unless otherwise directed in writing. Original OEM components shall be used; an alternative component may be used only where the original has become unavailable, against OEM written compatibility certification and prior approval of the E-in-C.
- 1.1.4** The provisions shall be read with the main EPC contract, issued tender drawings, final Part C and accepted BOQ. Nothing herein diminishes statutory requirements, prescribed life-safety operation, main-contract DLP, OEM product warranty or the main contractor’s obligation to complete and commission the installation.
- 1.1.5** **The main contractor shall associate specialized agencies/OEM/Authorized Service Provider for each specialized item for comprehensive annual maintenance contract. Both main contractor and associate agency/service provider shall be jointly responsible for satisfactory performance and maintenance of all installations covered under CAMC.**

1.2 DLP, commencement and CAMC duration

- 1.2.1** The main-work Defect Liability Period shall be 36 months. The Main Contractor shall ensure continuous manufacturer-backed maintenance and all DLP defect rectification without separate CAMC payment during that period. System-wise CAMC shall begin on the calendar day immediately following the DLP expiry date certified under the main EPC agreement for the accepted installation; transfer of upkeep to the Bank shall not waive a pending main-contract or warranty claim.
- 1.2.2** The post-DLP CAMC service term, calculated on a system-wise basis, shall be as specified in the following table. The service obligation, spare availability and quoted tender rates shall cover the complete term. A period stated herein does not establish a separate statutory useful life or extend an OEM’s original warranty.

SYSTEM	EXPECTED LIFE INCLUDING DLP (YEARS)	POST-DLP CAMC (YEARS)
Fire alarm, PA, emergency lighting/exit signs	8	5
Lifts	20	17
IP CCTV	8	5
EPABX / intercom / VDP	8	5
Solar PV	10	7
UPS and battery banks	8	5
VRV/VRF / AHU	5	2
50 KLD MBBR STP	10	7
HT/LT substation	8	5
Three 250 kVA DG sets	8	5

1.2.3 CAMC for an accepted addition to a covered system shall commence after the defect/warranty period expressly specified for the addition in its written variation order and shall end with the principal system's CAMC, unless the Bank approves a separately priced extension. No additional work or payment shall arise merely from an informal request or revision of an asset register.

1.3 Appointment, OEM authorisation and security

1.3.1 Prior to approval of the specialised E&M agency, the Main Contractor shall submit its Annexure 1 undertaking, proof of current OEM authorisation (where it is not itself the OEM), trained manpower details, Patna service escalation chart, spare-part support and executed maintenance association/MOU. The Bank shall enter into the system-wise bipartite CAMC agreement in Annexure 2 with the approved Service Provider at the time of acceptance of the system. The Main Contractor shall remain responsible for discharge of its main-contract and DLP duties.

1.3.2 The Service Provider shall furnish to the Bank an unconditional and irrevocable performance bank guarantee issued by a scheduled commercial bank in India for 5% of the accepted capital cost of the respective installation. The initial guarantee shall be furnished at least 15 days prior to expiry of DLP, and shall remain valid for the CAMC term plus 60 days; rolling guarantees of not less than 12 months each may be furnished if continuously renewed at least 45 days before the prevailing expiry. Failure to maintain uninterrupted security constitutes a material breach.

1.3.3 Where a system is added or its accepted capital cost changes by an approved variation, the requisite BG amount shall be revised proportionately for the remaining contract period within 30 days of acceptance. Release of security shall be considered after expiry of CAMC and resolution of all recorded obligations and claims in accordance with the executed agreement.

1.4 Quotation, payment and revision of rates

- 1.4.1** The quoted rate and amount of each item for CAMC (as per Annexure-14) for 1st year shall be worked out based on the quoted overall % rate (% above /below) on composite estimate cost for main project. The first-year CAMC rate for any system shall not exceed 7% of its accepted quoted capital cost; where a higher rate is worked out, the admissible first-year rate shall stand restricted to 7% of quoted amount of each item. A missing CAMC figure for a listed/priced system shall not relieve the contractor of its full maintenance obligations.
- 1.4.2** The annual rate for each subsequent CAMC year shall be adjusted by the index-linked formula in Annexure 14. In no case shall the formula apply retrospectively to a completed contract year. Actual rates shall be determined using the officially published indices and verified by the Bank before payment.
- 1.4.3** The Bank shall pay the Service Provider directly in four equal quarterly instalments in arrears for satisfactory services, subject to certification of planned maintenance, complaint and downtime records, statutory testing, applicable deductions, taxes and verified variation orders. No amount shall become payable merely upon raising an invoice or on the basis of an unsigned service report.
- 1.4.4** Normal labour, genuine spare parts, filters, belts, bearings, lubricants, refrigerant loss rectification and top-up, electronic components, firmware, batteries, OEM licences, hydraulic/drive fluids and process consumables necessary for the covered installations shall be included. STP biological treatment chemicals and laboratory sampling, as required to meet the accepted process guarantee, shall be included. Electricity, external potable/input water, diesel fuel for DG operation and statutory governmental application fees are excluded from the CAMC charge and shall be arranged by the Bank; no ordinary routine material may be separately billed on that account.

1.5 Engineer-in-Charge approval and drawing control

- 1.5.1** Within 15 days after appointment, the Service Provider shall submit an asset-wise preventive maintenance programme, organisation and telephone escalation chart, safety plan, downtime plan, manufacturers' O&M manuals, current software/license register, replacement-parts register and measurement/testing formats to the E-in-C for approval. The Service Provider shall maintain these records current throughout the service term.
- 1.5.2** Maintenance not involving any design change may proceed in accordance with approved manuals, drawings and permits. Any change of make/model, altered wiring or protection setting, equipment relocation, opening in a structure, change in capacity, revisions to PLC/software logic, modifications to alarm interfaces or reconfiguration of safety functions shall require prior E-in-C approval based on revised shop drawings, SLDs/P&IDs, equipment data sheets, OEM compatibility proof, method statement and impact on interfaced services. Where required, competent statutory authority approval shall be obtained before the system is re-energised or returned to use.

- 1.5.3** Approval of a shop drawing or replacement part shall not by itself entitle the Service Provider to extra payment or absolve it of responsibility. All drawings and records affected by approved changes shall be revised and supplied as red-line/as-built documents, along with test results and updated equipment inventory.

1.6 Safety, essential services and resident protection

- 1.6.1** The Service Provider shall take a work permit and written consent for all planned interruptions affecting lift service, power supply, fire alarm, emergency lighting, CCTV, potable/fire water or STP. A switching sequence, lock-out/tag-out arrangement, PPE, barriers, temporary service or fire watch (as appropriate), occupant warning and restoration plan shall be submitted in advance. Emergency isolation to eliminate an immediate danger may be performed at once and reported without delay to the Bank.

- 1.6.2** All statutory licences, fitness inspections, electrical safety clearances, fire approvals, pollution-control consents and mandatory tests applicable to the supplied installation shall be kept current; statutory governmental fees shall be paid by the Bank while liaison, testing, documentation, defect correction and attendance for covered equipment shall remain within the CAMC. Shutdown and re-energisation of HT installations shall be handled only by authorised qualified personnel.

- 1.6.3** The Service Provider shall provide temporary safe continuity arrangements where practicable for critical failures. No bypass of an electrical, lift, fire-protection or process safety interlock, and no unsafe temporary energisation, is permitted. It shall keep all plant rooms, shafts, escape routes and service areas clean and secure and reinstate disturbed fire stopping, waterproofing, guards and identification signs.

1.7 Failure reporting, deductions and default

- 1.7.1** The call receipt timestamp shall be taken from the earliest written/electronic record, including the Bank helpdesk, authorised telephone confirmation, SMS or email. “Attendance” means arrival of competent personnel at the affected equipment; “rectification” means demonstrable return to the prescribed safe function and acceptance by the Bank. Working hours for service periods expressly stated as working hours mean 09:00–18:00 on days other than Sundays and public holidays at Patna; elapsed hours apply in all other cases.

- 1.7.2** Where a defect exceeds the service period prescribed in Section 2, recovery shall accrue from the expiry of that period until certified restoration. A day means each completed 24-hour period, except where the schedule states “day or part thereof”; multiple faults arising from one identifiable common cause shall not attract duplicate recoveries for the same affected equipment and overlapping period. Recovery, substitute-service costs and invocation of performance security shall be administered in accordance with this package and the executed agreement, without prejudice to applicable statutory remedies.

- 1.7.3** On continued default, the Bank may issue a written notice of 15 days to remedy the breach and, if unremedied, arrange substitute maintenance at the defaulting Service Provider's risk and cost, invoke performance security or terminate the affected CAMC as provided in the bipartite agreement. Necessary emergency work to protect life and property may be arranged immediately without waiting for the notice period, with reasons entered in the record.

2. CONTRACTUAL RESPONSE, RECTIFICATION AND RECOVERY SCHEDULE

The following obligations apply both during the DLP (through the Main Contractor) and during the subsequent CAMC (through the Service Provider). Fault logging, attendance, restoration and recovery shall follow Clauses 1.7 and Annexures 3–12. Emergency attendance shall not wait for the next scheduled preventive visit.

FAILURE CLASS	SITE ATTENDANCE	MAXIMUM RECTIFICATION	RECOVERY AFTER DEADLINE
Lift — passenger trapped	Immediately mobilise; rescue by qualified OEM personnel within 60 minutes of call	Immediate safe rescue; no unauthorised manual release	₹2,000 per incident of late rescue
Lift — ordinary stoppage	3 hours	24 hours for repair other than major repair	4 × the affected lift's daily CAMC charge per day beyond 24 hours
Lift — major repair (motor, ropes, gearbox, controller)	3 hours	72 hours; provide approved alternative service plan	4 × the affected lift's daily CAMC charge per day beyond 72 hours
UPS — partial outage	24 hours	24 hours	₹1,000 per day
UPS — complete outage	8 hours	8 hours	₹1,000 per day
CCTV — individual camera	24 hours	24 hours	₹1,000 per affected camera per day
CCTV — recorder/server/switch, entire system	8 working hours	8 working hours	₹2,000 per day
CCTV — network fault, few cameras	24 hours	24 hours	₹1,500 per day
CCTV — software failure, entire system	4 hours	8 hours	₹3,000 per day or part thereof
Fire alarm — total system failure	Immediately mobilise	12 hours with approved interim fire watch	₹2,000 per day
Fire alarm / PA / exit light — local defect	24 hours	24 hours	₹500 per day per affected independent device / circuit
EPABX / VDP — exchange failure	2 hours	12 working hours	₹500 per day
EPABX / VDP — another defect	2 hours	12 working hours	₹200 per day
VRV/VRF — total system failure	Immediately mobilise	12 hours	₹2,000 per day

FAILURE CLASS	SITE ATTENDANCE	MAXIMUM RECTIFICATION	RECOVERY AFTER DEADLINE
VRV/VRF — individual unit / circuit	24 hours	24 hours	₹500 per day
STP — breakdown	2 working hours	24 hours; major repair within 48 hours	2 × daily STP CAMC charge per day after 24 hours (48 hours for major repair)
Solar — full inverter / grid-interface outage	8 hours	48 hours	₹1,000 per day per affected inverter
Solar — individual string / monitoring defect	24 hours	72 hours	₹500 per day
Substation — full supply failure caused by CAMC equipment	2 hours	24 hours; major OEM replacement within 72 hours with safe alternate supply plan	₹2,000 per day
Substation — individual feeder / protection defect	4 hours	24 hours	₹500 per day
DG — failure of a set to start or carry assigned standby load	2 hours	24 hours; major repair within 72 hours with standby provision	₹2,000 per affected DG per day
DG — noncritical local defect	4 hours	24 hours	₹500 per day

For daily-CAMC-charge recoveries, the charge per day shall be the applicable system annual CAMC charge for the contract year divided by 365; for lifts the per-lift allocation shall be the annual CAMC charge for all lifts divided by the number of covered lifts and 365. Recoveries under this table do not authorise unsafe operation or derogation from statutory duty. Non-availability of an ordinary spare is not a ground for extending the rectification period.

ANNEXURE 1 — UNDERTAKING BY OEM / AUTHORISED SERVICE PROVIDER**To**

**The Engineer-in-Charge,
CPWD, Patna and the Estate Department,
Reserve Bank of India, Patna.**

Subject: Undertaking for post-DLP CAMC of the system specified below at RBI Officers' Residential Colony, GC-4, Lohianagar, Kankarbagh, Patna.

1. We confirm that we are the OEM/original system integrator or the currently authorised service agency of the OEM for the covered installation and shall submit evidence of the authority and its continued validity before taking over CAMC.
2. We have examined the main EPC specifications, the system inventory, this Package C-15 and the priced CAMC schedule; we agree to provide the complete scope, full-term support, genuine spare parts and manufacturer-trained technicians, including any number of breakdown calls, within the stipulated annual CAMC rate.
3. We agree to execute the prescribed bipartite CAMC agreement with the Bank, furnish and maintain the specified performance bank guarantee and provide a 24-hour emergency escalation contact.
4. We shall attend calls within the system-specific attendance and rectification periods, carry out preventive maintenance, statutory testing support and approved changes, and maintain all registers and service reports prescribed in this Package.
5. We shall not discontinue support or substitute any other service provider without the Bank's prior written consent and completion of an orderly handover.

SERVICE PROVIDER PARTICULARS	DETAILS
System / component	As per Annexure 14 accepted CAMC schedule
Company and registered office	To be entered by authorised signatory
OEM / authorisation reference	Attach valid OEM certificate, if applicable
Main EPC contractor	As identified in the EPC work order
Service manager / 24×7 contact	To be furnished with signed undertaking
Local service facility and spare depot	Patna location and stock plan to be furnished
Authorised signatory, seal, date	Signature and company seal

ANNEXURE 2 — BIPARTITE AGREEMENT FOR COMPREHENSIVE ANNUAL MAINTENANCE

This Agreement is made at Patna on the date entered in the executed agreement by and between the approved OEM / authorised Service Provider (“First Party”) and Reserve Bank of India, constituted under the Reserve Bank of India Act, 1934, acting through its Estate Department, Patna (“Second Party” or “Bank”).

A. RECITALS

- A.1** CPWD is executing, through the Main Contractor identified in the principal EPC Agreement, the residential redevelopment works for RBI at Plot No. GC-4, Lohianagar, Kankarbagh, Patna. The First Party has supplied/installed or is OEM-authorised to maintain the equipment specified in the executed system-wise CAMC schedule.
- A.2** The Bank has accepted the system and requires uninterrupted comprehensive maintenance for the period prescribed in Package C-15 after the three-year main-contract DLP; the First Party accepts the said duty for the annual CAMC charge quoted by the Main Contractor and accepted by the Bank, subject to annual index-linked renewal and other conditions herein.

B. MUTUAL TERMS

- 1.** The system-wise capital cost, applicable annual CAMC charge, accepted asset register, commissioning certificate and equipment inventory of Annexure 14 and Annexure 15 shall form part of this Agreement on signature; no later substitution of the priced scope shall be effective unless signed by both parties.
- 2.** The First Party shall supply all labour, services, genuine spare parts, normal consumables and repairs, including equipment replacement where repair is impracticable, without additional charge except expressly allocated Employer-supplied utilities and government fees under Clause 1.4.4.
- 3.** The First Party shall maintain valid OEM authorisation, competent technical personnel and spare stocks, respond to any number of breakdown calls, complete all preventive and statutory support services and provide certified reports in accordance with Package C-15.
- 4.** The First Party shall furnish an unconditional irrevocable bank guarantee in favour of the Bank for 5% of the accepted system capital cost no later than 15 days before DLP expiry. Security shall remain continuously valid for the whole CAMC term plus 60 days and may be renewed by rolling guarantees subject to Clause 1.3.2.
- 5.** The CAMC shall commence on the day following expiry of the 36-month DLP for the accepted system; the post-DLP period shall be the number of years stated against the relevant system in Clause 1.2.2. No DLP or OEM-warranty obligation is transferred to the CAMC account.
- 6.** The Bank shall pay the First Party directly quarterly in arrears upon satisfactory service certification and submission of the prescribed bill, logbooks, test results, statutory records and deductions. The first-year amount and subsequent index-linked renewal shall be as prescribed in Clause 1.4 and Annexure 14.

7. For non-performance, the attendance, rectification and recovery schedule of Section 2 shall apply. After a 15-day written notice to remedy a continuing default, the Bank may employ another qualified service agency at the First Party's risk and cost, invoke performance security or terminate the affected CAMC; immediate action is permissible for an emergency threatening life or property.
8. The First Party shall indemnify the Bank against proven direct damage or injury caused by the First Party's negligent act, omission or breach in the performance of this Agreement, subject to the law and limitations, if any, expressly incorporated in the principal executed contract. The First Party shall obtain applicable employee insurance and meet labour, safety and environmental law obligations.
9. The Bank shall provide reasonable and pre-authorised access to equipment and shall supply the Employer-allocated utilities and statutory application fees. The First Party shall coordinate work so that residents, essential electrical services and life-safety installations remain adequately protected.
10. No material change in design, make/model, protection setting, system interface or safety logic may be made without prior approval of the E-in-C and applicable statutory authority. The First Party shall deliver post-repair testing and red-line/as-built revisions before commissioning the changed system.
11. The First Party shall not assign the contract or relinquish OEM support without prior written consent of the Bank; if ownership or service network changes, the First Party shall arrange continuing equivalent service through a Bank-approved successor without reduction in warranties, scope or rates.
12. Notices under this Agreement shall be served at the official address/email designated by each party in the executed contact sheet. The Agreement shall be governed by Indian law; dispute resolution and competent jurisdiction shall be those stated in the principal Bank-CPWD/EPC arrangements to the extent incorporated by the signatories, otherwise the competent courts at Patna shall have jurisdiction.

C. EXECUTED AGREEMENT PARTICULARS

CONTRACT PARTICULAR	ENTRY IN EXECUTED AGREEMENT
System and CAMC component	The system identified in the executed Annexure 14 schedule
First Party / authorised signatory	Legal name and registered office as per signed offer
Bank signatory and address	Estate Department, RBI, Patna
Main Contractor and EPC Agreement	Accepted main EPC work order and agreement number
System acceptance and DLP expiry	Dates recorded in system-wise takeover certificate
Capital cost and first-year CAMC charge	Accepted priced figures for the above system, Annexure 14
CAMC duration and scheduled end date	Clause 1.2.2 and acceptance certificate

CONTRACT PARTICULAR	ENTRY IN EXECUTED AGREEMENT
BG number, issuer, value and validity	Original scheduled-commercial-bank guarantee attached
E-in-C / Bank contact and Service Provider contact	Accepted address, email and 24×7 support number

IN WITNESS WHEREOF the parties have signed this Agreement on the date of execution recorded above. The system-specific CAMC annexure, asset register, priced schedule, test dossier and performance guarantee are incorporated by reference.

FIRST PARTY — SERVICE PROVIDER	SECOND PARTY — RESERVE BANK OF INDIA
Authorised signatory: _____	Authorised signatory: _____
Designation / seal: _____	Designation / seal: _____
Date / place: _____	Date / place: _____
Witness: _____	Witness: _____

ANNEXURE 3 — LIFTS — SH C-4

(A) SCOPE OF WORK

The complete lift installation including traction machine, motor, controller, VVVF drives, encoder, hoist ropes, guide rails, guide shoes, governor, safety gear, brakes, door operators/locks, car/landing fixtures, overload, CCTV interface, ARD, UPS/batteries where integral to lift, fireman's switch, emergency lighting, alarm and intercom shall be maintained exclusively by the lift OEM or its currently authorised service agency.

(B) SERVICE PROVIDER'S COMPREHENSIVE OBLIGATIONS

- a. Carry out a documented inspection and servicing of every lift at least once per calendar month and additional OEM-prescribed work based on running cycles. Clean/lubricate guides and moving parts; inspect ropes for wear and correct tension; verify door lock, closing-force and multi-beam curtain operation without defeating any interlock.
- b. Test brake operation, governor/safety-circuit supervision, ARD rescue and nearest-floor landing, emergency alarm/intercom, fire recall, limit switches and overload; perform full-load tests and statutory inspections at the frequency prescribed by the competent lift authority.
- c. On trapping of a passenger, mobilise trained rescue personnel immediately and obtain safe release within 60 minutes. Only trained authorised personnel shall carry out rescue; the lift shall remain isolated until inspected and cleared for use.
- d. For defective major assemblies, provide genuine OEM parts, submit replacement proposal and carry out proof testing before handing back the lift. Record entrapment, fault sequence, downtime, running hours, rope/brake measurements and safety-test evidence.

(C) PREVENTIVE-MAINTENANCE / TEST CALENDAR

PERIOD	MINIMUM TASK / DELIVERABLE
Monthly	Per-lift safety devices, doors, brakes, ARD, drive, ropes, controller and cleaning
Quarterly	Full-function rescue/fireman interface test and service performance summary
Annually	Statutory fitness / safety tests and OEM annual overhaul as due

(D) ITEMISED INSPECTION AND ACCEPTANCE CHECKLIST

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Traction ropes / sheaves	Wear, alignment and tension in OEM permitted range
Landing/car doors	All locks, reopening sensors and safe closing tested

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Brake / governor / safety chain	Mechanical and electrical safety proof recorded
ARD and emergency power	Automatic nearest-floor rescue with battery status
Passenger alarm and intercom	Audible and bidirectional call proven
Fire recall and firefighter control	Sequence proved with C-3 contractor witness
Ride comfort / leveling	OEM permitted tolerances and no abnormal vibration

(E) BREAKDOWN RECTIFICATION, RECORDS AND HANDOVER

1. All breakdowns shall be attended within the time prescribed for this system in Section 2. The Service Provider shall provide the cause, elapsed hours, affected asset and functional restoration results in the fault register, sign with the Bank representative and carry out no design change without E-in-C approval.
2. The Service Provider shall retain the replaced parts for joint verification, update shop drawings and as-built inventory after an approved change and submit quarterly inspection, test and performance records for certification. The Bank's authorised representative may direct additional justified tests where a defect recurs or life safety is affected.

ANNEXURE 4 — UPS AND BATTERY BANKS — PART C UPS SCHEDULE

(A) SCOPE OF WORK

All three 20 kVA UPS units (60 kVA installed aggregate), associated rectifier/inverter, static and maintenance bypass, filters, DC links, power modules, batteries, battery racks, circuit breakers, monitoring, control cabling and output distributions forming part of the accepted UPS package shall be covered. Battery replacement, faulty boards, firmware and genuine consumables shall be included.

(B) SERVICE PROVIDER'S COMPREHENSIVE OBLIGATIONS

- a. Inspect UPS alarms, input/output voltage and frequency, loading by phase, harmonics and environmental conditions; clean filters/vents and tighten terminals after isolation.
- b. Measure battery-cell or block voltage, terminal condition, temperature and string imbalance using OEM-safe methods; replace failed blocks or complete strings as required to preserve specified backup performance.
- c. Verify mains-loss transfer, rectifier/inverter recovery, bypass functionality and safe return to normal mode during approved shutdown; record autonomy and full-load/partial-load testing in accordance with OEM procedure.
- d. Do not alter UPS topology, select incompatible batteries, override thermal protection or undertake unapproved firmware changes; secure all maintenance bypass operations through permit-to-work.

(C) PREVENTIVE-MAINTENANCE / TEST CALENDAR

PERIOD	MINIMUM TASK / DELIVERABLE
Monthly	UPS alarms, load balance, bypass status and battery visual checks
Quarterly	Electrical tests, battery diagnostic and alarm integration tests
Annually	Approved autonomy test, internal service and earthing/safety report

(D) ITEMISED INSPECTION AND ACCEPTANCE CHECKLIST

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
UPS operating status	No unresolved active alarm, input/output within OEM limits
Battery bank	Block voltages/temperature and autonomy verified
Static / maintenance bypass	Safe transfer, interlock and return-to-normal witnessed
Protection / earthing	Protection contacts and earthing integrity verified
Cooling / ventilation	Fans, filters and ambient conditions within OEM limits
Monitoring	UPS status at approved panel / BMS interface
Restoration	Correct load supply and error-free self-diagnostics

(E) BREAKDOWN RECTIFICATION, RECORDS AND HANDOVER

1. All breakdowns shall be attended within the time prescribed for this system in Section 2. The Service Provider shall provide the cause, elapsed hours, affected asset and functional restoration results in the fault register, sign with the Bank representative and carry out no design change without E-in-C approval.
2. The Service Provider shall retain the replaced parts for joint verification, update shop drawings and as-built inventory after an approved change and submit quarterly inspection, test and performance records for certification. The Bank's authorised representative may direct additional justified tests where a defect recurs or life safety is affected.

ANNEXURE 5 —IP CCTV AND SURVEILLANCE — SH C-7

(A) SCOPE OF WORK

Complete IP CCTV and surveillance shall cover accepted cameras, IR illuminators, housing, poles/brackets, PTZ motors, encoders, NVR/VMS/server, monitors, storage, UPS/PoE, fibre and copper links, active network devices, software, licences and the recording/monitoring workstation.

(B) SERVICE PROVIDER'S COMPREHENSIVE OBLIGATIONS

- a. Clean and refocus cameras; verify camera-wise field of view, timestamp, analytics if installed, night/IR recording and PTZ operation.
- b. Check recording retention against the approved retention period, recording continuity, playback/export rights, NVR disk-health and RAID redundancy if provided, system time synchronisation and standby power.
- c. Maintain VMS and device security: unique privileged accounts, restricted remote access, necessary patches after approved backup/testing, preservation of event logs and secure return of failed storage media to the Bank.
- d. Provide signed camera-wise health reports. Any relocation or field-of-view alteration requires prior Bank and E-in-C approval and updated shop/network drawings.

(C) PREVENTIVE-MAINTENANCE / TEST CALENDAR

PERIOD	MINIMUM TASK / DELIVERABLE
Monthly	Camera-wise cleaning, recording playback, storage and switch status
Quarterly	Full camera inventory, retrieval drill, power/backup and network checks
Annually	Storage endurance, software licence audit and security configuration review

(D) ITEMISED INSPECTION AND ACCEPTANCE CHECKLIST

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Each camera / channel	Image usable day and night, approved view and no obstruction
Video recorder and disks	Continuous recording, free capacity and disk-health normal
Retrieval drill	Required dated clip replayed/exported by Bank witness
Network, PoE and UPS	Communication and normal power restored
PTZ, if installed	Pan/tilt/zoom, presets and auto-return tested
User access / logs	Authorised account rights and audit log retained
Time / retention	Clock and recording retention per approved schedule

(E) BREAKDOWN RECTIFICATION, RECORDS AND HANDOVER

1. All breakdowns shall be attended within the time prescribed for this system in Section 2. The Service Provider shall provide the cause, elapsed hours, affected asset and functional restoration results in the fault register, sign with the Bank representative and carry out no design change without E-in-C approval.
2. The Service Provider shall retain the replaced parts for joint verification, update shop drawings and as-built inventory after an approved change and submit quarterly inspection, test and performance records for certification. The Bank's authorised representative may direct additional justified tests where a defect recurs or life safety is affected.

ANNEXURE 6 — FIRE ALARM, PA, EMERGENCY LIGHTING AND EXIT SIGNS — SH C-3

(A) SCOPE OF WORK

Complete addressable fire detection and alarm, public-address/voice-evacuation system, interfaces with lifts, ventilation and other accepted fire services, centrally supplied/addressable emergency lighting and LED escape/exit signs, including panels, loops, MCPs, detectors, modules, sounders, amplifiers, speakers, batteries, chargers, drivers, cables, power supplies, software and fire interface devices shall be comprehensively maintained.

(B) SERVICE PROVIDER'S COMPREHENSIVE OBLIGATIONS

- a. Deploy a trained fire-alarm engineer weekly to check panel healthy/fault indications, disablements, loop integrity and representative device function; carry out full servicing and device cleaning quarterly.
- b. Test detectors and MCPs progressively so that every installed device is functionally tested over the annual cycle; verify alarm, PA zone, evacuation messages, sounder coverage and interface cause-and-effect in approved safe test windows.
- c. Verify emergency lighting upon normal-supply loss, battery charging, indication/fault monitoring, signs and directional arrows, approved escape illumination and the 90-minute functional endurance stipulated for the installed system.
- d. A system-wide failure is a life-safety impairment: alert the Bank immediately, arrange approved interim protection/fire-watch, preserve access to manual fire reporting and restore within the specified period. Testing shall not disable alarm coverage without an approved impairment plan.
- e. Fire hydrant and sprinkler pumps are specified under SH C-2 and are not included in this C-3 CAMC charge; their maintenance allocation shall be governed by the separately priced firefighting/O&M provisions of the executed main contract. This C-3 service provider shall test the monitoring and cause-and-effect interfaces with the C-2 equipment.

(C) PREVENTIVE-MAINTENANCE / TEST CALENDAR

PERIOD	MINIMUM TASK / DELIVERABLE
Weekly	Engineer visit, panel status and representative devices
Quarterly	Clean/test all device classes, amplifier/PA zones and battery/charger
Annually	All-device functional coverage, cause/effect tests and 90-minute emergency-light demonstration

(D) ITEMISED INSPECTION AND ACCEPTANCE CHECKLIST

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Fire alarm control panel	Healthy status, faults and isolate indications reviewed
Detectors / MCPs / modules	Device tested and correct address/zone indicated

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Sounders / PA zones	Correct priority and audibility/announcement checked
Lifts / HVAC / firefighting interfaces	Cause-and-effect sequence witnessed without unsafe bypass
Panel / central batteries	Voltage, charging and annunciation verified
Emergency lighting / exit signs	Supply-failure operation and illuminated escape path verified
Endurance test	Accepted 90-minute emergency duration demonstrated

(E) BREAKDOWN RECTIFICATION, RECORDS AND HANDOVER

1. All breakdowns shall be attended within the time prescribed for this system in Section 2. The Service Provider shall provide the cause, elapsed hours, affected asset and functional restoration results in the fault register, sign with the Bank representative and carry out no design change without E-in-C approval.
2. The Service Provider shall retain the replaced parts for joint verification, update shop drawings and as-built inventory after an approved change and submit quarterly inspection, test and performance records for certification. The Bank's authorised representative may direct additional justified tests where a defect recurs or life safety is affected.

ANNEXURE 7 — CENTRALISED INTERCOM, EPABX AND VIDEO DOOR PHONE — SH C-8

(A) SCOPE OF WORK

The central intercom/EPABX, controllers, line cards, endpoints, outdoor video door stations, indoor colour monitors, cameras, door-release interfaces, network devices, cabling, power supplies, software and user licences supplied under the accepted installation shall be maintained as an integrated system.

(B) SERVICE PROVIDER'S COMPREHENSIVE OBLIGATIONS

- a. Check exchange operation, line/card health, extension connectivity, call establishment, speech quality, time/date and failover as installed.
- b. Clean VDP cameras, indoor and outdoor stations and terminals; test visitor call, video, audio, remote reception and release operation without compromising access-control safety.
- c. Update firmware, preserve configuration backups and restore approved security/access permissions following repairs; any network or endpoint migration requires approved revised topology/endpoint register.
- d. Maintain an endpoint-wise call and defect register and 24×7 helpdesk availability.

(C) PREVENTIVE-MAINTENANCE / TEST CALENDAR

PERIOD	MINIMUM TASK / DELIVERABLE
Quarterly	Exchange, user endpoints, door-release and firmware review
Annually	Configuration backup/restore drill and end-to-end communications test

(D) ITEMISED INSPECTION AND ACCEPTANCE CHECKLIST

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
EPABX exchange / extensions	Internal and external calling as installed
Audio / video door stations	Two-way audio and clear video verified
Door release / safety	Correct authorised door operation without unsafe unlocking
Endpoint register	Numbers, model, location and extension updated
Controller / software	Backup, licensing and fault log checked
Power and network	Stable supply, earthing and network continuity

(E) BREAKDOWN RECTIFICATION, RECORDS AND HANDOVER

1. All breakdowns shall be attended within the time prescribed for this system in Section 2. The Service Provider shall provide the cause, elapsed hours, affected asset and functional restoration results in the fault register, sign with the Bank representative and carry out no design change without E-in-C approval.
2. The Service Provider shall retain the replaced parts for joint verification, update shop drawings and as-built inventory after an approved change and submit quarterly inspection, test and performance records for certification. The Bank's authorised representative may direct additional justified tests where a defect recurs or life safety is affected.

ANNEXURE 8 — ROOFTOP SOLAR PV — SH C-9

(A) SCOPE OF WORK

The accepted 134 kWp grid-interactive rooftop solar PV system comprising module strings, module supports and fasteners, DC cabling/connectors/combiner boxes, DC/AC isolators and SPDs, inverter(s), monitoring equipment, earthing, lightning-protection connections and associated AC protection shall be included.

(B) SERVICE PROVIDER'S COMPREHENSIVE OBLIGATIONS

- a. Clean modules at intervals appropriate to dust and season using approved water and nonabrasive methods; prevent dry rubbing, thermal shock, rooftop water leakage and unsafe work at height.
- b. Inspect and tighten mounting members, anchorages and earthing connections; check broken glass, hotspots/discolouration, damaged DC connectors, cable abrasion and water entry to junction boxes.
- c. Record string voltage/current and inverter energy, alarms, grid protection status and communication; compare output against irradiance and historic plant performance, investigate abnormal yield and resolve defective strings/inverters.
- d. Any alteration of inverter settings, grid connectivity or rooftop layout requires prior E-in-C approval and applicable distribution-company permission; maintain proper electrical isolation and anti-islanding functions.

(C) PREVENTIVE-MAINTENANCE / TEST CALENDAR

PERIOD	MINIMUM TASK / DELIVERABLE
Monthly	Module cleaning and visual/energy monitoring
Quarterly	String/inverter inspection, mounting and protection status
Annually	Thermography as appropriate, earth/protection checks and generation review

(D) ITEMISED INSPECTION AND ACCEPTANCE CHECKLIST

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Module face / strings	No breakage, shadowing or connector overheating
Mounting and roof integrity	No loose anchor, corrosion or roof membrane injury
DC insulation / disconnect	Approved safety test and isolator operation
Inverter / protection	Alarms cleared; anti-islanding protection intact
Earthing / surge protection	Earthing integrity and SPD indication verified
Generation / monitoring	Actual and historic outputs reconciled; downtime logged

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Cleaning protocol	Safe access and OEM-compatible wash method recorded

(E) BREAKDOWN RECTIFICATION, RECORDS AND HANDOVER

1. All breakdowns shall be attended within the time prescribed for this system in Section 2. The Service Provider shall provide the cause, elapsed hours, affected asset and functional restoration results in the fault register, sign with the Bank representative and carry out no design change without E-in-C approval.
2. The Service Provider shall retain the replaced parts for joint verification, update shop drawings and as-built inventory after an approved change and submit quarterly inspection, test and performance records for certification. The Bank's authorised representative may direct additional justified tests where a defect recurs or life safety is affected.

ANNEXURE 9 — VRV / VRF AIR CONDITIONING AND ASSOCIATED VENTILATION — SH C-13

(A) SCOPE OF WORK

All VRV/VRF indoor/outdoor units, compressors, refrigerant circuit, branches, insulation, controllers, condensate drainage, AHU/DX AHU where accepted, treated-fresh-air and mechanical ventilation units, fans, motors, belts, grilles, filters, fire dampers and related controls installed under C-13 shall be covered; maintenance shall preserve the accepted 120 HP Community Centre VRF basis and accepted connected equipment.

(B) SERVICE PROVIDER'S COMPREHENSIVE OBLIGATIONS

- a. Carry out quarterly full servicing of covered units and weekly condition review of critical/common-area installations; clean filters, coils and drain pans, check condensate trap and test the operation of pumps where installed.
- b. Check compressor current, refrigerant pressure and superheat/subcooling parameters as applicable; locate and permanently rectify leaks before charging. Record refrigerant quantity and comply with safe recovery practices.
- c. Inspect fans, AHU bearings, belts, dampers and ventilation controls. Test fire/smoke damper and alarm interfaces in coordination with the fire-alarm Service Provider.
- d. Monitor occupant comfort, temperature and abnormal alarms. Keep approved temperature setpoints, control logic, pipe supports/insulation, air volumes and approved fresh-air provisions in service.

(C) PREVENTIVE-MAINTENANCE / TEST CALENDAR

PERIOD	MINIMUM TASK / DELIVERABLE
Weekly	Common/critical HVAC alarms and operating conditions
Quarterly	VRF indoor/outdoor servicing, ventilation, AHU, drain and filter work
Annually	Electrical checks, interlock demonstration, refrigerant integrity and performance review

(D) ITEMISED INSPECTION AND ACCEPTANCE CHECKLIST

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Indoor / outdoor filters and coils	Clean; unrestricted airflow and drain performance
Refrigerant circuit	No leak, OEM pressure/temperature readings recorded
Compressor / fan / inverter	Current and vibration in normal operating band
AHU / ventilation	Belt, motor, damper, fresh-air operation demonstrated
Condensate and insulation	No overflow, sweating or wet ceiling
Fire/smoke interlocks	Correct shutdown/fire damper response jointly tested
Controls and comfort	Approved setpoints and space-temperature response logged

(E) BREAKDOWN RECTIFICATION, RECORDS AND HANDOVER

1. All breakdowns shall be attended within the time prescribed for this system in Section 2. The Service Provider shall provide the cause, elapsed hours, affected asset and functional restoration results in the fault register, sign with the Bank representative and carry out no design change without E-in-C approval.
2. The Service Provider shall retain the replaced parts for joint verification, update shop drawings and as-built inventory after an approved change and submit quarterly inspection, test and performance records for certification. The Bank's authorised representative may direct additional justified tests where a defect recurs or life safety is affected.

ANNEXURE 10 — 50 KLD MBBR SEWAGE-TREATMENT PLANT — SH C-11

(A) SCOPE OF WORK

The 50 KLD Moving Bed Biofilm Reactor (MBBR) STP package includes the installed equalisation and treatment process equipment, screens, transfer/sludge pumps, blowers, MBBR media and retention screens, tertiary/UF polishing as provided, filters and CIP systems, dosing, filter press, pipework, valves, panels, instruments, sensors and control software. No Membrane Bio Reactor (MBR) substitution or unapproved process conversion is permitted.

(B) SERVICE PROVIDER'S COMPREHENSIVE OBLIGATIONS

- a. Perform daily process monitoring through trained operator attendance to maintain flows, biological activity, dissolved oxygen, chemical dosing, treated-water availability and compliant discharge/reuse; carry out preventive servicing at least monthly.
- b. Check pump seals and duty/standby changeover, blower bearings and air flow, media retention, clarification/sludge handling, UF pressure and CIP status, dosing lines and safe chemical storage. Keep tanks, chambers and approaches clear of sludge accumulation.
- c. Test treated effluent through an approved laboratory at least once a fortnight for prescribed parameters and submit a consolidated quarterly report to the Bank. Quality shall comply with the actual Consent to Operate, project approval and applicable statutory standards; no unrelated precedent parameter shall supersede these.
- d. Attend process failures promptly, isolate unsafe discharge, provide approved interim containment and preserve required recirculation/biological conditions. Cleaning, sludge handling and authorised off-site disposal shall be within CAMC; disposal receipts shall accompany quarterly certification.
- e. The STP package CAMC includes daily operating personnel and process consumables, but not electricity, fresh/incoming wastewater supply or governmental fees. This CAMC obligation shall not duplicate any separately paid STP O&M item; for measurement, these activities constitute one indivisible CAMC system charge.

(C) PREVENTIVE-MAINTENANCE / TEST CALENDAR

PERIOD	MINIMUM TASK / DELIVERABLE
Daily	Process log, flow/DO, pump/blower changeover, chemical dosing and sludge
Fortnightly	Independent approved-lab treated-water testing
Monthly	Full mechanical/electrical preventive servicing and quality trend
Quarterly	Consolidated performance and statutory compliance report

(D) ITEMISED INSPECTION AND ACCEPTANCE CHECKLIST

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Feed, EQ and transfer pumps	Design-flow availability and safe standby changeover
Blowers and media	Required aeration, media retention and no abnormal noise
Sludge handling / filter press	Pump, polymer, filter press and disposal trail complete
UF / tertiary and dosing	Pressure, CIP/cleaning and dosing function verified
Instrumentation / alarms	Level/flow/pH/DO, if installed, checked against calibration
Treated-water analysis	Accredited laboratory report meets operative consent
Electrical safety / hygiene	Motor protection, spill cleanup and safe chemical handling

(E) BREAKDOWN RECTIFICATION, RECORDS AND HANDOVER

1. All breakdowns shall be attended within the time prescribed for this system in Section 2. The Service Provider shall provide the cause, elapsed hours, affected asset and functional restoration results in the fault register, sign with the Bank representative and carry out no design change without E-in-C approval.
2. The Service Provider shall retain the replaced parts for joint verification, update shop drawings and as-built inventory after an approved change and submit quarterly inspection, test and performance records for certification. The Bank's authorised representative may direct additional justified tests where a defect recurs or life safety is affected.

ANNEXURE 11 — HT / LT SUBSTATION AND DISTRIBUTION — SH C-5

(A) SCOPE OF WORK

The accepted three 1250 kVA compact substations, 11 kV RMU/VCB, dry-type cast-resin transformers with OLTC and RTCC, integrated LT distribution, capacitor/APFC and harmonic filtering as installed, metering, cable terminations, protection, busbar, earthing and associated controls and safety accessories shall be maintained under competent authorised electrical supervision.

(B) SERVICE PROVIDER'S COMPREHENSIVE OBLIGATIONS

- a. Carry out planned daily/weekly operating inspection of panel alarms, transformer temperature, ventilation and indications and monthly cleaning/external equipment checks without unsafe exposure to energised components.
- b. Undertake periodic inspection of VCB/RMU mechanisms, SF6 enclosure indication (without opening sealed chamber), relay operation and settings, OLTC/RTCC functionality, LT breaker interlocks and connection thermography during approved outage windows.
- c. Test and record earth continuity/resistance, insulation and protection relays as permitted by the approved switching schedule and OEM manual. Any changes to relay settings, tap control, circuit ratings or source interlocking require approved revised SLDs and protection coordination study.
- d. Maintain statutory registers, danger notices, insulated mats, fire and first-aid equipment, authorised switching register and locked control of HT rooms. In the event of a full substation failure, provide safe approved alternate supply without defeating protection devices.

(C) PREVENTIVE-MAINTENANCE / TEST CALENDAR

PERIOD	MINIMUM TASK / DELIVERABLE
Daily/weekly	Operating inspection, fault/temperature status and ventilation
Monthly	Panel/transformer condition, alarm and earthing visual checks
Quarterly	HT/LT functional checks in sanctioned outage windows
Annually	Protection coordination verification, approved tests, thermal/earthing and statutory documents

(D) ITEMISED INSPECTION AND ACCEPTANCE CHECKLIST

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
RMU/VCB and interlocks	Normal switch position and protection/earthing verified
Dry-type transformer	Winding temperature, ventilation, alarms and enclosure sound
OLTC/RTCC	Tap operation within OEM procedure and settings approved

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
LT breaker / APFC / filters	Feeder function, capacitor staging and alarms checked
Earth and protection records	Latest authorised earth/relay test report available
Terminations / thermography	No abnormal heating or looseness
Authority/switching register	Permit and authorised switching approvals retained

(E) BREAKDOWN RECTIFICATION, RECORDS AND HANDOVER

1. All breakdowns shall be attended within the time prescribed for this system in Section 2. The Service Provider shall provide the cause, elapsed hours, affected asset and functional restoration results in the fault register, sign with the Bank representative and carry out no design change without E-in-C approval.
2. The Service Provider shall retain the replaced parts for joint verification, update shop drawings and as-built inventory after an approved change and submit quarterly inspection, test and performance records for certification. The Bank's authorised representative may direct additional justified tests where a defect recurs or life safety is affected.

ANNEXURE 12 — SILENT DIESEL GENERATING SETS — SH C-6

(A) SCOPE OF WORK

The accepted three 250 kVA silent DG sets, diesel engines, alternators, AMF/synchronising controls and common-services interface, acoustic enclosures, day/bulk tanks and piping, filters, cooling, exhaust, starting batteries and charger, panels, earthing and safety devices shall be maintained by the engine/alternator OEM or authorised specialist.

(B) SERVICE PROVIDER'S COMPREHENSIVE OBLIGATIONS

- a. Inspect each set weekly for fuel line integrity, visible leakage, coolant/oil level, battery charge, belts, hose condition, canopy integrity, alarms and ventilation; record hours and starting readiness.
- b. Carry out OEM-prescribed oil/filter/belt and coolant replacement, battery testing, alternator insulation and terminal checks, and checking of AMF/synchronising, load sharing, emergency stop and protections.
- c. Conduct a recorded monthly no-load/approved-load readiness run and a quarterly representative-load or OEM-recommended test subject to the Bank's approved shutdown/load plan. The Bank shall supply diesel consumed in running and testing; all maintenance fluids, filters and spares remain within CAMC.
- d. Do not alter rated output, fuel/exhaust layout, emission-control devices or controller/AMF logic without E-in-C and relevant statutory approvals. Maintain running-hour, load, voltage/frequency, temperature and servicing records.

(C) PREVENTIVE-MAINTENANCE / TEST CALENDAR

PERIOD	MINIMUM TASK / DELIVERABLE
Weekly	Fluid/leak, battery, alarms, filters and readiness checks
Monthly	OEM service as due and functional start / AMF checks
Quarterly	Approved representative load and synchronising/interlock test
Annually	Major OEM scheduled service, statutory emission/safety records and overhaul review

(D) ITEMISED INSPECTION AND ACCEPTANCE CHECKLIST

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Engine / coolant / lube	Operating readings and leak-free system verified
Start battery / charger	Cranking readiness, voltage and charge current logged
Alternator output	Approved voltage/frequency regulation under load
AMF and synchronisation	Normal sequence, protection and emergency stop proved

TEST / INSPECTION POINT	MINIMUM ACCEPTANCE EVIDENCE
Fuel / exhaust / acoustic housing	No unsafe leakage, obstruction or enclosure damage
Load test and run hours	Approved load, runtime and alarms recorded
Emission and statutory records	Required certificates and OEM service events current

(E) BREAKDOWN RECTIFICATION, RECORDS AND HANDOVER

1. All breakdowns shall be attended within the time prescribed for this system in Section 2. The Service Provider shall provide the cause, elapsed hours, affected asset and functional restoration results in the fault register, sign with the Bank representative and carry out no design change without E-in-C approval.
2. The Service Provider shall retain the replaced parts for joint verification, update shop drawings and as-built inventory after an approved change and submit quarterly inspection, test and performance records for certification. The Bank's authorised representative may direct additional justified tests where a defect recurs or life safety is affected.

ANNEXURE 13 — SYSTEM-WISE TESTING, CERTIFICATION AND FREQUENCY MATRIX

COVERED SYSTEM	MINIMUM INSPECTION / TEST	CERTIFICATION RECORD
Lift	Monthly each lift; quarterly rescue/ARD/fire interface; annual statutory safety check	Per-lift log and rescue / fitness record
UPS	Monthly; quarterly battery analysis; annual backup test	Input/output, battery health, transfer and autonomy
IP CCTV	Monthly cameras/storage; quarterly complete network/retention	Camera-wise uptime, playback and access
Fire alarm/PA/exit lights	Weekly engineer, quarterly service, annual complete device and endurance coverage	Loop/device, fire cause-effect, 90-minute signage / lighting
Intercom / VDP	Quarterly; annual end-to-end call test	Exchange, line and VDP register
Solar PV	Monthly cleaning/energy; quarterly strings/inverters; annual earth/thermal	Generation, alarms and preventive report
VRV / VRF	Weekly critical review; quarterly full service; annual performance	Outdoor/indoor unit and ventilation register
STP (MBBR)	Daily operations; fortnightly lab; monthly service; quarterly compliance	Flow, sample reports, sludge and safe disposal
Substation	Daily/weekly log; monthly visual; quarterly functional; annual tests	Switching log, relay/earth/temperature record
DG	Weekly; monthly start; quarterly load test; annual OEM service	Start, load, runtime, fuel and OEM record

Where the OEM manual, competent statutory authority or accepted installation performance guarantee prescribes a stricter service interval or test criterion, that provision shall be followed without additional charge. Every visit shall identify asset, date/time, readings, parts replaced, defects, tested function, signature and next due date.

ANNEXURE 14 — CAMC PRICE, INDEX-LINKED RENEWAL AND CONTRACT SCHEDULE

14.1 First-year component-wise priced schedule

The bidder shall enter one capital cost and one first-year post-DLP CAMC charge for each system at tender submission. The CAMC charge is an annual comprehensive amount for all accepted equipment listed against that system, irrespective of the number of preventive or breakdown calls. Rates shall be exclusive of GST, which shall be dealt with under the main tender.

N O.	SYSTEM	SH	ACCEPTED CAPITAL COST	YEAR-1 CAMC CHARGE	POST-DLP YEARS
01	Fire detection, fire alarm, PA / voice evacuation, emergency lighting and exit signs	C-3	Tender BOQ rate	Tender BOQ rate	5
02	Lifts including passenger, service and capsule lifts as installed	C-4	Tender BOQ rate	Tender BOQ rate	17
03	HT/LT substation, transformers, switchgear and power-distribution equipment	C-5	Tender BOQ rate	Tender BOQ rate	5
04	Three 250 kVA silent diesel generator sets and associated controls	C-6	Tender BOQ rate	Tender BOQ rate	5
05	IP CCTV and surveillance	C-7	Tender BOQ rate	Tender BOQ rate	5
06	Centralised EPABX / intercom and video door phone	C-8	Tender BOQ rate	Tender BOQ rate	5
07	134 kWp rooftop grid-interactive solar photovoltaic installation	C-9	Tender BOQ rate	Tender BOQ rate	7
08	UPS system, battery banks and associated power-control equipment	Part-C UPS schedule	Tender BOQ rate	Tender BOQ rate	5
09	50 KLD MBBR sewage-treatment plant	C-11	Tender BOQ rate	Tender BOQ rate	7
10	VRV/VRF air conditioning, AHUs and package ventilation	C-13	Tender BOQ rate	Tender BOQ rate	2

14.1.1 The first-year annual CAMC rate shall not exceed 7% of the accepted capital cost of its corresponding system. For recoveries in Section 2 the applicable annual CAMC charge is the rate for the affected contract year, recalculated per the formula below; instalments shall be quarterly after certified performance.

14.2 Renewal of annual rate

$$AC = (AP / 100) \times [15 + 70 \times (EPC / EPP) + 15 \times (WIC / WIP)]$$

SYMBOL	INTERPRETATION
AC	Annual CAMC amount payable for the current year.
AP	Contracted annual CAMC amount for the previous CAMC year.
EPC	Published wholesale price index for electrical products, six months before start of current CAMC year.
EPP	Published wholesale price index for electrical products, six months before start of previous CAMC year.
WIC	Published consumer price index for industrial workers for the installation city/its officially applicable series, six months before start of current CAMC year.
WIP	Published consumer price index for industrial workers for the installation city/its officially applicable series, six months before start of previous CAMC year.

14.2.1 The E-in-C/Bank shall document the published index series, reference month and calculation in each anniversary rate certificate. If the specified index series is discontinued, only its officially notified successor series and published linking factor shall be used.

14.3 Mandatory commercial parameters

CONTRACT TERM	PRESCRIBED CAMC CONDITION
DLP	36 months, with commencement / expiry certified under the executed main EPC agreement
First-year rate ceiling	7% of accepted corresponding system capital cost
Payment	Quarterly in arrears after satisfactory certified service
Performance bank guarantee	5% of accepted system capital cost in favour of RBI; validity throughout CAMC + 60 days
Service periods / recoveries	Section 2, applied against certified breakdown log
Additional assets	Only by authorised variation and signed amended asset/priced schedule

ANNEXURE 15 — TAKEOVER, SERVICE LOGS AND PAYMENT CERTIFICATION FORMATS

15.1 Equipment-wise takeover / DLP completion certificate

RECORD	DOCUMENTED ENTRY
Component, building / location	Equipment identifier and installed site
Make/model/serial/capacity	Signed detailed asset register attached
Installation and formal acceptance dates	Commissioning and completion certificate references
DLP expiry and CAMC start/end	Calculated in accordance with Clause 1.2
Baseline functional tests / deficiencies	Signed joint inspection, separately identified pending DLP defects
As-built and OEM dossier	Drawings, settings, manuals, licence and spare inventory supplied
Contract price / first-year CAMC / BG	Signed priced schedule and original BG attached
Service Provider and Bank acceptance	Name, signature, designation and date of joint inspection

15.2 Routine preventive-maintenance report

REQUIRED FIELD	SERVICE RECORD
Asset ID, make/model/serial and location	To be completed by Service Provider and jointly certified
Visit date/time and ticket or job reference	To be completed by Service Provider and jointly certified
Manufacturer-approved checklist and measured test results	To be completed by Service Provider and jointly certified
Cleaning, lubrication, calibration and replacement performed	To be completed by Service Provider and jointly certified
Outstanding defect and authorised shutdown reference	To be completed by Service Provider and jointly certified
Instrument calibration and statutory test reference	To be completed by Service Provider and jointly certified
Engineer name / OEM authorisation	To be completed by Service Provider and jointly certified
Next due date and Bank representative signature	To be completed by Service Provider and jointly certified

15.3 Breakdown / emergency restoration record

REQUIRED FIELD	SERVICE RECORD
Unique complaint number, source and first timestamp	To be recorded in the numbered fault register
Affected equipment, symptom and life-safety classification	To be recorded in the numbered fault register
Actual arrival time and immediate protective action	To be recorded in the numbered fault register
Fault root cause, OEM diagnosis and proposed spare	To be recorded in the numbered fault register
E-in-C approved part/change/shop-drawing reference	To be recorded in the numbered fault register
Temporary service and final restoration time	To be recorded in the numbered fault register
Post-repair measured test and witness signature	To be recorded in the numbered fault register
Contractual time calculation / recovery, if any	To be recorded in the numbered fault register

15.4 Prior approval of replacement / changed shop drawing

The Service Provider shall submit the existing approved drawing, marked-up proposed change, reason/diagnosis, comparison of old and new technical data, OEM compatibility evidence, service interface review, method statement, isolation/resident protection plan and test programme. Approval by the E-in-C is required before supply or execution. The record shall show whether the proposal is within CAMC or under a separately sanctioned variation.

15.5 Quarterly bill / performance certificate

CERTIFICATION ITEM	CHECK / REFERENCE
Quarter and system; payable annual rate / 4	Report and supporting documentary reference
Number of planned visits / achieved visits	Report and supporting documentary reference
Breakdown complaints, attendance and closure	Report and supporting documentary reference
Test / laboratory / statutory reports due and submitted	Report and supporting documentary reference
Genuine-spares inventory and OEM authorisation current	Report and supporting documentary reference
Deduction under Section 2, if any	Report and supporting documentary reference
Quarterly maintenance performance accepted by Bank	Report and supporting documentary reference
RBI authorised signature, designation and date	Report and supporting documentary reference

15.6 Annual handover on expiry / termination

The Service Provider shall furnish an asset inventory and condition report, complete logbooks and historical fault records, last approved shop/as-built drawings, latest firmware and legally transferable licence details, password/credential transfer through the Bank's secure procedure, test and statutory dossiers, existing spare stock and warranty claims register, and a service-continuity handover to the replacement provider. All keys, access badges, removable media and Bank data shall be returned against receipt.

15.7 Close-out and service-continuity certificate

REQUIRED CLOSE-OUT RECORD	CERTIFIED HANDOVER
All scheduled preventive visits and statutory checks	Signed completion summary and latest test report
Open defects, repairs and warranty claims	Numbered register with planned actions and responsible agency
Genuine spare inventory and maintenance tools	Joint inventory and ownership / return receipts
Drawings, software, event logs and authorised credentials	Accepted document index and secure credential receipt
Successor service agency and emergency cover	Agreed transition contact and commencement date
Final asset status / outstanding CAMC payment	Jointly signed statement of condition, deductions and dues

For the outgoing Service Provider: _____ For the Bank / RBI:

 Designation, seal and date: _____ Witness / Engineer-in-
 Charge: _____

FORM OF SUPPLEMENTARY AGREEMENT

This Agreement made this day the 20..... between hereinafter called the First Party which expression shall include his heirs, executors and administrators/their successors and assigns and the President of India, hereinafter called the Second Party, which expression shall include his successors and assigns, shown as under :

1. That this Agreement shall be called as Supplementary Agreement to the Agreement No. relating to the Name of work entered into by the parties to this Agreement.
2. That WHEREAS the First Party has substantially completed the execution of the work described in and covered by the Agreement No. except the items mentioned in the Schedule annexed to this Agreement and whereas the items of the work mentioned in the Schedule annexed to this agreement cannot now be executed on account of non completion of the sanitary work, electric installation and some other work; and whereas both the parties are desirous that the items mentioned in the Schedule annexed to this Agreement should be executed by the First Party after the completion of the sanitary work, electric installation and some other work, it is hereby further agreed as under :
 - (a) That First Party shall and will execute the work covered by the items mentioned in the Schedule annexed to this Agreement at the rates and as per the terms and conditions of the original Agreement No. whatsoever called upon to do so by the Engineer-in- Charge, within a period of one year from the date hereof.
 - (b) That the First Party shall have absolutely no claim of whatsoever nature against the Second Party for doing the work mentioned in the Schedule annexed to this Agreement as required under clause (a) above, except that which he would be entitled to under the original Agreement No.
 - (c) That the First Party shall have to execute all the items which the Engineer-in-charge consider necessary.
 - (d) That the First Party shall start with the work of the remaining items mentioned in the Schedule annexed to this Agreement within days from on the receipt of a letter to the effect from the Engineer-in-Charge or from any date fixed in the said letter and shall complete the said work within the time fixed by the Engineer-in-Charge or as extended by him from time to time.
 - (e) That on the due execution and completion of this Agreement by the parties, the bill of the First Party in relation to the work already done by him under the Original Agreement No..... shall be provisionally finalized by the Second Party and payment on account, if any amount due, shall be made to the First Party provided that the Second Party shall have a right to retain such amount as is considered reasonable by him as a security for the execution of the work mentioned in the Schedule annexed to this Agreement and the Second Party shall have right to deal with the said amount of security as he thinks proper under the terms and conditions of the Original Agreement. Further, on the due execution and original completion of this Agreement, the First Party shall be entitled to claim back his security deposit relating to the work in question, subject to the right of the Second Party to retain such amount as he thinks reasonable as mentioned above soon after the maintenance period of three months or six months, as the case may be mentioned in clause of the Original Agreement, is over.
 - (f) That the final bill relating to the entire work under the two agreements shall be prepared after the completion of the entire work covered by Agreement No. and this Agreement.
- (3) Except as modified by this Agreement the said Agreement No. shall remain in full force and effect.

IN WITNESS WHEREOF THE ABOVE MENTIONED PARTIES HAVE PUT THEIR SIGNATURE
ON THIS DAY THE.....

BOQ CAMC (Comprehensive Annual Maintenance Contract)

Name of Work:-Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh, Distt-Patna, Bihar.		
S. No.	Activity	First year (after defect liability period of three years)
1	Lifts Comprehensive Annual Maintenance for all type of lifts, installed under the work, including routine and preventive maintenance, safety tests, rescue support, attending all breakdowns and repair/replacement of defective spare parts, after completion of the defect liability period of three years. The contractor shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	16,00,000.00
2	UPS systems Comprehensive Annual Maintenance for the installed UPS systems including 3 Nos. x 20 kVA units, battery banks, chargers, inverters, controls and accessories, including preventive servicing, testing, breakdown rectification and repair/replacement of defective spares after completion of the defect liability period of three years. The contractor shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	62,000.00
3	CCTV / security systems Comprehensive Annual Maintenance for the complete IP-CCTV and surveillance installation, comprising cameras, recorders/servers, storage, network equipment, software, displays, power supplies and cabling, including scheduled servicing, testing, attending breakdowns and repair/replacement of defective spare parts after completion of the defect liability period of three years. The contractor shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	2,38,000.00
4	Fire Fighting System i/c Fire Pumps, Fire alarm / PA / exit signage Comprehensive Annual Maintenance for the complete fire fighting system, addressable fire alarm and detection system, public address / voice evacuation system, emergency lighting and illuminated directional / exit signage, including inspection, functional testing, servicing, breakdown attendance and repair/replacement of defective components and spare parts after completion of the defect liability period of three years. The contractor shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	23,00,000.00

5	Solar photovoltaic system Comprehensive Annual Maintenance for the 134 kWp grid-interactive rooftop solar photovoltaic installation, including modules, inverters, mounting structures, DC/AC cabling, controls, protection, earthing and monitoring equipment, with periodic cleaning, servicing, testing, breakdown rectification and repair/replacement of defective spare parts after completion of the defect liability period of three years. The contractor shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	3,81,000.00
6	VRV / VRF air conditioning Comprehensive Annual Maintenance for the complete VRV/VRF air-conditioning, AHU / treated fresh-air units and associated ventilation and pressurisation equipment, including indoor/outdoor units, piping, controllers, electrical/control accessories, scheduled servicing, testing, attending breakdowns and repair/replacement of defective spare parts after completion of the defect liability period of three years. The contractor shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	7,10,000.00
7	Sewage treatment plant Comprehensive Annual Maintenance for the complete 50 KLD MBBR sewage treatment plant, including process units, blowers, pumps, filtration, dosing, instrumentation, electrical panels and controls, scheduled maintenance, performance monitoring, breakdown rectification and repair/replacement of defective equipment and spare parts after completion of the defect liability period of three years. The contractor shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	2,00,000.00
8	Intercom / EPABX / VDP Comprehensive Annual Maintenance for the complete centralised intercom / EPABX and video door phone installation, including exchange, cards, indoor/outdoor stations, displays, power supplies, cabling, system software and related accessories, with periodic servicing, testing, breakdown rectification and repair/replacement of defective components and spare parts after completion of the defect liability period of three years. The contractor shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	2,61,000.00
9	HT/LT substation Comprehensive Annual Maintenance for the complete HT/LT substations, including 3 Nos. 1250 kVA dry-type transformers as per approved equipment schedule, HT switchgear, LT panels, OLTC/RTCC where installed, protection, control, metering, APFC, cables, earthing and associated accessories, with routine servicing, statutory/OEM testing, breakdown rectification and repair/replacement of defective components after completion of the defect liability period of three years. The contractor shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	14,80,000.00

10	DG sets Comprehensive Annual Maintenance for 3 Nos. x 250 kVA silent diesel generator sets, including engines, alternators, acoustic enclosures, AMF/synchronising panels, batteries, chargers, controls, exhaust and related accessories, with preventive servicing, periodic functional and load tests, breakdown rectification and repair/replacement of defective components and spare parts after completion of the defect liability period of three years. The contractor shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	4,21,000.00
	TOTAL FIRST-YEAR CAMC AFTER 3 YEARS OF DEFECTS LIABILITY PERIOD (DLP)	76,53,000.00
	Add/Less quoted % rate (overall) on Estimated Cost of Main Project.(Civil + Electrical + Hort.)	
	Total Quoted Amount for CAMP (for 1st One year after DLP)	

Part – D

PAYMENT SCHEDULE

Basement Parking			
(For Item No.1 of Schedule of Quantity of Building Work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		92.10
1	Completion of Pile work including preparation of base for Raft Foundation.		48.00
a	Completion of 15% of pile work including preparation of base for RAFT.	8.00	
b	Completion of 15% of pile work including preparation of base for RAFT.	8.00	
c	Completion of 15% of pile work including preparation of base for RAFT.	8.00	
d	Completion of 15% of pile work including preparation of base for RAFT.	8.00	
e	Completion of 20% of pile work including preparation of base for RAFT.	8.00	
f	Completion of 20% of pile work including preparation of base for RAFT.	8.00	
3	Completion of Raft Foundation slab including waterproofing treatment for Raft, Retaining wall,		16.00
a	Completion of 25% of RAFT including waterproofing treatment for Raft Retaining wall,	4.00	
b	Completion of 25% of RAFT including waterproofing treatment for Raft Retaining wall,	4.00	
c	Completion of 25% of RAFT including waterproofing treatment for Raft Retaining wall,	4.00	
d	Completion of 25% of RAFT including waterproofing treatment for Raft Retaining wall,	4.00	
4	Completion of making stronger structural members to take heavy load above 500 kg per sqm upto 1000 kg per sqm (taken Road area only)	2.00	2.00
5	Completion of filler wall/panel and finishing works i.e. masonry work, flooring, plastering, fixing of doors & windows, interior & exterior painting, internal water supply and sanitary installation etc.		21.10
a	On completion of casting upto 30 % basement floor roof slab.	5.00	
b	On completion of casting upto 30 % basement floor roof slab.	5.00	
c	On completion of casting upto 40 % basement floor roof slab.	5.50	
d	Completion of filler walls and casting of lintel/chajja at basement floor	1.00	
e	Internal plastering including Self curing plaster & Putty.	0.75	
f	External Plastering with self-curing plaster	0.50	
g	Fire check doors and fittings	0.25	
h	Internal painting and finishing in all respect	0.25	
i	All types of External painting and finishing in all respect.	0.50	
j	Complete stainless steel railing works, steel works, trench work	0.50	
k	Internal water supply works including fixtures.	0.50	
l	Completion of rain water pipes, water proofing works.	0.35	

m	All miscellaneous works such as false ceiling, fixing of doors, ramps, drains with cover etc.	1.00	
6	Completion of all other balance civil works as per scope of NIT not reflected in above stages, cleaning of site and removal of defects, testing and Commissioning.	2.00	2.00
7	Submission of completion certificate of the building, all statutory post-construction clearances, licenses and as built drawing, invoice of all materials, guarantee bond etc., handing over of buildings and successful closing of agreement.	3.00	3.00
	E & M WORKS		7.90
1	Internal Electrical Installation		4.35
a	On supply of all MS conduits	0.60	
b	On installation of all MS conduits	0.17	
c	On supply of all wires and wiring accessories like switch and sockets etc.	0.93	
d	On drawing of all wires and fixing of switch and sockets etc.	0.26	
e	On testing, commissioning & completion of all wiring works.	0.22	
f	On supply of all power distribution materials like rising mains, DB's MCB's etc.	0.61	
g	On installation, testing and commissioning of all power distribution materials like rising mains, DB's MCB's etc.	0.26	
h	On supply of luminaires' & fans, etc., U.G. cable, control panel etc.	0.91	
i	On installation of luminaires' & fans, U.G. cable, control panel etc.	0.26	
j	On testing, commissioning & completion of luminaires' & fans, U.G. cable, control panel etc.	0.13	
2	Fire Fighting System		1.26
a	On supply of firefighting pipe, sprinklers, hydrants, valves, hose pipes, hose reel, FBC & accessories etc.	0.62	
b	On installation of firefighting pipe, sprinklers, hydrants, valves, hose pipes, hose reel, FBC & accessories etc.	0.13	
c	On supply of fire pumps, panel, cable etc.	0.26	
d	On installation of fire pumps, panel, cable etc.	0.06	
e	On testing & commissioning of entire firefighting system	0.13	
f	On completion firefighting system complete with getting NOC from CFO / local fire body	0.06	
3	Fire Alarm System		0.72
a	On supply of fire alarm Panel, Detectors & cabling and other accessories etc.	0.50	
b	On installation of Panel, cabling and detectors etc. as required	0.11	
c	On testing & commissioning of entire fire alarm system	0.07	
d	On completion fire alarm system complete with getting NOC from CFO / local fire body	0.04	
4	Mechanical ventilation		1.11
a	Supply of major ventilation equipment at site, including supply/exhaust/jet fans and other specified equipment, complete with accessories.	0.31	
b	Installation of major ventilation equipment including supports, foundations/frames, vibration isolation and flexible connections.	0.13	
c	Supply of ductwork, dampers, louvers, grilles/diffusers, insulation, acoustic treatment, supports and other accessories at site.	0.27	

d	Installation and completion of ductwork, dampers, louvers, grilles/diffusers, insulation, acoustic treatment and associated accessories.	0.12	
e	Completion testing and commissioning of electrical/control works associated with the mechanical ventilation system, including starters/VFDs, control panels, cabling, interlocking,	0.22	
f	On completion of testing, commissioning of all services and equipment's i/c all NOC and handing over the installation, O&M manuals, warranties, training and final handing over of the system.	0.06	
5	CCTV, Illuminated Signages System & lighting automation		0.46
a	On Supply of CCTV camera, wiring, conduit and other accessories required for CCTV at suitable locations	0.23	
b	On completion of above installation, testing and commissioning as per scope of work.	0.08	
c	On supply of illuminated signages and other signage, floor marking etc.	0.03	
d	On completion of above installation, testing and commissioning as per scope of work.	0.01	
e	On supply of lighting automation devices etc.	0.07	
f	On completion of above installation, testing and commissioning as per scope of work.	0.02	
a	On completion of testing, commissioning of all services and equipment's i/c all NOC and handing over the installation.	0.02	
	Total		100.00

Tower B & C			
(For Item No.2 of Schedule of Quantity of Building Work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		78.27
1	Completion of Building Structure above PL.		34.00
a	On completion of casting upto stilt, 1st & 2nd floor slab.	4.65	
b	On completion of casting upto 3rd & 4th floor slab.	4.65	
c	On completion of casting upto 5th & 6th floor slab.	4.65	
d	On completion of casting upto 7th & 8th floor slab.	4.65	
e	On completion of casting upto 9th & 10th floor slab.	4.65	
f	On completion of casting upto 11 th & 12 th floor slab.	4.65	
g	On completion of casting upto 13 th & 14 th floor slab.	4.65	
h	On completion of RCC Casting of mumty, overhead water tanks, Complete structural RCC Work i/c parapet wall.	1.45	
2	Completion of filler walls/panel and finishing works i.e. masonry work, flooring, plastering, fixing of doors & windows, interior & exterior painting, internal water supply and sanitary installation etc.		34.77
a	Completion of filler walls and casting of lintel/chajja at 1st,2nd&3rd floor	0.90	
b	Completion of filler walls and casting of lintel/chajja at 4th,5th&6th floor	0.90	
c	Completion of filler walls and casting of lintel/chajja at 7th,8th&9th floor	0.90	
d	Completion of filler walls and casting of lintel/chajja at 10th, 11 th & 12th floor	0.90	
e	Completion of filler walls and casting of lintel/chajja at 13 th & 14 th floor	0.90	
e	On completion of filler walls and casting of lintel/chajja of mumty	0.20	
f	Internal plastering including self-curing plaster & Putty.	2.40	
g	External Plastering with self-curing plaster.	2.40	
h	All type of flooring, skirting, dado and window sills, jambs.	5.40	
i	Fixing of all type of door frames and shutters including Door hardware's.	2.80	
j	Fixing of windows and ventilators including Low E-DGU glass.	2.85	
k	Fire check doors and fittings.	0.80	
l	Internal painting and finishing in all respect.	2.00	
m	All types of External painting, Structural Glazing/ ACP and finishing in all respect.	2.50	
n	Internal water supply works including fixtures.	2.50	
o	Internal sanitary installation works including fixtures.	3.42	
p	Complete stainless steel railing works, steel works.	1.00	
q	Completion of rain water pipes, water proofing works.	1.00	

r	All miscellaneous works such as toilet false ceiling, WPC jali, plinth protection, ramps, etc.	1.00	
6	Completion of all other balance civil works as per scope of NIT not reflected in above stages, cleaning of site and removal of defects, testing and Commissioning	4.50	4.50
7	Submission of completion certificate of the building, all statutory post-construction clearances, licenses and as built drawing, invoice of all materials, guarantee bond etc., handing over of buildings and successful closing of agreement.	5.00	5.00
	E & M WORKS		21.73
1	Internal Electrical Installation		11.74
a	On supply of all MS conduits	1.70	
b	On installation of all MS conduits	0.45	
c	On supply of all wires and wiring accessories like switch and sockets etc.	2.39	
d	On drawing of all wires and fixing of switch and sockets etc.	0.70	
e	On testing, commissioning & completion of all wiring works.	0.60	
f	On supply of all power distribution materials like rising mains, DB's MCB's etc.	1.70	
g	On installation, testing and commissioning of all power distribution materials like rising mains, DB's MCB's etc.	0.70	
h	On supply of luminaires' & fans, etc. U.G. cable, control panel etc.	2.48	
i	On installation of luminaires' & fans, U.G. cable, control panel etc.	0.68	
j	On testing, commissioning & completion of luminaires' & fans, U.G. cable, control panel etc.	0.34	
2	Fire Fighting System		3.24
a	On supply of firefighting pipe, hydrants, valves, hose pipes, hose reel, FBC & accessories etc.	1.44	
b	On installation of firefighting pipe, hydrants, valves, hose pipes, hose reel, FBC & accessories etc.	0.39	
c	On supply of fire pumps, panel, cable etc.	0.72	
d	On installation of fire pumps, panel, cable etc.	0.25	
e	On testing & commissioning of entire firefighting system	0.29	
f	On completion firefighting system complete with getting NOC from CFO / local fire body	0.15	
3	Fire Alarm System		2.11
a	On supply of fire alarm Panel, Detectors & cabling and other accessories etc.	1.47	
b	On installation of Panel, cabling and detectors etc. as required	0.32	
c	On testing & commissioning of entire fire alarm system	0.21	
d	On completion fire alarm system complete with getting NOC from CFO / local fire body	0.11	
4	Lifts		3.37
a	On supply Lift equipment	2.36	
b	On installation of lift equipment's	0.67	

c	On testing & commissioning of entire lift system	0.34	
5	CCTV, Intercom system, Illuminated signages and Lighting automation		1.27
a	On Supply of CCTV camera, wiring, conduit and other accessories required for CCTV at suitable locations	0.53	
b	On completion of above installation, testing and commissioning as per scope of work.	0.19	
c	On Supply of intercom, wiring, conduit and other accessories required at suitable locations	0.18	
d	On completion of above installation, testing and commissioning as per scope of work.	0.06	
e	On supply of illuminated signages and other signage, floor marking etc.	0.07	
f	On completion of above installation, testing and commissioning as per scope of work.	0.03	
g	On supply of lighting automation devices etc.	0.11	
h	On completion of above installation, testing and commissioning as per scope of work.	0.04	
i	On completion of testing, commissioning of all services and equipment's i/c all NOC and handing over the installation.	0.06	
	Total		100.00

Tower D & E			
(For Item No.3 of Schedule of Quantity of Building Work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		75.60
1	Completion of Building structure above PL.		32.00
a	On completion of casting upto 1st & 2nd floor slab.	6.10	
b	On completion of casting upto 3rd & 4th floor slab.	6.10	
c	On completion of casting upto 5th & 6th floor slab.	6.10	
d	On completion of casting upto 7th & 8th floor slab.	6.10	
e	On completion of casting upto 9th & 10th floor slab.	6.10	
f	On completion of RCC Casting of mumty, overhead water tanks, Complete structural RCC Work i/c parapet wall.	1.50	
2	Completion of filler wall/panel and finishing works i.e. masonry work, flooring, plastering, fixing of doors & windows, interior & exterior painting, internal water supply and sanitary installation etc.		34.10
a	Completion of filler walls and casting of lintel/chajja at 1st,2nd&3rd floor	1.00	
b	Completion of filler walls and casting of lintel/chajja at 4th,5th&6th floor	1.00	
c	Completion of filler walls and casting of lintel/chajja at 7th,8th&9th floor	1.00	
d	Completion of filler walls and casting of lintel/chajja at 10 th floor	0.36	
e	On completion of filler walls and casting of lintel/chajja of mumty	0.20	
f	Internal plastering including self- curing plaster & Putty.	2.60	
g	External Plastering including white cement-based putty.	2.60	
h	All type of flooring, skirting, dado and window sills, jambs.	5.19	
i	Fixing of all type of door frames and shutters including Door hardware's.	3.00	
j	Fixing of windows and ventilators including Low E-DGU glass.	3.00	
k	Fire check doors and fittings.	0.75	
l	Internal painting and finishing in all respect.	2.00	
m	All types of External painting, Structural Glazing/ ACP and finishing in all respect.	2.40	
n	Internal water supply works including fixtures.	3.00	
o	Internal sanitary installation works including fixtures.	3.00	
p	Complete stainless steel railing works, steel works.	1.00	
q	Completion of rain water pipes, water proofing works.	1.00	
r	All miscellaneous works such as toilet false ceiling, WPC jali, plinth protection, ramps, etc.	1.00	

3	Completion of all other balance civil works as per scope of NIT not reflected in above stages, cleaning of site and removal of defects, testing and Commissioning	4.50	4.50
4	Submission of completion certificate of the building, all statutory post-construction clearances, licenses and as built drawing, invoice of all materials, guarantee bond etc., handing over of buildings and successful closing of agreement.	5.00	5.00
	E & M WORKS		24.40
1	Internal Electrical Installation		11.25
a	On supply of all MS conduits	1.60	
b	On installation of all MS conduits	0.45	
c	On supply of all wires and wiring accessories like switch and sockets etc.	2.36	
d	On drawing of all wires and fixing of switch and sockets etc	0.67	
e	On testing, commissioning & completion of all wiring works.	0.56	
f	On supply of all power distribution materials like rising mains, DB's MCB's etc.	1.57	
g	On installation, testing and commissioning of all power distribution materials like rising mains, DB's MCB's etc.	0.67	
h	On supply of luminaires' & fans, etc. U.G. cable, control panel etc.	2.36	
i	On installation of luminaires' & fans, U.G. cable, control panel etc.	0.67	
j	On testing, commissioning & completion of luminaires' & fans, U.G. cable, control panel etc.	0.34	
2	Fire Fighting System		2.68
a	On supply of firefighting pipe, hydrants, valves, hose pipes, hose reel, FBC & accessories etc.	1.22	
b	On installation of firefighting pipe, hydrants, valves, hose pipes, hose reel, FBC & accessories etc.	0.26	
c	On supply of fire pumps, panel, cable etc.	0.66	
d	On installation of fire pumps, panel, cable etc.	0.14	
e	On testing & commissioning of entire firefighting system	0.27	
f	On completion firefighting system complete with getting NOC from CFO / local fire body	0.13	
3	Fire Alarm System		1.95
a	On supply of fire alarm Panel, Detectors & cabling and other accessories etc.	1.37	
b	On installation of Panel, cabling and detectors etc. as required	0.29	
c	On testing & commissioning of entire fire alarm system	0.20	
d	On completion fire alarm system complete with getting NOC from CFO / local fire body	0.10	
4	Lifts		7.31
a	On supply Lift equipment	5.12	
b	On installation of lift equipment's	1.46	
c	On testing & commissioning of entire lift system	0.73	

5	CCTV, Intercom system, Illuminated signages and Lighting automation		1.21
a	On Supply of CCTV camera, wiring, conduit and other accessories required for CCTV at suitable locations	0.51	
b	On completion of above installation, testing and commissioning as per scope of work.	0.18	
c	On Supply of intercom, wiring, conduit and other accessories required at suitable locations	0.17	
d	On completion of above installation, testing and commissioning as per scope of work.	0.06	
e	On supply of illuminated signages and other signage, floor marking etc.	0.07	
f	On completion of above installation, testing and commissioning as per scope of work.	0.02	
g	On supply of lighting automation devices etc.	0.10	
h	On completion of above installation, testing and commissioning as per scope of work.	0.04	
i	On completion of testing, commissioning of all services and equipment's i/c all NOC and handing over the installation.	0.06	
	Total		100.00

Residential Bungalow (RD Bungalow)			
(For Item No.4 of Schedule of Quantity of Building Work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl.No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		80.17
1	Completion of Building structure above PL.		34.00
a	On completion of casting upto ground floor slab.	15.00	
b	On completion of casting upto first floor roof slab.	15.00	
b	On completion of RCC Casting of mumty, overhead water tanks, Complete structural RCC Work i/c parapet wall.	4.00	
2	Completion of filler wall/panel and finishing works i.e. masonry work, flooring, plastering, fixing of doors & windows, interior & exterior painting, internal water supply and sanitary installation etc.		36.67
a	Completion of filler walls and casting of lintel/chajja at ground floor	3.00	
b	Completion of filler walls and casting of lintel/chajja at first floor	3.00	
b	On completion of filler walls and casting of lintel/chajja of mumty	1.50	
c	Internal plastering including Gypsum plaster & Putty.	3.00	
d	External Plastering including white cement-based putty.	3.00	
e	All type of flooring, skirting, dado and window sills, jambs.	5.07	
f	Fixing of all type of door frames and shutters including Door hardware's.	3.00	
g	Fixing of windows and ventilators including 5mm toughened reflective glass.	3.00	
h	Internal painting and finishing in all respect.	3.00	
i	All types of External painting, Structural Glazing/ ACP and finishing in all respect.	2.10	
j	Internal water supply works including fixtures.	1.00	
k	Internal sanitary installation works including fixtures.	2.00	
l	Complete stainless steel railing works, steel works, trench work	2.00	
m	Completion of rain water pipes, water proofing works.	1.00	
n	All miscellaneous works such as toilet false ceiling, WPC jali, plinth protection, ramps, etc.	1.00	
6	Completion of all other balance civil works as per scope of NIT not reflected in above stages, cleaning of site and removal of defects, testing and Commissioning	4.50	4.50
7	Submission of completion certificate of the building, all statutory post-construction clearances, licenses and as built drawing, invoice of all materials, guarantee bond etc., handing over of buildings and successful closing of agreement.	5.00	5.00

	E & M WORKS		19.83
1	Internal Electrical Installation		12.50
a	On supply of all MS conduits	1.67	
b	On installation of all MS conduits	0.50	
c	On supply of all wires and wiring accessories like switch and sockets etc.	2.51	
d	On drawing of all wires and fixing of switch and sockets etc.	0.72	
e	On testing, commissioning & completion of all wiring works.	1.00	
f	On supply of all power distribution materials like DB's MCB's etc.	1.70	
g	On installation, testing and commissioning of all power distribution materials like DB's MCB's etc.	0.80	
h	On supply of luminaires' & fans, etc. U.G. cable, control panel etc.	2.52	
i	On installation of luminaires' & fans, U.G. cable, control panel etc.	0.72	
j	On testing, commissioning & completion of luminaires' & fans, U.G. cable, control panel etc.	0.36	
2	Lifts		6.17
a	On supply Lift equipment	4.32	
b	On installation of lift equipment's.	1.23	
c	On testing & commissioning of entire lift system	0.62	
3	CCTV, Intercom system		1.16
a	On Supply of CCTV camera, wiring, conduit and other accessories required for CCTV at suitable locations	0.49	
b	On completion of above installation, testing and commissioning as per scope of work.	0.17	
c	On Supply of intercom, wiring, conduit and other accessories required at suitable locations	0.32	
d	On completion of above installation, testing and commissioning as per scope of work.	0.12	
	On completion of testing, commissioning of all services and equipment's i/c all NOC and handing over the installation.	0.06	
	Total		100.00

Community Centre			
(For Item No.5 of Schedule of Quantity of Building Work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		69.68
1	Completion of Building structure above PL.		27.00
a	On completion of casting upto ground floor roof slab.	8.50	
b	On completion of casting upto 1st floor roof slab.	8.50	
c	On completion of casting upto 2nd floor roof slab.	8.50	
d	On completion of RCC Casting of mumty, overhead water tanks, Complete structural RCC Work i/c parapet wall.	1.50	
2	Completion of filler wall/panel and finishing works i.e. masonry work, flooring, plastering, fixing of doors & windows, interior & exterior painting, internal water supply and sanitary installation etc.		33.18
a	Completion of filler walls and casting of lintel/chajja at ground floor	1.50	
b	Completion of filler walls and casting of lintel/chajja at 1 st floor	1.50	
c	Completion of filler walls and casting of lintel/chajja at 2nd floor	1.50	
d	On completion of filler walls and casting of lintel/chajja of mumty	0.50	
e	Internal plastering including self-curing plaster & Putty.	2.43	
f	External Plastering including white cement-based putty.	2.00	
g	All type of flooring, skirting, dado and window sills, jambs.	5.00	
h	Fixing of all type of door frames and shutters including Door hardware's.	3.00	
i	Fixing of windows and ventilators including 5mm toughened reflective glass.	2.00	
j	Fire check doors and fittings.	0.75	
k	Internal painting and finishing in all respect.	2.00	
l	All types of External painting, Structural Glazing/ ACP and finishing in all respect.	3.00	
m	Internal water supply works including fixtures.	2.00	
n	Internal sanitary installation works including fixtures.	3.00	
o	Complete stainless steel railing works, steel works.	1.00	
p	Completion of rain water pipes, water proofing works.	1.00	
q	All miscellaneous works such as toilet false ceiling, WPC jali, plinth protection, ramps, etc.	1.00	
3	Completion of all other balance civil works as per scope of NIT not reflected in above stages, cleaning of site and removal of defects, testing and Commissioning	4.50	4.50

4	Submission of completion certificate of the building, all statutory post-construction clearances, licenses and as built drawing, invoice of all materials, guarantee bond etc., handing over of buildings and successful closing of agreement.	5.00	5.00
	E & M WORKS		30.32
1	Internal Electrical Installation		9.74
a	On supply of all MS conduits	1.40	
b	On installation of all MS conduits	0.40	
c	On supply of all wires and wiring accessories like switch and sockets etc.	2.20	
d	On drawing of all wires and fixing of switch and sockets etc.	0.60	
e	On testing, commissioning & completion of all wiring works.	0.13	
f	On supply of all power distribution materials like rising mains, DB's MCB's etc.	1.40	
g	On installation, testing and commissioning of all power distribution materials like rising mains, DB's MCB's etc.	0.60	
h	On supply of luminaires' & fans, etc. U.G. cable, control panel etc.	2.11	
i	On installation of luminaires' & fans, U.G. cable, control panel etc.	0.60	
j	On testing, commissioning & completion of luminaires' & fans, U.G. cable, control panel etc.	0.30	
2	Fire Fighting System		2.73
a	On supply of firefighting pipe, sprinklers, hydrants, valves, hose pipes, hose reel, FBC & accessories etc.	1.34	
b	On installation of firefighting pipe, sprinklers, hydrants, valves, hose pipes, hose reel, FBC & accessories etc.	0.29	
c	On supply of fire pumps, panel, cable etc.	0.57	
d	On installation of fire pumps, panel, cable etc.	0.12	
e	On testing & commissioning of entire fire fighting system	0.27	
f	On completion fire fighting system complete with getting NOC from CFO / local fire body	0.14	
3	Fire Alarm System		1.52
a	On supply of fire alarm Panel, Detectors & cabling and other accessories etc.	1.06	
b	On installation of Panel, cabling and detectors etc. as required	0.23	
c	On testing & commissioning of entire fire alarm system	0.15	
d	On completion fire alarm system complete with getting NOC from CFO / local fire body	0.08	
4	Lifts		7.00
a	On supply Lift equipment	4.90	
b	On installation of lift equipment's	1.40	
c	On testing & commissioning of entire lift system	0.70	
5	VRV/VRF air-conditioning system		7.00
a	On supply VRV/VRF equipment's like ducts, indoor unit, outdoor unit, AHU's, cabling, refrigerant piping, control cable, LT and control panels etc.	4.90	

b	On installation of VRV/VRF equipment's like ducts, indoor unit, outdoor unit, AHU's, cabling, refrigerant piping, control cable, LT and control panels etc.	1.05	
c	On testing & commissioning of entire air-conditioning system	0.70	
d	On completion of air-conditioning system complete with getting NOC from CFO / local fire body	0.35	
6	IP based EPABX system		1.52
a	On supply of EPABX, telephone devices, servers, switches, racks, cabling, termination etc.	1.06	
b	On completion of above installation, testing and commissioning as per scope of work.	0.38	
c	On completion of testing, commissioning of equipment's i/c all NOC and handing over the installation.	0.08	
7	CCTV, Illuminated signages and Lighting automation		0.81
a	On Supply of CCTV camera, wiring, conduit and other accessories required for CCTV at suitable locations	0.40	
b	On completion of above installation, testing and commissioning as per scope of work.	0.10	
c	On supply of illuminated signages and other signage, floor marking etc.	0.10	
d	On completion of above installation, testing and commissioning as per scope of work.	0.05	
e	On supply of lighting automation devices etc.	0.10	
f	On completion of above installation, testing and commissioning as per scope of work.	0.03	
g	On completion of testing, commissioning of all services and equipment's i/c all NOC and handing over the installation.	0.03	
	Total		100.00

SERVICE AREAS (GATE POST, METRE ROOM, PANEL ROOM)			
(For Item No.6 of Schedule of Quantity of Building Work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		84.78
1	Completion of work i/c excavation, structure work, finishing work.		74.78
a	Completion of excavation & structure work	30.00	
b	Completion of finishing work including masonry work, Flooring work, fixing of doors & windows, internal water supply line.	30.00	
c	All miscellaneous works such as plastering, painting etc.	14.78	
2	Completion of all other balance civil works as per scope of NIT not reflected in above stages, cleaning of site and removal of defects.		5.00
3	Submission of completion certificate, handing over of works and successful closing of agreement.		5.00
	E & M WORKS		15.22
1	Internal Electrical Installation		14.01
a	On supply of all MS conduits	1.96	
b	On installation of all MS conduits	0.60	
c	On supply of all wires and wiring accessories like switch and sockets etc.	2.93	
d	On drawing of all wires and fixing of switch and sockets etc.	0.84	
e	On testing, commissioning & completion of all wiring works.	0.70	
f	On supply of all power distribution materials like rising mains, DB's MCB's etc.	1.9	
g	On installation, testing and commissioning of all power distribution materials like rising mains, DB's MCB's etc.	0.84	
h	On supply of luminaires' & fans, etc., U.G. cable, control panel etc.	2.94	
i	On installation of luminaires' & fans, U.G. cable, control panel etc.	0.84	
j	On testing, commissioning & completion of luminaires' & fans, U.G. cable, control panel etc.	0.42	
2	CCTV and illuminated signages		1.21
a	On Supply of CCTV camera, wiring, conduit and other accessories required for CCTV at suitable locations	0.68	
b	On completion of above installation, testing and commissioning as per scope of work.	0.24	
c	On supply of illuminated signages and other signage, floor marking etc.	0.17	
d	On completion of above installation, testing and commissioning as per scope of work.	0.06	
e	On completion of testing, commissioning of all services and equipment's i/c all NOC and handing over the installation.	0.06	
Total			100.00

Dismantling & Demolishing			
(For Item No.1 of Schedule of Quantity of Development work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		100.00
1	Completion of Dismantling & Demolishing of existing structure	26.00	
2.	Removal of debris & malba from site	26.00	
3.	Cleaning of site in all respect.	48.00	
	Total	100.00	

Connecting Corridor			
(For Item No.2 of Schedule of Quantity of Development work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		98.90
1.	Completion of Structure work of connecting corridor	55.00	
2.	Completion of finishing work of connecting corridor including flooring, Railing work etc. all complete	29.00	
3.	Completion of all other balance civil works as per scope of NIT not reflected in above stages, cleaning of site and removal of defects, testing and Commissioning	9.90	
4	Submission of completion certificate, handing over of works and successful closing of agreement.	5.00	
	E & M WORKS		
1	Internal Electrical Installation		1.10
a	On supply of all MS conduits	0.30	
b	On installation of all MS conduits	0.06	
c	On supply of all wires and wiring accessories like switch and sockets etc.	0.28	
d	On drawing of all wires and fixing of switch and sockets etc.	0.08	
e	On testing, commissioning & completion of all wiring works.	0.07	
f	On supply of luminaires' etc.	0.21	
g	On installation of luminaires' etc.	0.06	
h	On testing, commissioning & completion of luminaires' etc.	0.04	
	Total		100.00

RCC UG water tank and pump house			
(For Item No.3 of Schedule of Quantity of Development work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		98.46
1	Completion of foundation & plinth including plinth beams upto 1.20 mtr.		15.00
a	Completion of Foundation i/c earthwork.	5.00	
b	Completion of RCC wall, Columns etc upto 1.20 mtr.	10.00	
3	Completion of RCC wall structure.		48.00
a	Completion of RCC wall, Columns etc from 1.20 mtr. level to top i/c partition RCC wall.	18.00	
b	Completion of RCC slab of UG water tank and pump room.	30.00	
4	Completion of water proofing work, wall & floor tiles, finishing and painting.		25.00
a	Completion of water proofing work.	6.00	
b	Completion of wall & floor tiles work of RCC UG water tank and ladder inside the RCC UG water tank i/c all finishing work.	11.00	
c	Completion of flooring work and all finishing work in pump rooms i/c doors, windows with all fittings and Connection of inlet & outlet pipe with all accessories from water tank to pump room and signages works.	8.00	
5	Completion of balance works, cleaning of site and removal of defects.	4.46	4.46
6	Submission of completion certificate of the water tank, all statutory post-construction clearances, licenses and as built drawing, handing over of buildings and successful closing of agreement.	6.00	6.00
	E & M WORKS		1.54
1	Internal Electrical Installation, External Electrical Installation		
a	Submission of Design, Drawing for approval	0.05	
b	Supplying and drawing of wires	0.35	
c	Supplying of DBs and MCBs rising mains along with accessories.	0.35	
d	Supply of Electrical indoor light fittings, Fans, Ex. Fans, Lightening controls etc.	0.30	
e	Supply of Earthing Materials and Lightning Protection system etc.	0.24	
f	Installations of above equipment's	0.15	
g	Testing & commissioning of all equipment's	0.10	
	Total		100.00

LEVELLING WORK			
(For Item No.4 of Schedule of Quantity of Development work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		
Payment shall be done on actual quantity executed and measure as per scope and specification			

INTERNAL ROAD WITH CEMENT CONCRETE PAVEMENT			
(For Item No. 5.1 of Schedule of Quantity of Development work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		
1	Completion of work i/c excavation, PCC, sand filling, paver block & kerb stone.		80.00
a	Completion of excavation	5.00	
b	Completion of GSB.	12.00	
c	Completion of WMM.	13.00	
d	Completion of Kerb stone kerb channel.	10.00	
e	Completion of Cement concrete pavement with vacuum dewatered concrete	40.00	
2	Completion of Painting of kerb stone and road marking.		10.00
3	Completion of balance works, cleaning of site and removal of defects.		3.00
4	Submission of completion certificate, handing over of works and successful closing of agreement.		7.00
	Total		100.00

INTERLOCKING PAVER BLOCKS M-30 Grade 60 MM THICK C.C.			
(For Item No.5.2 of Schedule of Quantity of Development work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		
1	Completion of work i/c excavation, PCC, sand filling, paver block & kerb stone.		80.00
a	Completion of excavation	5.00	
b	Completion of PCC.	15.00	
c	Completion of sand filling.	10.00	
d	Completion of Kerb stone.	15.00	
e	Completion of paver block.	35.00	
2	Completion of Painting of kerb stone and road marking.		10.00
3	Completion of balance works, cleaning of site and removal of defects.		3.00
4	Submission of completion certificate, handing over of works and successful closing of agreement.		7.00
	Total		100.00

SEWER LINES			
(For Item No.6 of Schedule of Quantity of Development work			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		100.00
1	Completion of Sewer pipe Line work etc.	80.00	
2	Completion of finishing and connection to the STP Tanks	10.00	
3	Completion of balance works, cleaning of site and removal of defects.	3.00	
4	Submission of completion certificate, handing over of works and successful closing of agreement.	7.00	
	Total		100.00

WATER SUPPLY LINE			
(For Item No.7.1 of Schedule of Quantity of Development work			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		100.00
1	Completion of work i/c excavation, painting of pipes, sand filling, laying of pipes etc.		90.00
a	Completion of excavation	5.00	
b	Completion of painting of pipes.	10.00	
c	Completion of pipe laying, sand filling around pipes etc.	60.00	
d	Completion of pipe works i/c earth filling.	15.00	
2	Completion of balance works, cleaning of site and removal of defects.	3.00	3.00
3	Submission of completion certificate, handing over of works and successful closing of agreement.	7.00	7.00
	Total		100.00

STROM WATER DRAIN			
(For Item No.8 of Schedule of Quantity of Development work			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		
1	Completion of work i/c excavation, painting of pipes, sand filling, laying of pipes etc.		90.00
a	Completion of excavation and PCC	10.00	
b	Completion of RCC drain base.	20.00	
c	Completion of Brick drain Wall & Manholes & Strom pipe line.	45.00	
d	Completion of SFRC cover	15.00	
2	Completion of balance works, cleaning of site and removal of defects.	3.00	3.00
3	Submission of completion certificate, handing over of works and successful closing of agreement.	7.00	7.00
	Total		100.00

RAIN WATER HARVESTING SYSTEM			
(For Item No.9 of Schedule of Quantity of Development work			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		100.00
1	Completion of work i/c excavation, Brick work, filling with boulder, gravel and sand, Boring, Chamber and RCC pipes etc.		90.00
a	Completion of excavation, Boring and lowering PVC screen pipe	20.00	
b	Completion of Brick work / Brick Masonry chamber and laying RCC pipe	30.00	
c	Completion of filling of Boulder, Gravels and sand.	40.00	
2	Completion of balance works, cleaning of site and removal of defects.	3.00	3.00
3	Submission of completion certificate, handing over of works and successful closing of agreement.	7.00	7.00
	Total		100.00

TRENCHES FOR SERVICES			
(For Item No.10 of Schedule of Quantity of Development work			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		
1	Completion of work i/c excavation		100.00
	Total		100.00

Diaphragm Wall & Sheet Pile			
(For Item No.11 of Schedule of Quantity of Development work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		
1	Completion of Diaphragm wall, sheet pile including excavation.		100.00
a	Design of Diaphragm wall& Sheet pile including vetting of drawings by IIT.	4.00	
b	Completion of 25% of Diaphragm wall, sheet pile including excavation.	23.00	
c	Completion of 25% of Diaphragm wall, sheet pile including excavation.	23.00	
d	Completion of 25% of Diaphragm wall, sheet pile including excavation.	23.00	
e	Completion of 25% of Diaphragm wall, sheet pile including excavation.	23.00	
f	Completion of all other balance civil works as per scope of NIT not reflected in above stages, cleaning of site and removal of defects.	4.00	
	Total	100.00	

Barricading of height 6.0 metre			
(For Item No.12 of Schedule of Quantity of Development work)			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		
Payment shall be done on actual quantity executed and measure as per scope and specification			

Boundary wall			
(For Item No.1 of Schedule of Quantity of Boundary wall & Gates)			
(For intermittent payments, Pro-rata payment will be released based on length)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS (Boundary wall)		100%
1	Completion of excavation & structure work.		22.88
a	On completion of 25% of excavation & structure work.	5.72	
b	On completion of 25% of excavation & structure work.	5.72	
c	On completion of 25% of excavation & structure work.	5.72	
d	On completion of 25% of excavation & structure work.	5.72	
2	Completion of Masonary work including plastering, painting, fixing of concertina coil including fixing of wicket gate		22.88
a	On completion of 25% of boundary wall.	5.72	
b	On completion of 25% of boundary wall.	5.72	
c	On completion of 25% of boundary wall.	5.72	
d	On completion of 25% of boundary wall.	5.72	
3	Toran & Chaitya Gates		46.24
a	On fabricating, supplying, transporting and erecting on site a Glass Reinforced Concrete (GRC) Toran Gate	16.08	
b	On fabricating, supplying, transporting and erecting on site a Glass Reinforced Concrete (GRC) Chaitya-arch gateway	30.16	
2	Completion of all other balance civil works as per scope of NIT not reflected in above stages, cleaning of site and removal of defects.	4.00	4.00
3	Submission of completion certificate, handing over of works and successful closing of agreement.	4.00	4.00
	Total		100.00

FURNITURE			
Schedule of Quantity As per Furniture Subhead			
(For intermittent payments, Pro-rata payment will be released based on supply)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		
1	On Supplying of various furniture items as per schedule		80.00
2	On fixing & assembling of various furniture items as per schedule		20.00
	Total		100.00

Badminton court			
Schedule of Quantity As per Badminton court			
(For intermittent payments, Pro-rata payment will be released based on completion of work as per area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
1.	Badminton court		92.00
a	On completion of flooring, court marking, fixing of badminton pole set, Installation of acoustic panels or foam on the ceiling as per schedule.	86.00	
b	Final Completion	6.00	
2.	E & M WORKS		8.00
a	On supply of luminaires', flood light, U.G. cable, control panel etc.	2.00	
b	On installation of luminaires', flood light, U.G. cable, control panel etc.	2.00	
c	On testing, commissioning & completion of luminaires', flood light, U.G. cable, control panel etc.	4.00	
	Total		100.00

Health Club & GYM Equipment's			
Schedule of Quantity As per Health Club & GYM Equipment's			
(For intermittent payments, Pro-rata payment will be released based on supply)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		100.00
1	On Supplying of Health club Equipment's as per schedule.	80.00	
2	On fixing & assembling of Health club Equipment's.	15.00	
3.	Final Completion	5.00	
	Total		100.00

Organic Waste converter		
Schedule of Quantity As per Organic Waste Converter		
(For intermittent payments, Pro-rata payment will be released based on completion of work as per area)		
Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
Organic Waste converter		100.00
On Supplying & installation of organic waste converter	85.00	
Final Completion including testing & commissioning	15.00	
Total		100.00

Bore Wells for water Supply			
Schedule of Quantity As per Bore Wells for water Supply			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	CIVIL WORKS		
Payment shall be done on actual quantity executed and measure as per scope and specification			

HORTICULTURE AND LANDSCAPING			
Schedule of Quantity As per HORTICULTURE AND LANDSCAPING			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	HORTICULTURE WORKS		
1	Completion of work i/c excavation, disposal, supply of good earth manure, fine sand plants, etc.		75.00
a	Completion of excavation disposal of soil.	4.00	
b	Completion of stacking good earth, manure, sand etc.	15.00	
c	Completion small planting work (Horizontal & Vertical).	31.00	
d	Completion of grassing work.	25.00	
2	Completion of planting Trees, Shrubs, and Hedge.		10.00
3	Completion of balance works, cleaning of site and removal of defects.		8.00
4	Submission of completion certificate, handing over of works and successful closing of agreement.		7.00
	Total		100.00

Development of Site i/c Bulk services - E&M WORKS			
Schedule of Quantity As per Development of Site i/c Bulk services - E&M WORKS			
(For intermittent payments, Pro-rata payment will be released based on plinth area)			
Sl. No.	Stage of payment	Break up of % of Item Contract value	% of Item Contract Value
	Development of Site i/c Bulk services - E&M WORKS		100.00
1	Installation of system of various E & M services		
2	On Supply of HT Panel, Transformers, LT Panel, HT & LT cables, LT Panel, Essential Panel, APFC Panel, Meter panel in each block i/c its cable complete as required for installing substation.	31.62	
3	On completion of above installation, testing and commissioning as per scope of work.	13.55	
4	On supply of DG sets, AMF Panel, Diesel tank, Control Panel, Exhaust Piping and its structure etc. complete as required.	9.03	
5	On Completion of installation of DG set i/c testing and commissioning as required.	3.87	
6	On supply of UPS system i/c batteries interconnecting cables, battery rack etc.	1.33	
7	On completion of above installation, testing and commissioning as per scope of work.	0.57	
8	On installation, testing and commissioning of solar photovoltaic plant as per scope of work.	8.16	
9	On completion of above installation, testing and commissioning as per scope of work.	3.50	
10	On Supply of CCTV camera, wiring, conduit and other accessories required for CCTV at suitable locations	1.57	
11	On completion of above installation, testing and commissioning as per scope of work.	0.67	
12	On supply of street lights, poles, Decorative lights, cable, feeder pillar, bollard etc. complete as required.	1.56	
13	On completion of above installation, testing and commissioning as per scope of work.	0.67	
14	On Supply of Boom barrier, card reader, control panel, cable etc. complete as required.	0.39	
15	On completion of above installation, testing and commissioning as per scope of work.	0.17	
16	Supply of facade lighting luminaires/fixtures, drivers, controllers, junction boxes, all mounting brackets, clamps, supports, conduits, and associated accessories at site etc.	4.32	
17	On completion of above installation, testing and commissioning as per scope of work.	1.85	

18	On Supply of STP including membrane, other chamber, tanks, electrical cable, pumps, control panel, etc. complete as required for installation of STP in the campus.	3.90	
19	On completion of above installation, testing and commissioning as per scope of work.	1.67	
20	Supply of DC EV chargers with connectors, cables, communication equipment protection devices, metering and accessories at site.	1.90	
21	On completion of above installation, testing and commissioning as per scope of work.	0.80	
22	Supply of AC EV chargers with connectors, cables, communication equipment protection devices, metering and accessories at site.	1.00	
23	On completion of above installation, testing and commissioning as per scope of work.	0.40	
24	Supply of video monitors, outdoor door stations, cameras, controllers, power supplies, cables, conduits, boxes, racks, accessories and other major equipment at site.	1.50	
25	On completion of above installation, testing and commissioning as per scope of work.	0.61	
26	On Supply of all type Fire extinguisher etc. as per scope of work.	3.00	
27	On completion of above installation, testing and commissioning as per scope of work.	1.18	
28	Supply of borewell, open well and dewatering submersible pump, control panel/starter, cables and accessories etc. at site.	0.85	
29	On completion of above installation, testing and commissioning as per scope of work.	0.36	
	Total		100.00

SCHEDULE OF QUANTITIES

SCHEDULE OF QUANTITIES FOR EPC WORK					
SH: -A - BUILDING WORK					
Sl. No.	Description of Items	Qty	Unit	Rate	Amount
1	Construction of Basement as per approved Good for construction Drawings (Architectural/ Structural/ MEP) along with foundation including cutting, filling, supplying/disposal of earth, all internal & external services (CIVIL + E&M) i/c raft, basement wall & podium waterproofing, W/S & S/I, Internal EI (i/c power wiring & plugs), Wet riser and sprinkler system, Automatic Fire Alarm system, pressurized mechanical ventilation system, lighting automation (i/c occupancy sensor), CCTV, Illuminated signage's etc. complete in all respect as per detailed scope and specifications as mentioned in NIT to complete the building with its functionality for its intended purpose and as per approved architectural & structural drawings all complete as per direction of Engineer-in-charge and hand over the same to the client. NOTE- The rate also includes all structures above podium like mumty, shaft covering, parapet wall, all platforms to support MEPF structures etc. and it will not to be measured separately. Also, the rate includes additional cost for additional floor height in lieu of normal floor height as per architectural drawing.	7006.79	Sqm	95,132.21	66,65,71,406.00
2	Construction of (Stilt + 14 storeyed above basement) residential building grade B&C tower as per approved Good for construction Drawings (Architectural/ Structural/MEP) with all internal & external services (CIVIL + E&M) i/c W/S & S/I, overhead tank without independent staging, External service connection, Internal EI (i/c power wiring & plugs), Wet riser system, Automat/ ic. Fire Alarm system, lightning conductors,	12477.44	Sqm	33,747.63	42,10,84,027.00

	telephone conduits, lifts, lighting automation (i/c occupancy sensor), CCTV, Intercom system, Illuminated signage's, etc. complete in all respect as per detailed scope and specifications as mentioned in NIT to complete the building with its functionality for its intended purpose and as per approved architectural & structural drawings and all complete as per direction of Engineer-in-charge and hand over the same to client. NOTE- The rate also includes all structures above terrace like OHT, mumty, machine room, shaft covering, parapet wall, all platforms above terrace to support MEPF structures etc. and it will not to be measured separately. Also, the rate includes additional cost for additional floor height in lieu of normal floor height as per architectural drawing.				
3	Construction of (Stilt + 10 storeyed above basement) residential building grade D&E tower as per approved Good for construction Drawings (Architectural/ Structural/MEP) with all internal & external services (CIVIL + E&M) i/c W/S & S/I, overhead tank without independent staging, External service connection, Internal EI (i/c power wiring & plugs), Wet riser system, lightning conductors, telephone conduits, lifts (i/c one no. capsule lift in Grade F quarter), lighting automation (i/c occupancy sensor), CCTV, Intercom system, Illuminated signage's, etc. complete in all respect as per detailed scope and specifications as mentioned in NIT to complete the building with its functionality for its intended purpose and as per approved architectural & structural drawings and all complete as per direction of Engineer-in-charge and hand over the same to client. NOTE- The rate also includes all structures above terrace like OHT, mumty, machine room, shaft	3942.38	Sqm	33,936.75	13,37,91,578.00

	covering, parapet wall, all platforms above terrace to support MEPF structures etc. and it will not to be measured separately. Also, the rate includes additional cost for additional floor height in lieu of normal floor height at all floor level and entrance verandah/porch etc. as per architectural drawing.				
4	Construction of 01 no duplex type (above basement) Regional Director Bungalow as per approved Good for construction Drawings (Architectural/ Structural/MEP) with all internal & external services (CIVIL + E&M) i/c W/S & S/I, overhead tank without independent staging, External service connection, Internal EI (i/c power wiring & plugs), lightning conductors, telephone conduits, one no. capsule lift, CCTV, Intercom system, etc. complete in all respect as per detailed scope and specifications as mentioned in NIT to complete the building with its functionality for its intended purpose and as per approved architectural & structural drawings and all complete as per direction of Engineer-in-charge and hand over the same to client. NOTE- The rate also includes all structures above terrace like OHT, mumty, machine room, shaft covering, parapet wall, all platforms above terrace to support MEPF structures etc. and it will not to be measured separately. Also, the rate includes additional cost for additional floor height in lieu of normal floor height at all floor level and entrance verandah/porch etc. as per architectural drawing.	500.43	Sqm	31,295.98	1,56,56,445.00
5	Construction of 1 no (G+2) storeyed (above basement) Community Center as per approved Good for construction Drawings (Architectural/ Structural/MEP) with all internal & external services (CIVIL + E&M) i/c W/S & S/I, overhead tank without	2206.88	sqm	44,446.49	9,80,88,075.00

	independent staging, External service connection, Internal EI (i/c power wiring & plugs), wet riser and sprinkler system, Automatic Fire Alarm system, lightning conductors, telephone conduits, lifts, VRV/VRF AC system, CCTV, EPABX system, lighting automation (i/c occupancy sensor), Illuminated signages, etc. complete in all respect as per detailed scope and specifications as mentioned in NIT to complete the building with its functionality for its intended purpose and as per approved architectural & structural drawings and all complete as per direction of Engineer-in-charge and hand over the same to client. NOTE- The rate also includes all structures above terrace like OHT, mumty, machine room, shaft covering, parapet wall, all platforms above terrace to support MEPF structures etc. and it will not to be measured separately. Also, the rate includes additional cost for additional floor height in lieu of normal floor height at all floor level and entrance verandah/porch etc. as per architectural drawing.				
6	Construction of Single storied Service Buildings (Gate Post, Panel Room, Meter Room) as per approved Good for construction Drawings (Architectural/ Structural/MEP) with along with foundation including cutting, filling, supplying/disposal of earth, all internal & external services (CIVIL + E&M) i/c W/S & S/I, External service connection, Internal EI (i/c Power wiring & plugs), lightning conductors, telephone conduits, CCTV, Intercom system, Illuminated Signages, etc. complete in all respect as per detailed scope and specifications as mentioned in NIT to complete the building with its functionality for its intended purpose and as per approved architectural & structural drawings and all complete as per direction of	57.58	sqm	28,014.35	16,13,066.00

	Engineer-in-charge and hand over the same to client. NOTE- The rate also includes all structures above terrace like parapet wall, all platforms above terrace to support MEPF structures etc. and it will not to be measured separately. Also, the rate includes additional cost for additional floor height in lieu of normal floor height at all floor level and entrance verandah/porch etc. as per architectural drawing.				
	SH: - A SUB-TOTAL				133,51,91,125.00
SH: - B - DEVELOPMENT & BULK SERVICES (CIVIL WORKS)					
7	Dismantling, demolishing and removing all existing structures, buildings, quarters, sheds, security cabins, panel rooms, pump houses, underground sumps, worship structures, foundations, storm-water drains, DG sets, solid waste processing/management plant, pumps, equipment, machinery, installations and other miscellaneous structures/services identified for demolition, including superstructure and substructure, as required for construction of the proposed new building, complete in all respects. All dismantled materials shall be segregated, handled and disposed of as directed by the Engineer-in-Charge and in accordance with applicable statutory requirements, including the Construction and Demolition Waste Management Rules, 2016 and amendments thereto, NGT/MoEFCC directions and requirements of local authorities. Serviceable/unserviceable materials arising from dismantling shall be dealt with as directed by the Engineer-in-Charge. The work shall be executed strictly as per CPWD Specifications, relevant BIS Codes and approved dismantling methodology/safety plan, using safe and controlled methods without use of explosives, and with due protection to retained boundary walls, adjoining	1	Job	1,96,21,422.00	1,96,21,422.00

	buildings, roads, drains, utilities and public/private property. The rate shall be inclusive of all costs, risks and obligations associated with dismantling/demolition, salvage, segregation, loading, transportation, disposal, statutory permissions/ NOCs, protection of retained structures, barricading, safety, pollution control, debris removal, site cleaning, dressing and levelling. No separate or additional payment shall be admissible for any of the aforesaid activities or for any discrepancy in quantity, condition, accessibility or salvage value of dismantled materials.				
8	Salvage/buy-back value of all serviceable and unserviceable materials arising out of dismantling/demolition of existing buildings, structures and installations, including but not limited to bricks, concrete, reinforcement steel, structural steel, MS sections/angles, doors, windows, timber, roofing materials, electrical installations and fittings, sanitary and plumbing fittings, metalwork, DG set components, pumps, equipment, machinery, solid waste processing/management plant components and other materials of value, as identified during dismantling/demolition, on a lump-sum Job basis. The salvage/buy-back value shall be treated as recoverable from the Contractor irrespective of the actual quantity/value realized by the Contractor from such materials. No claim for reduction, compensation or reimbursement shall be entertained on account of variation in quantity, condition, recoverability or market value of the dismantled materials.	1	Job	-2,00,65,427.00	-2,00,65,427.00
9	Construction of two nos. connecting corridor in steel structure, one connecting the community center with Grade B & C Tower and other connecting Grade D & E Tower (at levels shown in the approved drawings including all Civil and Electrical & Mechanical (E&M) works, internal and	133.89	sqm	27,071.08	36,24,547.00

Correction...Nil Deletion... Nil Insertion...Nil Overwriting... Nil

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	external services, flooring over RCC slab, finishes, etc. complete in all respects, as per the detailed scope, technical specifications, approved architectural and structural drawings, and the provisions of the Notice Inviting Tender (NIT). The work shall include all materials, labour, plant, equipment, tools, tackles, scaffolding, temporary works, quality control and all other items necessary to complete the connecting corridor in a fully functional condition for its intended purpose, as directed by the Engineer-in-Charge and hand over the same to client.				
10	Construction of RCC UG water tank 3.50 Lakhs capacity in two or more compartment as per approved Architectural & Structural good for construction drawings along with foundation including cutting, filling, supplying/disposal of earth, all internal & external services (CIVIL + E&M) complete in all respect as per detailed scope and specifications as mentioned in NIT & all complete to make it functional for its intended purpose and as per direction of Engineer - in - charge.	3,50000	litre	23.35	81,72,500.00
11	Levelling of outside basement and in inside Boundary Wall of building area etc. i/c including back filling of excavated earth, disposal of excess earth/filling of borrowed earth, complete in all respect as per scope of work specifications as mentioned in NIT all complete as per approved architectural drawing and direction of engineer in charge.	2059.00	Sqm	155.68	3,20,545.00

12	Construction of Internal Road with Cement Concrete Pavement using Vacuum Dewatered Concrete (VDC) over WMM and Granular Sub-Base (GSB), including preparation, dressing, grading and consolidation of subgrade, complete beyond podium; and construction of Internal Road with Cement Concrete Pavement using Vacuum Dewatered Concrete (VDC) over PCC and sand filling, as detailed in the approved drawings, over podium, wherever applicable, including all necessary preparation and finishing works. The item shall include providing and laying all required layers, proper camber/cross-fall and longitudinal slope for effective drainage, construction of pavement complete with Vacuum Dewatered Concrete of specified grade and thickness, finishing and curing, including all materials, labour, tools, plants, equipment and incidental works. The scope shall also include providing and laying kerb stones on both sides of the road, including kerb channel, fixing and jointing of kerb stones, construction/provision of bell-mouth pipe crossings/road crossings wherever required, provision of drainage arrangements, road marking, painting of kerbs, cleaning and finishing, and all other associated works required to make the road complete and functional for its intended purpose, all as per approved Architectural and Structural drawings, detailed scope and specifications mentioned in	3097.00	sqm	2865.49	88,74,423.00
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	NIT and as directed by the Engineer-in-Charge. NOTE - Measurement shall be made based on the actual area of road constructed. The width shall be measured as the inner clear distance between the kerb stones, up to two decimal places in metre. The length shall be the actual length of road laid, measured up to two decimal places in metre.				
13	Construction of Footpath with PCC Base, 60 mm thick interlocking concrete paver blocks and kerb stone edging, including preparation and consolidation of subgrade, providing and laying PCC base of required thickness and grade over prepared subgrade/soil filling, providing and laying 60 mm thick interlocking concrete paver blocks of M-35 grade of approved colour, pattern, shape and strength over approved bedding layer, including cutting and fitting of paver blocks at edges, junctions and around obstructions, proper compaction and finishing, including provision of kerb stone edging on both sides, fixing and jointing of kerb stones in cement mortar/concrete as required, providing proper slope towards drainage outlets, finishing, curing, cleaning and all other incidental works complete in all respects as per approved Architectural & Structural drawings, detailed scope and specifications mentioned in NIT, to make the footpath functional for its intended purpose and as per directions of Engineer-in-Charge.	478.00	Sqm	2850.89	13,62,725.00

	NOTE - Measurement shall be done as per actual area of footpath constructed. Width shall be taken as the inner clear distance between kerb stones, measured up to two decimal digits in metre. Length shall be the actual length of footpath laid, measured up to two decimal digits in metre.				
14	Laying of External sewer Lines (for STP discharge) with required Pipes of suitable dia as per DSR-23 Items after excavating the trench as per scope/ specifications given in NIT. Manholes/ Inspection chambers of suitable size as per CPWD specification 2019 are to be provided along the sewer lines. At every change of alignment, gradient or diameter of a drain, there shall be a manhole. The maximum distance between manholes shall be 30mtr. or change in horizontal alignment/ direction whichever is less. Sewer line and manholes etc. complete in all respect as per detailed scope and specifications as mentioned in NIT & all complete as per approved architectural/structural drawing to make it functional for its intended purpose and as per direction of Engineer-in-charge. NOTE: - The measurement of this item shall be measured from the outlet pipe of first manhole	745.00	metre	4067.14	30,30,019.00
15	Laying of External water supply main/ branch and distribution lines including construction of chambers and fittings/ specials such as tees, bends, collars, unions, valves, etc. with GI/DI pipes of desired Class of different diameters as per approved water distribution system etc. complete in all respect	341.00	metre	2111.41	7,19,991.00

	as per detailed scope and specifications as mentioned in NIT & all complete as per approved architectural/structural drawing to make it functional for its intended purpose and as per direction of Engineer-in-charge.				
16	Construction of Storm water drain with brick work having 600 mm (minimum) depth & 450mm (minimum) width etc. complete in all respect as per detailed scope and specifications as mentioned in NIT & all complete as per approved architectural/structural drawing to make it functional for its intended purpose and as per direction of Engineer-in-charge	1102.00	Metre	10518.13	1,15,90,979.00
17	Construction of Rain water harvesting recharge pit with recharge pit size of 5.00mtr x 5.00mtr x 1.5mtr effective depth having 250mm thick brick wall filled with boulder, gravel & sand of each layer with thickness of 500mm (DSR'23 Item No-23.5,23.6 & 23.7). The recharge pit shall to be connected to tubewell of depth not less than 30mtr. & Dia 150mm. The entire depth of tubewell shall be provided with 150mm dia PVC screen pipe & filled up with gravel of size 5mm to 10mm, 150 mm dia RCC pipe, Brick masonry chamber etc. complete in all respect as per detailed scope and specifications as mentioned in NIT & all complete as per approved architectural/structural drawing to make it functional for its intended purpose and as per direction of Engineer-in-charge.	750.00	Metre	2267.09	17,00,318.00

18	Construction of trenches for laying of all types of underground services, including setting out, excavation in all types of soil, including ordinary soil, hard soil, moorum, etc., to required width, depth, line and level for laying of pipes, ducts, cables and other underground services of any diameter/size, including dressing and trimming of trench bottom and sides, dewatering wherever required, providing necessary shoring/strutting and safety arrangements, providing sand bedding/cushion or other approved bedding material wherever required as per the relevant service specification/drawing, including all labour, tools, plants and incidental works. The item shall also include careful backfilling of trenches after laying/testing of the concerned services, in suitable layers, using approved excavated earth or approved filling material, watering and mechanical/ manual compaction to the specified density, disposal of surplus/unserviceable excavated earth, and restoration of the surface to its original/proposed finished level, including all incidental works complete in all respects as per approved drawings, specifications, relevant CPWD provisions and as directed by the Engineer-in-Charge. The rate shall be inclusive of all excavation, handling, lifting, loading, transportation within the site, backfilling, compaction, dewatering, shoring/strutting, bedding/cushion wherever required and all other incidental works necessary for completion of the trench work. No separate payment shall be made for variation in depth/width of trench	402.00	Metre	7258.58	29,17,949.00
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	or for different diameters/sizes of pipes, ducts or cables. NOTE - Measurement shall be made in running metre based on the actual length of trench constructed and accepted. The length shall be measured along the centre line of the trench/service route, irrespective of the diameter/size or number of pipes, ducts or cables laid within the trench, up to two decimal places in metre.				
19	Designing Supplying, fabricating and erecting 6.00 metre high temporary barricading at site; each panel of size 2.50 m x2.00 m made of 40x40x6 mm angle iron or 50x50x3 mm hollow MS tube posts/horizontal members/bracings covered with 1.63 mm thick MS sheet. The sheet shall be fixed with 30x5 mm MS flat by suitable welding/riveting. The panels shall be made so that gap of 50cm above the ground is available making overall height as 2.5 m. MS channel ISLC 75 @ 5.70 kg/m, 50 cm long shall be provided at the bottom having oval shaped holes of size 50x25 mm at both ends with 50 cm long MS angle 40x40x6 mm bracing. Suitable arrangement shall be made to fix the barricading to avoid from overturning by providing 250 mm long expansion fasteners at both ends. The work shall be executed as per drawing/direction of Engineer-in-Charge which includes writing and painting, arrangement for traffic diversion such as traffic signals during construction at site for day and night, glow lamps, reflective signs, marking, flags, caution tape as directed by the Engineer-in-Charge. The barricading provided shall be retained in position at site continuously including shifting of barricading from one location to another location as many times as required during the execution of	400.00	Metre	5383.57	22,23,428.00

	the entire work till its completion. Rate include its maintenance for damages, painting, all incidentals, labour materials, equipment's and works required to execute the job. The barricading shall not be removed without prior approval of Engineer-in-Charge. (Note: - One-time payment shall be made for providing barricading from start of work till completion of work including shifting. The barricading provided shall remain to be the property of the contractor on completion of the work).				
20	Constructing cast-in situ RCC diaphragm wall by providing and laying machine batched, machine mixed, self-compacting, ready mix reinforced cement concrete, tremie controlled, of M-30 grade using minimum 350 kg cement per cum of concrete including providing and mixing required admixtures in recommended proportions as per IS : 9103, as approved by the Engineer-in-charge, for achieving 150-200 mm slump, for diaphragm wall having thickness as per approved structural design not exceeding 800 mm, in panels of required depth and lengths as per approved drawing, including constructing necessary guide walls of reinforced cement concrete grade M-25 using minimum cement content of 330 kg per cum (considering moderate exposure condition as per IS 456 : 2000) as required and as specified including boring in all kinds of soils and rocks, including working in or under water and / or liquid mud, in foul conditions and pumping or bailing out of water and removing slush, including disposal of earth / rock / slush etc. for all leads and all lifts, including preparing,				

	providing and re-circulating bentonite slurry in the trench as and when required for all depths, including agitating bentonite slurry during trenching etc., providing and fixing stop ends or form tubes, up to the required depth of diaphragm wall including extracting the same after casting, including chipping off the bentonite adulterated concrete or unsound concrete up to the cut off level for obtaining the sound concrete, dressing undulations on the exposed face of diaphragm wall after excavation by chipping/chiseling etc., including filling the depression / cavities with sound concrete etc. complete and as directed by the Engineer-in-charge, including providing recess for bearing plates and fixing insert boxes for inclined rock anchors etc. complete as per the specifications and approved design and as directed by the Engineer-in-charge, but excluding the cost of reinforcement and inserts. (Rates include cost of all inputs of labour, material and T & P, cost of handling, lifting & placing in position the reinforcement cage in the trench, including the additional cost of welding the reinforcement bars etc. involved in the work and all other incidental expenditure for completing the work as directed by the Engineer-in-charge. However, the actual area of the diaphragm wall, correct to two places of decimal, from design bottom level to the design cut off level (including portion anchored in the rock up to the design bottom level) only shall be measured for payment. Excess cement used for design mix				
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Correction... Nil Deletion... Nil Insertion... Nil Overwriting... Nil

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	including the extra cement required for under water concreting is payable separately.)				
20.1	D Wall for Front & Left side of Plot (M-30) RCC work as per above nomenclature.	2217.96	Cum	23552.93	5,17,95,865.00
20.2	D Wall for Front & Left side of Plot (CR Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete up to plinth level.)	277245	kg	120.68	3,34,57,927.00
21	Providing, supplying and installing sheet piling system for vertical earth-retention/protection, including mobilization and deployment of specialized sheet piling agency, setting out, guide arrangements, driving/ installation of sheet piles of size and thickness as specified in the approved drawings to the required depth, interlocking, alignment and maintenance of the sheet piling system during staged excavation and subsequent construction works, including all necessary temporary bracing, struts, walers, working platforms, access arrangements, dewatering, monitoring, instrumentation, safety arrangements and protection of adjoining structures, roads, underground utilities, Metro infrastructure and other properties, complete as per approved drawings, specifications, approved methodology and directions of the Engineer-in-Charge. The rate shall include all labour, materials, plant and machinery, specialized agency charges, installation, maintenance, monitoring, temporary works,	2268	sqm	12000	2,72,16,000.00

	removal of sheet piles wherever required, and all incidental works necessary for safe and complete execution. NOTE - Measurement shall be made in square metres (sqm) based on the actual area of vertical protection provided by the sheet piling system. The depth of sheet pile driven below the required level shall not be considered separately for measurement or payment.				
	SH: - B SUB-TOTAL (CIVIL)				15,65,73,211.00
	DEVELOPMENT & BULK SERVICES (ELECTRICAL WORKS)				
S. No	Description of items	Qty	Unit	Rate	Amount
1	SUB-STATION EQUIPMENT				
1.1	Supplying, installation, testing and commissioning of 11 KV/0.433 KV substation equipment comprising HT panel, transformers, HT cable, bus trunking from transformer to LT panel, LT panels, automatic power factor correction panel, active harmonic filters, TVSS (transient voltage suppression system), SPD (surge protection system), essential panel, earthing, required inter-connections, substation safety equipment's including LT cabling from substation to the buildings fed by the substation. (2 no 1250 KVA running, + 1 no. 1250 KVA Standby).	3,750.00	Per KVA	7881.30	2,84,55,874.00
2	DIESEL GENERATING SETS				
2.1	Supplying, installation, testing and commissioning of silent type DG sets, AMF panel, bus ducting/ cables from DG sets to essential panel, synchronizing panel where required, DG set enclosure room sound insulation/ ventilation/ smoke exhaust as required, earthing of DG set system, control cabling, fuel tank/piping, DG set exhaust piping/ exhaust chimney as per CPCB norms, civil works connected with DG sets including foundation as required. (3x250KVA = 750 KVA)	750.00	Per KVA	11,247.88	84,35,910.00

3	UNINTERRUPTED POWER SUPPLY				
3.1	Supplying, installation, testing and commissioning of online 3 phase UPS system with 30 minutes back up including batteries, interconnecting cables, battery racks etc. (3X20KVA = 60KVA)	60.00	per KVA	20,715.17	12,42,910.20
4	SOLAR PHOTO VOLTAIC POWER GENERATION SYSTEM				
4.1	Supply, Installation, Testing and Commissioning of ongrid Solar Photovoltaic Power Plant conforming to MNRE specifications as amended, consisting of Mono/Poly Crystalline silicon solar cells, net metering facility, necessary protections, earthing, mounted on Aluminium/GI structure of suitable strength with following components complete as required:- a) Solar Photovoltaic Module of capacity 330 Wp or above, manufactured in India, conforming to IS 14286/IEC 61215, IS/IEC 61730-Part-1, IS/IEC 61730-Part-2. Solar Photovoltaic Module conversion efficiency shall be not less than 16.5%. PV modules used in solar power plants/systems must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years. b) Power Conditioning Unit (PCU) of 350-800 V DC input voltage range and 400 V AC, three phase, 4 wire, 50Hz +/- 2.5 Hz, output voltage suitable to generate AC Power with efficiency not less than 97%, total harmonic distortion less than 3% and suitable for ambient temperature from 0 to 50 degree C. The PCU shall adjust the voltage and frequency level to suit the Grid Voltage Frequency. c) Data Monitoring System complete with accessories. d) Fixing of Array junction box & Main junction box with IP 65 protection and termination arrangement for incoming and outgoing cable along with glands, lugs and other accessories etc. as required. e) Lightning and surge voltage protection. f) Connections & Interconnections by supplying & fixing required size XLPE insulated copper conductor 1.1 kV grade	134.00	Per KWP	56,901.04	76,24,739.00

	armoured power and control cables between solar modules, main power cable to grid supply PCU unit along with supplying & fixing of necessary channel/conduit lugs and other accessories etc. as required.				
5	CCTV System				
5.1	Supplying, installation, testing and commissioning of IP based CCTV system for building security comprising of PTZ / fixed camera, cabling, recording, display system and hard ware software support- For external surveillance Note: Rate includes peripheral IP based PTZ camera etc., wiring up to CCTV room and setting up monitoring unit/ units, as required.	7,167.03	Sqm	204.33	14,64,439.00
6	STREET LIGHTING WITH LED				
6.1	Supplying, installation, testing and commissioning of LED street/ compound/ high mast/ pathway/ landscape lighting for the entire campus complete in all respect as per direction of Engineer-in-charge.	9,378.29	Per Sqm	155.68	14,60,012.00
7	Boom Barrier				
7.1	Supplying, installation, testing and commissioning of Electromechanical boom barrier with all accessories up to 6 m length complete including all cabling etc. complete in all respect as per direction of Engineer-in-charge.	3.00	Each	1,21,625.00	3,64,875.00
8	Facade Lighting (For Community center)				
8.1	Supply, Installation, Testing and Commissioning of LED RGB/RGBW floodlighting luminaire for facade lighting with Die-cast aluminium housing, powder-coated finish, of following wattage. Luminaire shall be capable of producing dynamic color changing light for with 16 million colors by DMX/ Ethernet based control. The beam angle of the fitting shall be narrow, medium, wide or asymmetric as per the requirement. Luminaire shall be complete with driver and capable of operating at line voltage without any separate power supply from 100-270 V AC, 50 Hz with power factor >				

	0.9. Fixture shall be suitable to operate at an ambient temperature range of - 10°C to +50°C and shall be IP 65 and IK 06 rated. Lifetime shall be at least L70:50000 burning hours at 50°C. Luminaire shall be conforming to BIS (IS 10322) and shall be complete with all necessary accessories required for proper working of fixture including weather proof connection cables, water proof connectors etc. as required.				
8.1.1	200W	20.00	Each	94933.00	18,98,660.00
8.2	Supply, Installation, Testing and Commissioning of LED RGB/RGBW Linear Wall Washer luminaire for Facade lighting with aluminium extruded housing, of following wattage. Luminaire shall be capable of producing dynamic color changing light with 16 million colors by DMX Ethernet based control. The beam angle of the fitting shall be narrow, medium, wide or asymmetric as per the requirement. Luminaire shall be complete with driver and capable of operating at line voltage without any separate power supply from 100 to 270 V AC, 50 Hz, power factor > 0.9. Fixture shall be suitable to operate at ambient temperature range of - 10°C to +50°C and shall be IP 65 and IK06 rated. Lifetime should be at least L70:50000 burning hours at 50°C. Luminaire shall be conforming to BIS and shall be complete with all necessary accessories required for proper working of fixture including weather proof connection cables, water proof connectors etc. as required.				
8.2.1	80 W	50.00	Each	42,783.00	24,60,023.00
9	STP PLANT				
9.1	Supplying, installation, testing and commissioning of STP/ETP of appropriate technology including civil works (except plant room), tertiary treatment etc. for the building/ campus				
9.1.1	Plant size up to 50KLD	50.00	KLD	72,975.00	36,48,750.00
10	Supplying Installation, Testing and Commissioning of EV charging station As per specifications and in Compliance to relevant IS codes etc.	8.00	Each	84,219.00	6,73,752.00

	Parkbay AC Charger (Mode -3) Power Level 2: Normal Power ~11kW/ 22 kW, 3 phase 415V AC (-40% to +20%), Frequency: 50 Hz +/-5%, output supply: 240 Volt AC, Operational temperature range: -25 to 55 °C (outdoor), -5 to 55 °C (Indoor), RH up to 95%, Charging Device as per IS-17017-1 EV-EVSE ISO-15118 for Smart Charging, Infrastructure Socket as per IS-17017-2-2, Vehicle Connector as per IS-17017-2-2 Vehicle Inlet/ Connector As per EV manufacturer, suitable for 4 wheelers. Indoor use: at least IP42; Outdoor use: at least IP 54. Mechanical Strength: protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262. O/L,S/C protection. Insulation Resistance >1 M Ω. Cable Length: 7.5. RCD having a rated residual operating current not exceeding 30 mA; Separate RCD for multiple outputs. Telecommunication port of the EV supply equipment according to IS 13252 (Part 1): 2010. OCPP (Open charge point protocol) 1.6J upgradable to OCPP 2.0. Device Should follow 17017 series of IS codes in general and the installation of the system shall comply with relevant IS Codes.				
11	Supplying Installation, Testing and Commissioning of EV charging station As per specifications and in Compliance to relevant IS codes etc. Parkbay DC Charger (Mode-3) Power Level 2: Normal Power ~24KW and above, 3 phase 415VAC(-40% to +20%), Frequency:50 Hz +/-5%, output supply: DC 12/24 Volt, Operational temperature range : -25 to 55 0C (outdoor), -5 to 55 0C (Indoor), RH upto 95%, Charging Device as per Device/protocol: IS-17017-23, EV-EVSE Communication as per IS-17017-24, ISO-15118, Infrastructure Socket as per IS-17017-2-2/3, Vehicle Connector as per IS-17017-2-3 Vehicle Inlet/Connector As per EV manufacturer, suitable for 4 wheelers. Indoor use: at least IP42; Outdoor use: at least IP54. Mechanical Strength: protection of the external enclosure against mechanical impact shall be IK08 according to IEC 62262. O/L, S/C protection.	2.00	Each	8,88,982.00	17,77,964.00

	Insulation Resistance > 1 M Ω . Cable Length: 7.5 m. RCD having a rated residual operating current not exceeding 30 mA; Separate RCD for multiple outputs. Telecommunication port of the EV supply equipment according to IS 13252 (Part 1) : 2010. OCPP (Open charge point protocol) 1.6J upgradable to ocpp 2.0. Device Should follow 17017 series of IS codes in general and the installation of the system shall comply with relevant IS Codes.				
12	Supply, Installation, Testing and Commissioning of complete Wi-Fi enabled Video Door Phone (VDP) system comprising one indoor colour touch-screen monitor and one outdoor video door station, complete with power supply, mounting accessories, connectors, cabling, programming and all accessories required for complete operation. Indoor monitor shall have minimum 10 inch colour IPS/TFT capacitive touch display with minimum 1024 x 600 resolution, hands-free two-way audio/video communication, visitor image/video recording, built-in memory with Micro-SD card support up to minimum 128 GB, Wi-Fi/mobile-app based remote viewing and communication, motion detection, intercom/call forwarding, DND mode and provision for electronic/electromagnetic door lock or gate release. System shall support minimum 2 door stations, 2 CCTV camera inputs and extension/slave monitors. Outdoor station shall have minimum 2 MP colour camera with approximately 120 degree wide viewing angle, microphone, speaker, illuminated call push button, night/low-light viewing and weather-resistant enclosure of minimum IP64 or better. Complete system shall include regulated power supply/SMPS suitable for 230 V AC input, required FRLS/FRLSH communication and power cables, conduits/trunking, junction boxes, mounting brackets, interfaces, terminations, configuration, testing, commissioning and demonstration to Engineer-in-Charge, complete in all	56.00	Each	22,600.00	12,65,600.00

	respects as per approved make and manufacturer's specifications.				
13	SiTC of fire extinguisher of following capacity				
13.1	Supply, Installation, Testing and Commissioning of 4.5 kg capacity CO2 type portable fire extinguisher, complete with ISI-marked cylinder, discharge horn/hose, operating valve, safety pin/seal, mounting bracket and all accessories, suitable for electrical and Class B fires, conforming to latest applicable BIS/IS standards, complete as directed by Engineer-in-Charge.	125.00	Each	9670.00	12,08,750.00
13.2	Supply, Installation, Testing and Commissioning of 6 kg capacity ABC dry chemical powder type portable fire extinguisher, stored-pressure type, complete with pressure gauge, discharge hose/nozzle, operating lever, safety pin/seal, mounting bracket and all accessories, suitable for Class A, B, C and electrical fires, conforming to latest applicable BIS/IS standards, complete as directed by Engineer-in-Charge.	125.00	Each	3563.00	4,45,375.00
13.3	Supply, Installation, Testing and Commissioning of 9 kg capacity ABC dry chemical powder type portable fire extinguisher, stored-pressure type, complete with pressure gauge, discharge hose/nozzle, operating lever, safety pin/seal, mounting bracket and all accessories, suitable for Class A, B, C and electrical fires, conforming to latest applicable BIS/IS standards, complete as directed by Engineer-in-Charge.	4.00	Each	5648.00	22,592.00
14	Bore Well Submersible Pump Set (Qty-03 Nos, (2W+1S))				
14.1	Supply, Installation, Testing and Commissioning of suitable capacity 3-phase bore well submersible pump set, suitable for 415 V $\pm 10\%$, 50 Hz AC supply, having discharge capacity approximately 1200 LPM to 140 LPM over a head range of 20-72 m, complete with submersible motor, pump assembly, non-return valve, required power cable, coupling/connection arrangement, supports and all necessary accessories, including installation, testing and	2.00	Each	1,17,257.00	2,34,514.00

	commissioning, complete as directed by Engineer-in-Charge.				
14.2	Supply of suitable capacity 3-phase bore well submersible pump set, suitable for 415 V $\pm 10\%$, 50 Hz AC supply, having discharge capacity approximately 1200 LPM to 140 LPM over a head range of 20-72 m, complete with submersible motor pump set, complete as directed by Engineer-in-Charge.	1.00	Each	75,966.00	75,966.00
15	Open Well Submersible Pump Set (Qty- 03 Nos, (2W+1S))				
15.1	Supply, Installation, Testing and Commissioning of suitable capacity multistage 3-phase open well submersible pump set, suitable for 415 V $\pm 10\%$, 50 Hz AC supply, having discharge capacity approximately 462 LPM to 210 LPM over a head range of 52-76 m, complete with submersible motor, pump assembly, non-return valve, required power cable, coupling/connection arrangement, supports and all necessary accessories, including installation, testing and commissioning, complete as directed by Engineer-in-Charge.	2.00	Each	1,22,274.00	2,44,548.00
15.2	Supply of suitable capacity multistage 3-phase open well submersible pump set, suitable for 415 V $\pm 10\%$, 50 Hz AC supply, having discharge capacity approximately 462 LPM to 210 LPM over a head range of 52-76 m, complete with submersible motor pump set, complete as directed by Engineer-in-Charge.	1.00	Each	80,656.00	80,656.00
16	Dewatering Submersible Pump Set (Qty- 08 Nos)				
16.1	Supply, Installation, Testing and Commissioning of suitable capacity heavy-duty 3-phase dewatering submersible pump set, suitable for 415 V $\pm 10\%$, 50 Hz AC supply, having discharge capacity approximately 960 LPM to 300 LPM over a head range of 8-16 m, suitable for continuous dewatering duty, complete with submersible motor, pump assembly, discharge connection, required power cable, lifting/handling arrangement and all necessary accessories, including installation, testing and commissioning,	8.00	Each	43,481.00	3,47,848.00

	complete as directed by Engineer-in-Charge..				
		Sub- Total (Electrical)			6,24,33,921.00
		Total (Civil + Electrical)			21,90,07,132.00
SH: - C - Boundary Wall					
1	Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 Sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and for all lift, as directed by Engineer-in-charge.				
1.1	All kinds of soil.	894.00	cum	198.61	1,77,557 .00
2	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	894.00	cum	219.31	1,96,063 .00
3	Providing and laying in position cement concrete of M-15 grade excluding the cost of centering and shuttering - All work up to plinth level.	127.00	cum	7622.29	9,68,031.00
4	Centering and shuttering including strutting, propping etc. and removal of form for :				
4.1	Foundations, footings, bases of columns, etc. for mass concrete.	400.00	Sqm	438.80	1,75,520.00
4.2	Walls(any thickness) including attached pilasters, buttresses, plinth and string courses etc	1358.00	Sqm	942.72	12,80,214.00
4.3	Lintels, beams, plinth beams, girders, bressumers and cantilevers	550.00	Sqm	823.99	4,53,195.00
4.4	Columns, Pillars, Piers, Abutments, Posts and Struts	269.00	Sqm	1075.65	2,89,350 .00
5	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete upto plinth level.				
5.1	Thermo-Mechanically Treated bars.	44550.00	kg	120.68	53,76,294.00
6	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level.				
6.1	Thermo-Mechanically Treated bars.	42000.00	kg	120.68	50,68,560.00
7	Providing and laying in position ready mixed or site batched design mix cement concrete for reinforced cement concrete work; using coarse aggregate and fine aggregate derived from natural sources, Portland Pozzolana / Ordinary Portland /Portland Slag cement, admixtures in recommended proportions as per IS: 9103 to accelerate / retard setting of concrete, to				

	improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the engineer-in-charge, for the following grades of concrete.: Note: Extra cement up to 10% of the minimum specified cement content in design mix shall be payable separately. In case the cement content in design mix is more than 110% of the specified minimum cement content, the contractor shall have discretion to either re-design the mix or bear the cost of extra cement.				
7.1	All works upto plinth level				
7.1.1	Concrete of M30 grade with minimum cement content of 350 kg /cum	297.00	Cum	10804.25	32,08,862 .00
7.2	All works above plinth level upto floor V level				
7.2.1	Concrete of M30 grade with minimum cement content of 350 kg /cum	240.00	Cum	11202.20	26,88,528 .00
8	Add for using extra cement in the items of design mix over and above the specified cement content therein.	275.77	Qtl.	820.74	2,26,336.00
9	Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level in all shapes and sizes in :				
9.1	Cement mortar 1:6 (1 cement : 6 coarse sand)	89.00	cum	10189.10	9,06,830 .00
10	Steel work welded in built up sections/ framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.				
10.1	In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works	6934.00	Kg	193.13	13,39,163.00
11	Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners , stainless steel bolts etc., of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.).	324.00	kg	864.28	2,80,027 .00

12	Washed stone grit plaster on exterior walls height upto 10 metre above ground level, in two layers, under layer 12 mm cement plaster 1:4 (1 cement : 4 coarse sand), furrowing the under layer with scratching tool, applying cement slurry on the under layer @ 2 Kg of cement per square metre, top layer 15 mm cement plaster 1:1/2:2 (1 cement: 1/2 coarse sand : 2 stone chipping 10 mm nominal size), in panels with groove all around as per approved pattern, including scrubbing and washing the top layer with brushes and water to expose the stone chippings ,complete as per specification and direction of Engineer-in-charge (payment for providing grooves shall be made separately).	745.00	Sqm	1300.49	9,68,873.00
13	Finishing walls with Acrylic Smooth exterior paint of required shade:				
13.1	New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @ 0.90 litre/10 sqm)	1972.00	Sqm	179.70	3,54,368.00
14	Providing and applying white cement based putty of average thickness 1 mm, of approved brand and manufacturer, over the plastered wall surface to prepare the surface even and smooth complete.	1227.00	Sqm	174.61	2,14,246 .00
15	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade:				
15.1	Two or more coats on new work	242.00	Sqm	174.44	42,214 .00
16	Providing and fixing concertina coil fencing with punched tape concertina coil 600 mm dia 10 metre openable length (total length 90 m), having 50 nos rounds per 6 metre length, upto 3 m height of wall with existing angle iron 'Y' shaped placed 2.4m or 3.00 m apart and with 9 horizontal R.B.T. reinforced barbed wire, stud tied with G.I. staples and G.I. clips to retain horizontal, including necessary bolts or G.I. barbed wire tied to angle iron, all complete as per direction of Engineer-in-charge, with reinforced barbed tape(R.B.T.) / Spring core (2.5 mm thick) wire of high tensile strength of 165 kg/ sq. mm with tape (0.52 mm thick) and weight 43.478 gm/ metre (cost of M.S. angle, C.C. blocks shall be paid separately)Providing and fixing concertina coil fencing with punched tape concertina coil 600 mm dia 10 metre openable length (total length 90 m), having 50 nos rounds per 6 metre length, upto 3 m height of wall with existing angle iron 'Y' shaped placed 2.4m or 3.00 m apart and with 9 horizontal	404.00	metre	420.50	1,69,882.00

	R.B.T. reinforced barbed wire, stud tied with G.I. staples and G.I. clips to retain horizontal, including necessary bolts or G.I. barbed wire tied to angle iron, all complete as per direction of Engineer-in-charge, with reinforced barbed tape(R.B.T.) / Spring core (2.5 mm thick) wire of high tensile strength of 165 kg/ sq. mm with tape (0.52 mm thick) and weight 43.478 gm/ metre (cost of M.S. angle, C.C. blocks shall be paid separately)				
17	Providing and applying Self Curing/Curing Free Ready-Mix Plaster of approved brand and manufacturer, having minimum compressive strength of 6.0 MPa, of specified thickness in one coat on new/old surface of walls/ceiling, using factory produced, pre-blended, premixed, formulated Self Curing/Curing Free ready-mix mortar supplied in dry form requiring only the addition of water at the site before start of application. The material shall have self-curing properties eliminating the need for post-application of water (curing). The ambient temperature at the time of application should not exceed 40°C. It should be applied on hacked/uneven background such as bare brick/CC and Block/RCC surface after preparation of surface etc. complete, including applying Portland cement slurry @ 0.40 kg/sqm, as per manufacturer's specification, finished in smooth line and level at locations and all floors. In case ambient temperature exceeds 40°C, manufacturer's specification may be followed.				
17.1	12 mm thick	1025.00	Sqm	568.65	5,82,866 .00
17.2	15 mm thick	202.00	Sqm	674.39	1,36,227.00
18	Motorized steel gates upto 6.00 m width	2.00	Each	4,86,500.00	9,73,000.00
19	TORAN & CHAITYA GATE				
19.1	Providing, fabricating, supplying, transporting and erecting on site a Glass Reinforced Concrete (GRC) Toran Gate inspired by traditional Indian Toran gateways, depicting Indian cultural motifs, of overall size 7.0 m clear width and 10.0 m height, comprising decorated pylons and curved lintel members with sculptural discs, bas-relief artwork and symbolic Indian motifs, complete with design and detailing including shop drawings, artwork patterns and structural vetting; structural MS frame of hollow sections concealed within GRC and	1	Each	80,15,090.00	80,95,240.00

	finished with primer and PU coating; factory cast GRC panels minimum 50 mm thick, AR-glass fibre reinforced with compressive strength ≥ 40 MPa, water absorption $\leq 14\%$ and integral ribs/back supports; surface finish with breathable mineral/silicate coating in terracotta tone including joint sealants and touch-ups; and installation using stainless steel (SS304) brackets, chemical anchors, mobile crane, scaffolding, labour, QA/QC and protection till handover, all complete as per architectural drawings and direction of Engineer-in-Charge (Including RCC foundation and anchor bolts)				
21	Providing, fabricating, supplying, transporting and erecting on site a Glass Reinforced Concrete (GRC) Chaitya-arch gateway inspired by traditional Buddhist/Indian architecture, of overall size approx. 15.0 m clear width and 13.5 m height (as per drawings), comprising full arch profile with projecting ribs, decorative terminals and moulded cultural motifs, complete with design and detailing including 3D model, shop drawings, artwork patterns and structural vetting; structural MS frame of hollow sections concealed within GRC and finished with primer and PU coating; factory cast GRC panels minimum 30 mm thick, AR-glass fibre reinforced with compressive strength ≥ 40 MPa, water absorption $\leq 14\%$ and integral ribs/back supports; surface finish with breathable mineral/silicate coating in terracotta tone including joint sealants and touch-ups; and installation using stainless steel (SS304) brackets, chemical anchors, mobile crane, scaffolding, labour, QA/QC and protection till handover, all complete as per architectural drawings and direction of Engineer-in-Charge (Including RCC foundation and anchor bolts).	2	Each	1,14,44,660.00	2,28,88,520.00
	Subtotal Sub head (C)				5,69,79,817.00

SH:-D - Furniture & Appliances for Residences/ Community Center/External area					
1	Providing, fabricating, and installing a Telephone Stand cum Book Rack or Wall Unit Cabinet of approximate finished size 2200 mm (W) × 2100 mm (H), or as per actual site conditions, suitably modified to fit within the planned wall space considering window and door locations. The unit shall be constructed from 18 mm thick BWP-grade marine plywood for the main structure, finished externally with 4 mm thick teak wood veneer, and melamine polished to a smooth, semi-matte finish. The back (wall-facing) side shall be fabricated using 6 mm thick marine ply, laminated with 4 mm thick teak wood veneer and similarly melamine polished. The design shall include functional shelves and compartments for organized placement of books, telephone units, music systems, and TV accessories, as per layout. A sturdy and suitably designed base shall be provided to support the structure and ensure durability. All visible plywood edges shall be neatly finished with melamine-polished teakwood beading. All fabrication and installation shall be done using high-quality joinery techniques, waterproof adhesives, stainless steel screws, and finished to the complete satisfaction and direction of the Engineer-in-Charge.	66	Each	1,18,510.00	78,21,660.00
2	Providing, fabricating and installing a wooden storage cabinet for crockery display and storage, of approximate finished size 2200 mm (W) × 1500 mm (H) (with depth and exact size to be finalized at site, depending on space constraints such as windows/doors). The unit shall be constructed from 18 mm thick BWP grade marine plywood,	66	Each	96,090.00	63,41,940.00

	externally finished with 4 mm thick teak wood veneer, melamine polished to a high-quality satin finish. The cabinet shall be provided with shelves and vertical/horizontal partitions suitable for crockery storage. The front face shall be glazed using clear glass panels embedded in teak wood shutter frames, also finished with melamine polish. The shutter frames shall be fitted with necessary hinges, knobs, and magnetic catches of approved make. The back (wall-facing) side shall be finished with 6 mm thick marine plywood, laminated with 4 mm teak wood veneer and melamine polish to match the rest of the unit. A suitable base platform/plinth shall be provided for elevation, made from the same plywood and veneered to maintain continuity in design. All exposed plywood edges shall be finished with solid teak wood beading, neatly rounded and melamine polished. The entire unit shall be manufactured with high-quality joinery, using water-resistant adhesives, SS screws, and all materials and accessories approved and direction of Engineer-in-Charge. The glass shall be minimum 5 mm thick float glass or toughened glass (as specified), securely fixed in the wooden frame.				
3	Providing, fabricating, and installing a custom-designed Shoe Rack Cabinet of approximate finished size 1200 mm (W) × 1200 mm (H), made to suit the site conditions and accommodate constraints like windows, doors, etc. The cabinet shall be constructed using 18 mm thick BWP grade marine	66	each	44,840.00	29,59,440.00

	plywood for the carcass, finished externally with 4 mm thick teak wood veneer, melamine polished to smooth finish. The unit shall include multiple horizontal shelves and vertical partitions for optimized storage of shoes and similar items. The back (wall-facing) side shall be finished with 6 mm thick marine plywood, also laminated with 4 mm thick teak wood veneer and melamine polish. The front face shall include swing shutters made from the same 18 mm ply, teak veneered and polished, with necessary SS butt hinges, magnetic catches, and knobs/handles. A suitable base with ventilation slits or louvered design shall be provided for air circulation and durability. All exposed edges of plywood shall be finished with solid teak wood beading, duly rounded and melamine polished to match the overall aesthetic. The complete work shall be executed in line with best joinery practices, using waterproof adhesives, SS screws, and approved quality materials, including edge banding, hardware, and polish, and to the full satisfaction and direction of the Engineer-in-Charge.				
4	Providing and installing a premium-quality surface-mounted two-door mirrored cabinet of approximate overall dimensions 756 mm (H) x 610 mm (W), fabricated from rust-proof aluminium finished in dark anodized aluminium or equivalent finish. The cabinet shall have a low-profile design with a sleek wall-hugging profile, and mirror-finished doors on the front and mirrored inner surfaces to enhance	212	each	23,120.00	49,01,440.00

	visibility and reflection. The internal configuration shall consist of three fixed shelves – one full-width and two partial shelves – with an innovative staggered layout to accommodate containers of varying heights. Hinges shall be two-way adjustable with 108° opening capability for smooth operation and easy access. The unit shall be supplied complete with factory-assembled body, and all necessary mounting hardware for easy surface-mounted installation without wall cutting. Installation shall be as per manufacturer's guidelines and to the satisfaction and direction of the Engineer-in-Charge.				
5	Providing and fixing a wall-to-wall frameless shower enclosure having a width between 2401 mm to 2800 mm and height up to 2000 mm. The enclosure shall consist of two fixed toughened glass panels and one openable door panel, fabricated from 10 mm thick clear toughened glass conforming to IS:2553 standards. All glass edges shall be polished and beveled to ensure safety and aesthetics. The entire assembly shall be supported and secured using high-quality chrome-plated fittings made from stainless steel (Grade SS304) or anodized aluminum, including top guide rails, wall connectors, floor channels, hinges, stabilizer bars, glass holders, and handles. The door shall operate smoothly with sliding or pivot hinges as approved, and include magnetic seals to ensure water tightness. All joints shall be sealed using approved quality clear silicone sealant or gaskets to make the unit leak-proof. The installation shall	66	each	67,320.00	44,43,120.00

	be done as per approved manufacturer's specifications, ensuring proper alignment, plumb, and slope for water drainage. The item includes all labour, cutting, polishing, drilling, fixing hardware, fasteners, anchoring, and cleaning the site after completion. The work shall be executed in accordance with the drawings and to the satisfaction and direction of the Engineer-in-Charge. The rate shall be inclusive of all components, accessories, labour, and incidental works required to complete the item in all respects.				
6	Manufacturing, providing and placing in position Sofa Set				
	The sofa to be provided and placed is designed with a wooden structure fabricated using high-quality hardwood that has been duly seasoned and treated with an approved anti-termite chemical and methodology. The wooden base frame of the sofa is reinforced with M.S. helical springs and high-quality elastic belts measuring 70-80mm for the seat and 40-60mm for the sides and back. The seat and back are covered with jute and foam, which is then layered with Polyfilla and finished with thick marking cloth before the final upholstery using leatherette material of approved quality and shade. The component specifications are as follows: the seat is made from PU foam with a density of 28-32 kg/cum and a thickness of 100mm. The back is made from PU foam with a density of 28-32 kg/cum and a thickness of 50mm. The inside sides are made from PU foam with a density of 28-32 kg/cum and a				

	thickness of 11-13mm, while the outside sides and the back are made from PU foam with a density of 28-32 kg/cum and a thickness of 13mm. The sofa arms and back top are constructed with PU hard foam with a density of 25-30mm and a density range of 50-80 kg/cum. The seat shell rests on an SS base frame section with a height ranging from 50-180mm. All stainless steel work is done with SS 304/202, utilizing a 5-8mm solid bar for the base of the frame and a 50-25mm pipe. The sofa is infilled with suitable wooden sections to provide proper support to the seat. The height of the sofa base is approximately 110-160mm, and the finished width of the arm, after upholstery work, is approximately 100-140mm. The sofa is fully upholstered with leatherette material of approved quality and shade, duly embossed, and includes all necessary materials and hardware as directed by the Engineer in charge. The construction and upholstery ensure durability and comfort, meeting the specified standards and aesthetic requirements. This product is BIFMA Gold-rated and SCS Global certified for in-house air quality, reflecting its adherence to high industry standards. The chair comes with a 5-year warranty, guaranteeing its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.				
6.1	2 seater sofa overall dimension - 1700mm W x 810-830mm D x 680-700mm H, Seating Height 440mm,	6	each	49,970.00	2,99,820.00

6.2	3 seater sofa overall dimension - 2100mm W x 810-830mm D x 680-700mm H, Seating Height 440mm,	3	each	65,340.00	1,96,020.00
7	Manufacturing, providing and placing in position Center Table				
7.1	Providing and placing a center table measuring 1000mm in width, 1000mm in depth, and 400-420mm in height. The table top shall be constructed using 25mm thick Pre-Laminated MDF Board, while the understructure, which includes an integrated shelf, shall be fabricated from 18mm thick Pre-Laminated MDF Board. All exposed edges of the table components shall be finished with 2mm thick PVC edge banding tape, while unexposed edges shall receive 0.6mm thick PVC edge banding tape. The edge banding process shall be executed using specialized machinery at a temperature of 200 degrees Celsius with hot melt glue to ensure secure and durable edge protection as per satisfaction and direction of Engineer in charge.	9	each	36,510.00	3,28,590.00
8	Manufacturing, providing and placing in position High Back Chair				
8.1	The high back chairs to be provided and placed are designed for ergonomic comfort, featuring an overall height of 1280-1290mm and an overall width of 510mm. The backrest, measuring 580mm in height and 510mm in width, is constructed with a comfortable fiberglass and nylon frame upholstered with mesh and includes adjustable lumbar support for enhanced comfort. These high back chairs also feature an adjustable mesh headrest to accommodate various user preferences.	4	each	18,260.00	73,040.00

	The seat, with dimensions of 508mm width and 508mm depth, is made of medium-density foam and molded plywood, upholstered with high-quality fabric for added comfort. Each chair is equipped with 2D adjustable armrests featuring TPU pads for comfort, with height adjustments ranging from 279.4 to 355.6mm. The back tilt mechanism allows for single-position upright locking, providing a simple and efficient user experience. The chair is supported by a Class IV Samhongs gas lift, offering height adjustments between 460mm and 560mm. An additional feature includes a coat hanger integrated into the chair. The base is made of polished aluminum with a 660mm diameter, fitted with five heavy-duty twin-wheel nylon castors, each with a diameter of 60mm. This product is BIFMA Gold-rated and SCS Global certified for in-house air quality, reflecting its adherence to high industry standards. The chair comes with a 5-year warranty, guaranteeing its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.				
9	Manufacturing, providing and placing in position Mid Back Chair				
9.1	The mid back chairs to be provided and placed are designed for ergonomic comfort, featuring an overall height of 1100mm and an overall width of 510mm. The backrest measures 580mm in height and 510mm in width and is constructed from a fiberglass and nylon frame, upholstered with mesh for breathability and comfort. It	9	each	15,810.00	1,42,290.00

	also includes an adjustable lumbar support feature to enhance the user's seating experience. The seat, with dimensions of 508mm width and 508mm depth, is made from medium-density foam and molded plywood, upholstered with durable fabric to ensure comfort and longevity. Each chair is equipped with 2D adjustable armrests featuring TPU pads for added comfort, with height adjustments ranging from 279.4mm to 355.6mm. The back tilt mechanism allows for a single-position upright locking feature, providing a simple yet effective seating adjustment option. The chair's support system includes a Class IV Samhongs gas lift, allowing for height adjustments between 460mm and 560mm to accommodate various user preferences. The base is constructed from polished aluminum with a 660mm diameter, providing stability and durability. It is fitted with five heavy-duty twin-wheel nylon castors, each with a diameter of 60mm, ensuring smooth and effortless movement across different floor surfaces. This product is BIFMA Gold-rated and SCS Global certified for in-house air quality, reflecting its adherence to high industry standards. The chair comes with a 5-year warranty, guaranteeing its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.				
10	Manufacturing, providing and placing in position machine made factory assembled Reception Table of following dimensions with the				

	following specifications as per direction of Engineer in charge. Reception Counter of size: 2000W x 750D1/550D2 x 1100/740 H mm				
10.1	This comprehensive office furniture set combines functionality with modern design, emphasizing environmental friendliness and high-quality materials. The attention to detail in wire management and storage options makes it suitable for professional office environments. The desk should feature a top and legs constructed from 36mm thick E1 grade laminate, finished with 2mm thick PVC edge banding and a melamine finish. The grains of the table top must be unidirectional for a consistent appearance. The front hanging panel should be made of 18mm thick decorative E1 grade board. The desk must adhere to specifications provided and images approved by the project architect, consultant, and engineer in charge. The drawer unit should include a 3-drawer melamine pedestal (Box + Box + File) with overall internal and external dimensions of 420 mm (W) x 450 mm (D) x 600 mm (H). The drawer body must be made of E1 grade laminate. The exposed edge of the worktop should be secured with 2mm thick PVC edge banding tape in an approved color. E-1 Grade laminate used to ensure no urea formaldehyde emission, with phenol base formaldehyde emission not exceeding 8mg/100g oven-dry board (perforated method), complying with EN 120-1892 standards. The product is BIFMA Gold-rated and SCS Global certified for in-house air	2	each	1,18,430.00	2,36,860.00

	quality, ensuring compliance with industry standards. It comes with a 5-year warranty, reflecting its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge..				
11	Manufacturing, providing and placing in position machine made factory assembled Reception Table of following dimensions with the following specifications as per direction of Engineer in charge. Reception Counter of size: 1500W x 750D1/550D2 x 1100/740Hmm				
11.1	This comprehensive office furniture set combines functionality with modern design, emphasizing environmental friendliness and high-quality materials. The attention to detail in wire management and storage options makes it suitable for professional office environments. The desk should feature a top and legs constructed from 36mm thick E1 grade laminate, finished with 2mm thick PVC edge banding and a melamine finish. The grains of the table top must be unidirectional for a consistent appearance. The front hanging panel should be made of 18mm thick decorative E1 grade board. The desk must adhere to specifications provided and images approved by the project architect, consultant, and engineer in charge. The drawer unit should include a 3-drawer melamine pedestal (Box + Box + File) with overall internal and external dimensions of 420 mm (W) x 450 mm (D) x 600 mm (H). The drawer body must be made of E1 grade laminate. The exposed edge of the worktop should be secured with 2mm thick PVC edge banding tape in	1	each	82,250.00	82,250.00

	an approved color. E-1 Grade laminate used to ensure no urea formaldehyde emission, with phenol base formaldehyde emission not exceeding 8mg/100g oven-dry board (perforated method), complying with EN 120-1892 standards. The product is BIFMA Gold-rated and SCS Global certified for in-house air quality, ensuring compliance with industry standards. It comes with a 5-year warranty, reflecting its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.				
12	Manufacturing, providing and placing in position machine made factory assembled Linear Table of following dimensions with the following specifications as per direction of Engineer in charge. Table :- 1200mm X 600mm X 740mm H				
12.1	Providing & Placing of Table with Melamine Mobile Pedestal with following details and specifications: Table Top and legs are made of 25mm E-1 grade particle board finished with 2mm PVC edge banding. E1 grade laminate with zero urea formaldehyde emissions ($\leq 8\text{mg}/100\text{ g}$ oven dry board-perforated method) for better in-house air quality. This should comply with (EN 120-1992). The exposed edge of worktop shall be secured with 2mm thick PVC edge banding. The 18mm Thick Modesty panel is made of E-1 grade particle board finished with 2mm PVC edge banding. E1 grade laminate with zero urea formaldehyde emissions ($\leq 8\text{mg}/100\text{ g}$ oven dry board-perforated method) for better in-house air quality. This should comply with (EN 120-	2	each	35,070.00	70,140.00

	1992). The exposed edge of worktop shall be secured with 2mm thick PVC edge banding. Wire management: Completely concealed wiremanagement with Aluminium anodized flipper with soft closure, wiring tray & Housing made from MS sheet 1.2 mm., flange structure epoxy powder 70-80 micron coated spray color, baked at temperature 200c with vertical wire uptake from floor via Fexibale cable riser/ Metal Powder pole Drawer Unit : 3 drawer melamine finish pedestal of overall dimensions internal and external dimensions 390-420 mm (W) x 430-460 mm (D) x 600-620 mm (H). Drawer should be made of 18mm thick E1 Grade particle board with matching edge banding. Each pedestal should have 5 Nos castor fitted. One castor to be fitted to lower most drawer to provide extra stability. E1 Grade laminate to be used which provide no urea formaldehyde emission and formaldehyde should be phenol base with emission of not more than ($\leq 8\text{mg}/100\text{ g oven dry board-perforated method}$) for better in-house quality. This should comply with (EN 120-1892).Product should be BIFMA gold rated SCSglobal certified for inhouse air quality and with 05 years warranty.				
13	Manufacturing, providing and placing in position machine made factory assembled Linear Table of following dimensions with the following specifications as per direction of Engineer in charge Table :- 1500mm X 600mm X 740mm H				

13.1	Providing & Placing of Table with Melamine Mobile Pedestal with following details and specifications : Table Top and legs are made of 25mm E-1 grade particle board finished with 2mm PVC edge banding. E1 grade laminate with zero urea formaldehyde emissions ($\leq 8\text{mg}/100\text{ g}$ oven dry board-perforated method) for better in-house air quality. This should comply with (EN 120-1992). The exposed edge of worktop shall be secured with 2mm thick PVC edge banding. The 18mm Thick Modesty panel is made of E-1 grade particle board finished with 2mm PVC edge banding. E1 grade laminate with zero urea formaldehyde emissions ($\leq 8\text{mg}/100\text{ g}$ oven dry board-perforated method) for better in-house air quality. This should comply with (EN 120-1992). The exposed edge of worktop shall be secured with 2mm thick PVC edge banding. Wire management: Completely concealed wiremanagement with Aluminium anodized flipper with soft closure, wiring tray & Housing made from MS sheet 1.2 mm., flange structure epoxy powder 70-80 micron coated spray color, baked at temperature 200c with vertical wire uptake from floor via Flexibale cable riser/ Metal Powder pole Drawer Unit : 3 drawer melamine finish pedestal of overall dimensions internal and external dimensions 390-420 mm (W) x 430-460 mm (D) x 600-620 mm (H). Drawer should be made of 18mm thick E1 Grade particle board with matching edge banding. Each pedestal should have 5 Nos castor fitted. One castor to be fitted to lower most drawer to provide extra stability. E1 Grade laminate to be used which provide no urea formaldehyde	1	each	44,010.00	44,010.00
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	emission and formaldehyde should be phenol base with emission of not more than ($\leq 8\text{mg}/100\text{ g}$ oven dry board-perforated method) for better in-house quality. This should comply with (EN 120-1892). Product should be BIFMA gold rated SCSglobal certified for inhouse air quality and with 05 years warranty.				
14	Manufacturing, providing and placing in position Waiting Sofa of following dimensions with the following specifications as per direction of Engineer in charge 3 seater sofa overall dimension - 1860mm W x 800-820mm D x 690-710mm H/ SH430mm				
14.1	The sofa to be provided and placed is designed with a wooden structure fabricated using high-quality hardwood that has been duly seasoned and treated with an approved anti-termite chemical and methodology. The wooden base frame of the sofa is reinforced with M.S. helical springs and high-quality elastic belts measuring 70-80mm for the seat and 40-60mm for the sides and back. The seat and back are covered with jute and foam, which is then layered with Polyfilla and finished with thick marking cloth before the final upholstery using leatherette material of approved quality and shade. The component specifications are as follows: the seat is made from PU foam with a density of 28-32 kg/cum and a thickness of 100mm. The back is made from PU foam with a density of 28-32 kg/cum and a thickness of 50mm. The inside sides are made from PU foam with a density of 28-32 kg/cum and a thickness of 11-13mm, while the	10	each	59,090.00	5,90,900.00

	outside sides and the back are made from PU foam with a density of 28-32 kg/cum and a thickness of 13mm. The sofa arms and back top are constructed with PU hard foam with a density of 25-30mm and a density range of 50-80 kg/cum. The seat shell rests on an SS base frame section with a height ranging from 50-180mm. All stainless steel work is done with SS 304/202, utilizing a 5-8mm solid bar for the base of the frame and a 50-25mm pipe. The sofa is infilled with suitable wooden sections to provide proper support to the seat. The height of the sofa base is approximately 110-160mm, and the finished width of the arm, after upholstery work, is approximately 100-140mm. The sofa is fully upholstered with leatherette material of approved quality and shade, duly embossed, and includes all necessary materials and hardware as directed by the Engineer in charge. The construction and upholstery ensure durability and comfort, meeting the specified standards and aesthetic requirements. This product is BIFMA Gold-rated and SCS Global certified for in-house air quality, reflecting its adherence to high industry standards. The chair comes with a 5-year warranty, guaranteeing its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.				
15	Manufacturing, providing and placing in position Center & Corner Table of following specifications as per direction of Engineer in charge.				

	Centre table Size - 1200mm W x 600mm D x 365mm				
15.1	The center and corner tables will be constructed using 25 mm thick E-1 grade prelaminated particle board, which is environmentally friendly and finished with a durable melamine surface. To enhance durability and aesthetics, the edges will be covered with 2 mm thick PVC edge banding. The understructure of the tables will feature a polished stainless steel chrome base, providing both stability and an elegant appearance. The E-1 grade laminate will ensure zero urea formaldehyde emissions (≤ 8 mg/100 g oven-dry board via the perforated method), promoting a healthier indoor environment and complying with EN 120-1992 standards. This combination of materials and finishes guarantees that the tables are not only functional but also contribute positively to in-house air quality.	8	each	13,930.00	1,11,440.00
16	Manufacturing, providing and placing in position machine made factory assembled Waiting Chair of following dimensions with the following specifications.				
16.1	The seat and back of the waiting chairs (3 Seater) are constructed from 3 mm MS perforated sheet inserts for durability and comfort. The seat dimensions are 52.0 cm in width and 46.5 cm in depth, while the back measures 52.0 cm in width and 51.5 cm in height. The crossbeam is made from black powder-coated MS ERW square tubing, with dimensions of 6.0 cm x 6.0 cm and a thickness of 0.018 cm $\pm$ 0.016	3	each	25,460.00	76,380.00

	cm. The tubing is fitted with polypropylene end caps for a neat finish. The legs and armrests are manufactured from high-pressure aluminum die-cast and are powder-coated for additional durability and aesthetics. The legs are equipped with soft grip PVC level-adjusting shoes, ensuring stability on uneven surfaces. This product is BIFMA Gold-rated and SCS Global certified for in-house air quality, reflecting its adherence to high industry standards. The chair comes with a 5-year warranty, guaranteeing its quality and durability. All specifications are completed as per the manufacturer's guidelines, approved samples, and the direction of the Engineer-in-Charge.				
17	Manufacturing, providing and placing in position machine made factory assembled Examination Couch of following dimensions with the following specifications as per direction of Engineer in charge.				
17.1	Overall Sizes Diagonal Leg Dia 538 mm H470 min-655maxSS 202 made sheet with spin section of thickness 1mm & should be non corrosive. It should have a diameter of 305mm, seat base is made of MS ring and rectangular tube. EN8 Screw having dia of 22 mm should be used for height adjustment of the seat base. The hub should be made of MS ERW tube having dia of 38mm and thickness 2 mm. The Hub should be welded with the legs and it should accommodate and cover the lead screw mechanism. The under structure should consist of 4 legs made up of MS ERW tube of diameter 25.4 mm and 1.6mm thick.	1	each	4,320.00	4,320.00

	The press formed pipe leg should give a round & clean look. All the legs should be provided with 4 nos of Nylon-6 bush. All metal components should be pre treated with zinc phosphating in 9 tank process and then powder coated with anti microbial epoxy polyester powder coating to fulfil the requirements for bacterial protection against at least 2 commonly found bacteria in Hospital environment [Gram positive and Gram Negative]. Safe working load must be 135kg				
18	Manufacturing, providing and placing in position machine made factory assembled Examination Couch bed of following dimensions with the following specifications as per direction of Engineer in charge.				
18.1	Size and Construction: Examination couch is a fixed upholstered top piece, divided into two sections. Its framework is constructed using rectangular and square MS CRC (Cold Rolled Close Annealed) tubes, which are mounted on PVC stumps or shoes for stability. The design features a knockdown construction for easy assembly and disassembly. For user comfort and versatility, the backrest is adjustable via a hand lever mechanism. The entire piece has been pre-treated and finished with an epoxy powder coating for durability and aesthetics. The overall approximate dimensions of the item are 1800mm in length, 600mm in width, and 800mm in height. Certification and Warranty: The locker unit will be BIFMA Gold rated and SCS Global certified for indoor air quality, ensuring compliance with high standards for safety and	1	each	18,740.00	18,740.00

	environmental responsibility. It will come with a 5-year warranty to guarantee its quality and longevity. These specifications ensure that the locker unit is highly durable, secure, and functional, suitable for a range of professional and personal storage needs.				
19	Manufacturing, providing and placing in position machine made factory assembled Single Bed of following dimensions with the following specifications as per direction of Engineer in charge. Single bed: 2020L x 960Wx750/600Hmm				
19.1	Providing and placing of Beds of the following specifications. Material : Head/Tail board/Side Rail is made of 18 mm thick E-1 grade particle board finished with 2mm PVC edge banding. E1 grade laminate with zero urea formaldehyde emissions (<or= 8mg/100 g oven dry board-perforated method) for better in-house air quality. This should comply with (EN 120-1992). The exposed edge of worktop shall be secured with 2mm thick PVC edge banding. Mattress panel is made out of 12m MDF Board. Metal Understructure : 'C' type frame & Cross members are made up of in 25X25X1.2mm THK MS Square pipe with Epoxy powder coated spray paint, baked at temperature 200 C° coated of 70-80 micron thickness. Foot pad : Made up of injection moulded in Nylon, Diameter 15mm and 7mm thk on the Head and Tail Board and 25 X 25 X 3thk Injection moulded nylon bush on Square pipe.	4	each	21,380.00	85,520.00

20	Manufacturing, providing and placing in position machine made factory assembled Lockers of following dimensions with the following specifications as per direction of Engineer in charge.				
20.1	The supply and installation of a 4-door locker unit equipped with cam locks, designed to meet the following detailed specifications. The locker unit will have overall dimensions of 380 mm in width, 450 mm in depth, and a height ranging from 1800 mm to 1850 mm, making it ideal for use in office or workspace environments, and providing ample storage space for personal belongings. Constructed from 100% virgin epoxy powder-coated Cold Reduced Carbon Steel Sheets (CRCA), the locker unit will conform to IS: 513 CR2 (Cold Reduced Carbon Steel Sheets & Strips, Part 1, 2016). The steel sheets will be procured from TATA Steel, and test certificates will be available upon request. The materials will undergo a rigorous seven-stage nano-technology-based pre-treatment process before powder coating, ensuring high corrosion resistance and durability. The locker will feature a superior finish achieved through a fully automatic powder coating plant utilizing world-leading GEMA™ spray booth technology and AkzoNobel™ powder, resulting in a smooth, uniform, and high-quality coating. The unit will employ modern rigid knock-down construction made from 0.8 mm thick CRCA sheet, providing extra strength and durability, with each compartment shelf supporting a uniformly	4	each	25,460.00	1,01,840.00

	distributed load capacity of up to 35 kg. Designed for ease of transportation, the locker unit will be a 100% knock-down product, facilitating safe and efficient shipping. Assembly will be completed on-site, simplifying logistics and installation processes. The locker features a simple yet effective design, offering ample capacity for storing clothes, shoes, sports gear, mobile phones, bags, office supplies, and cleaning materials. Each door will be equipped with a lift-up handle and recessed hasp, paired with cam locks for secure storage. Label holders will be included for easy identification, especially useful when multiple lockers are stacked together. To maintain a fresh environment and prevent bad odors, each shutter will feature louvers that allow free airflow. The locker unit will be BIFMA Gold rated and SCS Global certified for indoor air quality, ensuring compliance with high standards of safety and environmental responsibility. Additionally, it will come with a five-year warranty to guarantee quality and longevity. These specifications ensure that the locker unit is highly durable, secure, and functional, making it suitable for a range of professional and personal storage needs.				
21	Providing and placing in position stainless steel frame chairs for use in Ladies and Gents Maintenance Staff areas. The chair shall be of sturdy design, with stainless steel tubular frame construction, and fitted with cushioned seat and backrest made of high-density foam upholstered in premium-grade synthetic leather (Candy Black finish). The chair shall	10	each	3,360.00	33,600.00

	have fixed armrests with padded tops and be suitable for prolonged usage in staff rooms or maintenance lounges. The back shall be of “wing-back” design for ergonomic support, and the seat and backrest shall be upholstered in stitched square patterns to enhance comfort and aesthetics. The chair should be non-revolving, maintenance-free, with plastic foot caps to avoid floor scratches. Product dimensions approximately 83.8 cm (H) × 55.9 cm (W) × 83.8 cm (D). All items to be delivered, assembled and placed at the designated locations as per site requirements and to the satisfaction and direction of Engineer-in-Charge.				
22	Providing and fixing Triple Wave Playground Slide fabricated from high-strength and UV-resistant Fibre Reinforced Plastic (FRP), suitable for outdoor use in schools, parks, and recreational areas. The slide shall be of triple wave design for increased capacity and enhanced safety, having approximate dimensions of 371 cm (Length) × 63 cm (Width) × 244 cm (Height). The unit shall be mounted on a powder-coated MS steel support frame of adequate structural strength to withstand outdoor weather and play loads, complete with anti-slip climbing stairs, handrails, and a smooth contoured sliding surface to ensure child safety. The entire unit shall be installed on a prepared site with proper anchoring and alignment as per manufacturer’s installation guidelines, including necessary fixtures and support components and as per direction of Engineer-in-Charge.	1	each	1,05,060.00	1,05,060.00

23	Providing, supplying, and fixing of high-quality roller slide for children's play area, fabricated from powder-coated MS frame with smooth-finish multi-coloured roller-type sliding surface made from heavy-duty plastic or MS pipes. The structure shall include a sturdy staircase with handrails for access, support columns with proper bracing, and a reinforced base suitable for safe outdoor installation on natural ground or sandpit. The slide shall be designed for safety and durability, with rounded edges, child-safe finishes, and weather-resistant coating. Installation shall include all necessary civil works, anchoring, alignment, and fixing in position complete in all respects as per the manufacturer's specification and direction of Engineer-in-Charge.	1	each	57,650.00	57,650.00
24	Providing and fixing of Round Metal Sunset Climber Junior, suitable for children aged 5 to 10 years, fabricated from heavy-duty mild steel tubular sections. The frame shall be constructed in a geodesic dome shape with all joints securely welded and surfaces ground smooth to ensure child safety. The structure shall be duly treated with anti-corrosive red oxide primer and finished with two coats of weather-resistant synthetic enamel paint in multiple child-friendly colours. The equipment shall be installed over a compacted base with appropriate anchoring into the ground using concrete footings as per manufacturer's specifications to ensure stability and safety. Complete in all respects, including fabrication, finishing, transport, and installation at site and as per direction of Engineer-in-Charge.	1	each	38,440.00	38,440.00

25	Providing and fixing of double-seated see saw unit for playground installation, comprising two sets of green and yellow see saws mounted on a common mild steel frame. Each unit accommodates four children (two on each side), suitable for age group 5-12 years. The structure is fabricated using heavy-duty mild steel pipes and flats with smooth edges for safety, powder coated with weather-resistant green and yellow synthetic enamel paint. The seats are ergonomically designed using moulded plastic or FRP for comfort and durability, with safety handles and footrests provided on each side. The see saw is firmly anchored into the ground using base plates and grouted foundation bolts to ensure stability during use. The entire unit shall be installed at site complete in all respects including all accessories, labour, transportation, and necessary anchoring arrangements and as per direction of Engineer-in-Charge.	1	each	26,980.00	26,980.00
26	Providing and fixing of Loop Rung for children's outdoor play area, fabricated using high-grade mild steel structure with powder-coated finish for long-term durability and resistance to weather conditions. The equipment shall comprise of a horizontal bar supported by vertical posts with a series of looped hand grips hanging from the bar to aid children in swinging from one loop to the next. The structure shall include ladder steps on one side for safe access and cater to the age group of approximately 4 to 14 years. The overall installation should have a clear and safe ground area of approx. 3.6 m × 0.6 m and a height of approximately 2.5 m. All edges shall be rounded for safety and the unit shall be securely	1	each	49,840.00	49,840.00

	anchored in a concrete base as per manufacturer's guidelines. Installation shall be complete in all respects including civil works, grouting, and finishing, to the satisfaction and direction of the Engineer-in-Charge.				
27	Providing and fixing of Outdoor Multiplay System made of high-quality FRP (Fibre Reinforced Plastic) and suitable for installation in public parks, schools, or residential complexes. The system shall include two slides (curved and straight), an elevated playhouse with canopy, climbing features, and safe access steps, all fixed over a firm base as per manufacturer's design. The equipment is designed for children aged 3 to 15 years, supporting 8 to 12 users at a time, and is suitable for a maximum capacity of 10-15 children simultaneously. The entire system shall be installed on a clear area of approximately 20 ft × 20 ft × 12 ft (L × W × H) and shall be supplied complete in all respects, including all accessories, fixtures, base preparation, anchoring, and painting works, as required. Installation must ensure safety and durability, conforming to standard playground equipment norms. The unit shall be delivered and installed as per the site condition and to the satisfaction and direction of the Engineer-in-Charge.	1	each	1,79,370.00	1,79,370.00

28	Providing and fixing of outdoor parallel bars suitable for use in playgrounds, fabricated using high-strength mild steel with a durable anti-rust coating and powder-painted in vibrant color finish. The setup includes two parallel steel rods supported on vertical posts, dimensionally measuring approximately 6.56 ft x 2.28 ft. The structure shall be robust, weather-resistant, and ergonomically designed for children's physical activities and bodyweight training. The equipment shall be installed on a properly levelled and compacted surface as per manufacturer's specifications, complete in all respects including all labour, materials, tools, and installation accessories as required to the satisfaction and direction of Engineer-in-Charge.	1	each	24,280.00	24,280.00
29	Providing and installing a factory-finished, heavy-duty Round Merry-Go-Round, suitable for outdoor playground applications for children aged 4 to 15 years. The equipment shall consist of a circular platform made of durable FRP (Fibre Reinforced Plastic) with an anti-skid surface finish for enhanced safety. The platform shall be supported on a robust central rotating mechanism allowing smooth 360-degree rotation, and fitted with six or more powder-coated mild steel tubular handrails for safe grip and balanced standing during operation. The total diameter of the structure shall not be less than 1500 mm, and the system shall have a total seating/standing capacity of four children at a time. The unit shall be weather-resistant, UV-stable, rust-proof, and finished in red colour (or as approved), capable of withstanding outdoor environmental conditions	1	each	38,440.00	38,440.00

	without degradation in performance. The system shall include all anchoring, bolting, and safety components to ensure stable ground installation and child safety during rotational use. All work shall be executed as per manufacturer's specifications, including necessary labour, tools, and fittings, and completed in all respects to the satisfaction and direction of the Engineer-in-Charge.				
30	Providing and fixing of Rainbow Playground Climber of approved make, design, and color suitable for outdoor playground application. The equipment shall be fabricated from high-quality mild steel with smooth and child-safe manual climbing features. The structure shall be powder-coated or painted with weather-resistant, non-toxic coating in bright color finish (typically red) to enhance visibility and durability in outdoor conditions. The equipment is specifically designed for children aged 4-12 years, promoting physical activity, motor coordination, and upper body strength through manual climbing. The climber shall be arch-shaped, securely embedded into the ground with proper RCC concrete footings as per manufacturer's instructions, ensuring safety and structural stability. The unit shall be installed complete in all respects, including all necessary fasteners, anchor bolts, labor, tools, foundation works, transportation, loading, unloading, and handling at site as per direction of Engineer in charge. Delivery and installation shall be completed within 10 days from the	1	each	28,830.00	28,830.00

	date of order. Item quoted is exclusive of all taxes, duties, or contractor overheads.				
31	Supplying and placing in position cast iron framed 3-seater outdoor garden bench of approved design and make, having decorative armrest and legs made from high-strength cast iron duly powder coated in black finish for corrosion resistance. The seat and backrest to be fabricated from Fibre Reinforced Plastic (FRP) slats with a natural wooden texture finish, ensuring high durability, termite resistance, and suitability for long-term outdoor exposure. Bench size shall accommodate 3 adults comfortably with standard height and ergonomic back support. The item includes all required nuts, bolts, anchoring accessories and anti-rust coatings. The bench shall be placed at designated locations as per instructions and direction of Engineer-in-Charge and fixed properly on hard concrete/paved flooring using appropriate anchoring system. Rate includes cost of bench, transportation, loading, unloading, and placing complete in all respects.	6	each	14,110.00	84,660.00
32	Supplying and placing a high-quality table tennis setup consisting of one professional-grade table tennis table of approximate dimensions 2740 mm x 1525 mm with a 25 mm thick blue playing surface. The table shall be of STAG GLOBAL Deluxe 1000 DX model or equivalent as approved, featuring a durable and stable metal underframe with powder-coated finish and lockable caster wheels for	1	each	59,280.00	59,280.00

	easy mobility and safety during play. The equipment shall be delivered complete with 2 table tennis rackets, 6 balls, 1 clamp-type net with support posts, and 1 protective table cover. The table shall be foldable for compact storage and allow single-player playback configuration. The scope includes transportation, placement at designated indoor location, and necessary unpacking and basic alignment at site as per direction of Engineer in charge.				
33	Supplying, Installation, Testing and Commissioning (SITC) of Aquaguard Blaze Insta RO + UV + TA Hot and Ambient Water Purifier with Active Copper Technology, 5.6 Litres (Black): Providing and fixing of wall-mounted/standing Aquaguard Blaze Insta water purifier of 5.6 litres capacity, with dual dispensing system for hot and ambient water. The unit shall include advanced multi-stage purification comprising Reverse Osmosis (RO), Ultra Violet (UV), and Taste Adjuster (TA) purification stages. The purifier shall have a filtration capacity of minimum 15 litres/hour and storage capacity of 5.6 litres for ambient and 0.6 litres for hot water. The system shall be integrated with Active Copper Zinc Booster Cartridge, Copper Guard and UV e-Boiling technology, capable of ensuring healthy, mineral-enriched drinking water output. The appliance shall be provided with digital touch display, child-lock feature on hot water dispensing, and suitable power connections. The quoted item shall be inclusive of all accessories, necessary plumbing, wiring, clamps, fittings, and installation charges, complete in all	66.00	each	27,130.00	17,90,580.00

	respects as per manufacturer's specifications and to the satisfaction and direction of Engineer-in-Charge.				
34	Supplying, installing, testing and commissioning of 5-litre capacity electric instant water heater of reputed make such as Racold PRONTO NEO or equivalent, suitable for vertical wall-mounted installation in bathrooms or pantries. The geyser shall be constructed with a high-grade rust-proof ABS outer body and incorporate a fire-retardant cable, high-pressure resistance design suitable for high-rise buildings, and 3 levels of safety including thermostat, cut-out, and safety valve. The unit shall include anti-bacterial backflow protection system, and faster heating element for instant hot water delivery. The heater shall be BEE compliant and capable of operating on 230V, 50Hz AC supply, complete with all accessories, connecting pipes, fixing brackets, suitable electrical connections, and internal wiring termination as required. The item shall be installed at the specified location and made fully operational to the satisfaction and direction of the Engineer-in-Charge. The heater shall carry a minimum 5-year warranty on tank and 2-year warranty on the heating element, as per manufacturer's standard.	66.00	each	4,940.00	3,26,040.00

35	Providing and placing of Heavy Duty 3-Tier Foldable Cloth Drying Stand, brand – DryNest by HAVAI, suitable for both indoor and outdoor use. The unit shall be made from premium-grade anti-rust stainless steel, ensuring long-lasting durability and high resistance to corrosion. The drying rack shall feature 24 robust hanger rods designed to hold large loads of wet clothes without bending, including heavy garments, bedsheets, towels, and curtains. The design shall incorporate 3 jumbo-sized drying racks with ample spacing, foldable side wings for flexible drying of longer clothes, and smooth 360° caster wheels for easy mobility even when the unit is fully loaded. The stand shall be fully portable, collapsible, and space-saving, enabling easy storage when not in use. Minimum dimensions when unfolded shall accommodate a large family's laundry with a stable and balanced structure, suitable for balconies, laundry rooms, or open terraces as per direction of Engineer in charge.	66.00	each	4,660.00	3,07,560.00
36	Supplying, assembling, and placing in position a slotted angle storage rack made of prime quality CRC (Cold Rolled Close Annealed) sheet construction, comprising six (6) storage shelves and four vertical angle uprights. Each shelf shall be capable of supporting up to 100 kg of uniformly distributed load. The complete rack shall be finished with high-grade grey-colored oil paint for corrosion resistance and durability. The unit shall be modular and multipurpose, suitable for use in industrial stores, warehouses, kitchens, book storage, bath items, and general-purpose	8	each	19,260.00	1,54,080.00

	shelving in residential or commercial environments. The standard unit shall measure approximately 78 inches (H) × 47 inches (W) × 24 inches (D), and constructed with 18 gauge CRC sheet shelves and 14 gauge slotted angle uprights. The unit shall be delivered in two separate packets – one containing all angles/uprights and the other containing the shelves – and shall be supplied complete with nuts, bolts, and necessary fittings for onsite installation. The entire assembly shall be quick to install, sturdy, and designed for robust and long-term indoor use as per direction of Engineer in charge.				
37	Supplying and placing in position foldable 5-step premium household-grade ladder, fabricated from high-strength steel pipes with 7-layer processed powder-coated finish (Blue & Black), anti-rust and corrosion resistant, suitable for indoor and outdoor maintenance access. The ladder shall consist of 5 anti-skid PPCP steps with a secure top platform, step size approx. 30 cm x 20 cm, spaced at 23 cm, and shall withstand load capacity up to 150 kg. The ladder shall have extra thick D-section steel pipe frame of minimum 0.6 mm thickness and outer diameter 38.1 mm, equipped with anti-slip caps for stability and scratch-proofing on floors. Foldable and space-saving design with approximate closed dimensions: 6 cm (L) x 53 cm (W) x 182 cm (H) and open dimensions: 106 cm (L) x 53 cm (W) x 170 cm (H). Top platform height from ground: 117 cm. Product shall be backed by minimum 5-year manufacturer warranty and delivered	2	each	3,640.00	7,280.00

	fully assembled as per direction of Engineer in charge.				
38	Supply, installation, testing, and commissioning of commercial-grade RO + UV Water Purification System of model PRIMA 100 B of Eureka Forbes or approved equivalent, with 7-stage purification process comprising particulate filter, pre-carbon filter, antiscalant filter, sediment filter, RO membrane (with >90% TDS rejection), post-carbon filter, and UV disinfection system. The system shall be suitable for input TDS up to 2000 ppm, delivering a purification capacity of 100 LPH with a purified water recovery rate of 50%, and effective bacterial and viral removal through high-efficiency 8W UV lamp. The purification system shall operate on 24V / 48V DC power supply, with an input voltage of 170–230V AC / 50 Hz, and a maximum power rating of 230 W $\pm$10%. The frame shall be constructed from durable CRCA steel, and the unit shall be compact with dimensions of 630 mm (W) $\times$ 340 mm (D) $\times$ 650 mm (H) and net weight of 33 kg. The RO system shall incorporate a self-cleaning mechanism, high-efficiency thin-film composite membrane (0.0001 micron) for better water taste and microbiological safety, and shall be suitable for commercial applications such as hospitals, offices, educational institutes, manufacturing plants, and hospitality segments. The system shall include complete accessories, plumbing, inlet and outlet connections, and shall be installed to	1	each	80,280.00	80,280.00

	the satisfaction and direction of the Engineer-in-Charge.				
	SUB Total (D)				3,23,22,100.00
	SH: - E - Badminton court with Detachable Poles				
1	Providing and laying Aircush wooden flooring system comprising the following components, complete in all respects, including preparation of substrate, supply and installation of materials, fixing, levelling, finishing, polishing and all necessary accessories, as per manufacturer/particular specifications and directions of Engineer-in-Charge: Rubber Pad: 18 mm thick, pure EPDM rubber pads, of approved quality and density, placed below the supporting runners at suitable spacing as required for levelling, vibration isolation and protection of the substrate. SPF Runners: 45 mm × 70 mm nominal size, European Spruce-Pine-Fir (SPF) timber runners, properly seasoned, straight, sound and free from defects, treated as required, accurately spaced, levelled and securely fixed over EPDM rubber pads. Floor Board: 21 mm thick wooden flooring boards, of approved quality, properly seasoned and graded, with accurately machined edges and suitable tongue-and-groove/profiled joints, laid over the SPF runner system with approved fixing arrangement.	250.00	Sqm	4848.00	12,12,000.00

	Finishing: Finished flooring shall comprise approved African Teak timber floor boards, BWF-approved mix grade, with imported polishing/finishing system, including surface preparation, sanding, filling wherever required, application of approved primer/sealer and final coats of imported polish, complete to achieve a smooth, uniform and durable finish as approved by the Engineer-in-Charge. The complete flooring system shall be installed true to line and level, with proper alignment, joints, expansion provisions and finishing. All materials, adhesives, fasteners, treatment chemicals, polish and accessories shall be of approved quality and conform to relevant CPWD specifications, applicable IS standards and manufacturer's recommendations. The rate shall include all labour, materials, tools, tackles, transportation, wastage, cutting, fitting, fixing, finishing and incidental works necessary to complete the work as per direction of Engineer in charge.				
2.	Court Markings Painting court lines (white, 40mm, 1 courts) Marking badminton courts with 40mm wide white lines using durable, non-slip paint, as per BWF dimensions (13.4m x 6.1m court) and as per direction of Engineer in charge. Includes sidelines, baselines, service lines, and center lines. Precision ensured using stencils	1	Set	8306.00	8306.00
3.	Providing & Fixing of WS SPORTS portable Badminton Pole Set - Tournament Model - complete set including both side steel upright poles with heavy-duty base, each side	1	Set	26993.00	26993.00

	weighing approx. 90 kg, fitted with push-button pole locking system for easy adjustment and setup. Poles are made of high-quality powder-coated steel, 2" diameter, designed for stability, long life, and frequent outdoor use. The system includes a professional GARWARE brand Badminton Net (20ft × 2.5ft) made of all-weather resistant nylon mesh, with all four sides covered in high-visibility waterproof vinyl tapes (top & bottom: 1.25", sides: 4.75"). Setup also includes durable guide ropes with metal stakes for anchoring, suitable for school, college, and tournament competition level. The system is designed for ease of transport and relocation, and is provided with a 24-month manufacturer's warranty. Net and poles are suitable for both indoor and outdoor use, as per manufacturer's specifications. Complete item to be supplied with all necessary accessories and as per Engineer-in-charge's instructions.				
4.	Supplying & Installation of acoustic panels or foam on the ceiling to reduce echo and improve sound clarity, enhancing the playing experience as per direction of Engineer in charge.	236.82	Sqm	1384.00	3,27,759.00
5.	Supply of 2-player badminton racket set, suitable for beginners and casual users, comprising two lightweight and ergonomically designed racquets with pre-strung strings and cushioned grips for comfortable handling. Each racket is constructed using durable resin material and offers a grip size of 4 inches, ensuring ease of use for all age groups. The set includes a carrying case (1 no.), made of soft yet durable material with shoulder strap for easy portability. The product is branded as	2.00	Sets	5619.00	11,238.00

	Portzon, and includes 2 rackets (1 red and 1 blue) with a sleek aesthetic finish. The rackets are designed to deliver balanced performance with optimal elasticity and control. The set is ideal for indoor or outdoor recreational badminton play.				
6.	Supply, Installation and Testing of 200W LED floodlights to achieve 500 lux illumination, suitable for recreational badminton. Anti-glare design ensures player comfort. Mounted at 9m height, evenly distributed for uniform lighting complete in all respect as per direction of Engineer-in-charge.	4.00	Each	20764.00	86,056.00
	Total of Sub Head (E)- (Civil + Electrical)				16,69,352.00
	SH: - F - Organic Waste Converter				
1.	Supplying, installing, testing, and commissioning of fully automatic Organic Waste Converter Machine Model EF-150, suitable for processing up to 150 kg of organic waste per day. The machine shall be equipped with a high-quality stainless steel (SS 304) cylindrical chamber, electric heater (to maintain temperature at ~50-60°C), integrated air blower with UV chamber, odor control unit (bio-filter), and internal shaft with paddles for consistent mixing and aeration. The unit must feature automatic feed control, moisture sensing, and heater protection to avoid energy overuse. The machine should be skid-mounted with powder-coated frame, require only single-phase 230 V connection, and consume power not exceeding 1.5 kW. The entire process shall be based on aerobic decomposition, producing dry, odor-free compost within 24 hours. The quoted item shall include	1	Each Job	6,08,560.00	6,08,560.00

	all accessories, starter kit for initial operation, one-year comprehensive warranty, and installation at site complete in all respects as per manufacturer's specifications and to the satisfaction and direction of Engineer-in-Charge.				
	Total of Sub Head (F)				6,08,560.00

SH: - G - Health Club & GYM Equipment's					
1.	Providing and fixing 5mm thick clear float glass wall mirrors with polished edges, each panel measuring 2m x 2m. The mirrors shall be securely mounted on vertical surfaces using heavy-duty aluminum channels or clamps and proper backing support to prevent vibration or cracking. These mirrors are intended for gym usage to enhance spatial aesthetics and allow users to monitor their posture and form during workouts. The installation shall be aligned, levelled and free of visual distortion as per direction of Engineer in charge.	32.00	Sqm	4800.00	1,53,600.00
2.	Supplying, placing in position and commissioning of motor-driven treadmill of the following minimum technical specification, complete with control console, safety accessories and standard tool kit: (i) Motor: AC drive motor of 8 HP peak duty rating, continuous duty rating not less than 4 HP, with electronic speed controller. (ii) Speed range: 0.8 kmph to 20 kmph, variable in steps of 0.1 kmph. (iii) Incline: Motorized auto-incline mechanism, minimum 15 levels, 0% to 15% gradient (or equivalent degree range as per manufacturer's standard). (iv) Running surface: Running belt of minimum size 558 mm x 1524 mm, anti-static, anti-slip surface, mounted over minimum 2-ply orthopaedic deck/shock-absorption cushioning system. (v) Load rating: Maximum user weight capacity not less than 150 kg; frame of	4	Each	78,150.00	3,12,600.00

	minimum 2 mm thick MS/steel tube construction, powder coated. (vi) Console: LED/LCD display indicating time, speed, distance, incline, pulse rate and calories; minimum 12 pre-set workout programmes; heart-rate sensing through handgrip contact sensors. (vii) Safety features: Magnetic safety key/emergency stop switch, automatic motor cut-off on key removal, non-slip handrails on both sides. (viii) Electrical: To operate on 230V $\pm$ 10%, single phase, 50 Hz AC supply, with 3-pin earthed plug top and MCB-protected circuit; wiring and motor windings to be factory tested for insulation resistance and earth continuity before dispatch. (ix) The equipment shall be supplied with manufacturer's test certificate, operation manual, and shall be demonstrated for safe start, stop, speed and incline change, prior to handing over as per direction of Engineer in charge.				
3.	Providing and fixing high-performance indoor Spin Bike for strength and cardio training purposes. The equipment shall be equipped with a 6 kg magnetic flywheel, offering stepless resistance adjustment through magnetic resistance technology for smooth and silent operation. The Spin Bike shall be ergonomically designed for optimal comfort and posture, with adjustable seat height and handlebar positions to suit varied user sizes. The bike must support a maximum user weight of at least 120 kg and be suitable for commercial or semi-commercial use in gymnasiums or	4	Each	19860.00	79,440.00

	fitness studios. The unit shall include an integrated display for tracking time, speed, distance, and calories burnt, and be complete with foot straps and stabilizer base. All accessories required for safe installation and functioning shall be included as per direction of Engineer in charge.				
4.	Supplying and placing a pair of high-performance compact adjustable dumbbells, each with a variable weight range from 2.5 kg to 24 kg, with 15 distinct weight settings integrated in a single unit. The dumbbells shall feature a quick-adjust dial mechanism for seamless weight changes, eliminating the need for multiple individual dumbbells. The set shall come with a secure anti-roll base cradle for safe storage and support during adjustments. The handle grip shall be ergonomically designed with a non-slip surface for safety and user comfort. The system is ideal for home gym setups and allows efficient strength training without occupying excess space. Color: Black with high-visibility weight markers and durable finish. Each pair shall be provided with 6-month extended warranty. Rates to include all materials, handling, transportation, and delivery at site complete in all respects as per direction of Engineer in charge.	4	Set	21,140.00	84,560.00
5.	Supplying and installing one number of COSCO CSB 15 Multi-Functional Bench DELUXE, a heavy-duty home fitness bench designed for multifunctional workout use including incline, flat, and decline bench press, leg curl and extension, and abdominal strengthening exercises. The equipment features a robust steel frame with a corrosion-resistant	2	Set	31,790.00	63,580.00

	powder-coated finish, integrated barbell stands with safety catches, position-adjustable high-density foam padded backrest, and ergonomically designed foam ankle pads for enhanced comfort and grip. The structure allows seamless adjustment for multiple exercise modes and is ideally suited for home gym setups. The item shall be delivered, assembled, and installed at the designated location including all handling and transportation, with all accessories and tools required for commissioning, and shall carry a minimum 1-year manufacturer warranty. All work to be carried out as per manufacturer's specifications and to the satisfaction of the Engineer-in-Charge.				
6.	Providing and supplying a high-quality set of Black Bumper Plates 3.0, designed for professional Olympic weightlifting and strength training use. The bumper plates are manufactured using high-durability rubber with precision-machined stainless steel center hubs for superior impact absorption, reduced noise during drops, and long-term durability. The set includes a total of 150 kg, comprising 2 plates each of 5 kg, 10 kg, 15 kg, 20 kg, and 25 kg. All plates are standardized with a 450 mm outer diameter, ensuring uniform bar height and compatibility with all Olympic-size barbells. These plates are ideal for commercial gyms, training centers, or institutional fitness setups and ensure both performance and safety for high-intensity workouts as per direction of Engineer in charge.	4	Set	34,210.00	1,36,840.00
7.	Providing and supplying Olympic Barbell Weightlifting Bar (Men's - 20kg capacity), ATE make or equivalent,	4	Each	21,780.00	87,120.00

	fabricated from high-grade tensile steel with a minimum tensile strength of 200K PSI, ensuring durability and resistance against bending. The barbell shall have a total length of 2200 mm, with a shaft diameter of 28 mm and a loadable sleeve length of 415 mm on each side. The bar is equipped with high-precision 10HK needle bearings to ensure smooth rotation during lifts. Standard single knurl marking and center knurl shall be provided for grip alignment and lifting control. The grip area shall include 1.2 mm standard knurling for optimal hand grip without aggressive abrasion. The bar is designed to deliver good whip characteristics suitable for Olympic-style lifting, powerlifting, and strength training. A lifetime warranty against bending is included, Complete in all respects as per manufacturer's specifications and to the satisfaction and direction of the Engineer-in-Charge.				
8.	Supplying, assembling and installing squat stand, of the following technical specification: (i) Frame: Height 86/ 91 inches with Monkey Bar, Offset Bar, 2-Handle Bar, 2X3 Square, fabricated from structural-grade steel, with precision laser-cut holes for J-cup and safety-arm height adjustment. (ii) Base and stability: Horizontal floor-level stabilizer bar/base plate connecting both uprights, of adequate length and section to provide free-standing stability without floor anchoring, under maximum rated load	2	Each	35,090.00	70,180.00

	including dynamic loading during lift and re-rack. (iv) Fittings: J-cups (barbell rest hooks) lined with UHMW/nylon or similar non-marring liner, and safety spotter arms, both adjustable in height through the laser-cut hole pattern and secured with locking pins. (v) Finish: All members to be degreased, phosphated and powder-coated (colour red, or as approved) for corrosion resistance and uniform appearance. (vi) The unit shall be assembled strictly as per the manufacturer's fitting instructions, checked for plumb, level and rigidity, and demonstrated for safe loading/unloading of the barbell prior to handing over as per direction of Engineer in charge.				
	Total of Sub Head (G)				9,87,920.00

	SH: - H - Bore Wells for water Supply				
1.	Boring/drilling bore well of required dia for casing/ strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from different strata, preparing and submitting strata chart/ bore log, including hire & running charges of all equipments, tools, plants & machineries required for the job, all complete as per direction of Engineer-in-charge, upto 90 metre depth below ground level. All types of soil- 300 mm dia	180.00	Metre	791.94	1,42,549.00
2.	Boring/drilling bore well of required dia for casing/ strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from different strata, preparing and submitting strata chart/ bore log, including hire & running charges of all equipment's, tools, plants & machineries required for the job, all complete as per direction of Engineer - in-charge, beyond 90 metre & upto 150 metre depth below ground level. All types of soil- 300 mm dia	60.00	Metre	923.92	55,435.00
3.	Supplying, assembling, lowering and fixing in vertical position in bore well, unplasticized PVC medium well casing (CM) pipe of required dia, conforming to IS: 12818, including required hire and labour charges, fittings & accessories etc. all complete, for all depths, as per direction of Engineer -in-charge. 150 mm nominal size dia	90.00	Metre	887.60	79885.00
4.	Supplying, assembling, lowering and fixing in vertical position in bore well, unplasticized PVC medium well casing (CM) pipe of required dia, conforming to IS: 12818, including required hire and labour charges, fittings & accessories etc. all complete, for all depths, as per direction of Engineer -in-charge. 200 mm nominal size dia	90.00	Metre	1245.78	1,12,120.00

5.	Supplying, assembling, lowering and fixing in vertical position in bore well unplasticized PVC medium well screen (RMS) pipes with ribs, conforming to IS: 12818, including hire & labour charges, fittings & accessories etc. all complete, for all depths, as per direction of Engineer-in-charge. 150 mm nominal size dia	60.00	Metre	903.50	54,210.00
6.	Gravel packing in tubewell construction in accordance with IS: 4097, including providing gravel fine/ medium/ coarse, in required grading & sizes as per actual requirement, all complete as per direction of Engineer-in-charge.	12.72	Cum	2265.31	28,808.00
7.	Development of tube well in accordance with IS : 2800 (part I) and IS: 11189, to establish maximum rate of useable water yield without sand content (beyond permissible limit), with required capacity air compressor, running the compressor for required time till well is fully developed, measuring yield of well by "V" notch method or any other approved method, measuring static level & draw down etc. by step draw down method, collecting water samples & getting tested in approved laboratory, including disinfection of tubewell, all complete, including hire & labour charges of air compressor, tools & accessories etc., all as per requirement and direction of Engineer-in-charge.	32.00	Hours	1214.12	38852.00
8.	Providing and fixing suitable size threaded mild steel cap or spot welded plate to the top of bore well housing/ casing pipe, removable as per requirement, all complete for borewell of: 200 mm dia.	2.00	Each	359.35	719.00
9.	Providing and fixing M.S. clamp of required dia to the top of casing/ housing pipe of tubewell as per IS: 2800 (part I), including necessary bolts & nuts of required size complete. 200 mm dia	2.00	Each	2266.48	5133.00

10.	Providing and fixing Bail plug/ Bottom plug of required dia to the bottom of pipe assembly of tubewell as per IS:2800 (part I). 150 mm dia	2.00	Each	360.30	721.00
11.	Providing and fixing G.I. pipes complete with G.I. fittings including trenching and refilling etc. 40 mm dia nominal bore	150.00	Metre	691.45	1,03,568.00
Total of Sub head (H)					6,22,000.00
SH: - I - Horticulture works					
1.	Earth work in surface excavation not exceeding 30 cm in depth but exceeding 1.5 m in width as well as 10 sqm on plan including disposal of excavated earth up to 50 m and lift up to 1.5 m, as per directions of Engineer In-charge:	2847.00	Sqm	138.20	3,93,455.00
2.	Supply and stacking of good earth at site including royalty and carriage upto 5 km complete (earth measured in stacks will be reduced by 20% for payment)	71.20	Cum	803.75	57,227.00
3.	Supplying and stacking of well decayed cattle manure at site including royalty and carriage upto 5 k.m. lead complete (Cattle manure measured in stacks will be reduced by 8% for Payment).	71.20	Cum	667.10	47,497.00
4.	Spreading of sludge, dump manure and/or good earth in required thickness as per direction of officer-in-charge (cost of sludge, dump manure and/ or good earth to be paid separately).	142.40	Cum	79.70	11,349.00
5.	Fine dressing of the ground.	2847.00	Sqm	5.60	15,943.00
6.	Providing & laying of Selection no. 1 Doob grass turf with earth 50mm to 60mm thickness of existing ground prepared with proper level and ramming with required tools wooden and then rolling the surface with light roller make the surface smoothen and light watering the same and maintenance for 30 days or more till the	2200.00	Sqm	113.70	2,50,140.00

	grass establish properly, as per direction of the officer-in-charge.				
	Trees/Topiaries & Palms				
7.	Golden Bottle brush Topiary well developed with fresh & healthy foliage 5 to 6 big ball 115 to 180 cm ht in 40 cm Cement Pot	100	Each	850.00	85,000.00
8.	Providing and stacking of Plumeria alba dwarf dwarf of height 90-105 cm. with 3-4 branches and thick stem in big size HDPE bags as per direction of the officer-in-charge.	50	Each	812.50	40,625.00
9.	Providing and stacking of Foxtail palm ht. 180-210 cm bottom girth 25- 30 cm well developed in big size HDPE bag as per direction of the officer-in-charge.	50	Each	520.00	26,000.00
10.	Ficus black vivion piller Topiary (sylinder type) well developed with fresh & healthy 180 to 210 cm ht in 40 cm Cement Pot	150	Each	1800.00	2,70,000.00
11.	Bismarckia Palm 115 to 180 cm ht. plant, well developed 12 and above good color fresh and healthy leaves in 40 cm Cement Pot	30	Each	1735.00	52,050.00
12.	Cycus revoluta in 35 cm challi, specimen plant, having 30 to 40 with fresh and healthy, leaves having 25cm to 30cm circumfrance of base stem well developed	60	Each	1050.00	63,000.00
13.	Furcaria Variegated hybrid well developed with fresh & healthy foliage 20 and above attractive leaves in 35 cm Cement Pot	60	Each	400.00	24,000.00
	Shrubs Plant				
14.	Acalypha Different colour well developed, fresh & healthy with good foliage, multi branch 30 to 45 cm ht. plant in 20 cm size of Earthen Pot/Plastic Pot	600	Each	32.00	19,200.00
15.	Providing and stacking of Tecoma gaudichaudi of height 90-105 cm., bushy in big size HDPE bag as per direction of the officer-in-charge.	800	Each	119.15	95,320.00

16.	Providing and stacking of Hibiscus rosasinensis of height 60-75 cm. with 5-6 branches in p.bag of size 25 cm as per direction of the officer-in-charge	500	Each	49.35	24,675.00
17.	Providing and stacking of Nerium oleander (kaner) dwarf of height 30-40 cm. in earthen pot of size 20 cm as per direction of the officer-in-charge.	500	Each	42.15	21,075.00
18.	Providing and stacking of Tabernaemontana divaricata (Chandni double) of height 90-105 cm., bushy in big size HDPE bag as per direction of the officer-in-charge.	600	Each	97.50	58,500.00
19.	Providing and stacking of Jatropha multifida (red colour) of height 60-75 cm. multibranched in p.bag of size 25 cm as per direction of the officer-in-charge.	600	Each	49.35	29,610.00
	Cover Ground Plants				
20.	Asparagus Meyeri, well developed 15 to 20 leaves, full of branches and foliage in 25 cm size of Earthen Pot / Plastic Pot.as per direction of the officer-in-charge.	1500	Each	50.00	75,000.00
21.	Iresine herbstii, of height 20-25 cm. full of branches well developed in 15 cm size of Earthen Pot / Plastic Pot.as per direction of the officer-in-charge.	2000	Each	15.00	30,000.00
22.	Duranta Golden, having ht.15 to 20 cm bushy shape with fresh and healthy leaves in 15 cm size of Earthen Pot / Plastic Pot.as per direction of the officer-in-charge.	2000	Each	19.00	38,000.00
23.	Syngonium variegated,of height 30-45 cm. with 2-3 suckers healthy foliage in Earthen Pot/Plastic Pot of size 15 cm.	1000	Each	19.00	19,000.00
24.	Dracaena Rosea having ht. 30 cm & above with 8 to10 leaves, well developed, fresh and healthy in 20 cm size of Earthen pot / Plastic pot	300	Each	40.00	12,000.00
25.	Dreaceana pendanus, well developed, having 6 to 8 suckers with helthy foliage in 25 cm size Earthen pot /Plastic pot	300	Each	165.00	49,500.00
26.	Plantation of Trees, Shrubs, and Hedge at site i/c watering and removal				

	ofunserveiceable material's as per direction of officer in charge (excludingunserveiceable material's as per direction of officer in charge (excluding cost of plant & water)				
26.1	Trees plant	500	Each	9.45	4725.00
26.2	Shrubs Plant	3600	Each	4.70	16,920.00
26.3	Hedge Plant /Ground cover	7100	Each	3.15	22,365.00
27.	Complete maintenance of the entire garden features having as per yard stick in the garden area i.e. lawn trees, shrubs, herbs, edge, flower beds, foliages, creepers etc. including hoeing,weeding, pruning, replacement of plants, gap filling, watering, mowing of lawn, grass cutting by lawn mover and brush cutter, removal of garden waste, applying insecticide, pesticide & fertilizers(whenever required) top dressing of lawn with good earth and manure and maintenance of other garden related works as directed by office-in-charge (Cost of Good Earth, Manure, Fertilizer, Insecticide, Pesticide will be provided by the Department & lawn mover and brushcutter with fuel and other T & P material/articles shall be provided by the contractor.) and as per direction of officer in charge. 2847 sqm x 06 months= 17082 sqm Residential Flats and Govt. Officers Bungalow	17082	Per Sqm per month	4.95	84,556.00
28.	Topiary cutting/shapping of plant removing of cut materials, cleaning, hoeing of plants complete design hoeing of trees (Topiary) watering manure etc. (excluding the cost of material which shall be supplied by the department) and as per direction of officer in charge. Height of Topiary upto 120 cm. (250 Nos x 06 months= 1500 Nos	1500	Per plant/ per month	108.95	1,63,425.00
	Total of Sub Head (I)				21,00,158.00

BILL OF QUANTITIES (BOQ) (CAMC)

PRICE SCHEDULE FOR COMPREHENSIVE ANNUAL MAINTENANCE

S. No.	Activity	First year (after defect liability period of three years) Amount (Rs.)
1	Lifts - (2 no.- 8 Passengers, 6 nos. -13 Passengers, 2 Nos. - 20 Passenger Bed lift and 2 Capsule Lifts) Comprehensive Annual Maintenance Contract to be executed between RBI and the lift OEM / its authorised service provider for all passenger, service and capsule lifts installed under the work, including routine and preventive maintenance, safety tests, rescue support, attending all breakdowns and repair/replacement of defective spare parts, after completion of the defect liability period of three years. The contractor and OEM/service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	34,40,130.00
2	UPS systems Comprehensive Annual Maintenance Contract to be executed between RBI and the OEM / authorised service provider for the installed UPS systems including 3 Nos. x 20 kVA units, battery banks, chargers, inverters, controls and accessories, including preventive servicing, testing, breakdown rectification and repair/replacement of defective spares after completion of the defect liability period of three years. The contractor and OEM/service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	8,14,120.00
3	CCTV / security systems Comprehensive Annual Maintenance Contract to be executed between RBI and the OEM / system integrator / authorised service provider for the complete IP-CCTV and surveillance installation, comprising cameras, recorders/servers, storage, network equipment, software, displays, power supplies and cabling, including scheduled servicing, testing, attending breakdowns and repair/replacement of defective spare parts after completion of the defect liability period of three years. The contractor and service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	7,89,450.00

S. No.	Activity	First year (after defect liability period of three years) Amount (Rs.)
4	Fire alarm / PA / exit signage Comprehensive Annual Maintenance Contract to be executed between RBI and the OEM / system integrator / authorised service provider for the complete addressable fire alarm and detection system, public address / voice evacuation system, emergency lighting and illuminated directional / exit signage installed, including inspection, functional testing, servicing, breakdown attendance and repair/replacement of defective components and spare parts after completion of the defect liability period of three years. The contractor and service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	7,44,900.00
5	Solar photovoltaic system Comprehensive Annual Maintenance Contract to be executed between RBI and the solar PV OEM / system integrator / authorised service provider for the 134 kWp grid-interactive rooftop solar photovoltaic installation, including modules, inverters, mounting structures, DC/AC cabling, controls, protection, earthing and monitoring equipment, with periodic cleaning, servicing, testing, breakdown rectification and repair/replacement of defective spare parts after completion of the defect liability period of three years. The contractor and service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	4,68,050.00
6	VRV / VRF air conditioning Comprehensive Annual Maintenance Contract to be executed between RBI and the air-conditioning OEM / its authorised service provider for the complete VRV/VRF air-conditioning, AHU / treated fresh-air units and associated ventilation and pressurisation equipment, including indoor/outdoor units, piping, controllers, electrical/control accessories, scheduled servicing, testing, attending breakdowns and repair/replacement of defective spare parts after completion of the defect liability period of three years. The contractor and service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	10,70,420.00

S. No.	Activity	First year (after defect liability period of three years) Amount (Rs.)
7	Sewage treatment plant Comprehensive Annual Maintenance Contract to be executed between RBI and the STP OEM / process system integrator / authorised service provider for the complete 50 KLD MBBR sewage treatment plant, including process units, blowers, pumps, filtration, dosing, instrumentation, electrical panels and controls, scheduled maintenance, performance monitoring, breakdown rectification and repair/replacement of defective equipment and spare parts after completion of the defect liability period of three years. The contractor and service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	10,29,020.00
8	Intercom/ EPABX/ VDP Comprehensive Annual Maintenance Contract to be executed between RBI and the OEM / system integrator / authorised service provider for the complete centralised intercom / EPABX and video door phone installation, including exchange, cards, indoor/outdoor stations, displays, power supplies, cabling, system software and related accessories, with periodic servicing, testing, breakdown rectification and repair/replacement of defective components and spare parts after completion of the defect liability period of three years. The contractor and service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	4,39,400.00
9	HT/LT substation Comprehensive Annual Maintenance Contract to be executed between RBI and the respective OEM(s) / authorised specialist service provider for the complete HT/LT substations, including 3 Nos. 1250 kVA dry-type transformers as per approved equipment schedule, HT switchgear, LT panels, OLTC/RTCC where installed, protection, control, metering, APFC, cables, earthing and associated accessories, with routine servicing, statutory/OEM testing, breakdown rectification and repair/replacement of defective components after completion of the defect liability period of three years. The contractor and service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	10,55,340.00

S. No.	Activity	First year (after defect liability period of three years) Amount (Rs.)
10	DG sets Comprehensive Annual Maintenance Contract to be executed between RBI and the DG set OEM / its authorised service provider for 3 Nos. x 250 kVA silent diesel generator sets, including engines, alternators, acoustic enclosures, AMF/synchronising panels, batteries, chargers, controls, exhaust and related accessories, with preventive servicing, periodic functional and load tests, breakdown rectification and repair/replacement of defective components and spare parts after completion of the defect liability period of three years. The contractor and service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	11,37,570.00
11	Facade Lighting Comprehensive Annual Maintenance Contract to be executed between RBI and the facade lighting OEM / system integrator / authorised service provider for the complete facade and external architectural lighting installation, including RGB/RGBW floodlights, linear wall washers, LED floodlights, drivers, DMX/Ethernet controls, cabling, connectors and related accessories, with periodic cleaning, servicing, testing, alignment, colour-control checks, breakdown rectification and repair/replacement of defective equipment and spare parts after completion of the defect liability period of three years. The contractor and service provider shall quote the first-year annual CAMC charge accordingly and comply with the CAMC conditions.	6,16,760.00
	TOTAL - FIRST-YEAR CAMC AFTER 3 YEARS OF DEFECTS LIABILITY PERIOD (DLP)	1,16,05,160.00

BILL OF QUANTITIES (BOQ)

NIT No: 10/NIT/CE(PATNA)/CPWD/2026-27				
Name of Work: Demolition of existing structures and then re-construction of residential buildings for the officers of RBI, on its freehold land at Plot No. GC-4, Lohianagar, Kankarbagh Distt-Patna, Bihar including Internal Water Supply, Sanitary Installation, Electrical Installation, DG Set, Electrical Sub-Station, Power Backup, Lifts, Fire Fighting System, Furniture, Gym Equipment, other E & M works, CCTV, LAN, Solar Water Heaters, OHT, UGT, RWH, STP and External Development Work, Land-scaping & Art Work etc. in EPC Mode-III.				
Estimated cost put to Tender			165,28,78,800.00	
PROFORMA FOR QUOTING THE RATES				
Name of Agency				
Sl. No.	Description of Items	Estimated cost (In Rs.)	Rate to be quoted by agency in percentage above/below/at par with respect to estimated cost	Amount Quoted by agency (In Rs.)
1.	Estimated Cost Put to Tender Civil & Horticulture	137,87,21,501.00		
2.	Estimated Cost Put to Tender E & M	27,41,57,299.00		
	TOTAL ESTIMATED COST	165,28,78,800.00		

PART-E

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77	Typical floor plan (AC layout)	TD/RBI/Patna/Grade B&C /TYP/AC-01	937
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78	Stilt floor plan	TD/RBI/Patna/ Grade D&E /stilt-01	938
79	Typical floor plan (1st to 4th)	TD/RBI/Patna/Grade D&E /Typ(1-4)-02	939
80	5th floor plan	TD/RBI/Patna/Grade D&E /5th-03	940
81	6th floor plan	TD/RBI/Patna/Grade D&E /6th-04	941
82	Typical Floor plan (7th & 8th	TD/RBI/Patna/ Grade D&E /TYP(7-8)-05	942
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84	10th floor plan	TD/RBI/Patna/Grade D&E /10TH-07	944
85	Terrace floor plan	TD/RBI/Patna/Grade D&E /TF-08	945
86	Elevation A, B&C	TD/RBI/Patna/Grade D&E /Elev-09	946
87	Elevation D, Section A-A'&B-B'	TD/RBI/Patna/Grade D&E /Elev/Sec-10	947
88	Typical Balcony Section	TD/RBI/Patna/Grade D&E /Bal.-011	948

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90	Joinery Detail -02	TD/RBI/Patna/Grade D&E /JD-02	950
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91	Toilet Detail -01	TD/RBI/Patna/ Grade D& E /T.D/-01	951
92	Toilet Detail -02	TD/RBI/Patna/ Grade D& E /T.D/-02	952
93	Toilet Detail -03	TD/RBI/Patna/ Grade D& E /T.D/-03	953
94	Toilet Detail -04	TD/RBI/Patna/ Grade D& E /T.D/-04	954
95	Toilet Detail -05	TD/RBI/Patna/ Grade D& E /T.D/-05	955
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96	KITCHEN DETAIL	TD/RBI/Patna/Grade D&E/Kitchen Detail/-01	956
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97	CUP-BOARD DETAIL(C1&C2)	TD/RBI/Patna/DE/C.D-01	957
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98	Staircase Railing Detail	TD/RBI/Patna/D,E &F/R.D-01	958
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100	Staircase Detail	TD/RBI/Patna/Grade D&E /Str/Dt-01	960
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102	Typical floor plan	TD/RBI/Patna/Grade D&E /Typ.f/FL-02	962
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104	Grade F (10 floor plan)	TD/RBI/Patna/Grade F /10th/FC-04	964
105	Terrace floor plan	TD/RBI/Patna/Grade D&E /TERRACE/FC-05	965
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107	Typical floor plan	TD/RBI/Patna/Grade D&E /Typ.f/FC-01	968
108	9th floor plan	TD/RBI/Patna/Grade D&E /9th/FC-02	969
109	10th floor plan	TD/RBI/Patna/Grade D&E /10th/FC-03	970

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110	Typical floor plan (AC layout)	TD/RBI/Patna/Grade D&E /Typ.f/AC-01	971
111	9th floor plan (AC layout)	TD/RBI/Patna/Grade D&E /9th/AC-02	972
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113	Ground floor plan	TD/RBI/Patna/ RD/Gf-01	974
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115	Terrace floor plan	TD/RBI/Patna/RD/TF-03	976
116	Elevation -A,B,C	TD/RBI/Patna/RD/ELEV-04	977
117	Elevation -D & Sec- X-X'	TD/RBI/Patna/RD/ELEV/Sec-05	978
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122	Toilet Detail -03	TD/RBI/Patna/R.D/T.D/-03	983
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126	CUP-BOARD DETAIL(C1&C2)	TD/RBI/Patna/RD/C.D-01	987
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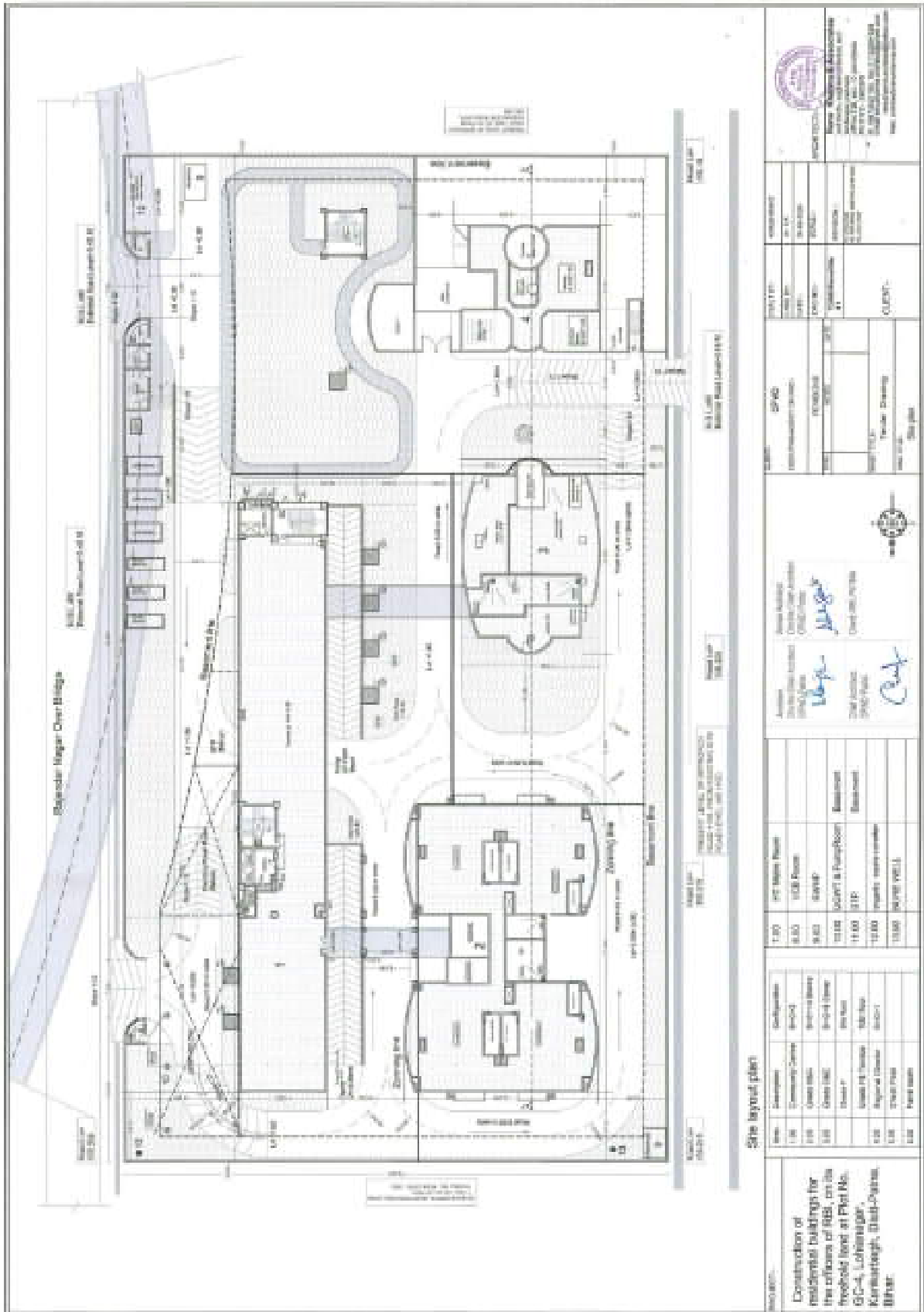
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148	Ground floor plan	WD/RBI/Patna/RD /GF /Elec-01	1009
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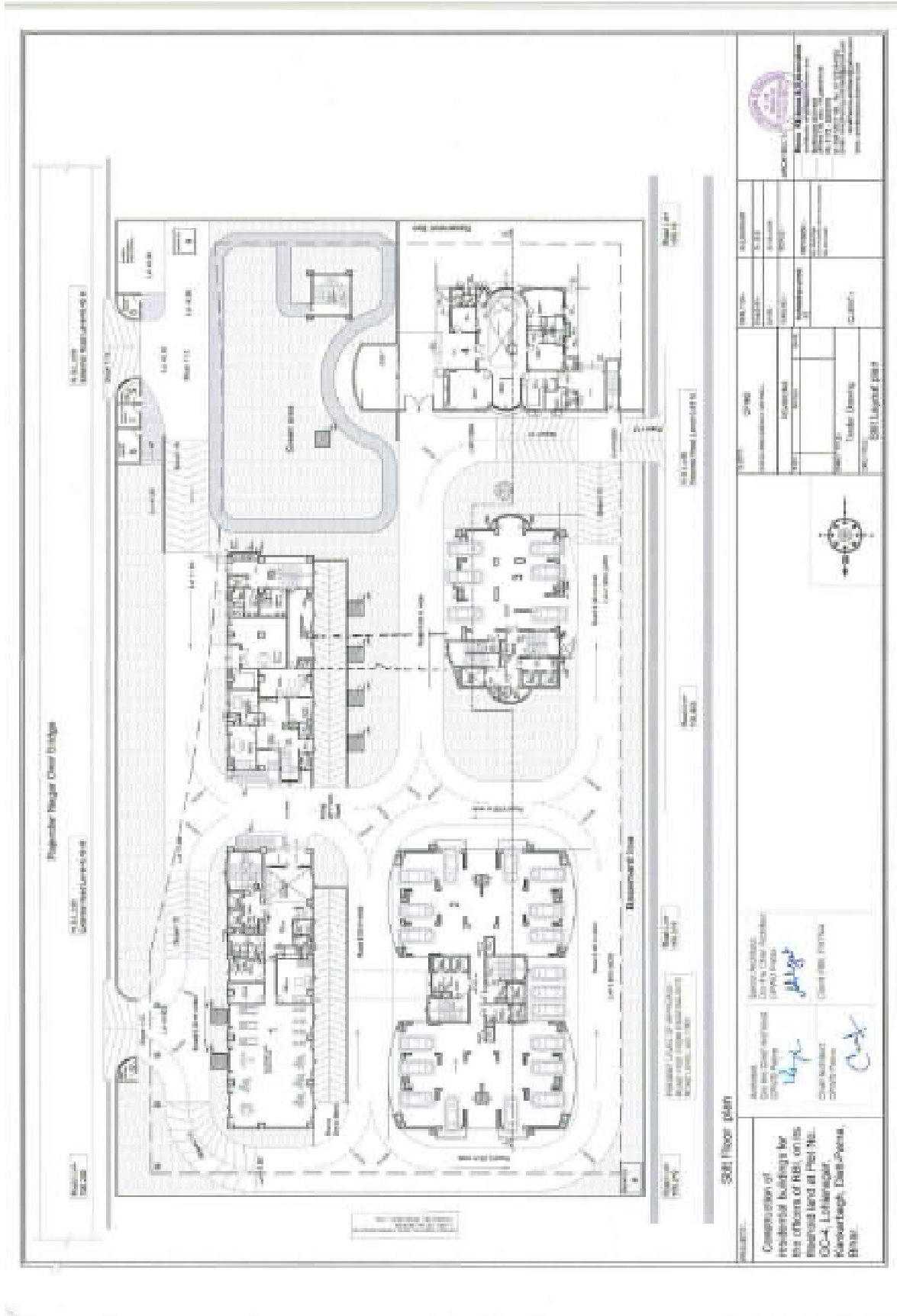
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221	Ground and First floor plan	WD/RBI/Patna/CC/GF/FF/Elv-01	1082
222	Second and Terrace floor plan	WD/RBI/Patna/CC/SF/TF/Elv-02	1083
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224	1 st to 14th floor plan	WD/RBI/Patna/Grade B & C /TYP/Elv-02	1085
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227	9 th floor plan	WD/RBI/Patna/Grade D & E /9 th floor /Elv-03	1088
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229	Terrace floor plan	WD/RBI/Patna/Grade D & E /TF /Elv-05	1090

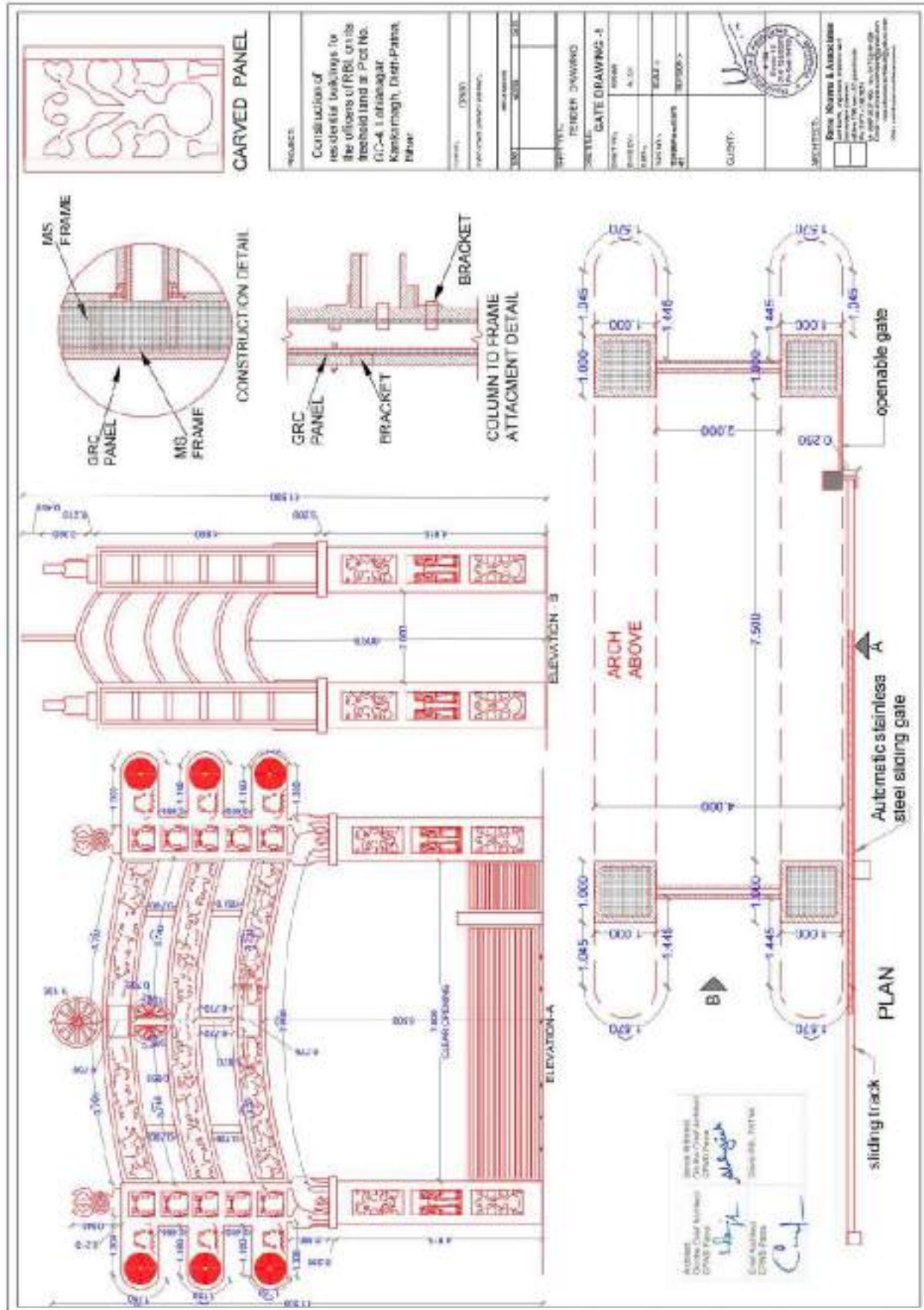


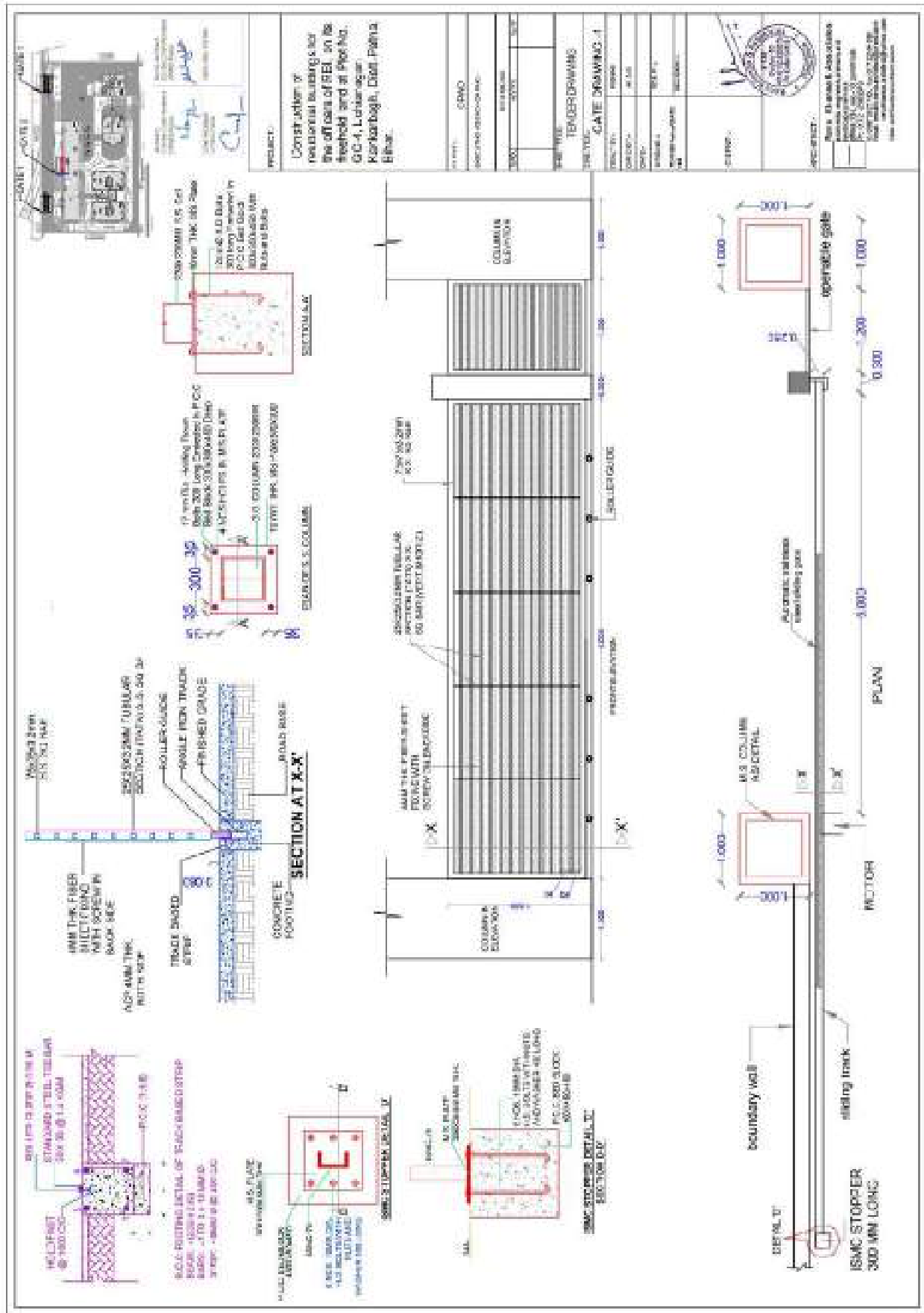


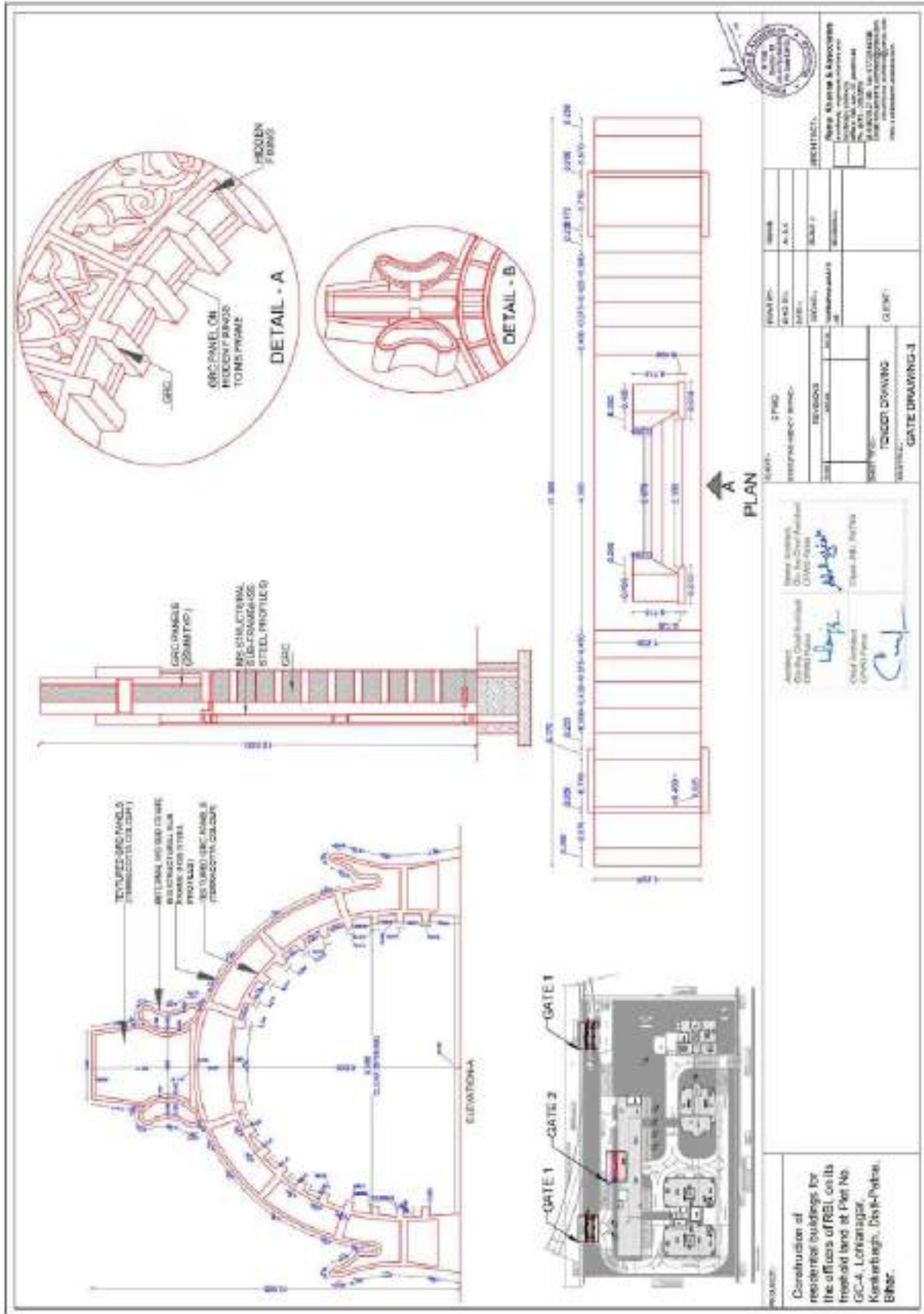


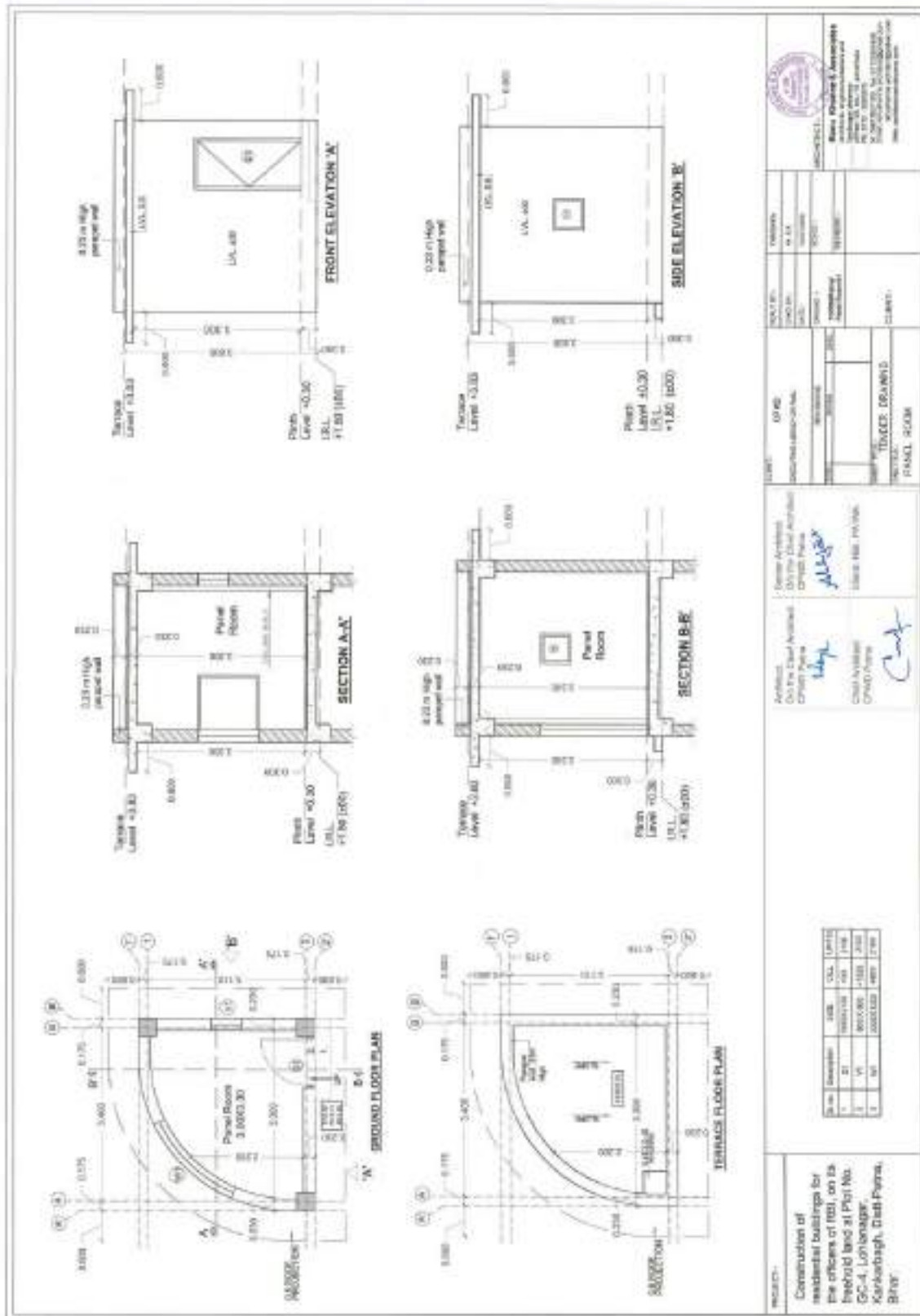
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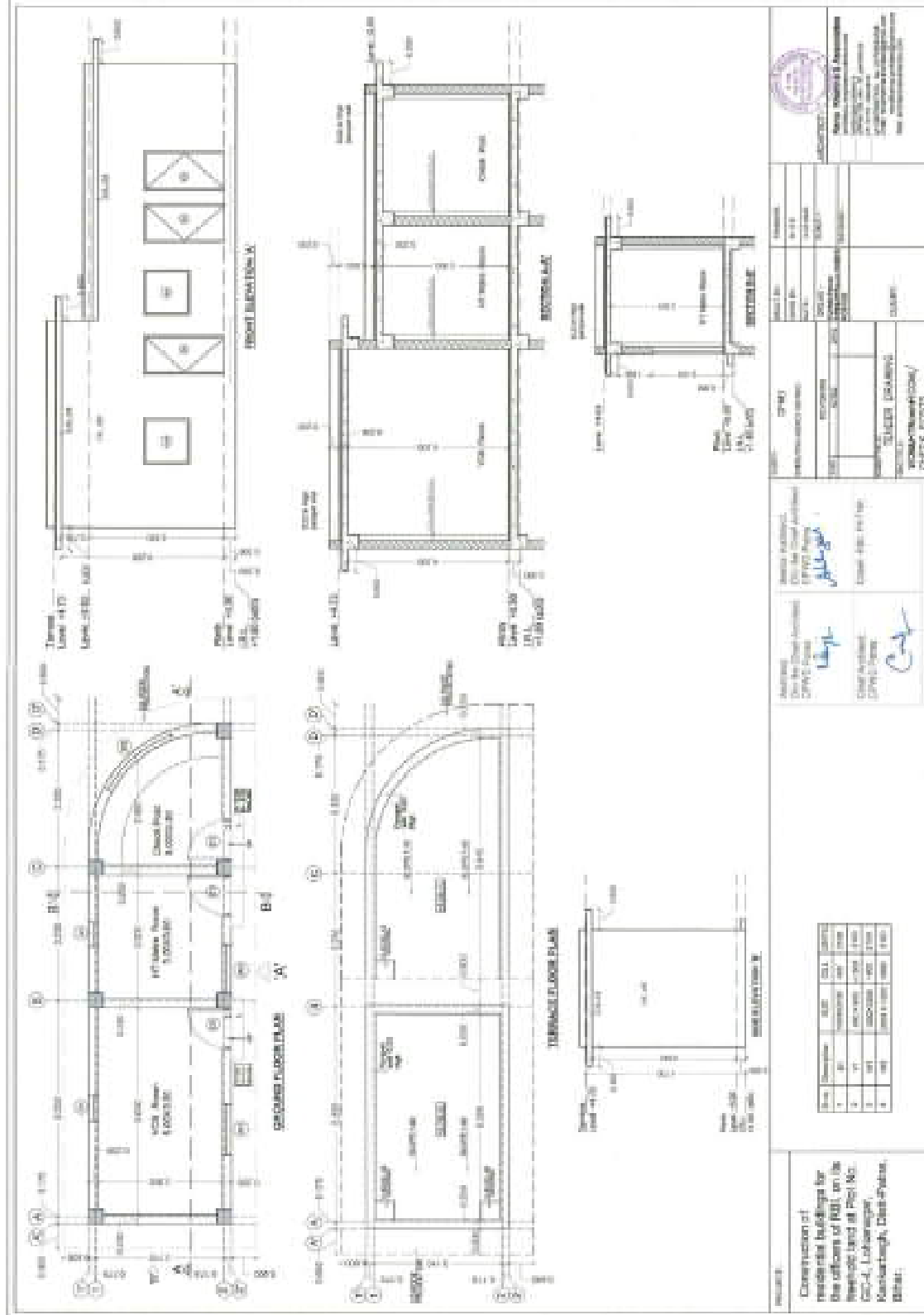
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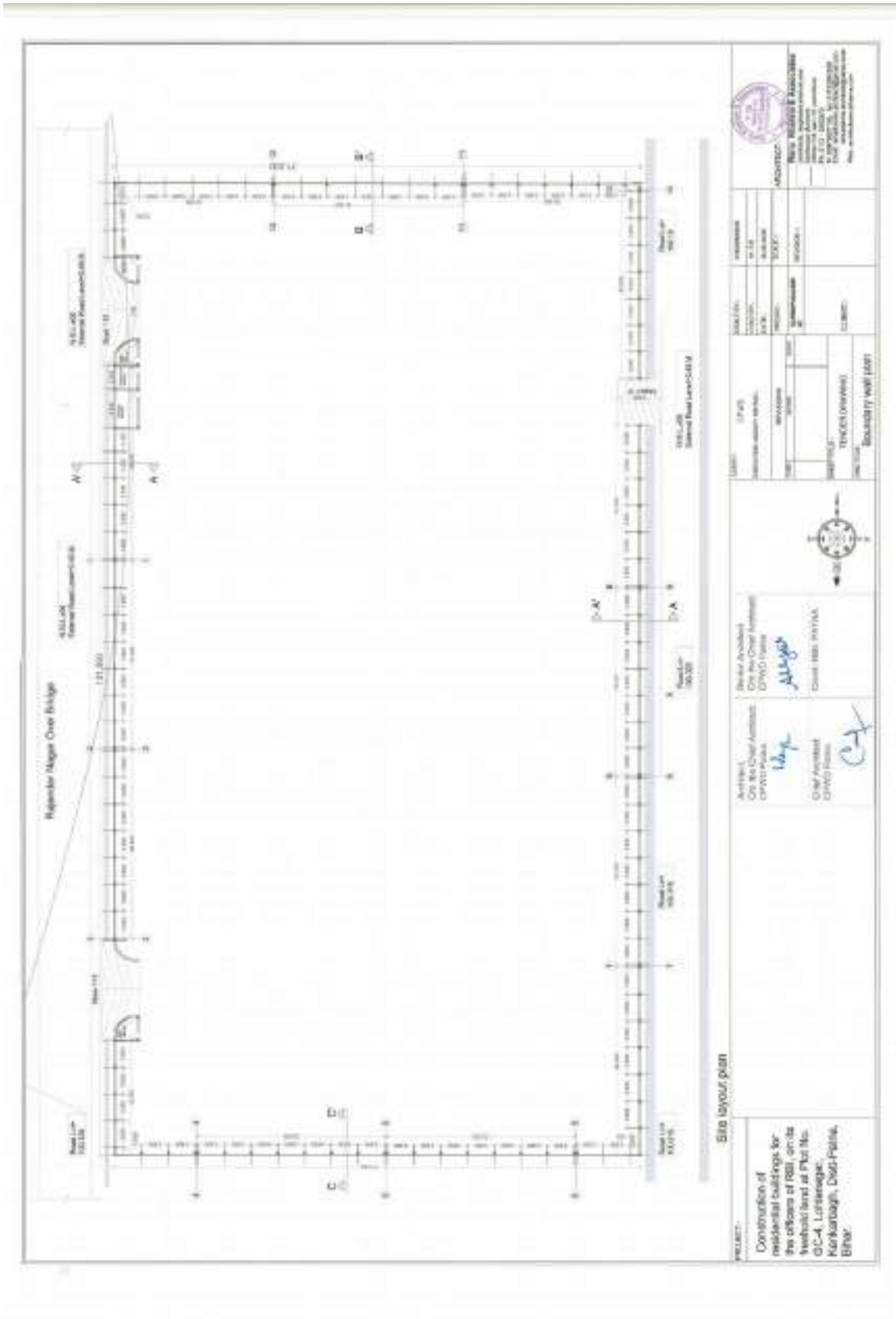


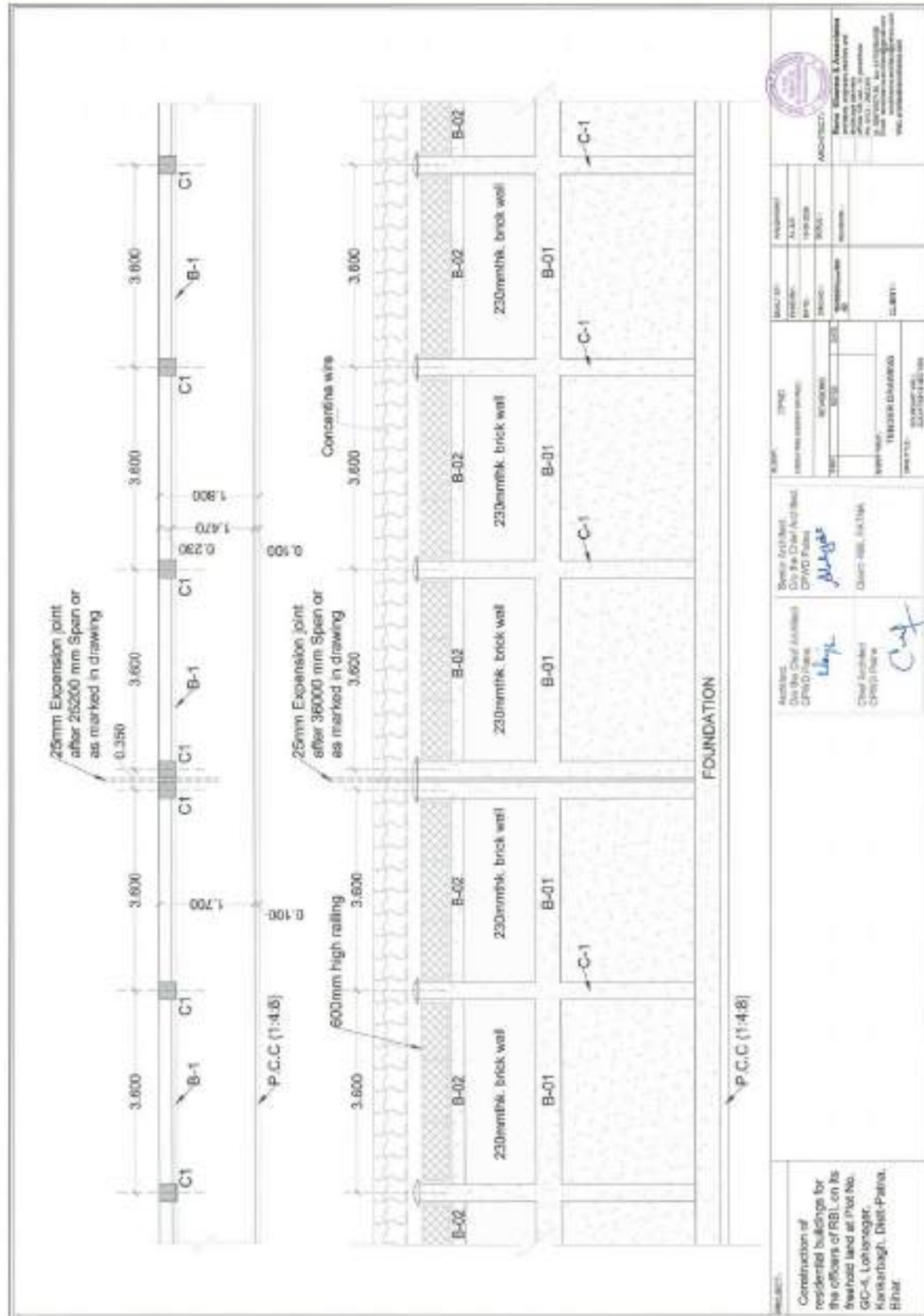


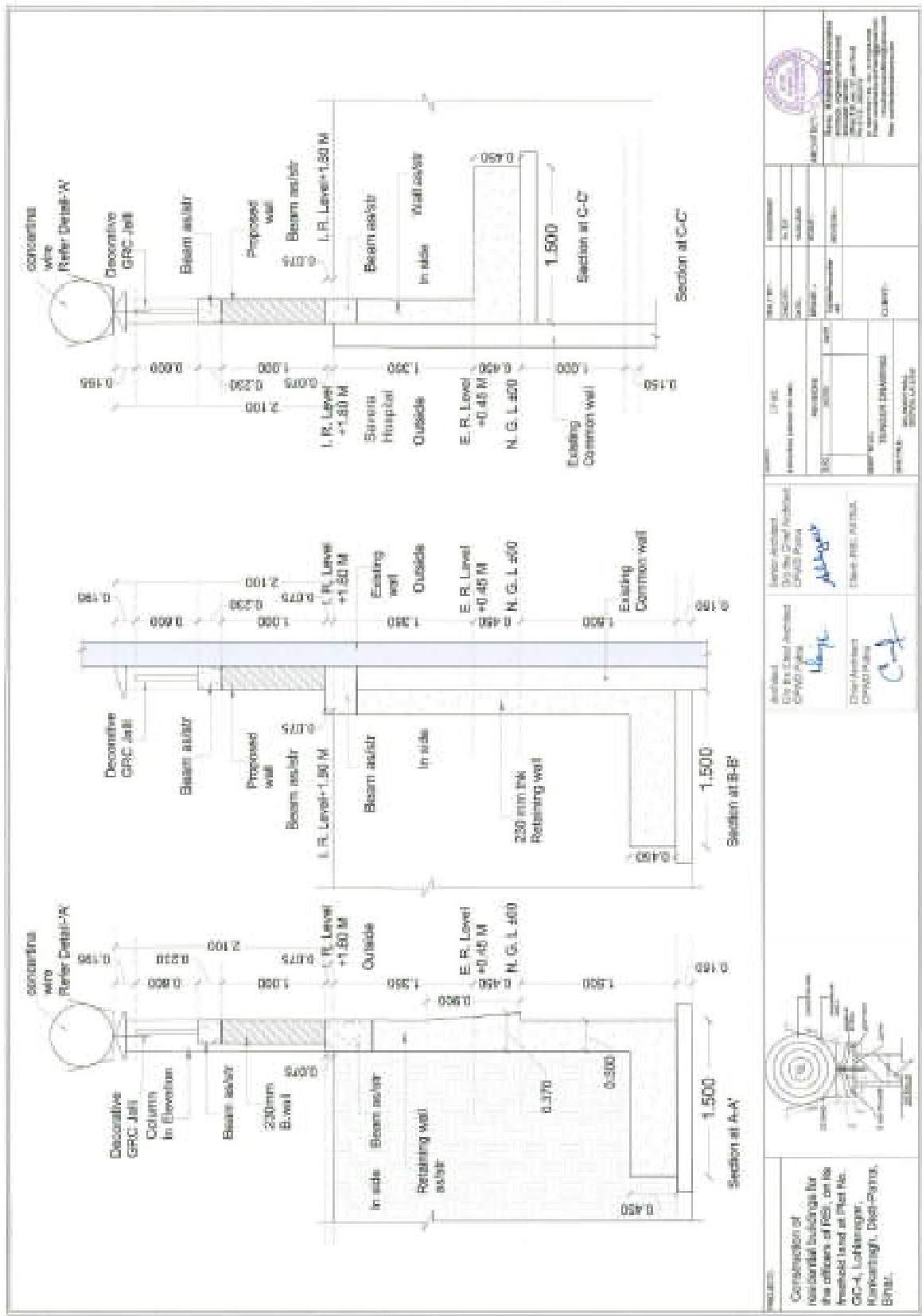


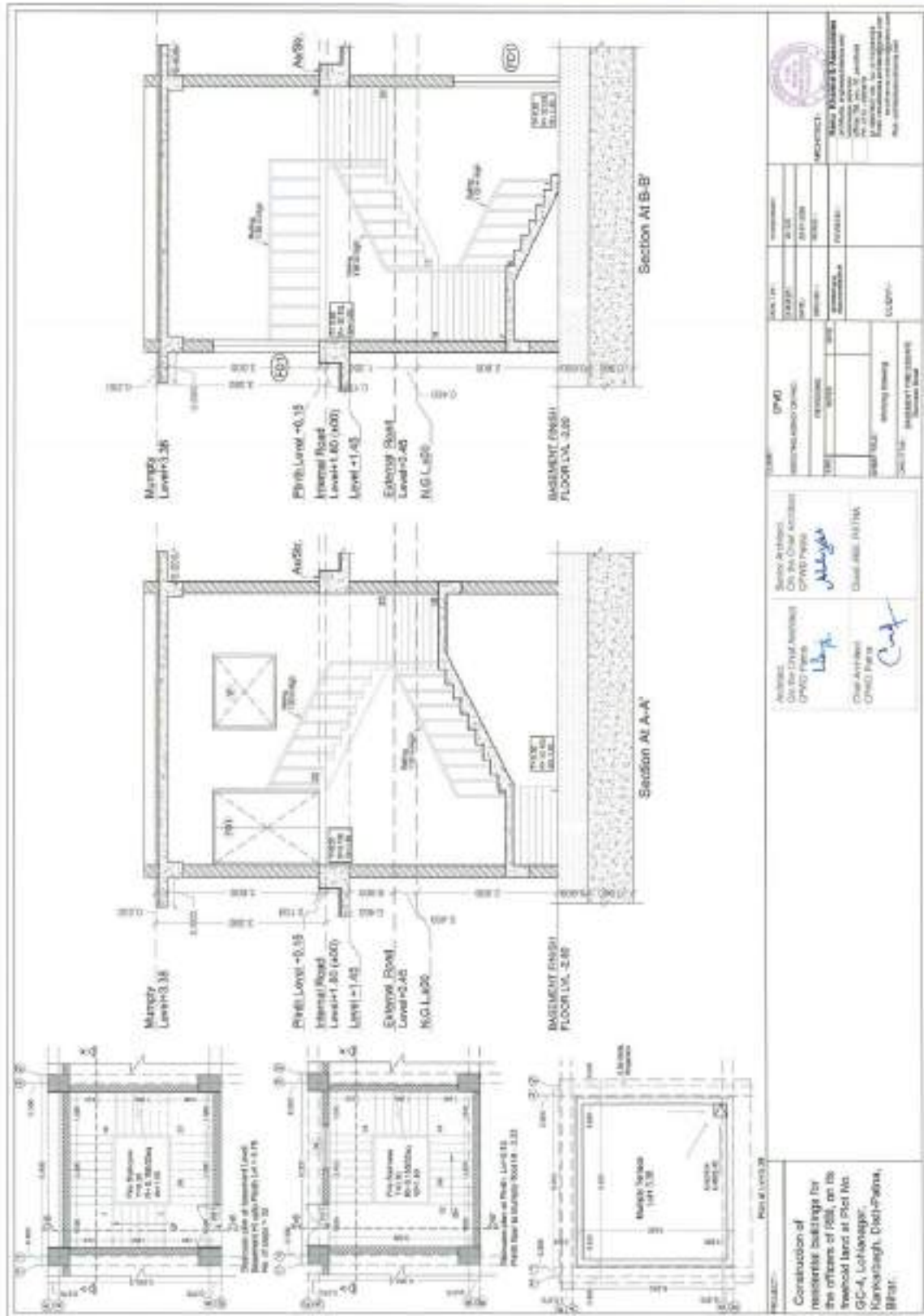


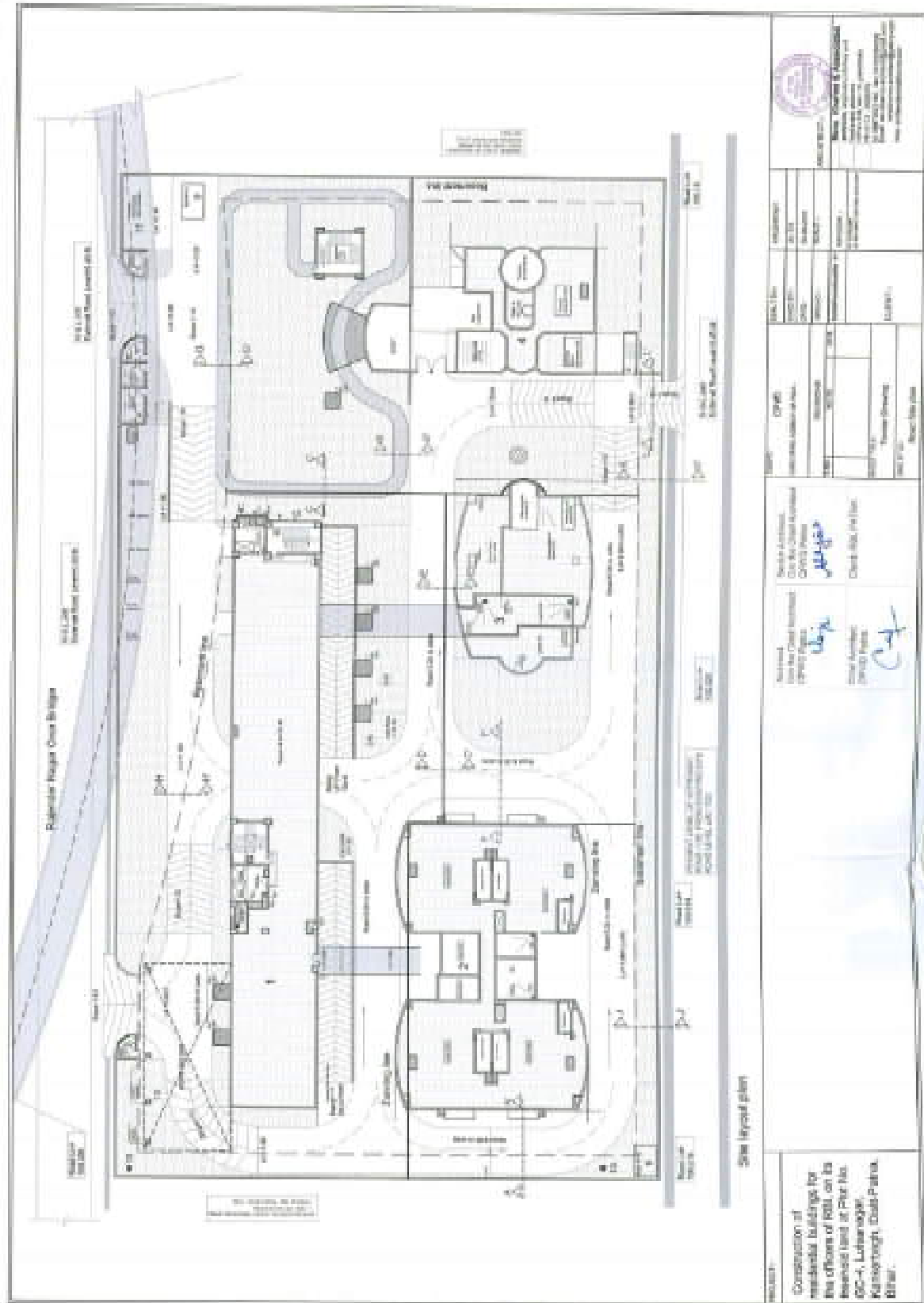


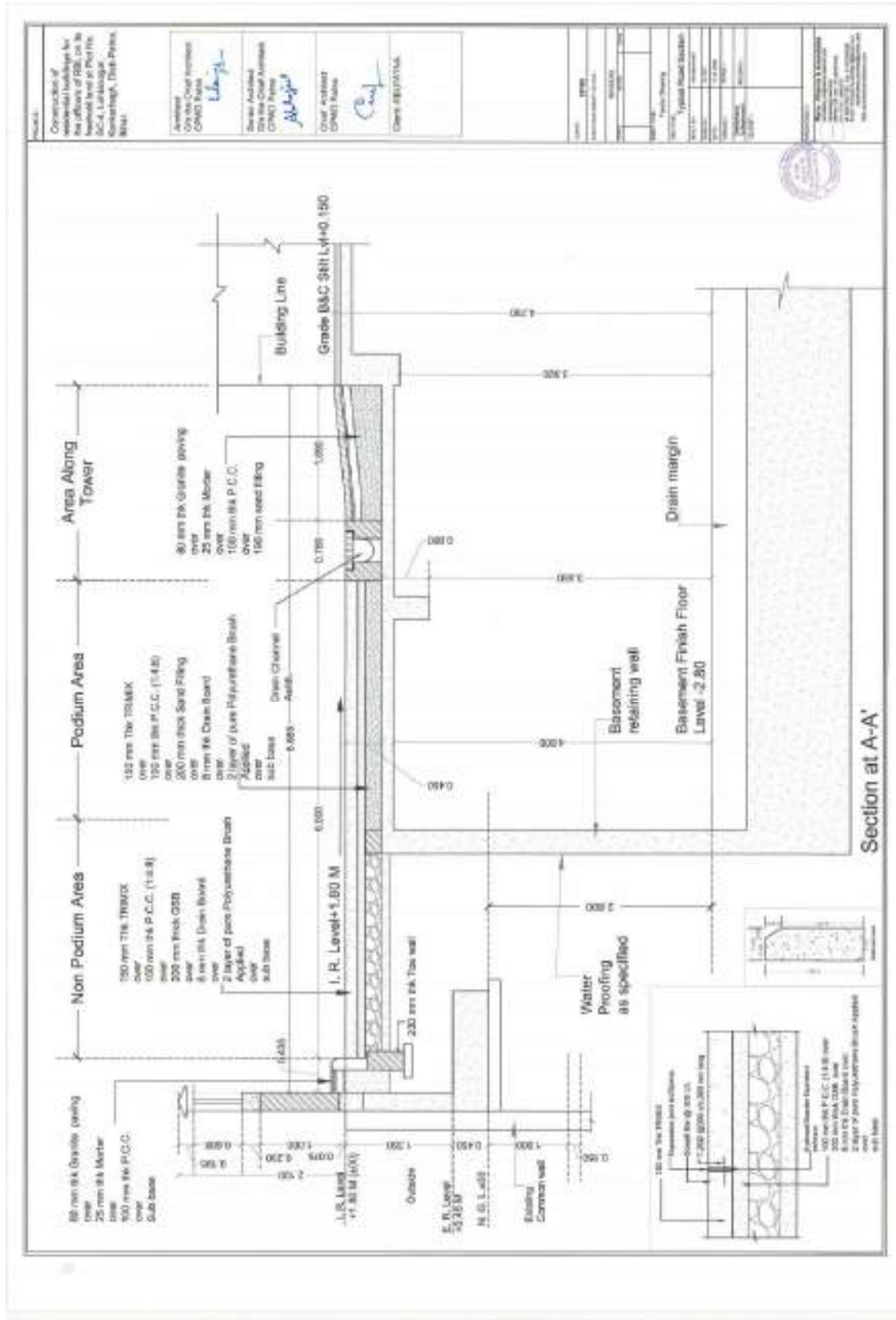


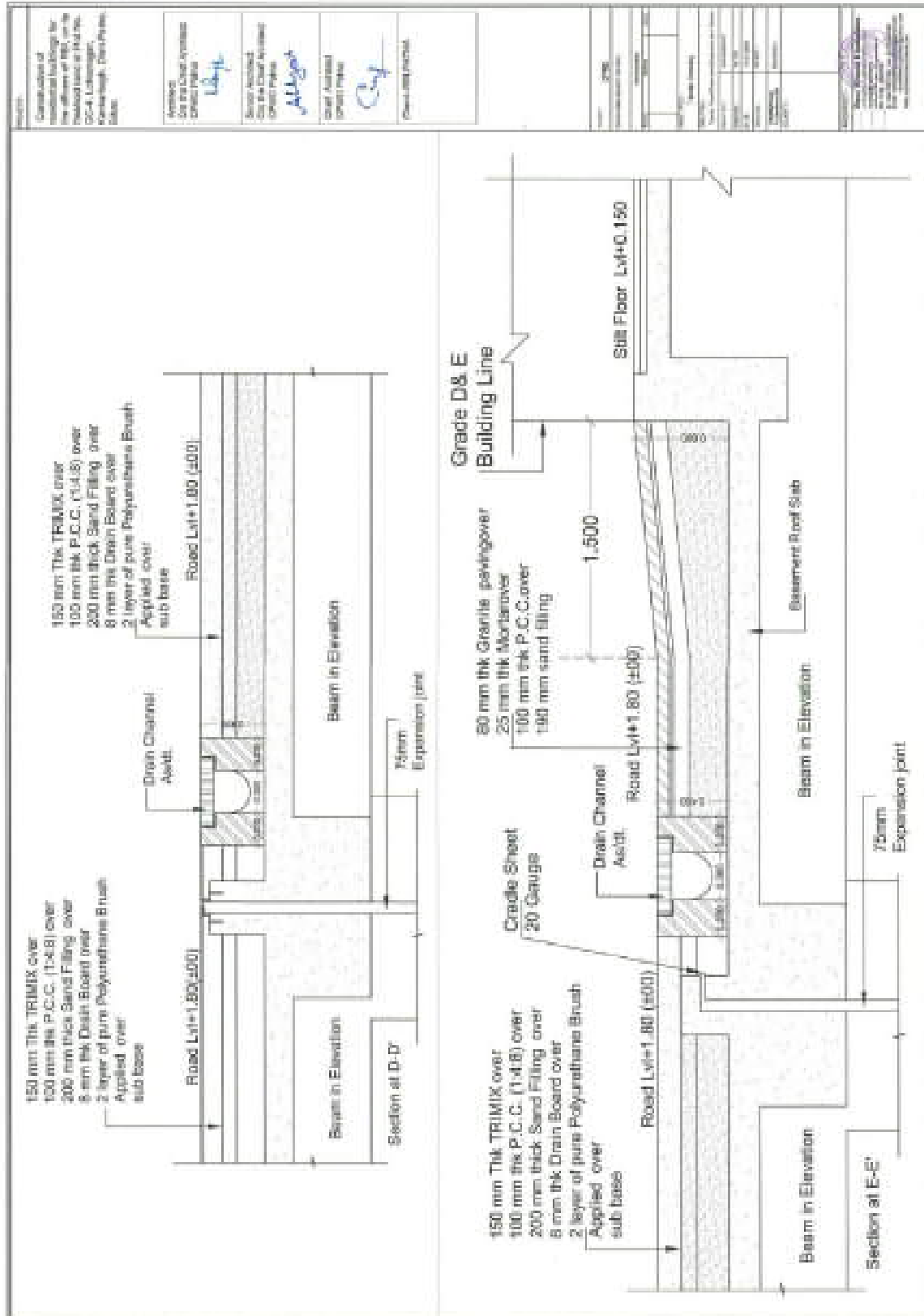


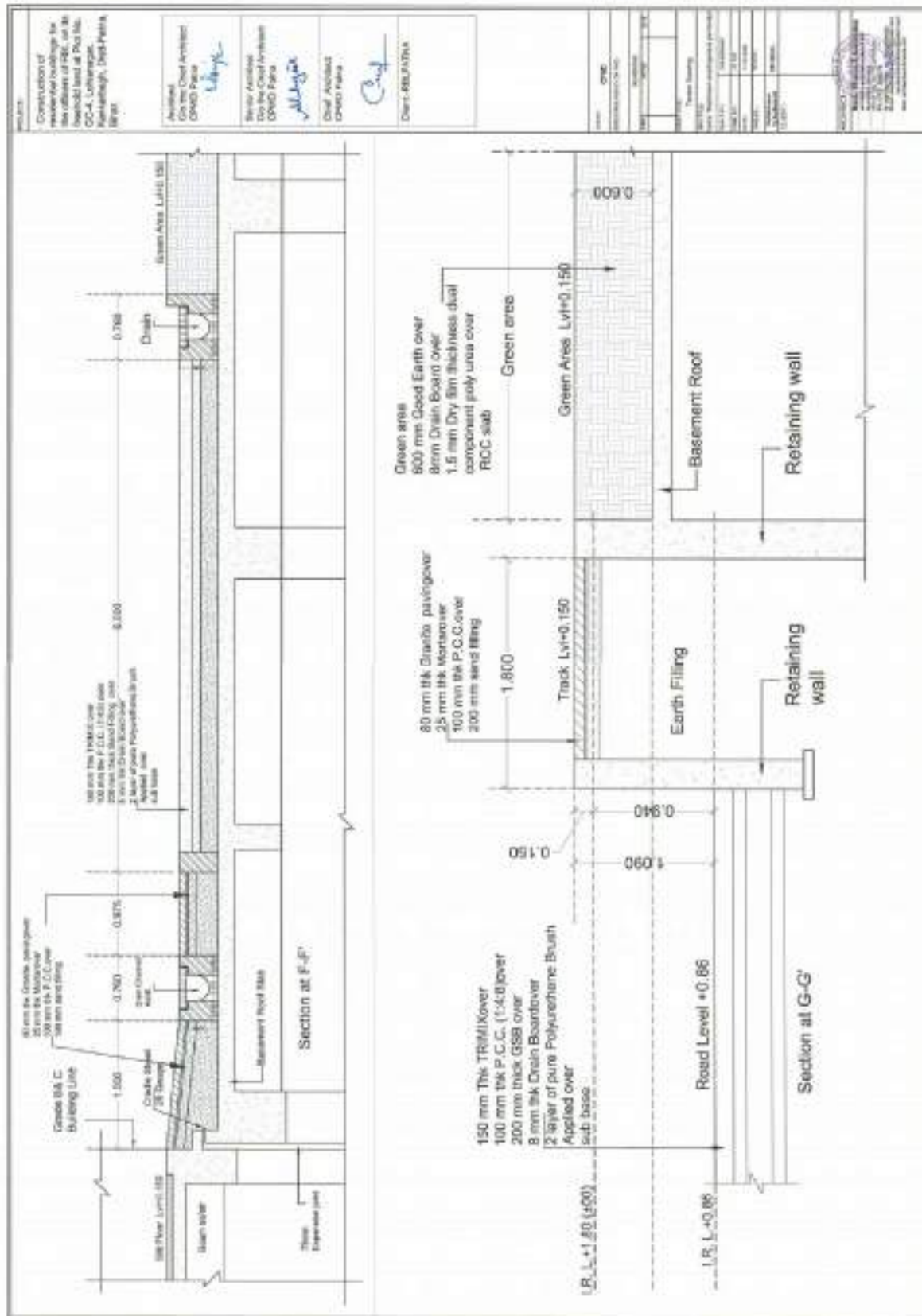


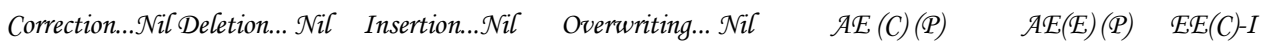


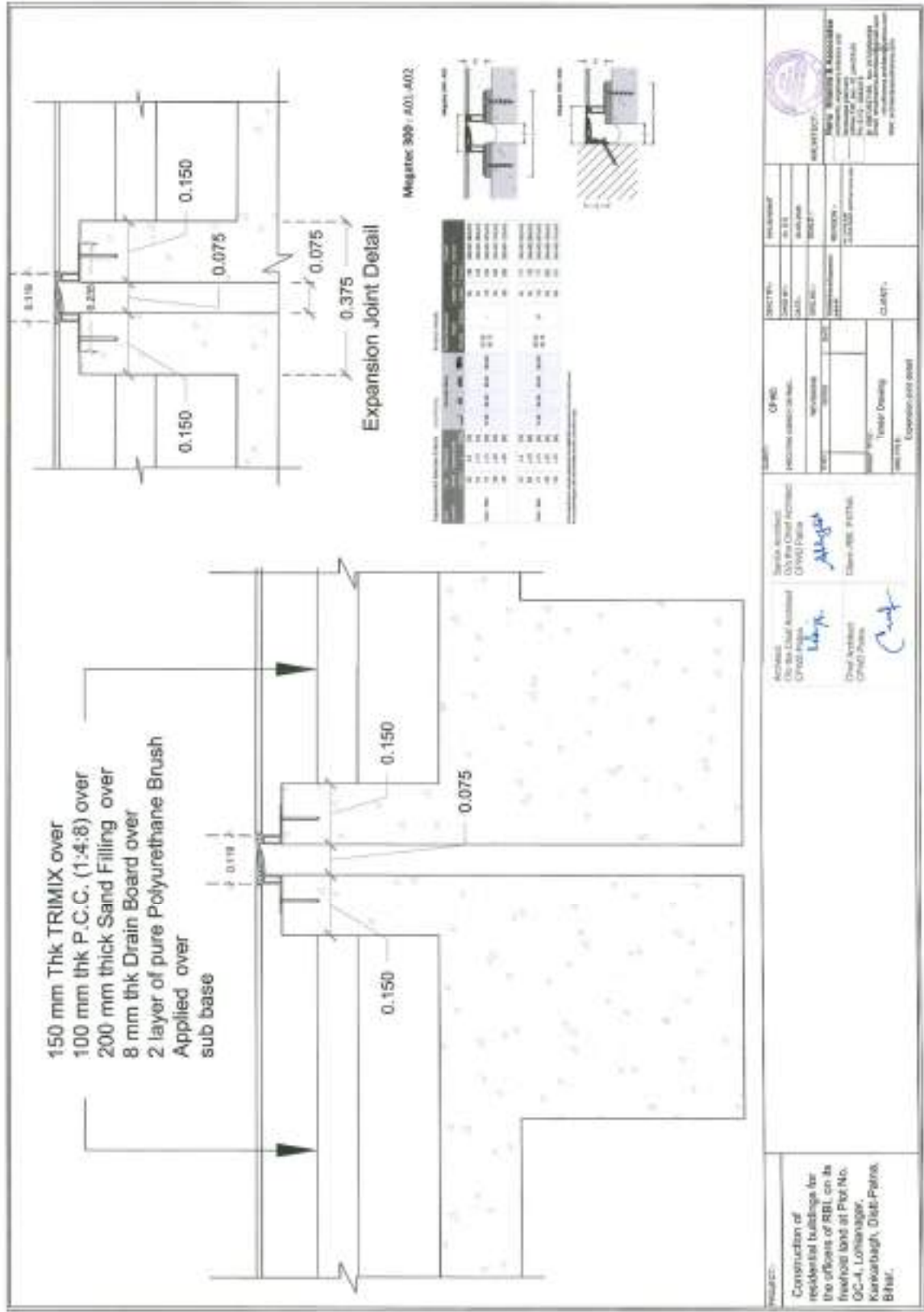


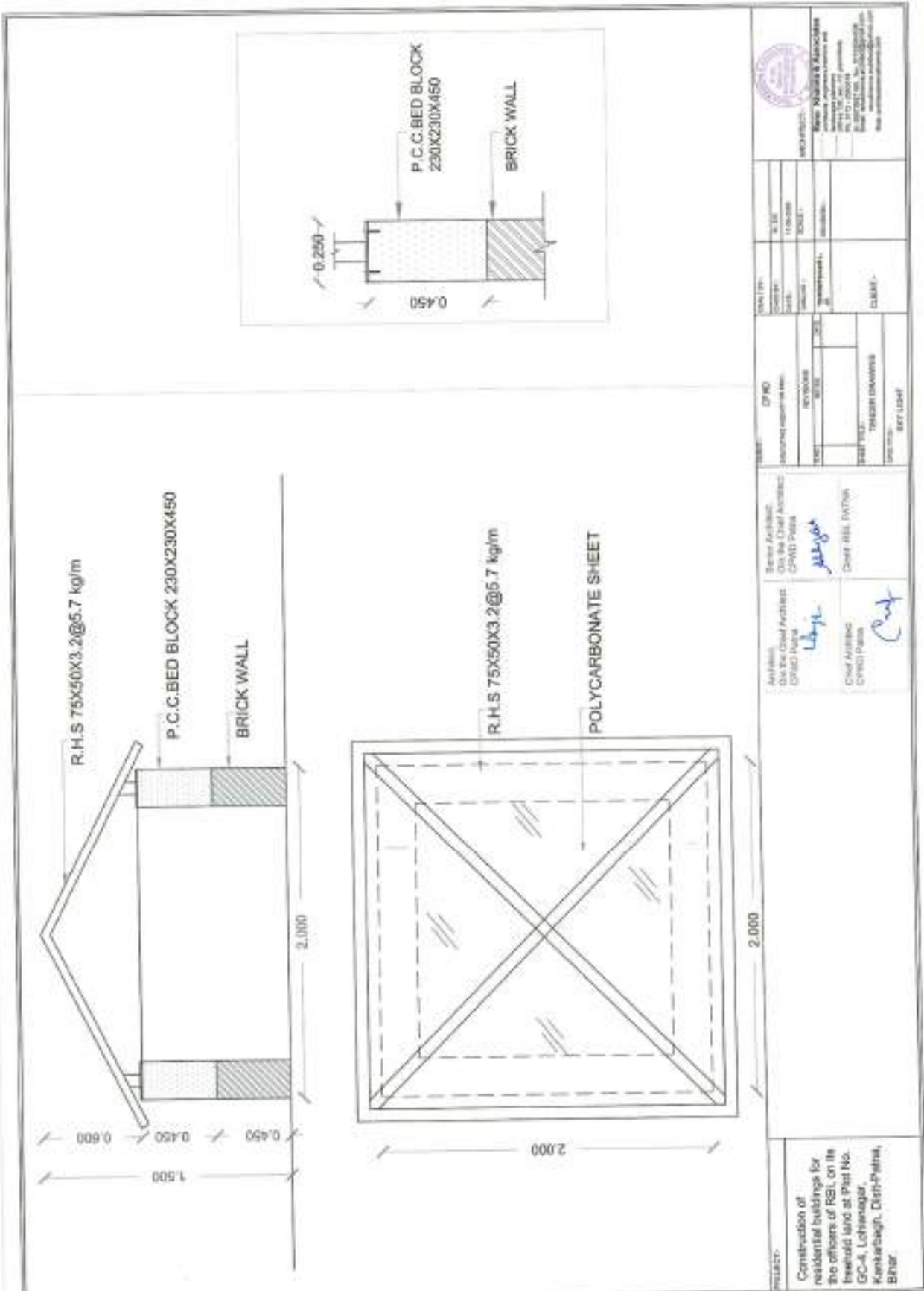


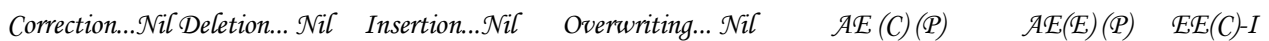




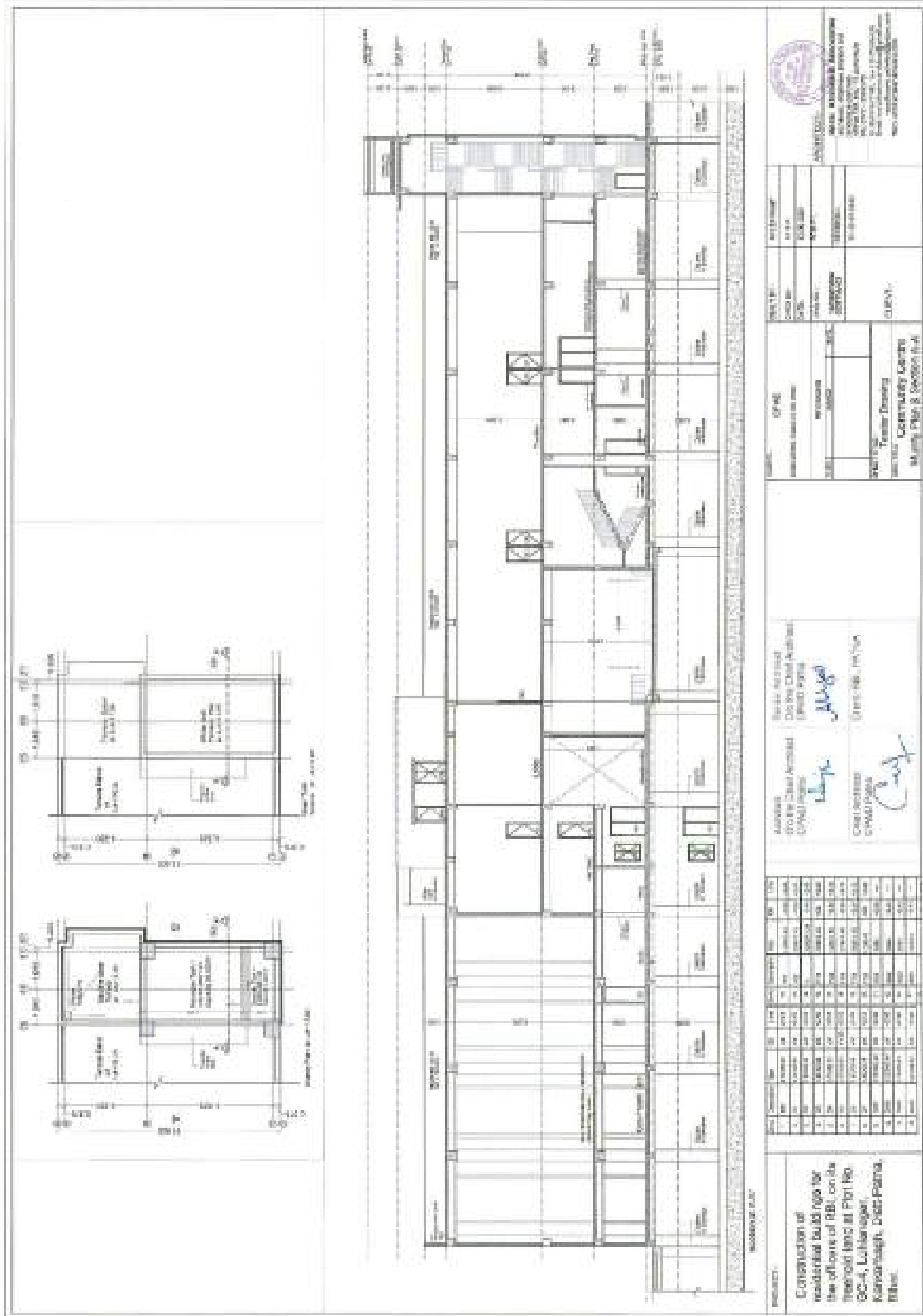












Architectural drawings of a building complex, including a site plan, floor plan, and section. The drawings are labeled 'Section A', 'Section B', and 'Section C'.

Section A: A cross-section of the building showing a central courtyard and multiple rooms. The drawing includes dimensions and labels for various components.

Section B: A cross-section of the building showing a central courtyard and multiple rooms. The drawing includes dimensions and labels for various components.

Section C: A cross-section of the building showing a central courtyard and multiple rooms. The drawing includes dimensions and labels for various components.

Site Plan: A plan view of the building complex showing the layout of the buildings, courtyards, and surrounding area. The drawing includes dimensions and labels for various components.

Floor Plan: A plan view of the building showing the layout of the rooms, corridors, and other interior spaces. The drawing includes dimensions and labels for various components.

Legend: A key for the symbols and labels used in the drawings.

Notes: A list of notes providing additional information about the drawings.

Scale: A scale bar indicating the dimensions of the drawings.

Author: The name of the person who created the drawings.

Date: The date when the drawings were created.

Project: The name of the project.

Client: The name of the client.

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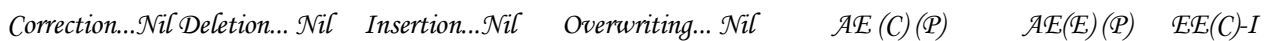
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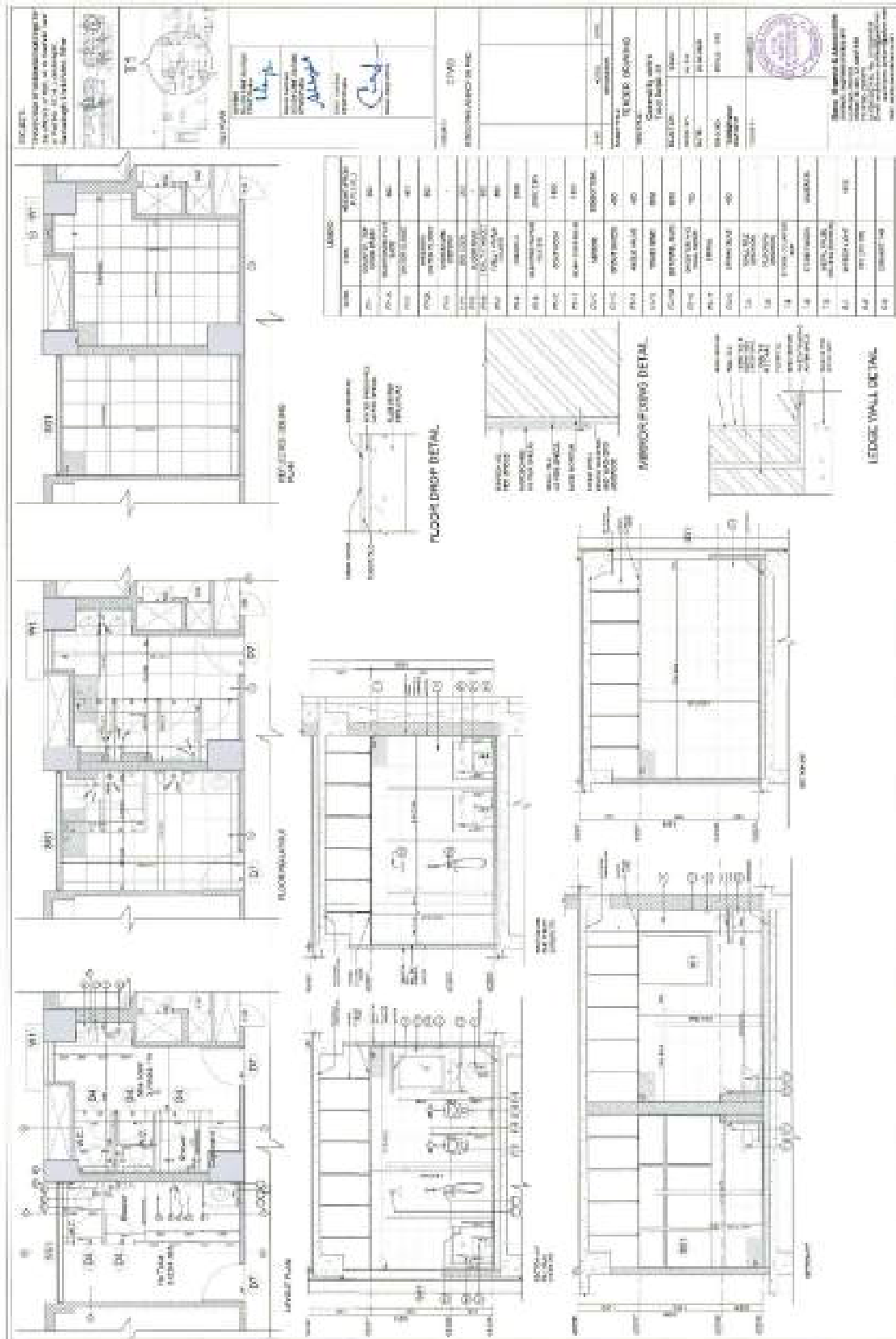
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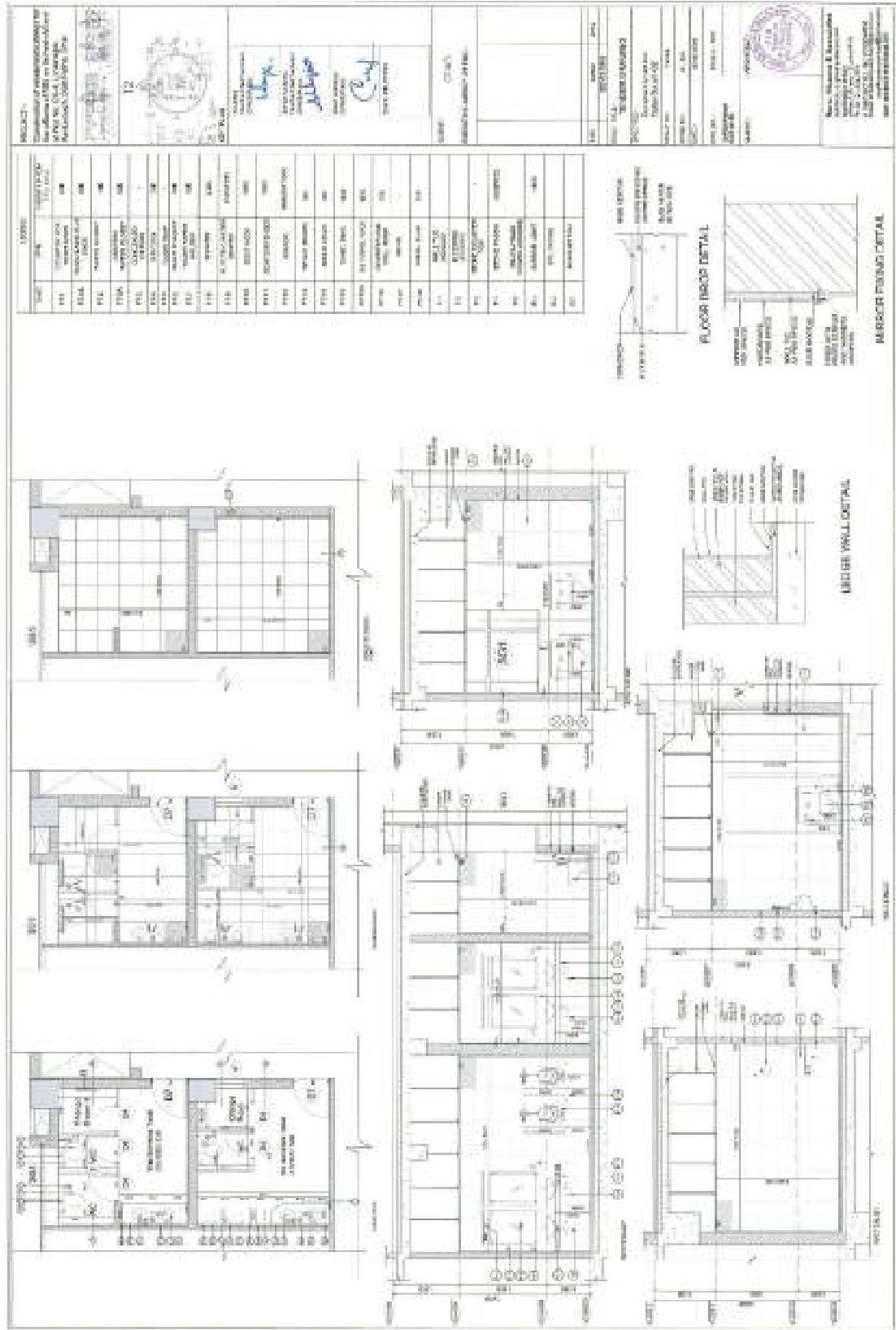
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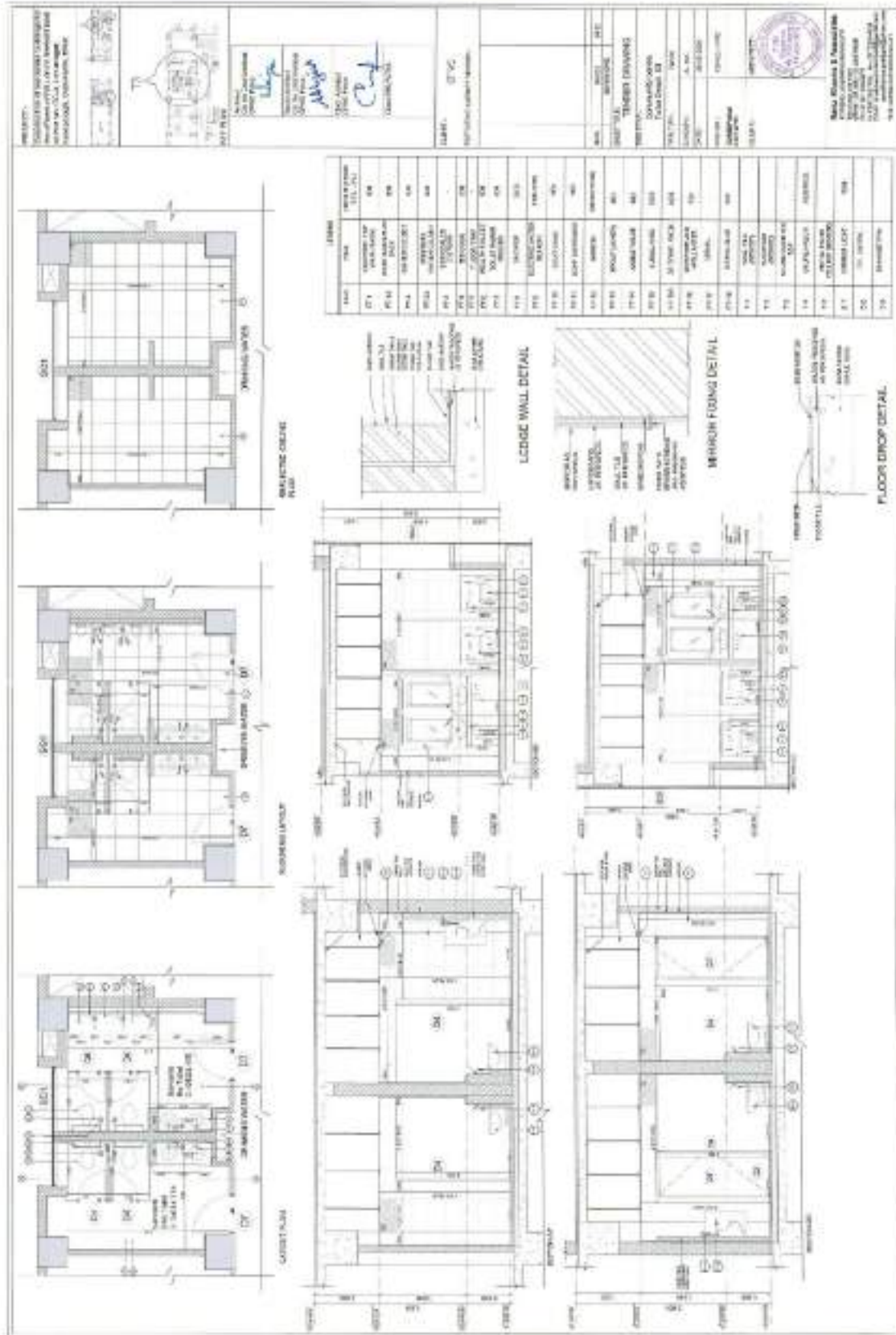
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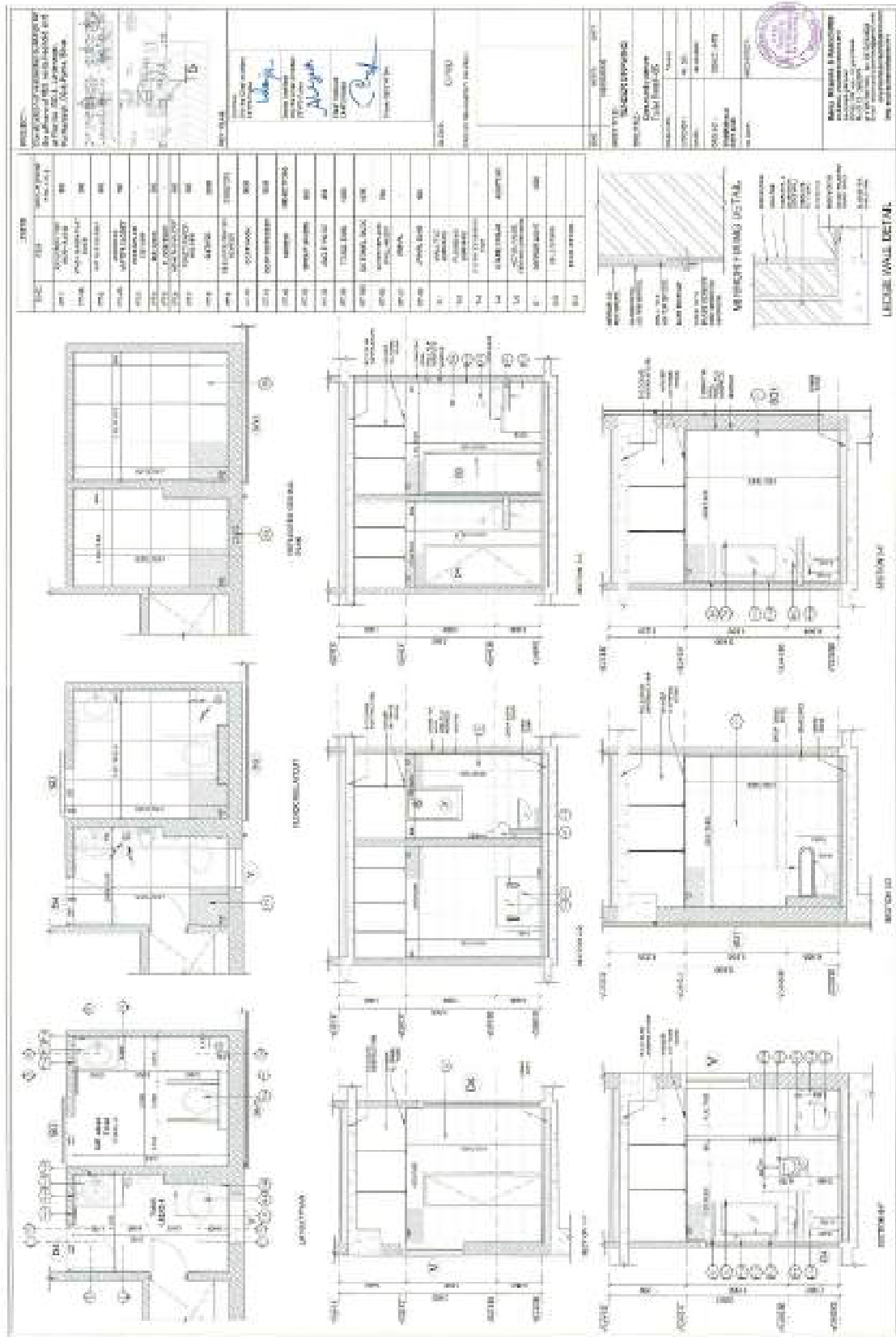
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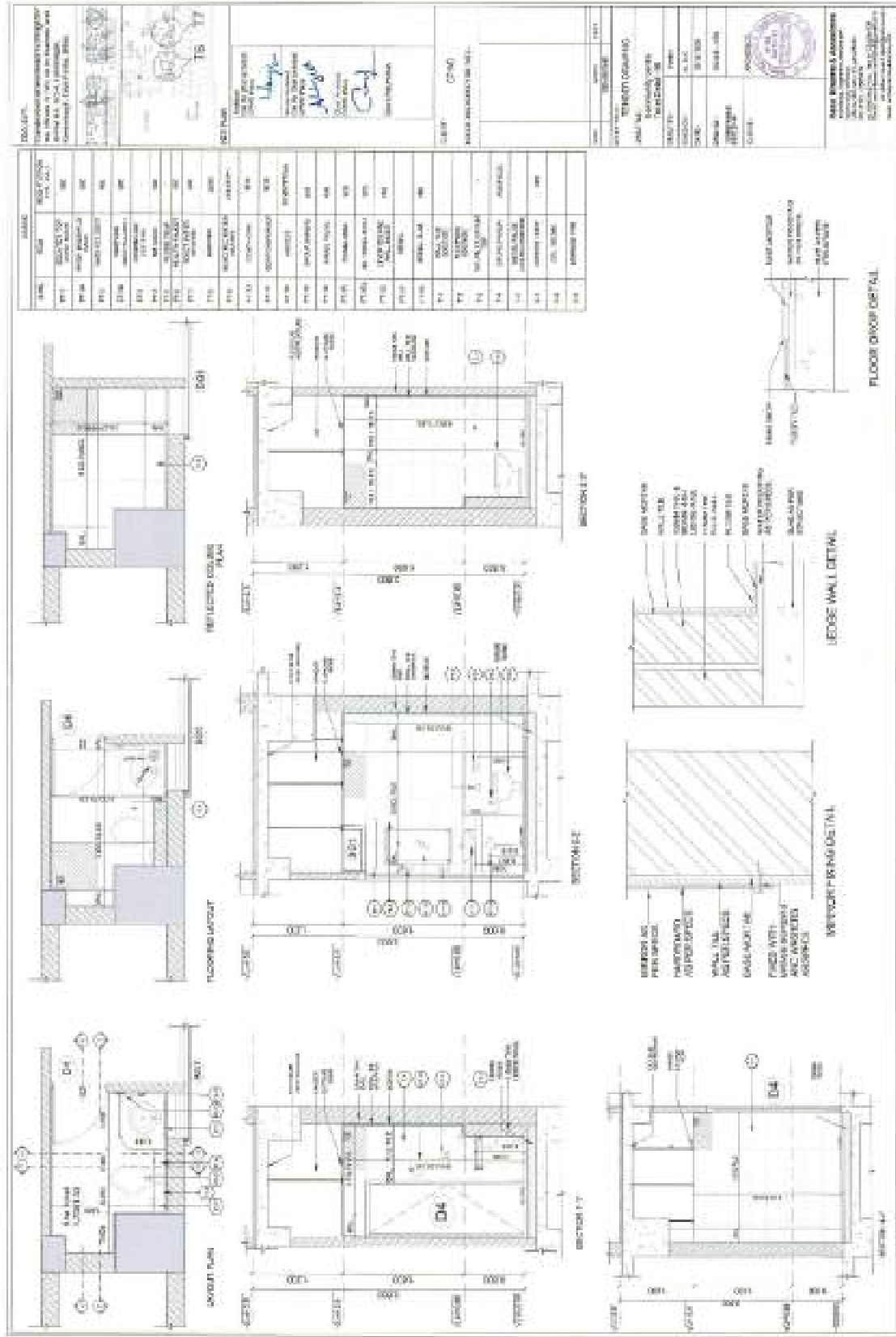


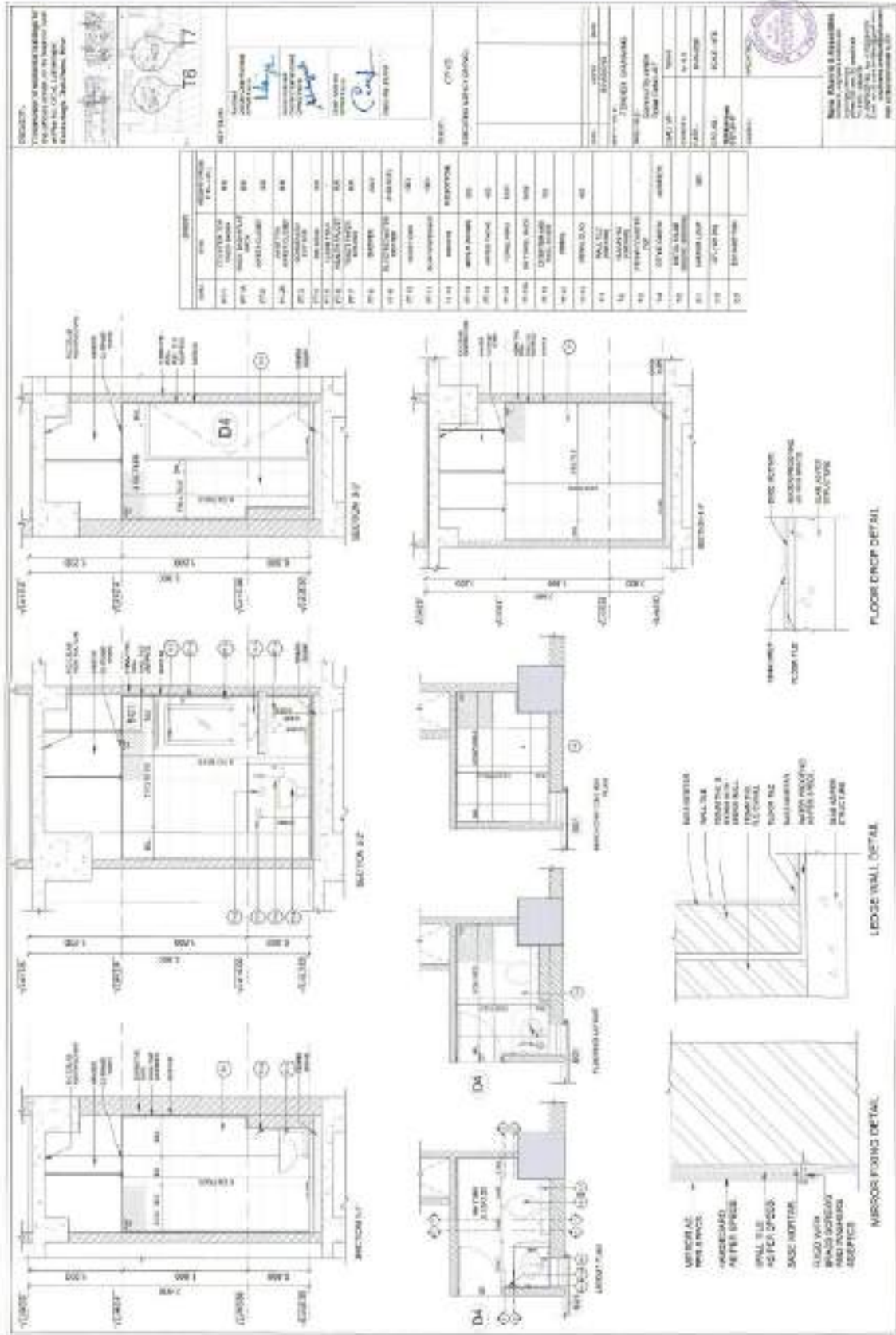


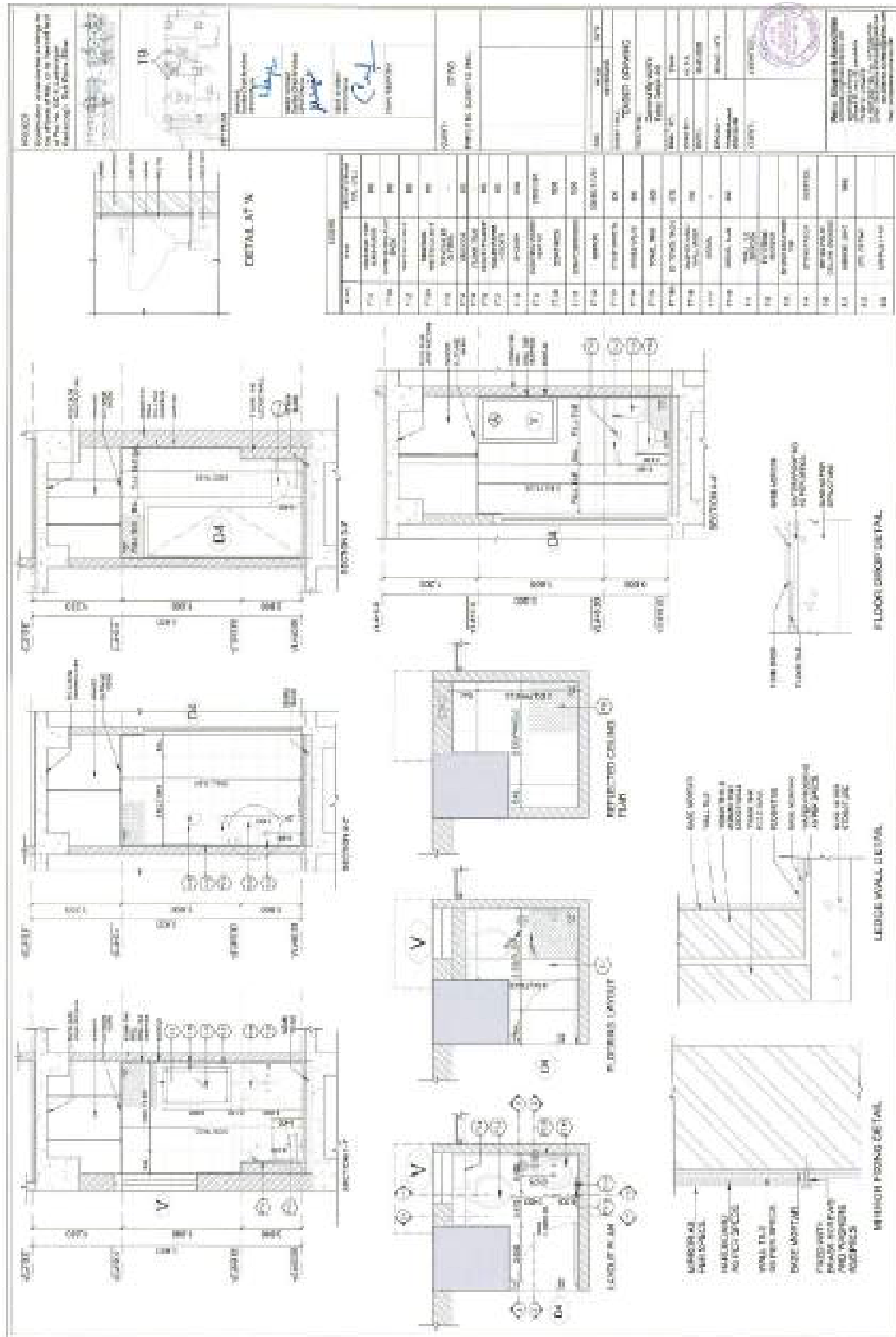


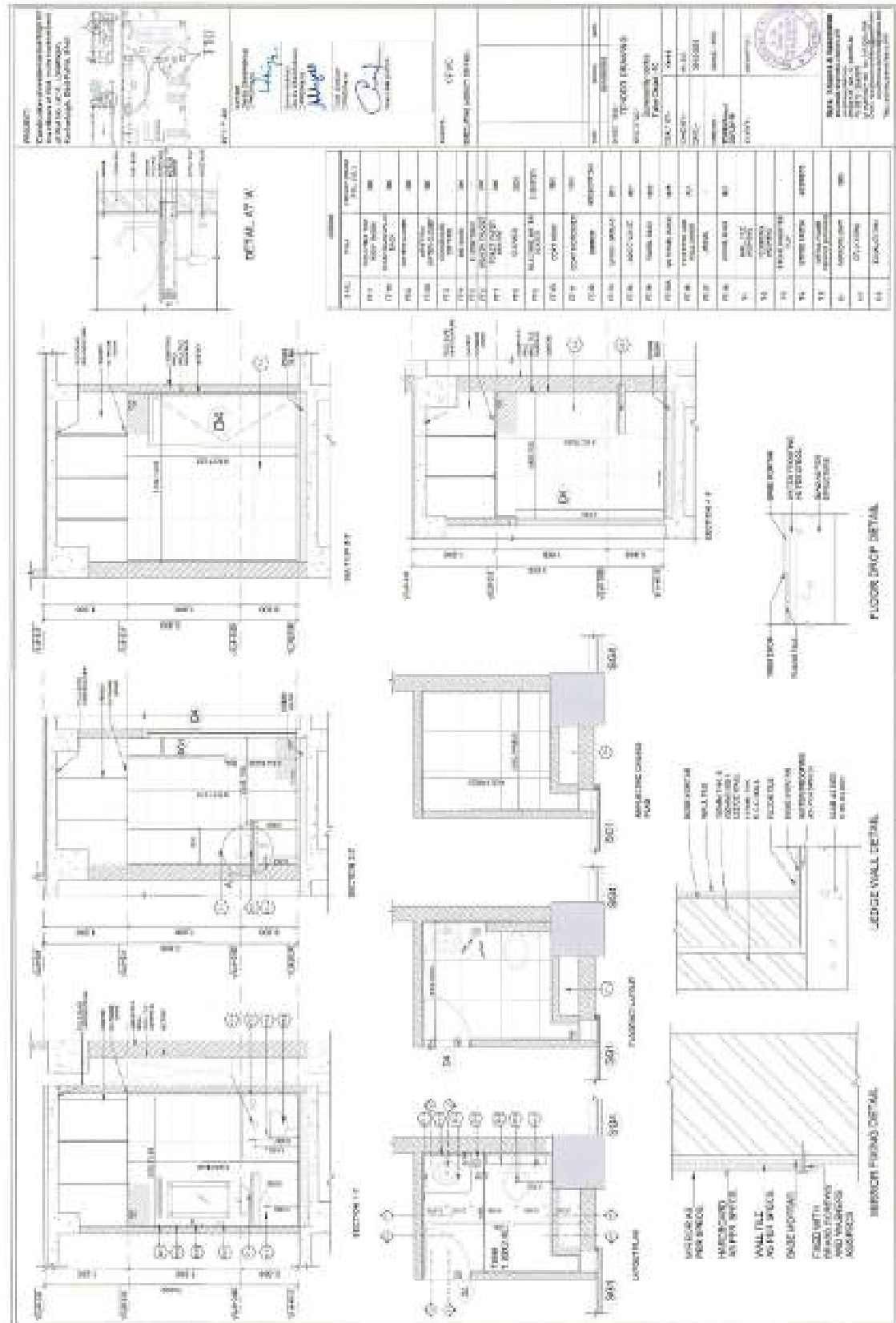


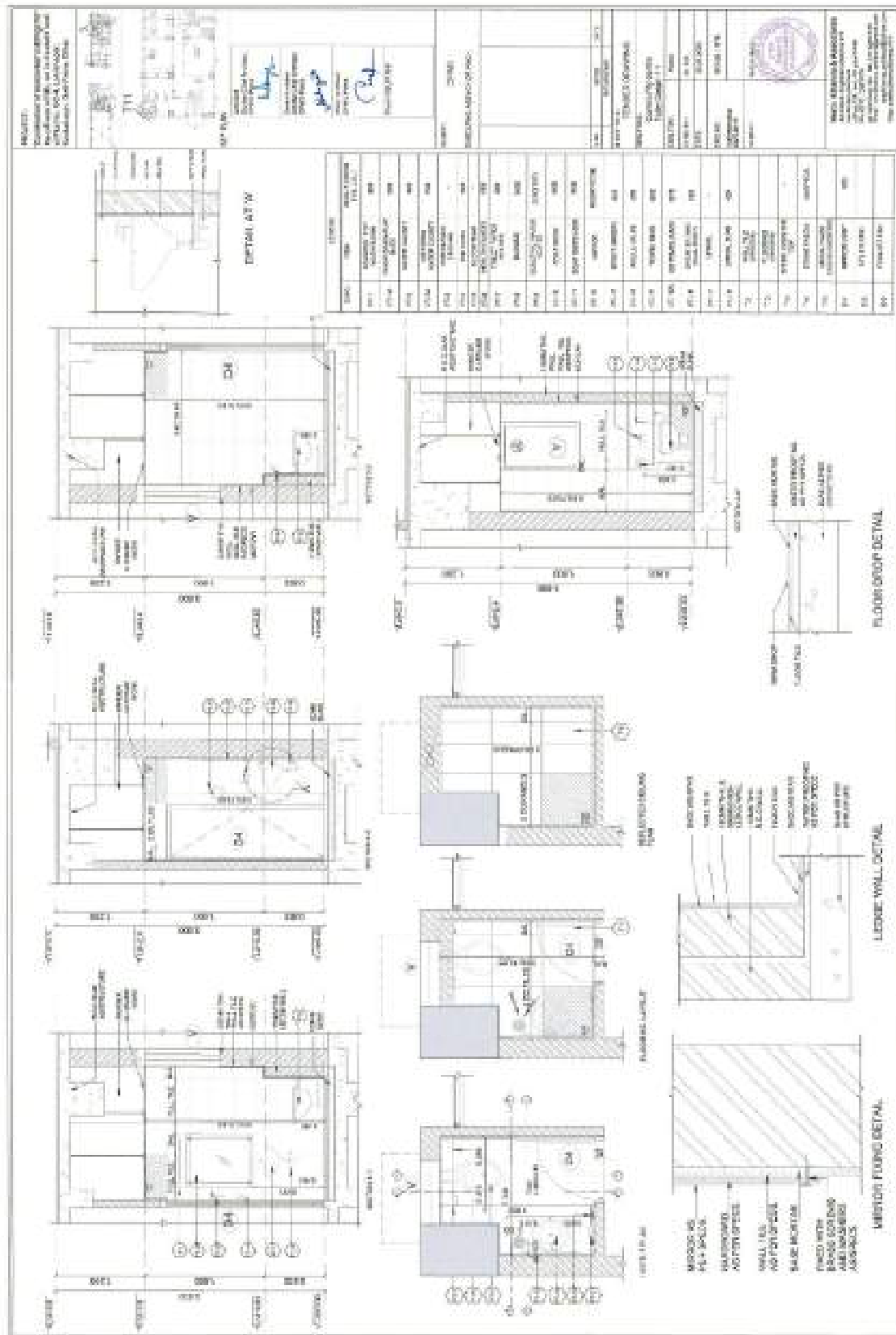


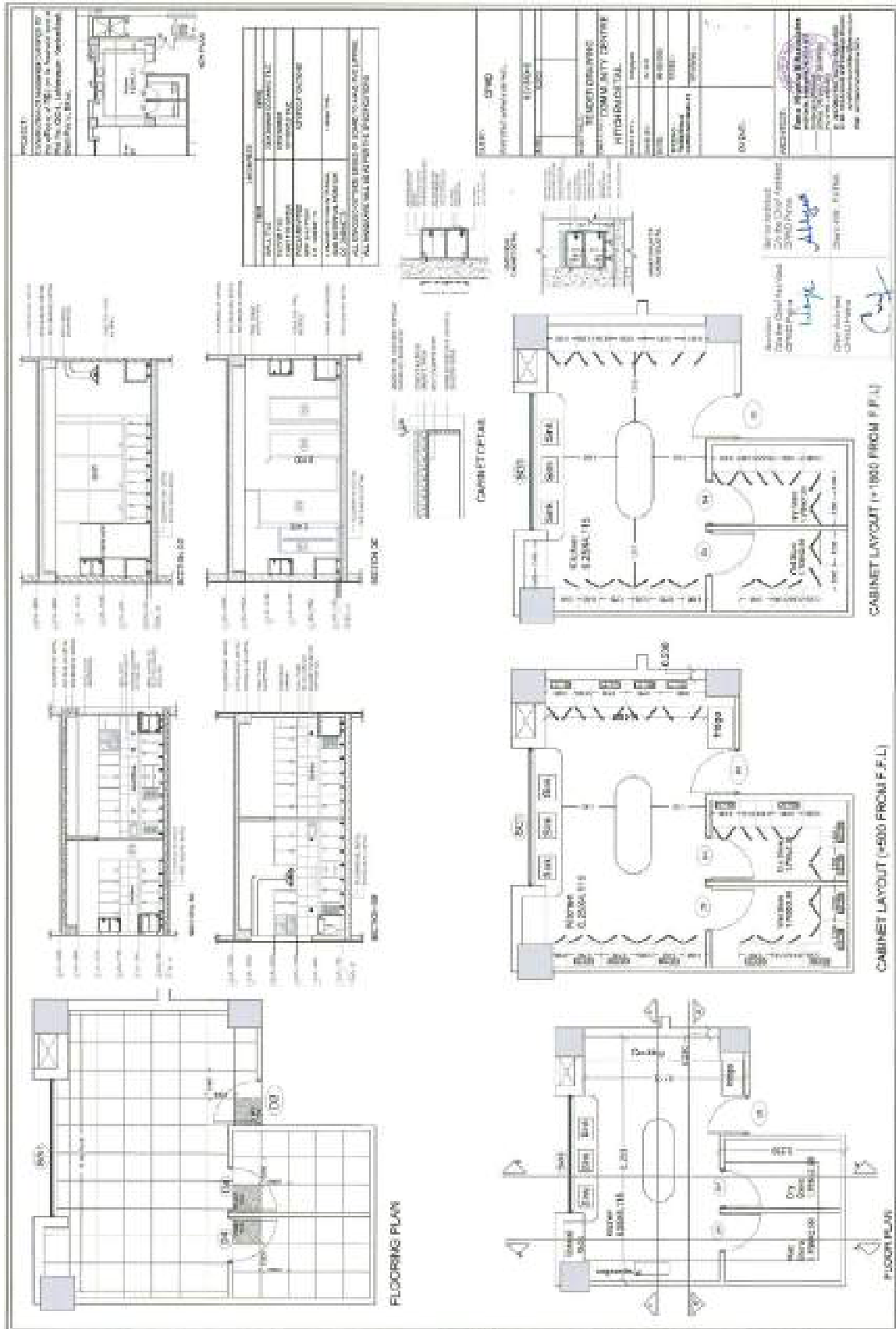


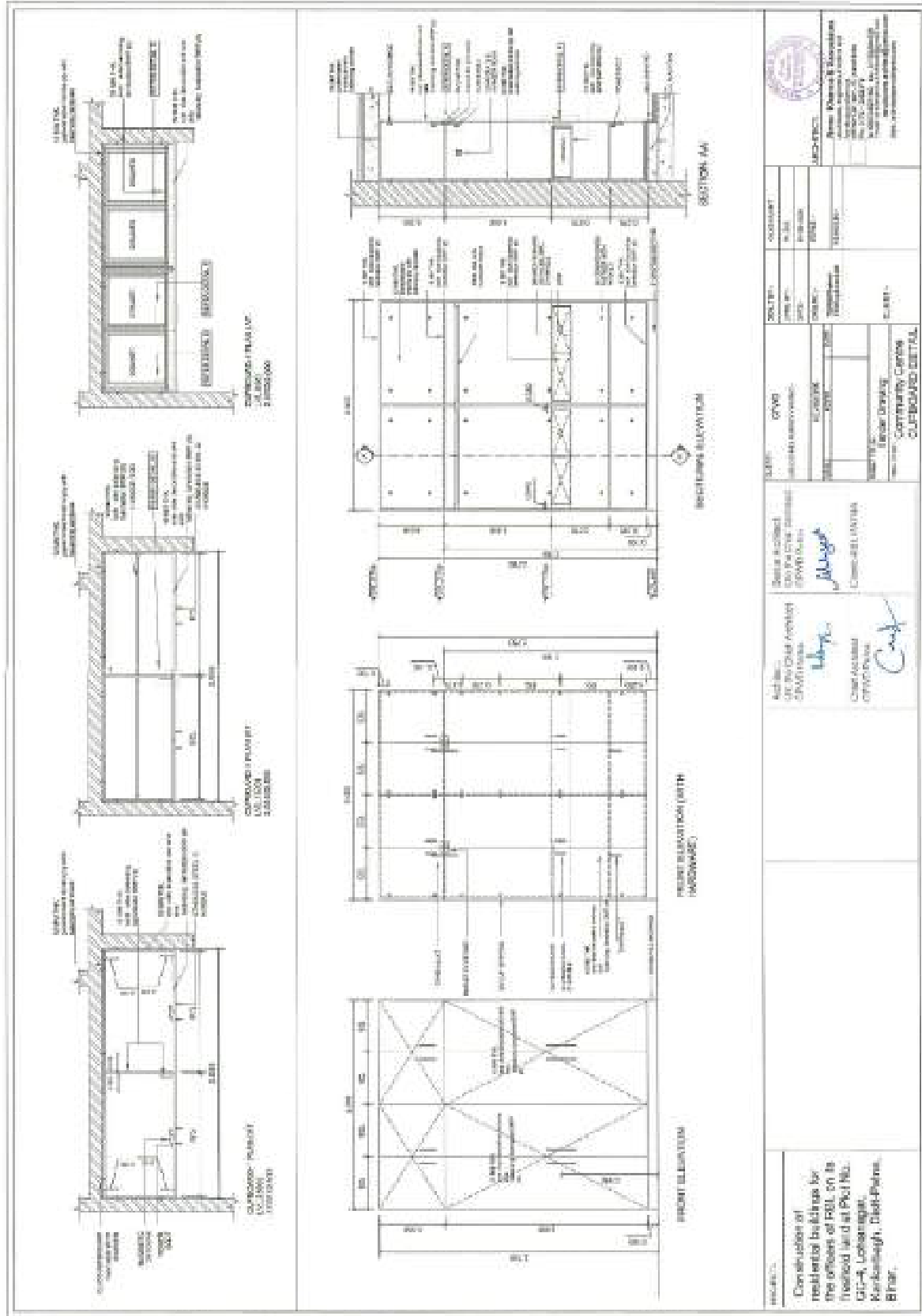


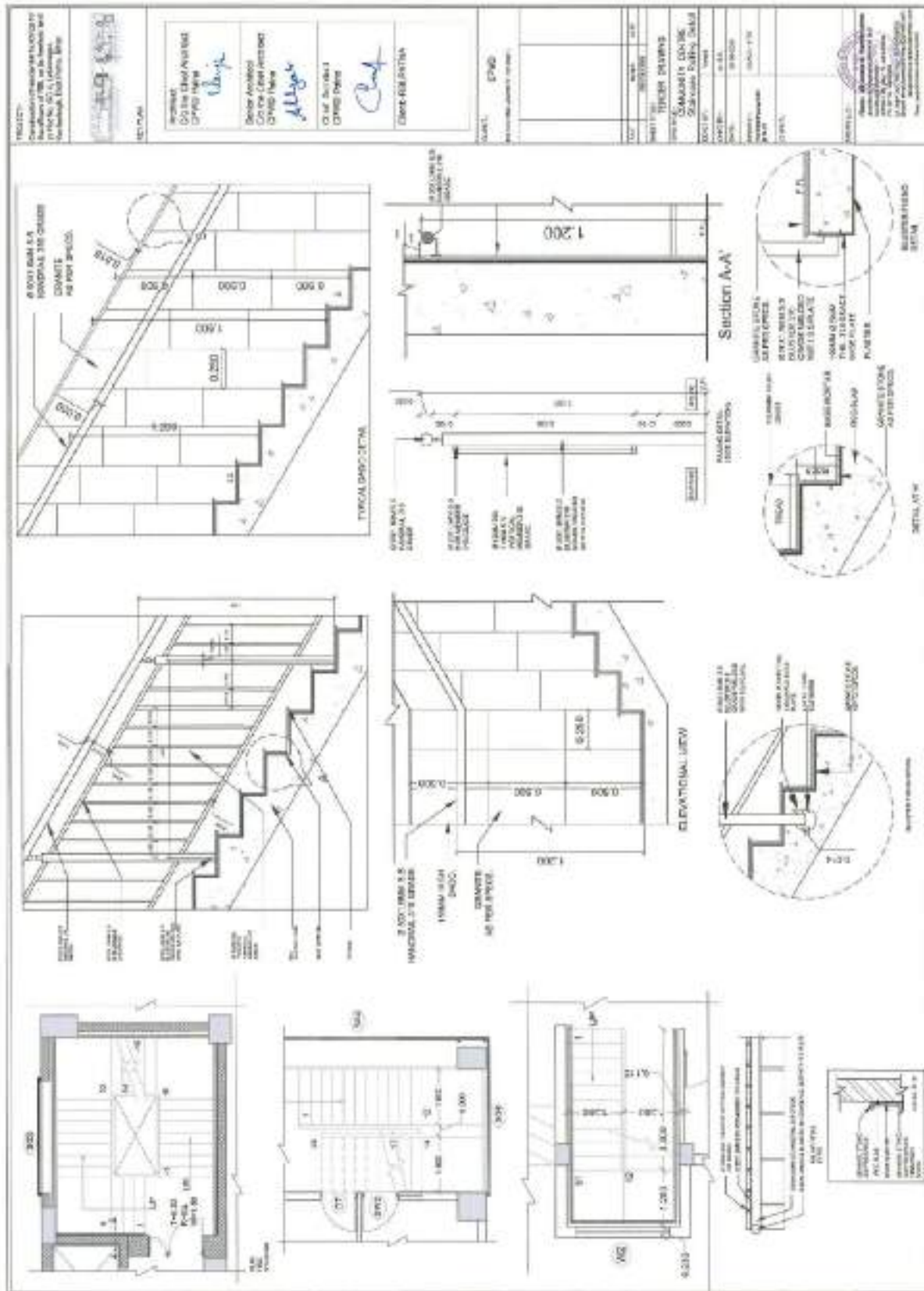


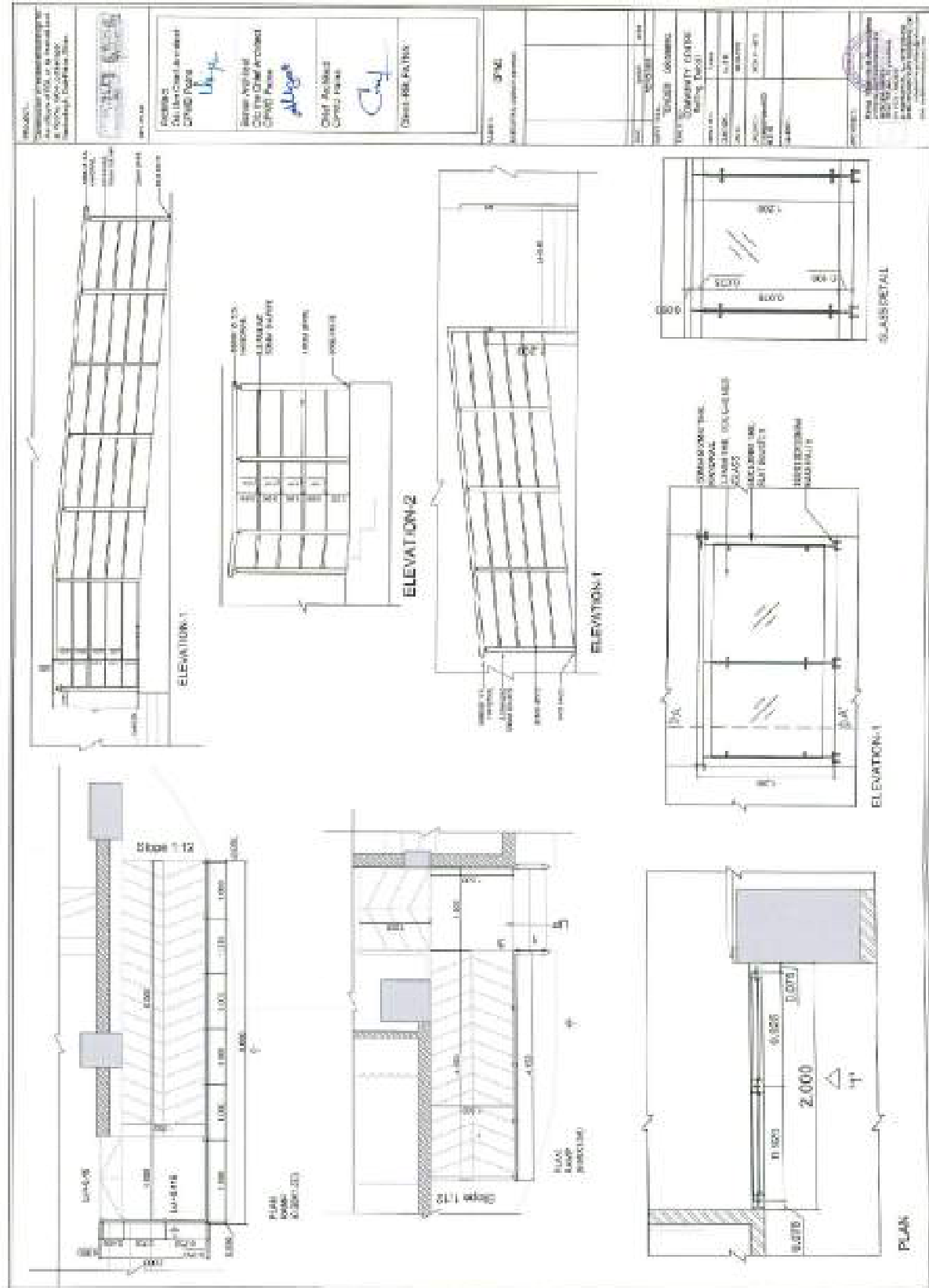


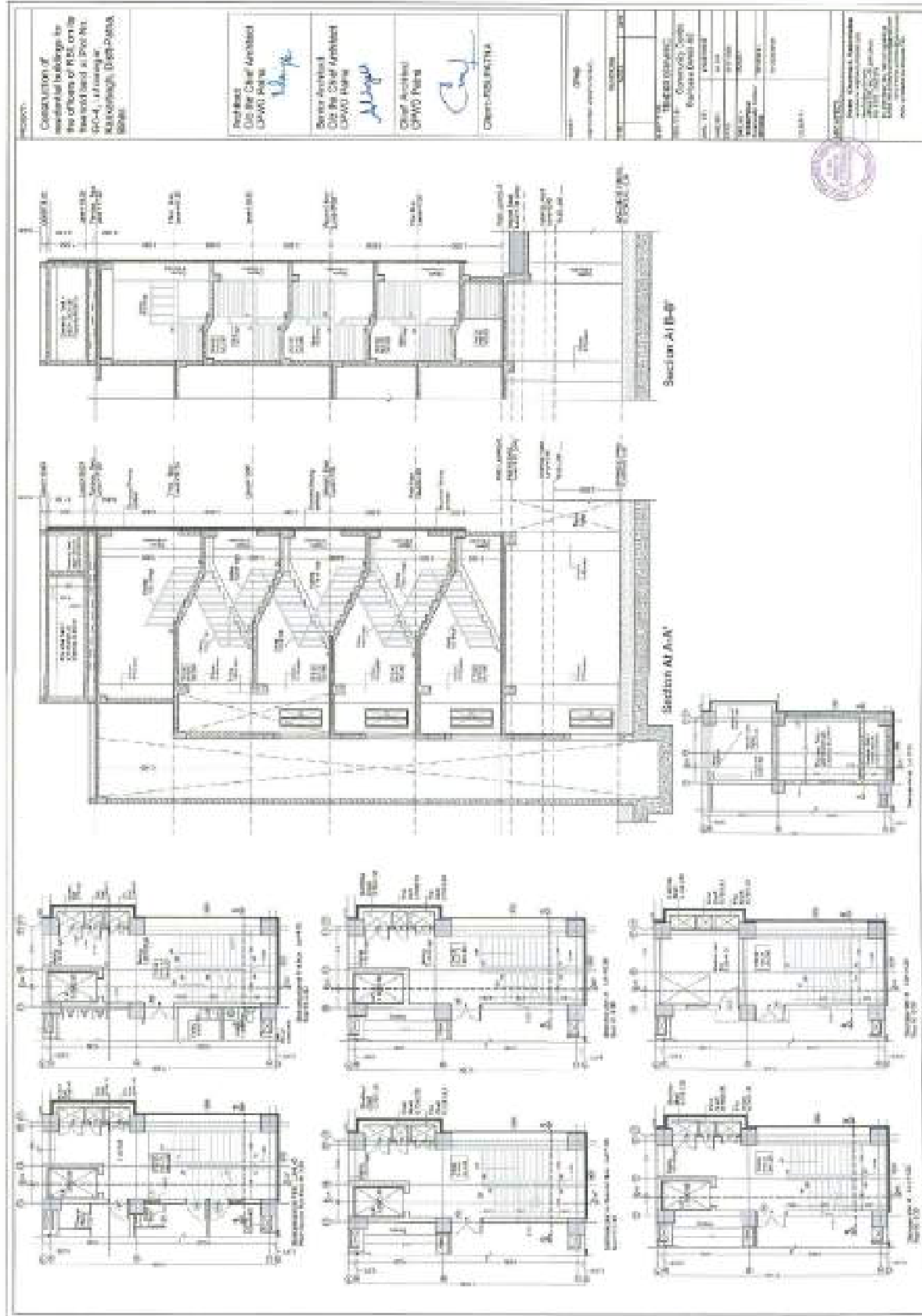












Architectural drawings of a residential building, including floor plans and a section view. The drawings show a complex layout with multiple rooms, corridors, and a large central area. The drawings are color-coded: green for existing structures, yellow for new additions, and blue for structural elements. The drawings are oriented vertically on the page.

Legend:

Color	Description
Green	Existing Structure
Yellow	New Addition
Blue	Structural Elements

Project Information:

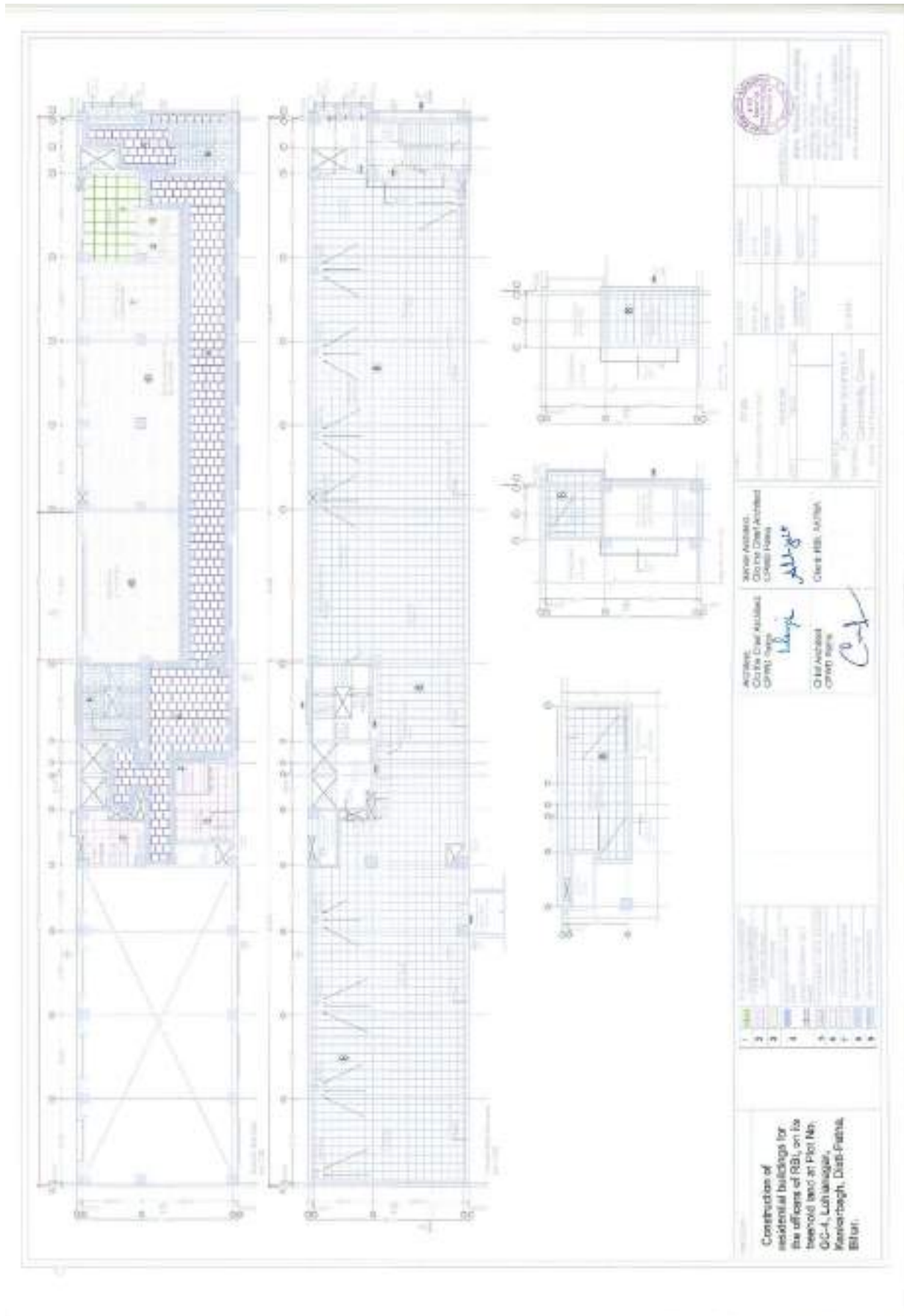
Project Name: Residential Building
 Client: Mr. X
 Date: 10/10/2020
 Scale: 1:50

Approval:

Architect: [Signature]
 Engineer: [Signature]
 Surveyor: [Signature]

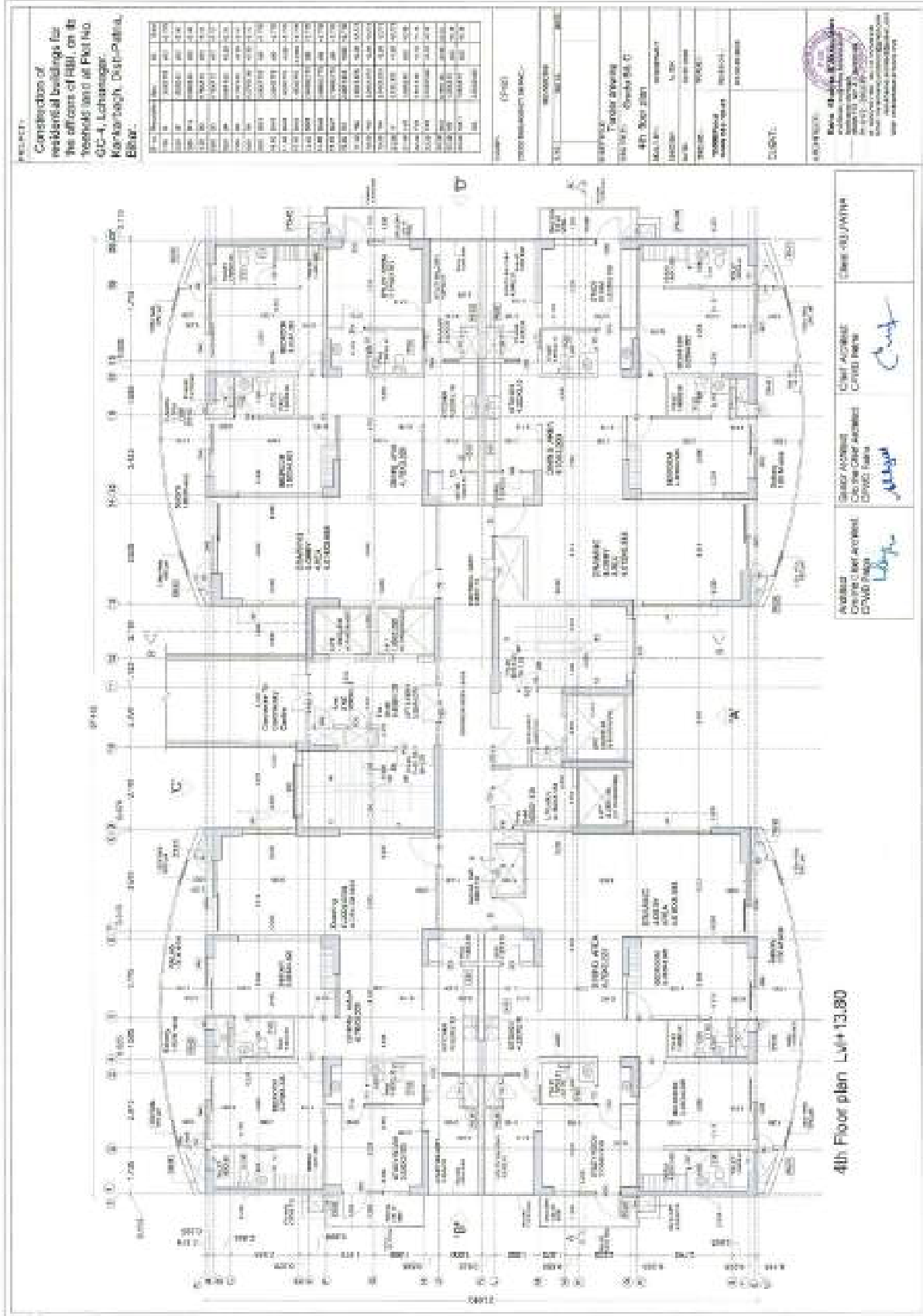
Notes:

1. All dimensions are in meters.
 2. The drawings are for the purpose of construction.
 3. The drawings are subject to change without notice.



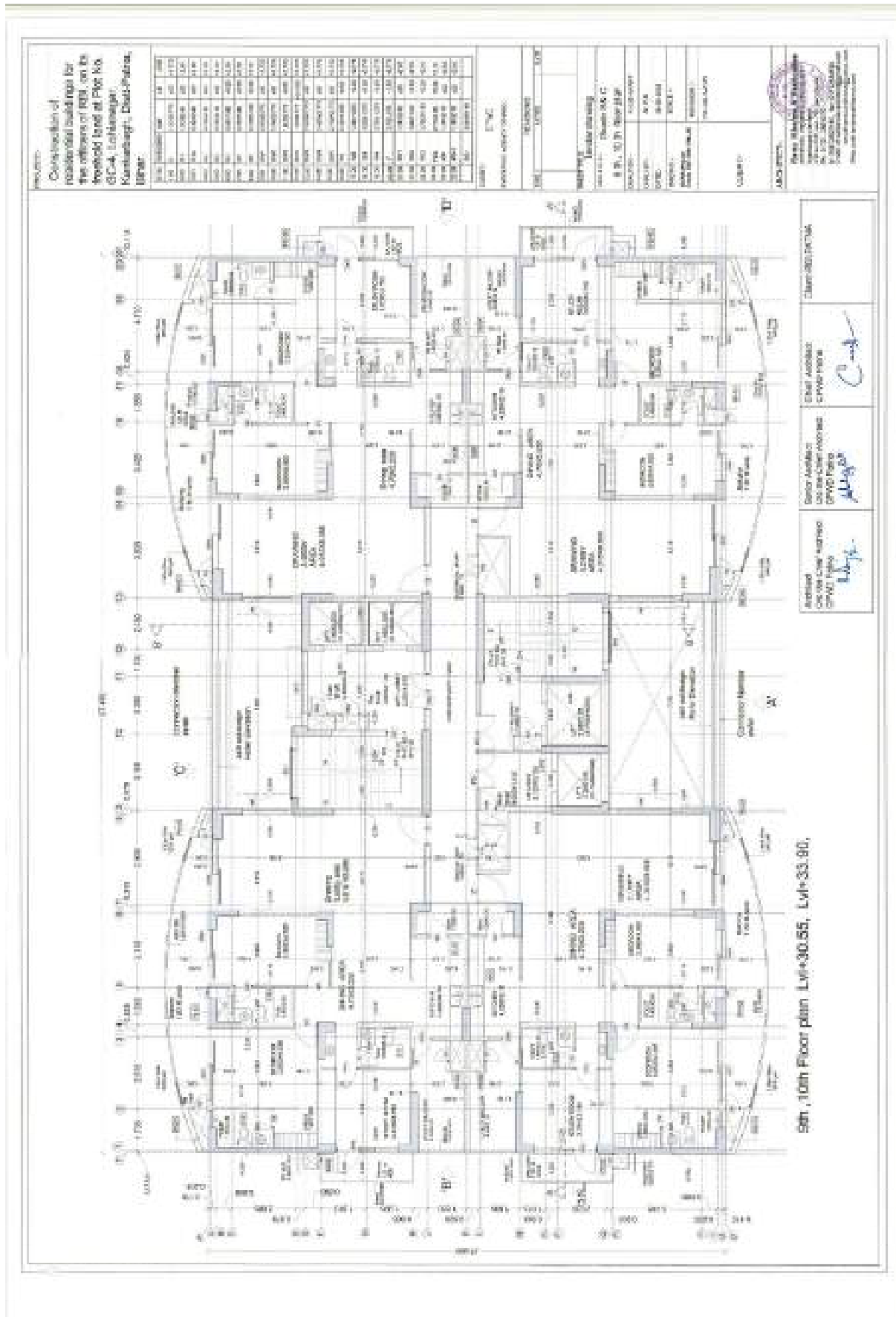


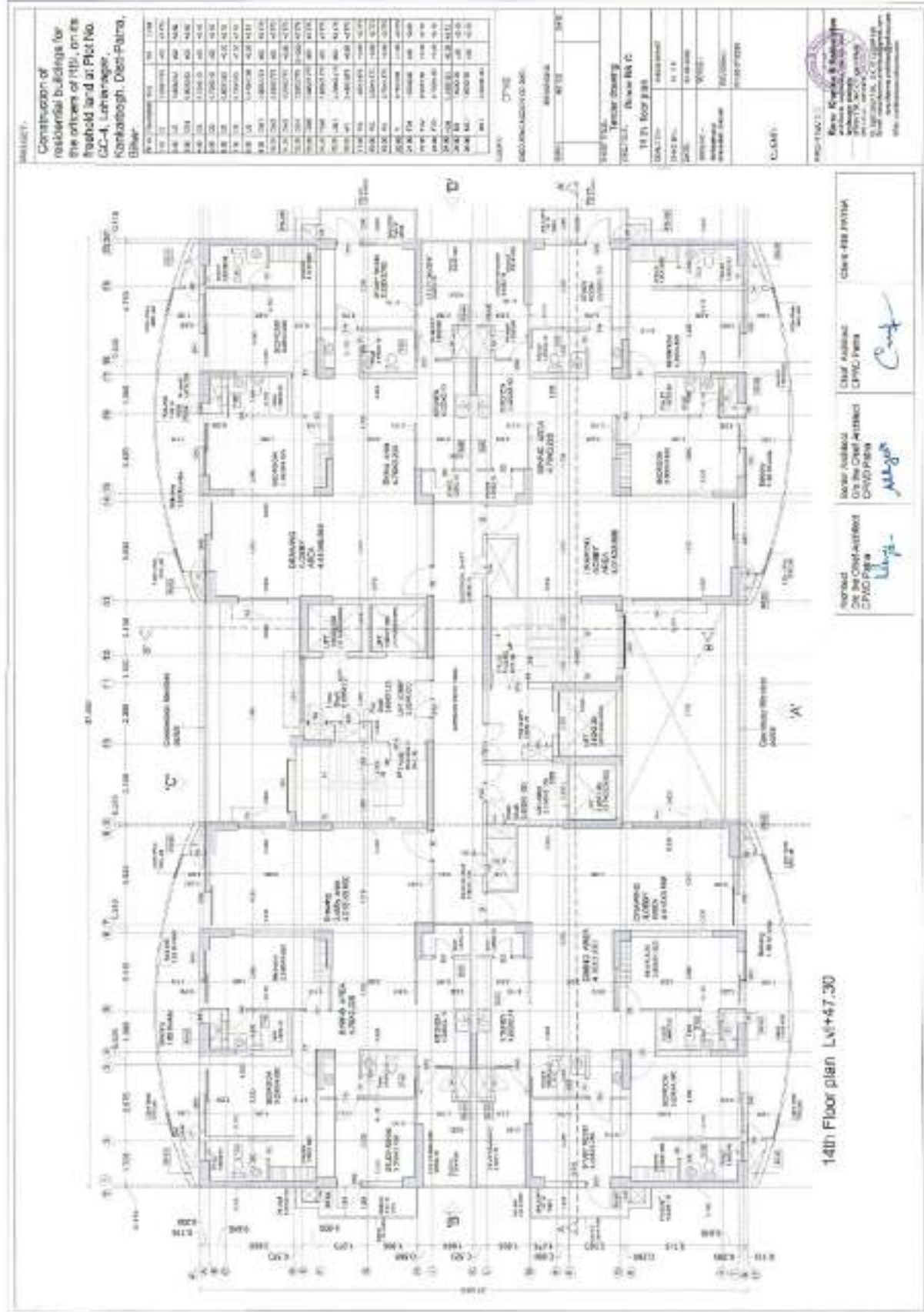


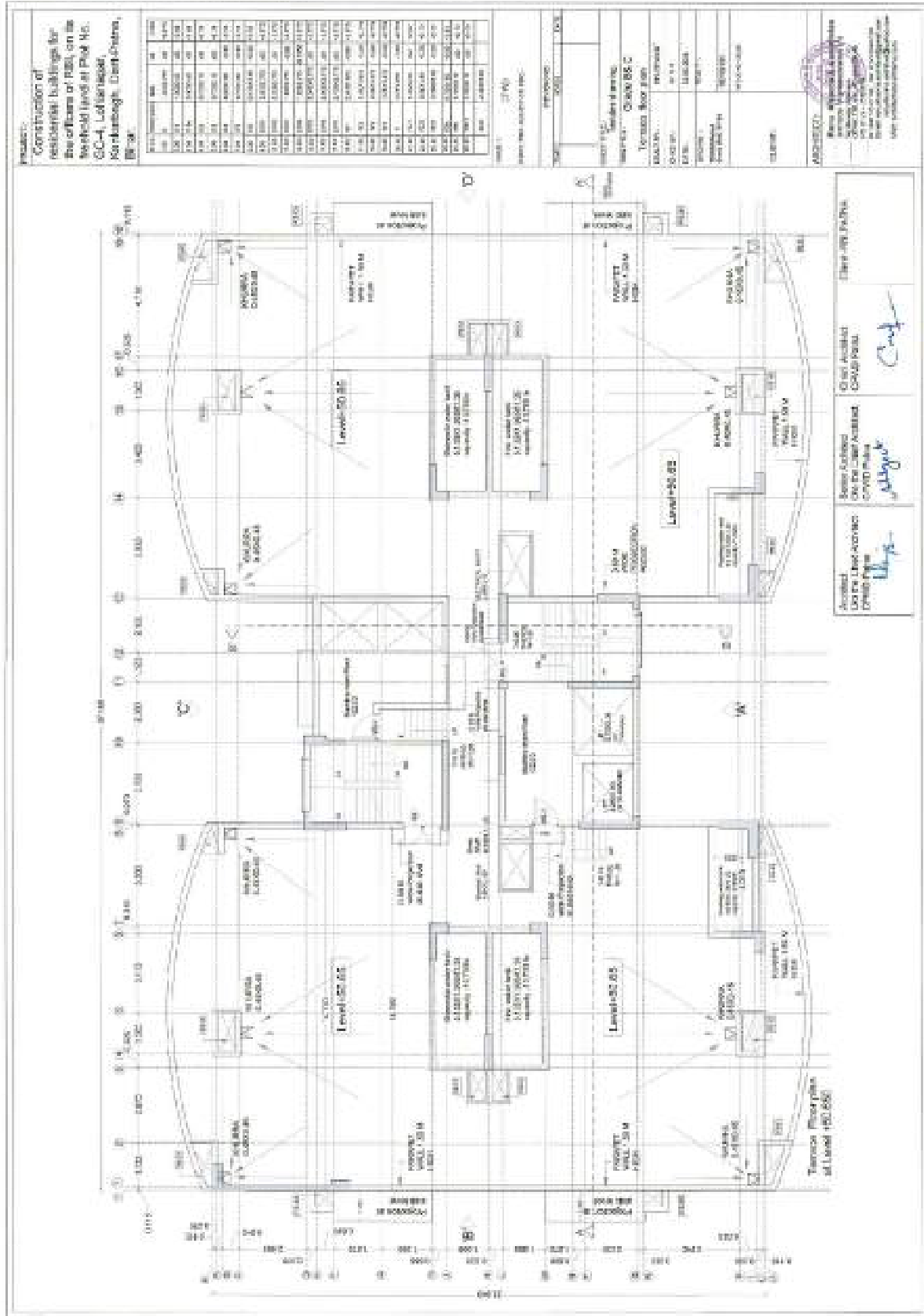






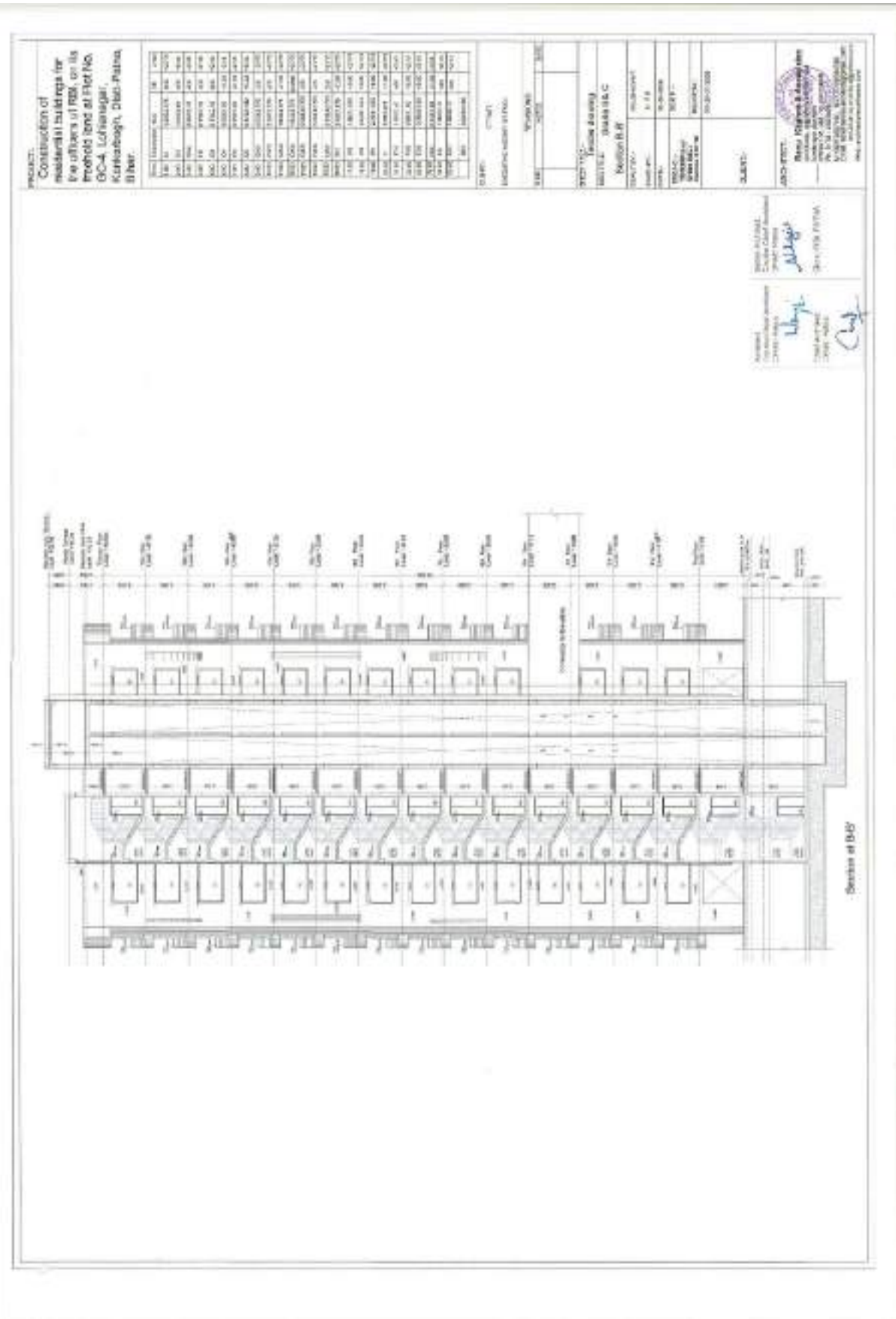


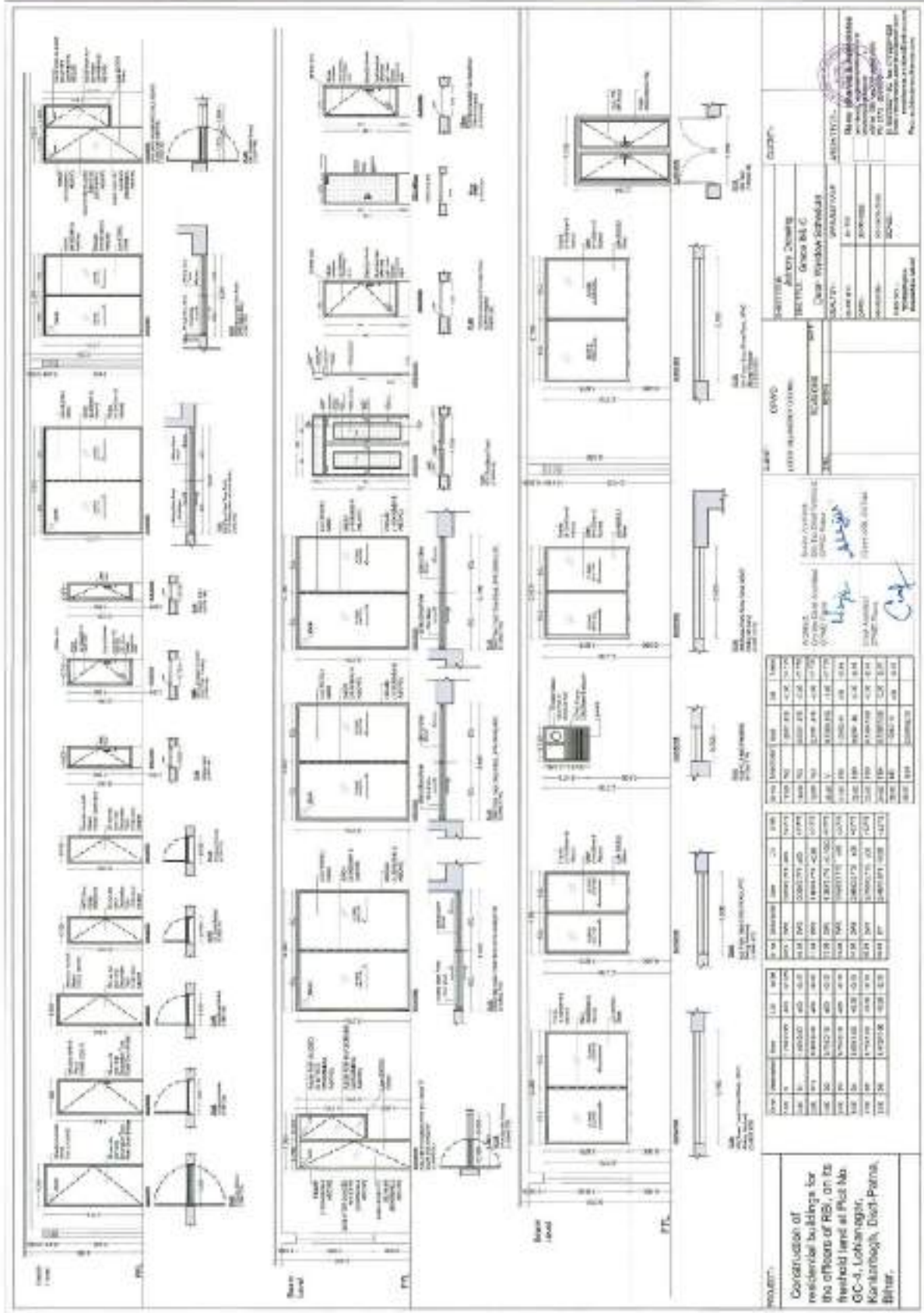


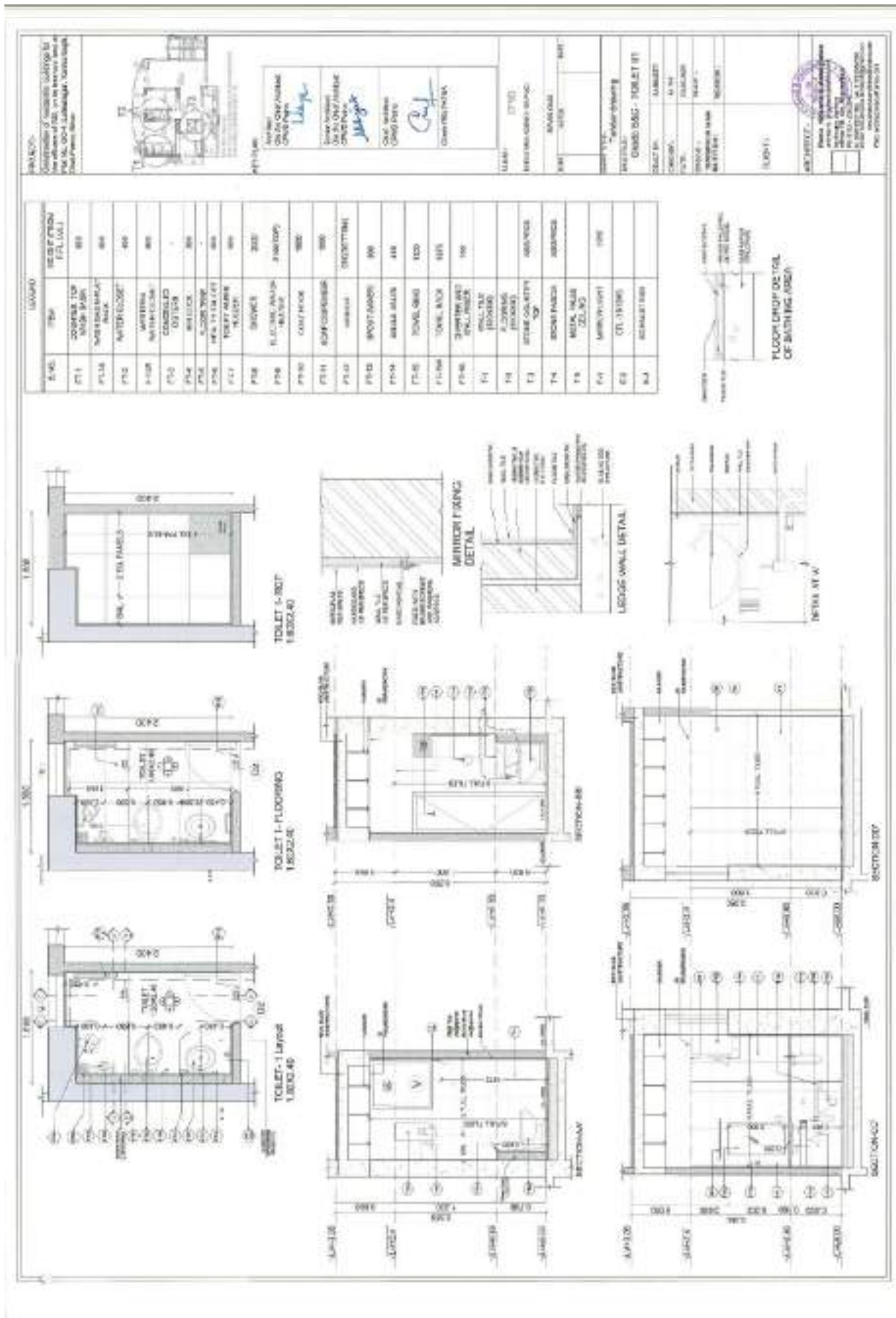


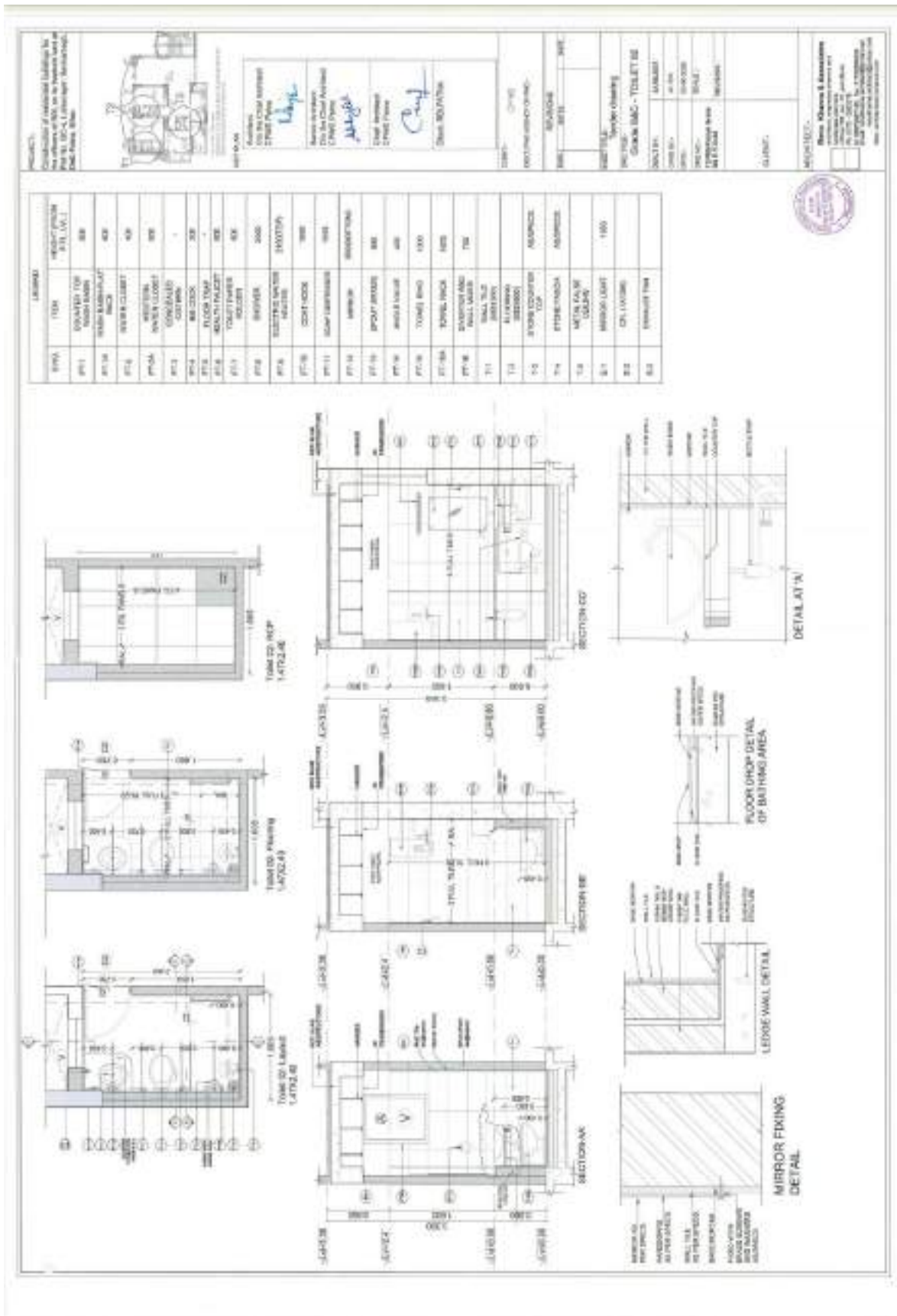


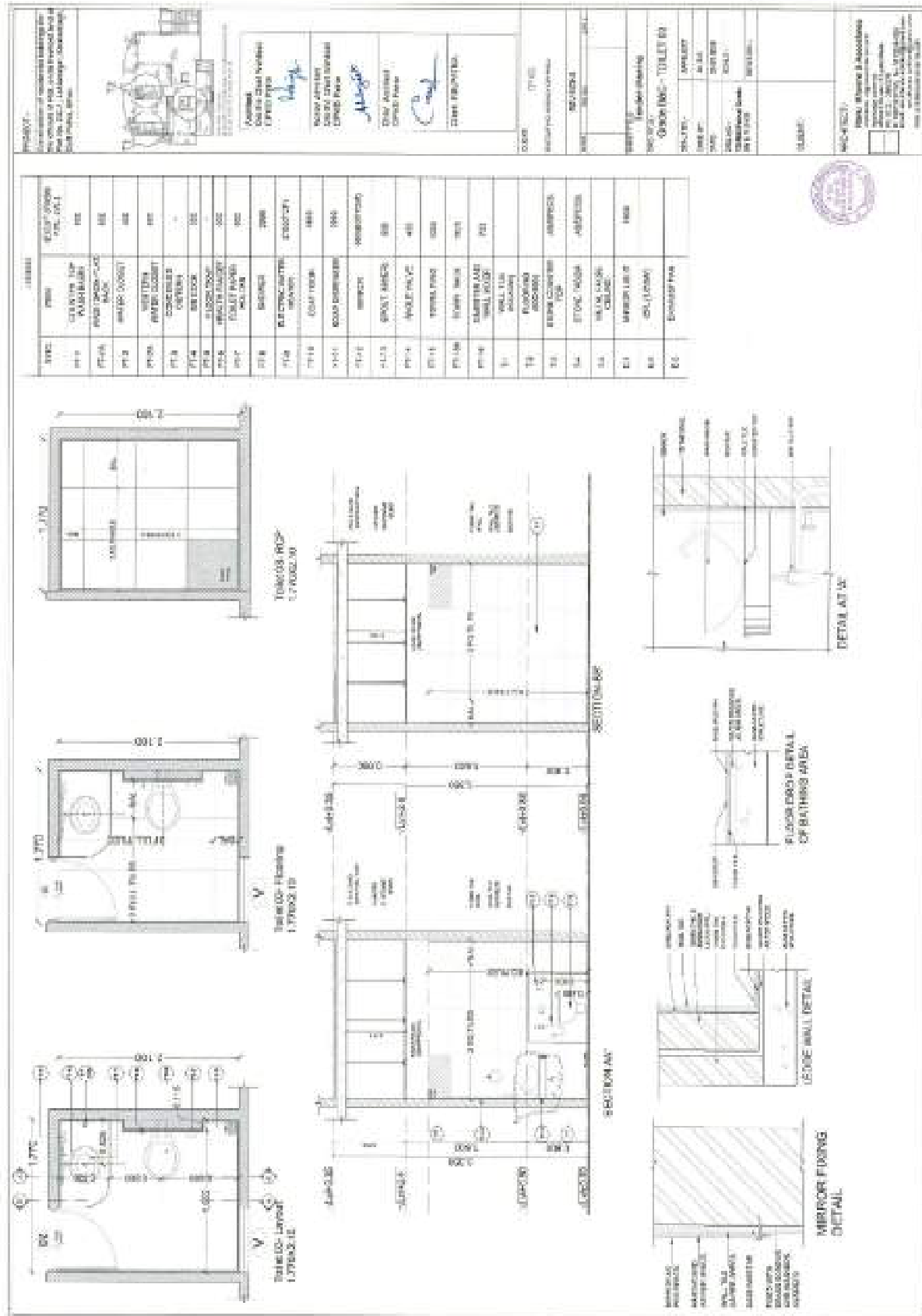
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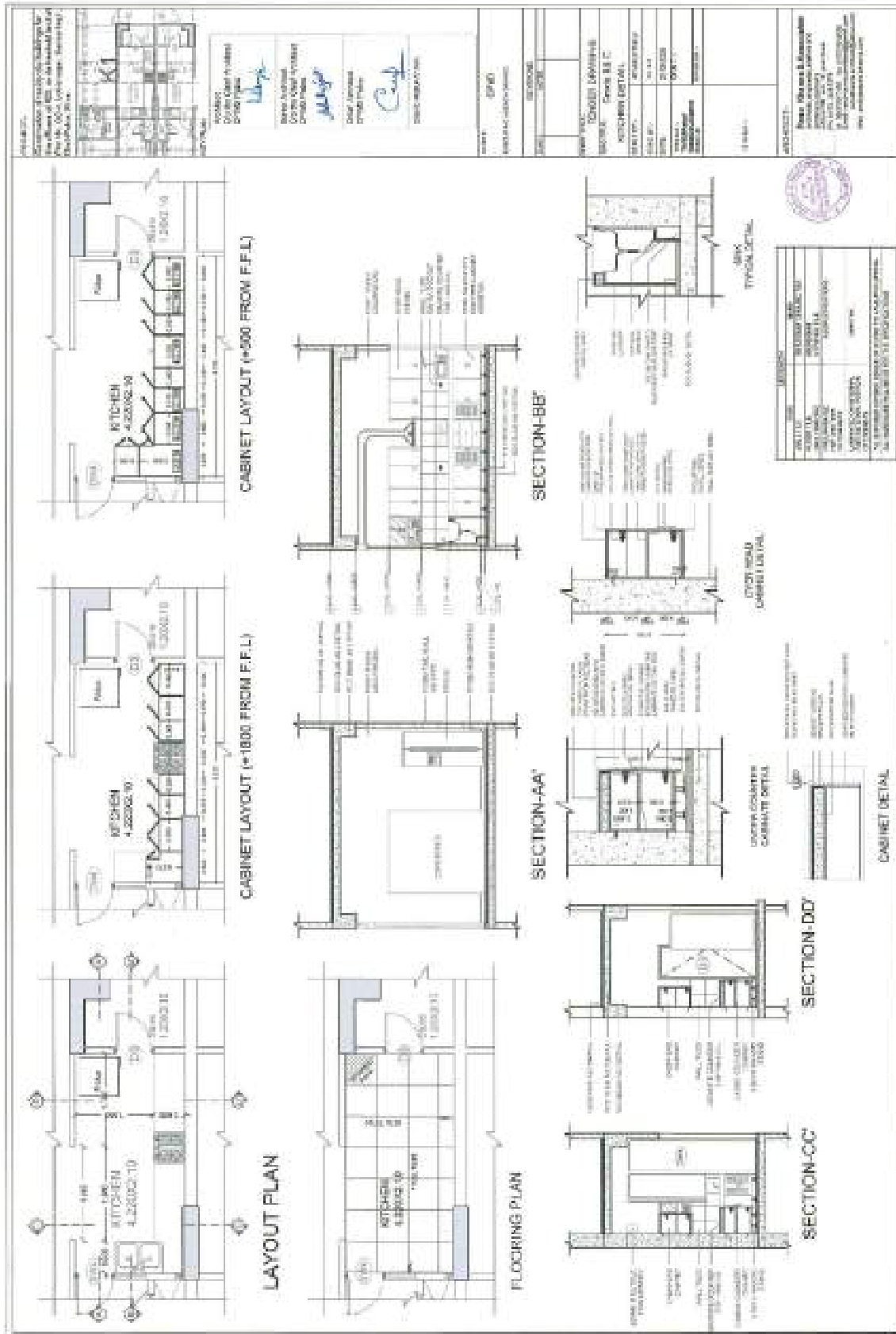


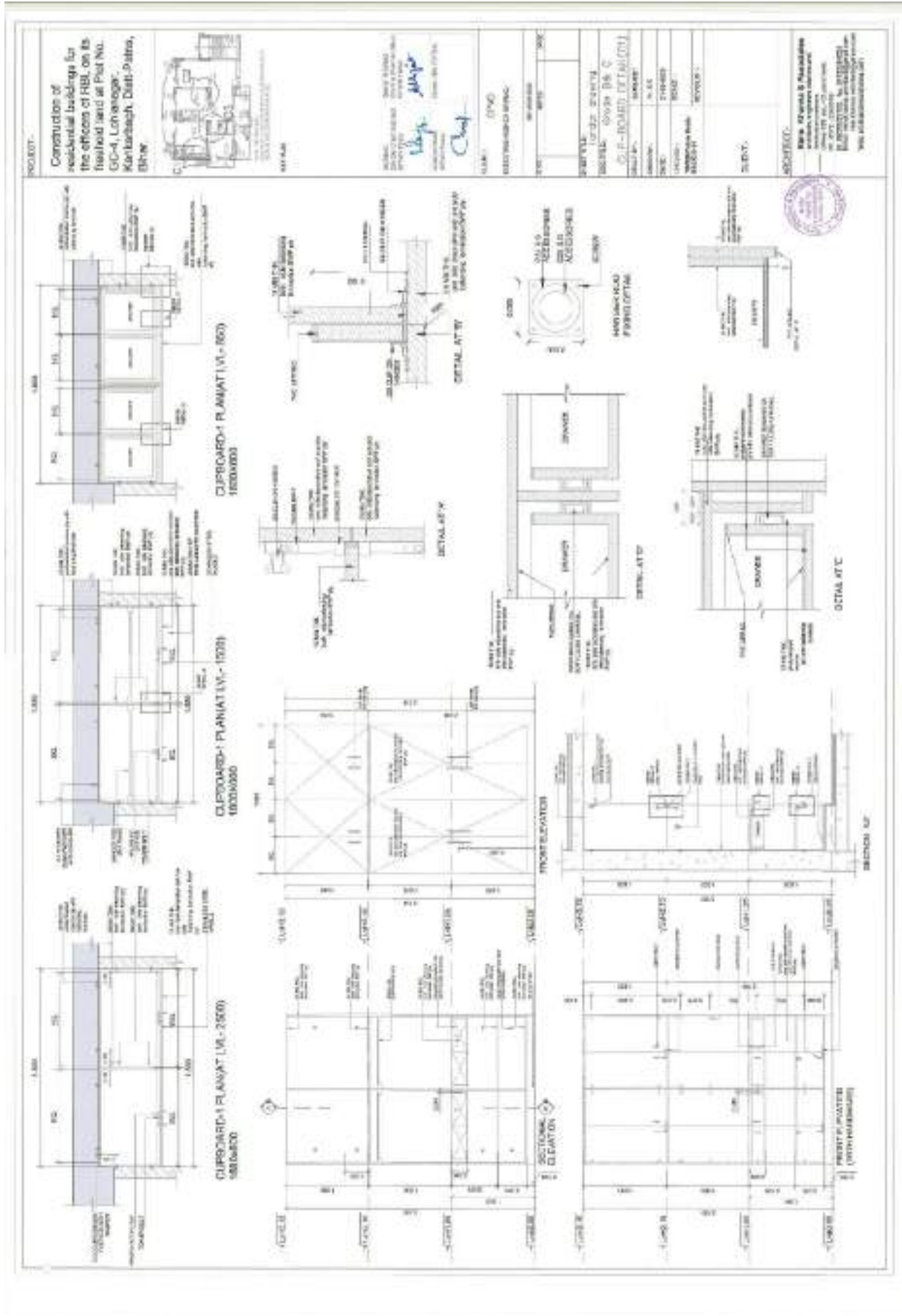


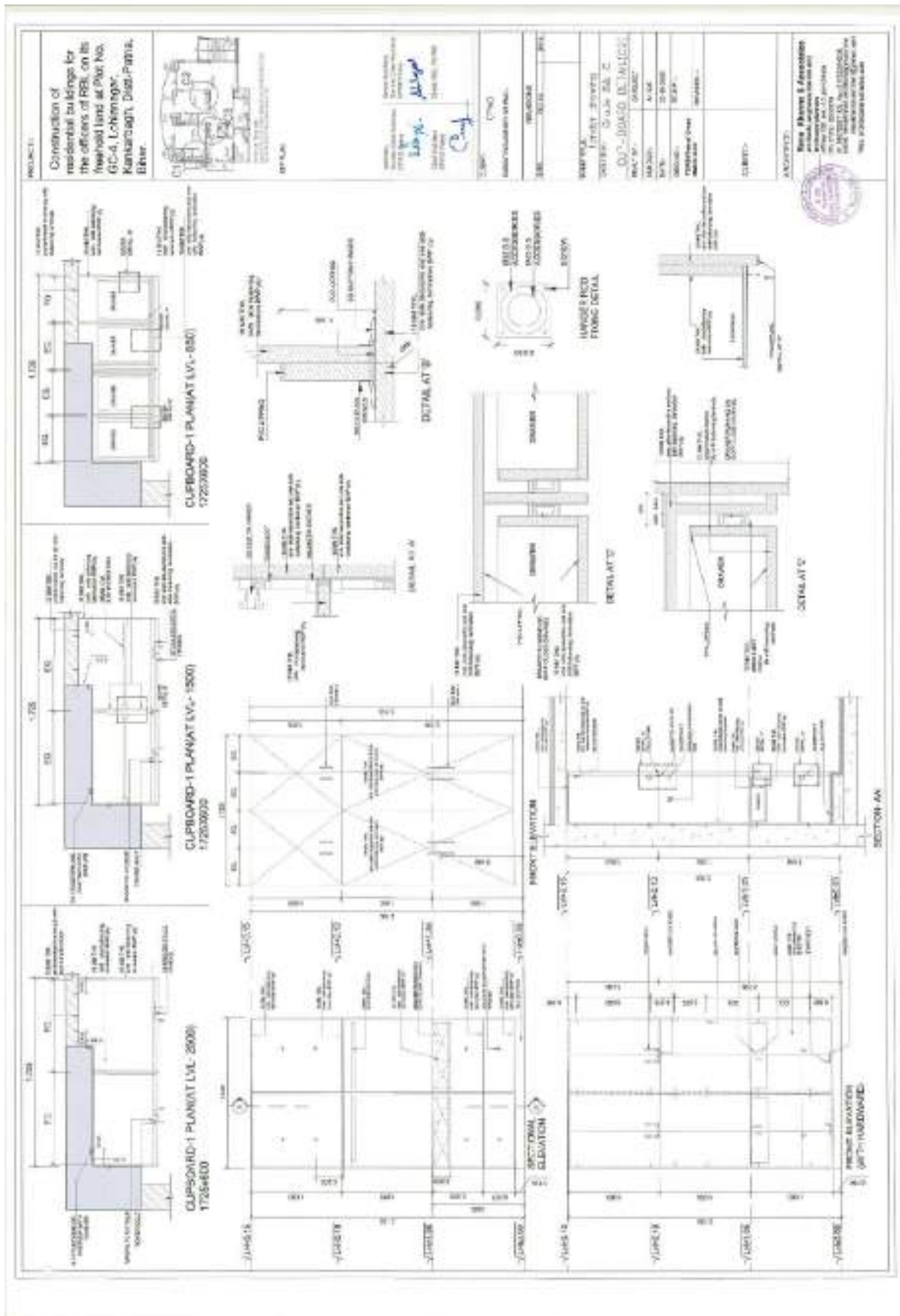


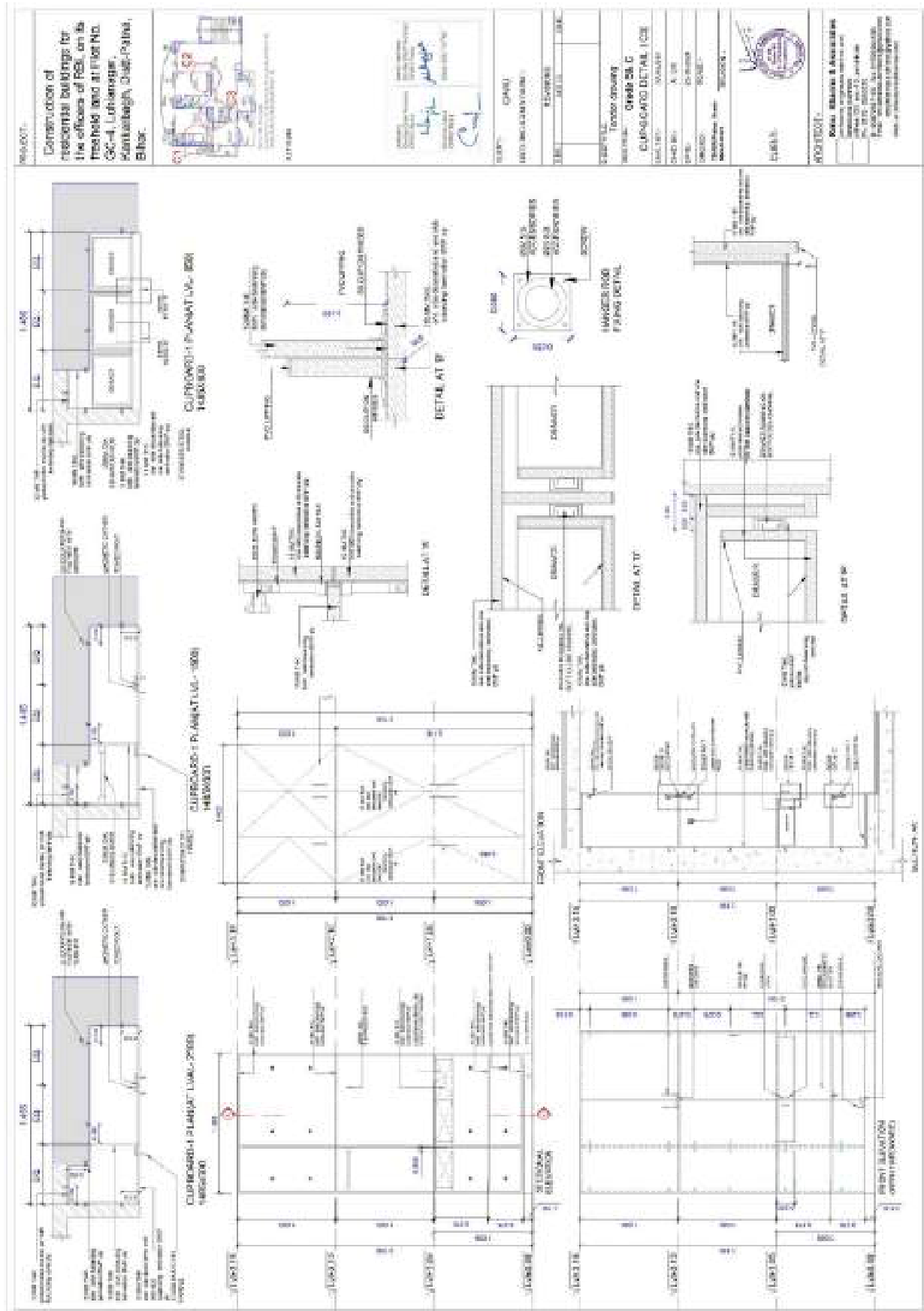


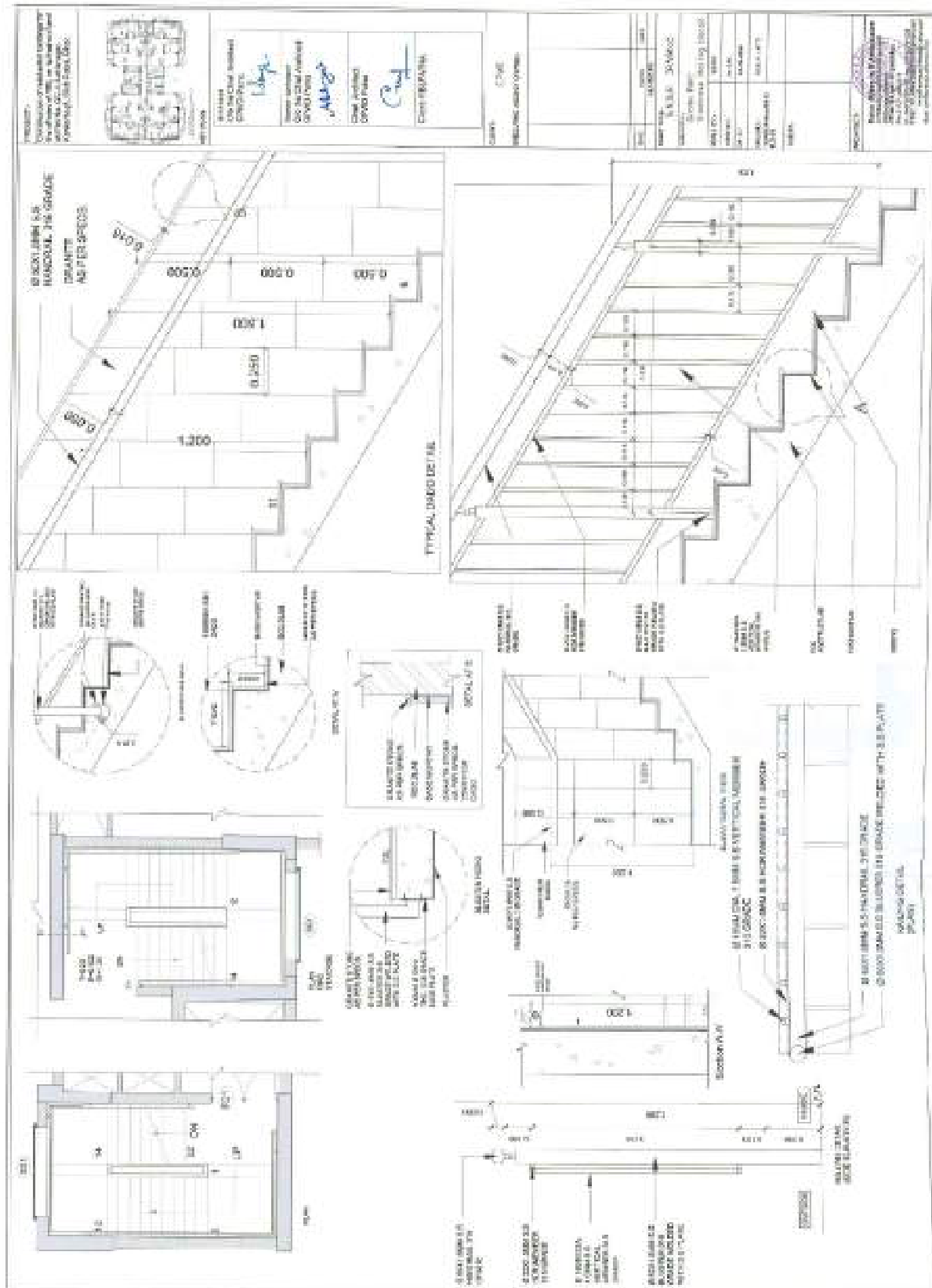


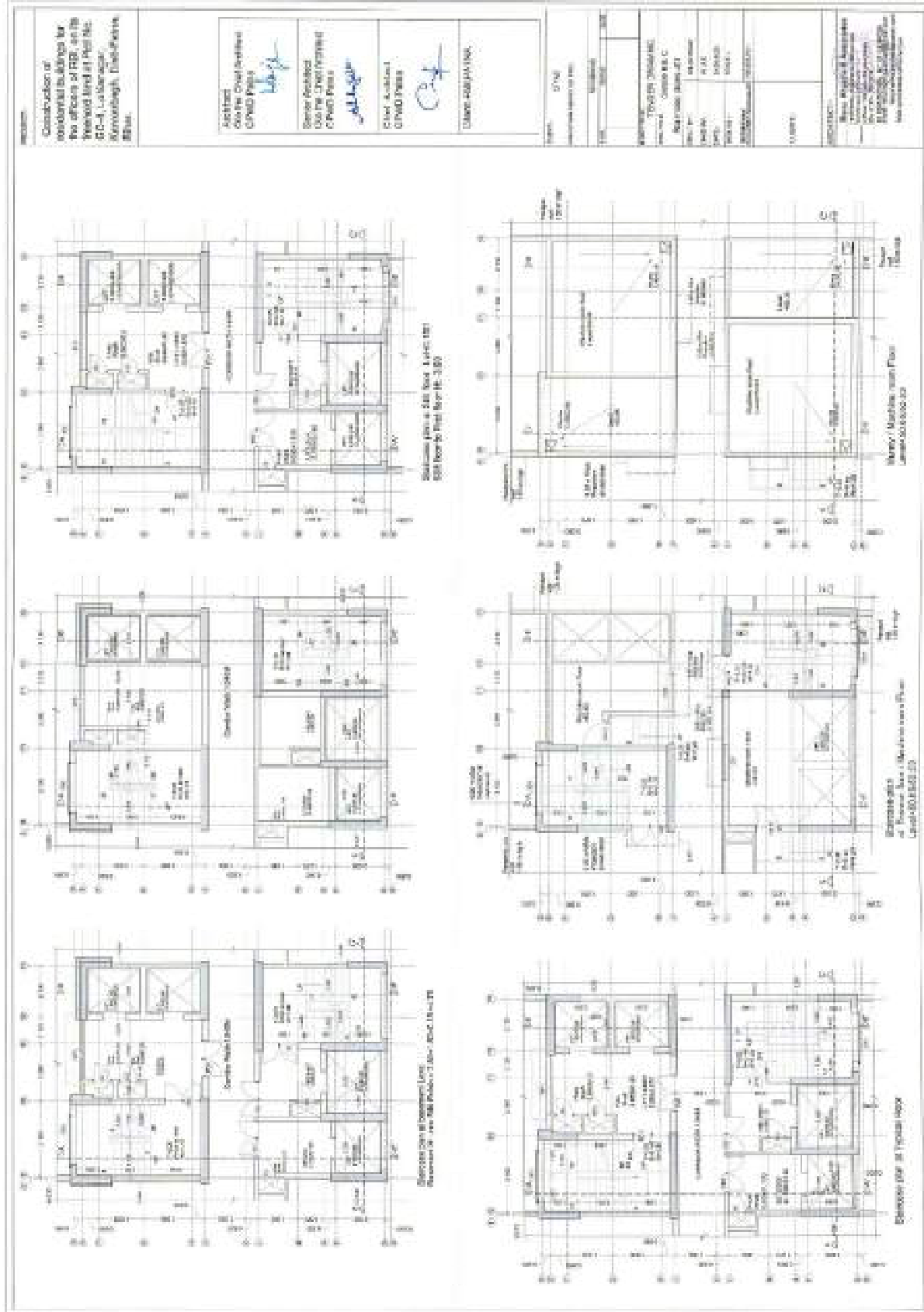


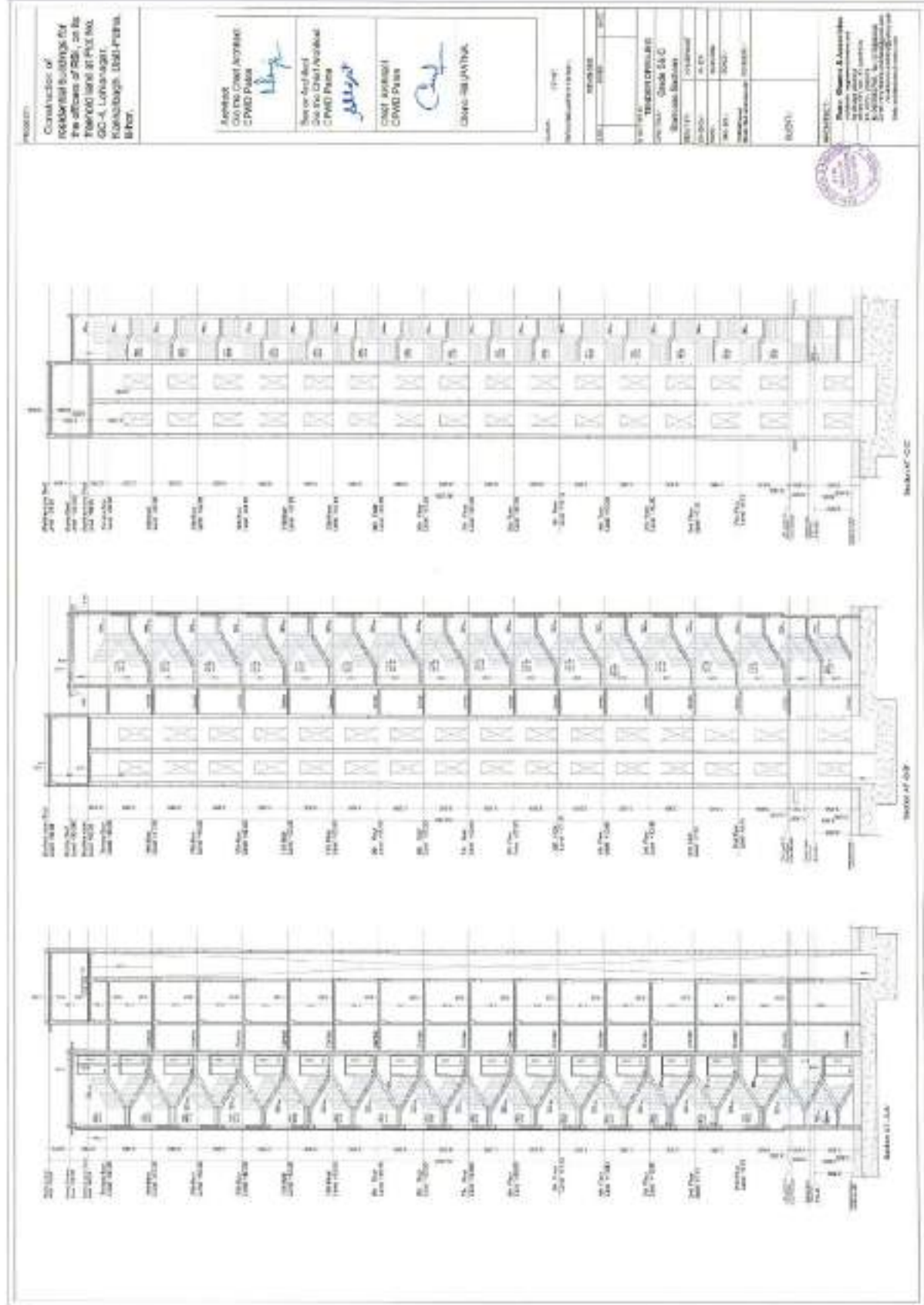


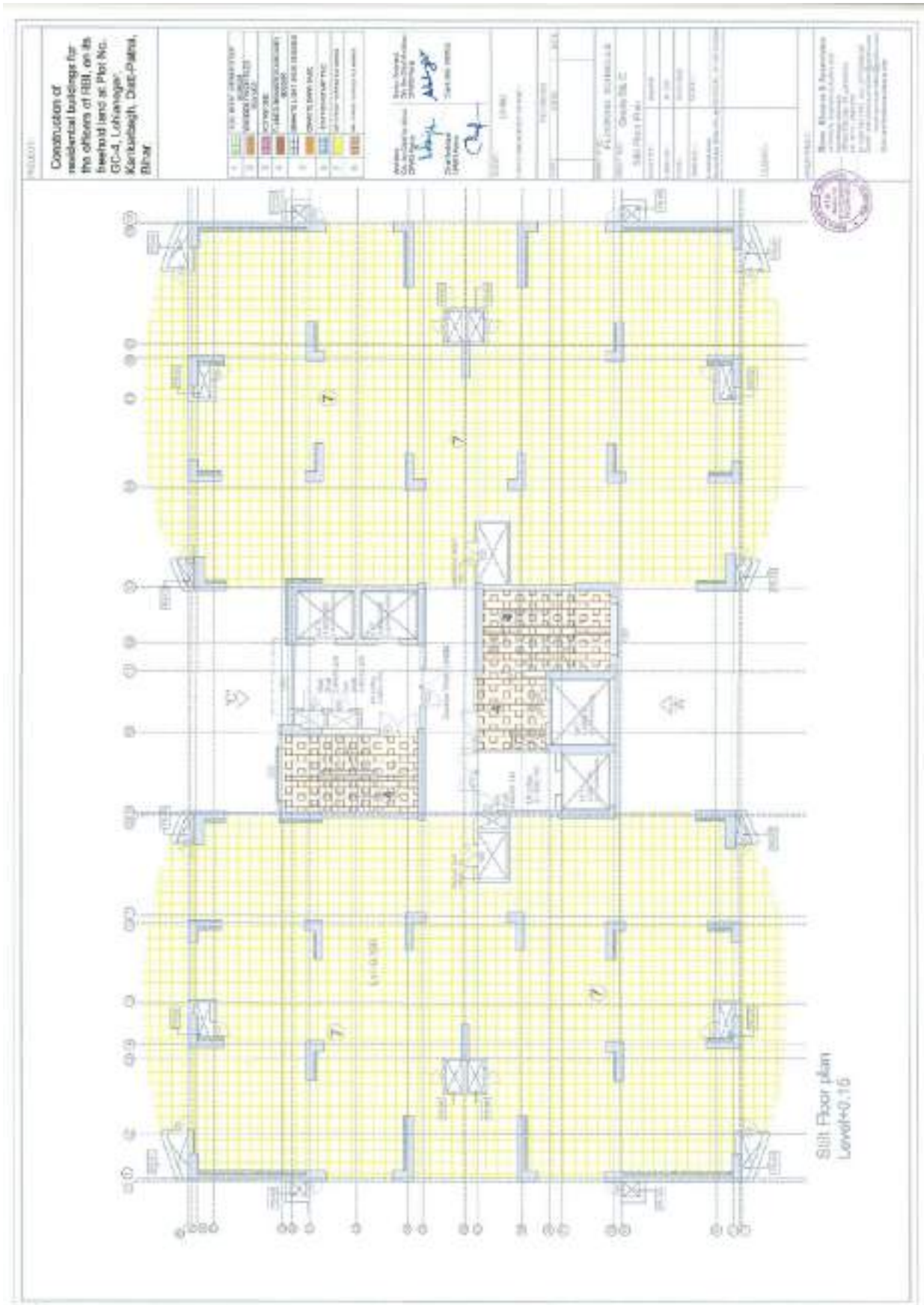


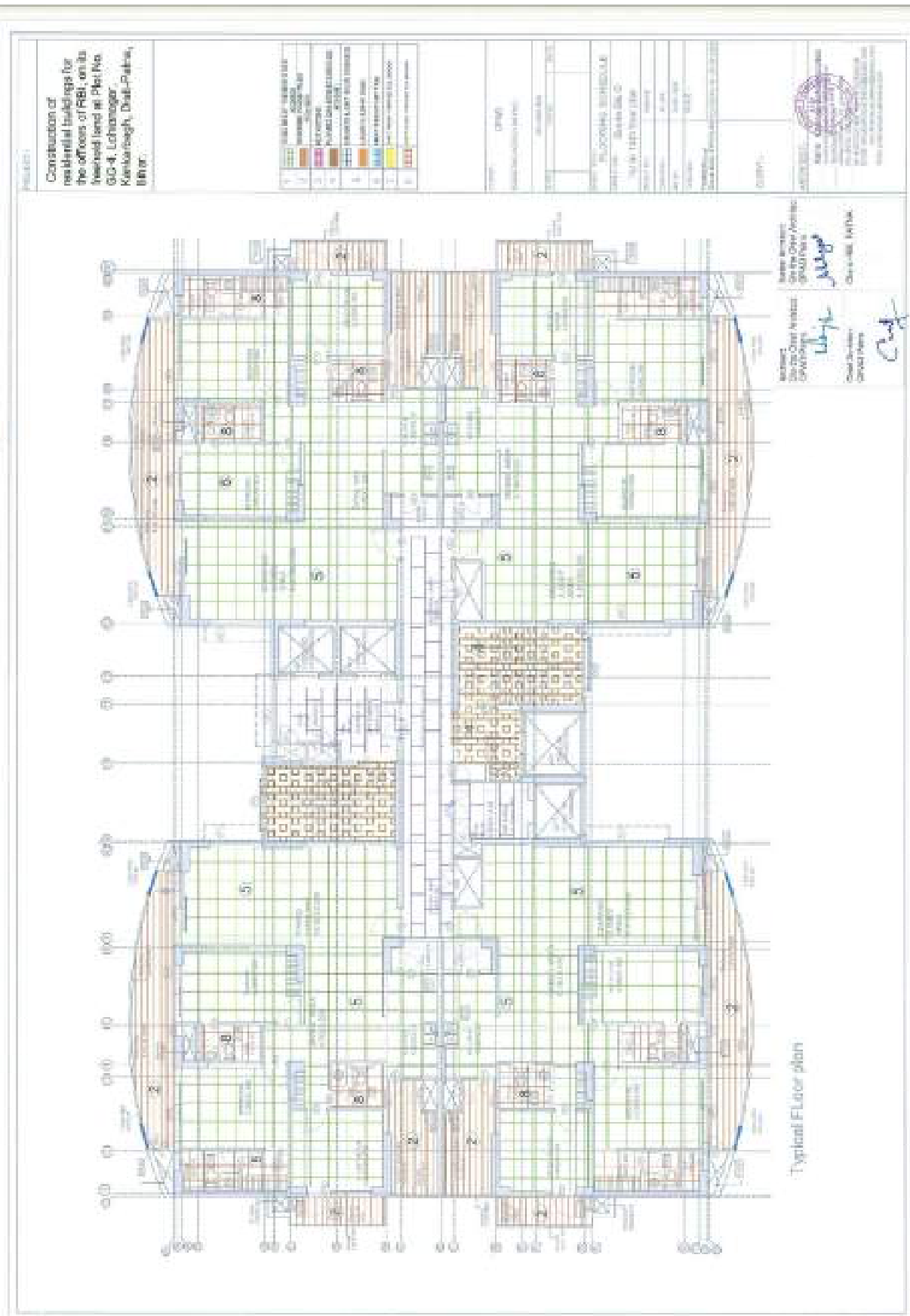


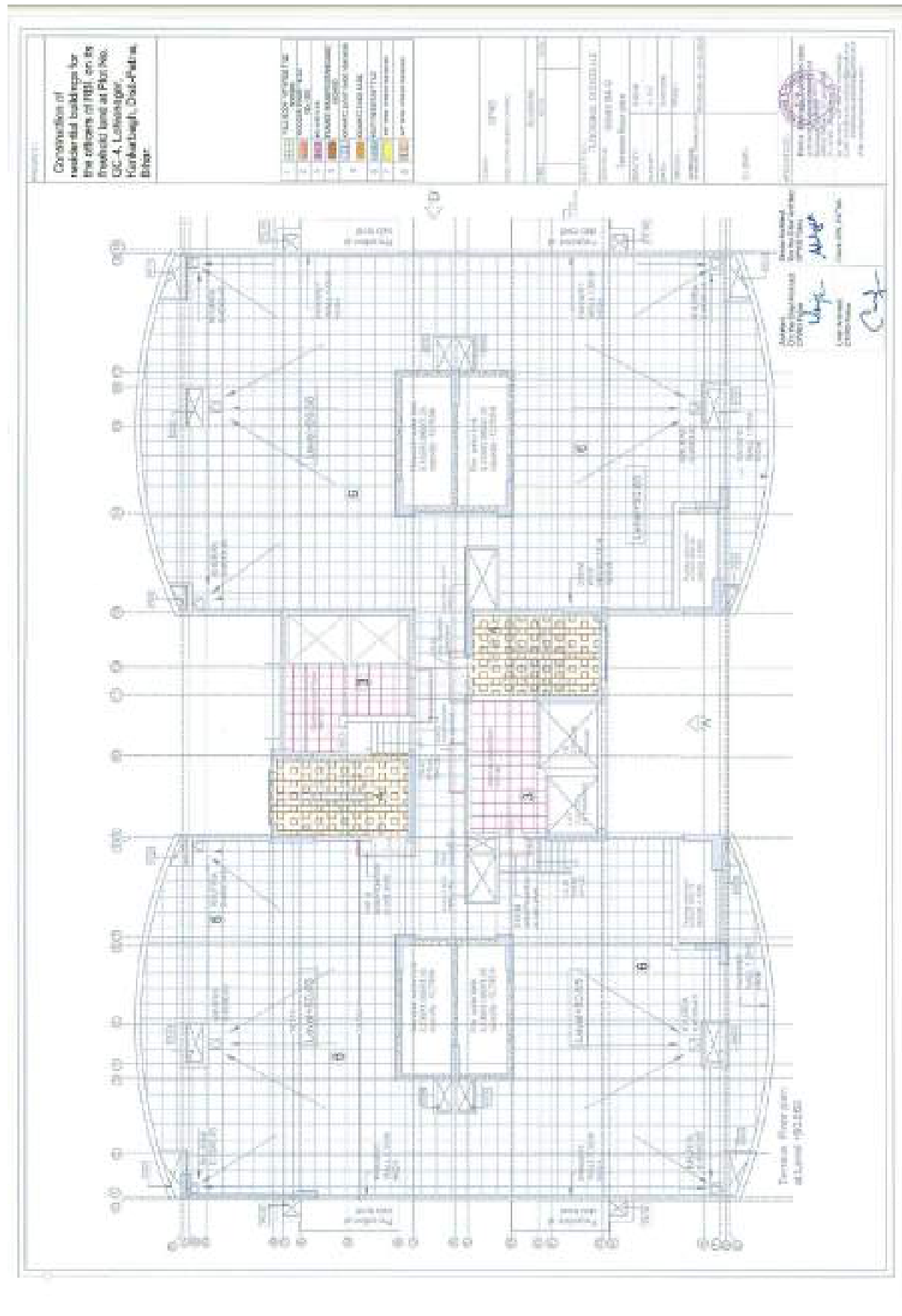






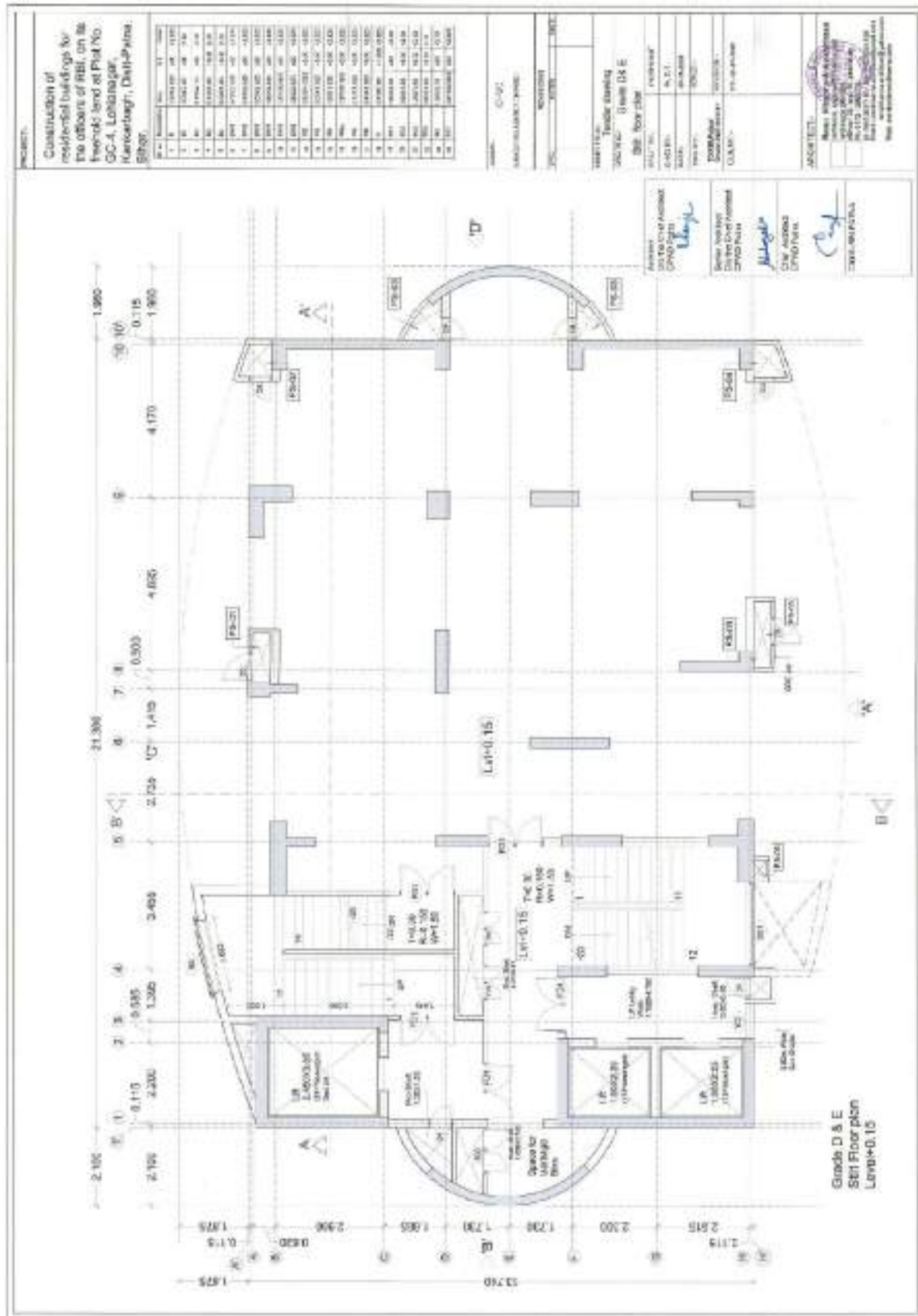


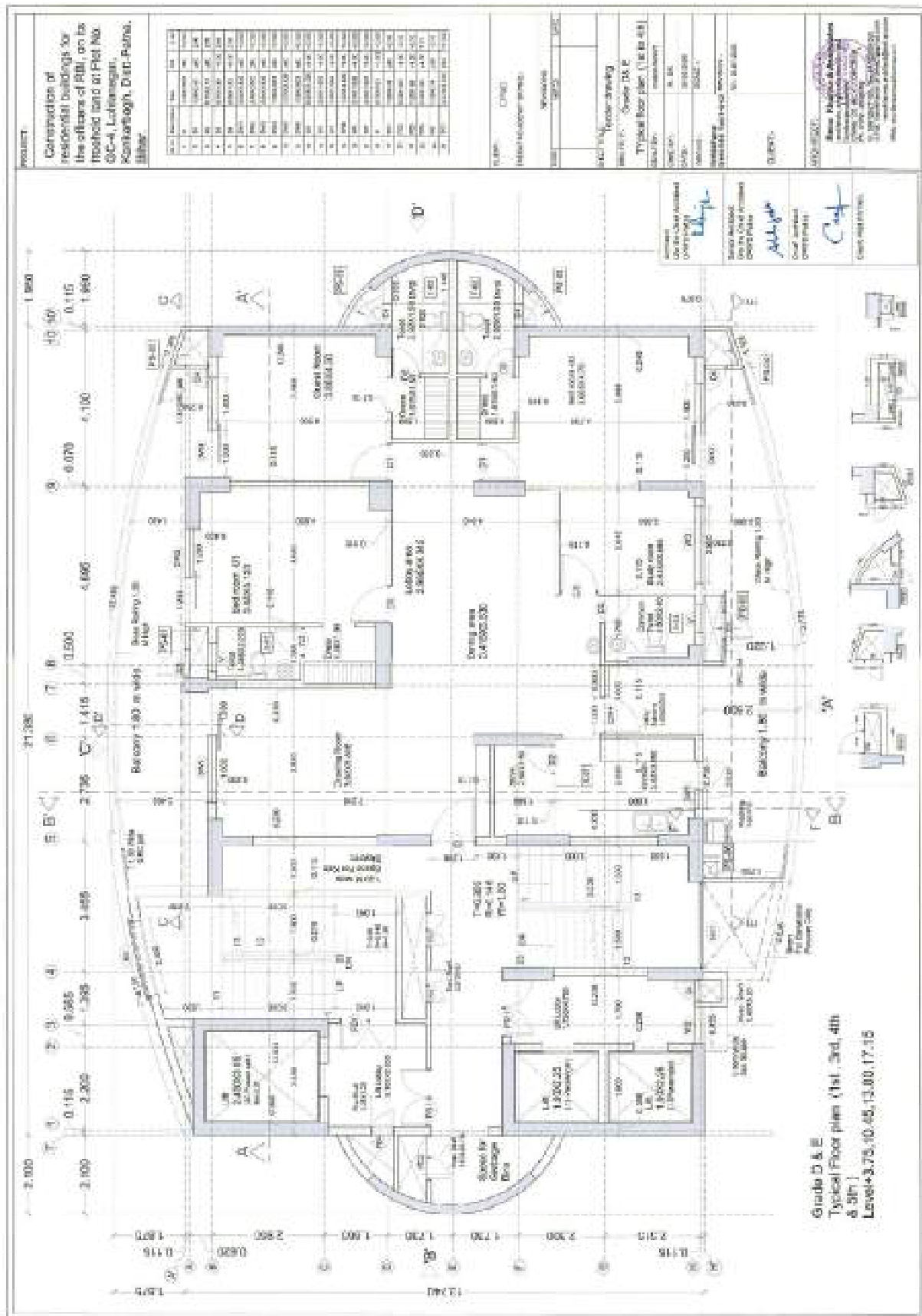


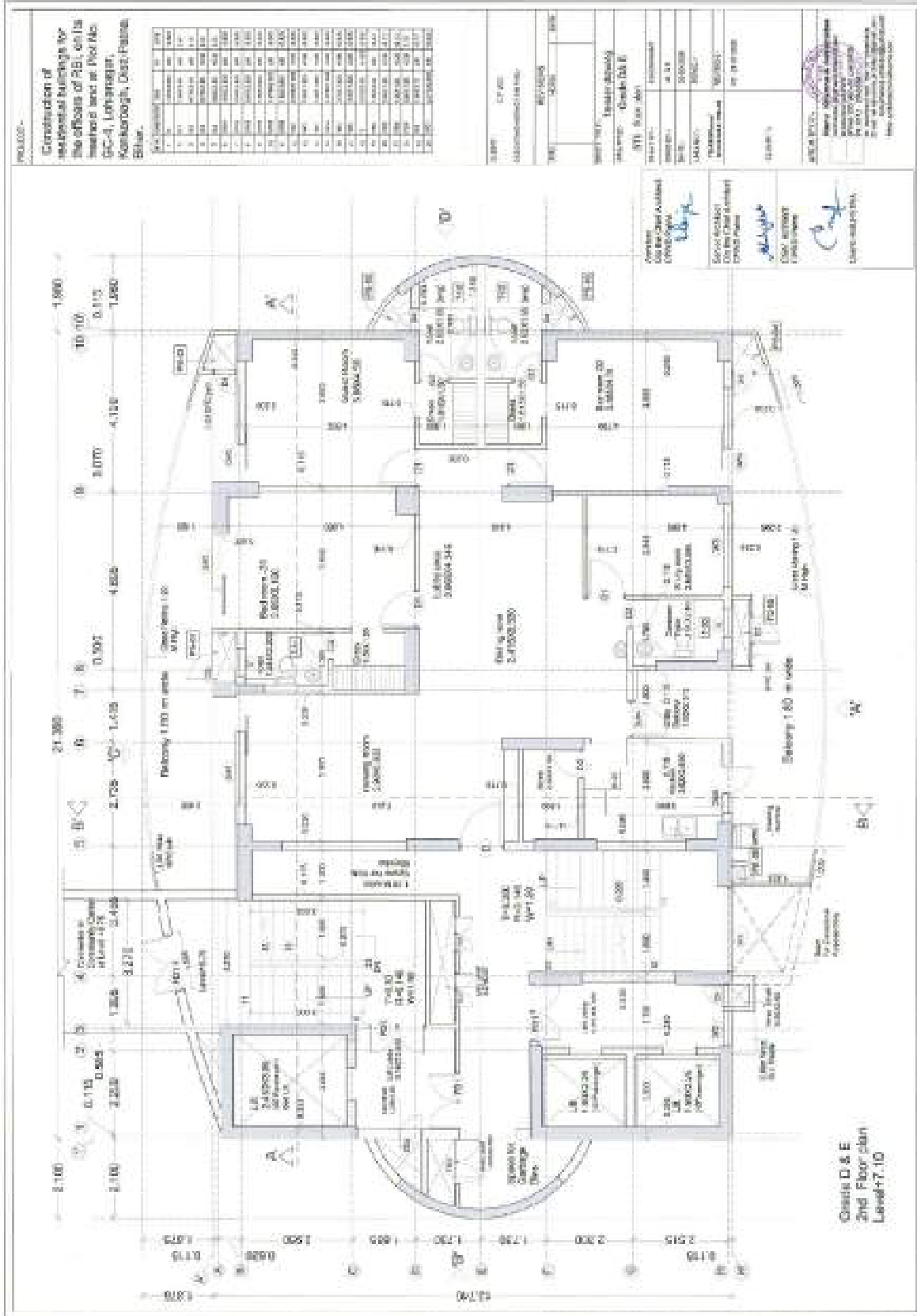


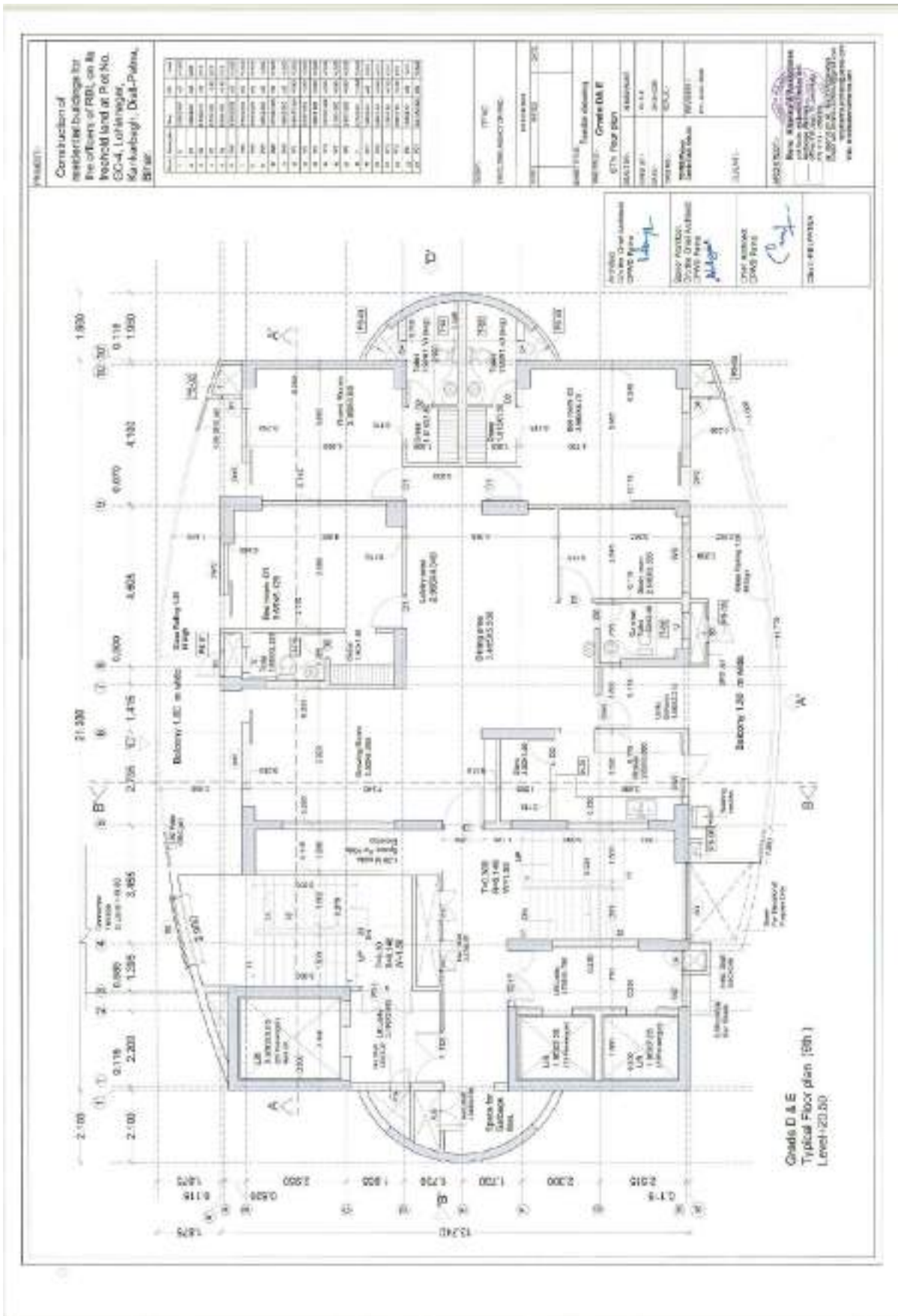


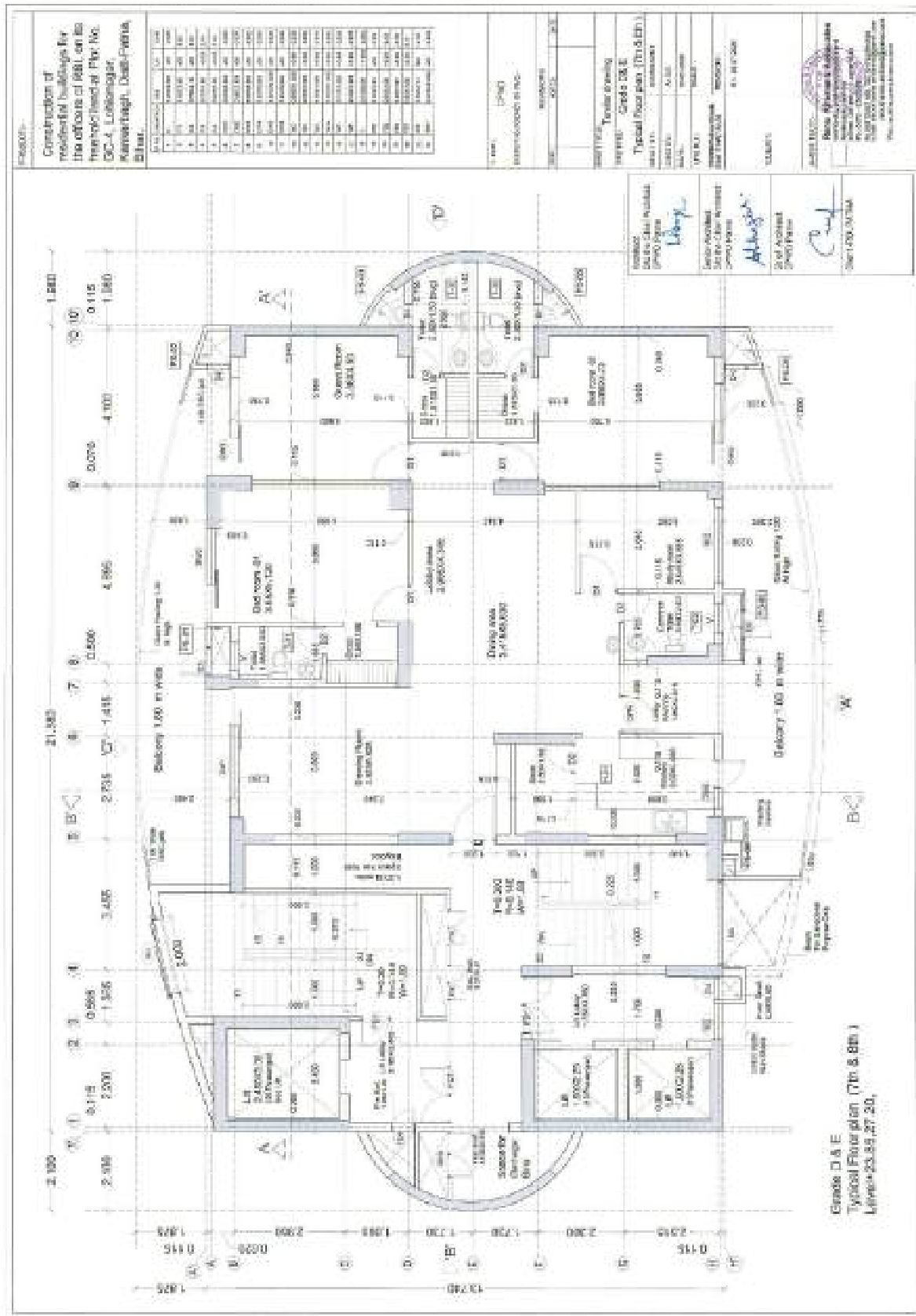


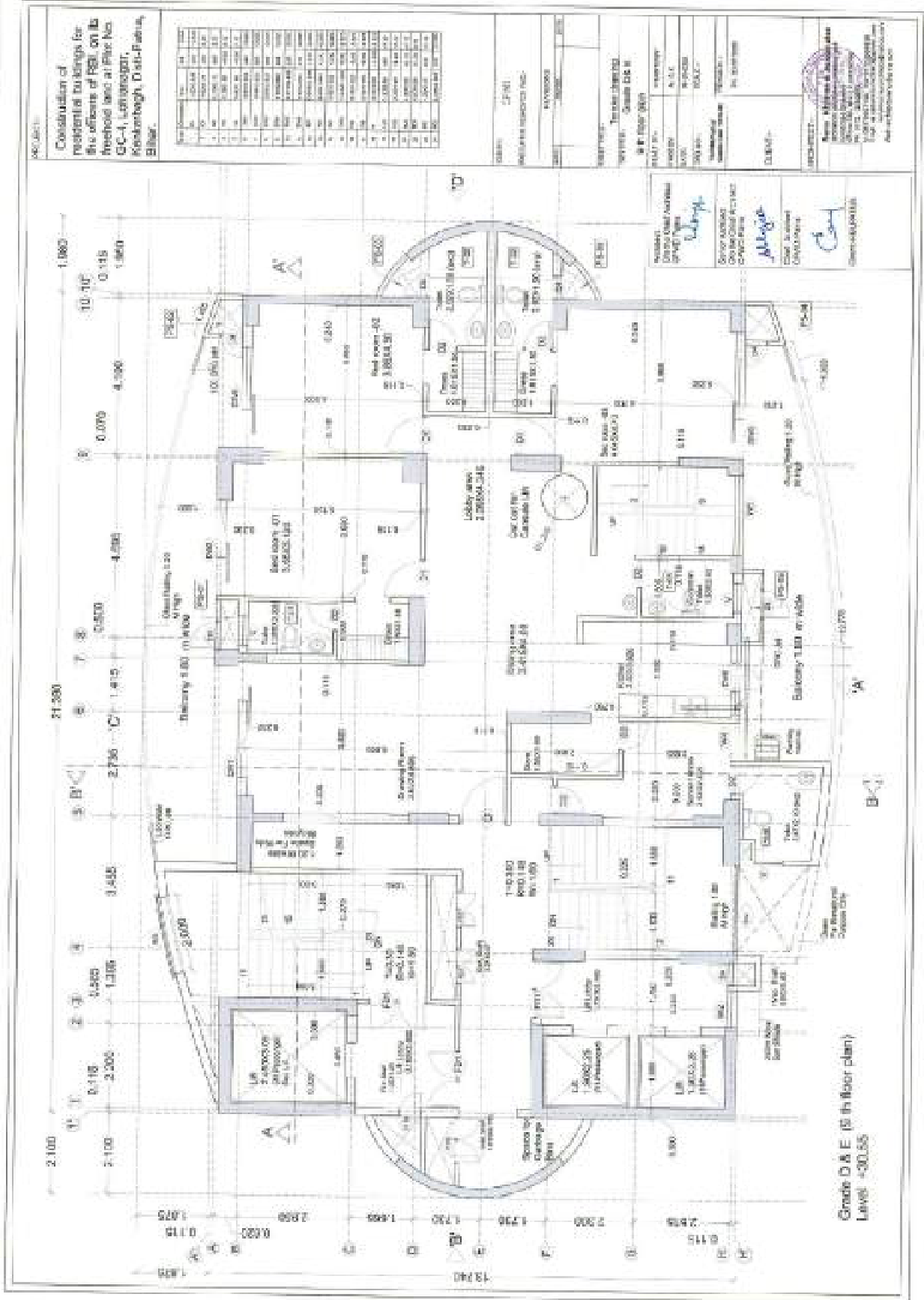


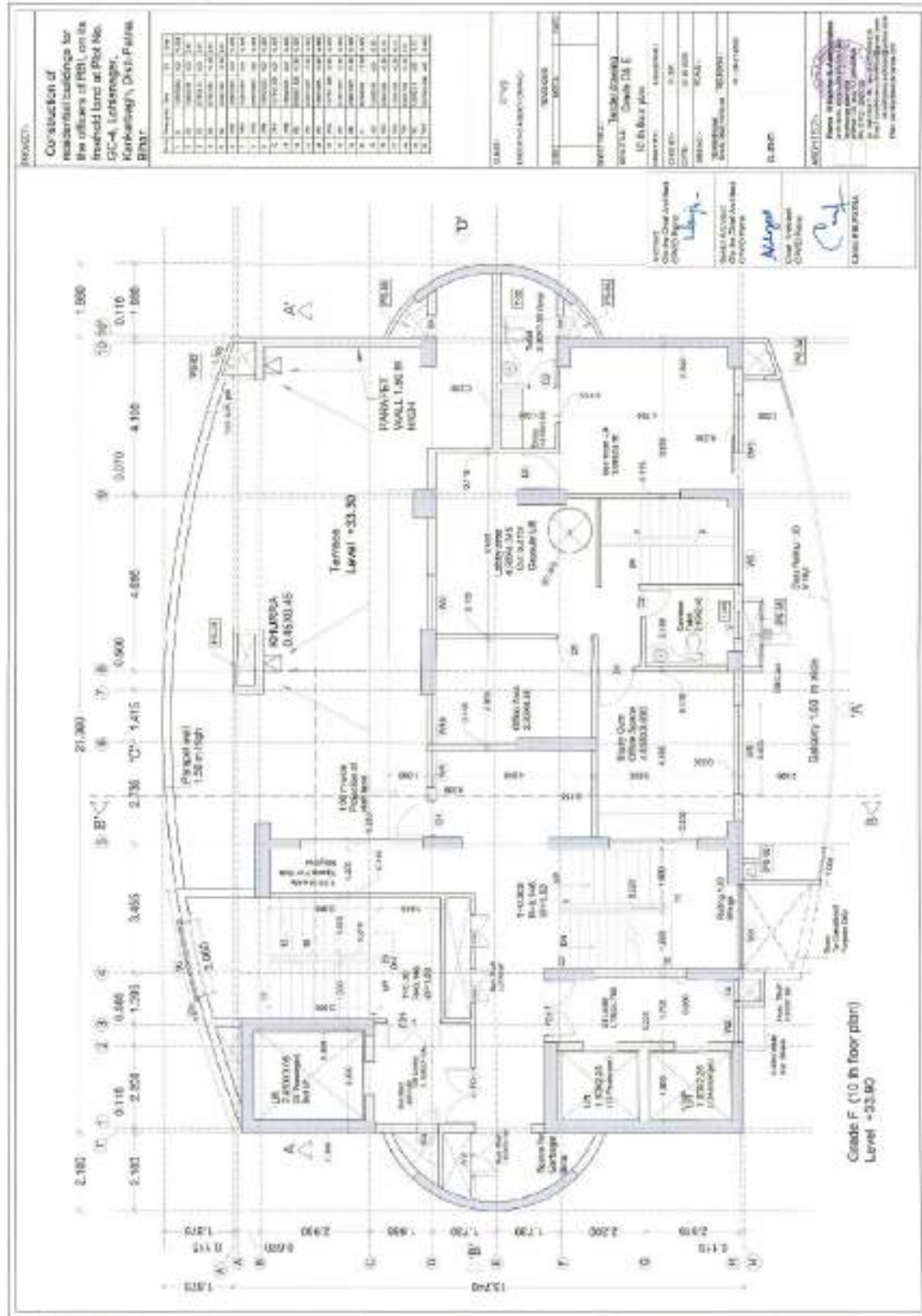


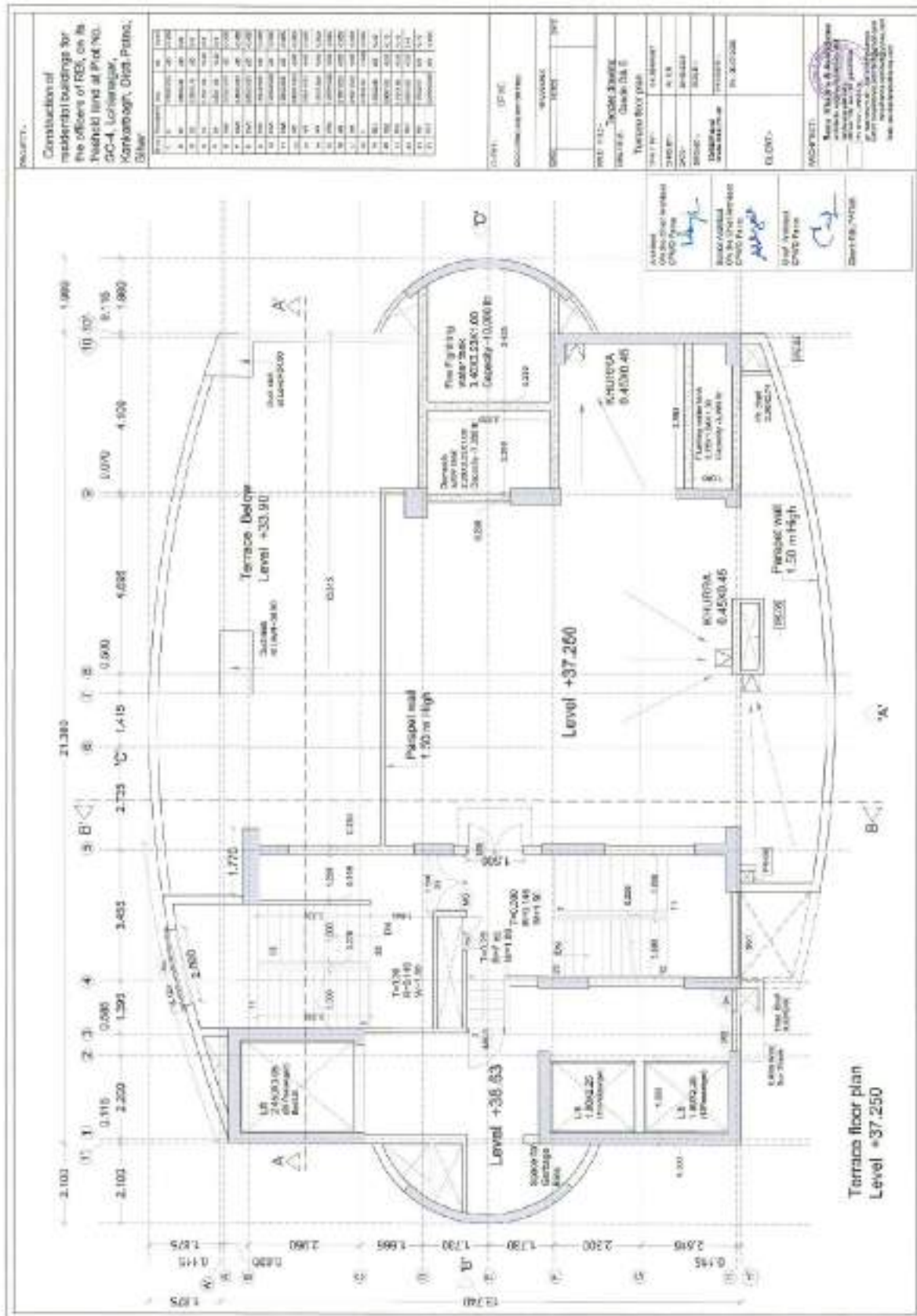




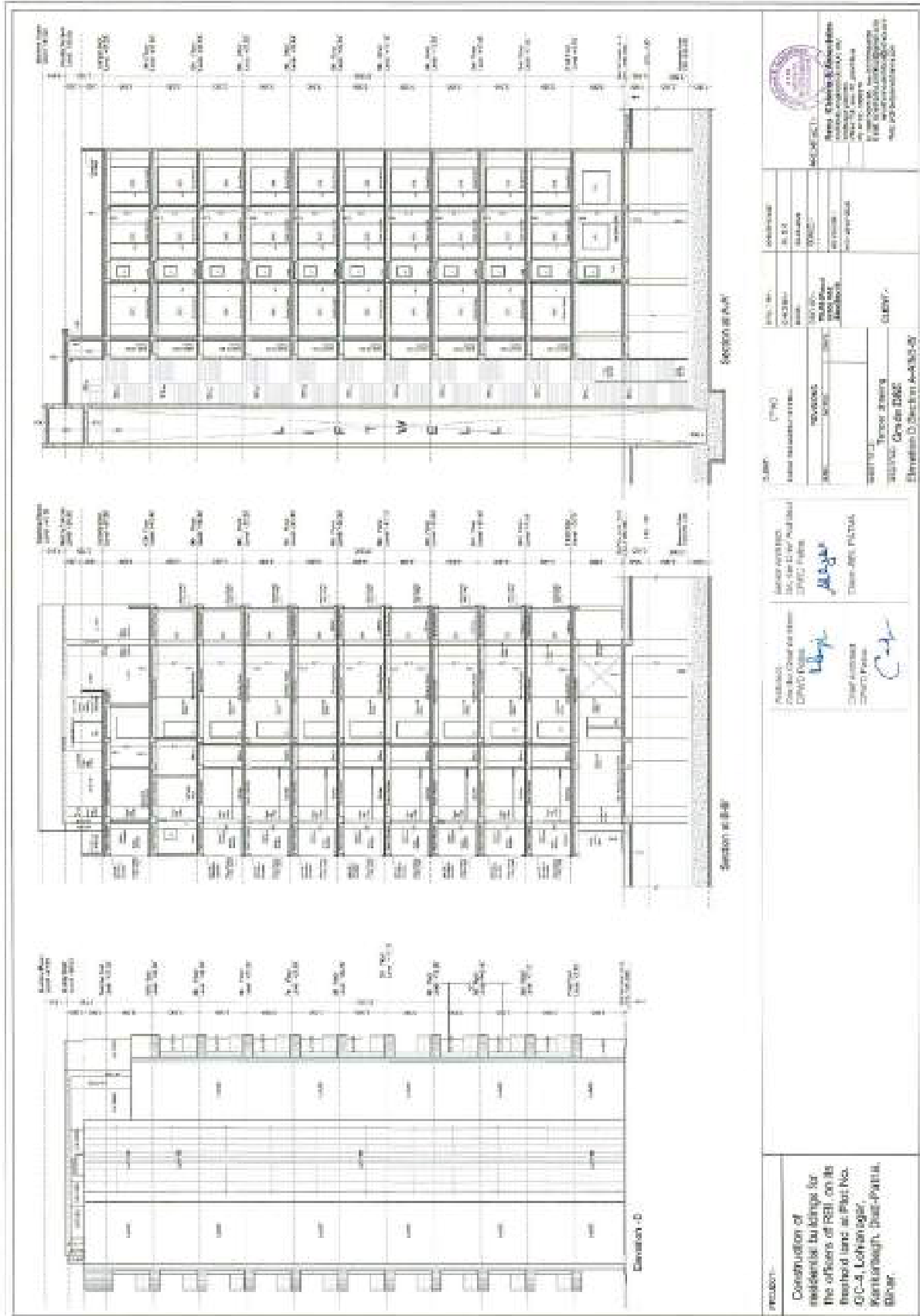


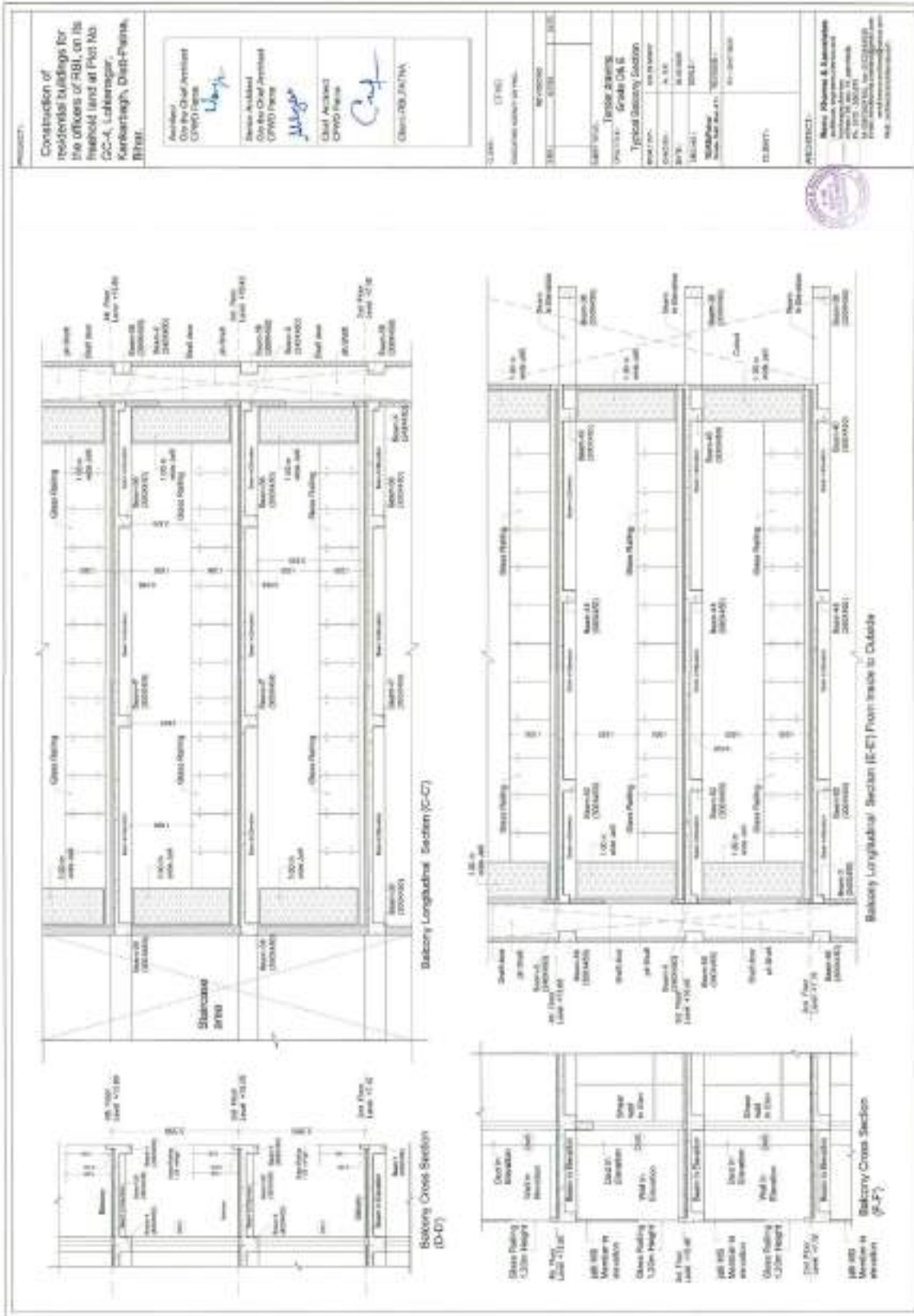






<i>Correction...Nil</i>	<i>Deletion... Nil</i>	<i>Insertion...Nil</i>	<i>Overwriting... Nil</i>	$\mathcal{AE}(C)(P)$	$\mathcal{AE}(E)(P)$	$EE(C)-I$
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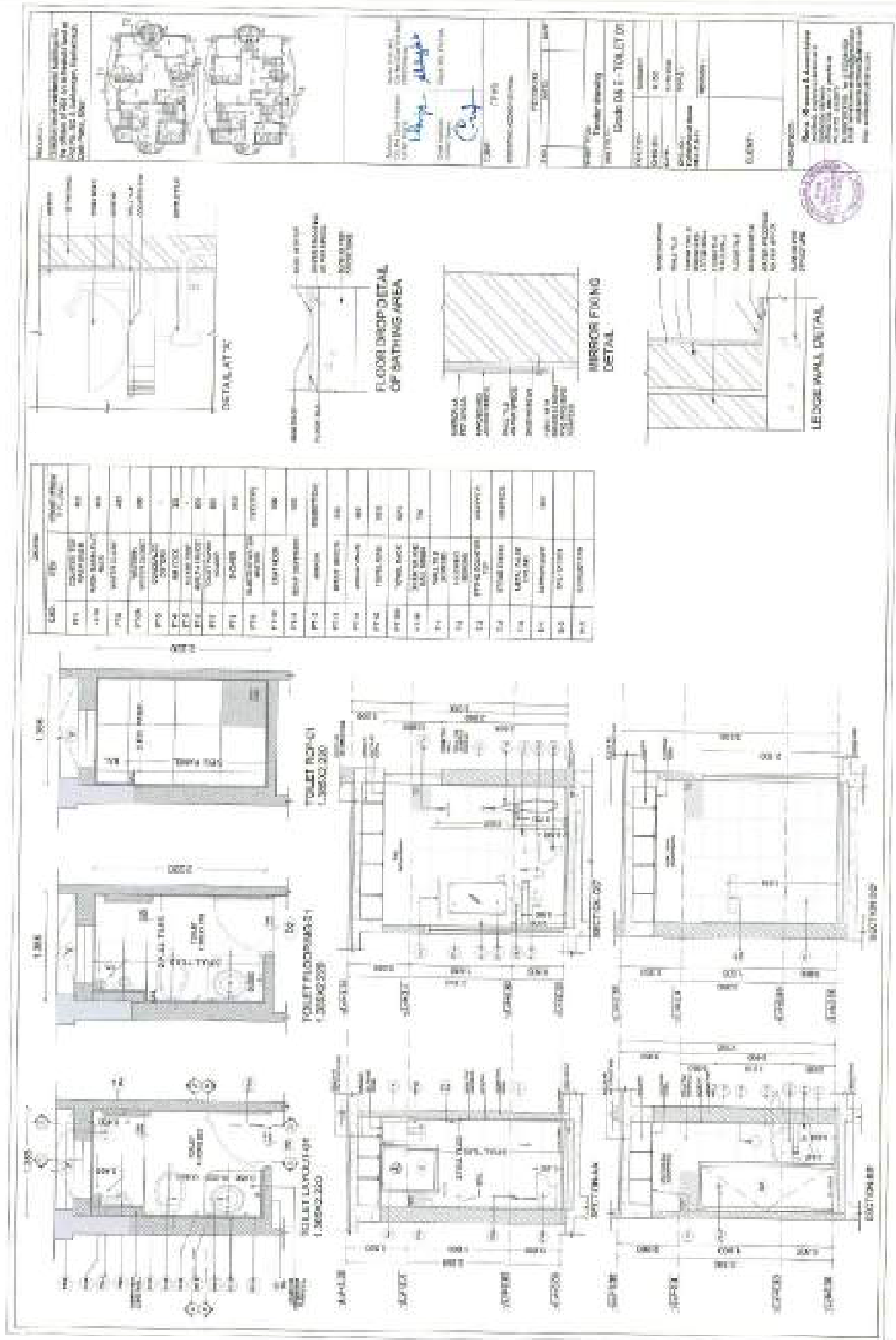
Floor Plan: The floor plan shows a rectangular building with overall dimensions of 14.00m by 10.00m. It includes a central corridor, several rooms, and a large open area. Dimensions for individual rooms and corridors are provided. The plan is signed and dated.

Elevations: The elevations show the building's facade. The front elevation features a central entrance with a porch and several windows. The side elevations show the building's profile and the placement of windows and doors. Dimensions for window and door heights and widths are provided.

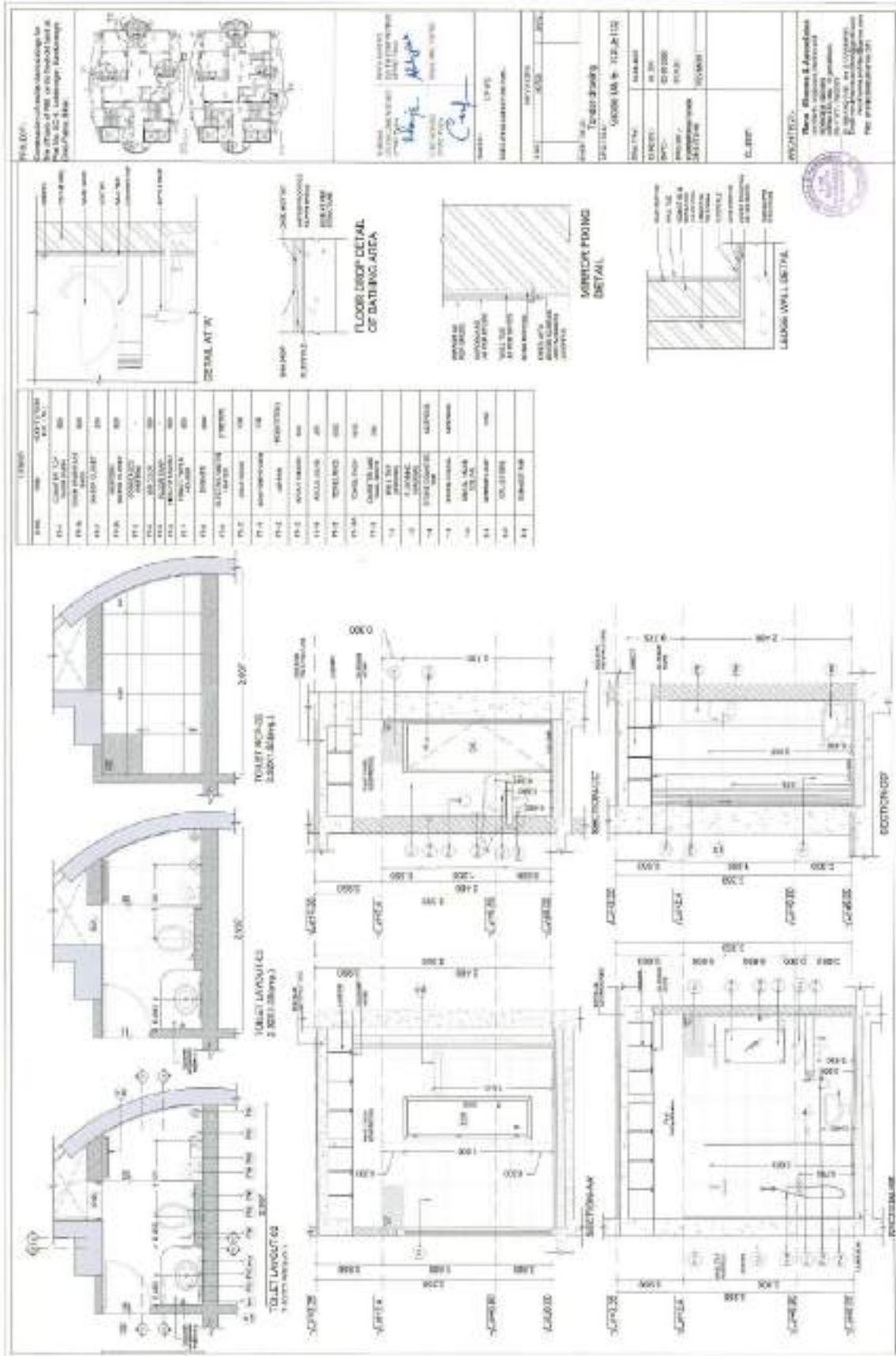
Sections: The sections show the building's profile and internal structure. The section shows the building's height and the placement of the roof, floor, and walls. Dimensions for the building's height and internal dimensions are provided.

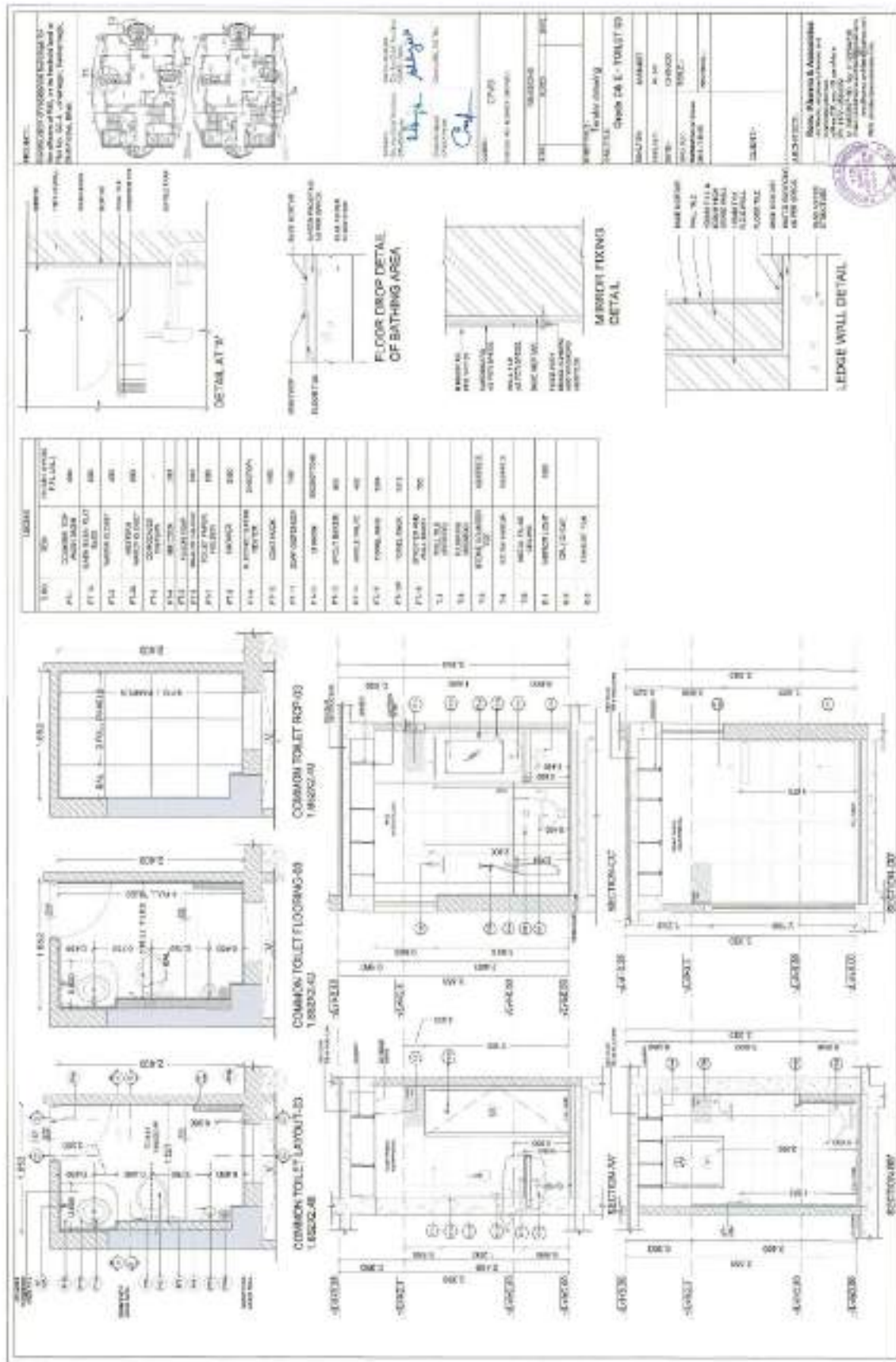
Architect's Signature and Stamp: The drawings are signed and dated by the architect. The signature is in blue ink, and the stamp is a circular seal with the architect's name and registration number.

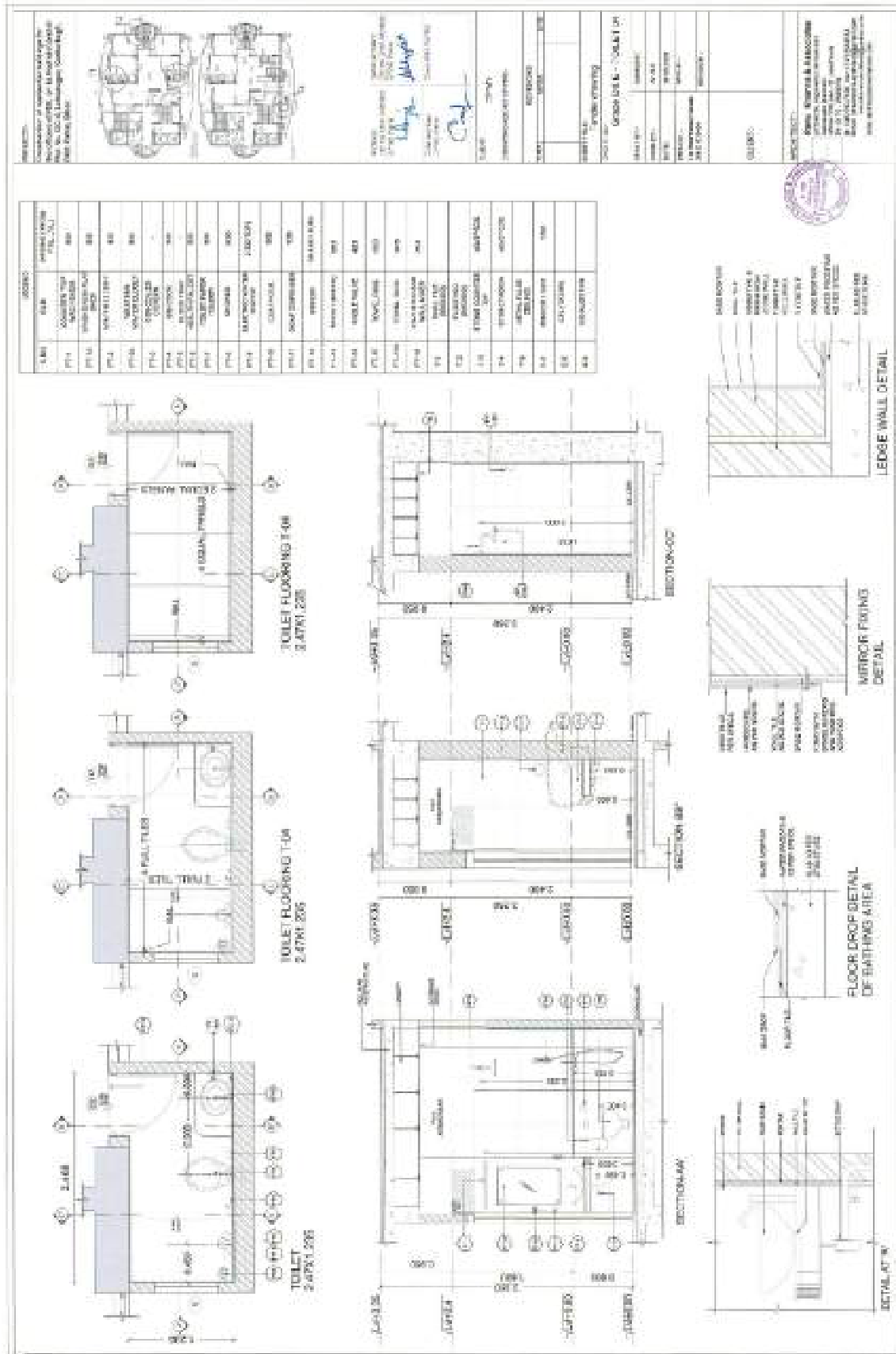
PROJECT: Construction of residential buildings for the officers of RBL on its freehold land at Plot No. GC-4, Loharogor, Kankarbagh, Dist-Patna, Bihar.	Architect: Dr. Ravi Chandra Acharya (CARE) Patna Structural Engineer: Dr. Ravi Chandra Acharya (CARE) Patna Client: RBL, Patna		Scale: General: 1/4" = 1'-0" Notes: 1. All dimensions are in feet and inches. 2. All work to be done in accordance with the specifications. 3. All materials to be of the best quality. 4. All work to be done in accordance with the drawings.																																																														
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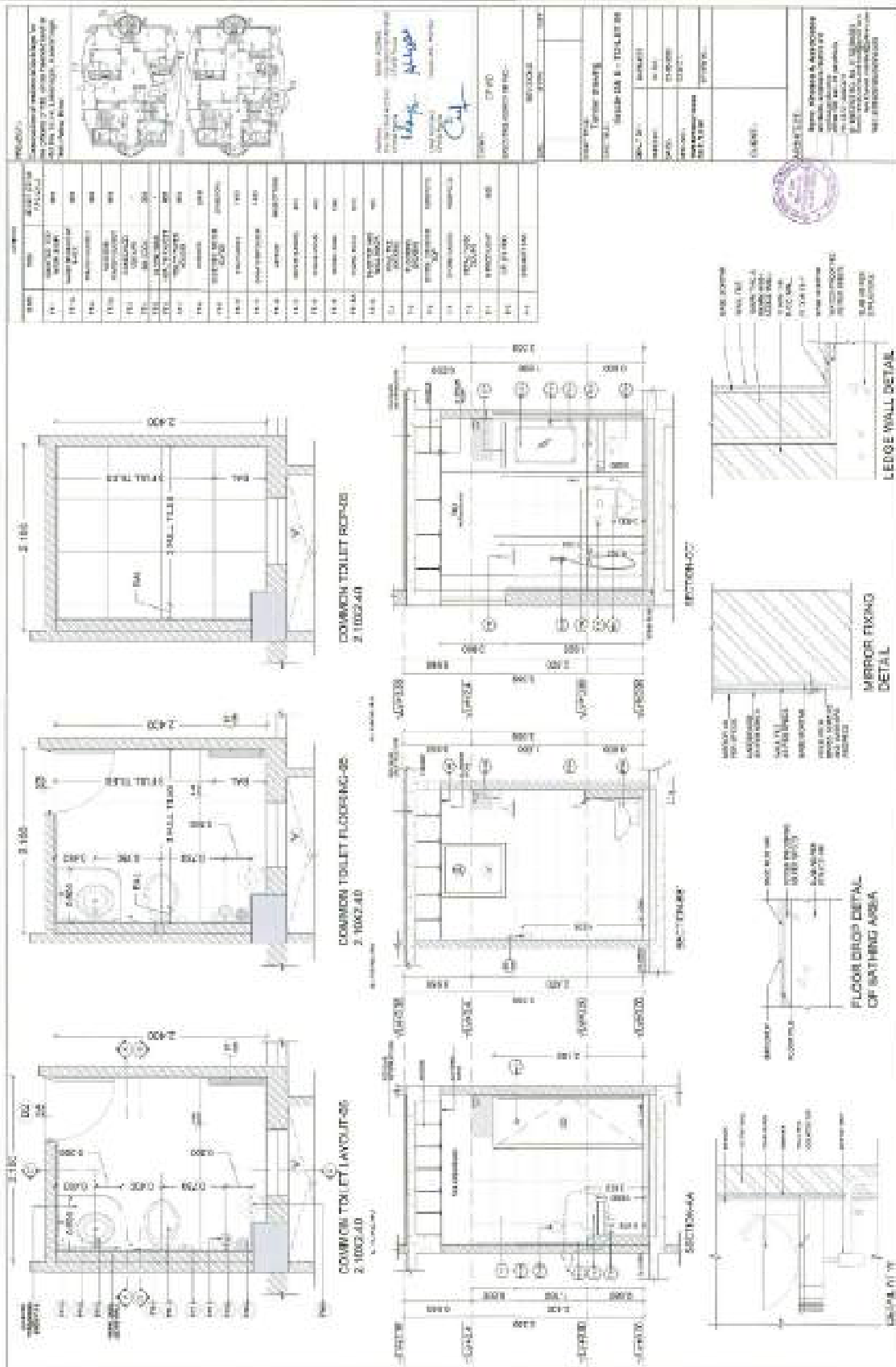


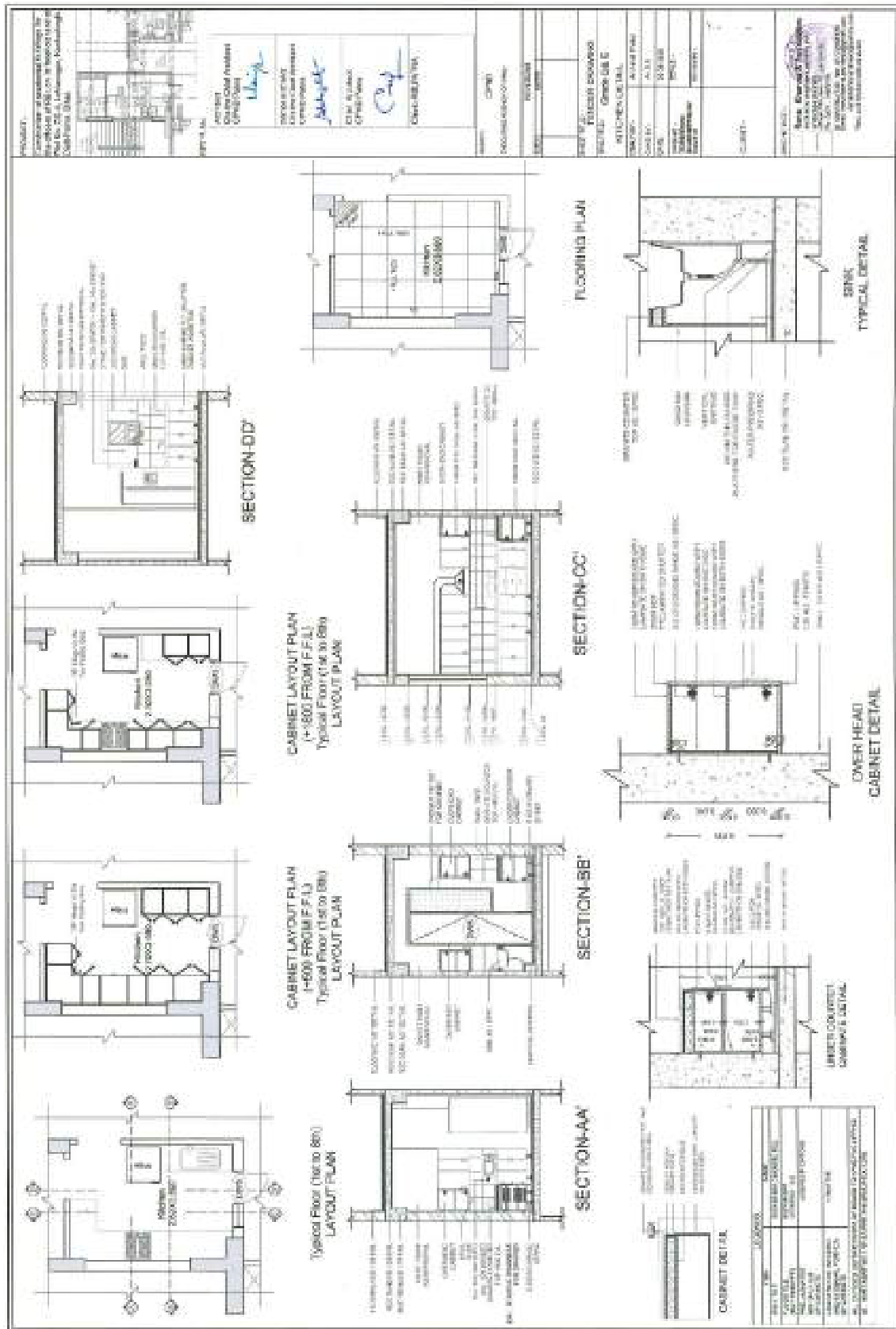
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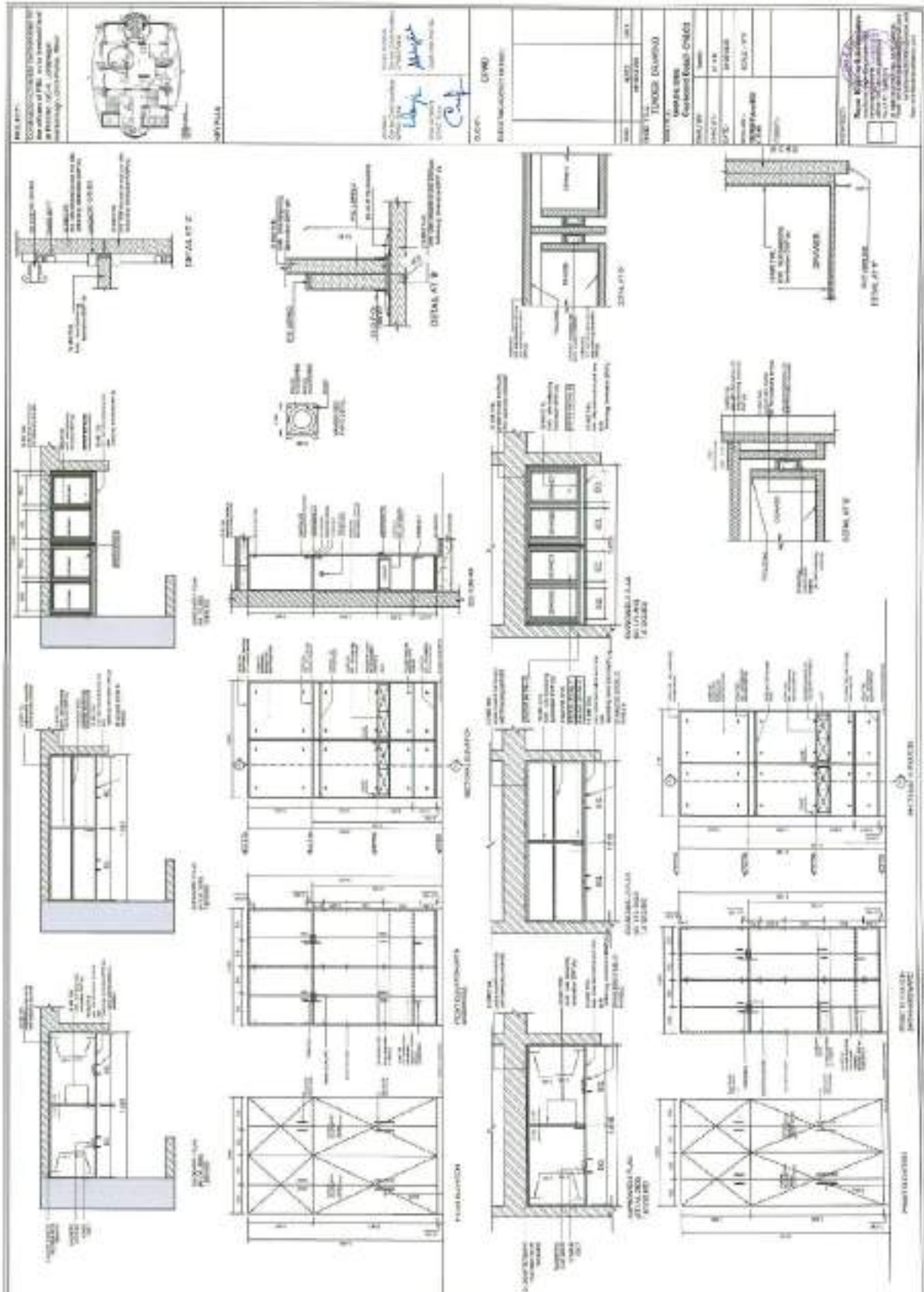


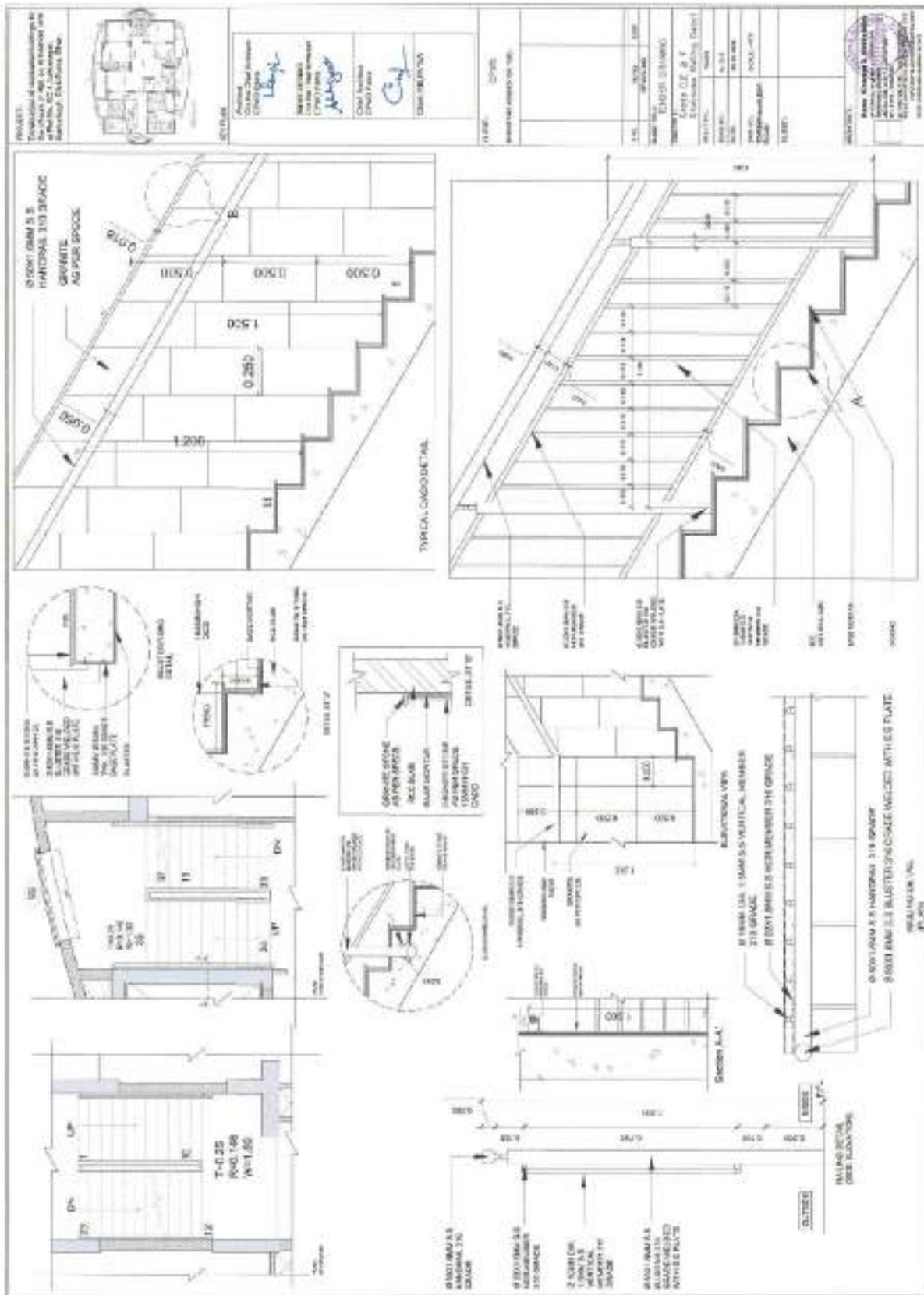


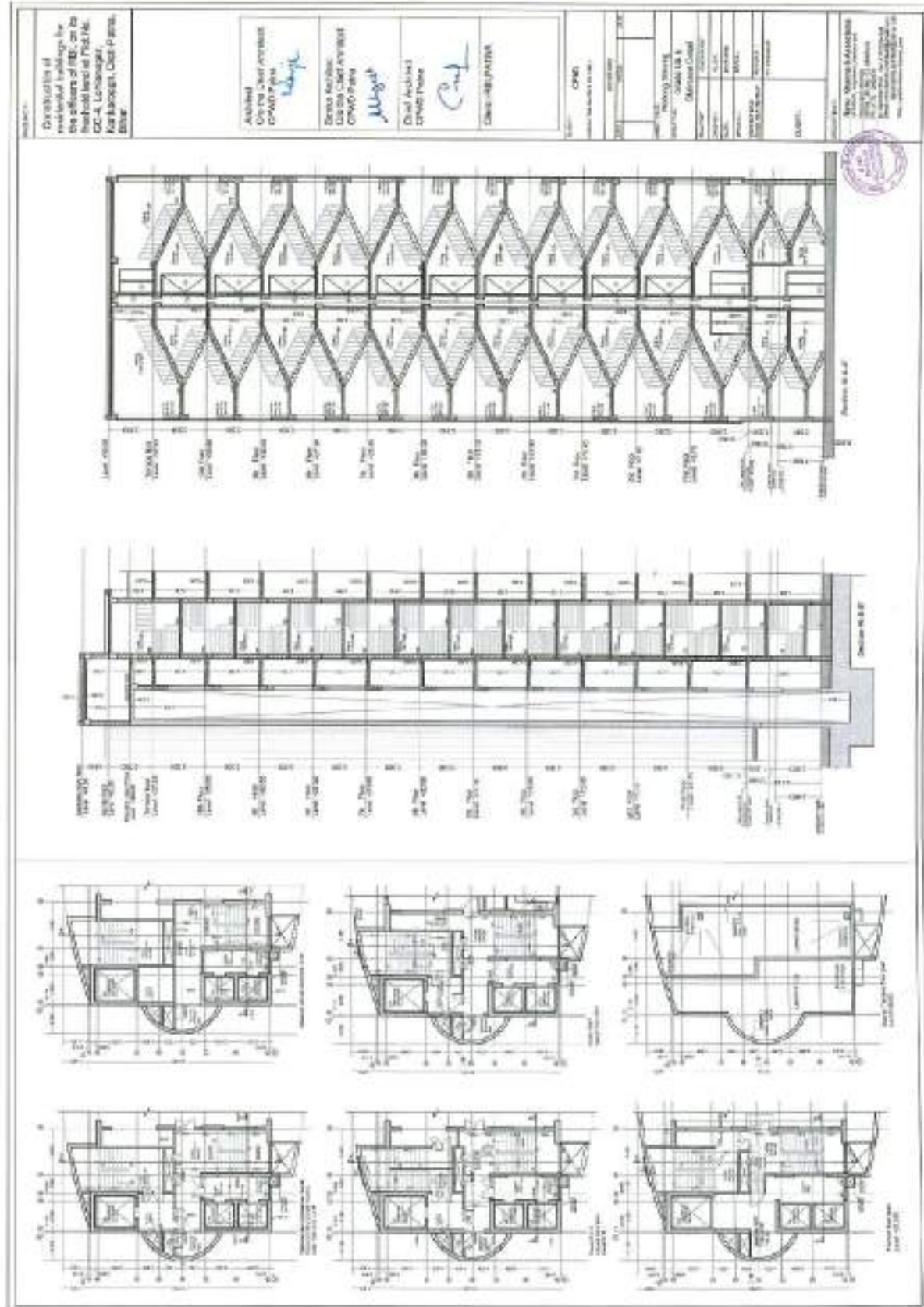


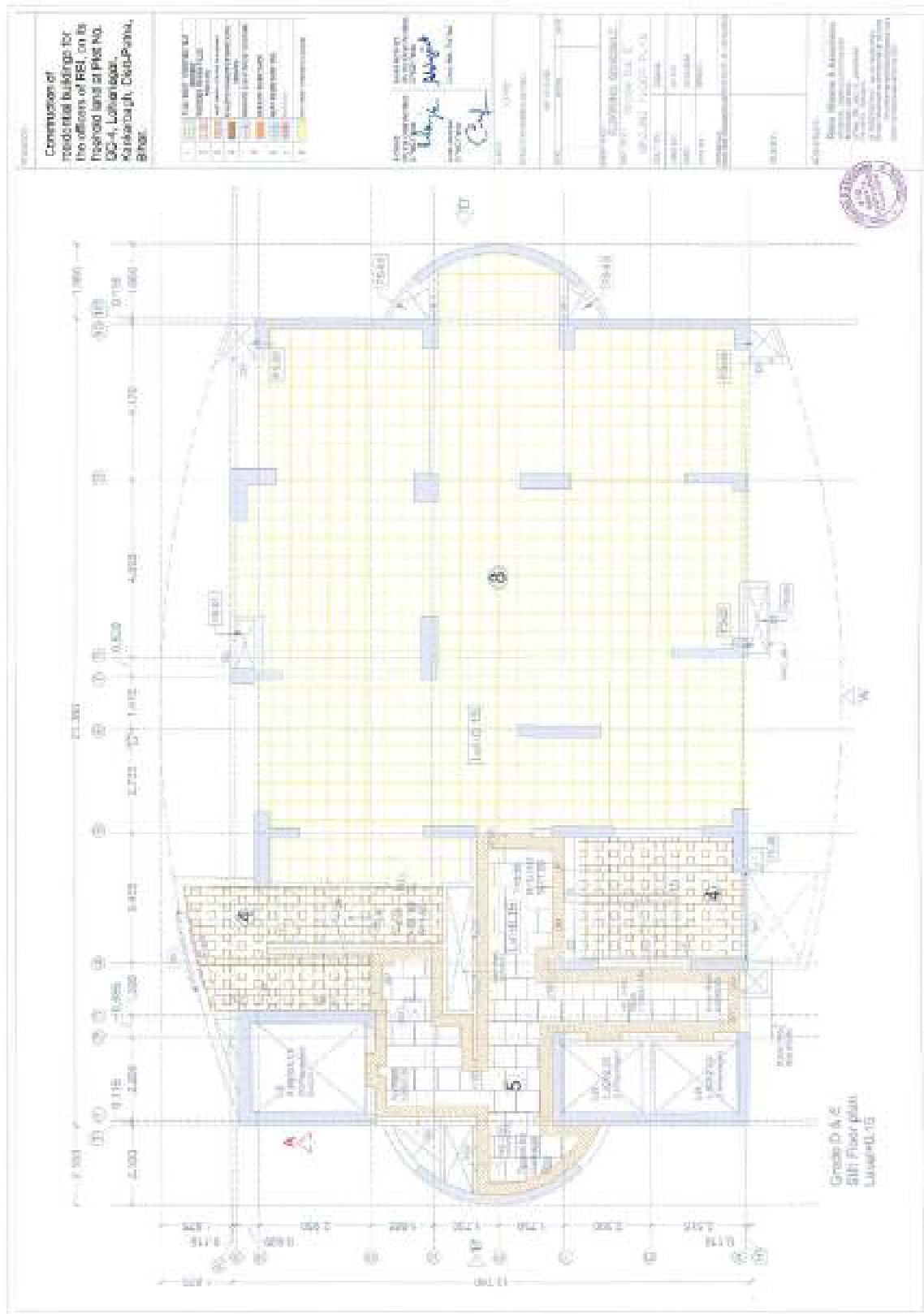


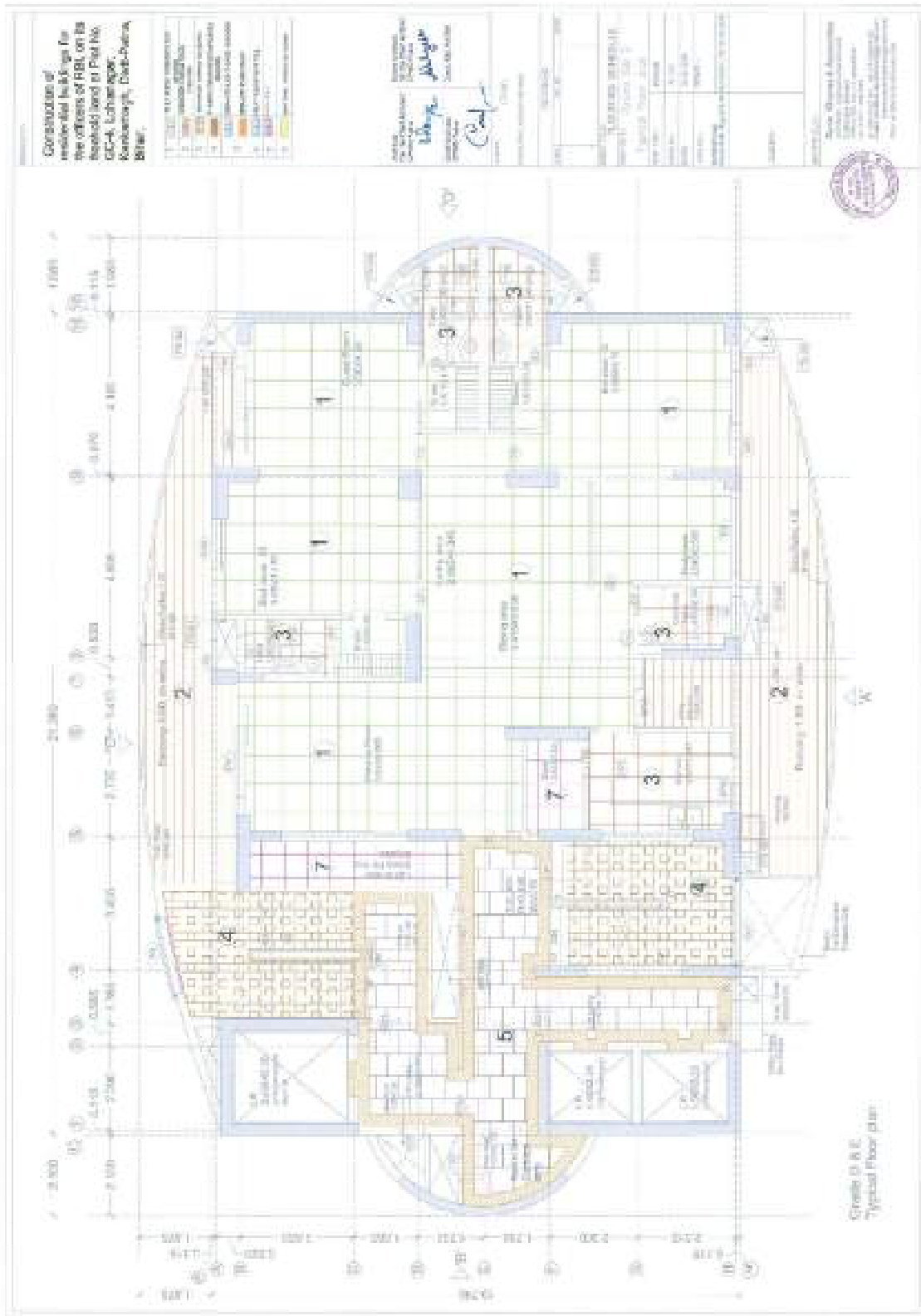


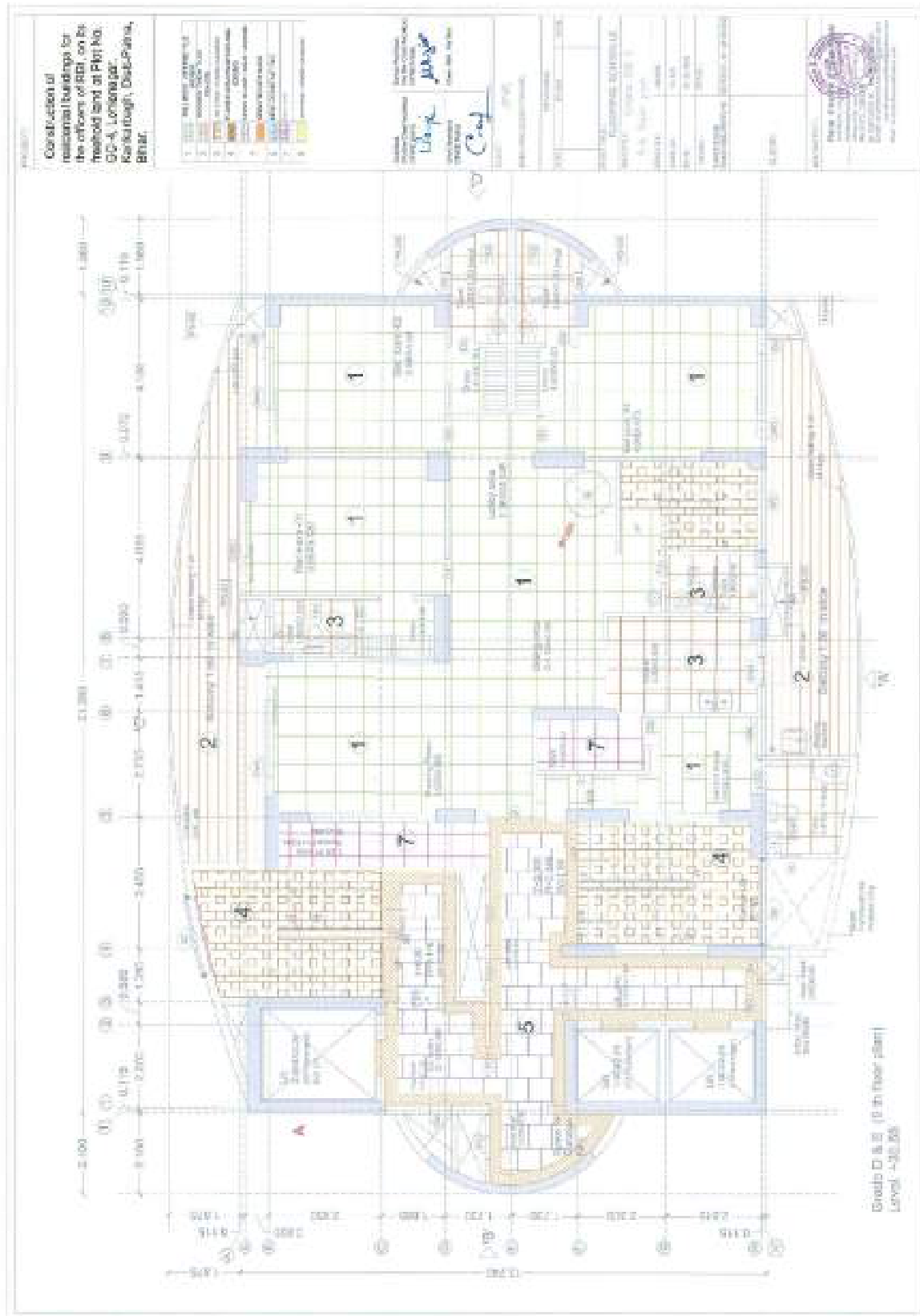


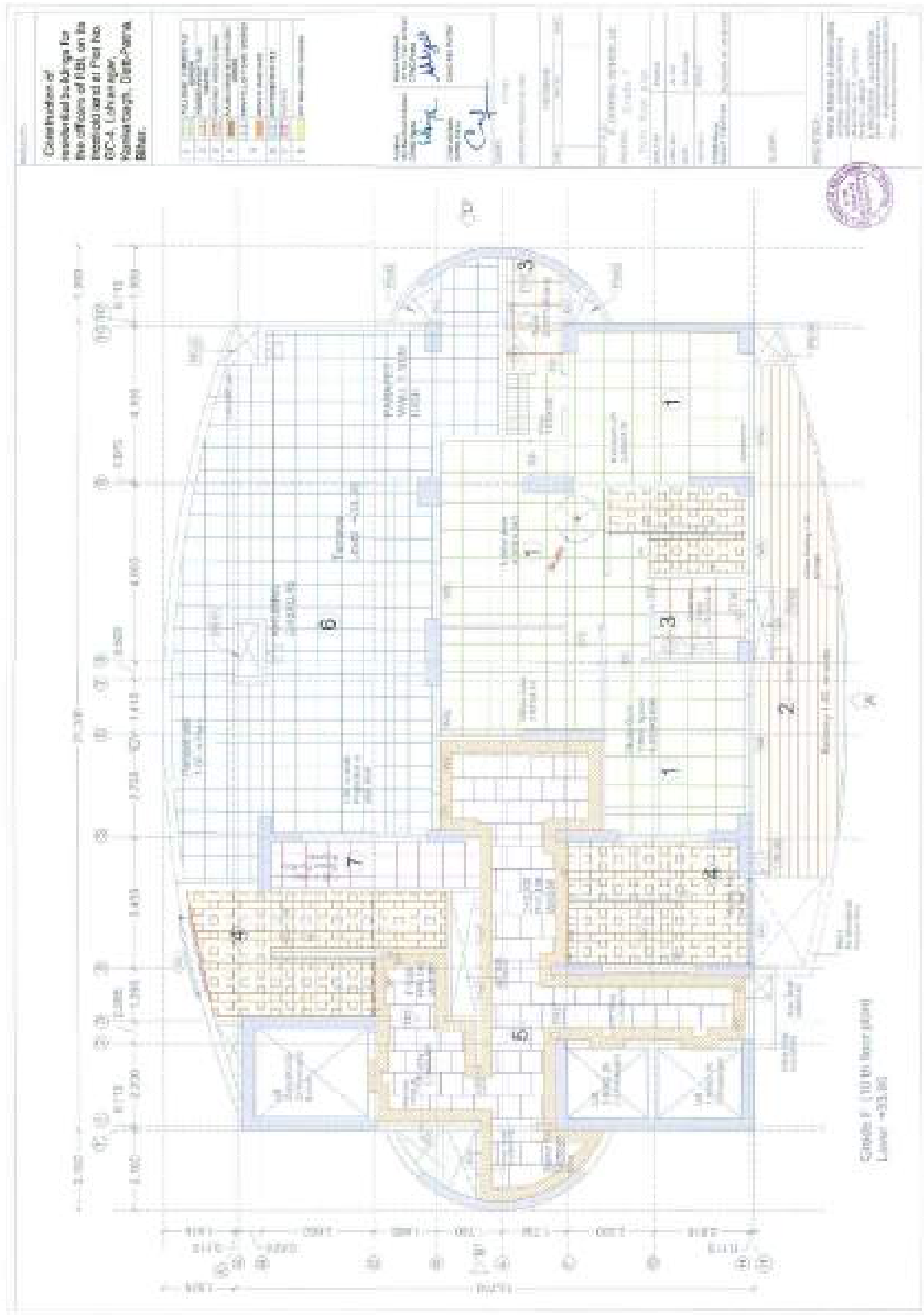


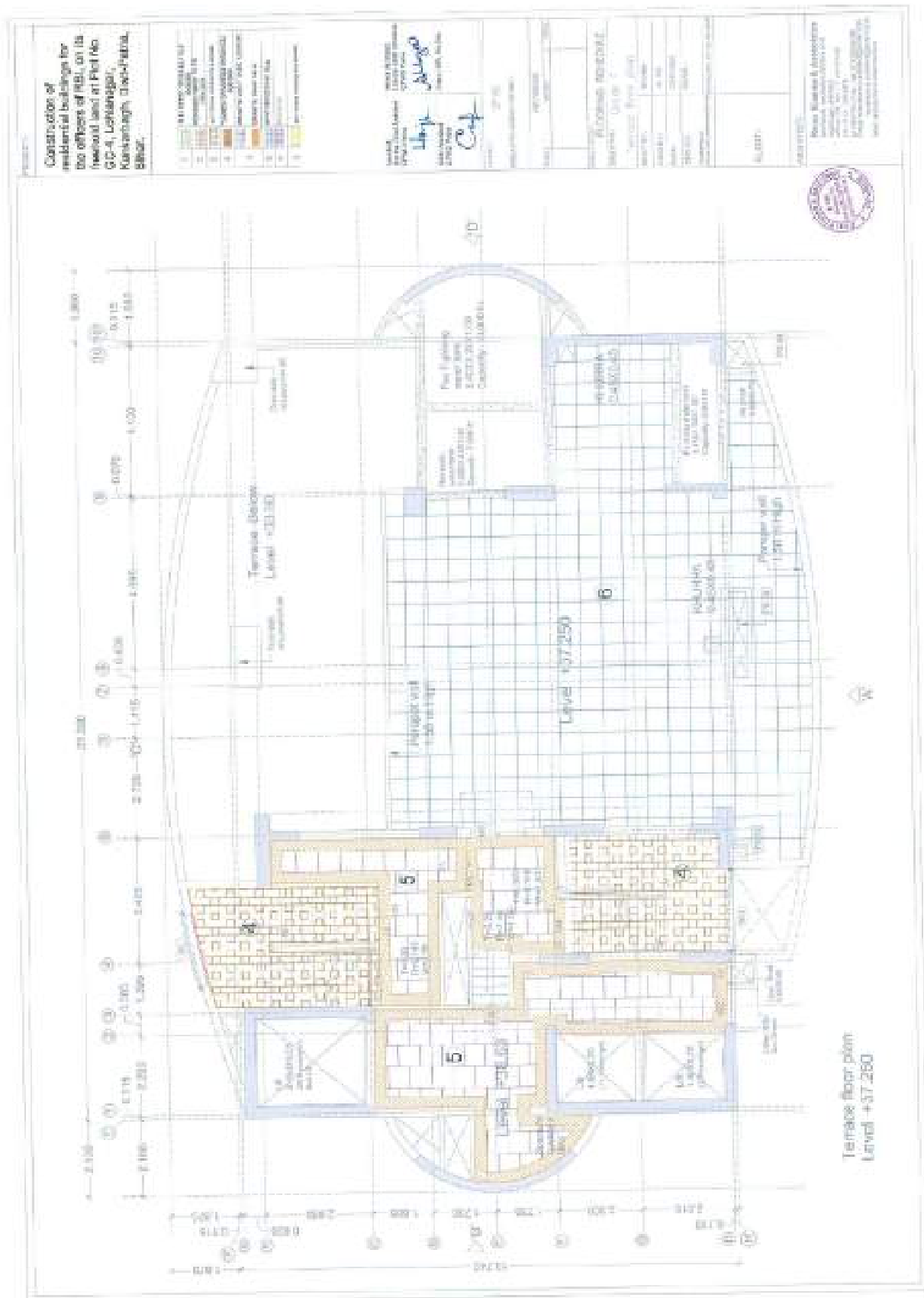


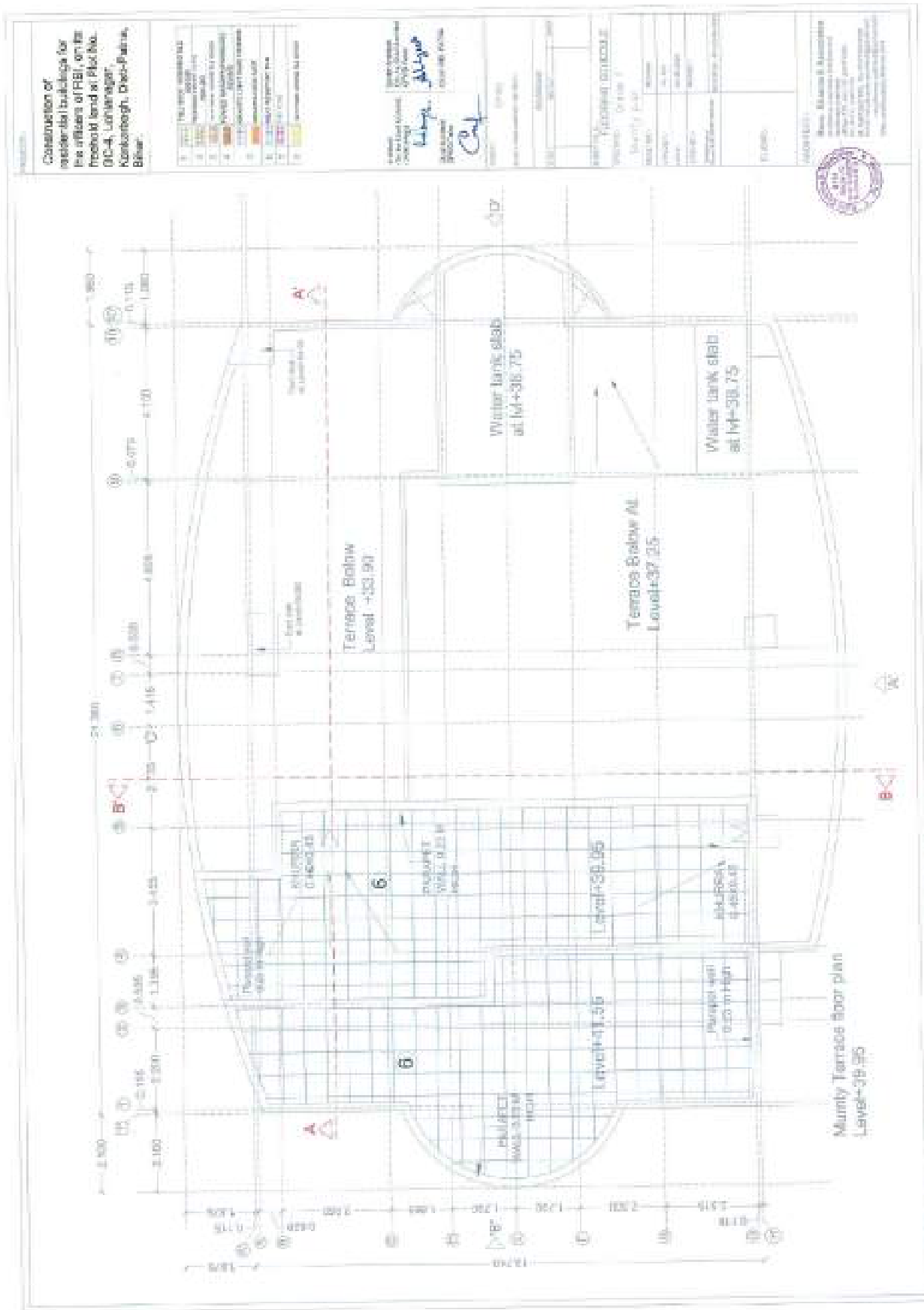


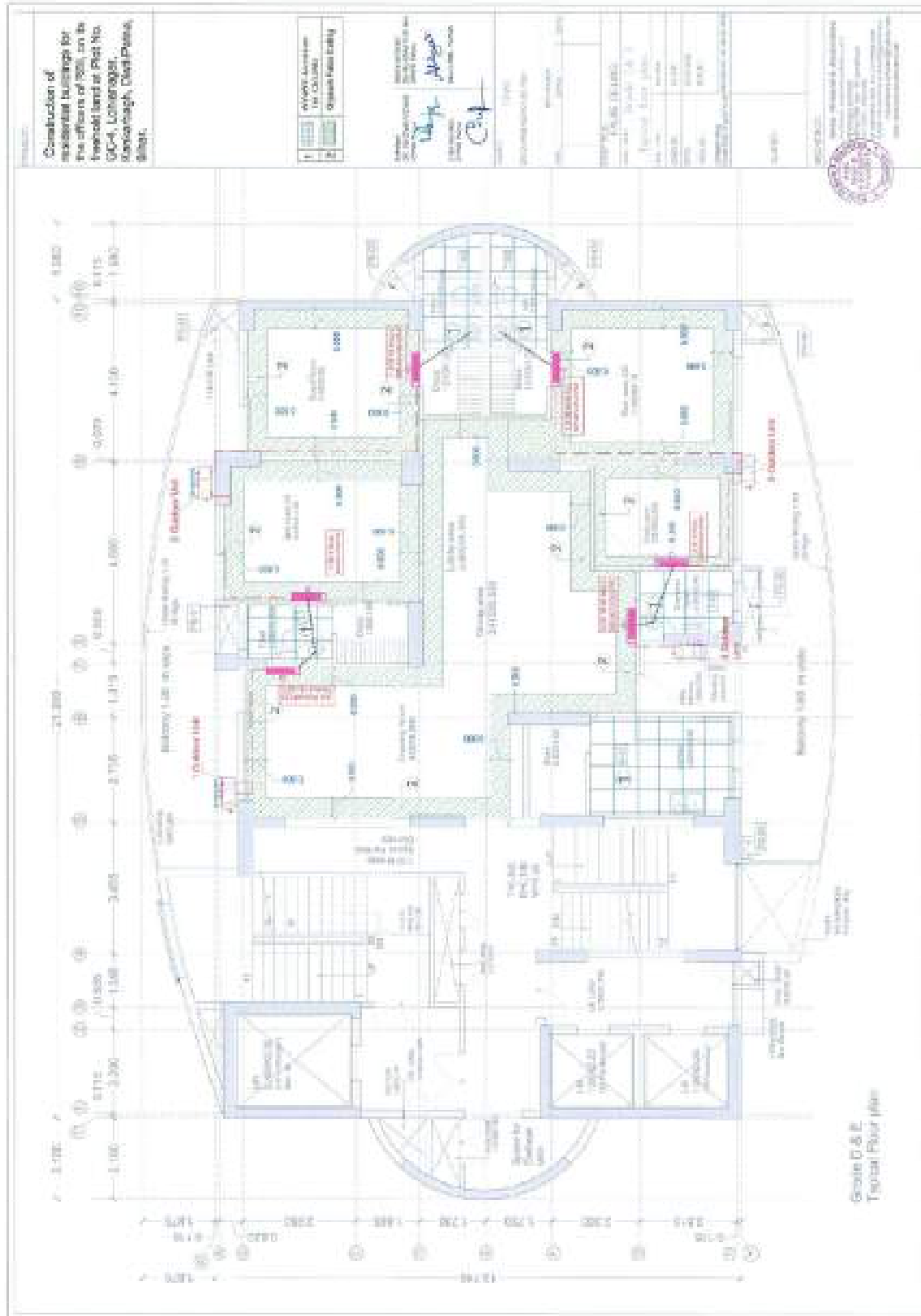


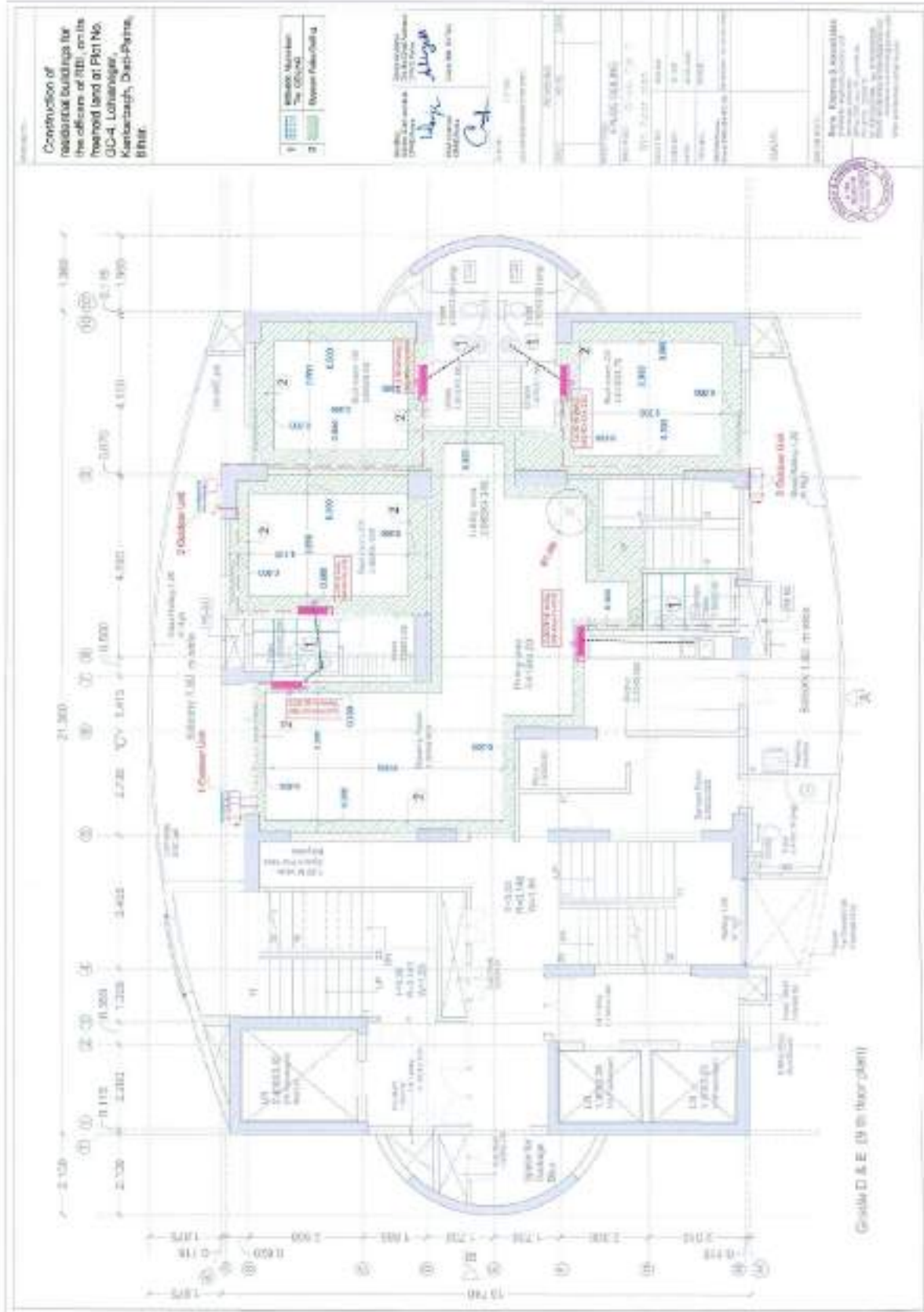


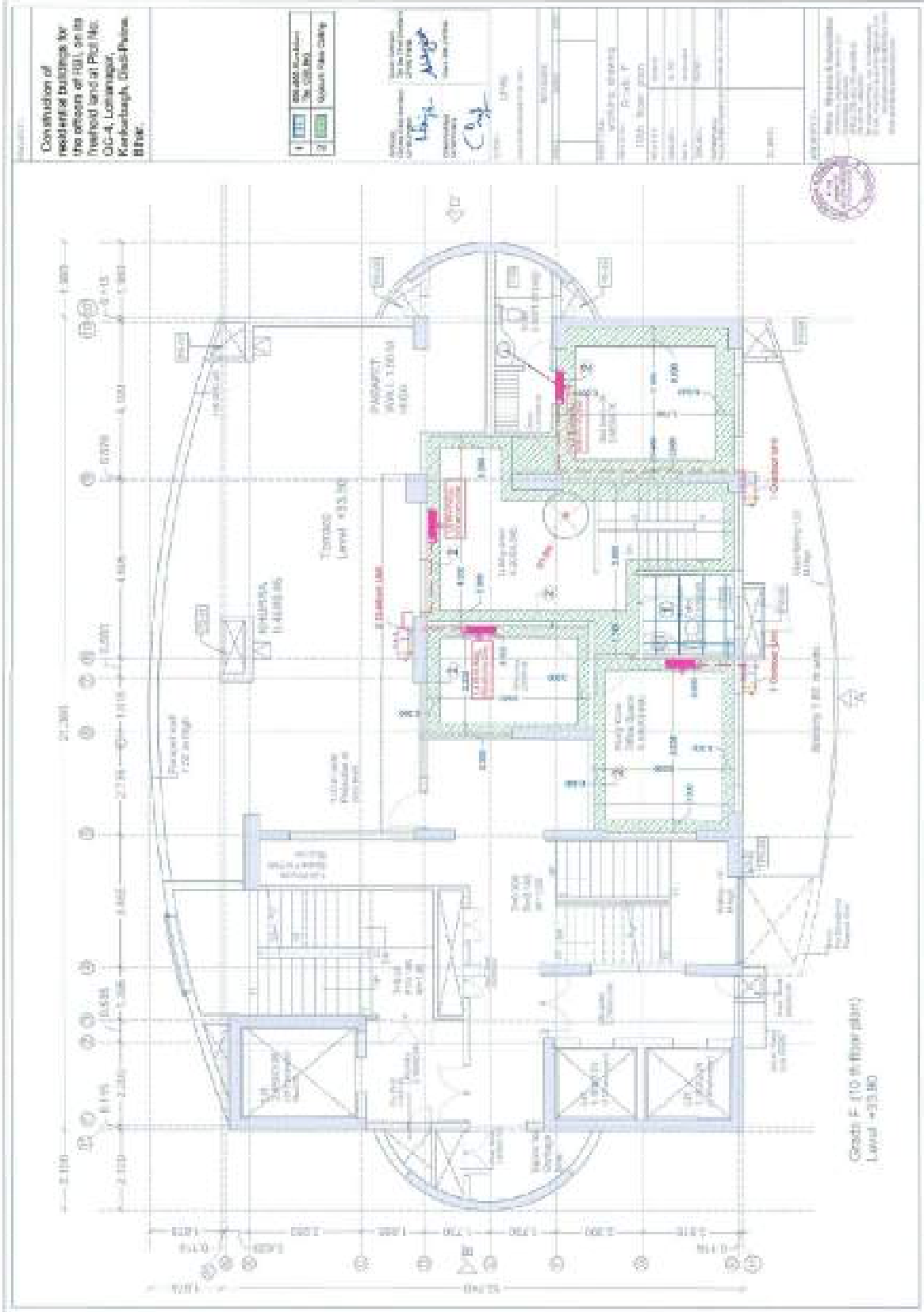


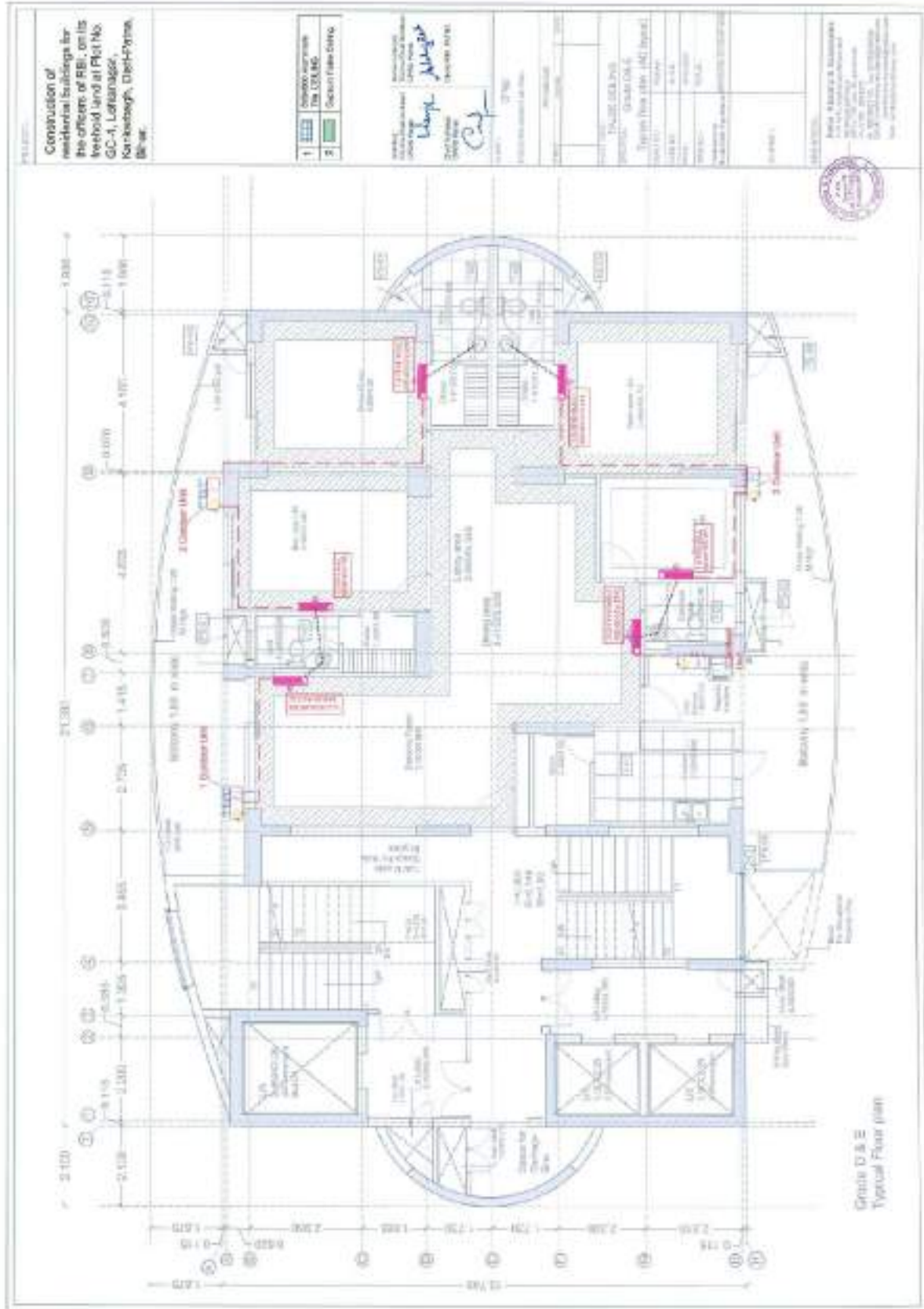


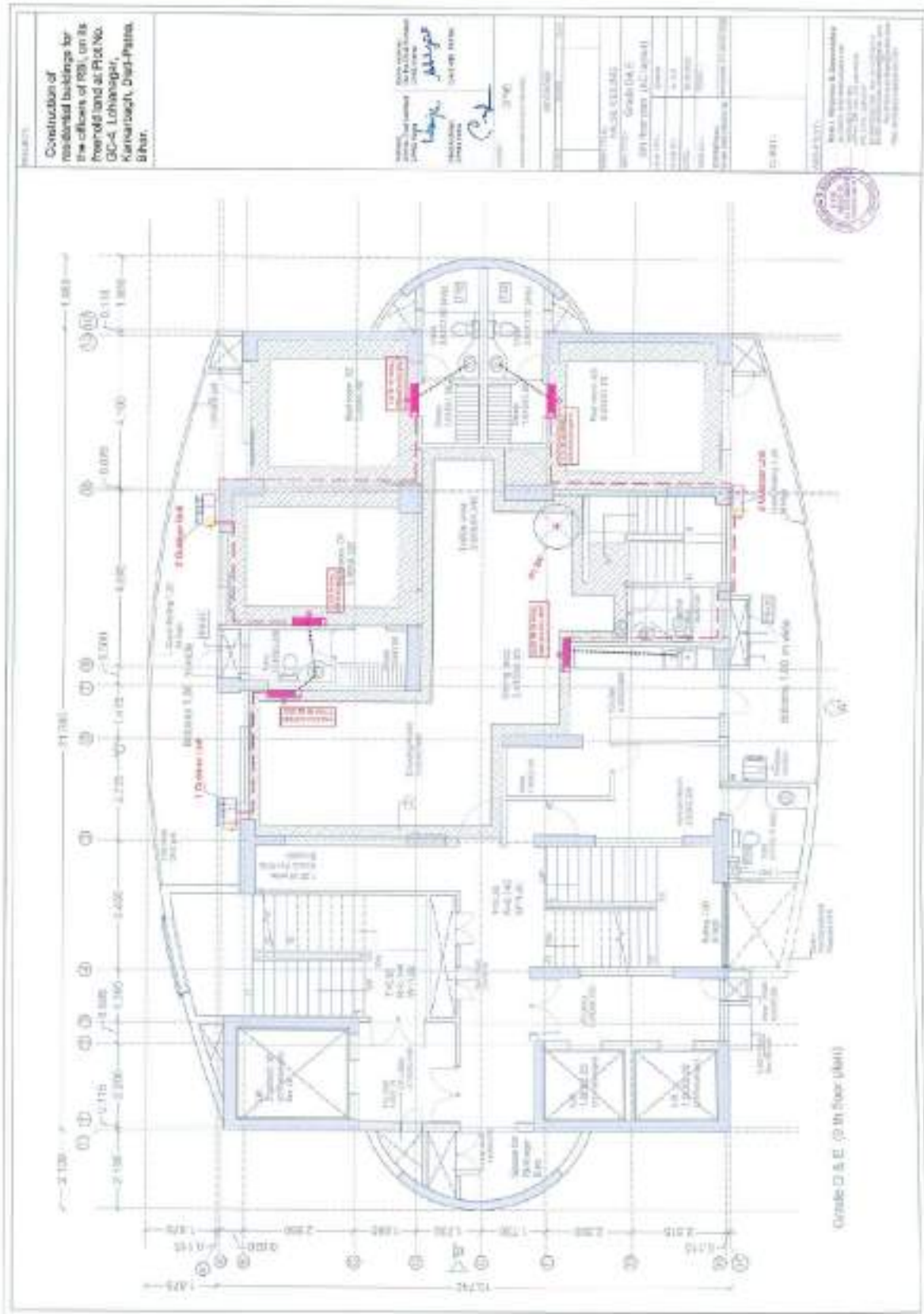


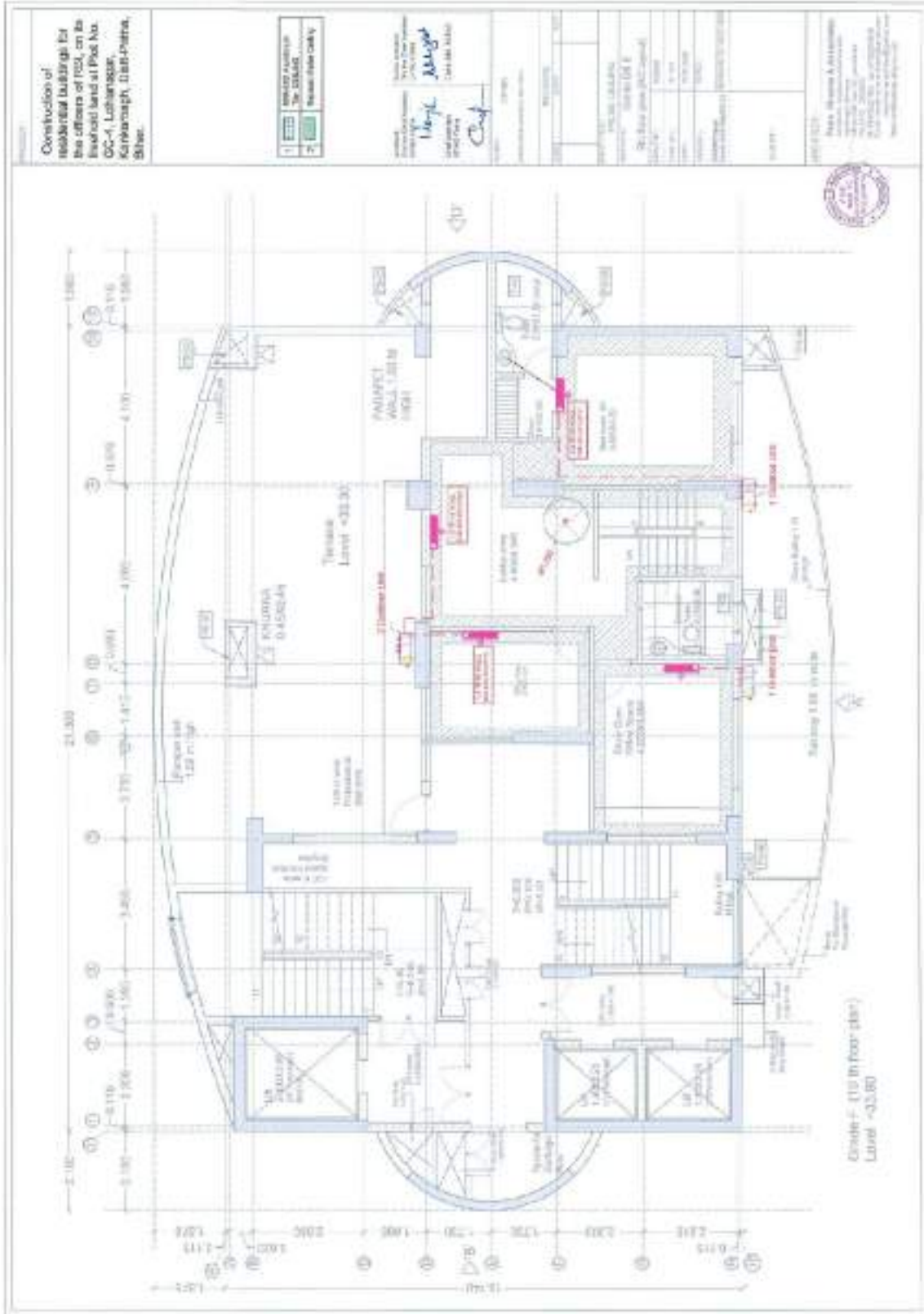


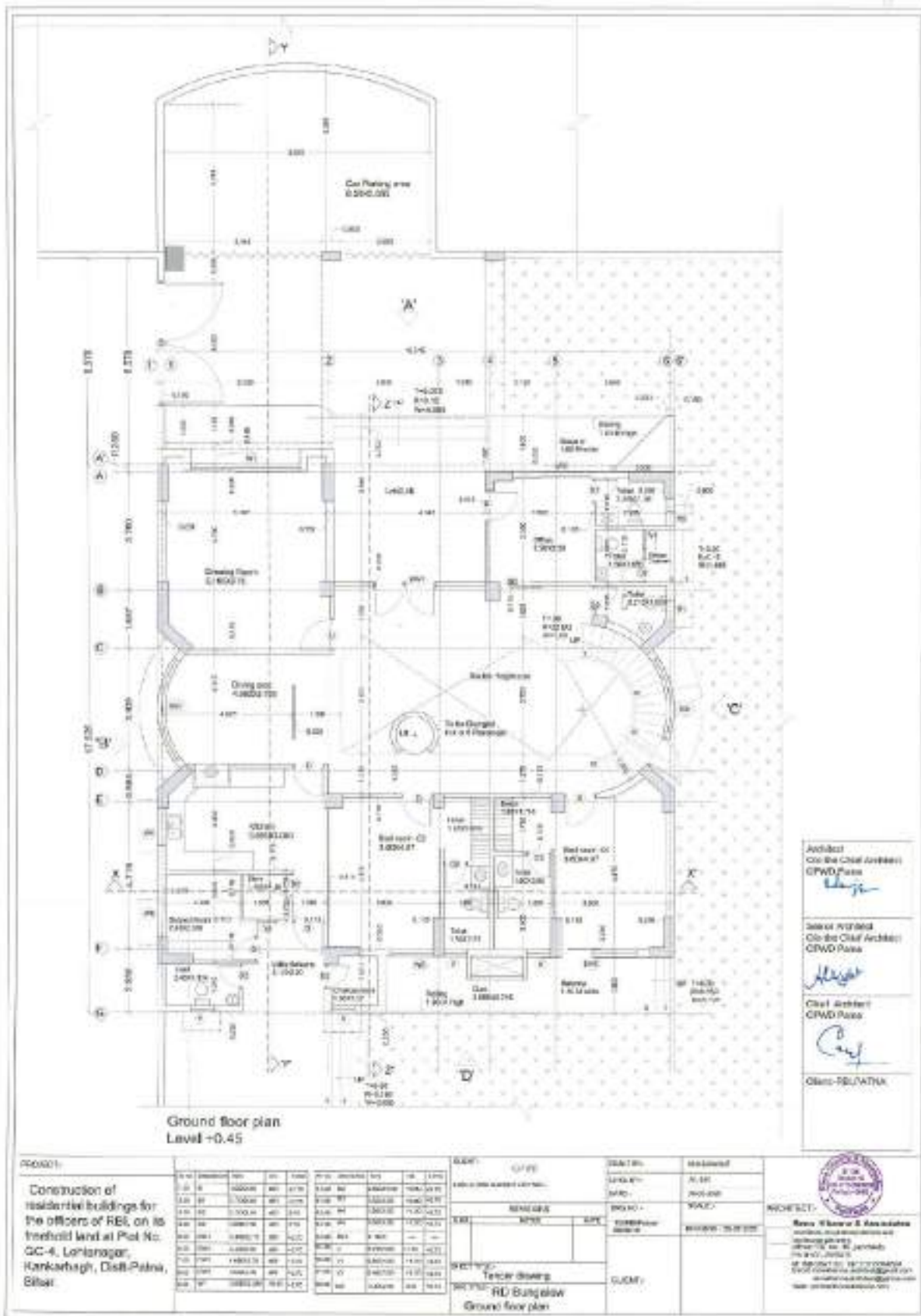


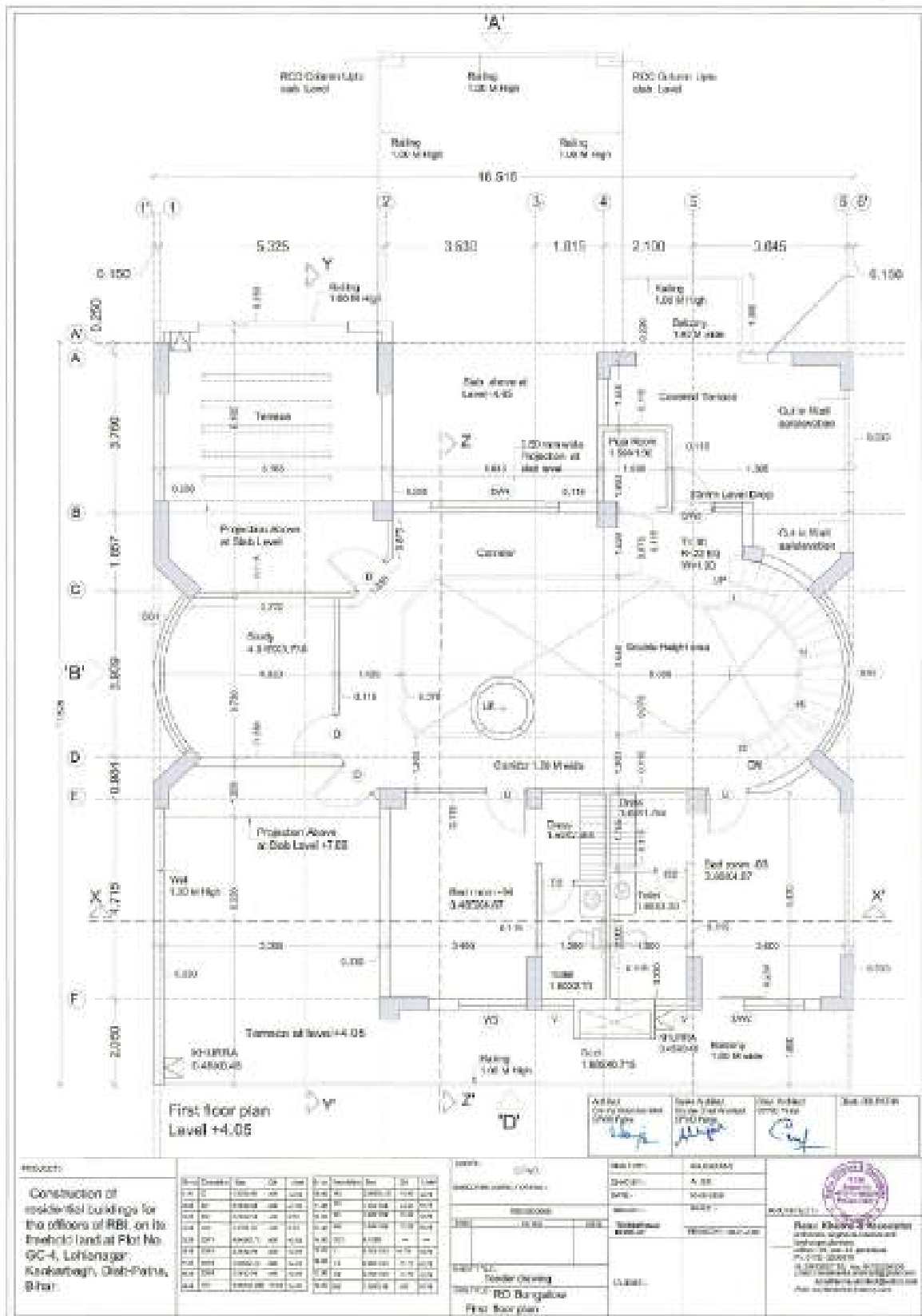


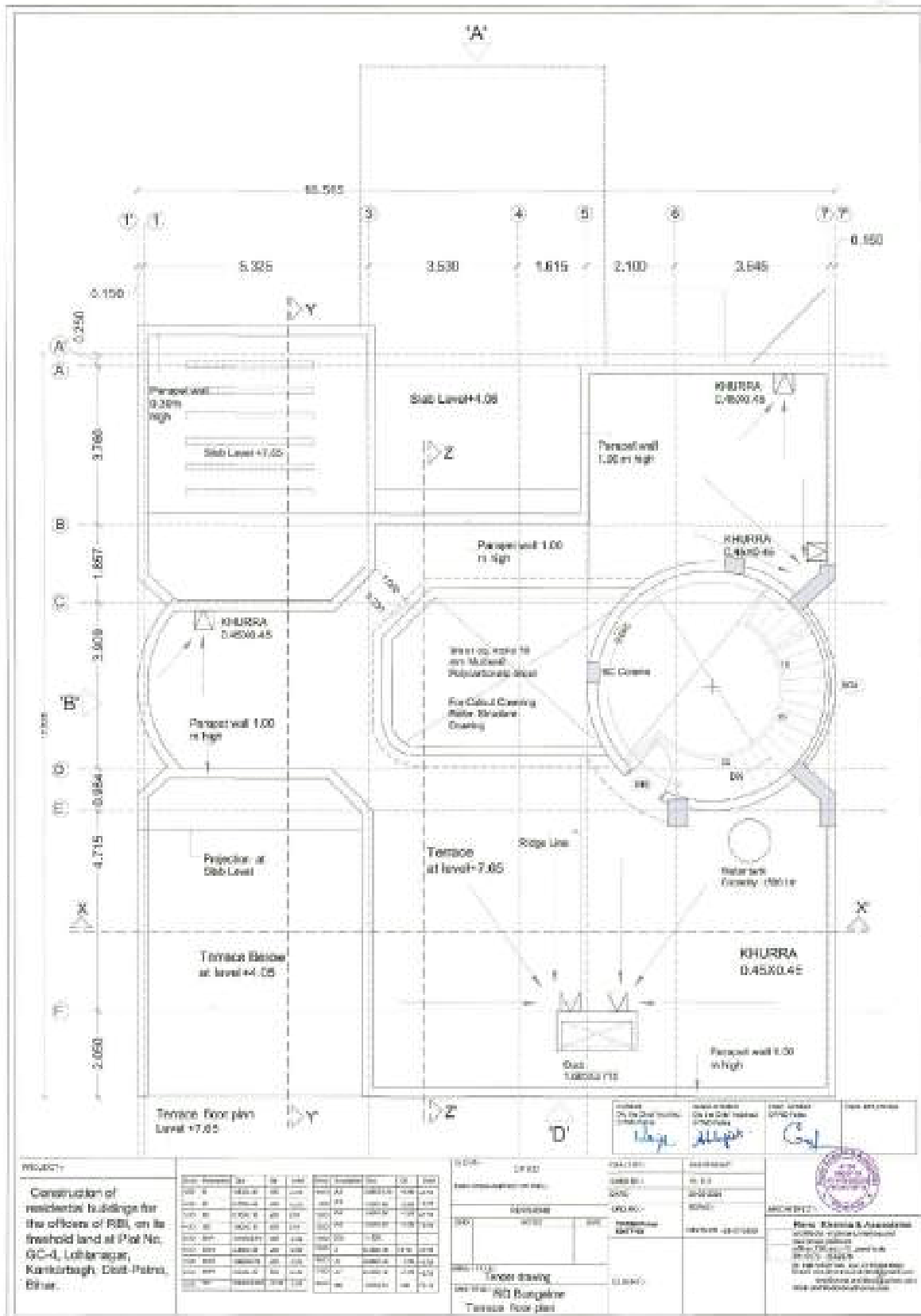






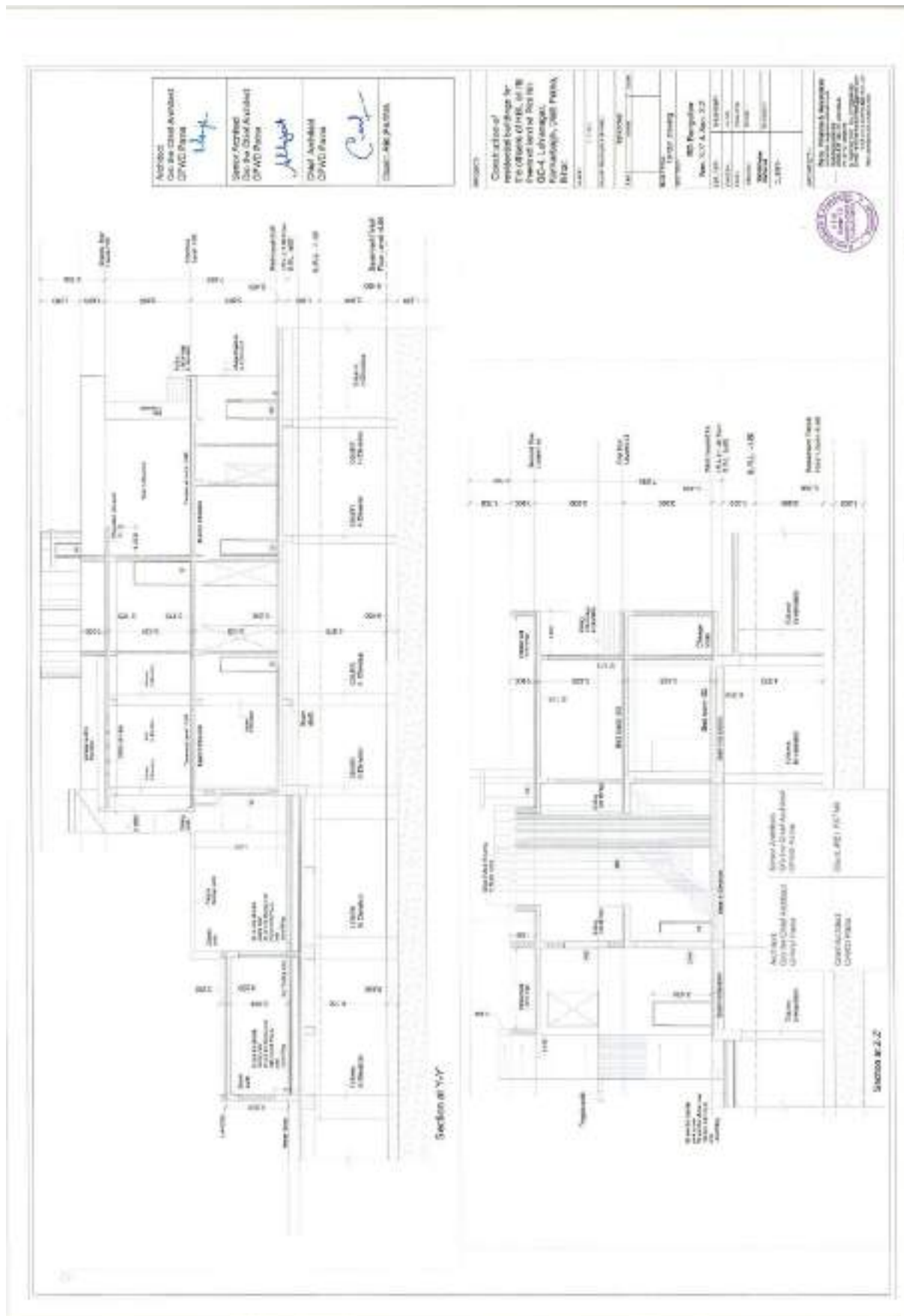


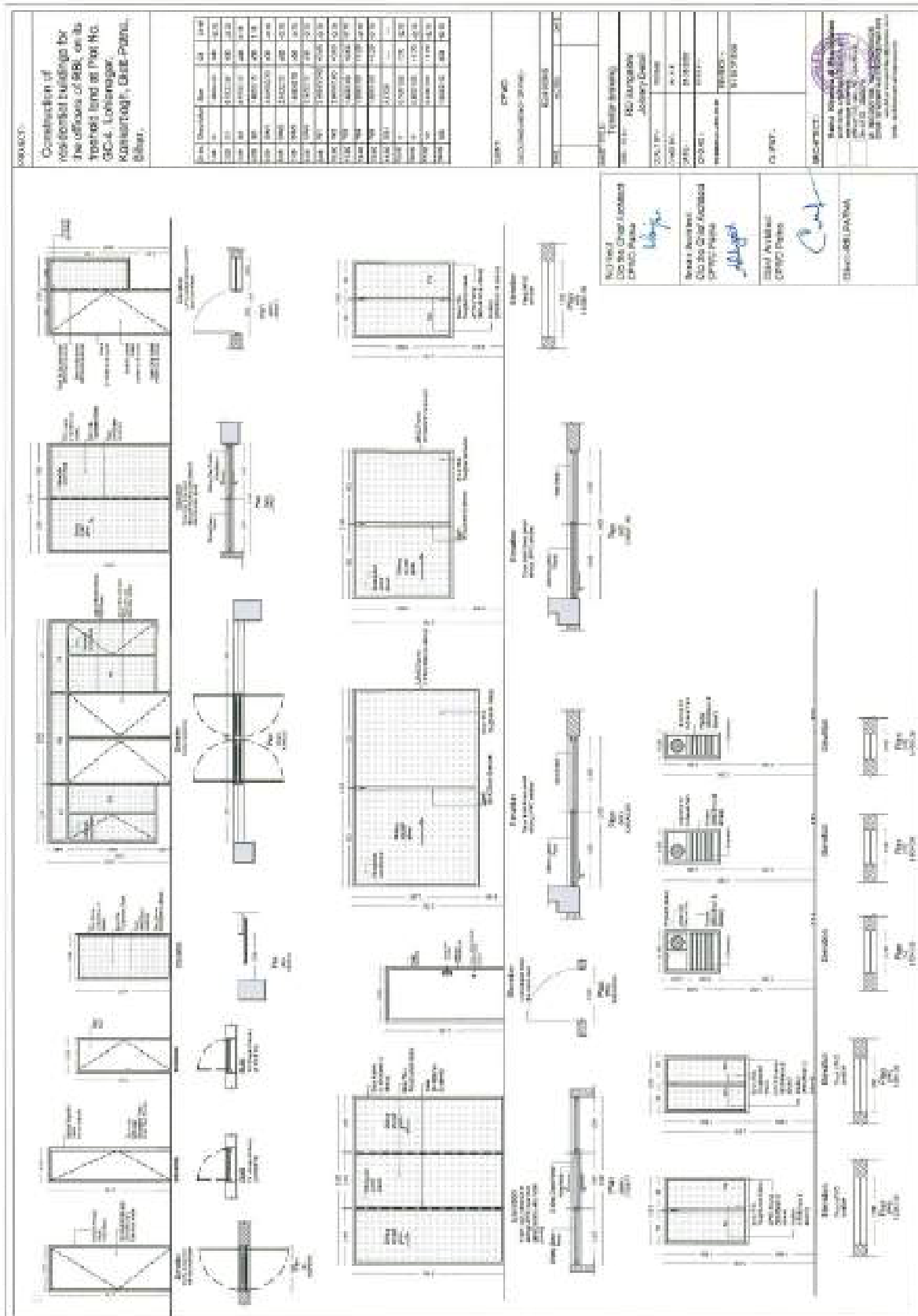


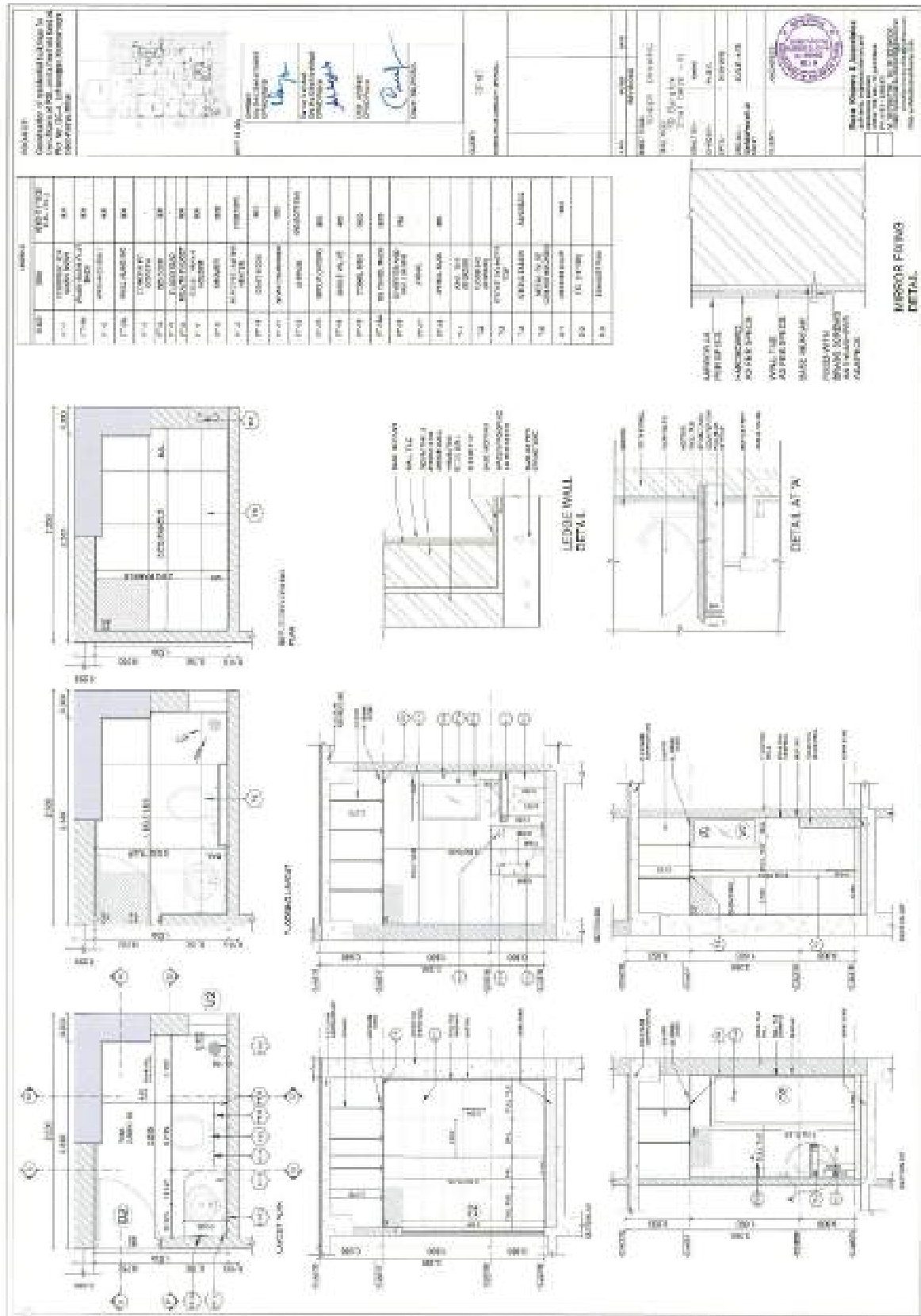


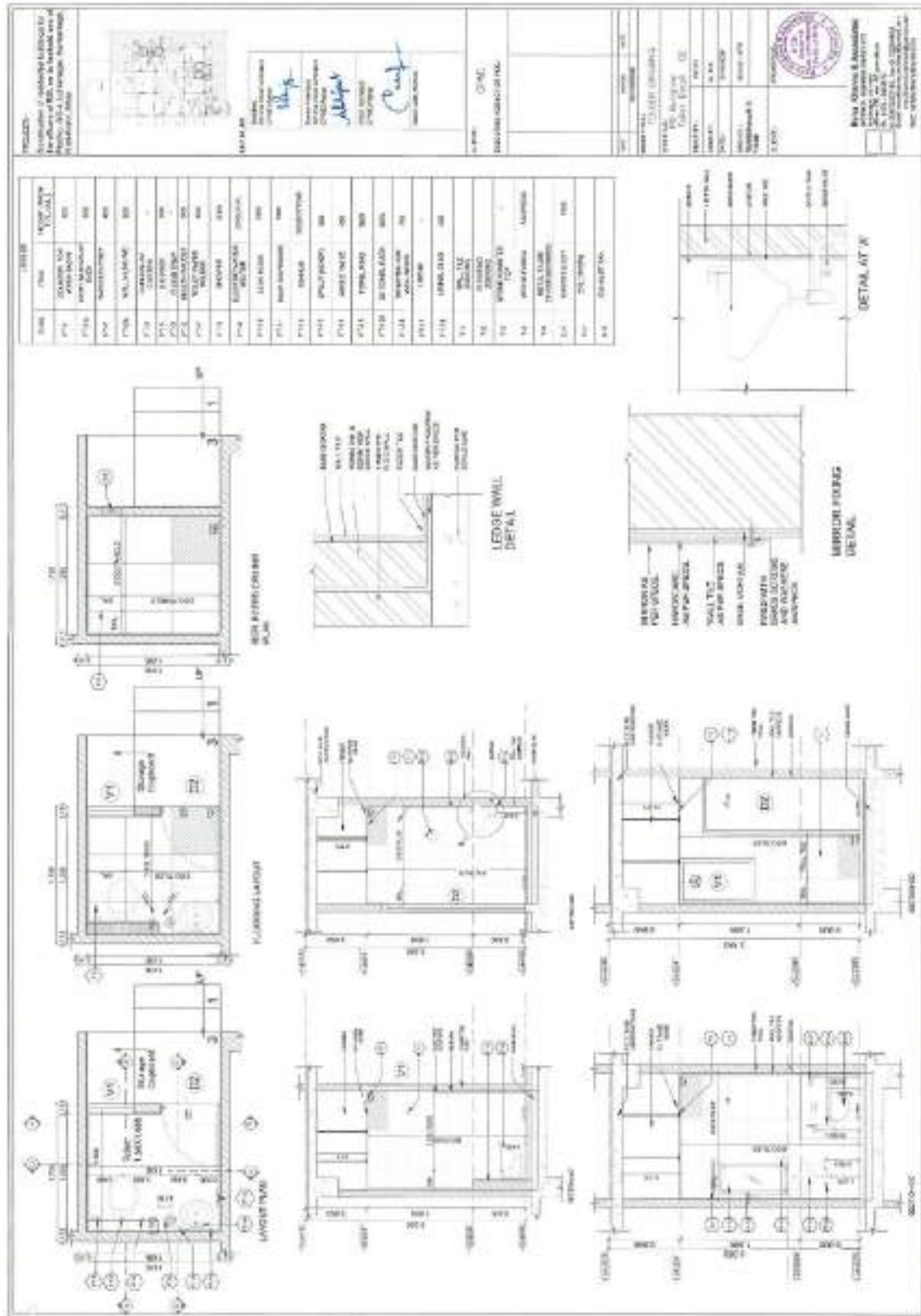


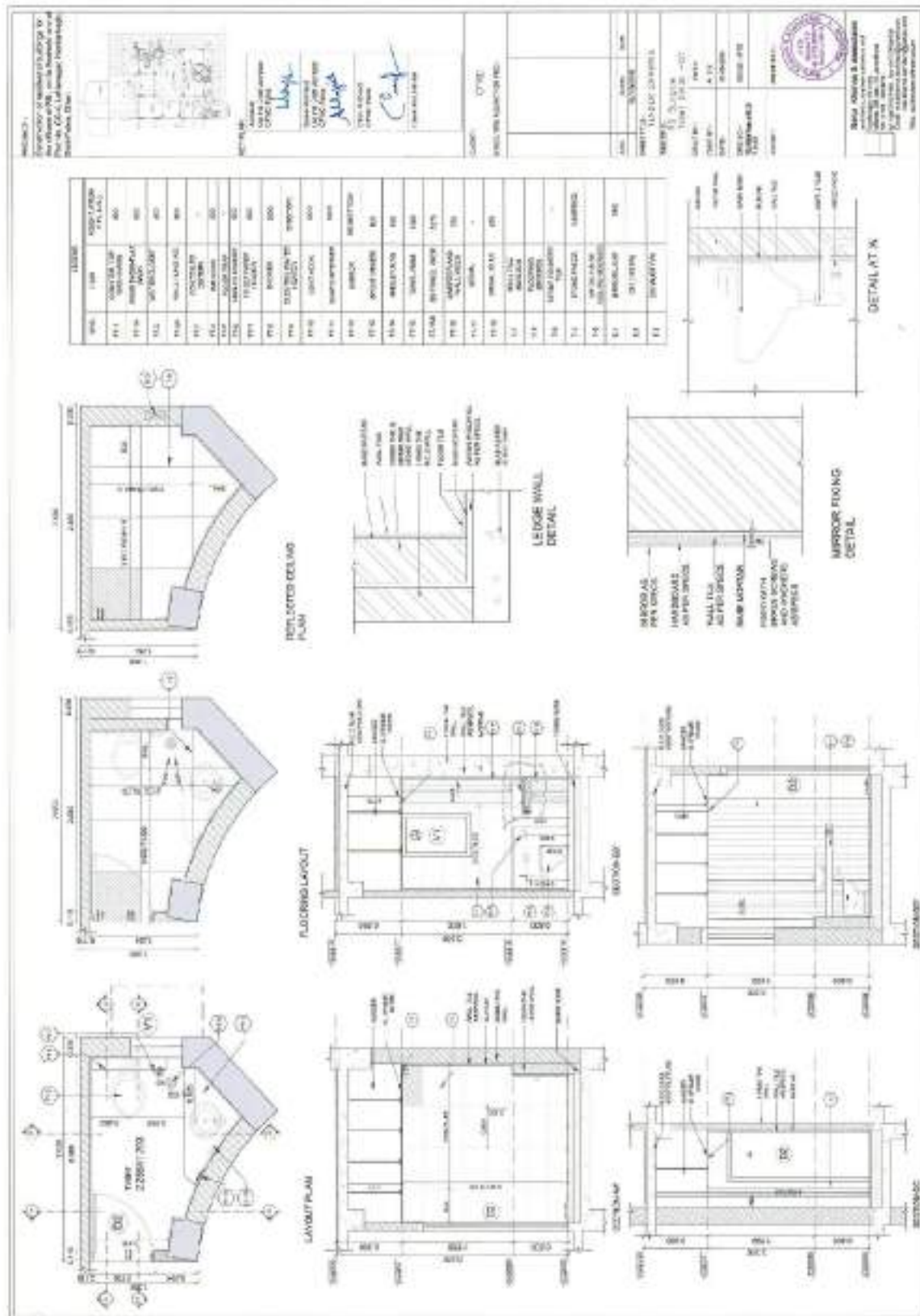


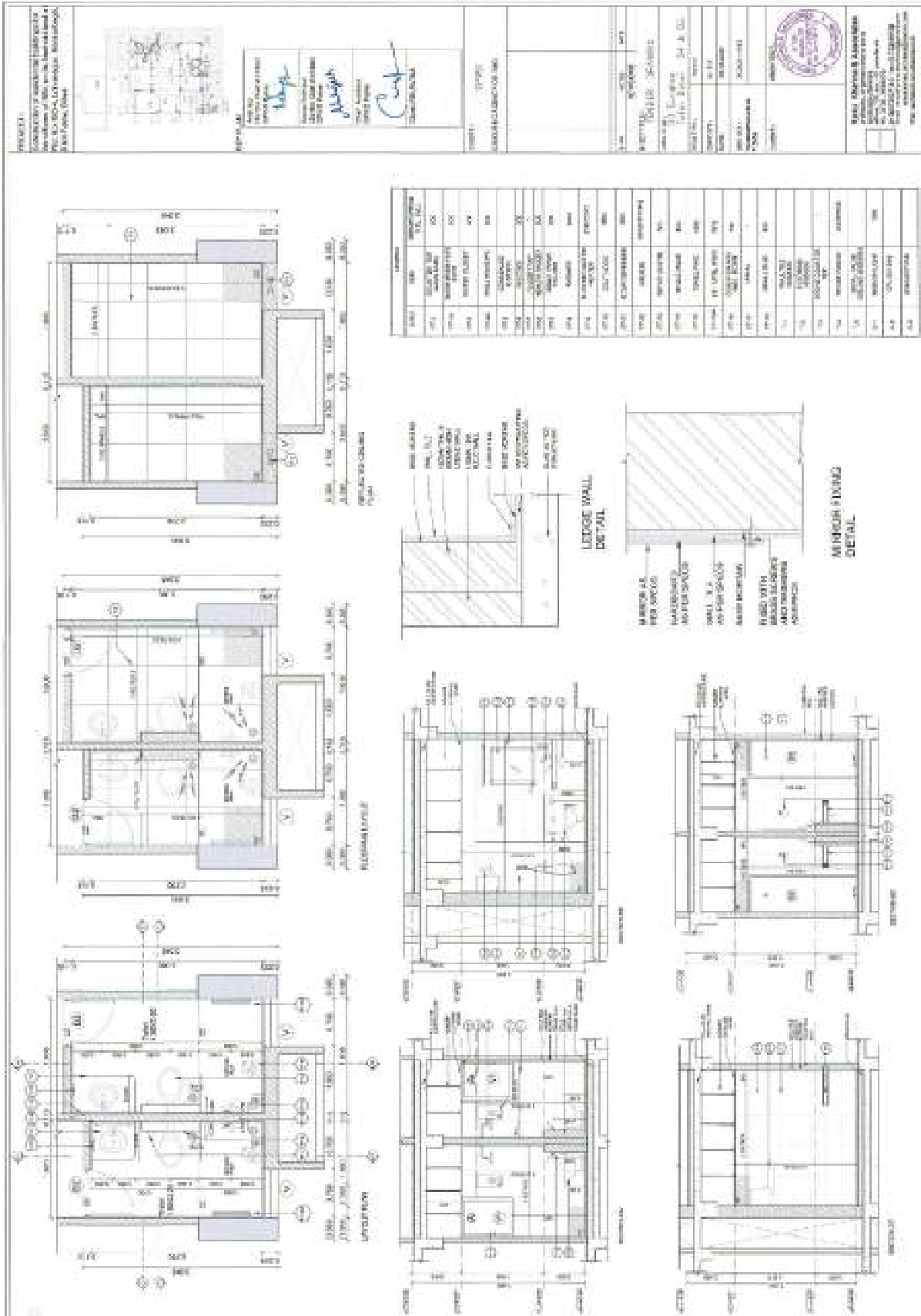


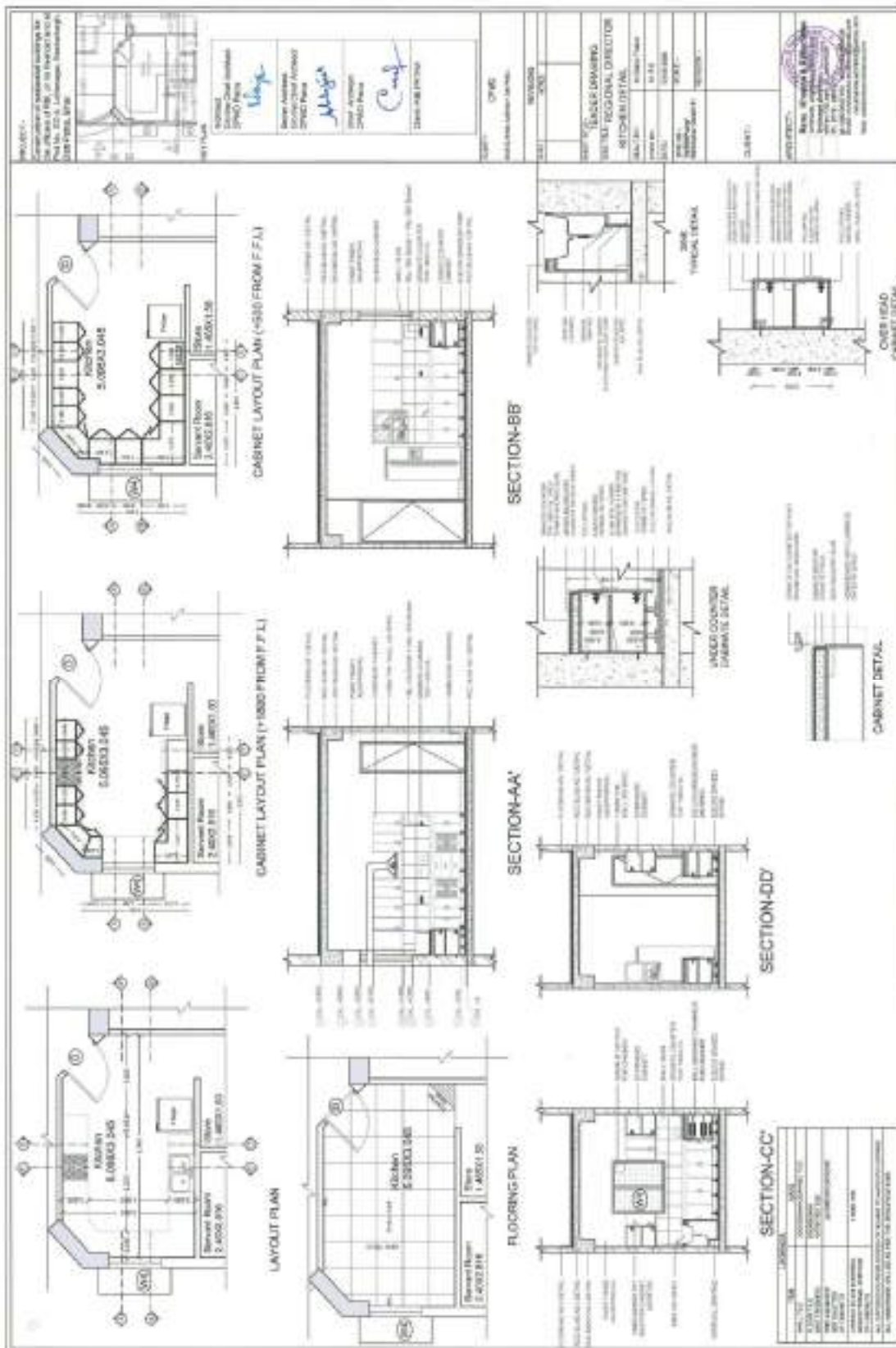












PROJECT: **DESIGN OF 7' x 7' x 7' ROOM**
 DRAWING NO: **01**
 DATE: **10/10/2023**
 SCALE: **1/4" = 1'-0"**

DESIGNED BY: **Mr. A. K. SINGH**
 CHECKED BY: **Mr. A. K. SINGH**
 APPROVED BY: **Mr. A. K. SINGH**

PROJECT LOCATION: **Plot No. 10, Sector 10, Gurgaon, Haryana**

PROJECT DESCRIPTION: **Design of 7' x 7' x 7' room for storage of materials.**

PROJECT SPECIFICATIONS: **Room dimensions: 7' x 7' x 7'. Room area: 49 sq. ft. Room volume: 343 cu. ft. Room height: 7'.**

PROJECT REQUIREMENTS: **Room should be designed for storage of materials. Room should be designed for 10 years life span. Room should be designed for 100% occupancy.**

PROJECT NOTES: **1. Room should be designed for storage of materials. 2. Room should be designed for 10 years life span. 3. Room should be designed for 100% occupancy.**

PROJECT DRAWINGS: **1. Room layout plan. 2. Room elevation. 3. Room section. 4. Room detail.**

PROJECT MATERIALS: **1. Concrete. 2. Brick. 3. Sand. 4. Cement. 5. Steel reinforcement.**

PROJECT COST: **Rs. 1,00,000/-**

PROJECT SCHEDULE: **1. Design. 2. Construction. 3. Completion.**

PROJECT CONTACT: **Mr. A. K. SINGH, 10/10/2023, 10/10/2023, 10/10/2023.**

PROJECT SIGNATURE: **Mr. A. K. SINGH**

PROJECT SEAL: **Mr. A. K. SINGH**

PROJECT STAMP: **Mr. A. K. SINGH**

PROJECT LOGO: **Mr. A. K. SINGH**

PROJECT PHOTO: **Mr. A. K. SINGH**

PROJECT VIDEO: **Mr. A. K. SINGH**

PROJECT AUDIO: **Mr. A. K. SINGH**

PROJECT TEXT: **Mr. A. K. SINGH**

PROJECT IMAGE: **Mr. A. K. SINGH**

PROJECT GRAPH: **Mr. A. K. SINGH**

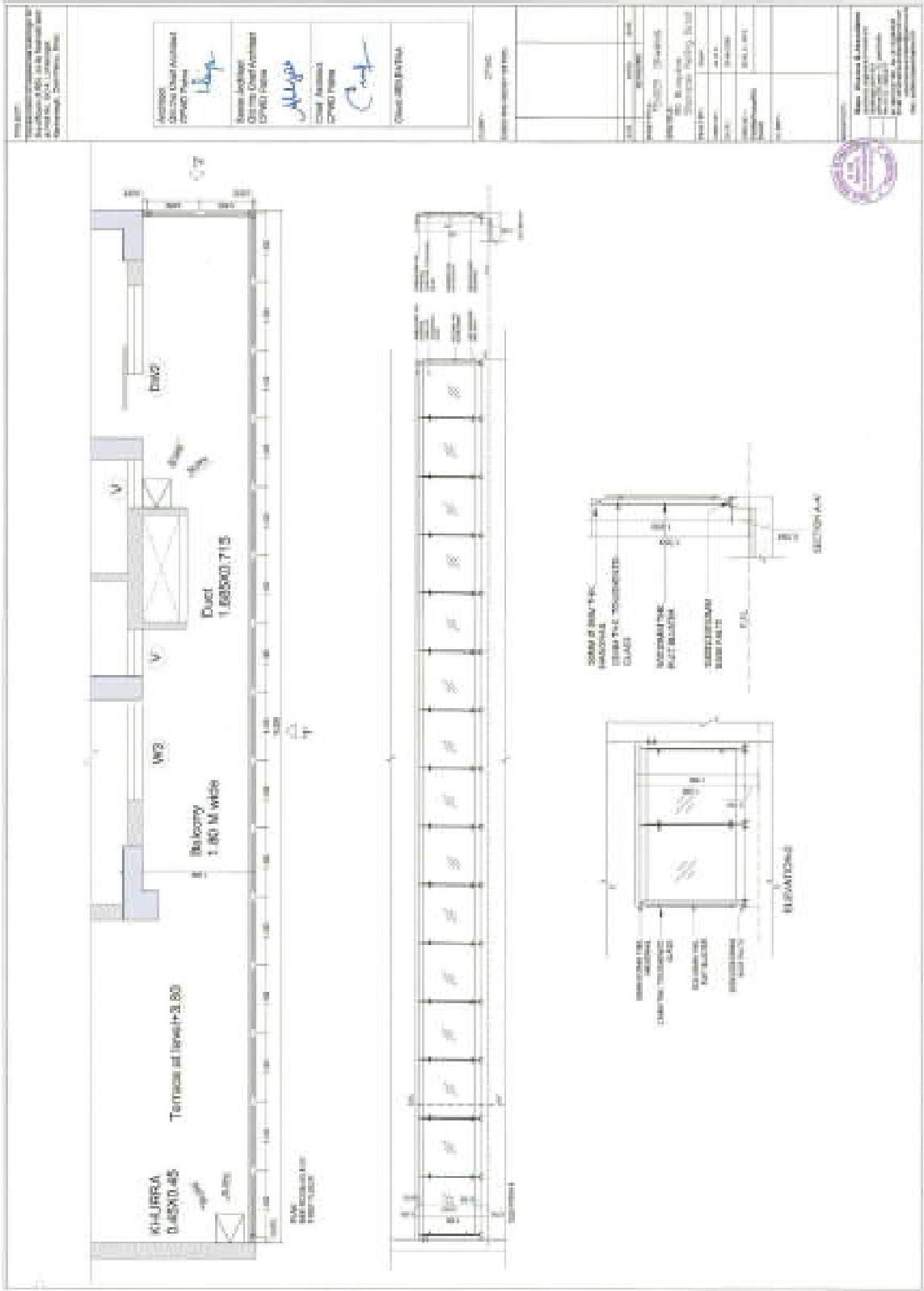
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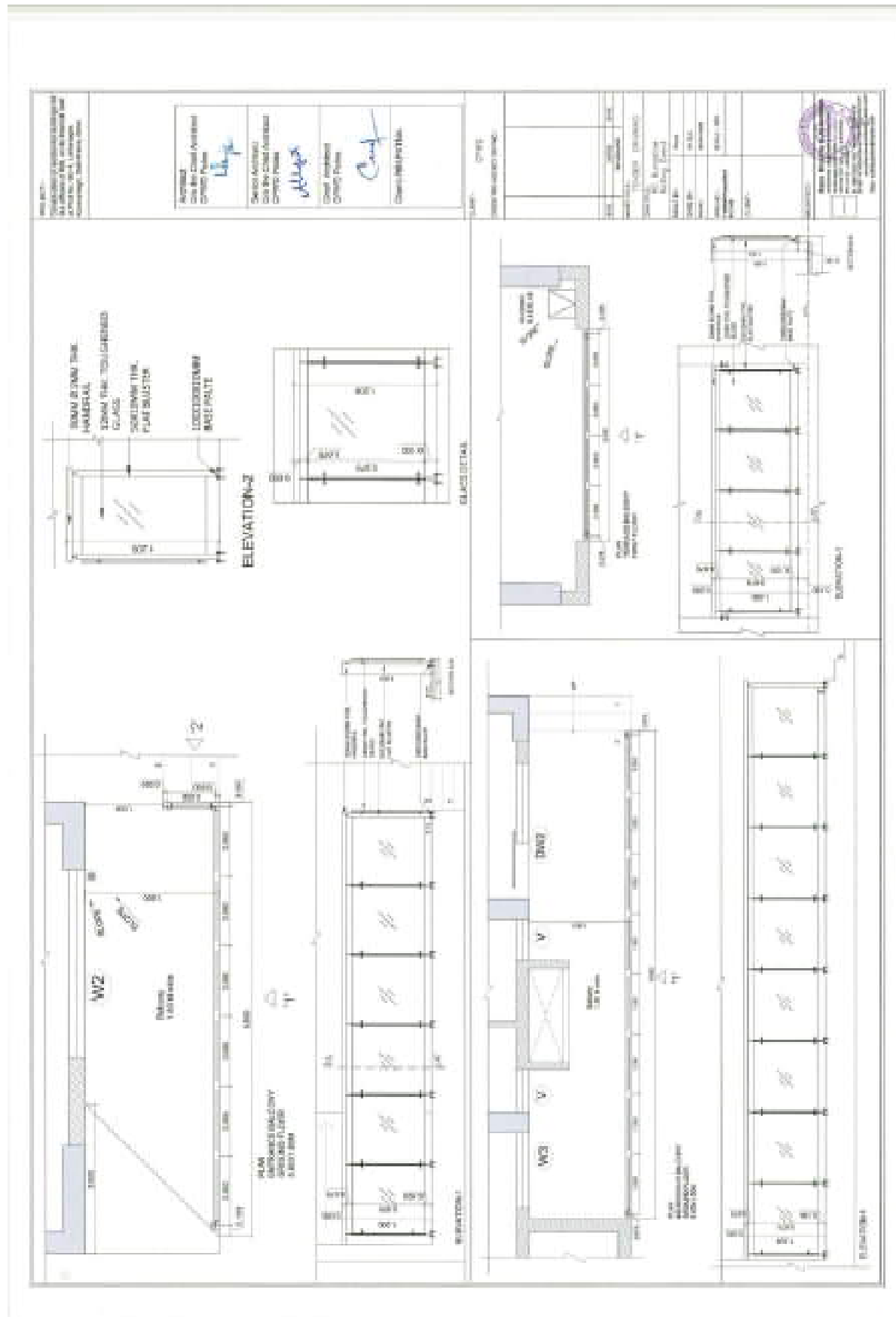
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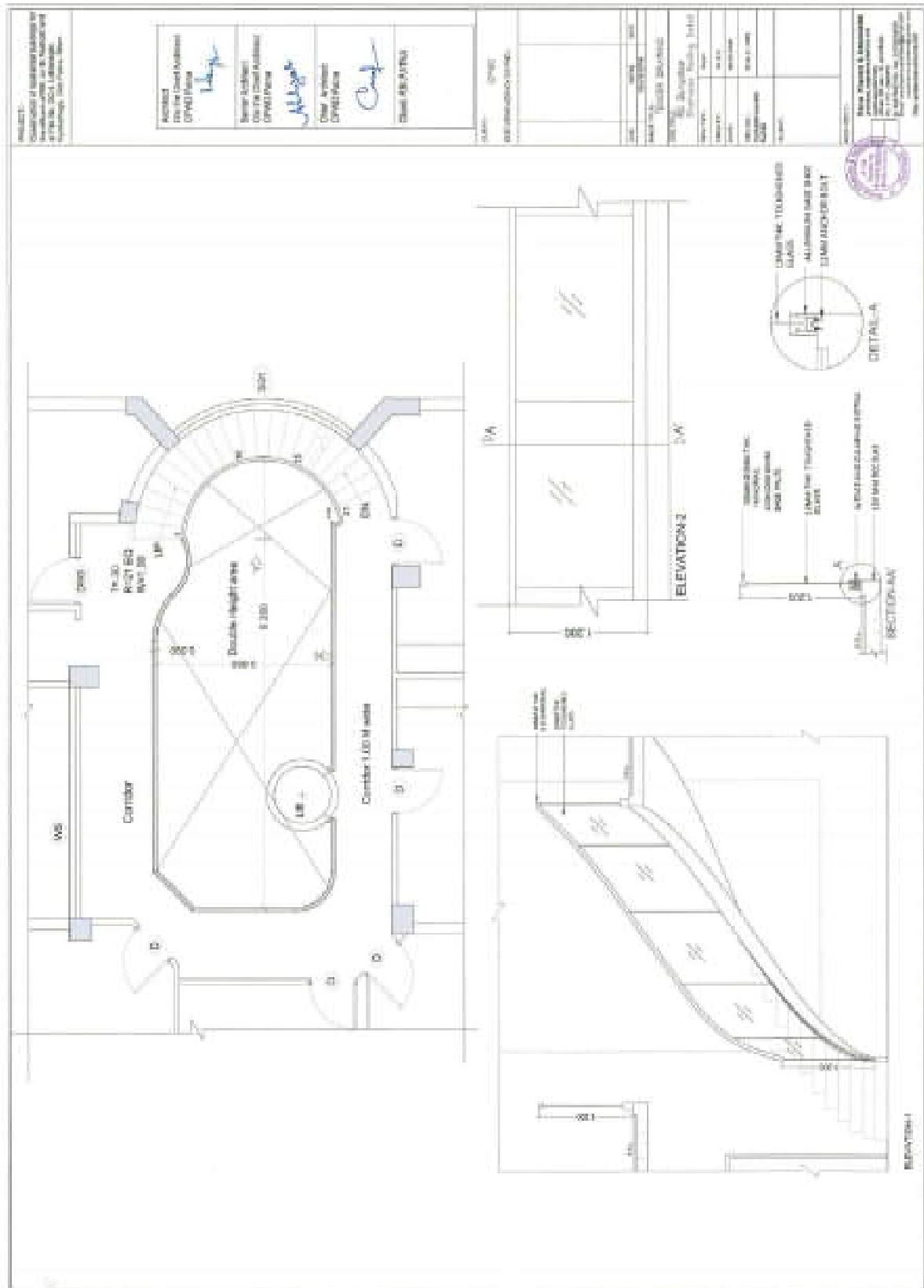
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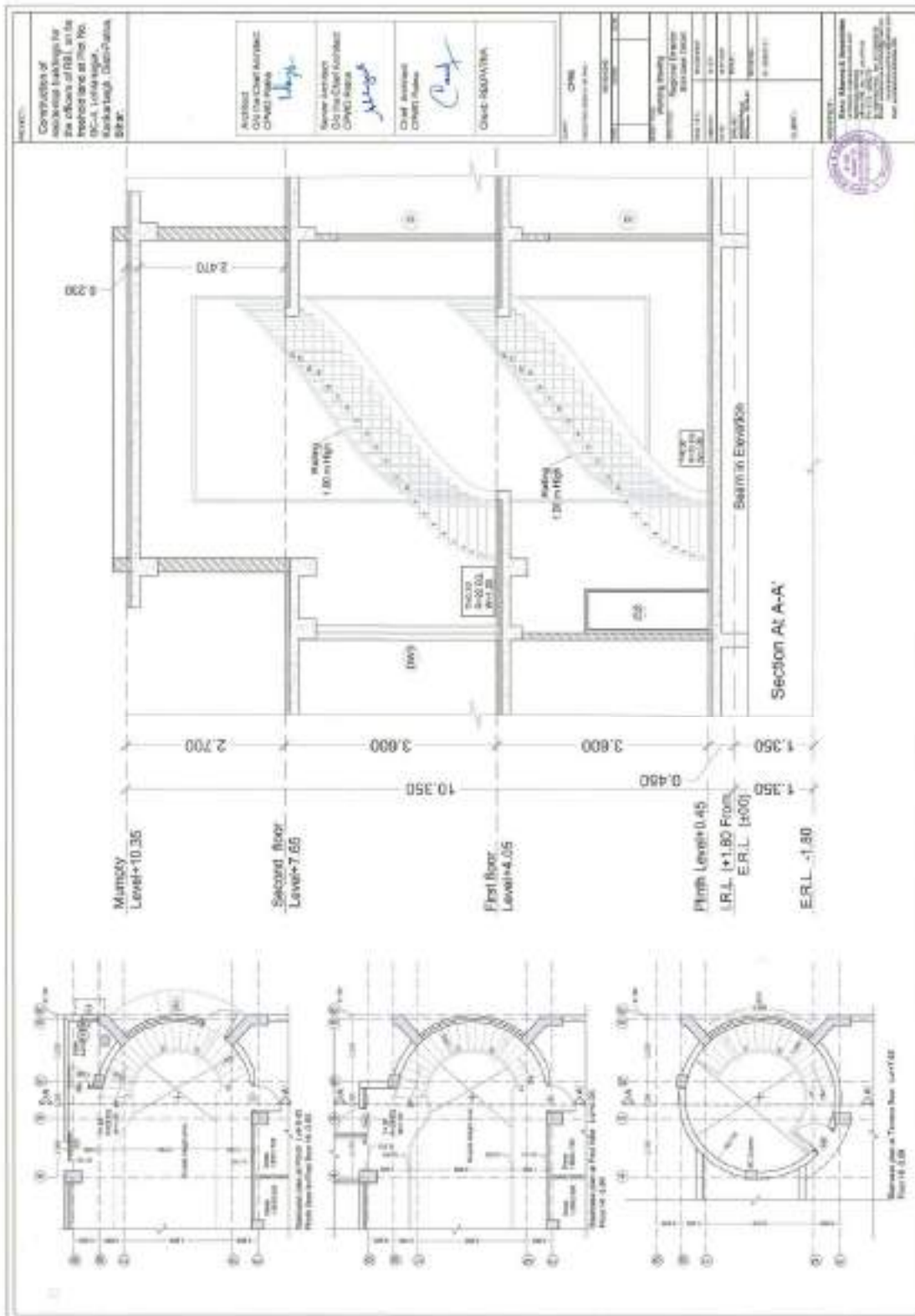
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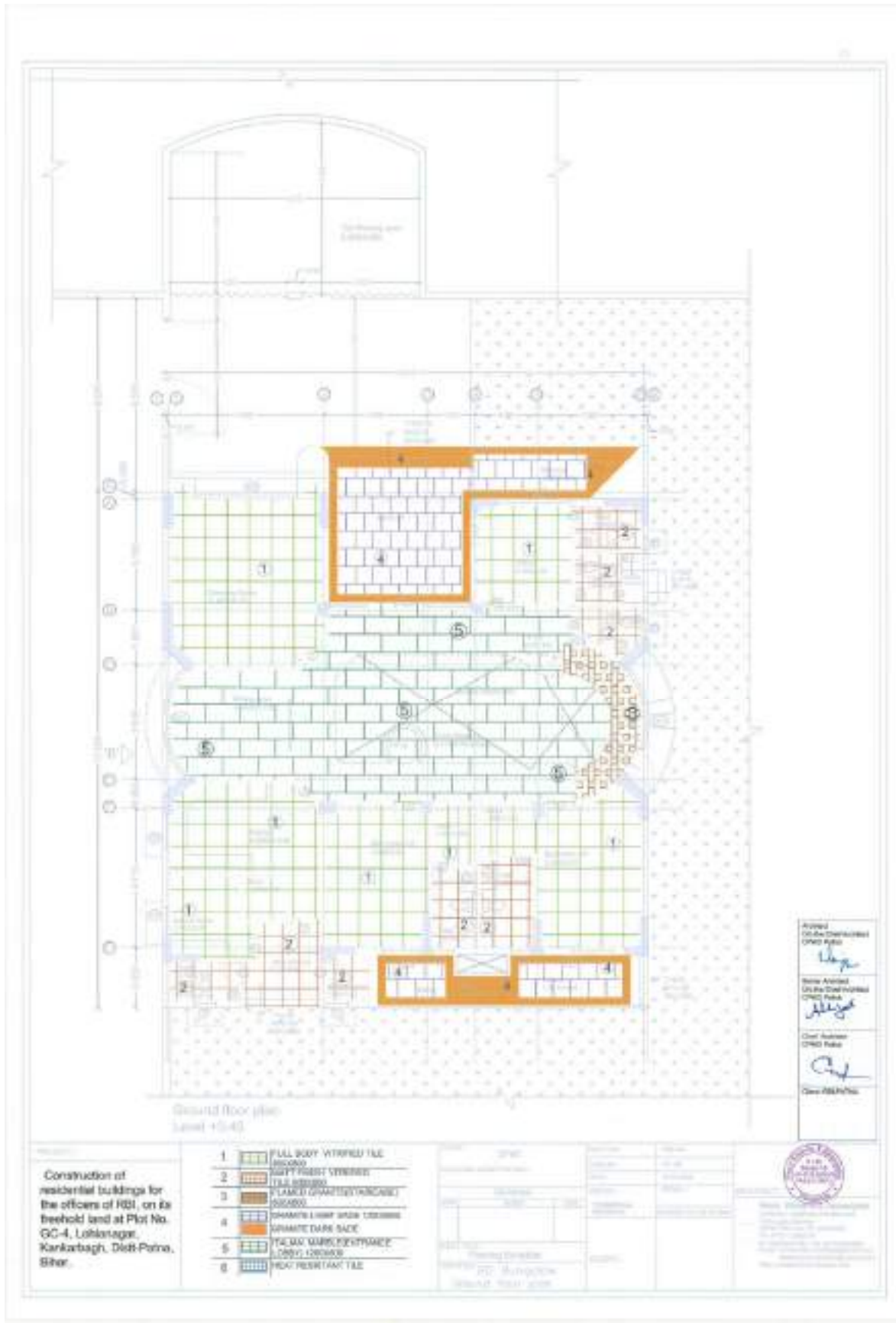
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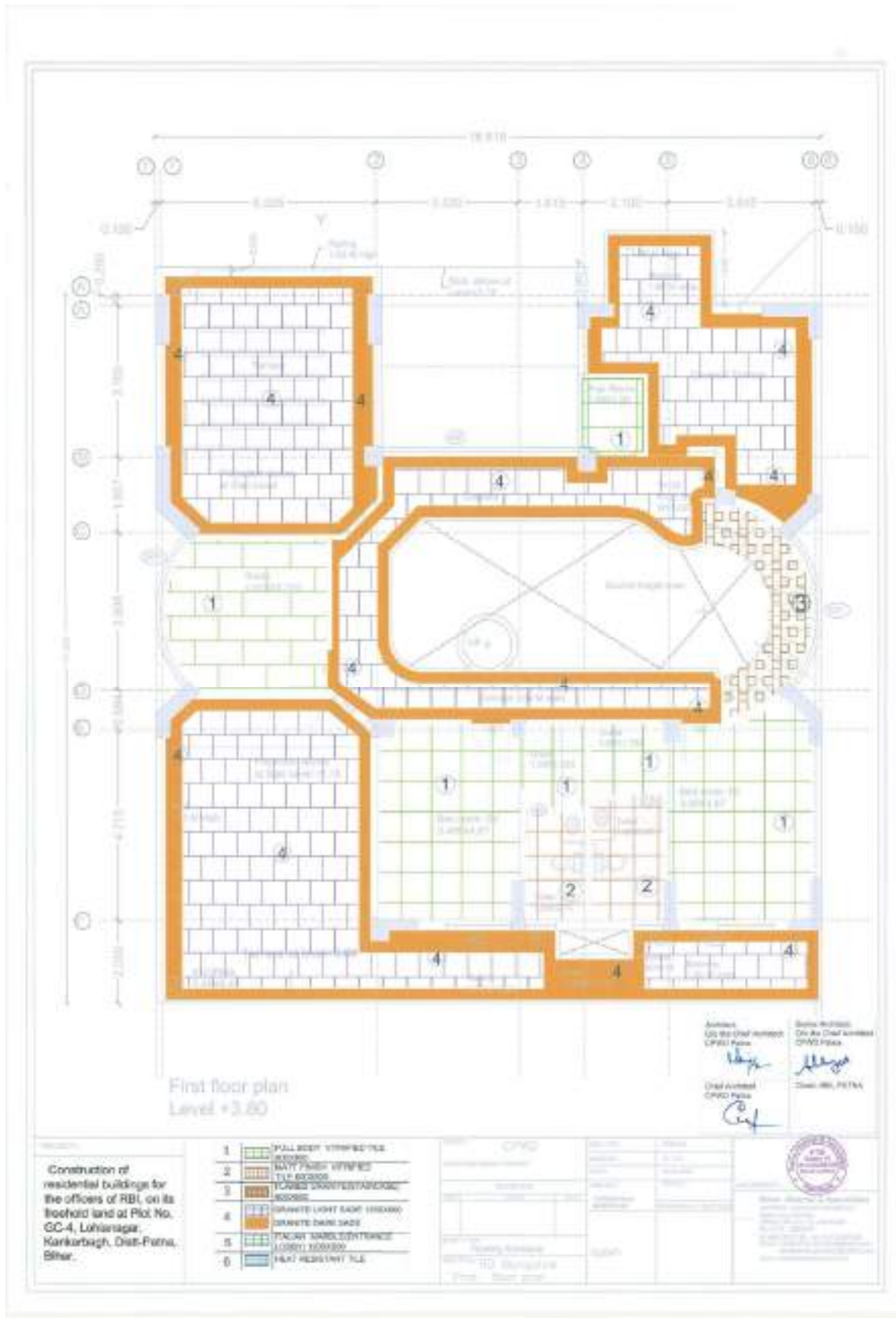


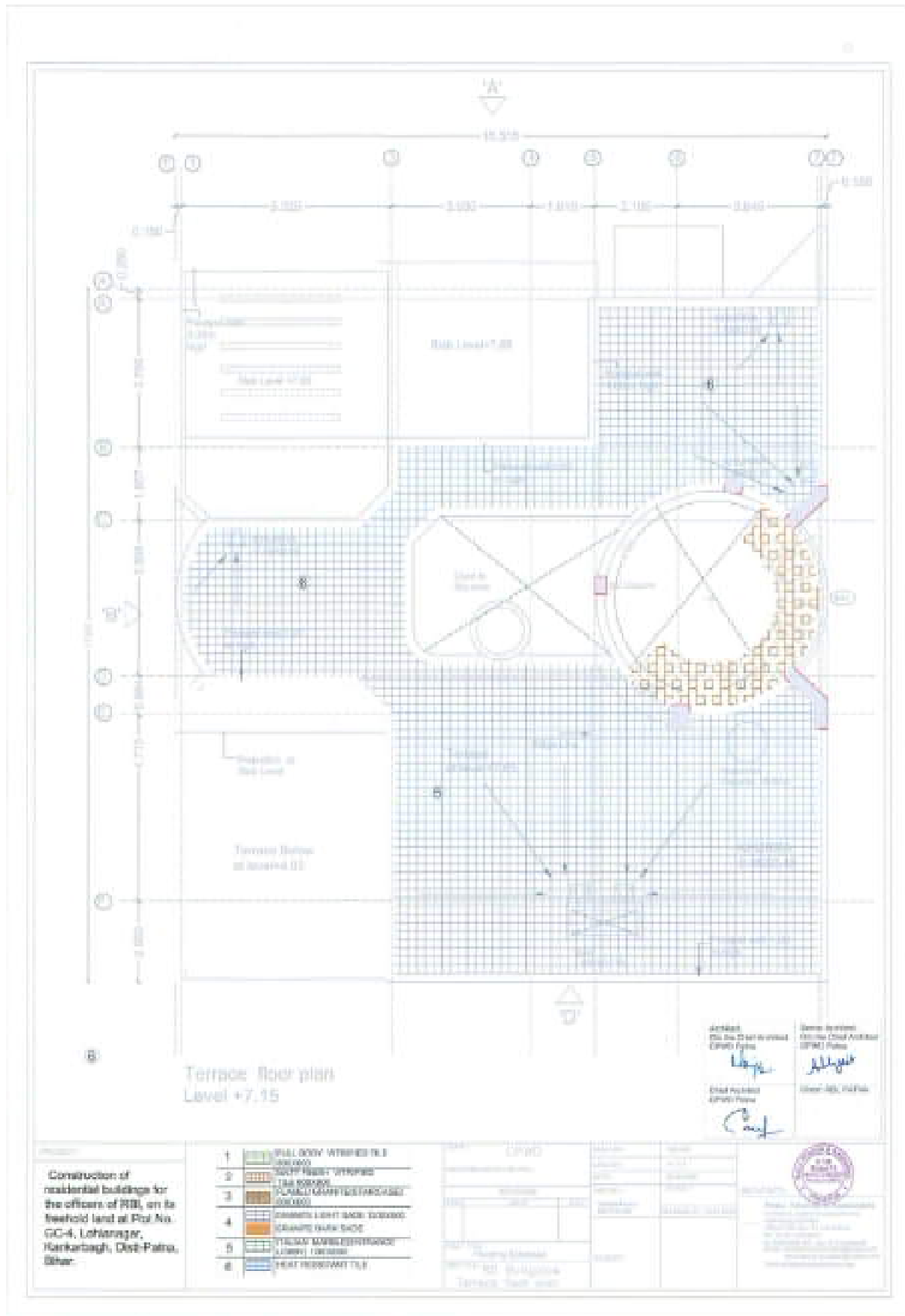




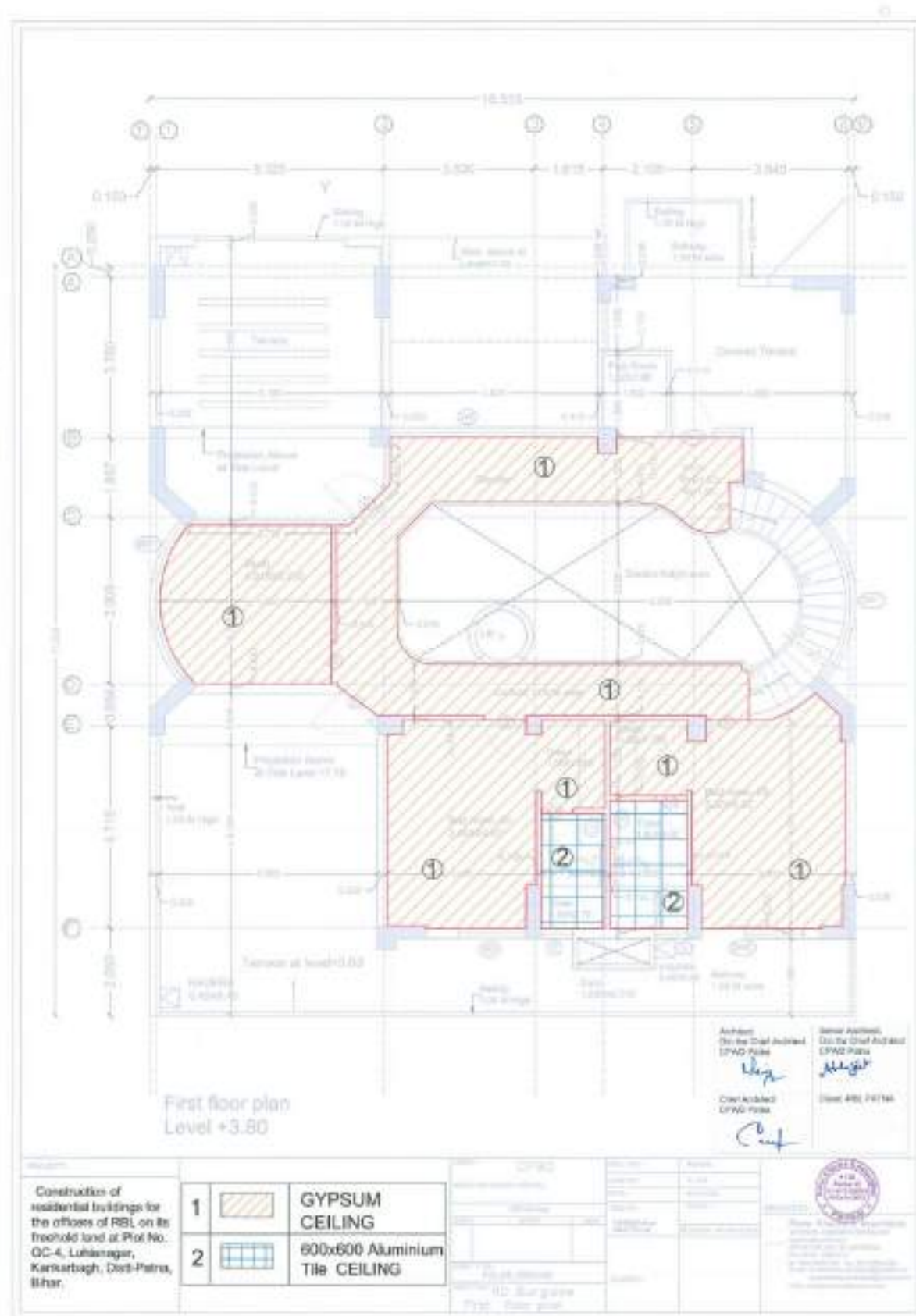


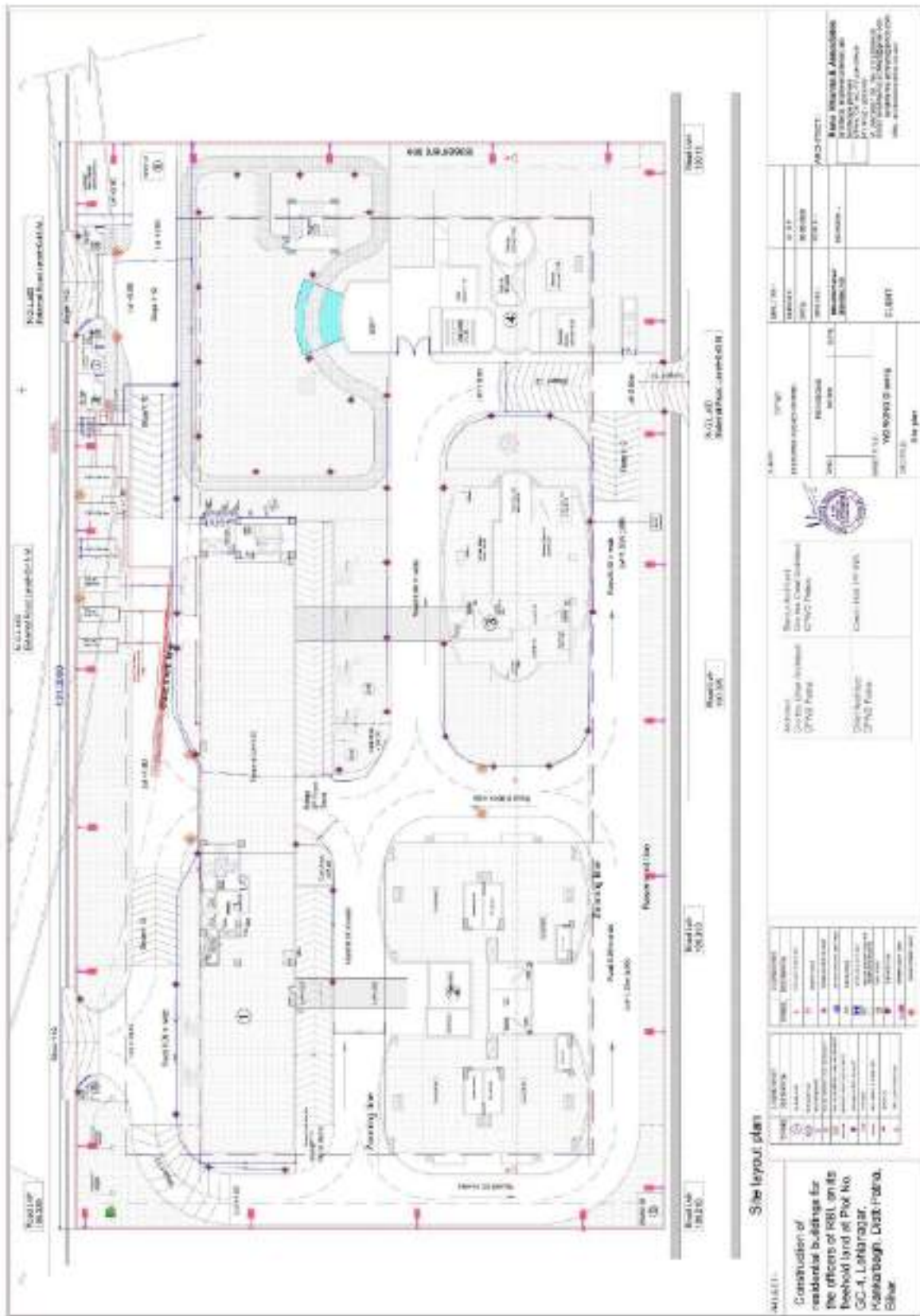






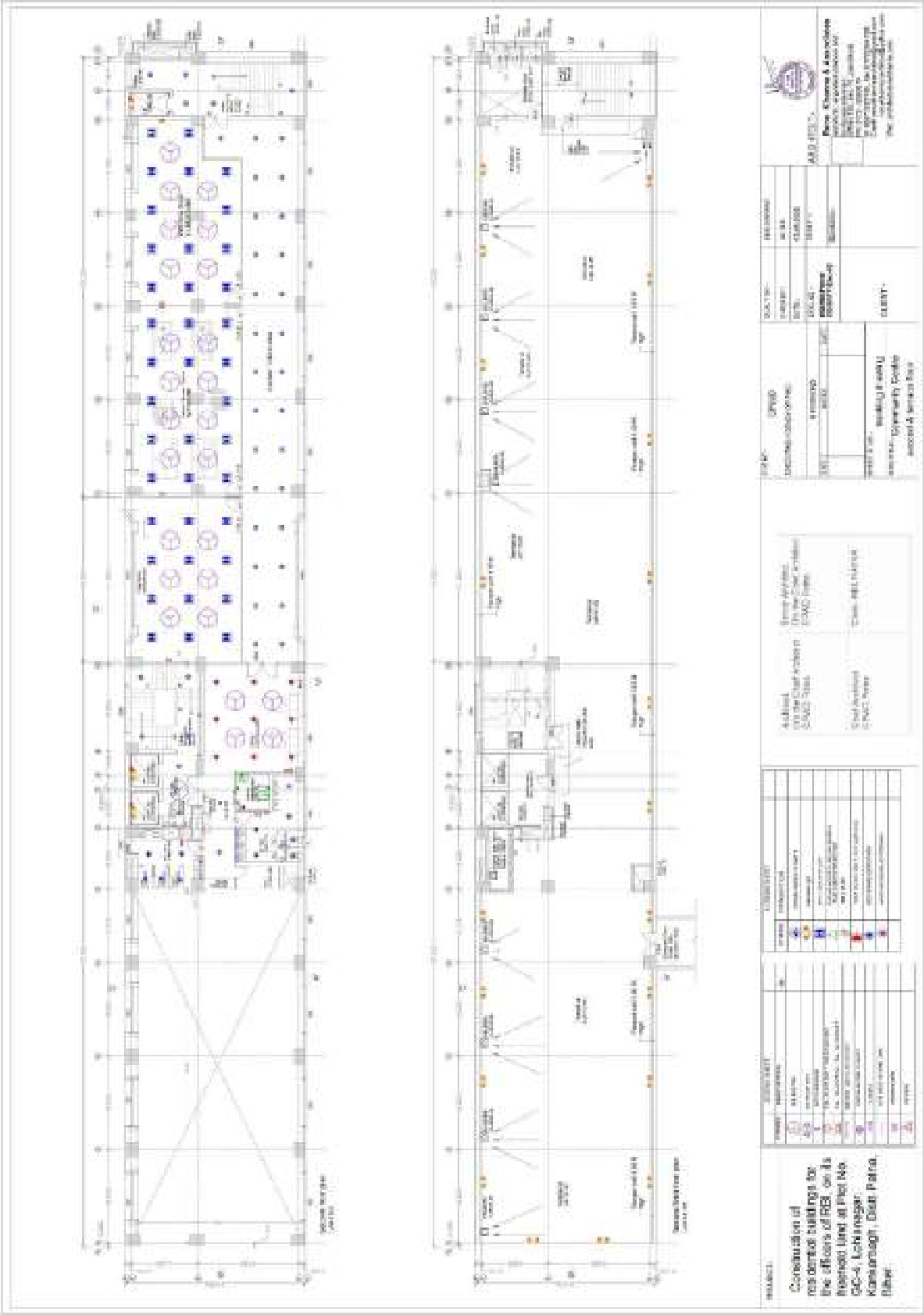




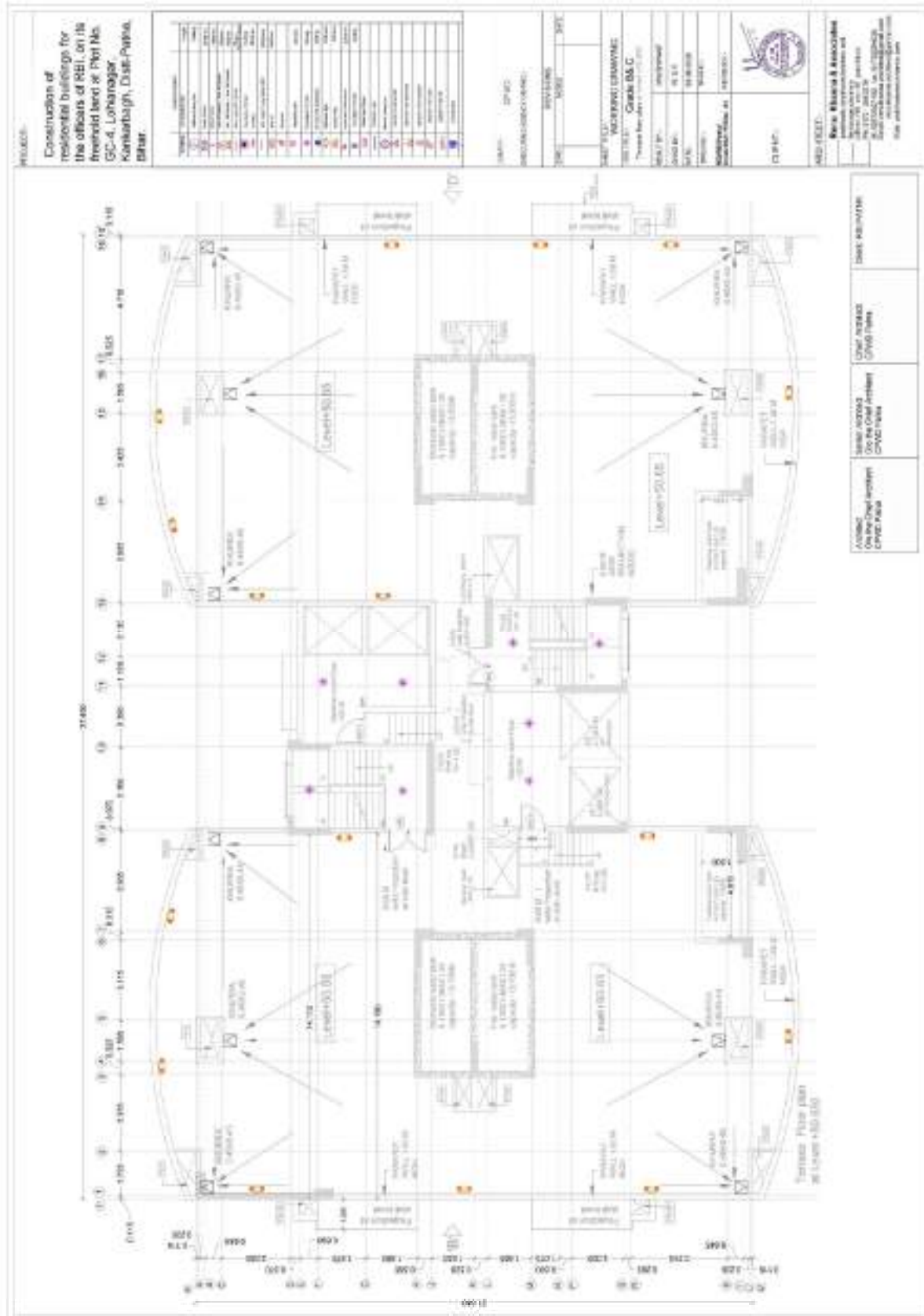








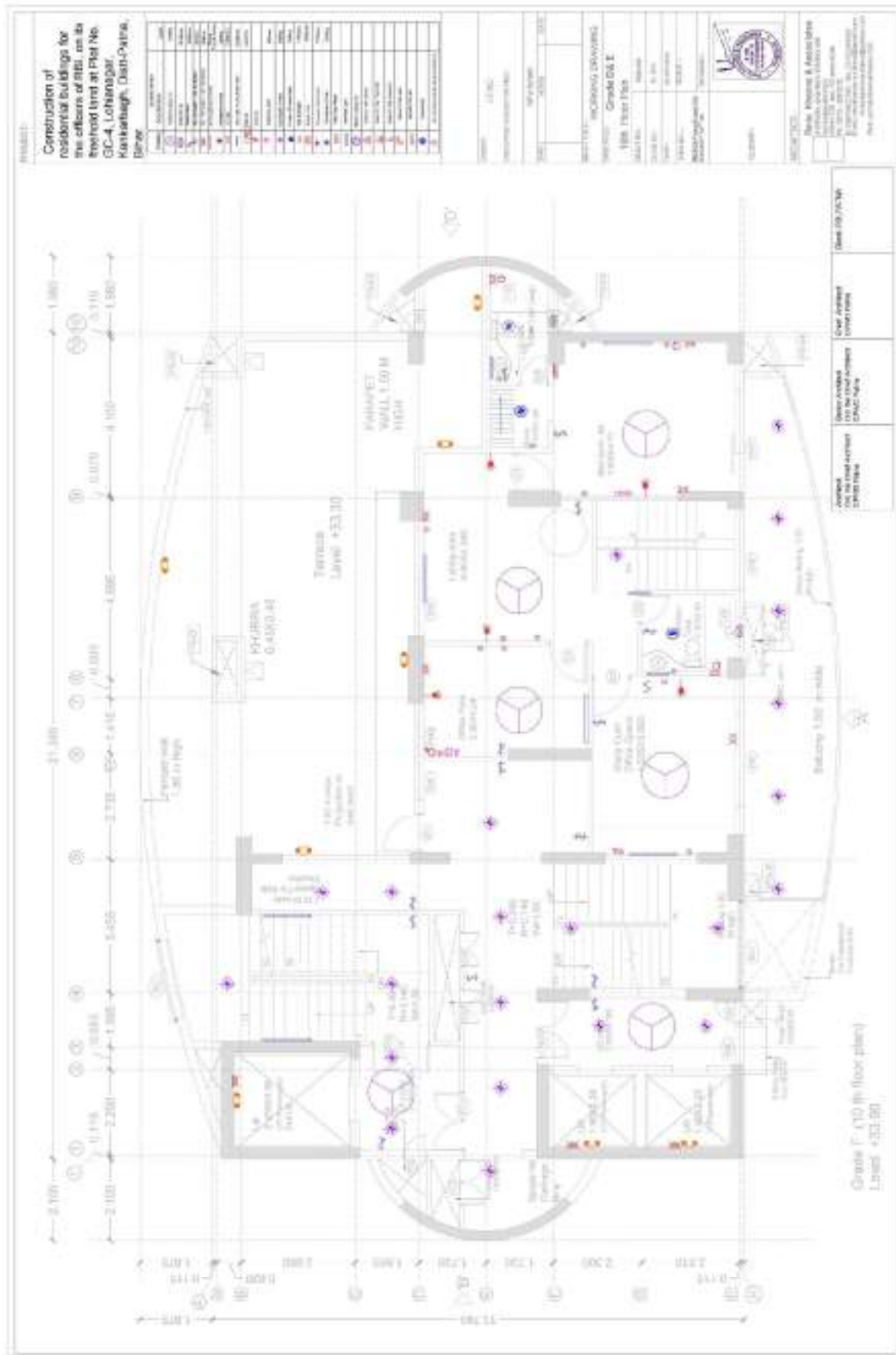






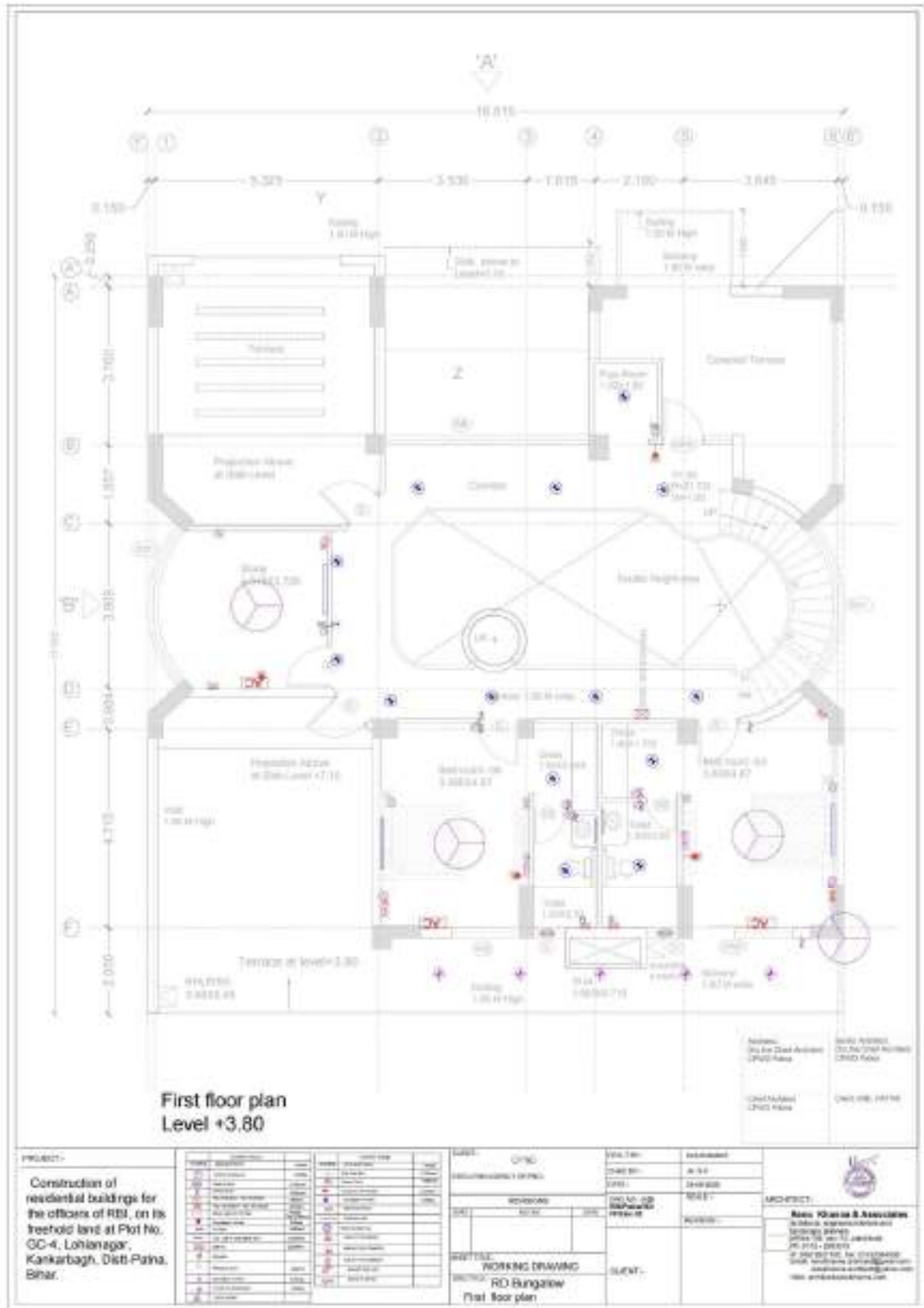


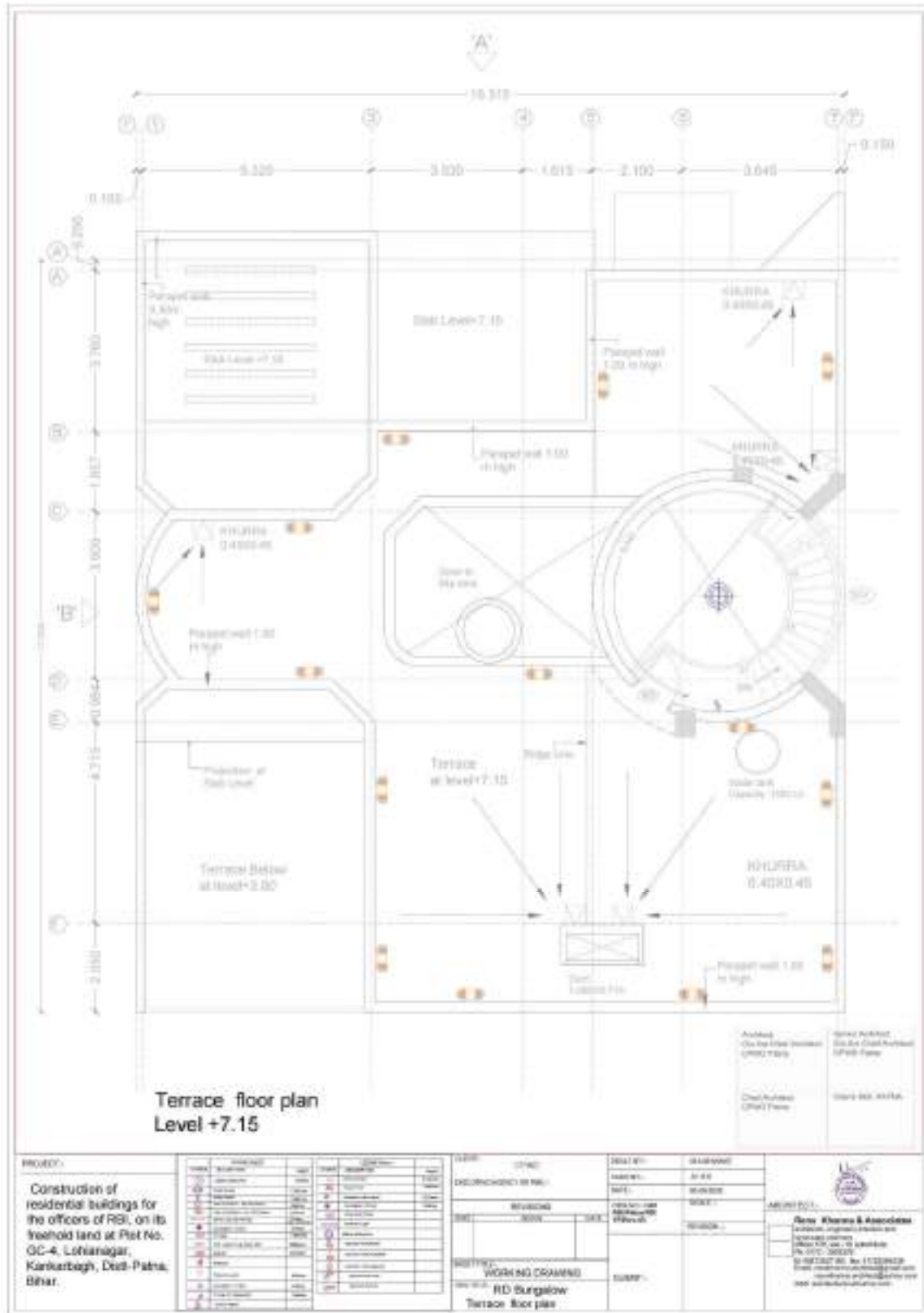


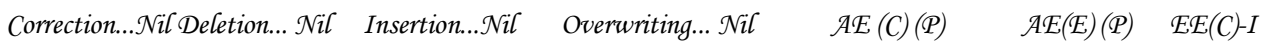


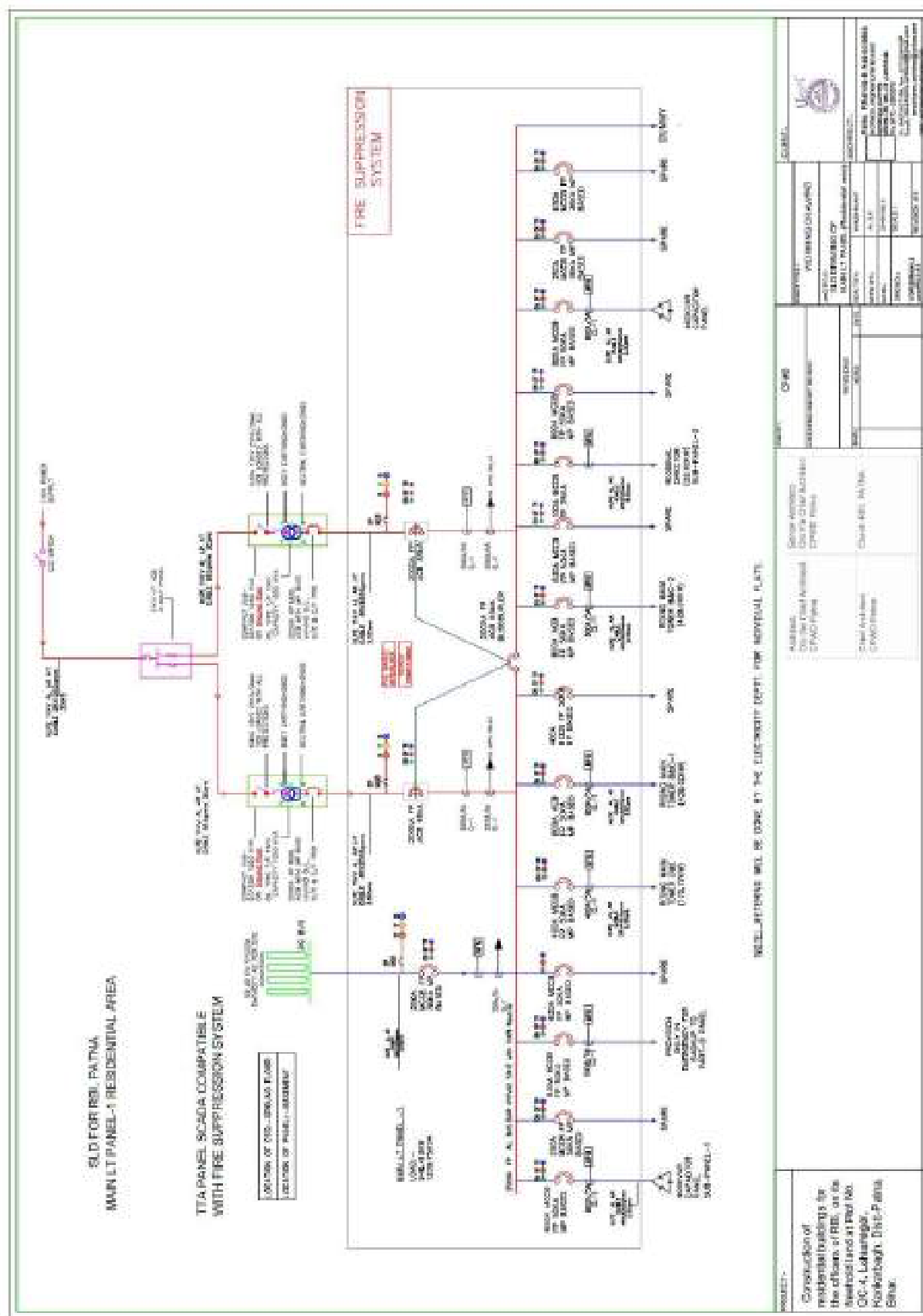


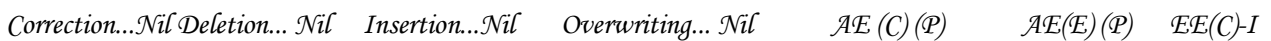


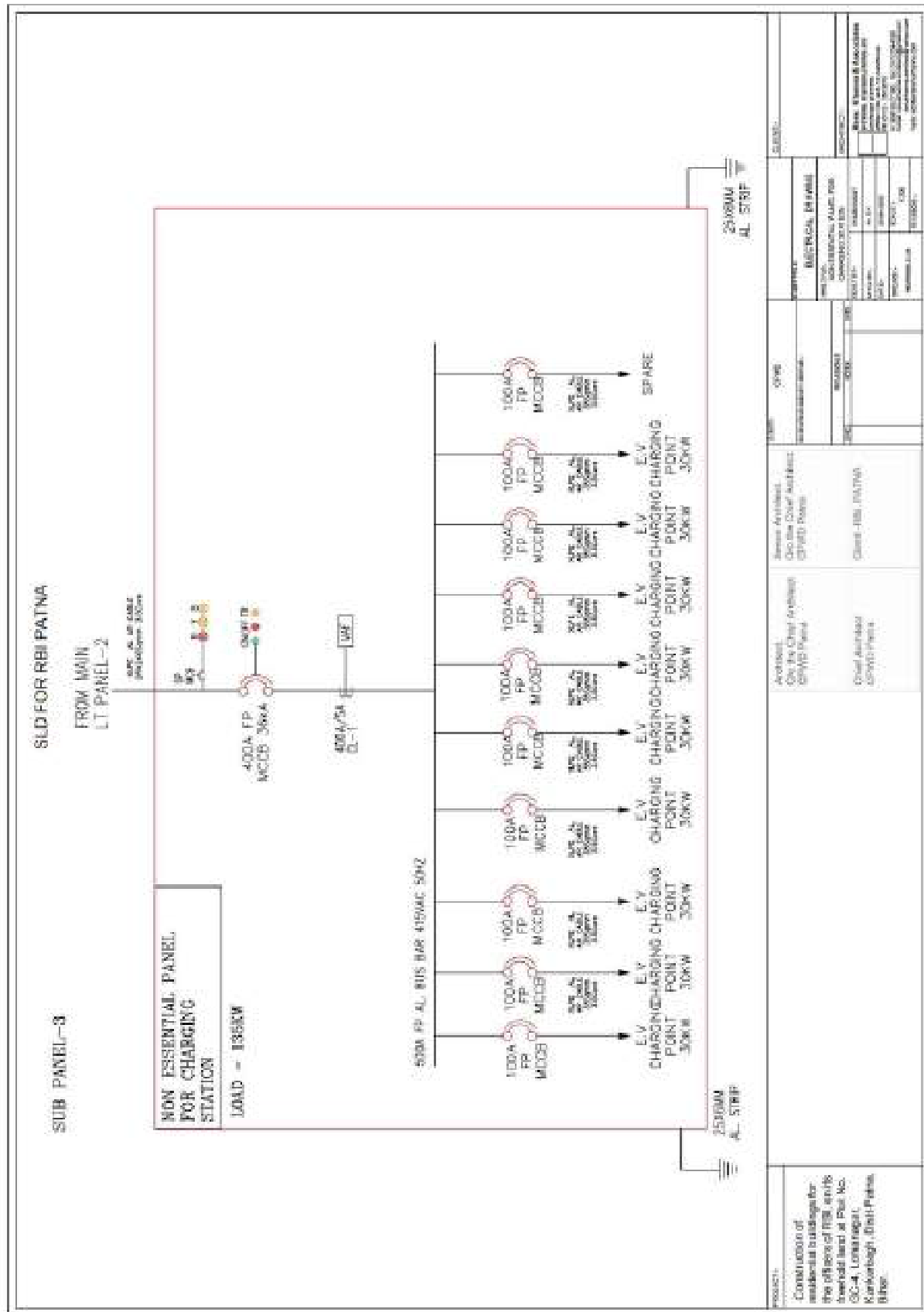


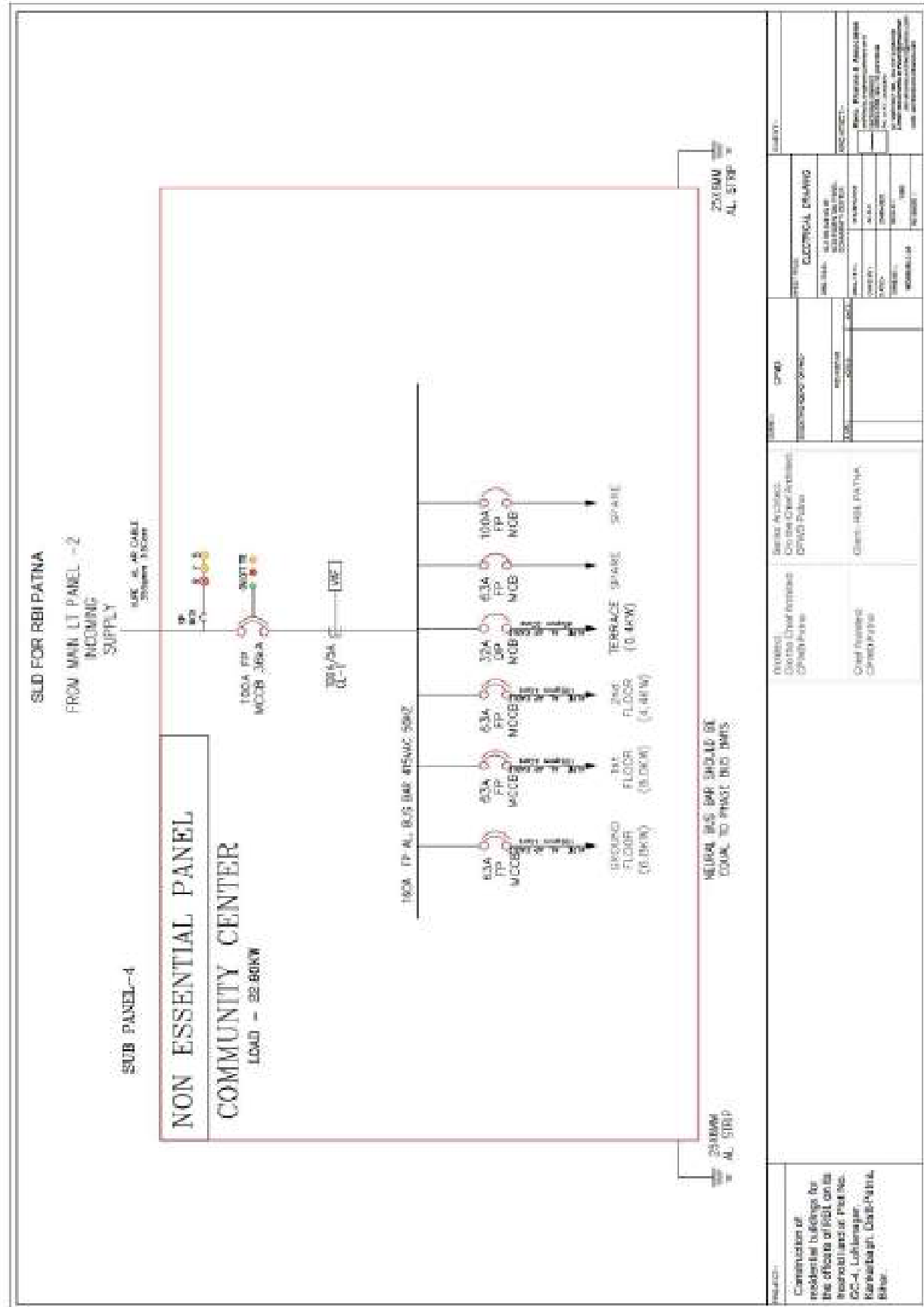


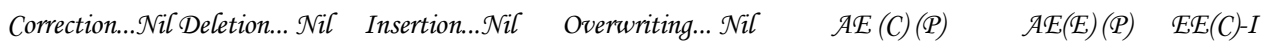


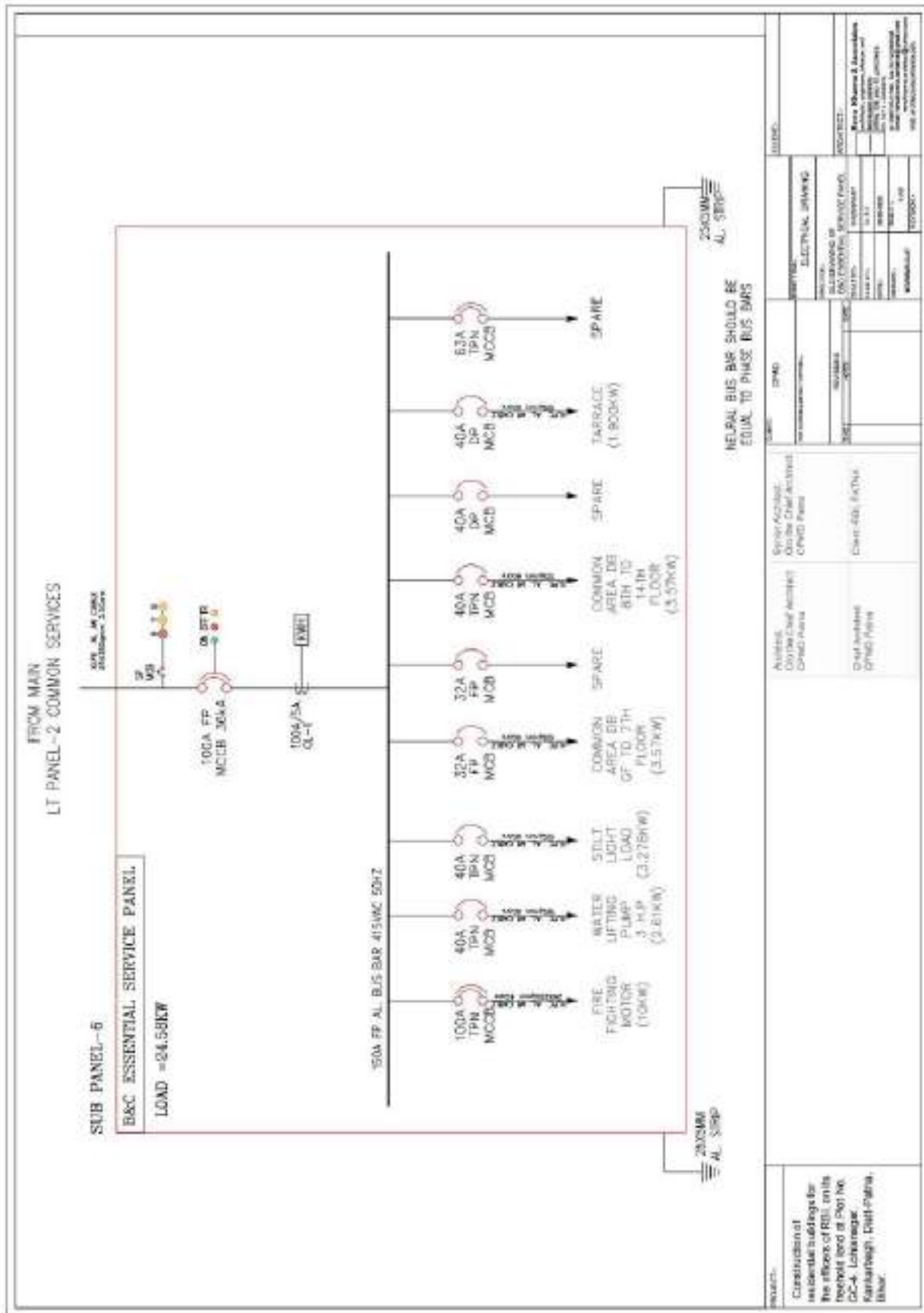


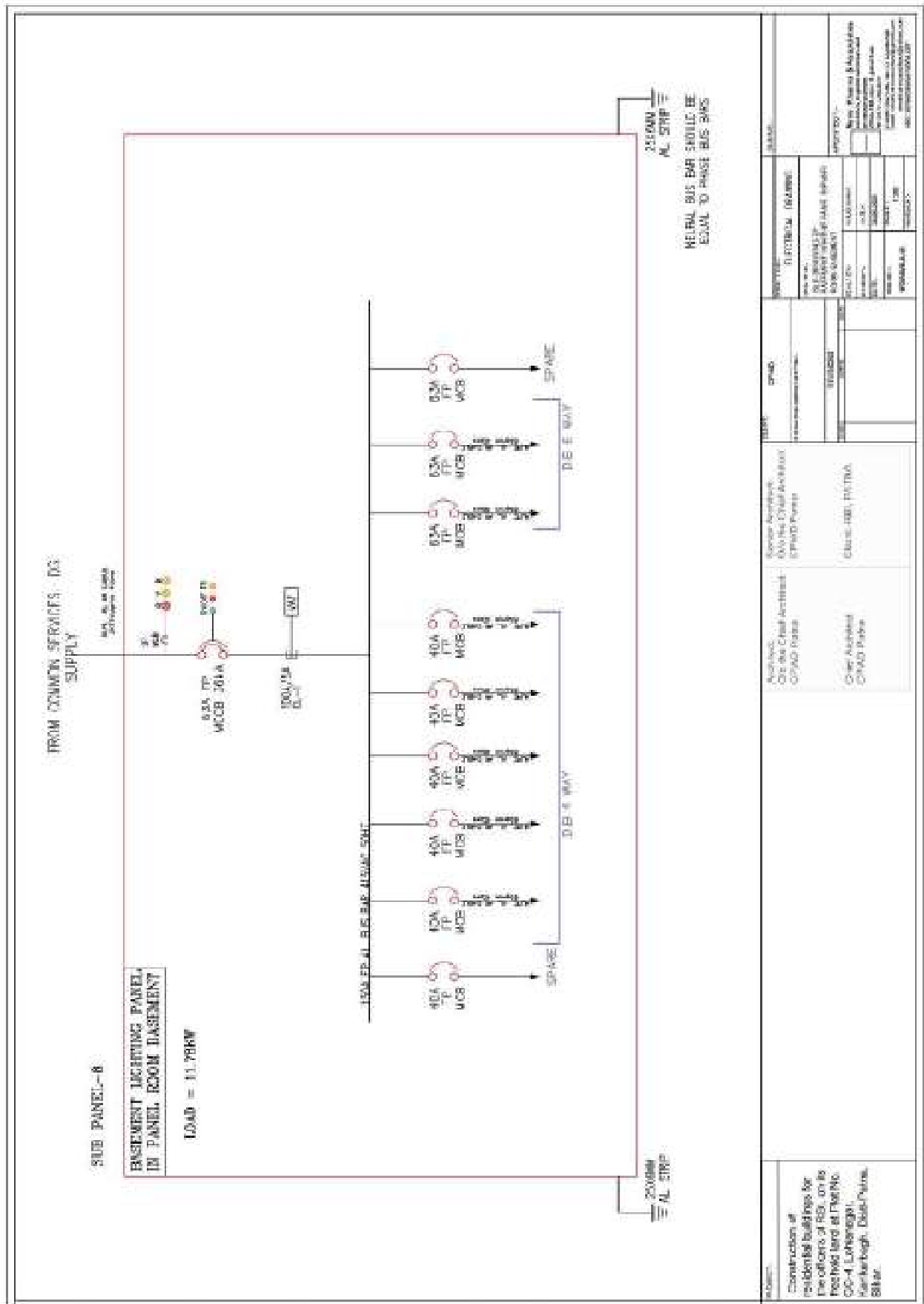


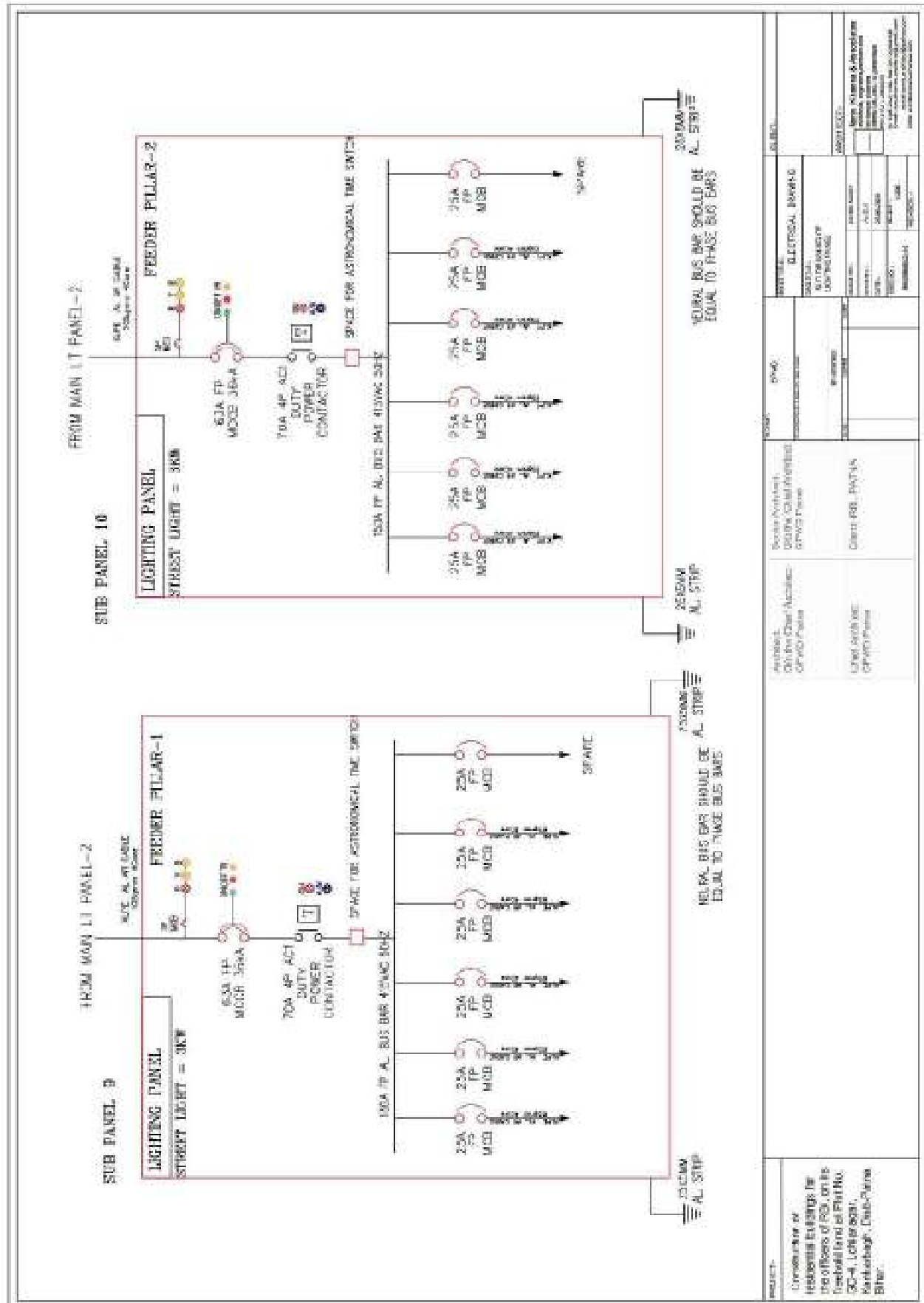


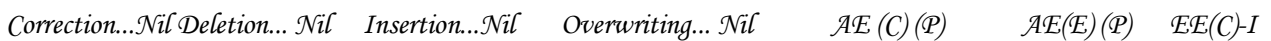


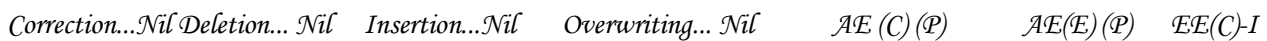


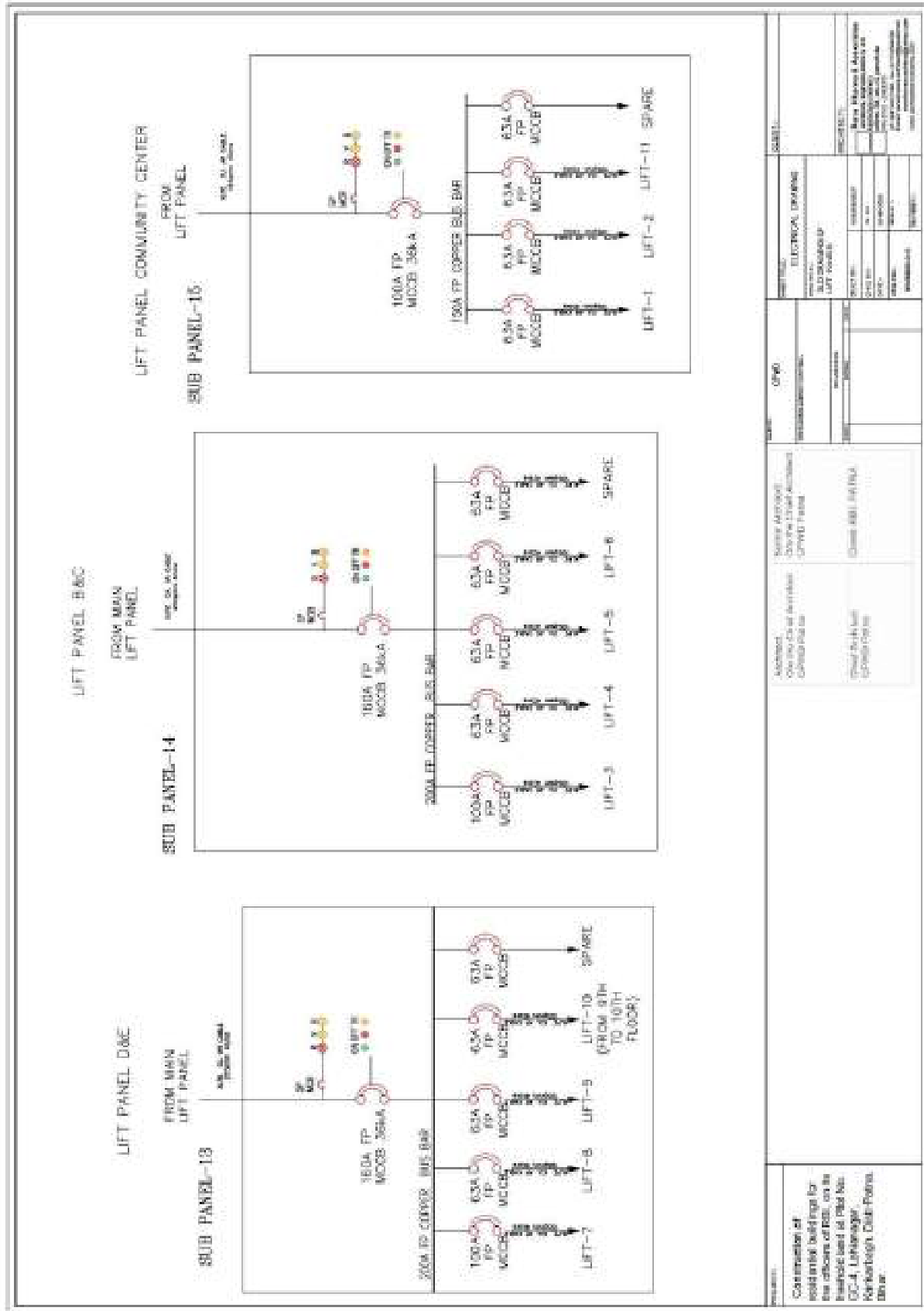


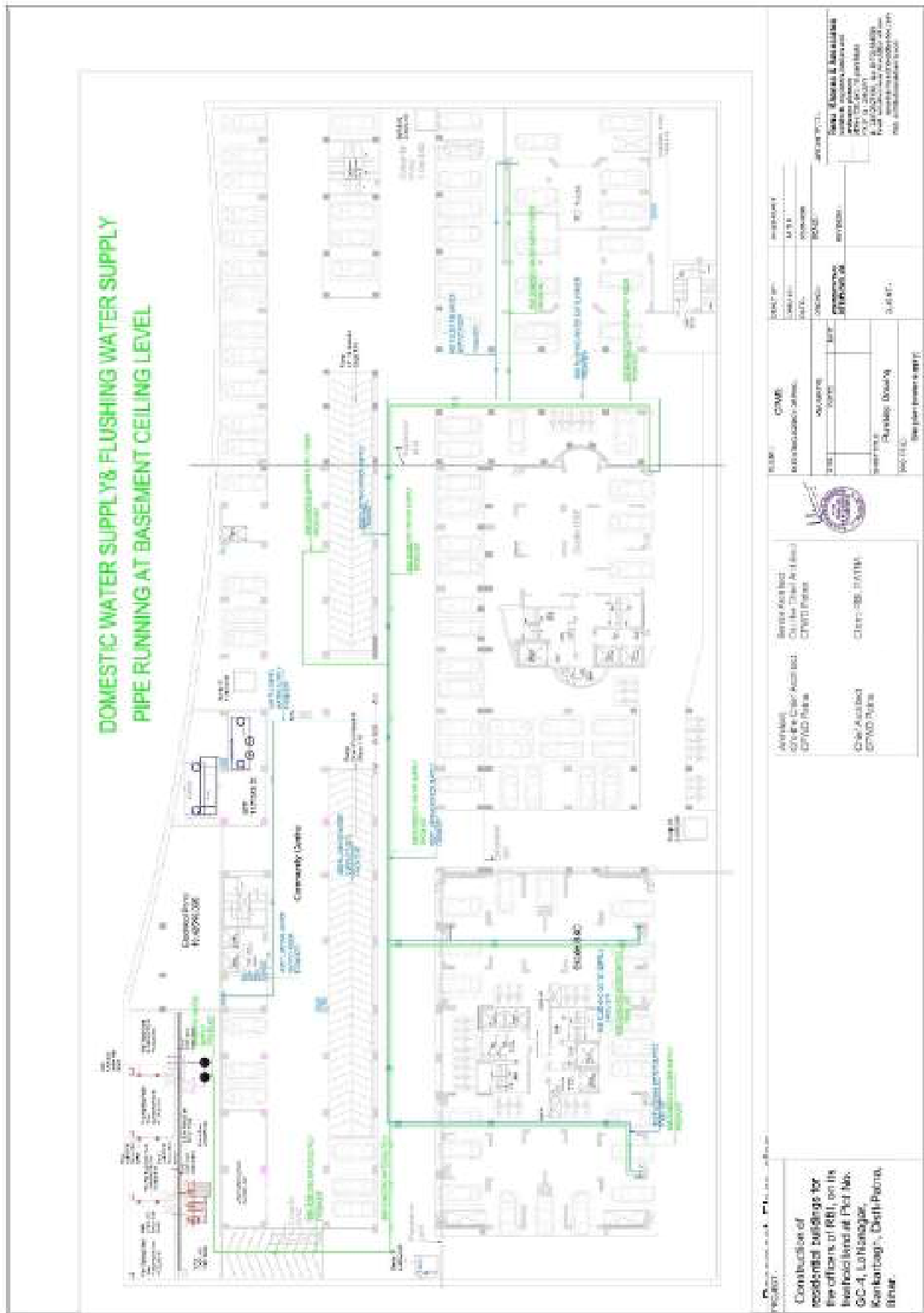


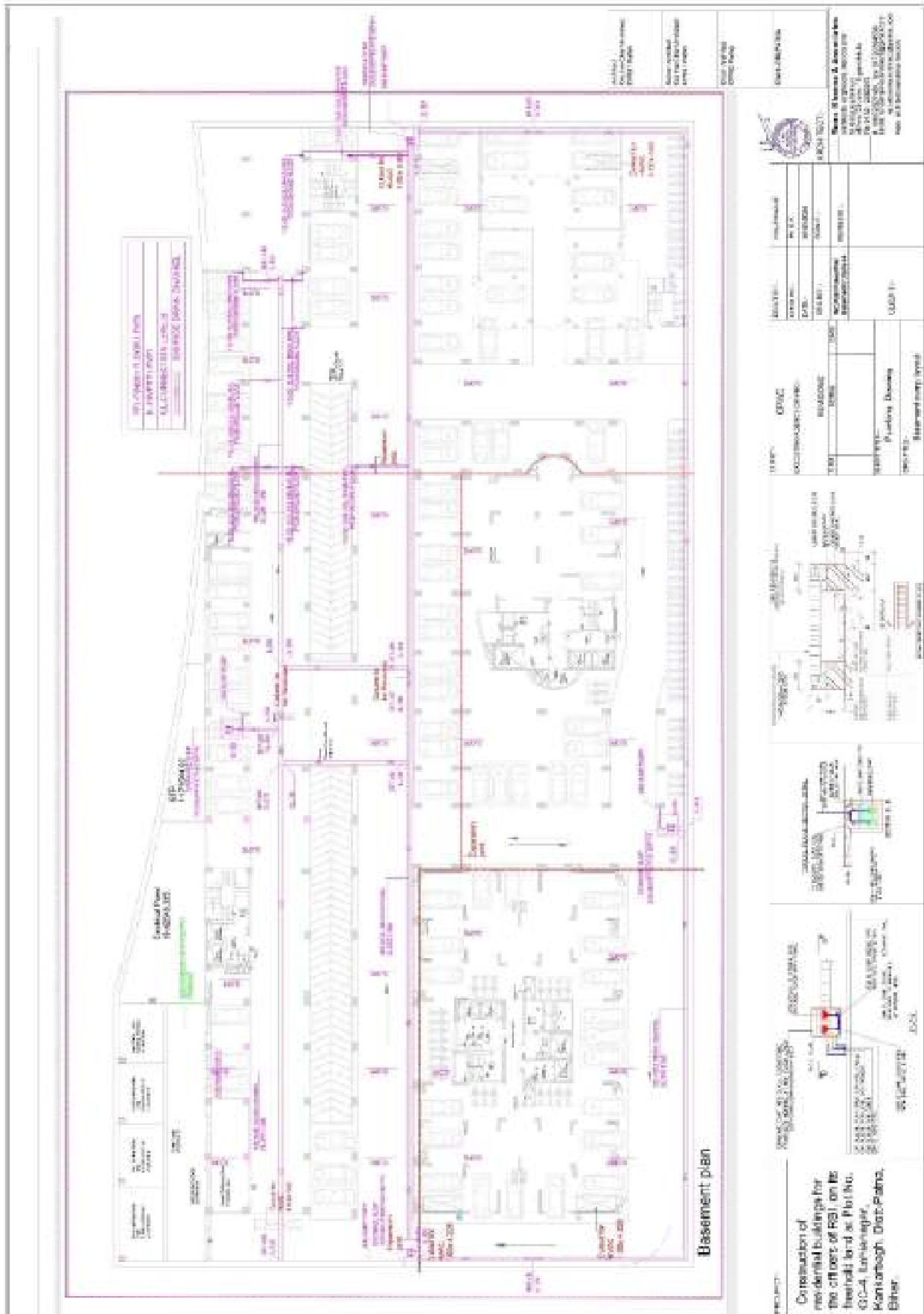


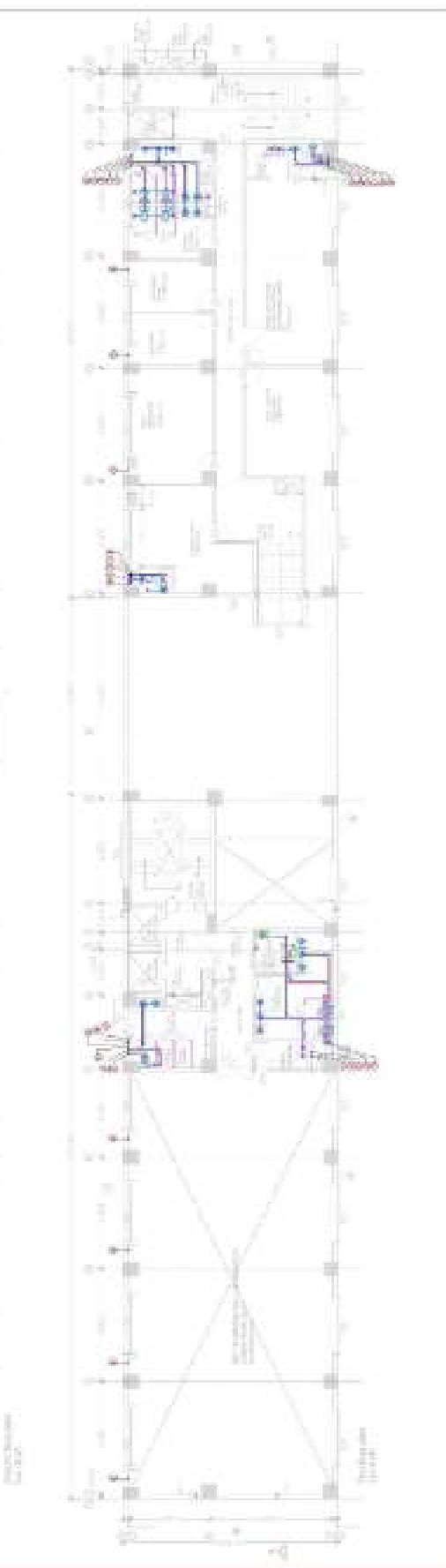




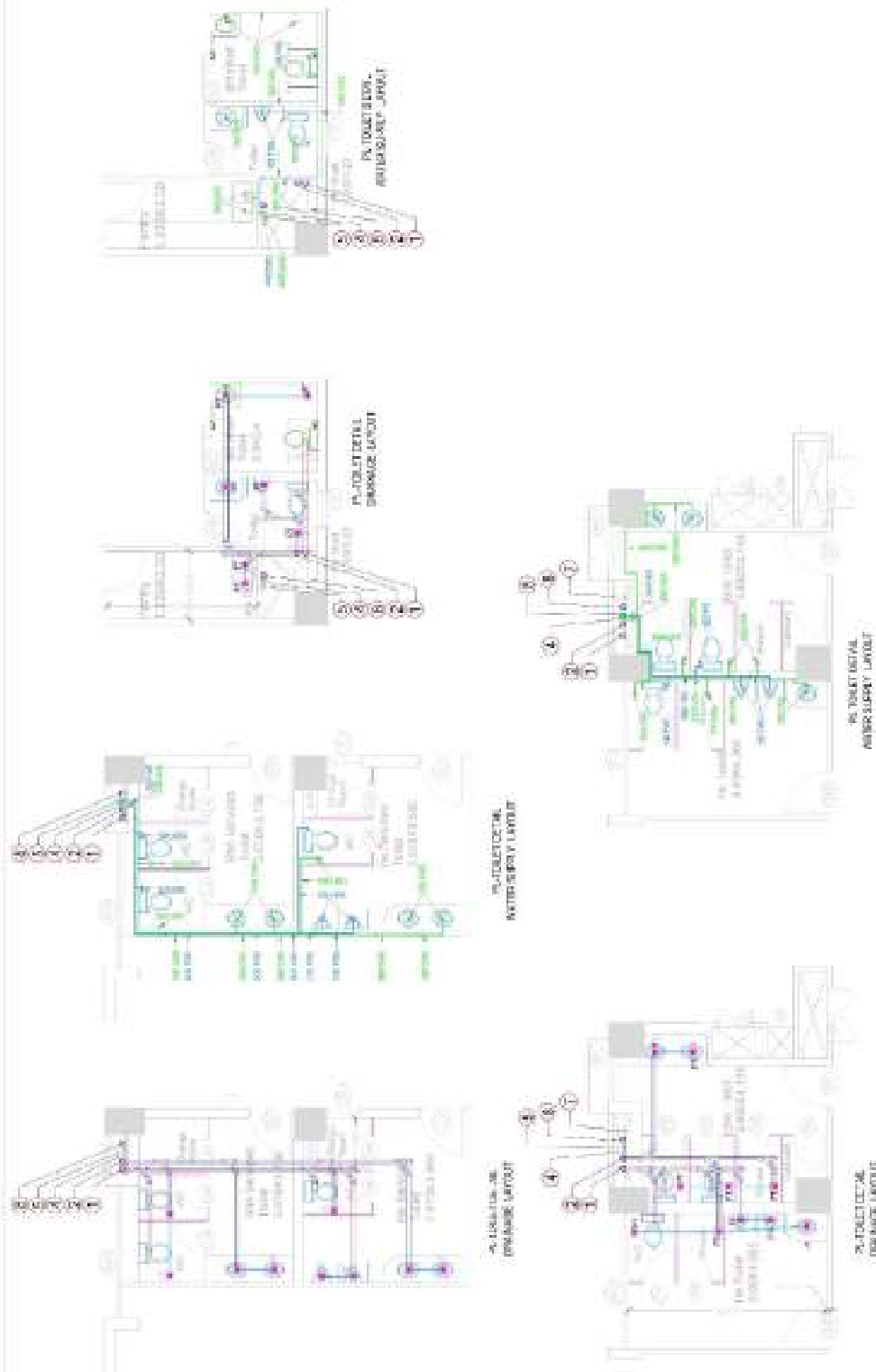






		 Ministry of Housing & Urban Planning Government of Karnataka Karnataka Housing Board KHB, 1st Floor, 1st Stage, 1st Cross, KHB Colony, KHB, Bangalore KHB, Bangalore Project Name: _____ Project No: _____ Project Date: _____ Project Status: _____ Project Location: _____ Project Area: _____ Project Type: _____ Project Category: _____ Project Status: _____ Project Details: _____ Project Description: _____ Project Objectives: _____ Project Outcomes: _____ Project Progress: _____ Project Budget: _____ Project Timeline: _____ Project Risks: _____ Project Team: _____ Project Manager: _____ Project Sponsor: _____ Project Stakeholders: _____ Project Documents: _____ Project Reports: _____ Project Meetings: _____ Project Communications: _____ Construction of residential buildings for the officers of KHB, on the 1st floor and at Plot No. 100-4, Lullabai, Kankarbagh, Chittham, Bhat.
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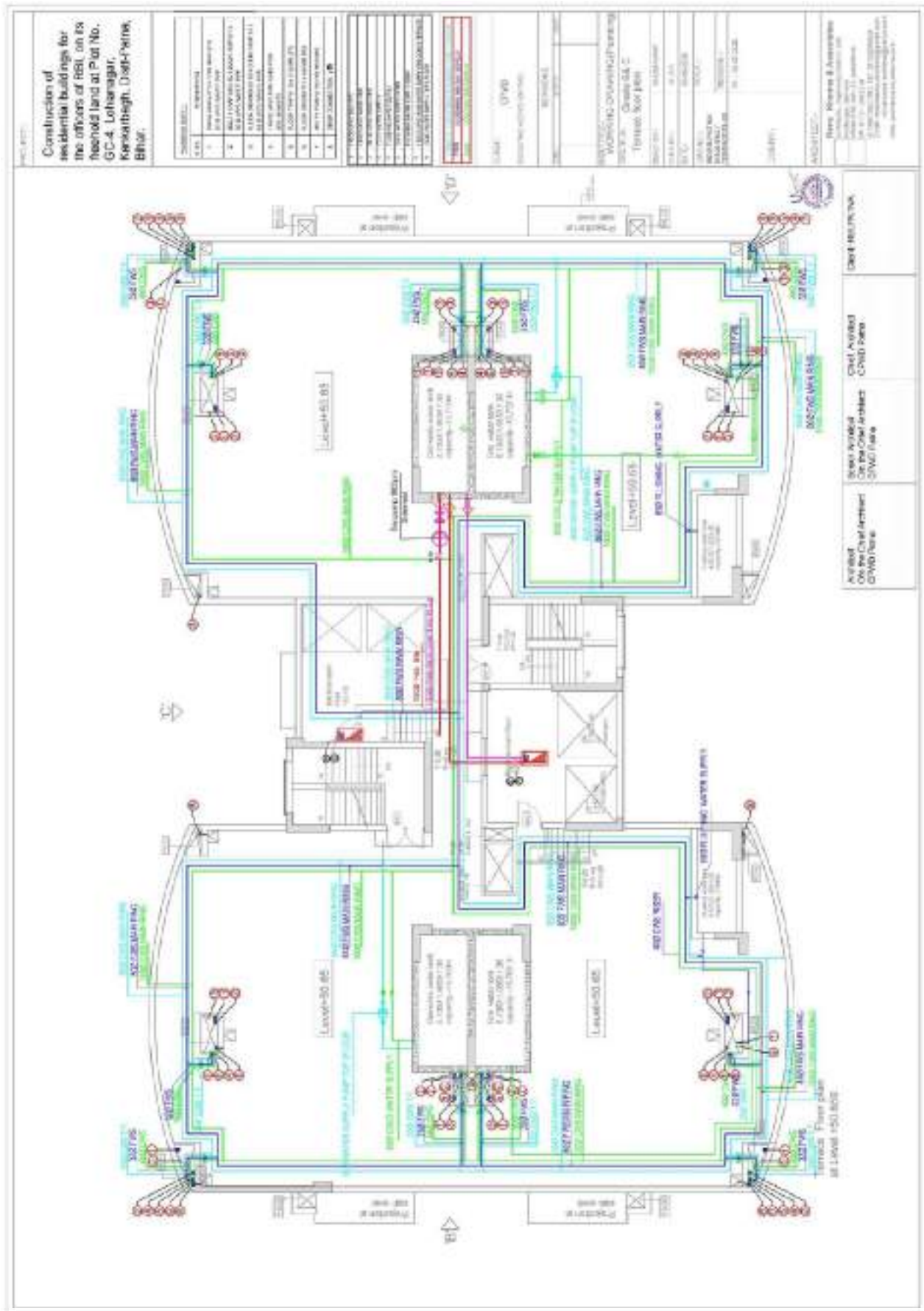


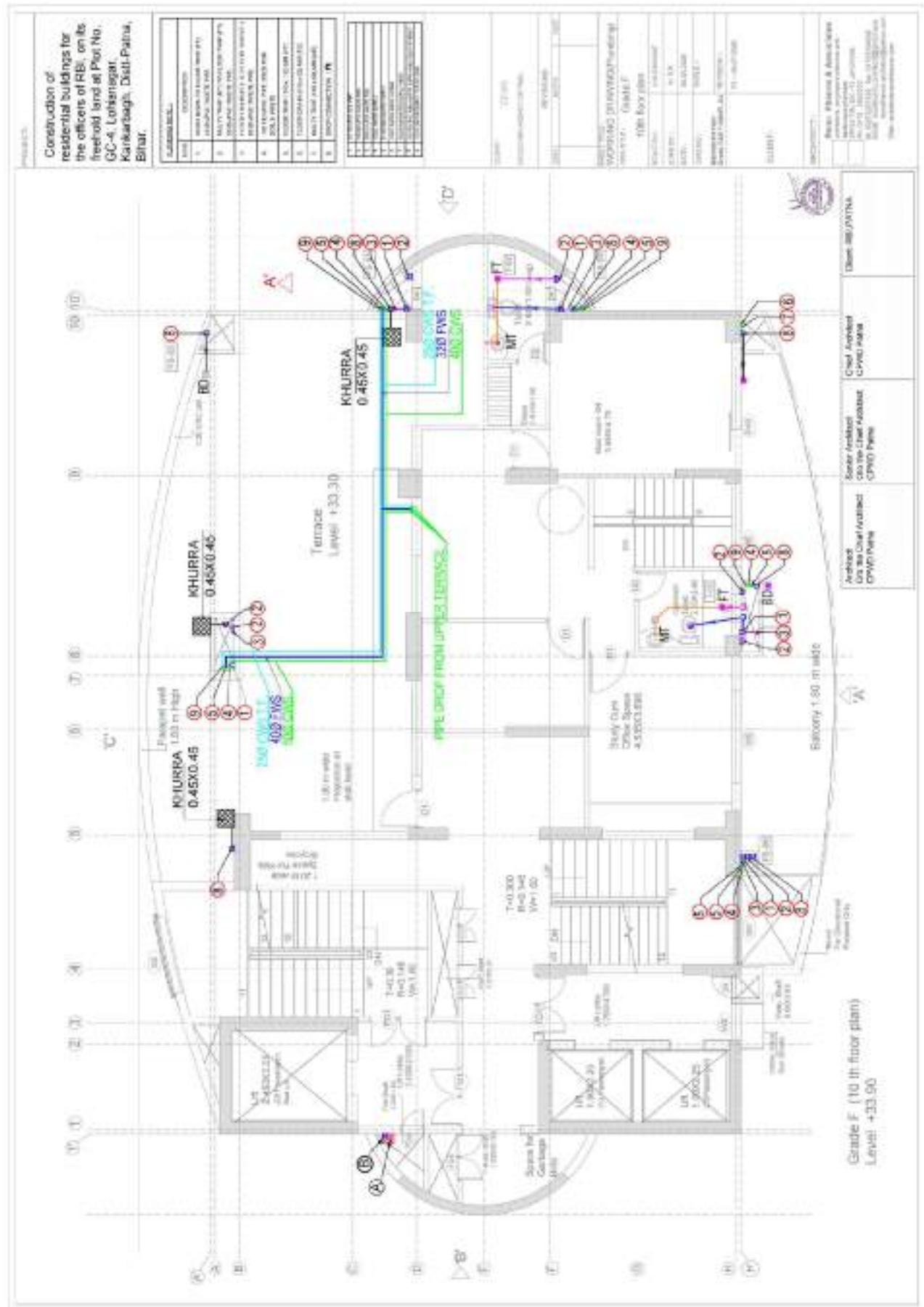
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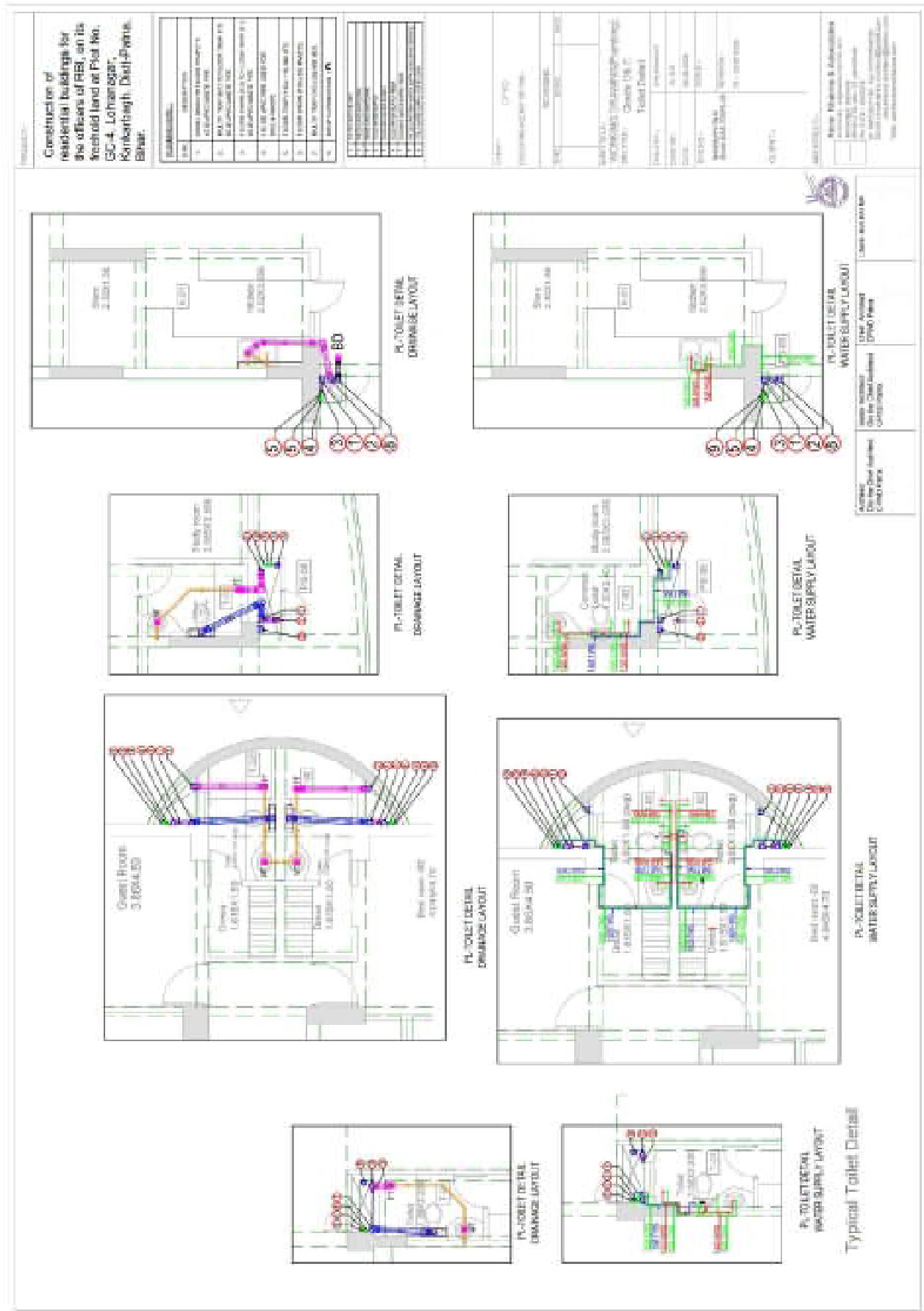
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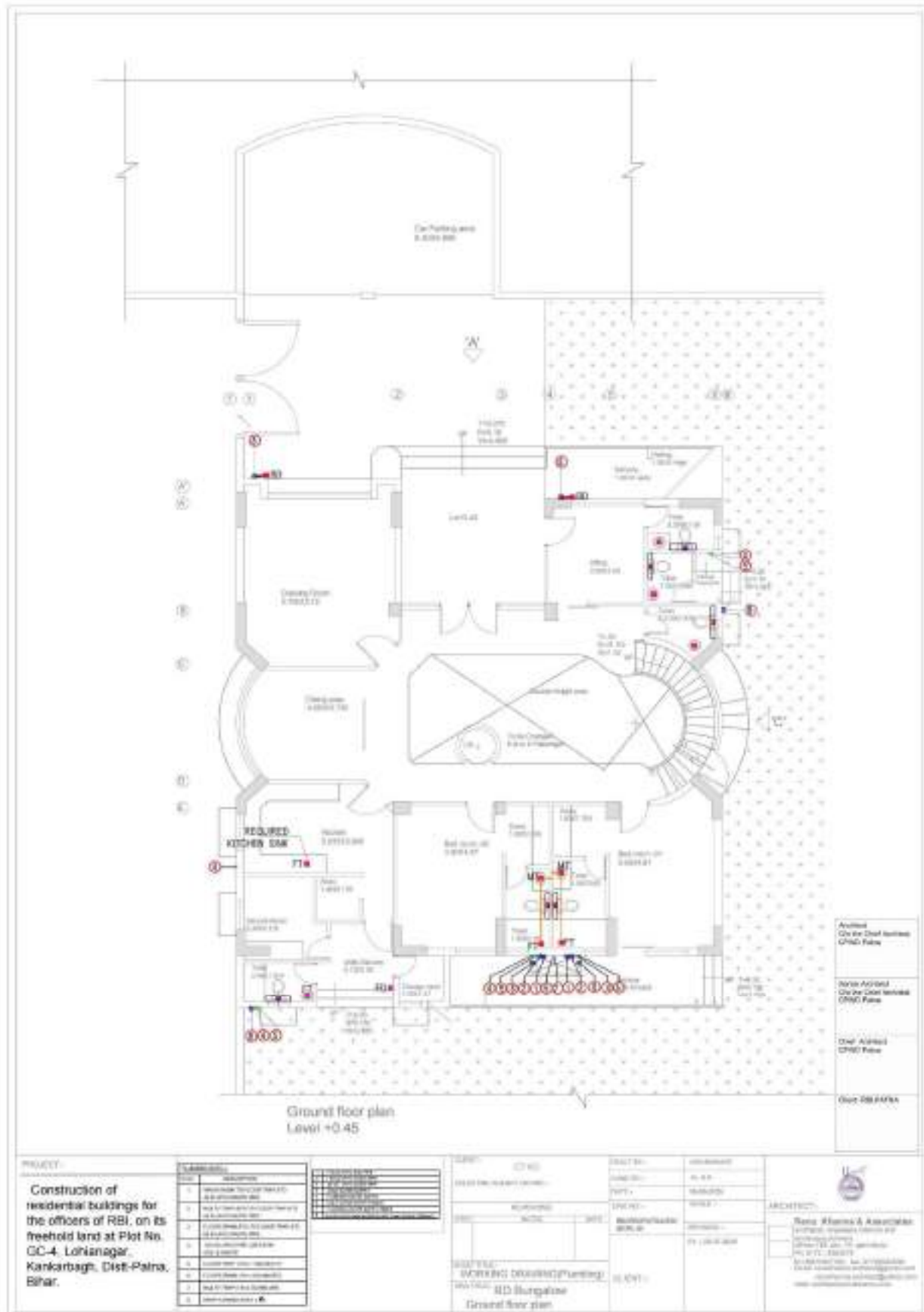
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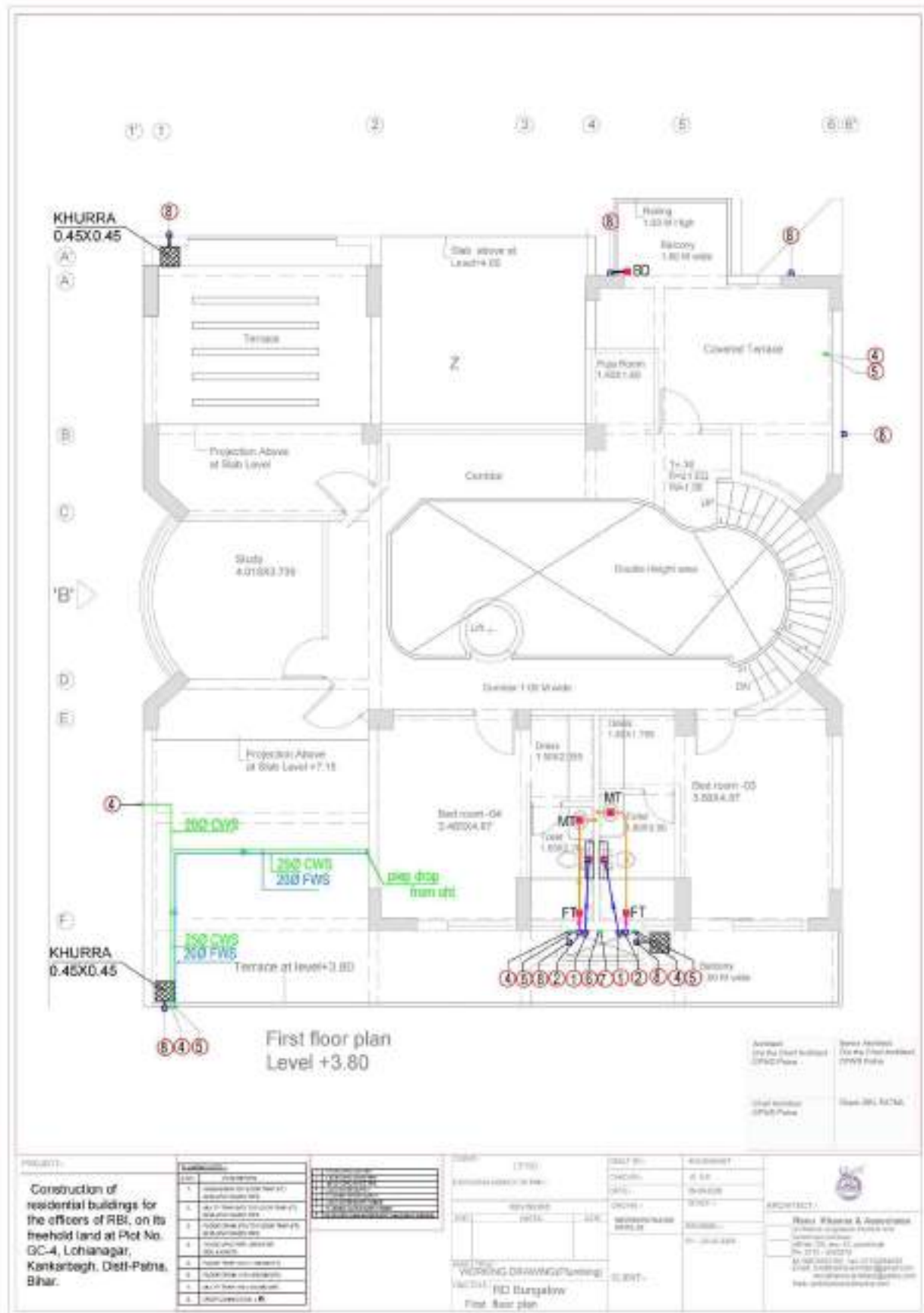


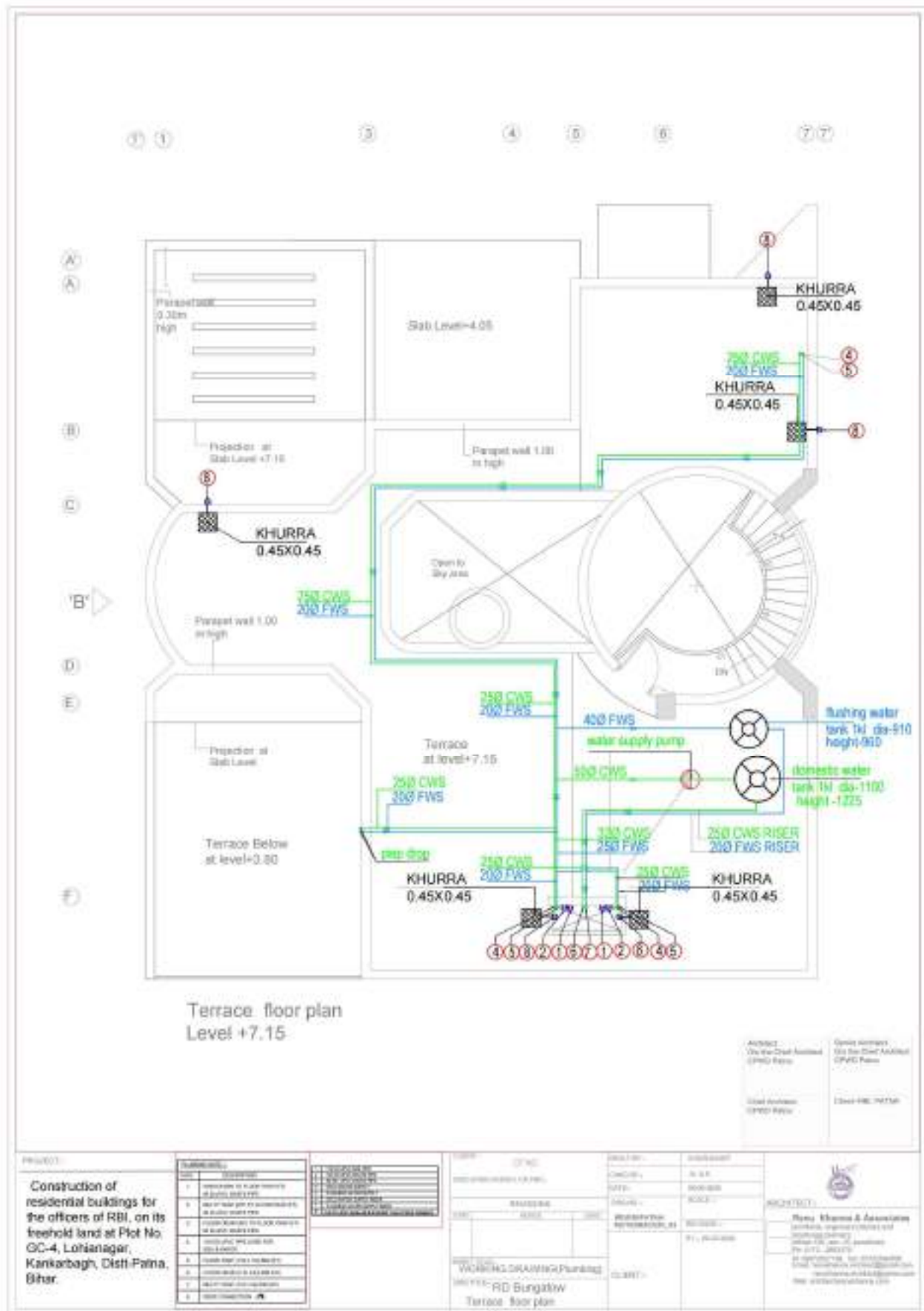














TYPICAL TOILET DETAIL
DRAINAGE LAYOUT



TYPICAL TOILET DETAIL
WATER SUPPLY LAYOUT



TOILET DRAINAGE LAYOUT
BASEMENT CEILING PLAN
WATER SUPPLY LAYOUT



TOILET DETAIL
WATER SUPPLY LAYOUT



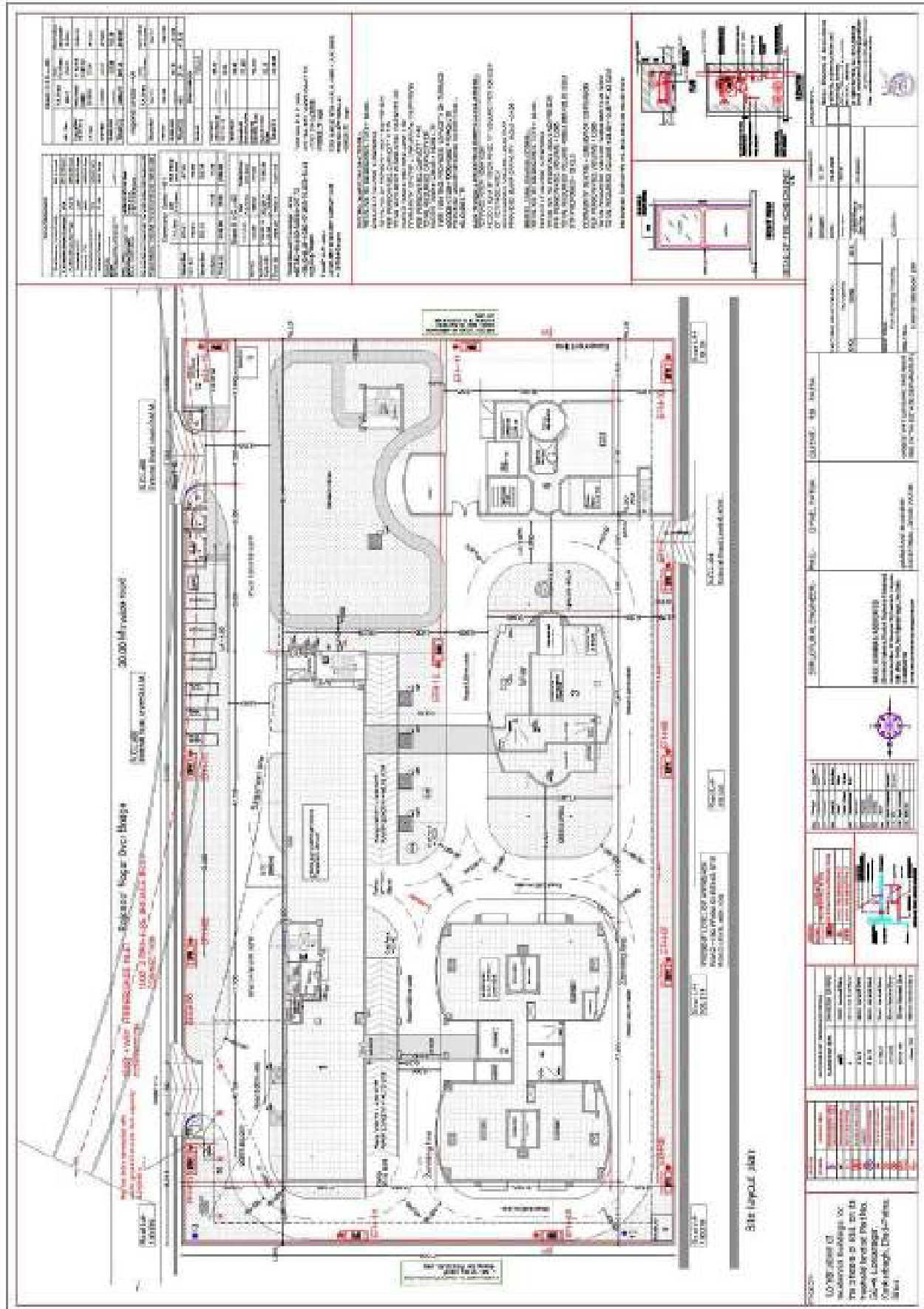
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BASEMENT CEILING PLAN
WATER SUPPLY LAYOUT



TOILET DETAIL
WATER SUPPLY LAYOUT

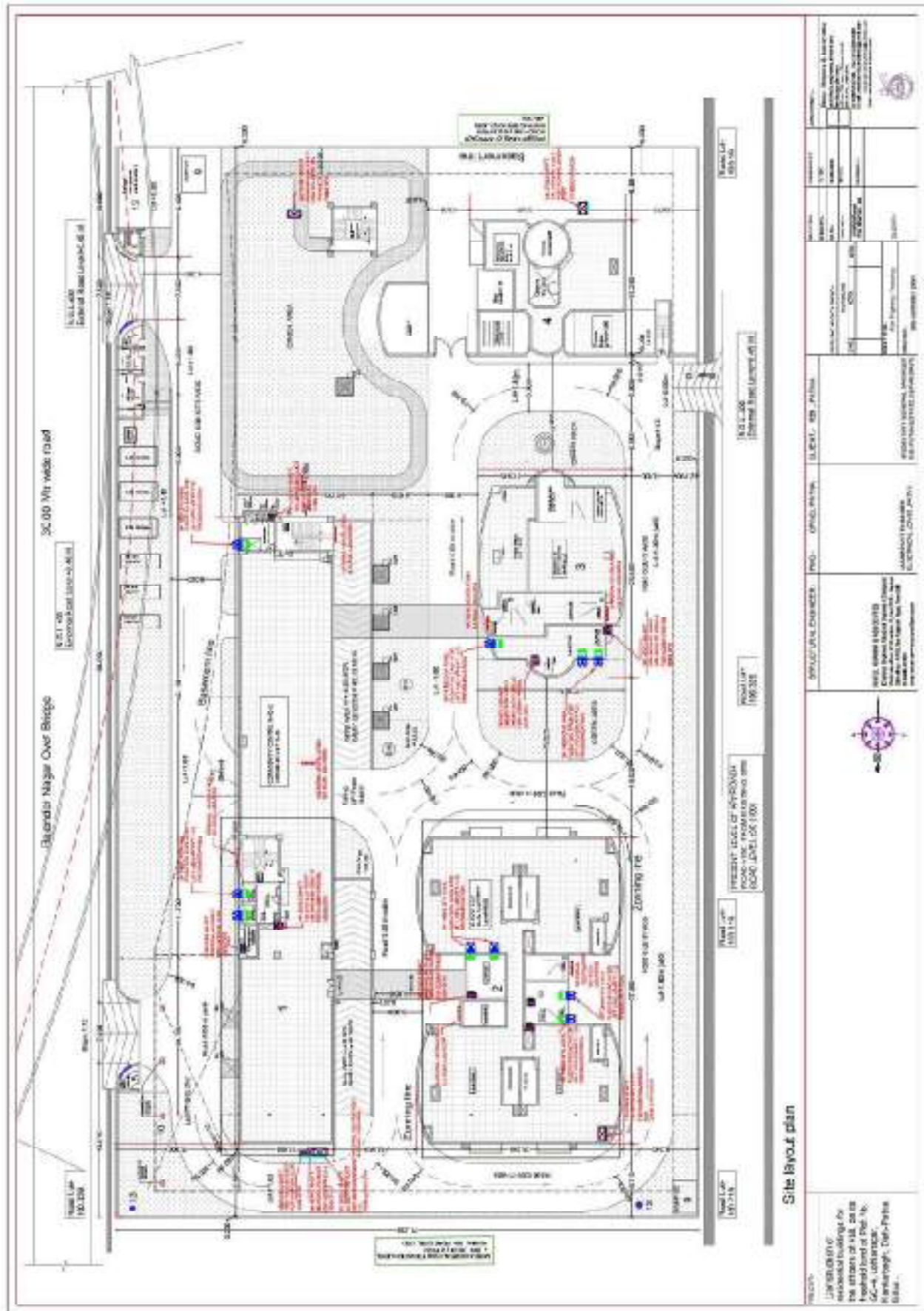
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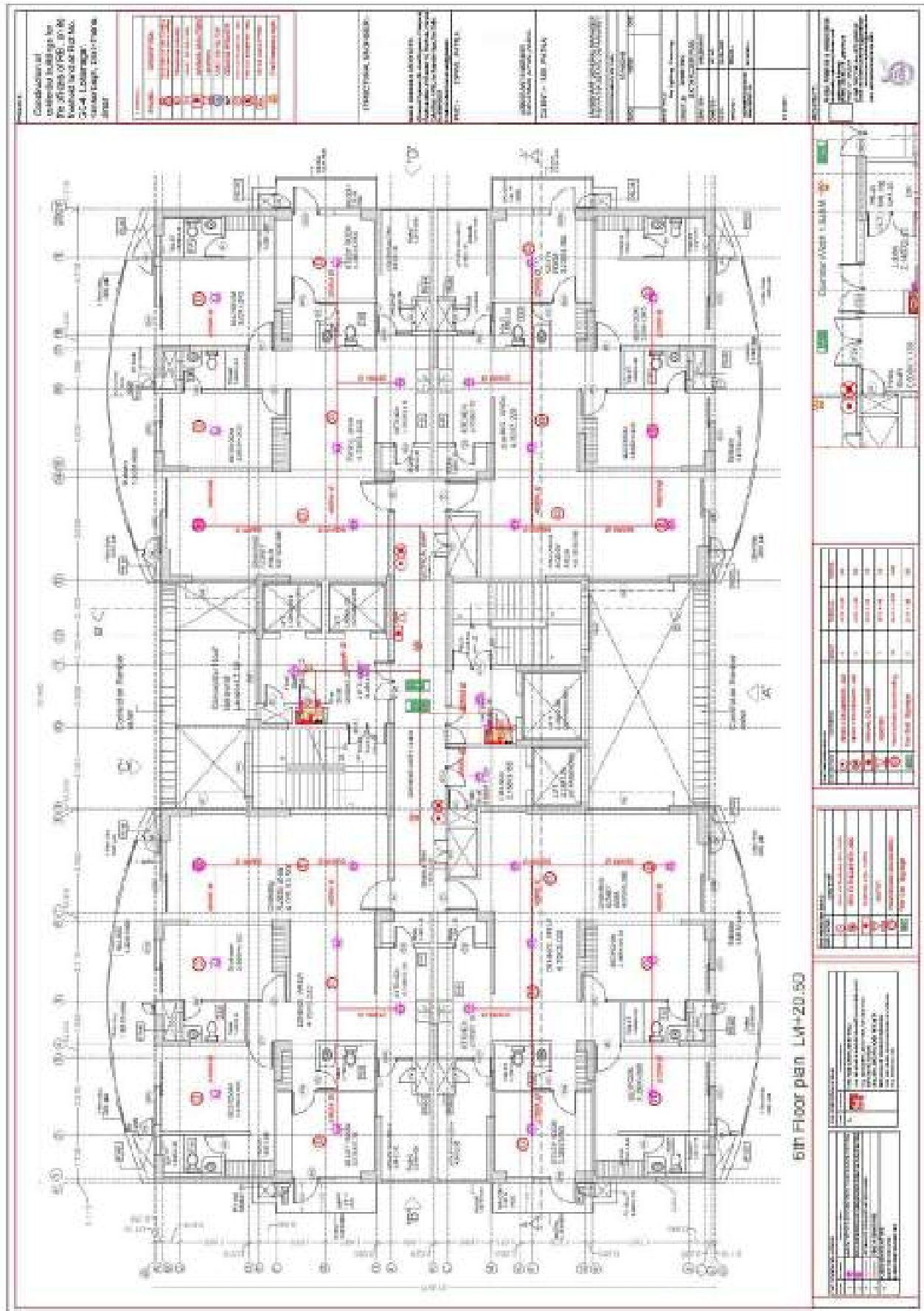


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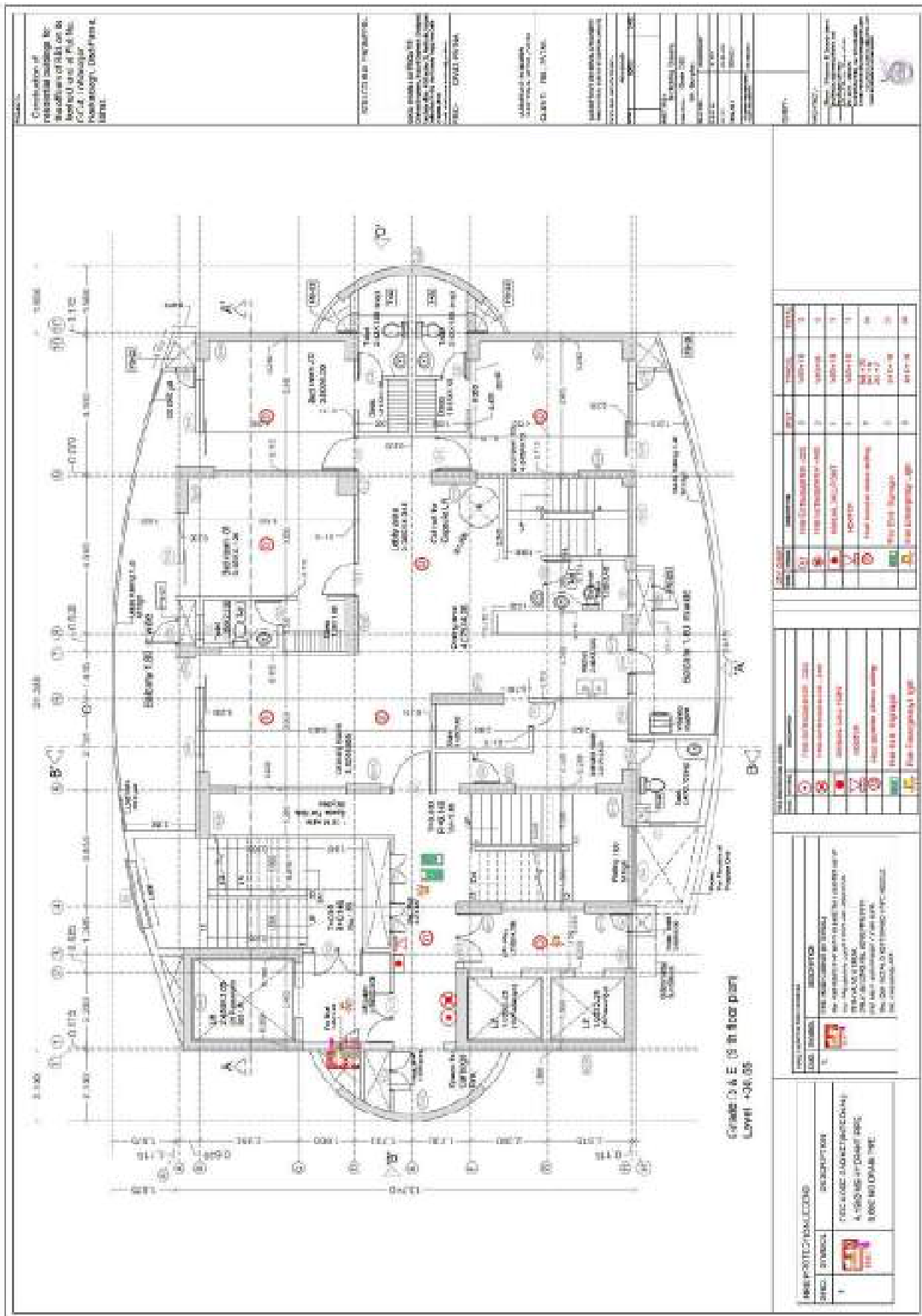


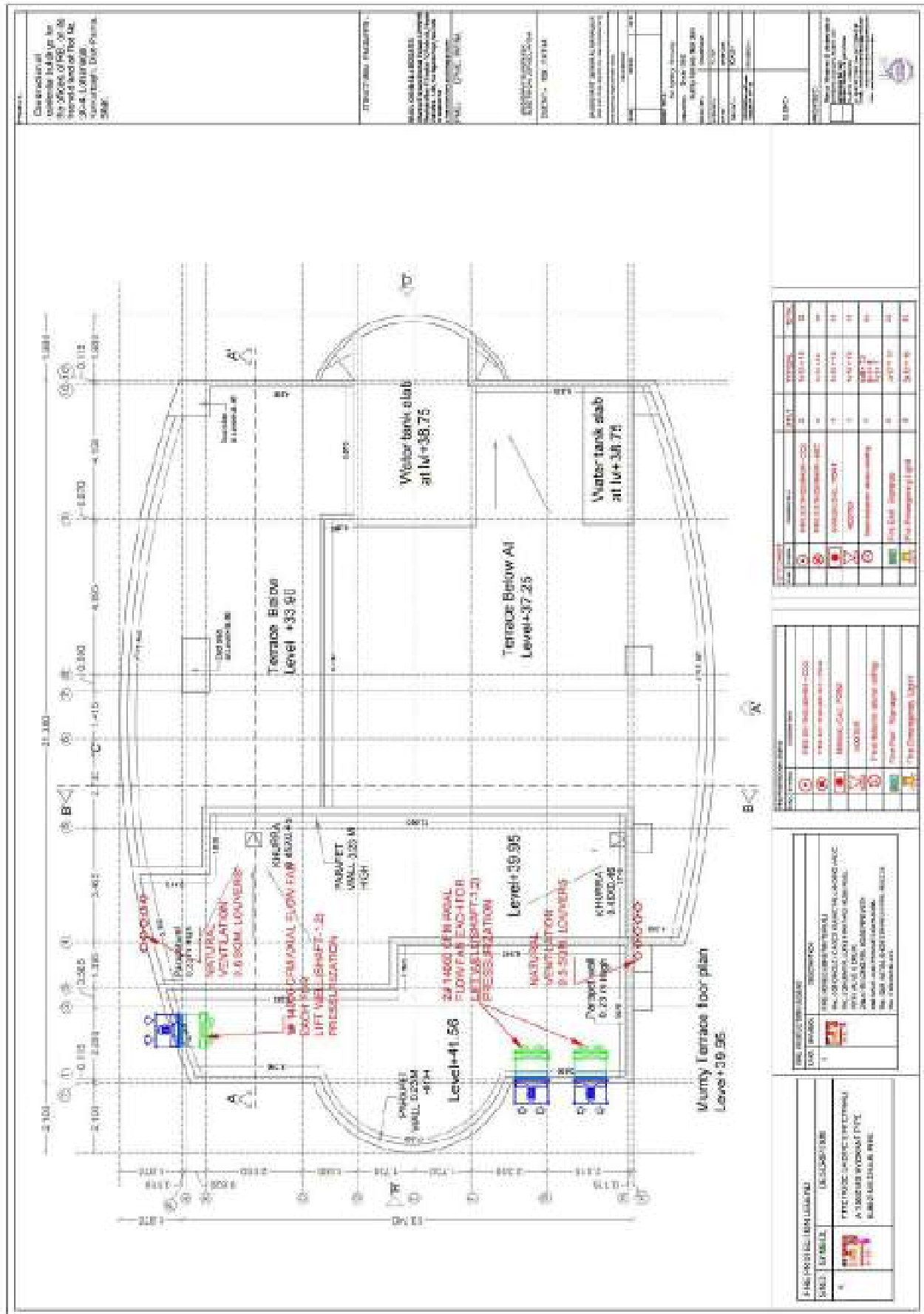




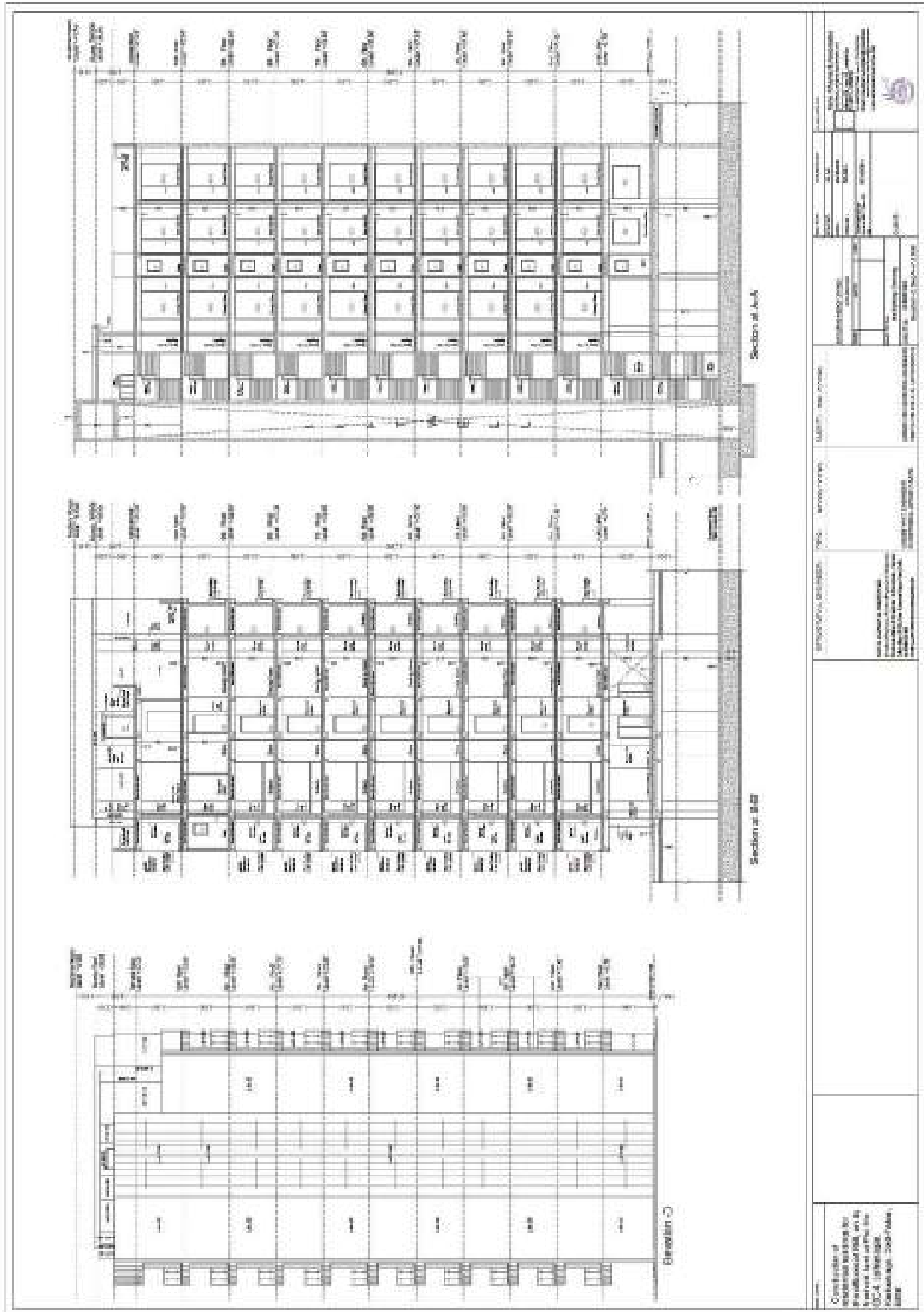


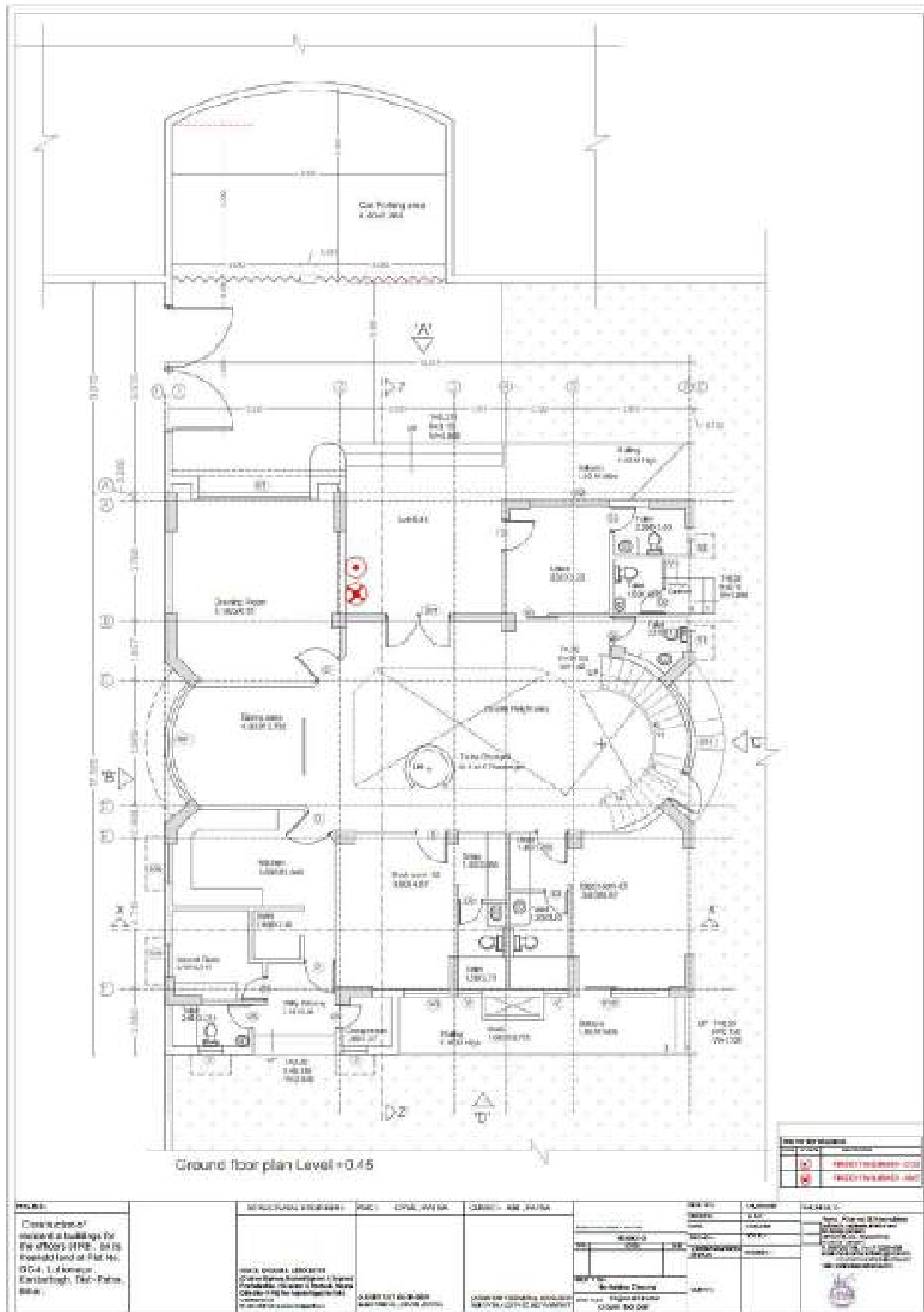


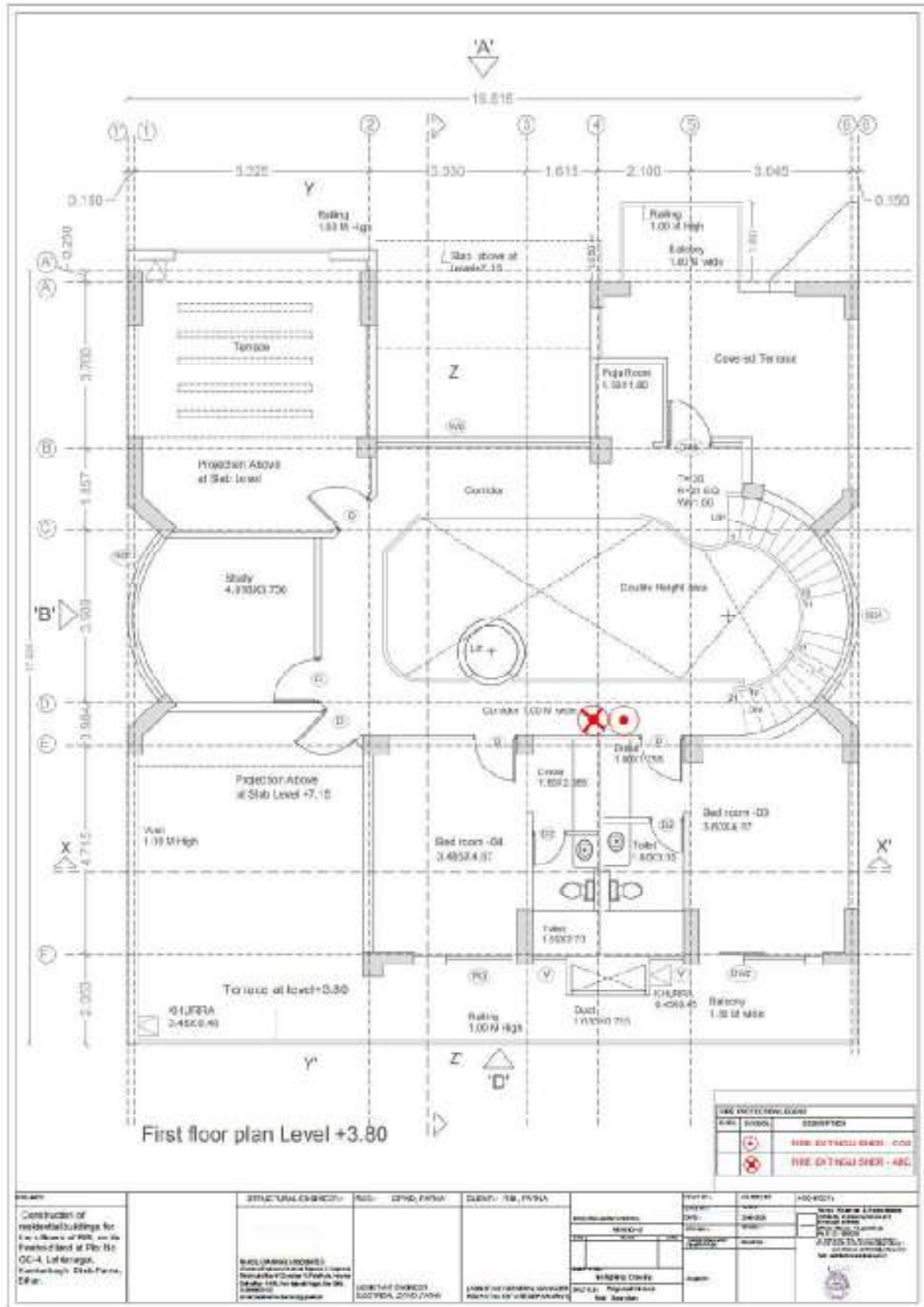




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PROJECT NAME: Project Name LOCATION: Project Location DATE: Project Date	DESIGNER NAME: Designer Name ADDRESS: Designer Address PHONE: Designer Phone	CONTRACTOR NAME: Contractor Name ADDRESS: Contractor Address PHONE: Contractor Phone							
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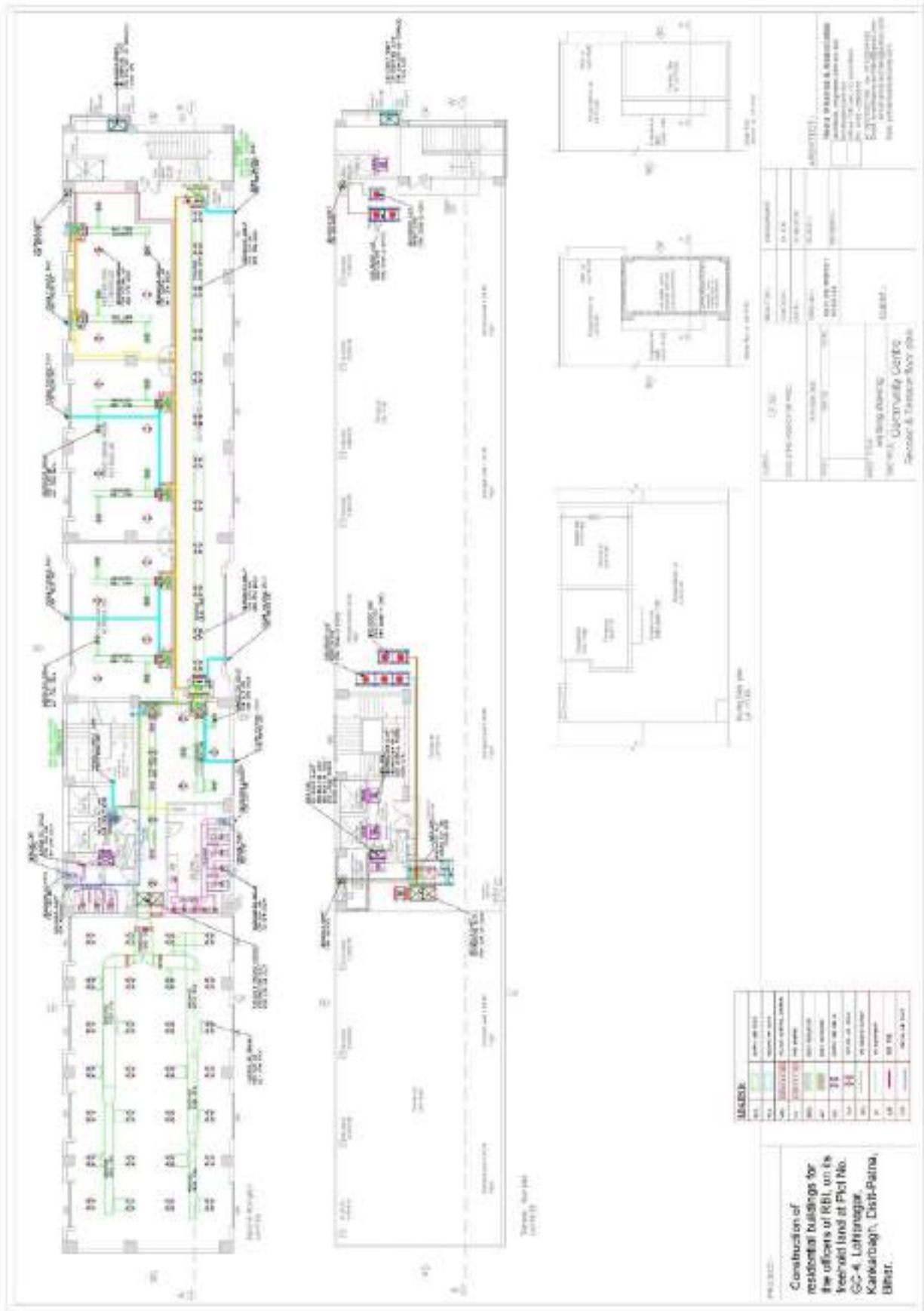








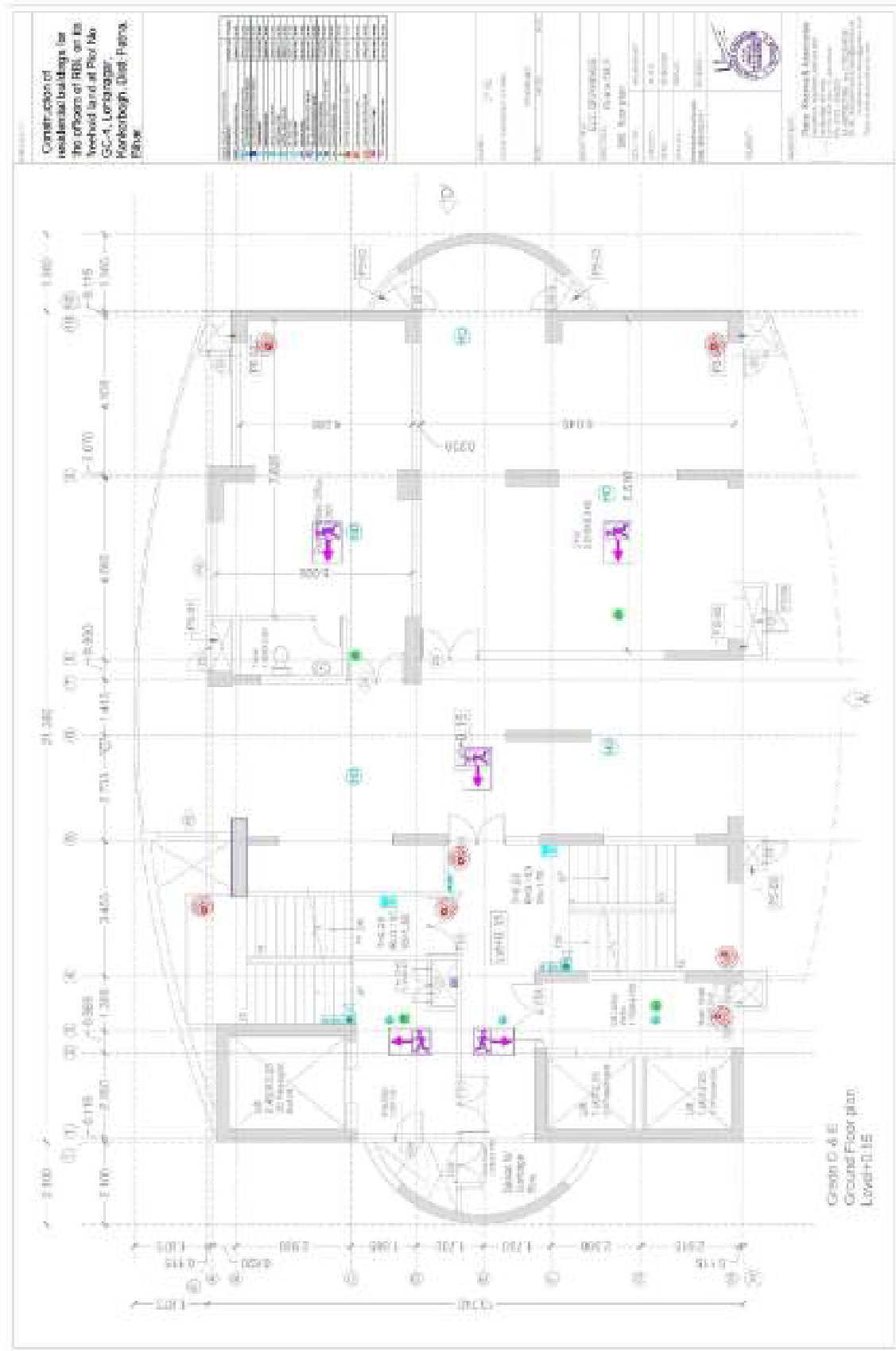




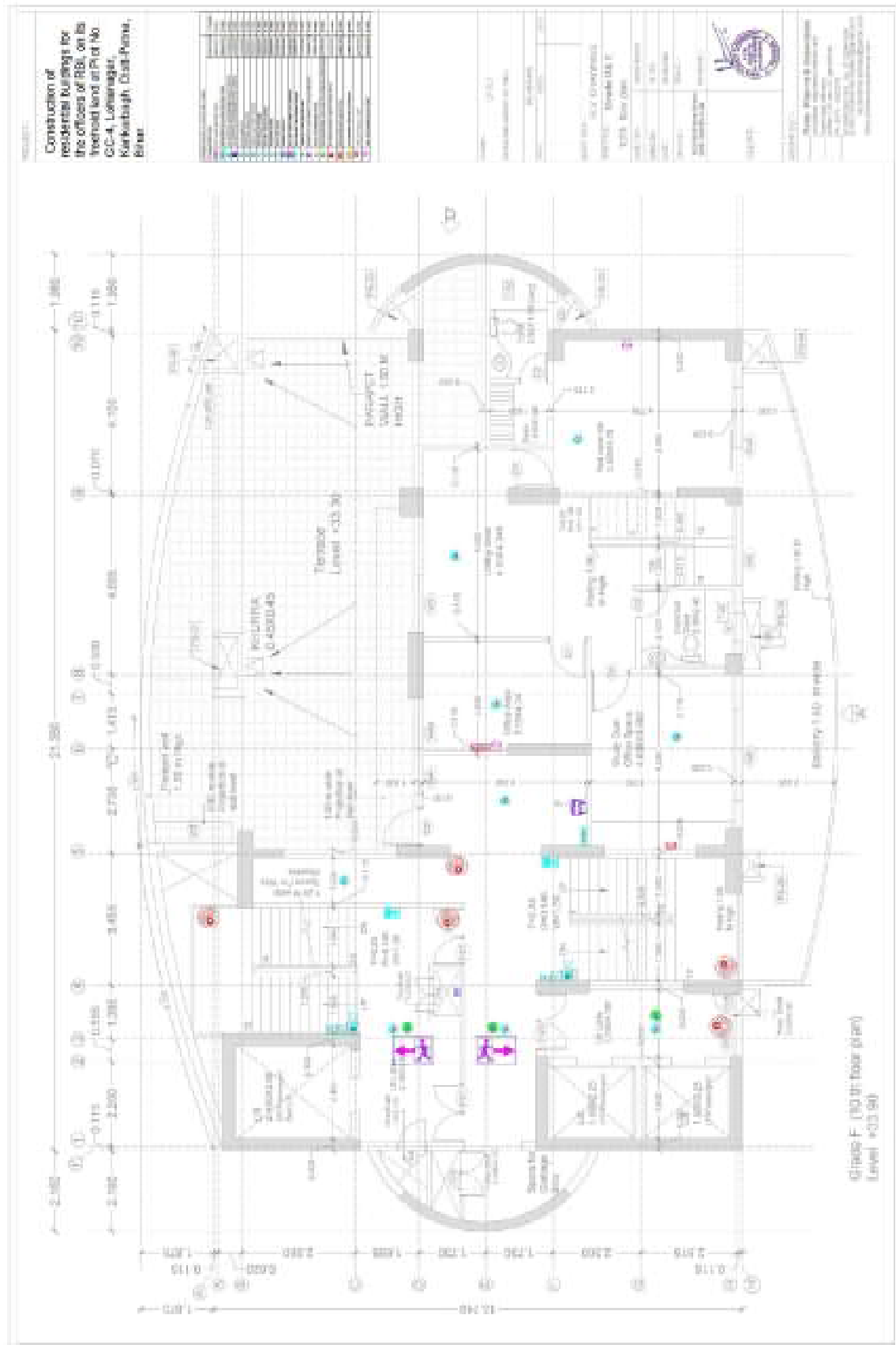


		PROJECCT: Construction of residential building for the officers of RBL on its freeland land at Plot No GC-1, Laxmanagar, Kankarbagh, Dist-Patna, Bihar. PROJECCT NO.: 1082/2021 PROJECCT DATE: 10/08/2021 PROJECCT LOCATION: GC-1, Laxmanagar, Kankarbagh, Dist-Patna, Bihar. PROJECCT OWNER: RBL PROJECCT ARCHITECT: RBL PROJECCT ENGINEER: RBL PROJECCT SURVEYOR: RBL PROJECCT DRAFTER: RBL PROJECCT CHECKER: RBL PROJECCT APPROVER: RBL
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PART-F

List of Structural Drawings:

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2	RBI/Pat/TW-CC/STR/104	Column Schedule / Column Details	1133
3	RBI/Pat/TW-CC/STR/105	Framing Plan at Basement Roof Level	1134

Sr no.	Drawing NO.	Drawing Title	Page No.
4	RBI/Pat/TW-CC/STR/106	Beam Detail at Basement Roof Level – Sheet 1	1135
5	RBI/Pat/TW-CC/STR/107	Beam Detail at Basement Roof Level – Sheet 2	1136
6	RBI/Pat/TW-CC/STR/108	Bottom Slab Reinforcement Plan at First Floor Level	1137
7	RBI/Pat/TW-CC/STR/109	Top Slab Reinforcement Plan at Basement Roof Level	1138
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9	RBI/Pat/TW-CC/STR/111	Beam Details / Beam Reinforcement Details – First Floor Level	1140
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11	RBI/Pat/TW-CC/STR/113	Beam Details / Beam Reinforcement Details – Second Floor Level	1142
12	RBI/Pat/TW-CC/STR/114	Framing Plan & Slab Reinforcement Plans at Terrace Level	1143
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14	RBI/Pat/TW-CC/STR/116	Framing Plan & Slab Reinforcement Details at Above Terrace Level	1145
15	RBI/Pat/TW-CC/STR/117	Beam Details at Above Terrace Level	1146
16	RBI/Pat/TW-CC/STR/118	Staircase-1 Detail	1147
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18	RBI/Pat/TW-CC/STR/120	Ramp-01 Plan & Details	1149
19	RBI/Pat/TW-CC/STR/121	Ramp-02 Plan & Details	1150

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1	RBI/Pat/TW-ALL/STR/000	GENERAL NOTES (TOWER-ALL)	1151
2	RBI/Pat/TW-B&C/STR/101	RAFT PLAN (TOWER-B&C)	1152
3	RBI/Pat/TW-B&C/STR/103	TOP EXTRA REINFORCEMENT PLAN (TOWER-B&C)	1153
4	RBI/Pat/TW-B&C/STR/104	BOTTOM EXTRA REINFORCEMENT PLAN (TOWER-B&C)	1154
5	RBI/Pat/TW-B&C/STR/105	COLUMN LAYOUT PLAN FOUNDATION TO STILT FLOOR LVL (TOWER-B&C)	1155
6	RBI/Pat/TW-B&C/STR/106	COLUMN LAYOUT PLAN TYPICAL FLOOR LVL (TOWER-B&C)	1156
7	RBI/Pat/TW-B&C/STR/107	COLUMN DETAIL AT FOUNDATION TO STILT FLOOR LVL (TOWER-B&C)	1157
8	RBI/Pat/TW-B&C/STR/108	COLUMN DETAIL AT STILT TO 4TH FLOOR LVL (TOWER- B&C)	1158
9	RBI/Pat/TW-B&C/STR/109	COLUMN DETAIL AT 4TH FLOOR LVL TO 9TH FLOOR LEVEL (TOWER-B&C)	1159
10	RBI/Pat/TW-B&C/STR/110	COLUMN DETAIL AT 9TH FLOOR LVL TO TERRACE FLOOR LEVEL (TOWER-B&C)	1160
11	RBI/Pat/TW-B&C/STR/111	FRAMING PLAN AT BASEMENT ROOF LVL	1161
12	RBI/Pat/TW-B&C/STR/112	BEAM DETAIL AT BASEMENT ROOF LVL (TOWER-B&C)	1162
13	RBI/Pat/TW-B&C/STR/113	TOP SLAB REINFORCEMENT DETAIL AT BASEMENT ROOF LVL (TOWER-B&C)	1163

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14	RBI/Pat/TW-B&C/STR/114	BOTTOM SLAB REINFORCEMENT DETAIL AT BASEMENT ROOF LVL (TOWER-B&C)	1164
15	RBI/Pat/TW-B&C/STR/115	FRAMING PLAN AT FIRST FLOOR LVL (TOWER-B&C)	1165
16	RBI/Pat/TW-B&C/STR/116	BEAM DETAIL AT FIRST FLOOR LVL (TOWER-B&C)	1166
17	RBI/Pat/TW-B&C/STR/117	TOP SLAB REINFORCEMENT DETAIL AT FIRST FLOOR LVL (TOWER-B&C)	1167
18	RBI/Pat/TW-B&C/STR/118	BOTTOM SLAB REINFORCEMENT DETAIL AT FIRST FLOOR LVL (TOWER- B&C)	1168
19	RBI/Pat/TW-B&C/STR/119	FRAMING PLAN TYPICAL FLOOR LVL (TOWER-B&C)	1169
20	RBI/Pat/TW-B&C/STR/120	BEAM DETAIL AT TYPICAL FLOOR LVL (TOWER-B&C)	1170
21	RBI/Pat/TW-B&C/STR/121	TOP SLAB REINFORCEMENT DETAIL AT TYPICAL FLOOR LVL (TOWER-B&C)	1171
22	RBI/Pat/TW-B&C/STR/122	BOTTOM SLAB REINFORCEMENT DETAIL AT TYPICAL FLOOR LVL (TOWER-B&C)	1172
23	RBI/Pat/TW-B&C/STR/123	FRAMING PLAN 4th & 5th FLOOR LVL (TOWER-B&C)	1173
24	RBI/Pat/TW-B&C/STR/124	BEAM DETAIL AT 4th & 5th FLOOR LVL (TOWER-B&C)	1174
25	RBI/Pat/TW-B&C/STR/125	TOP SLAB REINFORCEMENT DETAIL AT 4th & 5th FLOOR LVL (TOWER-B&C)	1175
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Sr no.	Drawing NO.	Drawing Title	Page No.
		4th & 5th FLOOR LVL (TOWER-B&C)	
27	RBI/Pat/TW-B&C/STR/127	FRAMING PLAN 6th FLOOR LVL (TOWER-B&C)	1177
28	RBI/Pat/TW-B&C/STR/128	BEAM DETAIL AT 6th FLOOR LVL (TOWER-B&C)	1178
29	RBI/Pat/TW-B&C/STR/129	TOP SLAB REINFORCEMENT DETAIL AT 6th FLOOR LVL (TOWER-B&C)	1179
30	RBI/Pat/TW-B&C/STR/130	BOTTOM SLAB REINFORCEMENT DETAIL AT 6th FLOOR LVL (TOWER-B&C)	1180
31	RBI/Pat/TW-B&C/STR/131	FRAMING PLAN 9th & 10th FLOOR LVL (TOWER-B&C)	1181
32	RBI/Pat/TW-B&C/STR/132	BEAM DETAIL AT 9th & 10th FLOOR LVL (TOWER-B&C)	1182
33	RBI/Pat/TW-B&C/STR/133	TOP SLAB REINFORCEMENT DETAIL AT 9th & 10th FLOOR LVL (TOWER-B&C)	1183
34	RBI/Pat/TW-B&C/STR/134	BOTTOM SLAB REINFORCEMENT DETAIL AT 9th & 10th FLOOR LVL (TOWER-B&C)	1184
35	RBI/Pat/TW-B&C/STR/135	FRAMING PLAN 14th FLOOR LVL (TOWER-B&C)	1185
36	RBI/Pat/TW-B&C/STR/136	BEAM DETAIL AT 14th FLOOR LVL (TOWER-B&C)	1186
37	RBI/Pat/TW-B&C/STR/137	TOP SLAB REINFORCEMENT DETAIL AT 14th FLOOR LVL (TOWER-B&C)	1187
38	RBI/Pat/TW-B&C/STR/138	BOTTOM SLAB REINFORCEMENT DETAIL AT 14th FLOOR LVL (TOWER-B&C)	1188

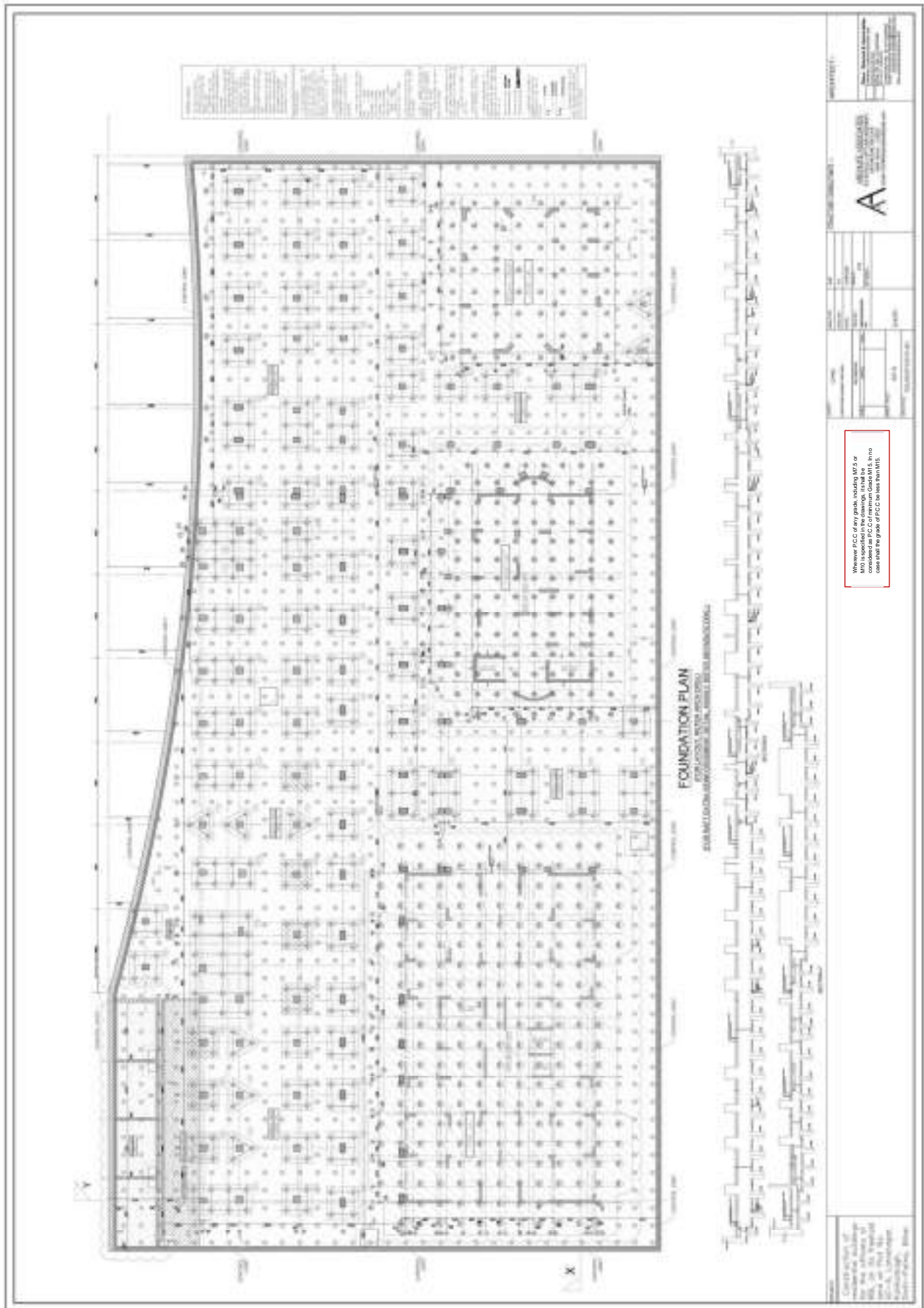
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39	RBI/Pat/TW-B&C/STR/139	FRAMING PLAN AT TERRACE LVL (TOWER-B&C)	1189
40	RBI/Pat/TW-B&C/STR/140	BEAM DETAIL AT TERRACE FLOOR LVL (TOWER-B&C)	1190
41	RBI/Pat/TW-B&C/STR/141	TOP SLAB REINFORCEMENT DETAIL AT TERRACE FLOOR LVL (TOWER-B&C)	1191
42	RBI/Pat/TW-B&C/STR/142	BOTTOM SLAB REINFORCEMENT DETAIL AT TERRACE FLOOR LVL (TOWER-B&C)	1192
43	RBI/Pat/TW-B&C/STR/143	FRAMING PLAN & DETAILS AT MUMTY, WATER TANK & MACHINE ROOM LVL (TOWER-B&C)	1193
44	RBI/Pat/TW-B&C/STR/144	BEAM DETAILS AT MUMTY, WATER TANK & MACHINE ROOM LVL (TOWER-B&C)	1194
45	RBI/Pat/TW-B&C/STR/145	SLAB REINFORCEMENT DETAIL AT MUMTY, WATER TANK & MACHINE ROOM LVL (TOWER-B&C)	1195
46	RBI/Pat/TW-B&C/STR/146	STAIRCASE DETAIL-1 (TOWER-B&C)	1196
47	RBI/Pat/TW-B&C/STR/147	STAIRCASE DETAIL-2 (TOWER-B&C)	1197
GRADE D AND E			
1	RBI/Pat/TW-D&E/STR/101	RAFT PLAN (TOWER-D&E)	1198
2	RBI/Pat/TW-D&E/STR/103	TOP EXTRA REINFORCEMENT PLAN (TOWER-D&E)	1199
3	RBI/Pat/TW-D&E/STR/104	BOTTOM EXTRA REINFORCEMENT PLAN (TOWER-D&E)	1200

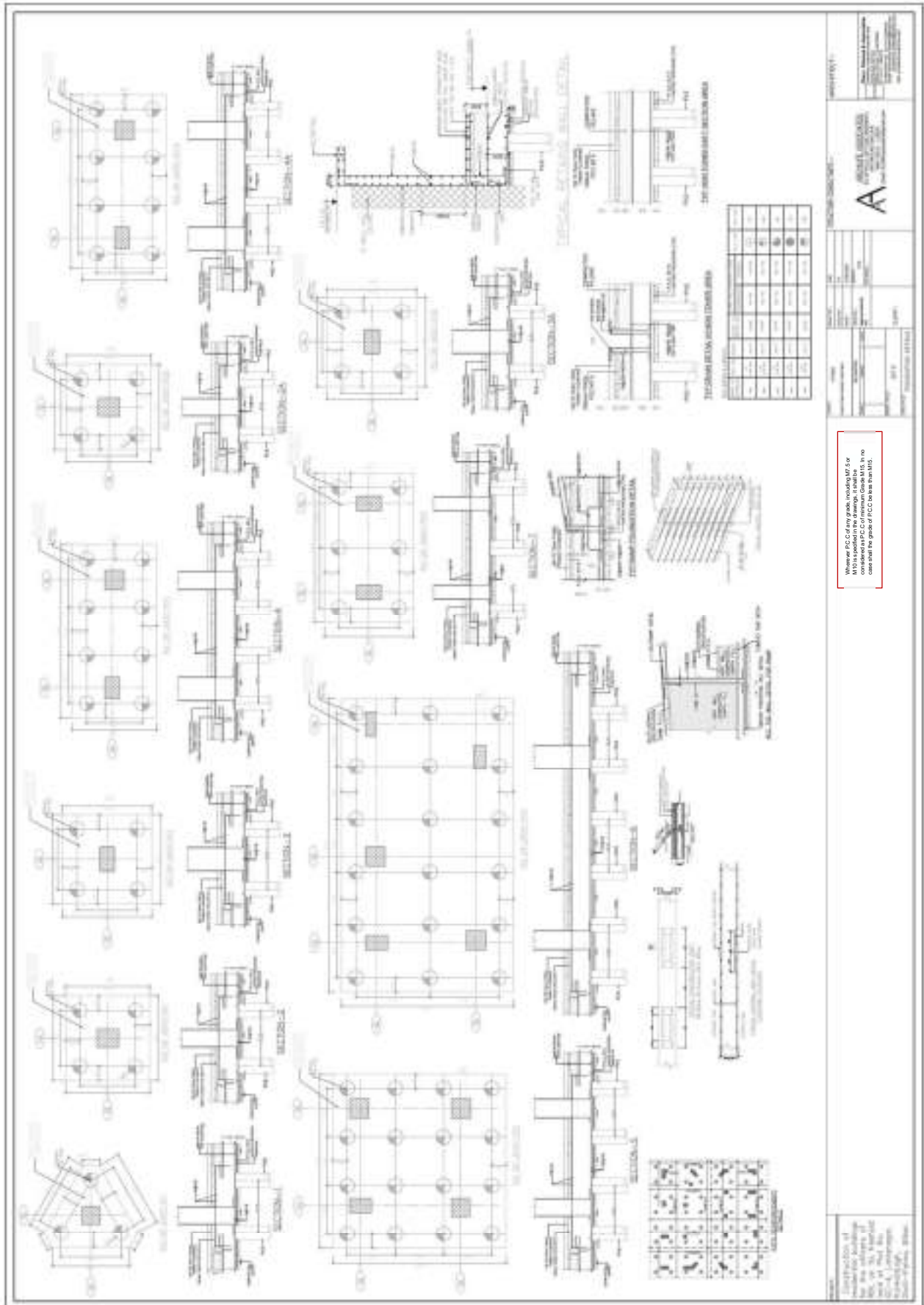
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4	RBI/Pat/TW-D&E/STR/105	COLUMN LAYOUT PLAN FOUNDATION TO 9TH FLOOR LVL (TOWER-D&E)	1201
5	RBI/Pat/TW-D&E/STR/106	COLUMN LAYOUT PLAN 9TH FLOOR LVL TO MUMTY LVL (TOWER-D&E)	1202
6	RBI/Pat/TW-D&E/STR/107	COLUMN DETAIL AT FOUNDATION TO FIRST FLOOR LVL (TOWER-D&E)	1203
7	RBI/Pat/TW-D&E/STR/108	COLUMN DETAIL AT FIRST FLOOR LVL TO 7TH LVL (TOWER-D&E)	1204
8	RBI/Pat/TW-D&E/STR/109	COLUMN DETAIL AT 7TH FLOOR LVL TO 9TH FLOOR LVL (TOWER-D&E)	1205
9	RBI/Pat/TW-D&E/STR/110	COLUMN DETAIL AT 9TH FLOOR LVL TO TERRACE LVL (TOWER-D&E)	1206
10	RBI/Pat/TW-D&E/STR/111	COLUMN DETAIL AT TERRACE FLOOR LVL TO MUMTY LVL (TOWER-D&E)	1207
11	RBI/Pat/TW-D&E/STR/112	FRAMING PLAN AT BASEMENT ROOF LVL (TOWER-D&E)	1208
12	RBI/Pat/TW-D&E/STR/113	BEAM DETAIL DETAIL AT BASEMENT ROOF LVL (TOWER-D&E) SHEET-1	1209
13	RBI/Pat/TW-D&E/STR/114	BEAM DETAIL DETAIL AT BASEMENT ROOF LVL (TOWER-D&E) SHEET-2	1210
14	RBI/Pat/TW-D&E/STR/115	TOP SLAB REINFORCEMENT DETAIL AT BASEMENT ROOF LVL (TOWER-D&E)	1211
15	RBI/Pat/TW-D&E/STR/116	BOTTOM SLAB REINFORCEMENT DETAIL AT BASEMENT ROOF LVL (TOWER-D&E)	1212

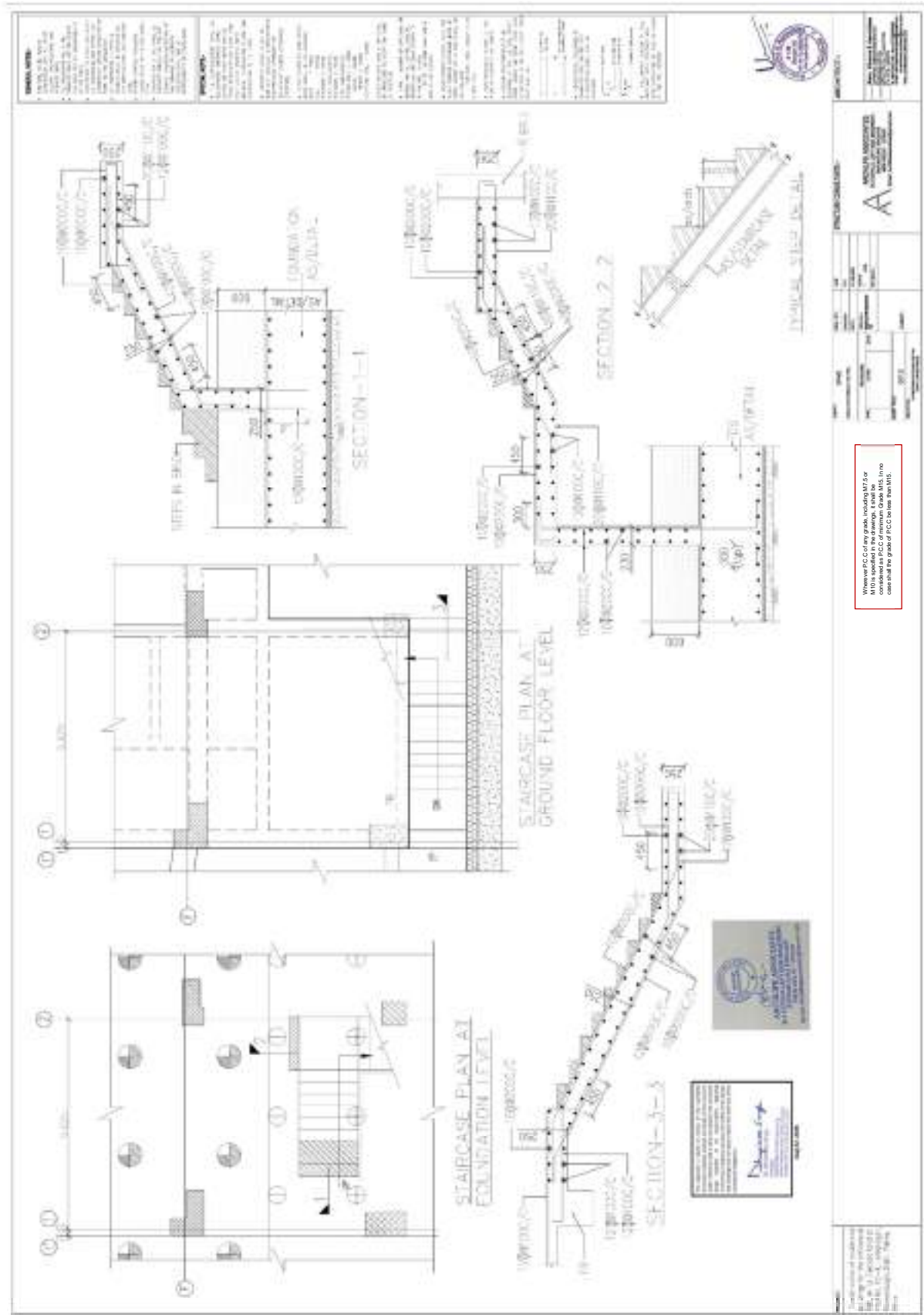
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16	RBI/Pat/TW-D&E/STR/117	FRAMING PLAN AT 1st to 4th FLOOR LVL. (TOWER-D&E)	1213
17	RBI/Pat/TW-D&E/STR/118	BEAM DETAIL AT 1st TO 4th FLOOR LVL. (TOWER-D&E)	1214
18	RBI/Pat/TW-D&E/STR/119	TOP SLAB REINFORCEMENT DETAIL AT 1st to 4th FLOOR LVL (TOWER-D&E)	1215
19	RBI/Pat/TW-D&E/STR/120	BOTTOM SLAB REINFORCEMENT DETAIL AT 1st to 4th FLOOR LVL (TOWER-D&E)	1216
20	RBI/Pat/TW-D&E/STR/121	FRAMING PLAN AT 5th to 6th FLOOR LVL. (TOWER-D&E)	1217
21	RBI/Pat/TW-D&E/STR/122	BEAM DETAIL AT 5th to 6th FLOOR LVL. (TOWER-D&E)	1218
22	RBI/Pat/TW-D&E/STR/123	TOP SLAB REINFORCEMENT DETAIL AT 5th to 6th FLOOR LVL (TOWER-D&E)	1219
23	RBI/Pat/TW-D&E/STR/124	BOTTOM SLAB REINFORCEMENT DETAIL AT 5th to 6th FLOOR LVL (TOWER-D&E)	1220
24	RBI/Pat/TW-D&E/STR/125	FRAMING PLAN AT 7th to 8th FLOOR LVL. (TOWER-D&E)	1221
25	RBI/Pat/TW-D&E/STR/126	BEAM DETAIL AT 7th TO 8th FLOOR LVL. (TOWER-D&E)	1222
26	RBI/Pat/TW-D&E/STR/127	TOP SLAB REINFORCEMENT DETAIL AT 7th to 8th FLOOR LVL (TOWER-D&E)	1223
27	RBI/Pat/TW-D&E/STR/128	BOTTOM SLAB REINFORCEMENT DETAIL AT 7th to 8th FLOOR LVL (TOWER-D&E)	1224
28	RBI/Pat/TW-D&E/STR/129	FRAMING PLAN AT 9TH FLOOR LVL. (TOWER-D&E)	1225

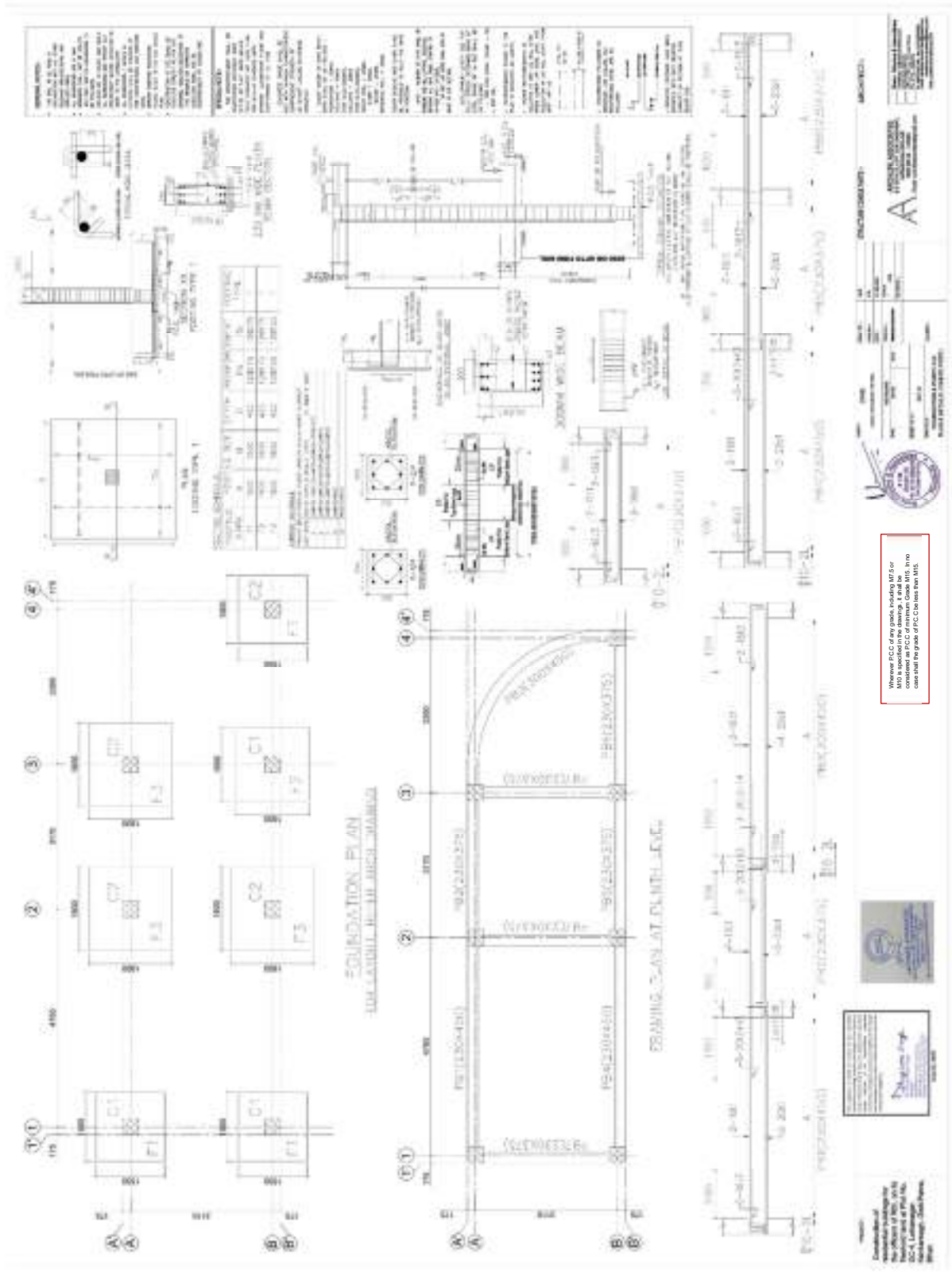
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29	RBI/Pat/TW-D&E/STR/130	BEAM DETAIL AT 9TH FLOOR LVL. (TOWER-D&E)	1226
30	RBI/Pat/TW-D&E/STR/131	TOP SLAB REINFORCEMENT DETAIL 9TH FLOOR LVL. (TOWER-D&E)	1227
31	RBI/Pat/TW-D&E/STR/132	BOTTOM SLAB REINFORCEMENT DETAIL 9TH FLOOR LVL. (TOWER-D&E)	1228
32	RBI/Pat/TW-D&E/STR/133	FRAMING PLAN AT 10TH FLOOR LVL. (TOWER-D&E)	1229
33	RBI/Pat/TW-D&E/STR/134	BEAM DETAIL AT 10TH FLOOR LVL. (TOWER-D&E)	1230
34	RBI/Pat/TW-D&E/STR/135	TOP SLAB REINFORCEMENT DETAIL 10TH FLOOR LVL. (TOWER-D&E)	1231
35	RBI/Pat/TW-D&E/STR/136	BOTTOM SLAB REINFORCEMENT DETAIL 10TH FLOOR LVL. (TOWER-D&E)	1232
36	RBI/Pat/TW-D&E/STR/137	FRAMING PLAN AT TERRACE FLOOR LVL. (TOWER-D&E)	1233
37	RBI/Pat/TW-D&E/STR/138	BEAM DETAIL AT TERRACE FLOOR LVL. (TOWER-D&E)	1234
38	RBI/Pat/TW-D&E/STR/139	TOP SLAB REINFORCEMENT DETAIL AT TERRACE FLOOR LVL (TOWER-D&E)	1235
39	RBI/Pat/TW-D&E/STR/140	BOTTOM SLAB REINFORCEMENT DETAIL AT TERRACE FLOOR LVL (TOWER-D&E)	1236
40	RBI/Pat/TW-D&E/STR/141	FRAMING PLAN AT MUMTY,MACHINE ROOM & WATER TANK LVL (TOWER-D&E)	1237

Sr no.	Drawing NO.	Drawing Title	Page No.
41	RBI/Pat/TW-D&E/STR/142	BEAM DETAILS AT MUMTY,MACHINE ROOM & WATER TANK LVL (TOWER-D&E)	1238
42	RBI/Pat/TW-D&E/STR/143	SLAB TOP & BOTTOM REINFORCEMENT DETAIL AT MUMTY & MACHINE ROOM FLOOR LVL (TOWER-D&E)	1239
43	RBI/Pat/TW-D&E/STR/144	SLAB TOP & BOTTOM REINFORCEMENT DETAIL AT MACHINE ROOM ROOF LVL (TOWER-D&E)	1240
44	RBI/Pat/TW-D&E/STR/145	SLAB TOP & BOTTOM REINFORCEMENT DETAIL AT WATER TANK BASE & ROOF LVL (TOWER-D&E)	1241
45	RBI/Pat/TW-D&E/STR/146	STAIRCASE DETAIL-1 (TOWER-D&E)	1242
46	RBI/Pat/TW-D&E/STR/147	STAIRCASE DETAIL-2 (TOWER-D&E)	1243

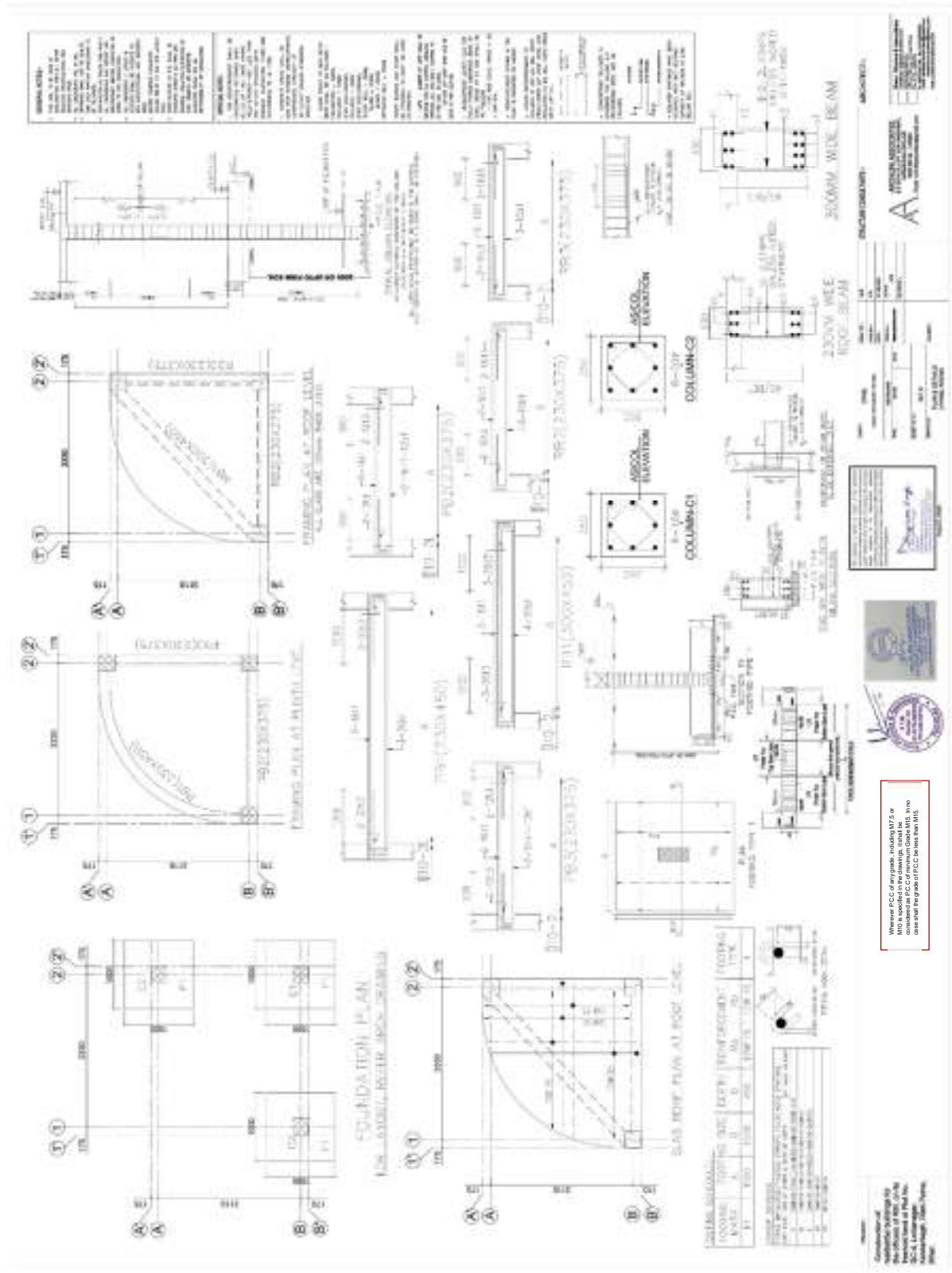


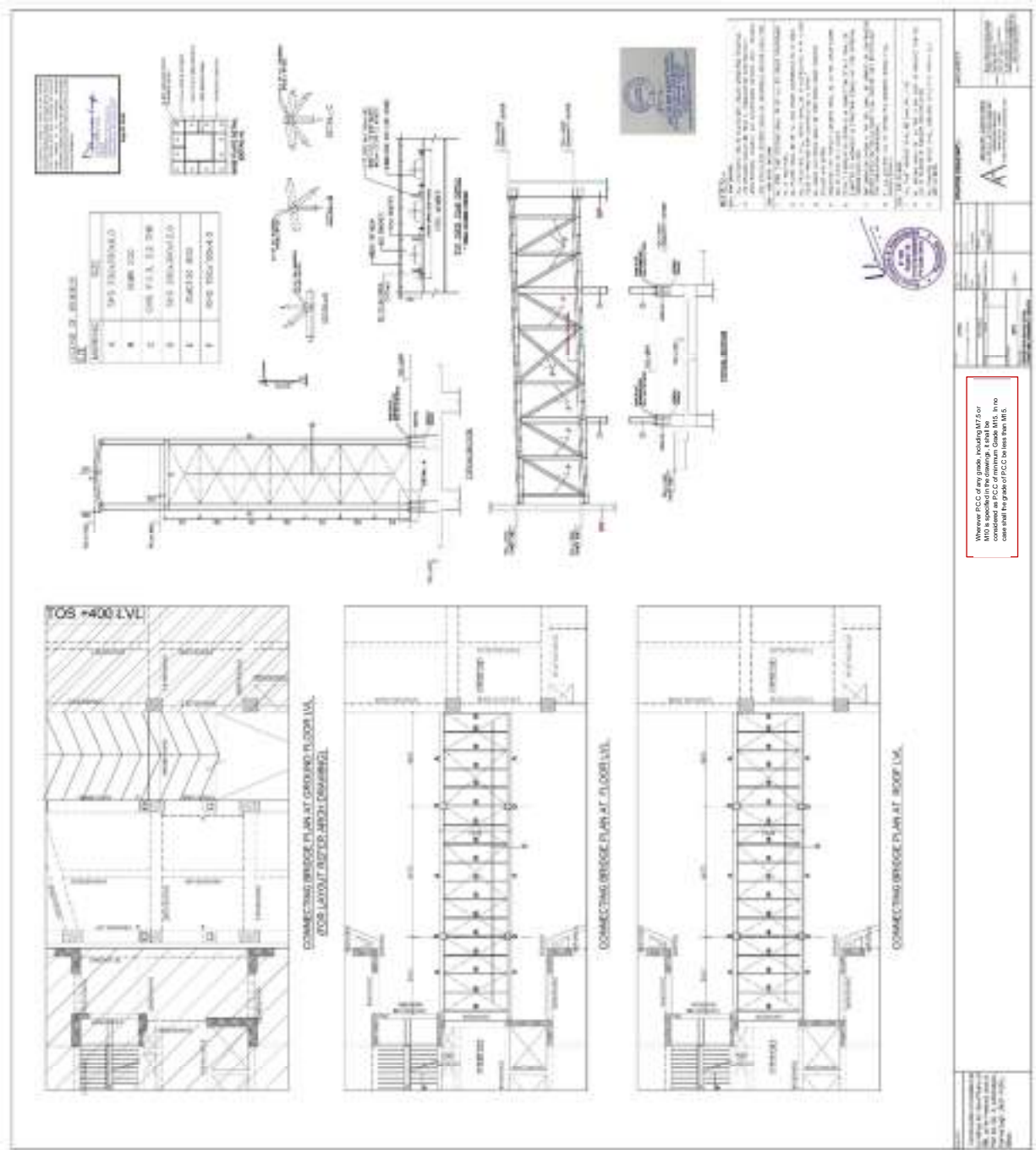






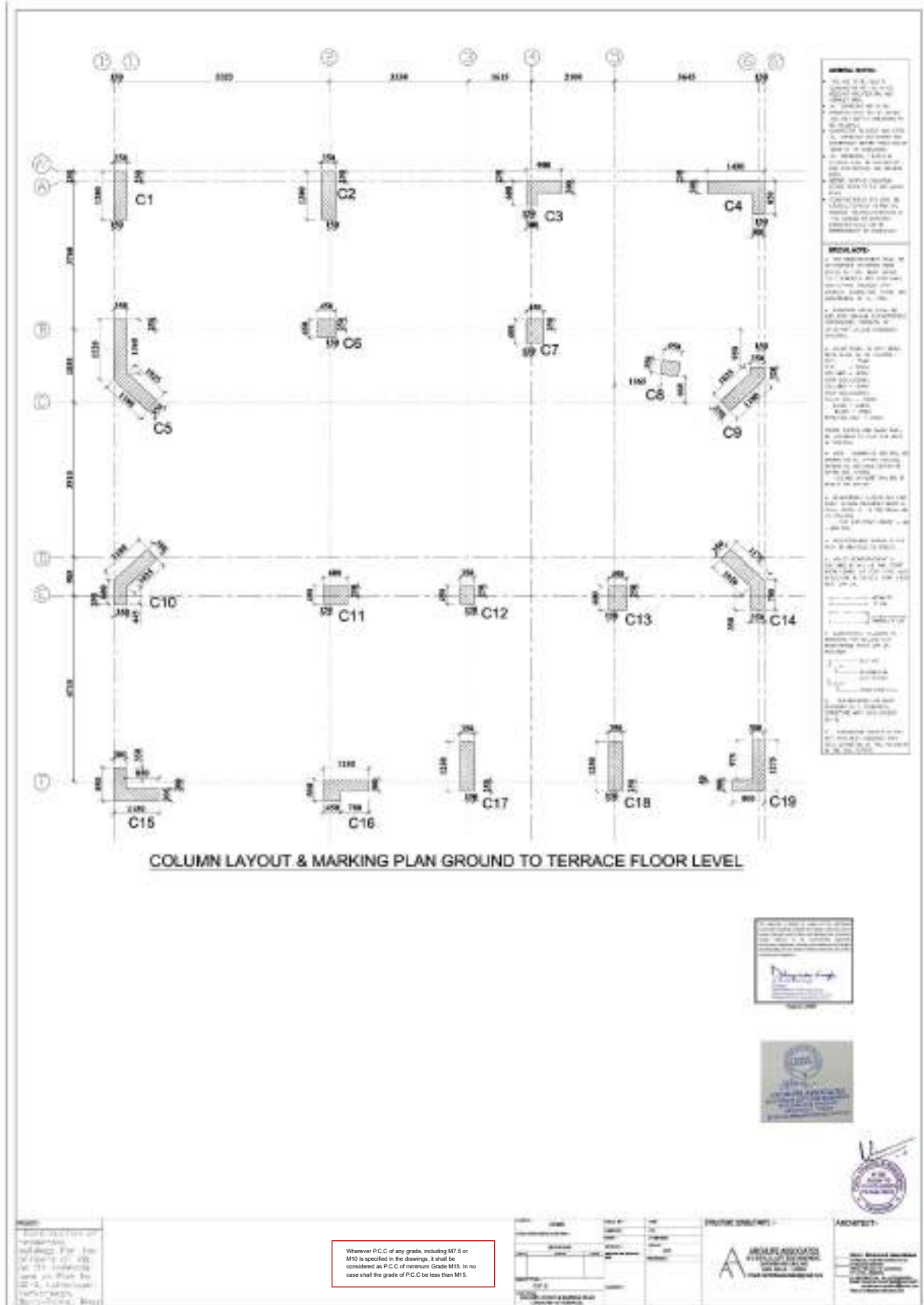




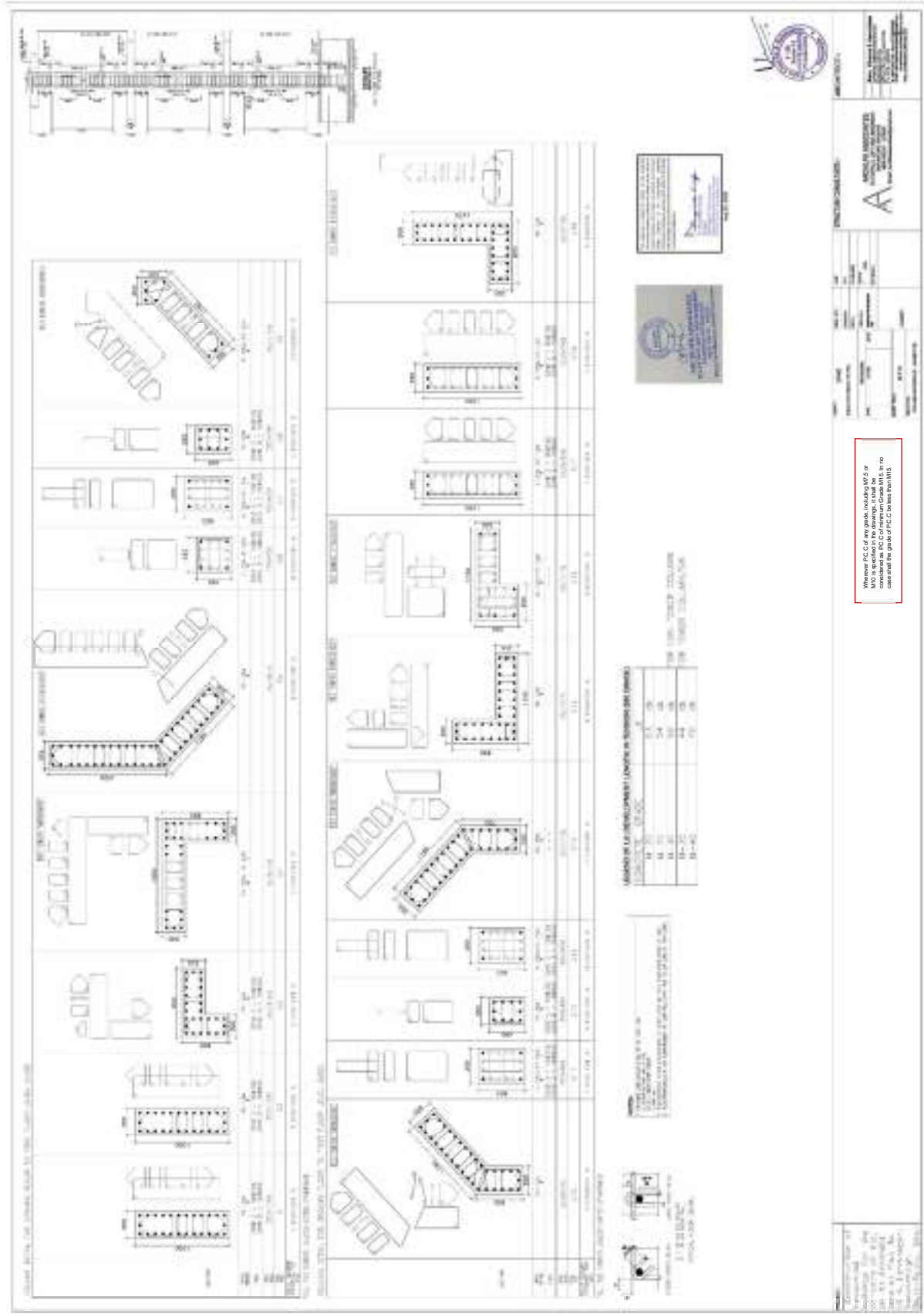




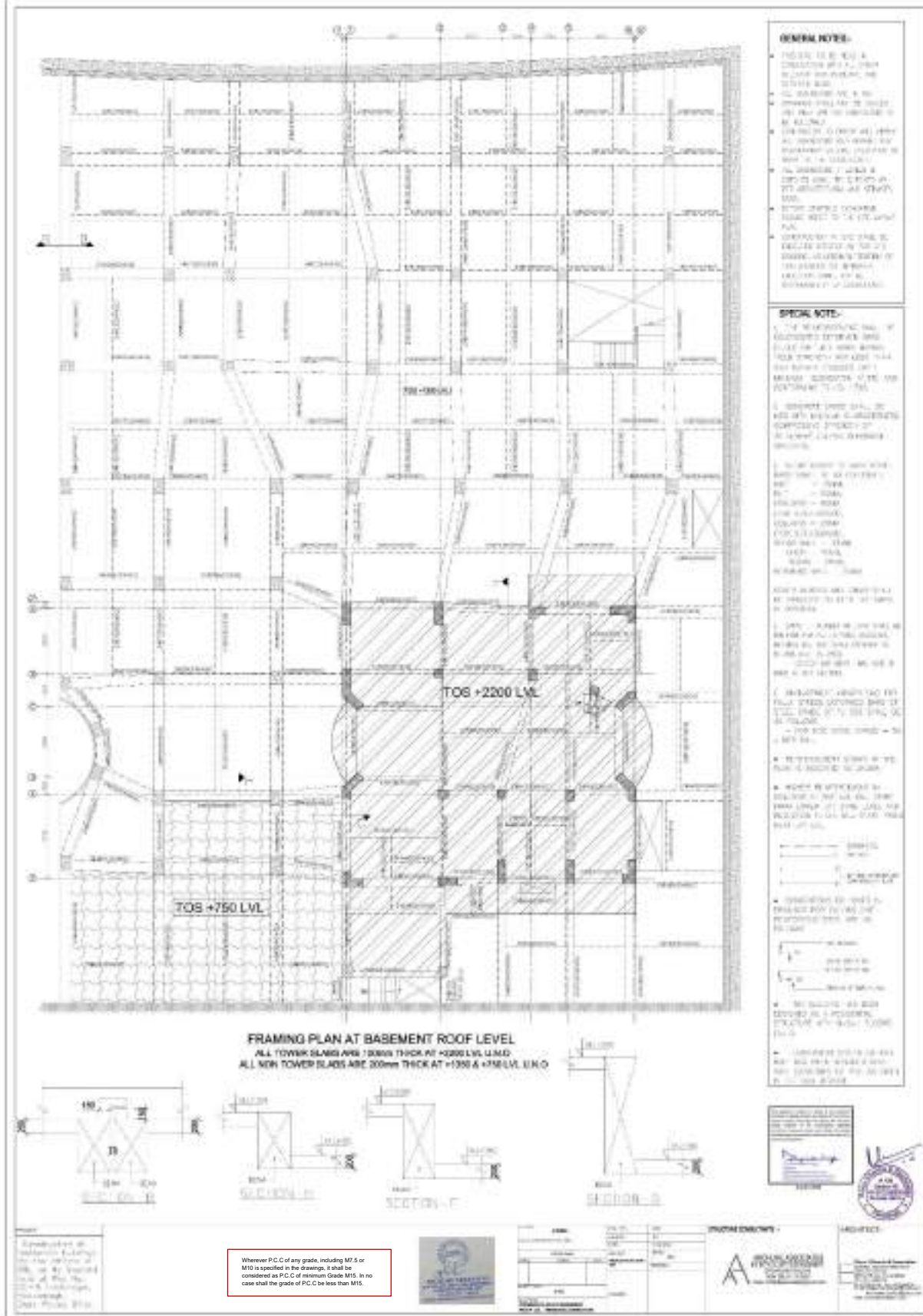


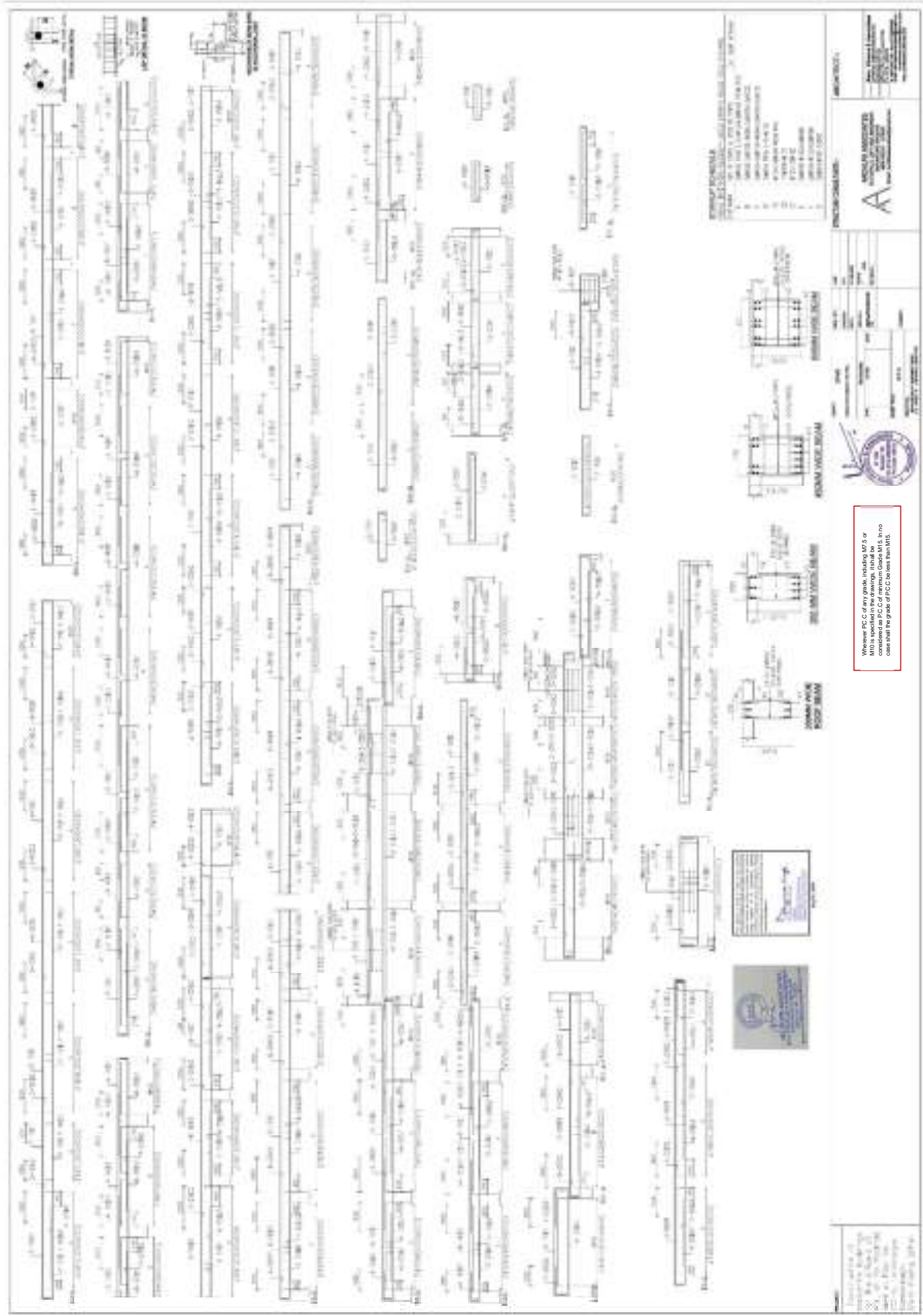


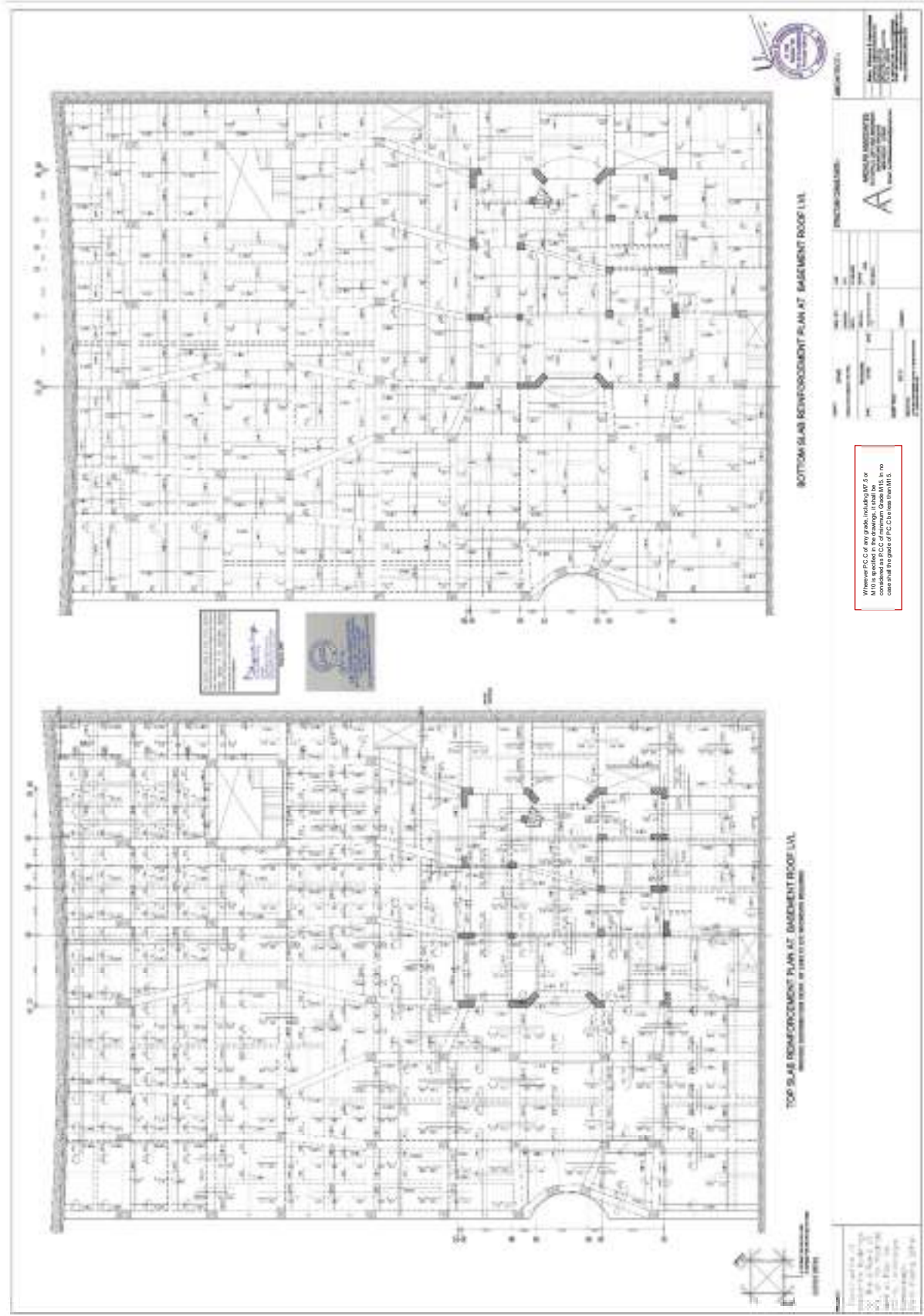


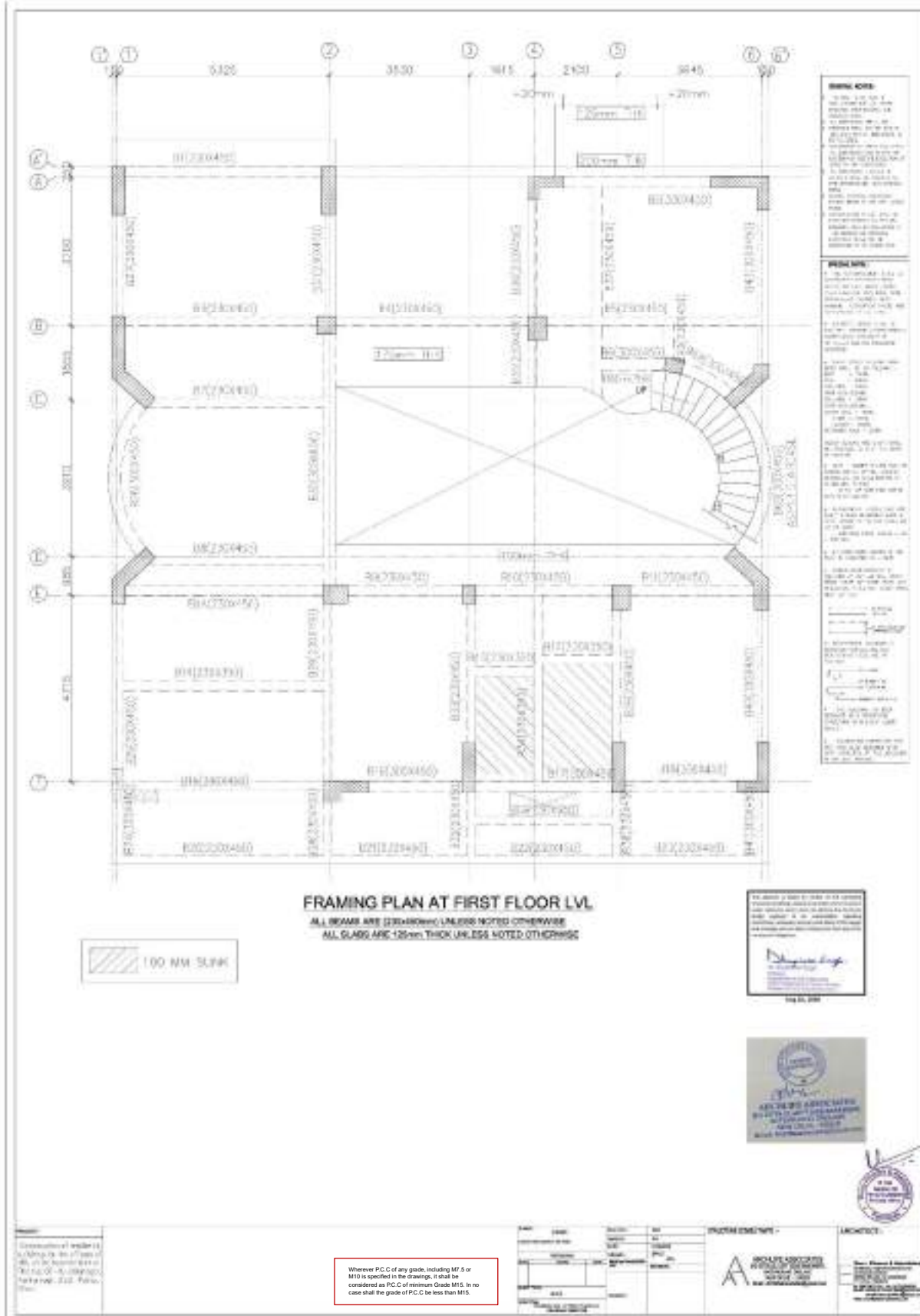


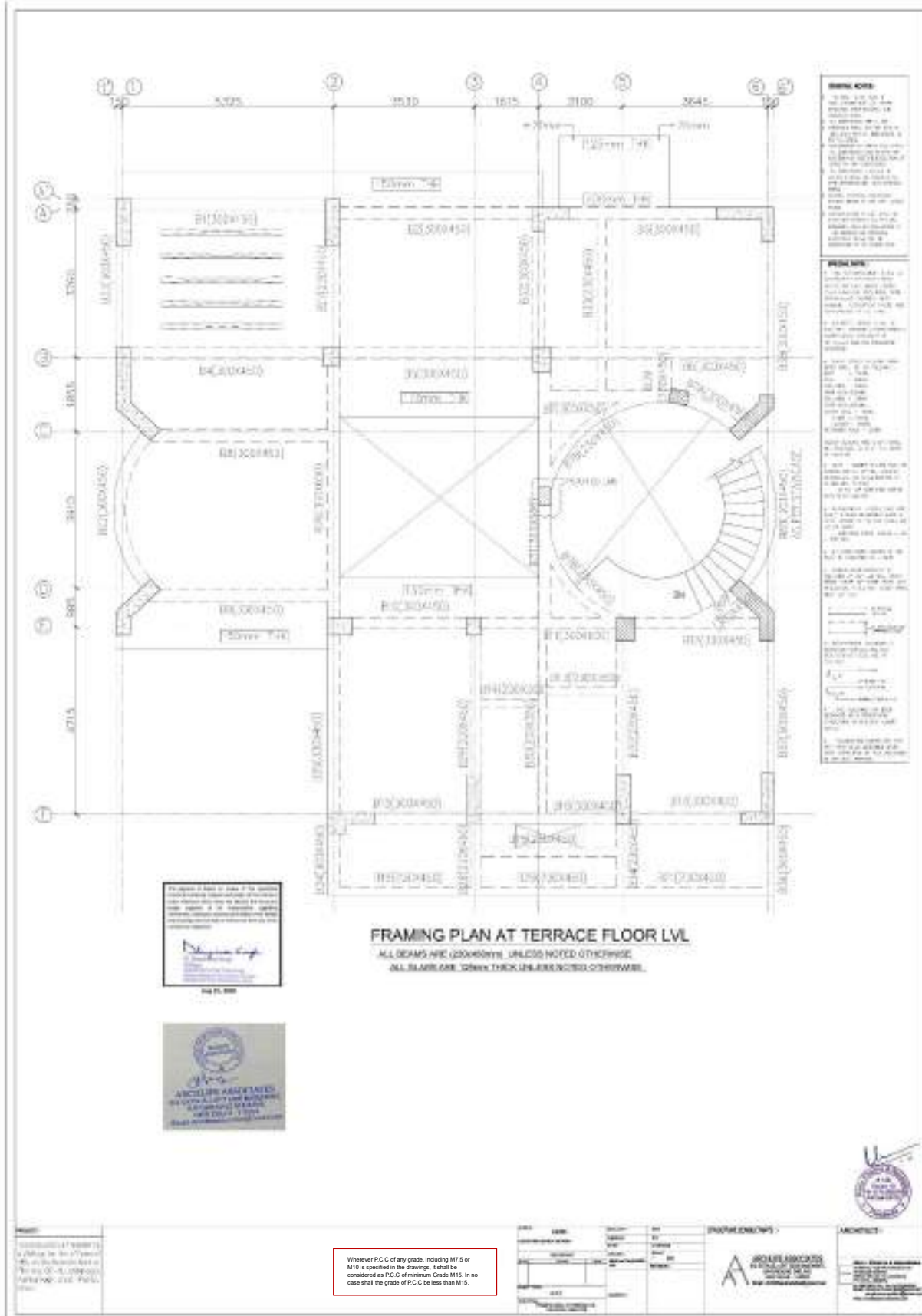


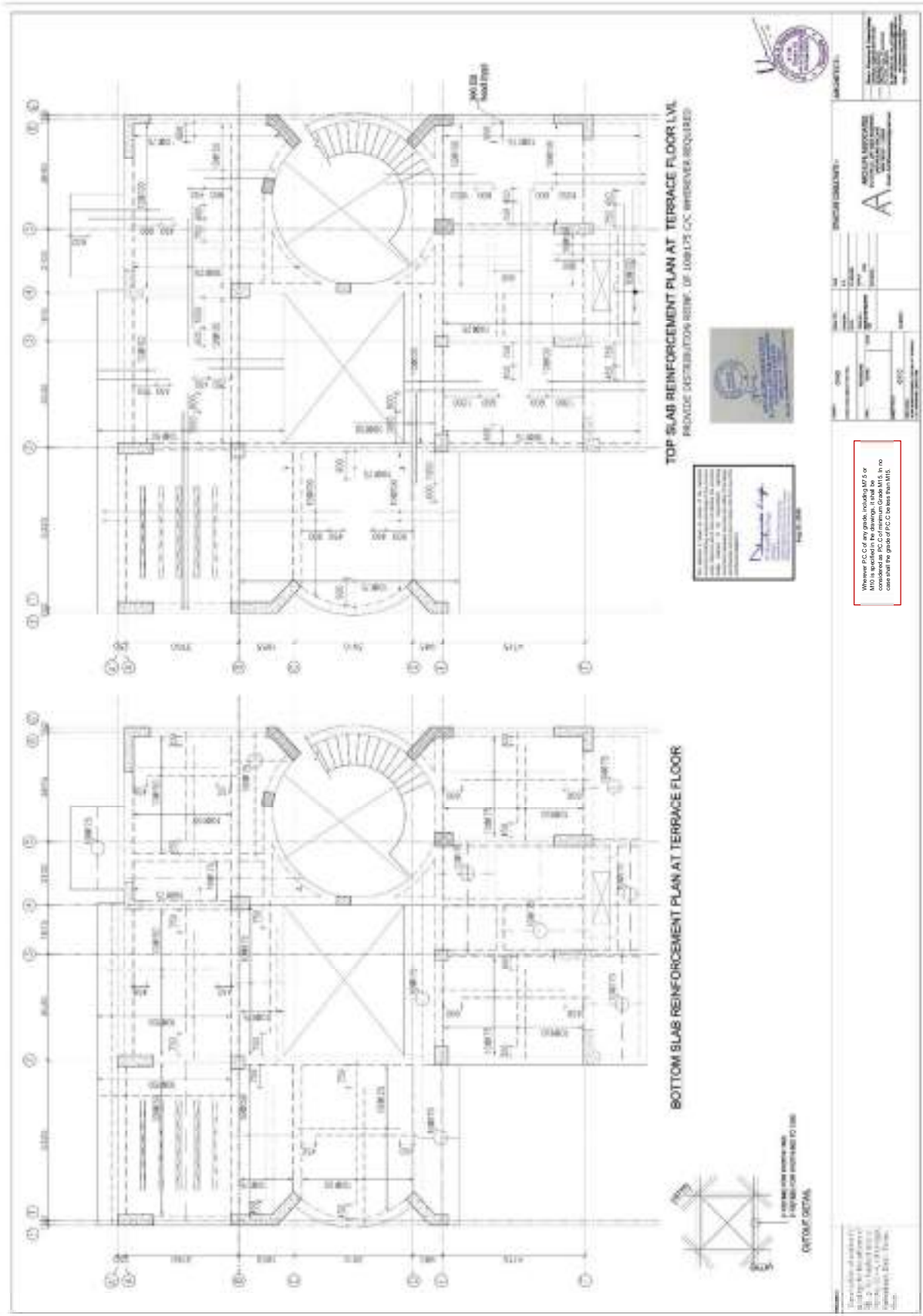


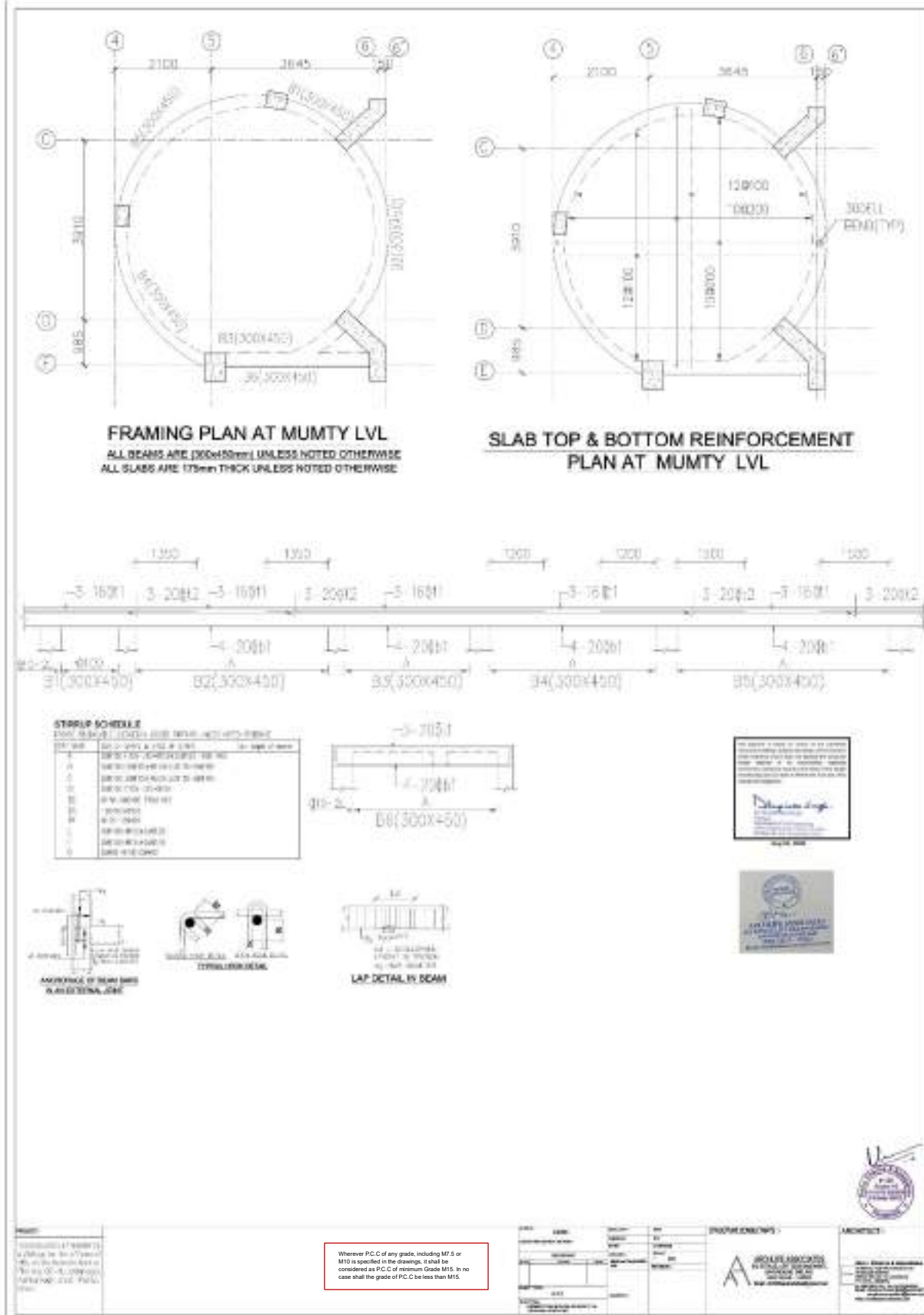


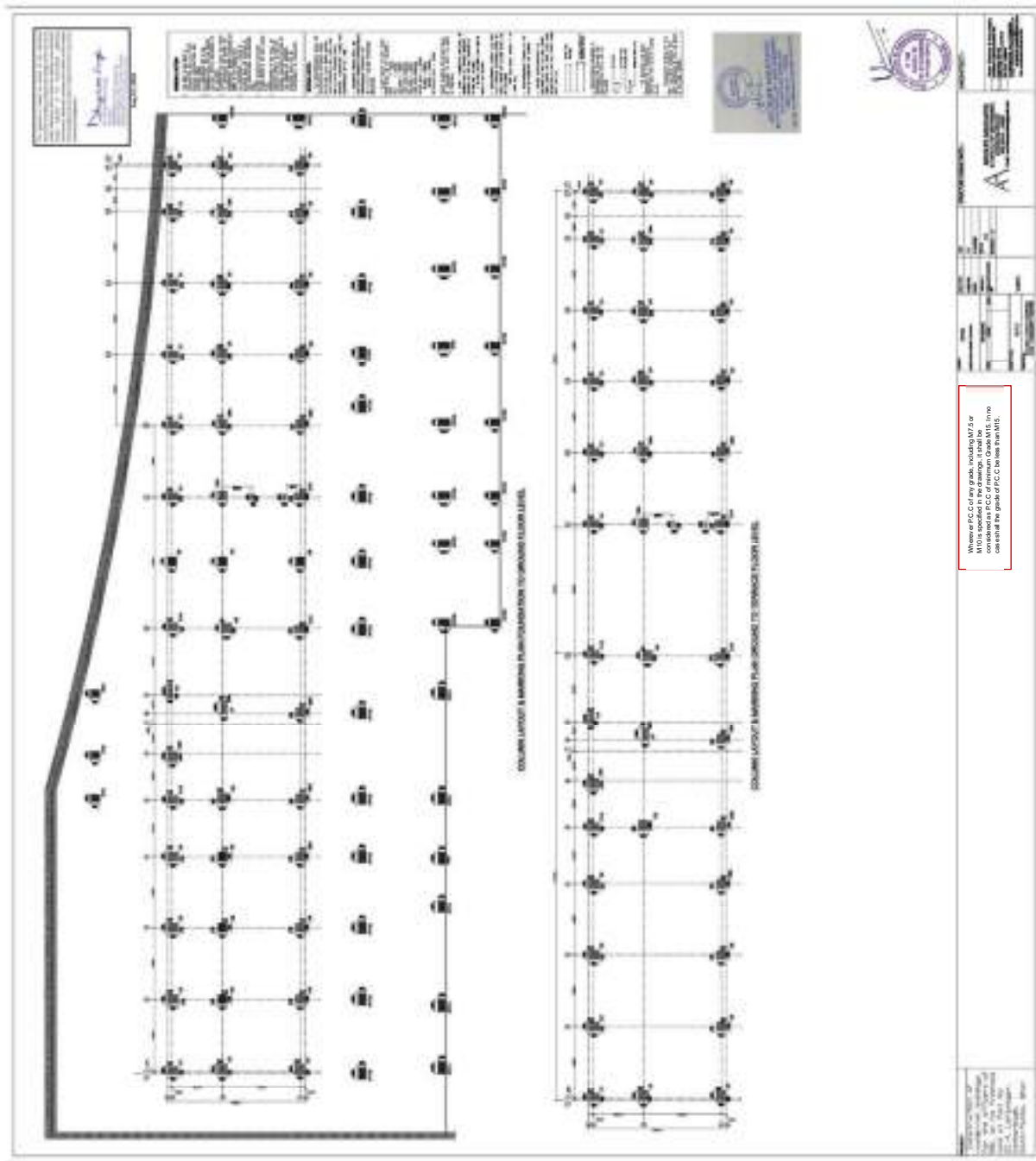






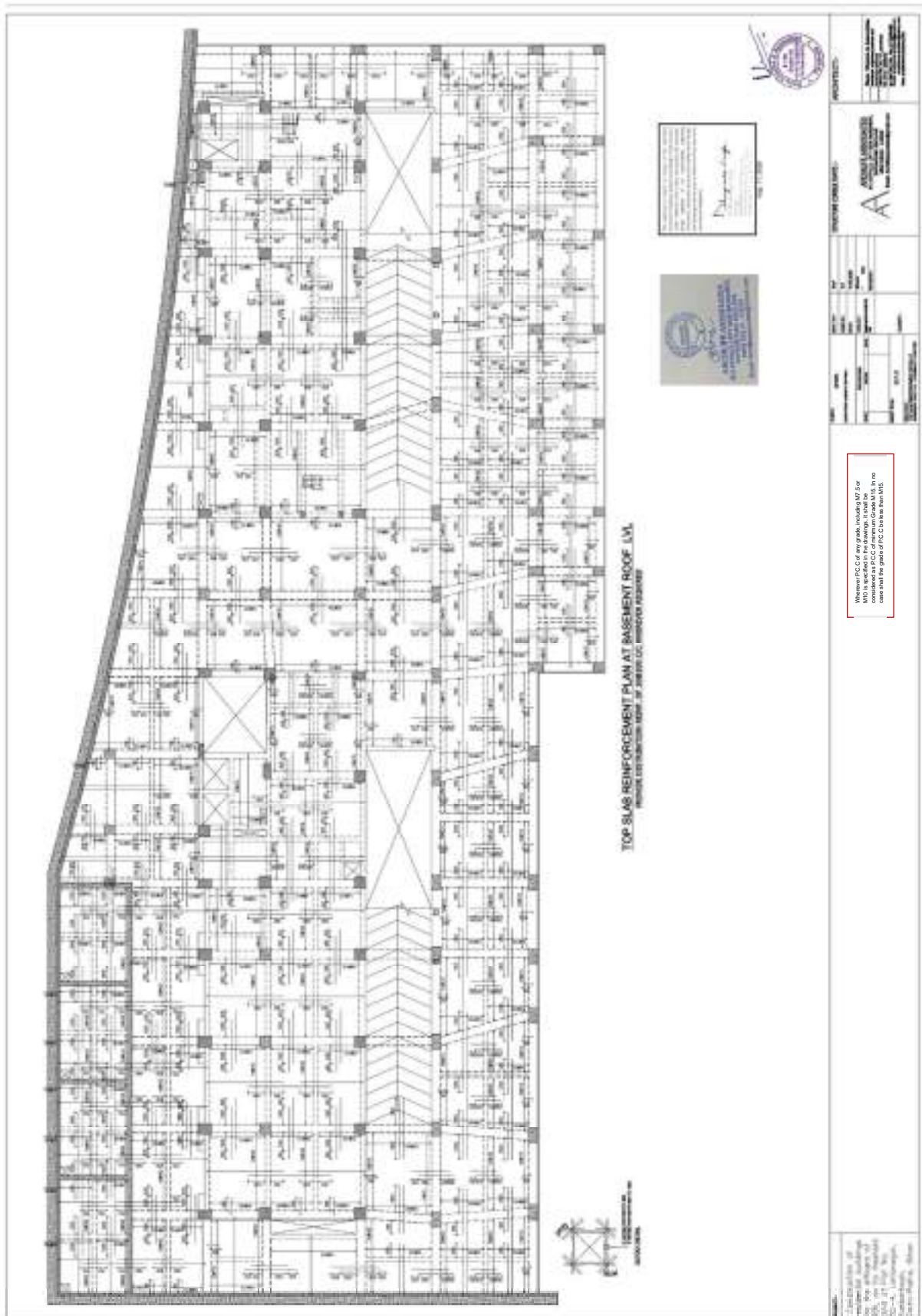


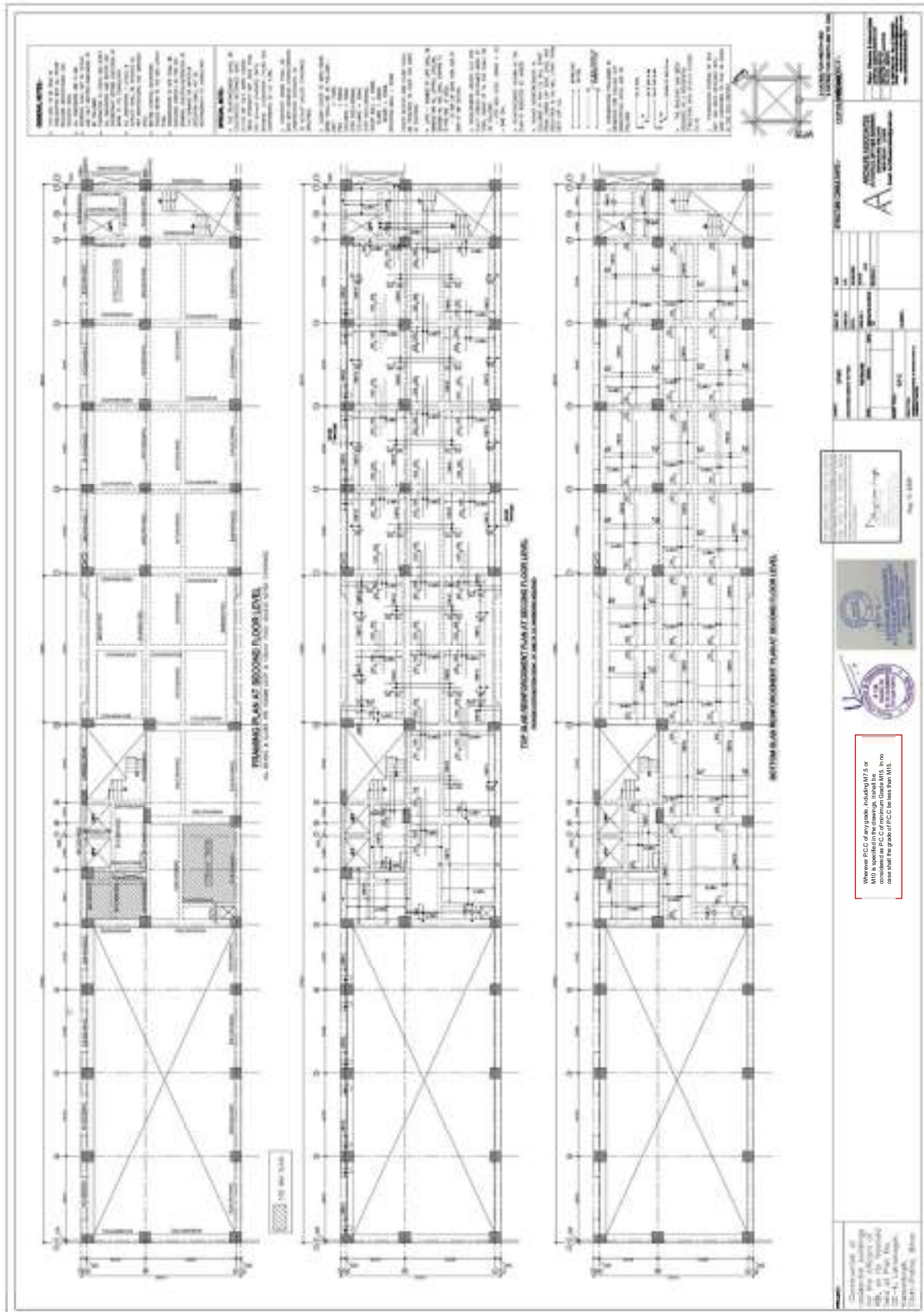


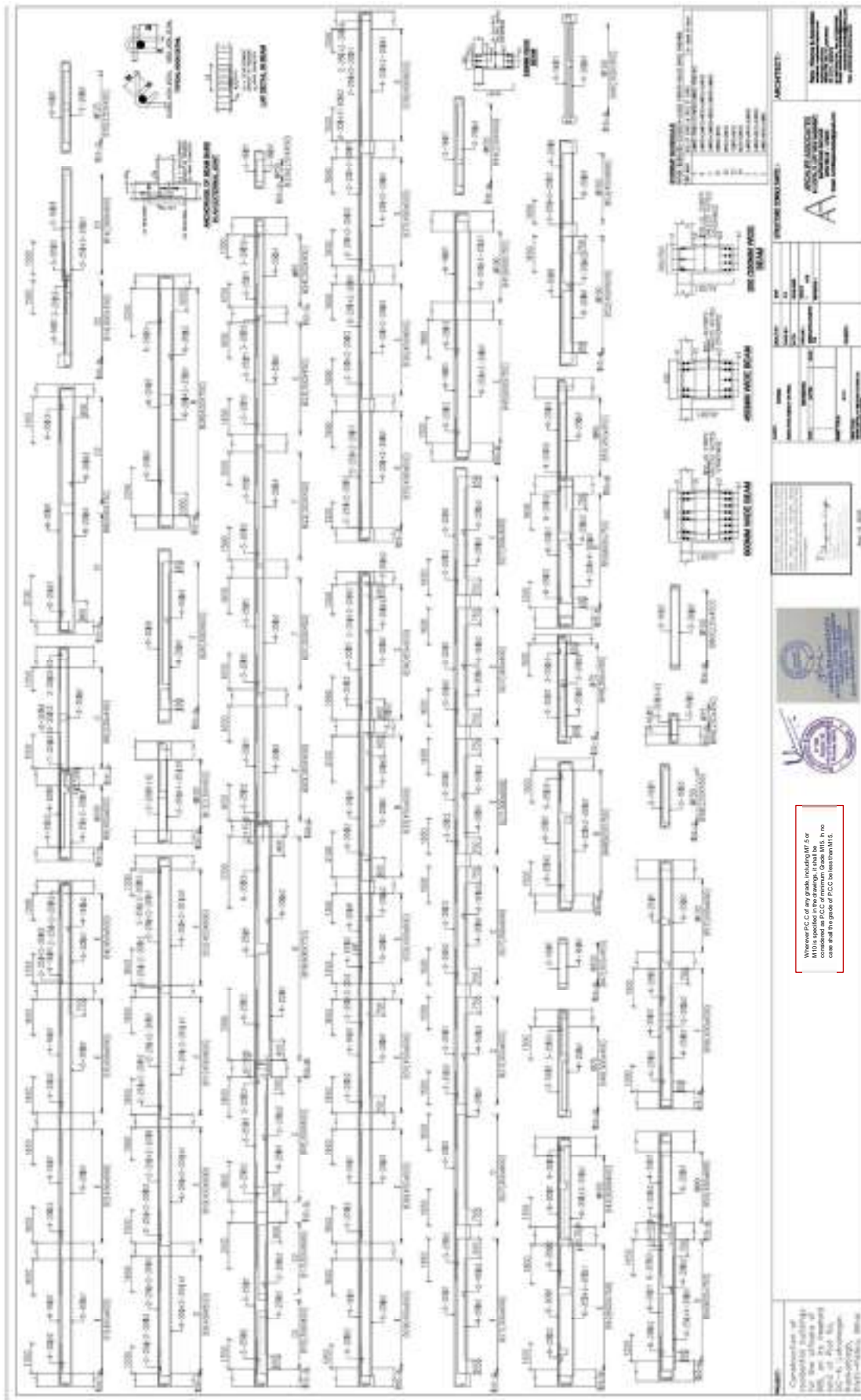


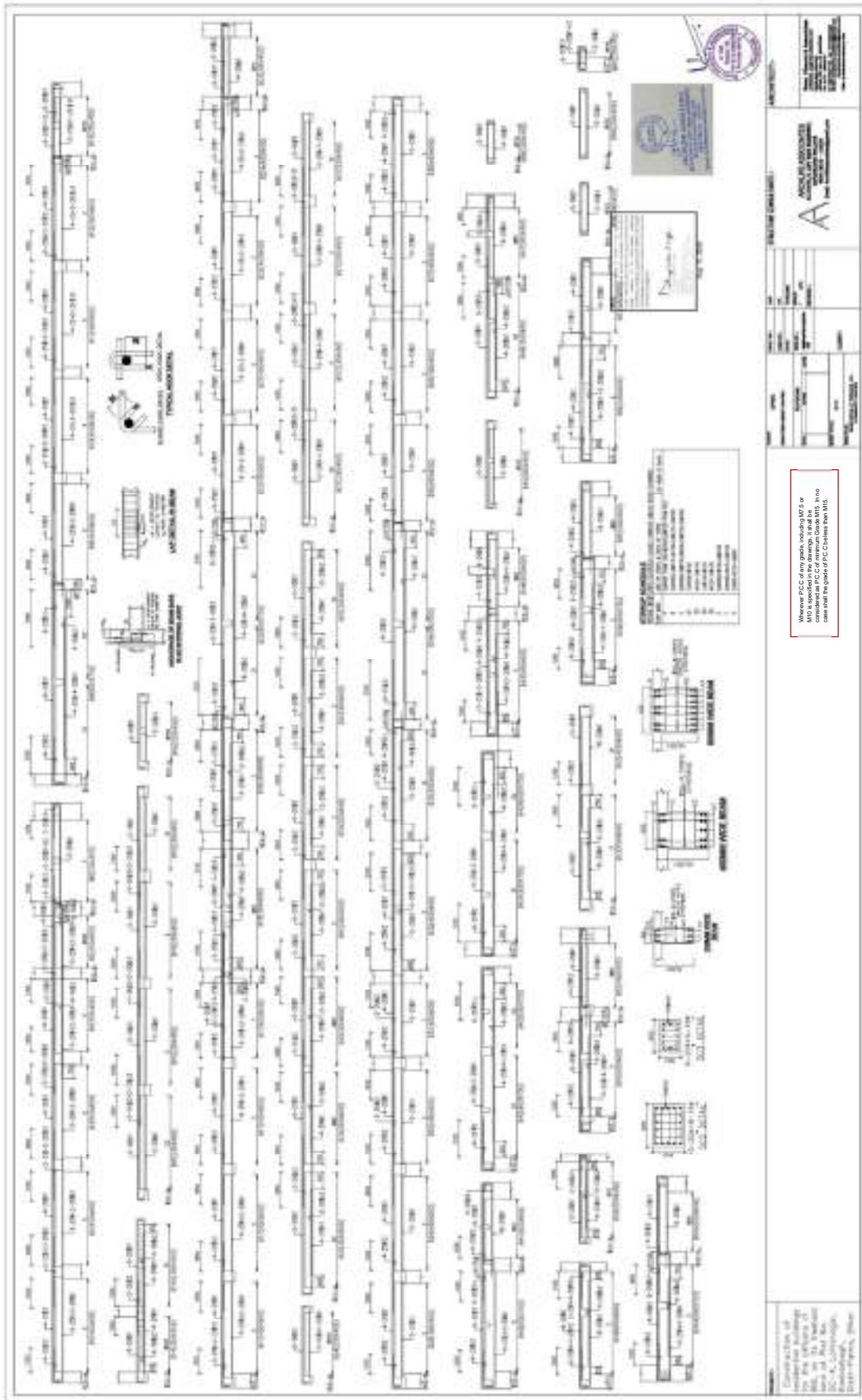
Wherever P.C.C. of any grade, including M7.5 or M10 is specified in the drawings, it shall be considered as P.C.C. of minimum Grade M15. In no case shall the grade of P.C.C. be less than M15.

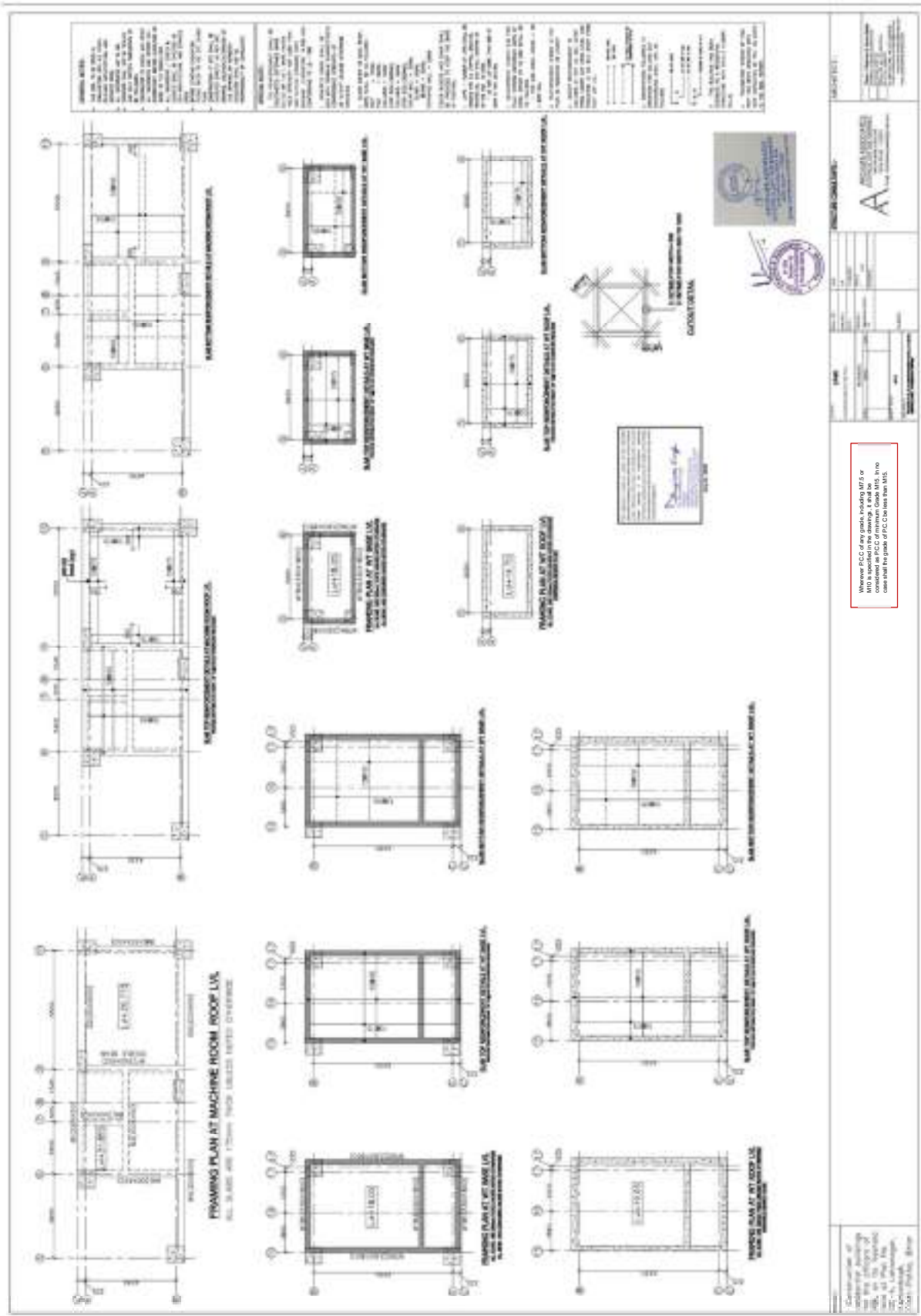


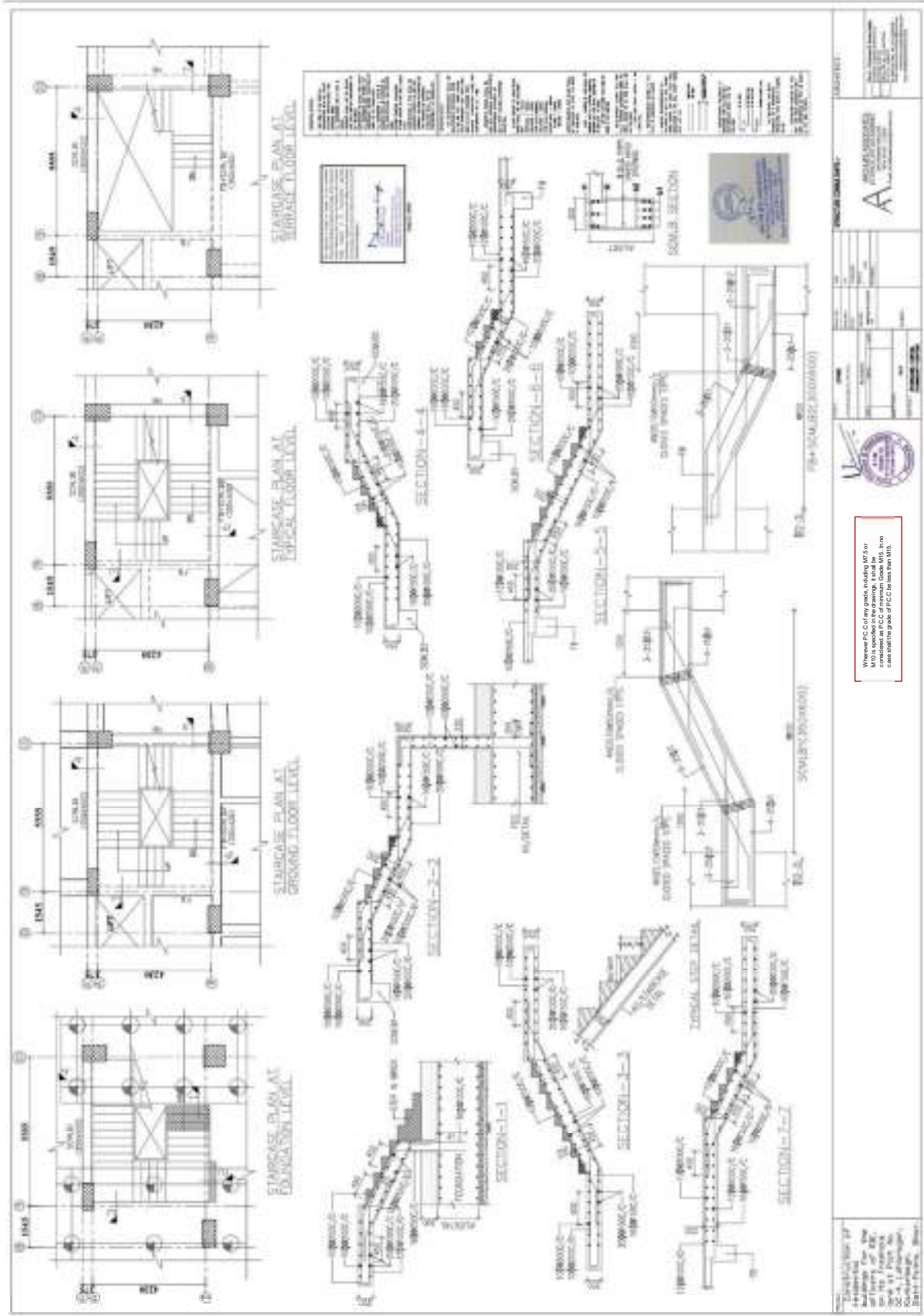


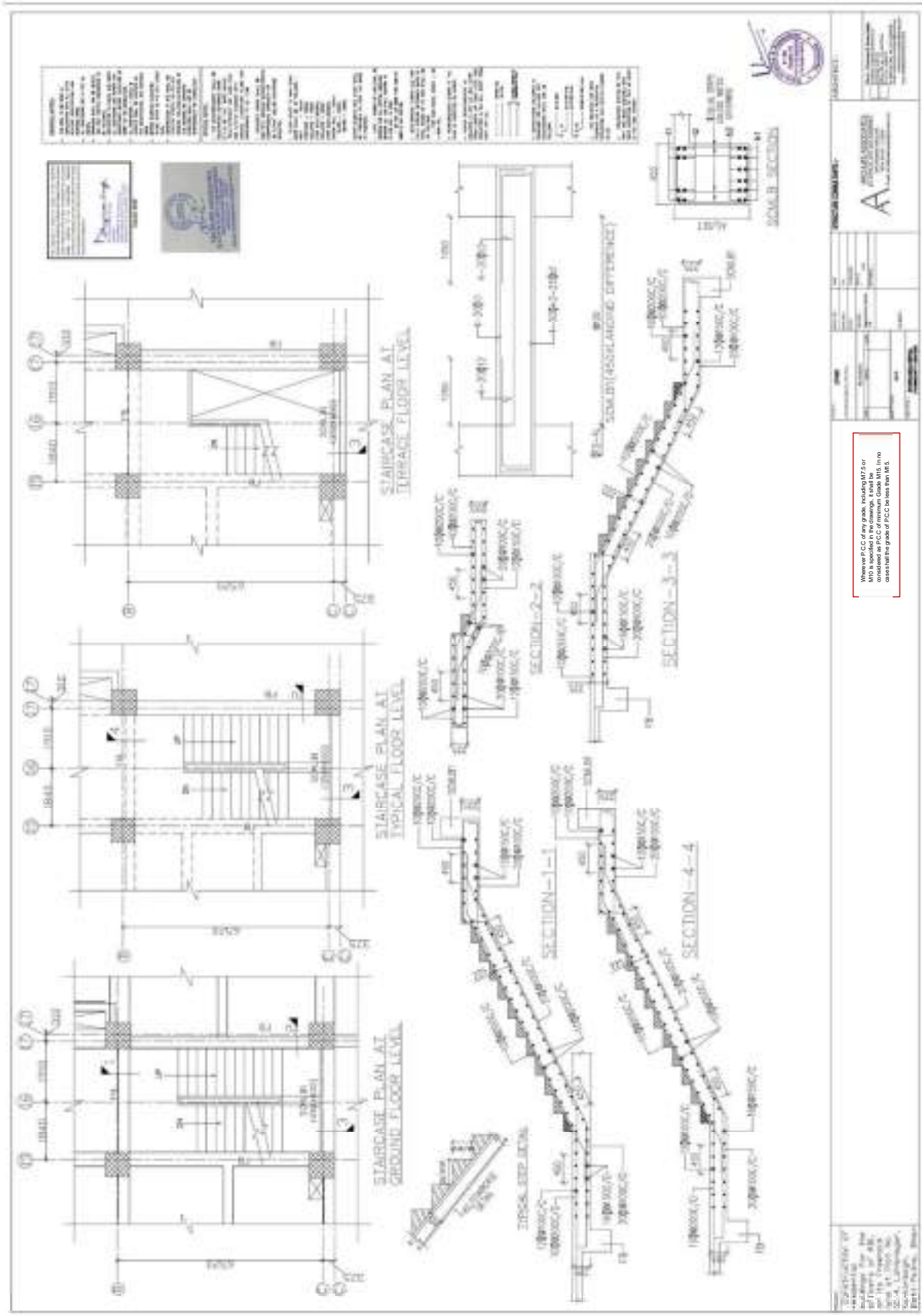


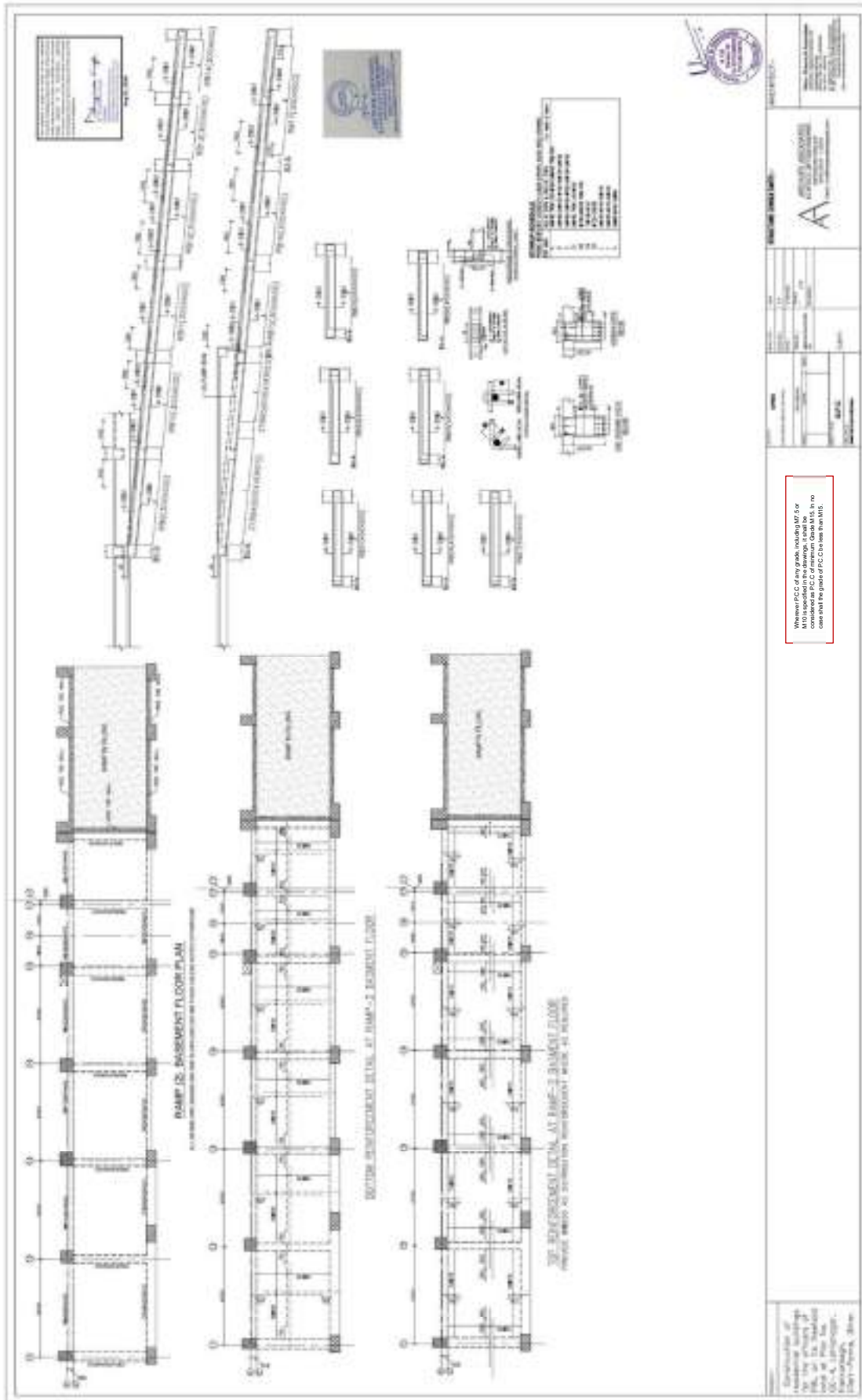




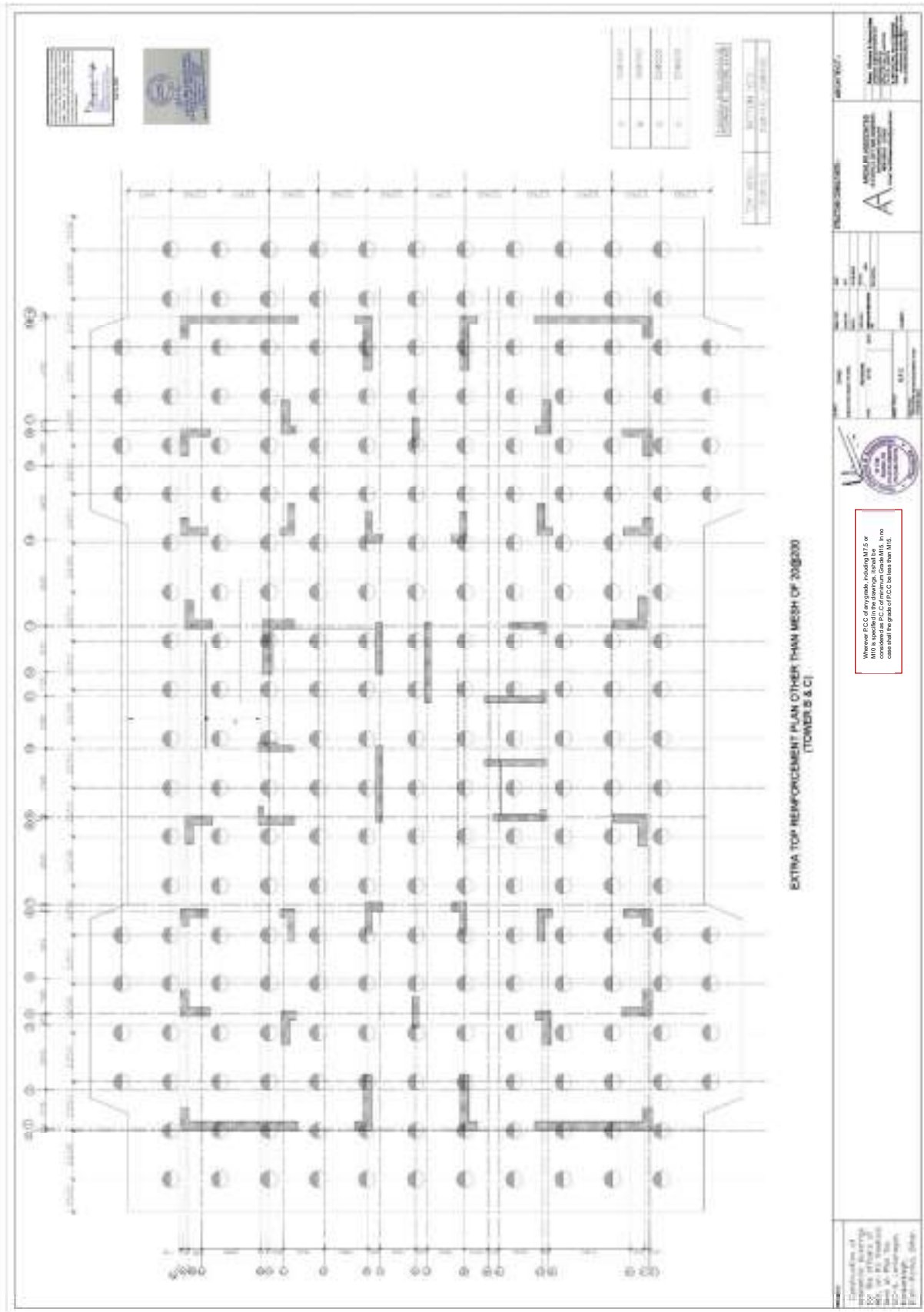


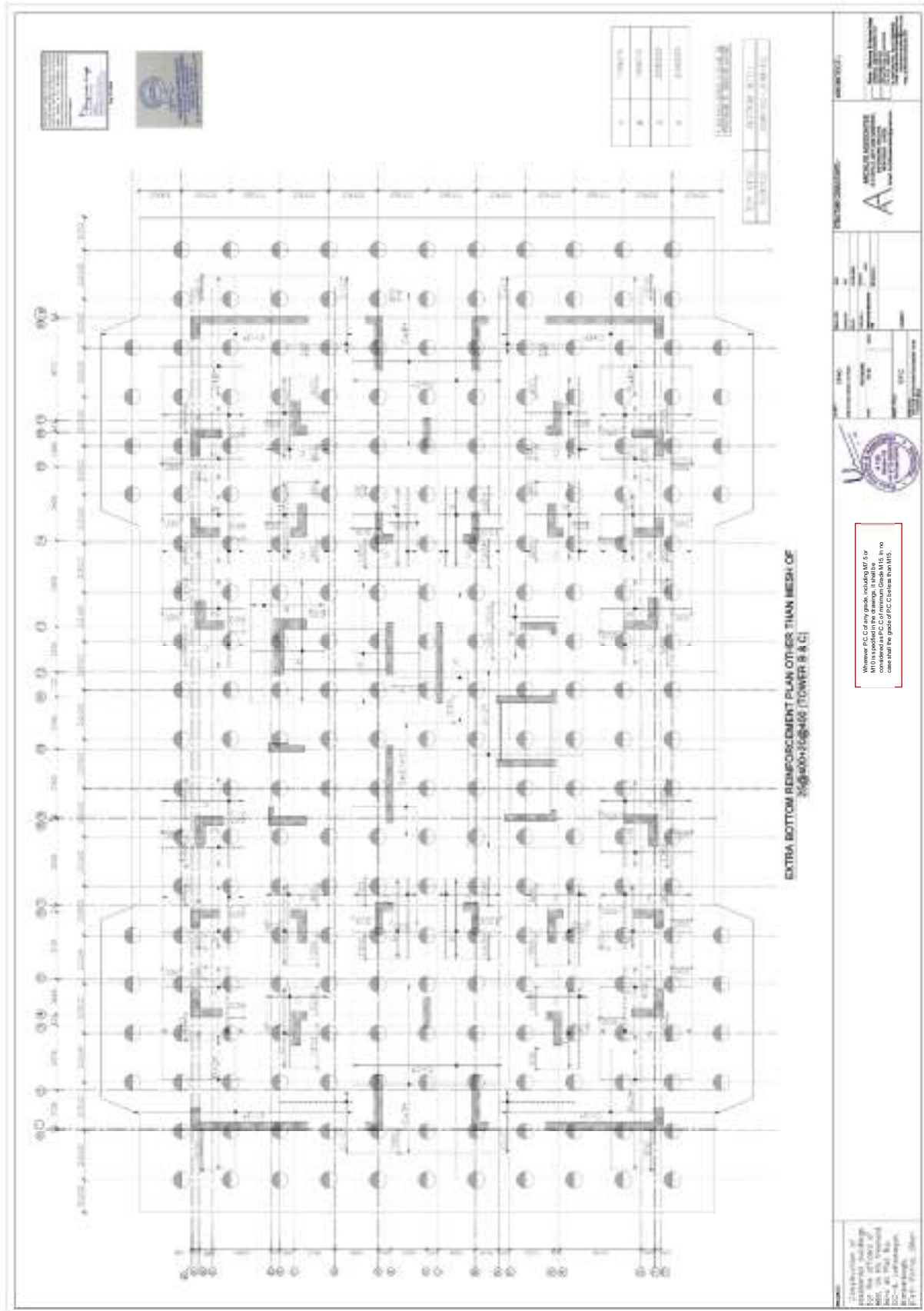






			
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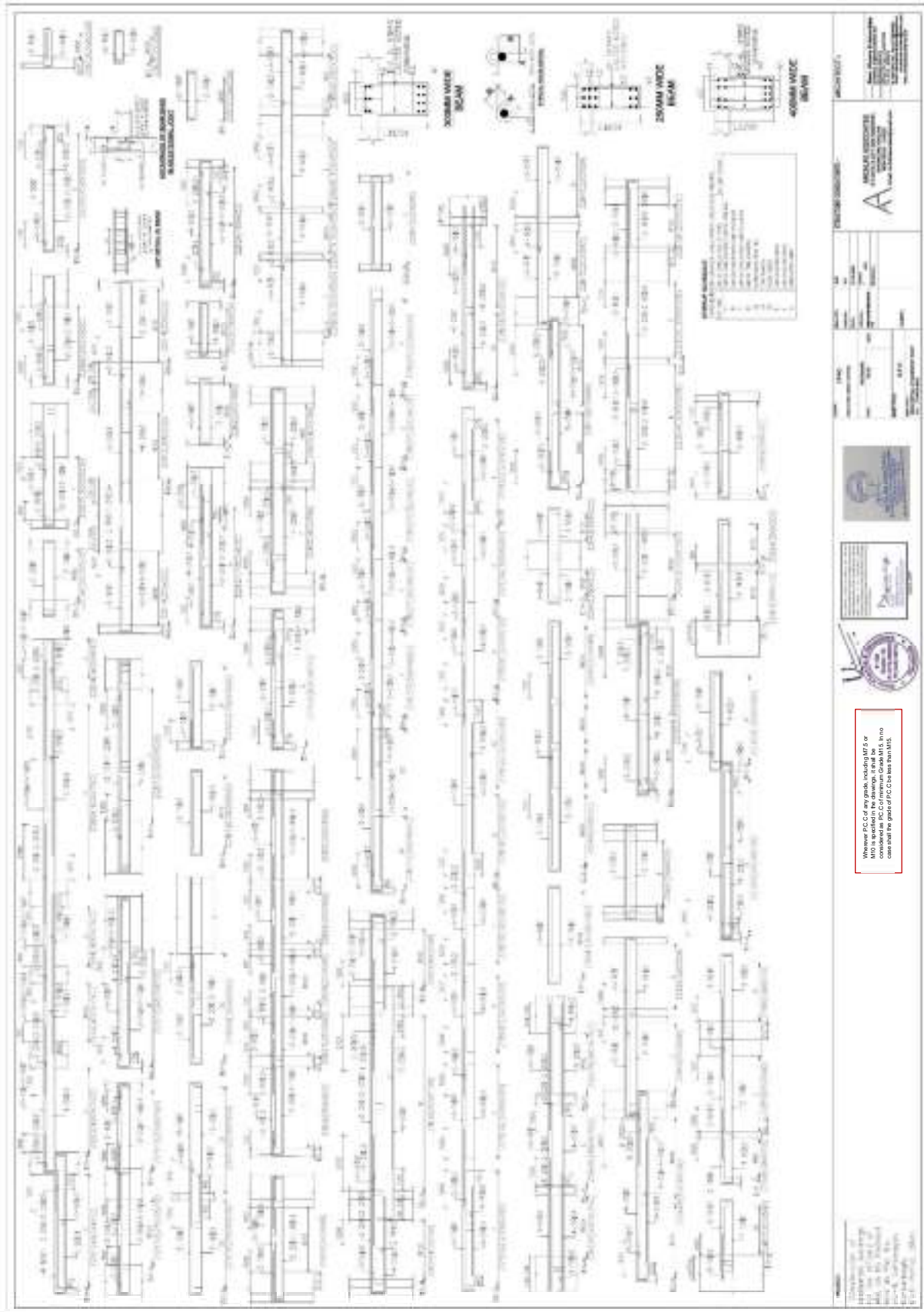


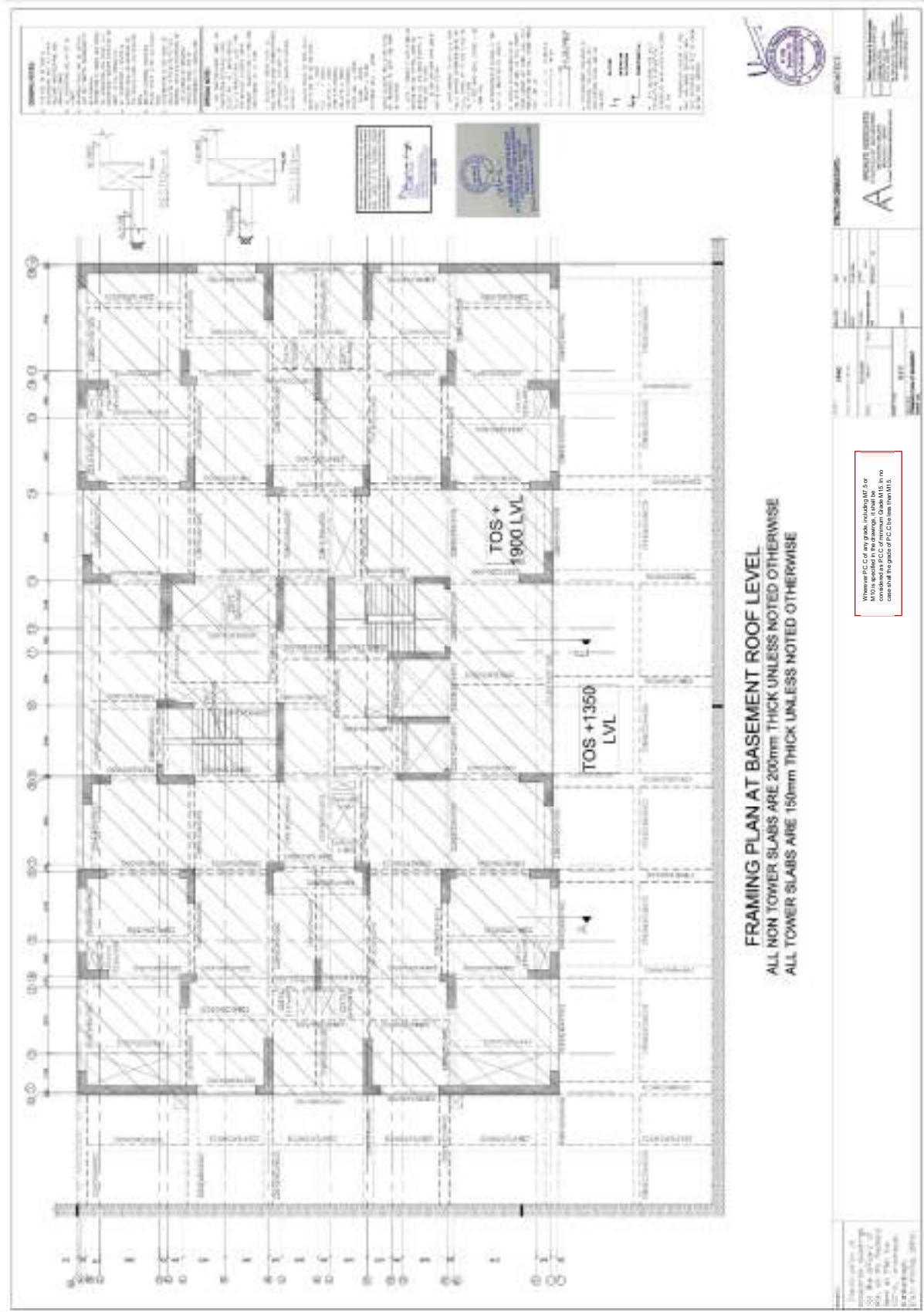
Wherever P.C.C. of any grade, including M7.5 or M10 is specified in the drawings, it shall be considered as P.C.C. of minimum Grade M15. In no case shall the grade of P.C.C. be less than M15.

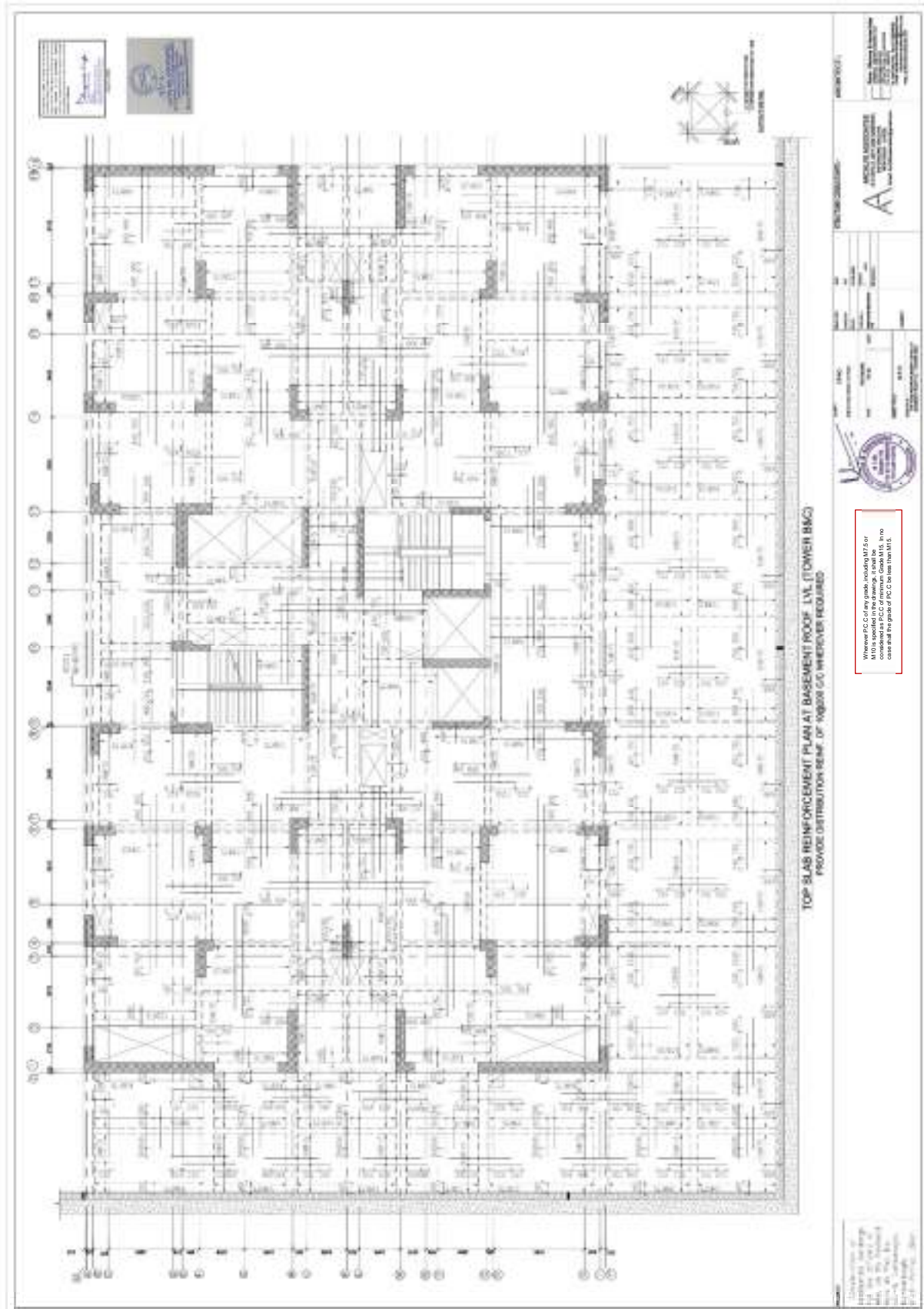
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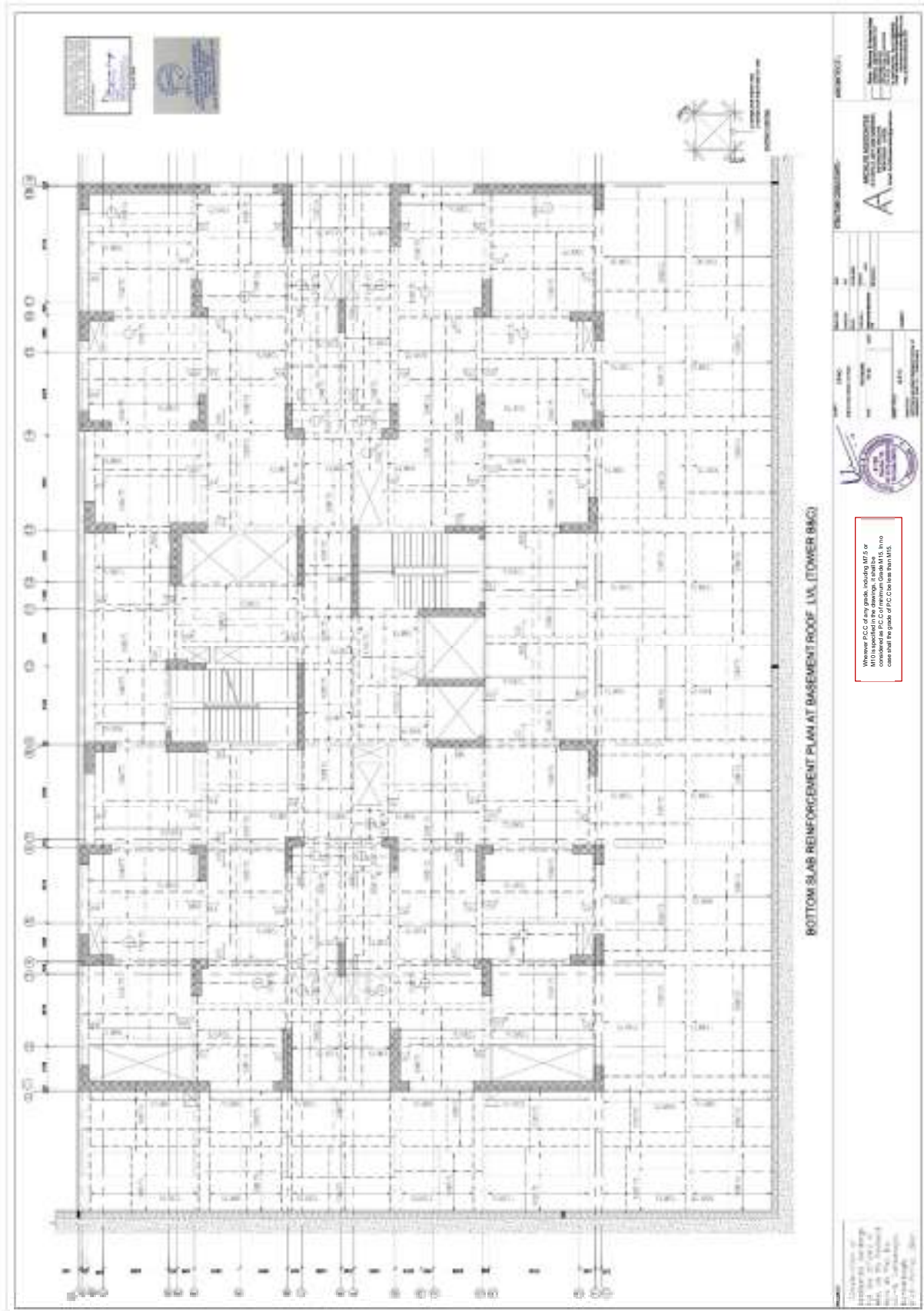
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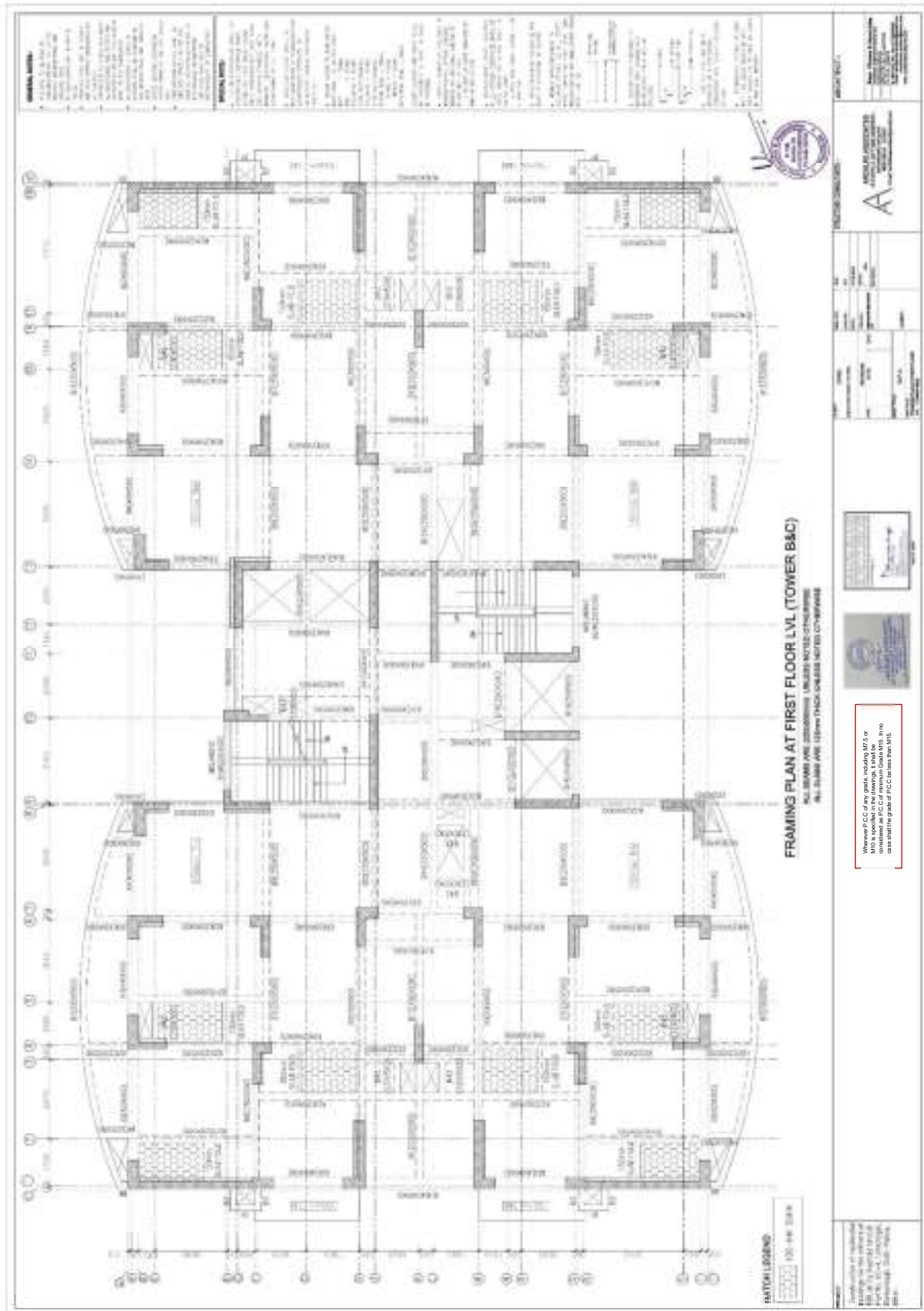
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1	DESIGN NO.			2	DESIGN DATE			3	DESIGNER			4	CHECKER				
5	PROJECT NO.			6	PROJECT NAME			7	PROJECT LOCATION			8	PROJECT STATUS			9	PROJECT PHASE
10	DESIGN TYPE			11	DESIGN CODE			12	DESIGN STANDARD			13	DESIGN METHOD			14	DESIGN TOOL
15	DESIGN MATERIAL			16	DESIGN SPECIFICATION			17	DESIGN REQUIREMENTS			18	DESIGN CONSTRAINTS			19	DESIGN ASSUMPTIONS
20	DESIGN DATA			21	DESIGN RESULTS			22	DESIGN CHECKS			23	DESIGN APPROVALS			24	DESIGN HISTORY
25	DESIGN APPROVALS			26	DESIGN HISTORY			27	DESIGN APPROVALS			28	DESIGN HISTORY			29	DESIGN APPROVALS
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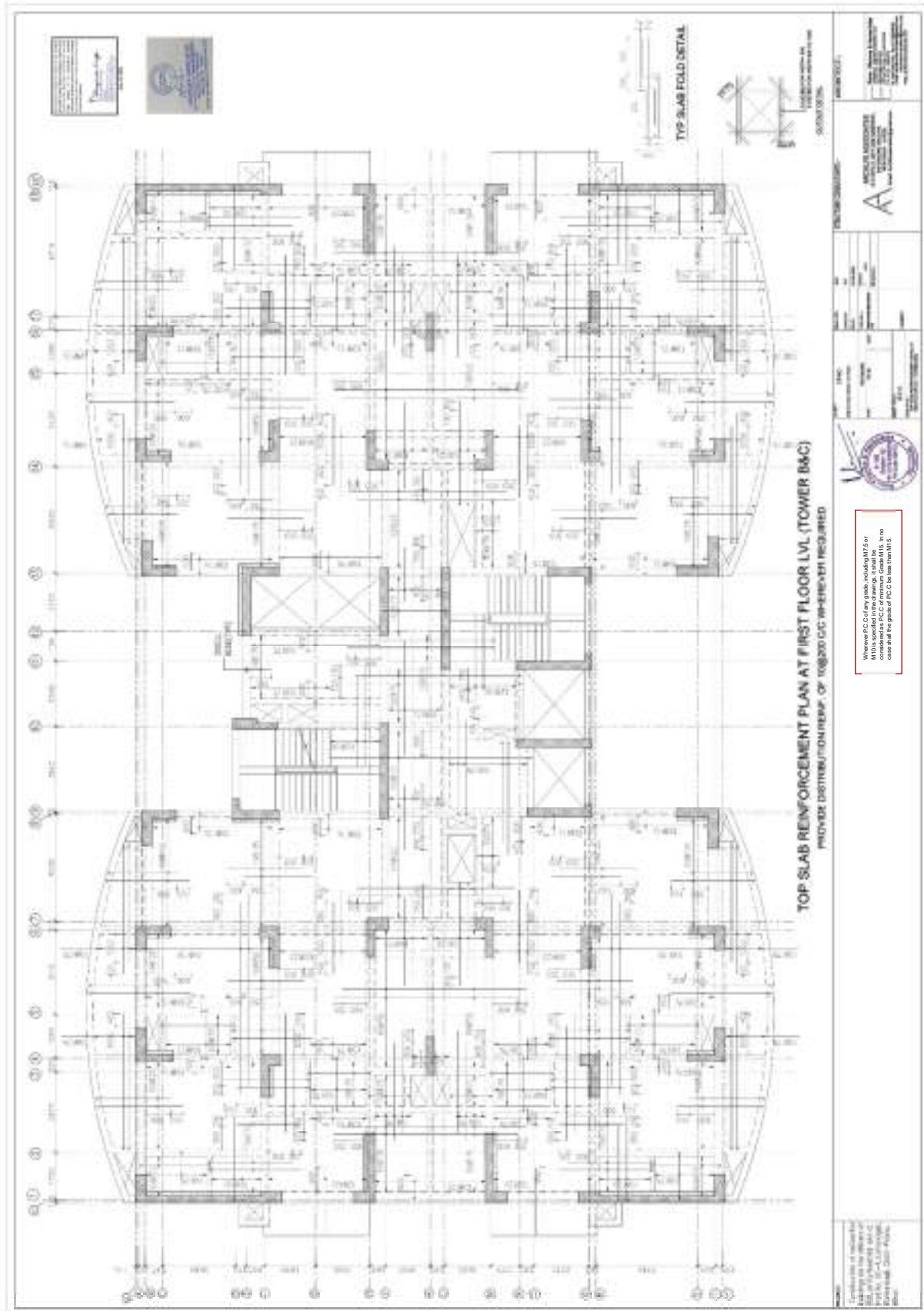


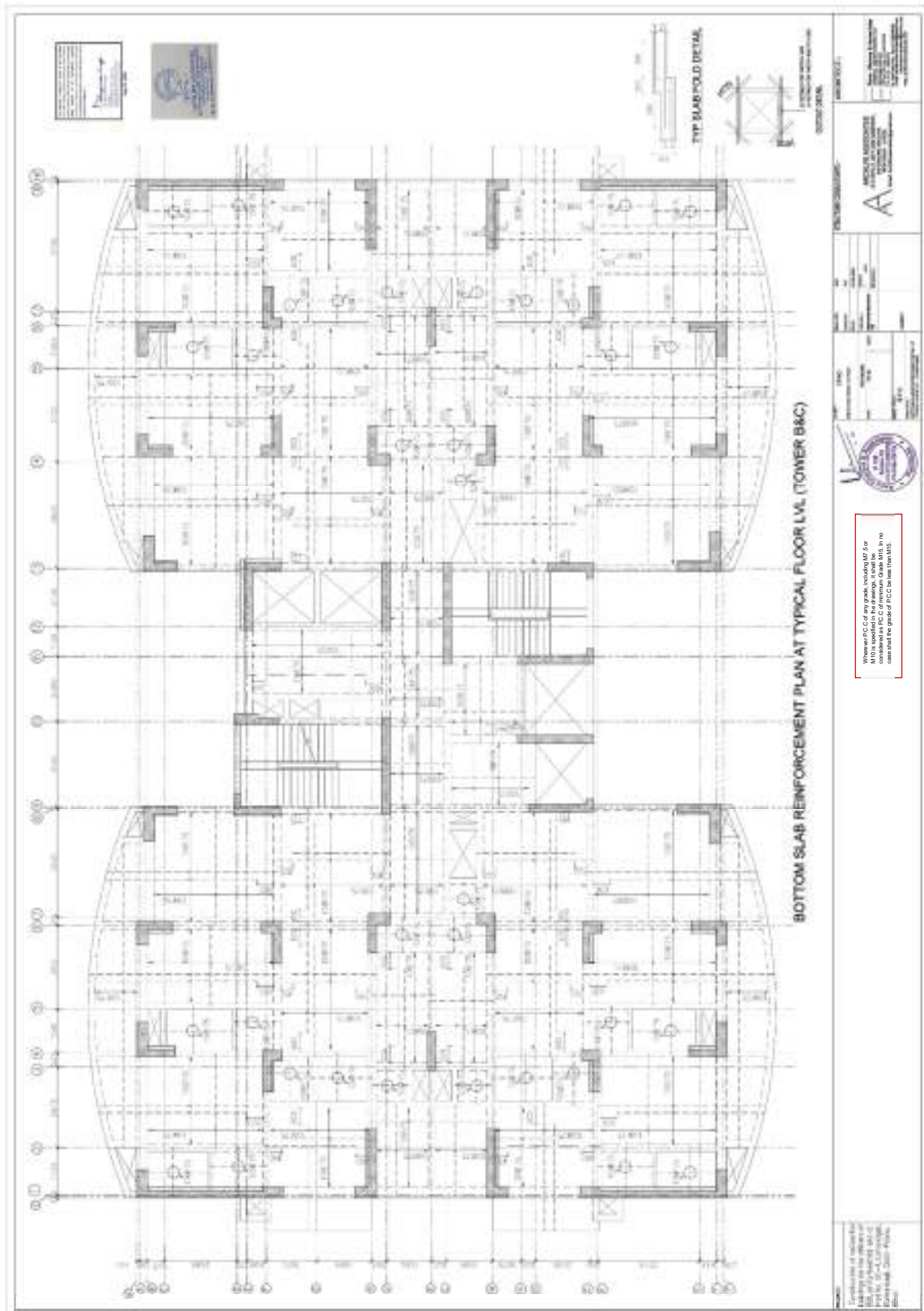


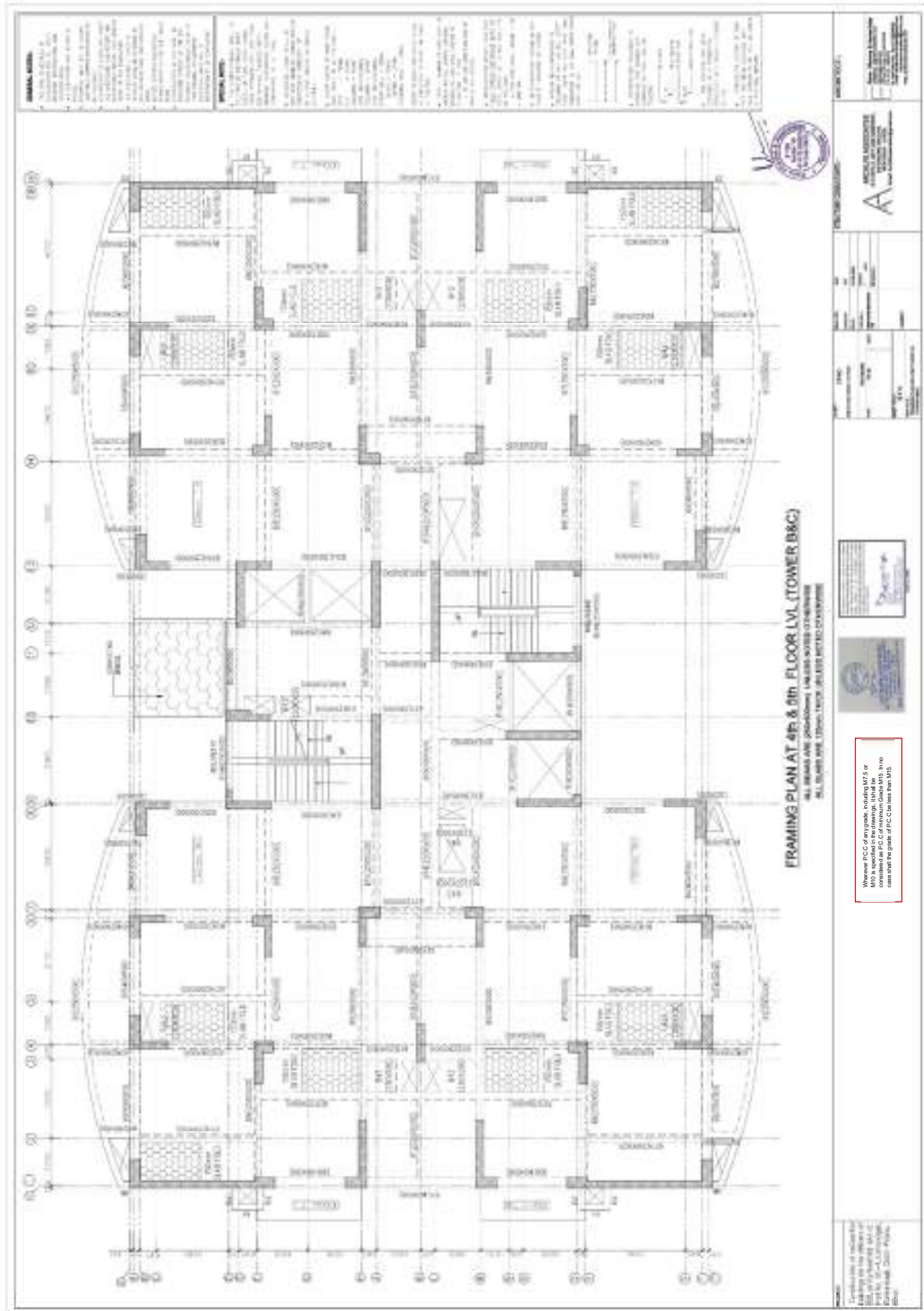


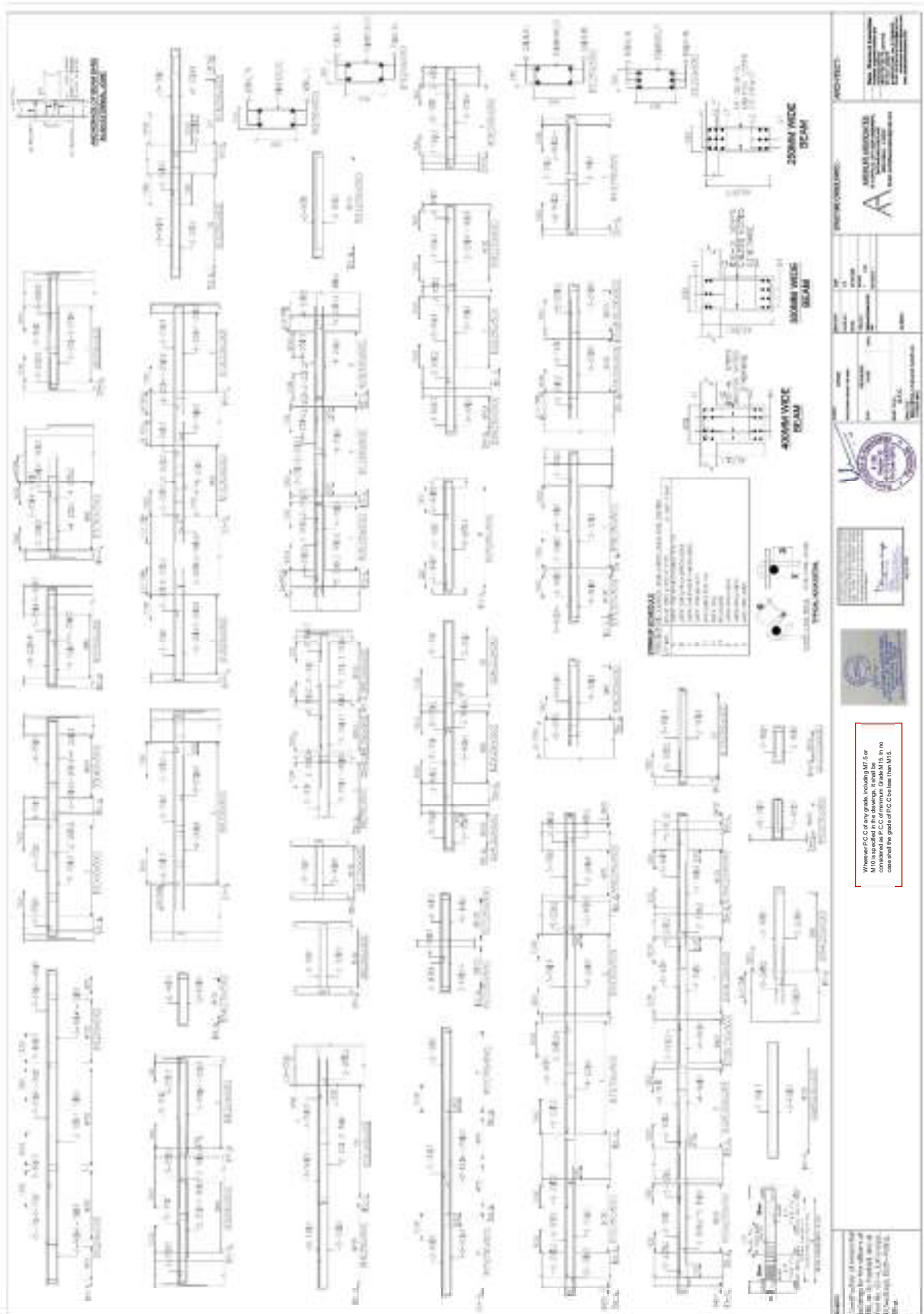


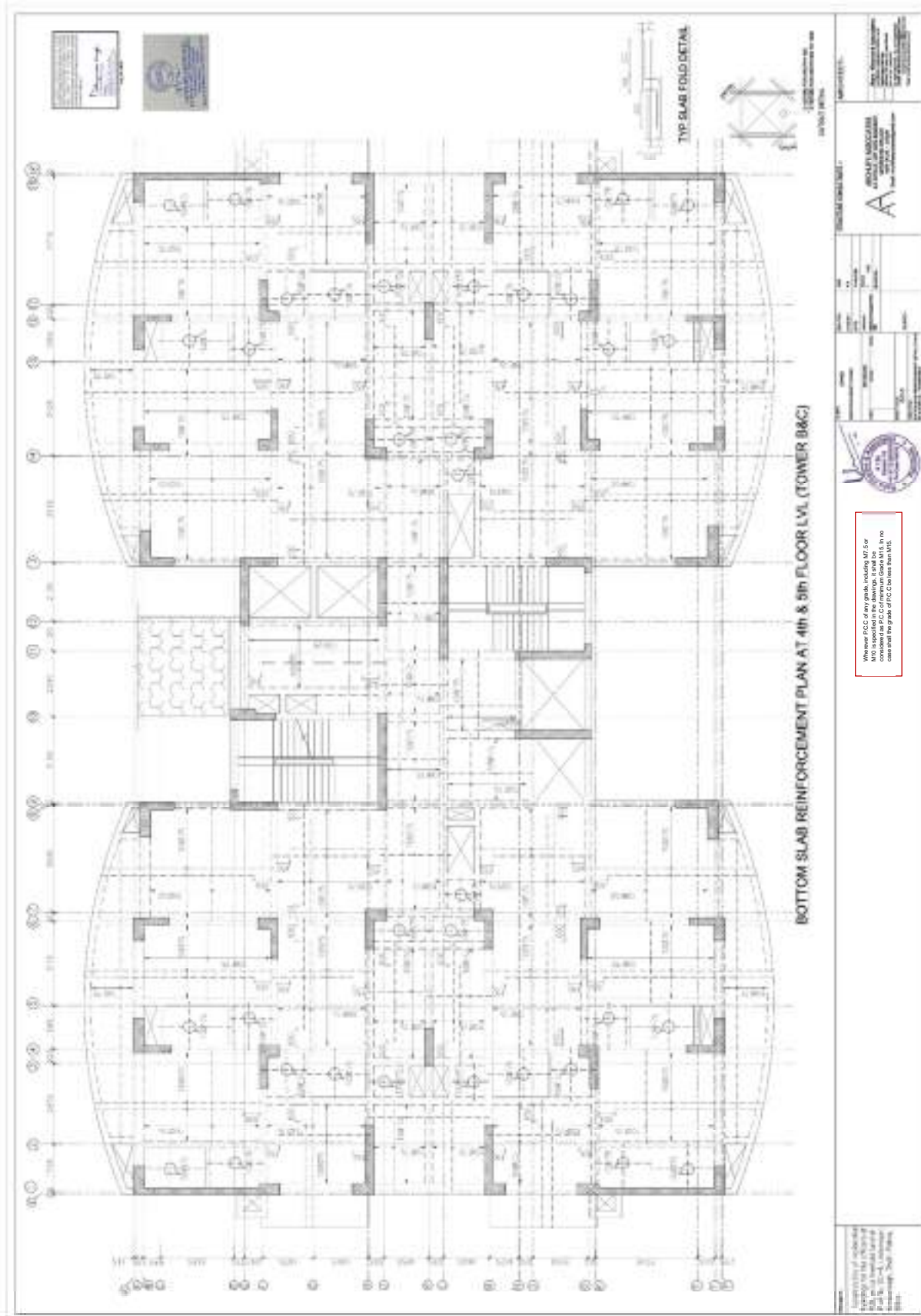


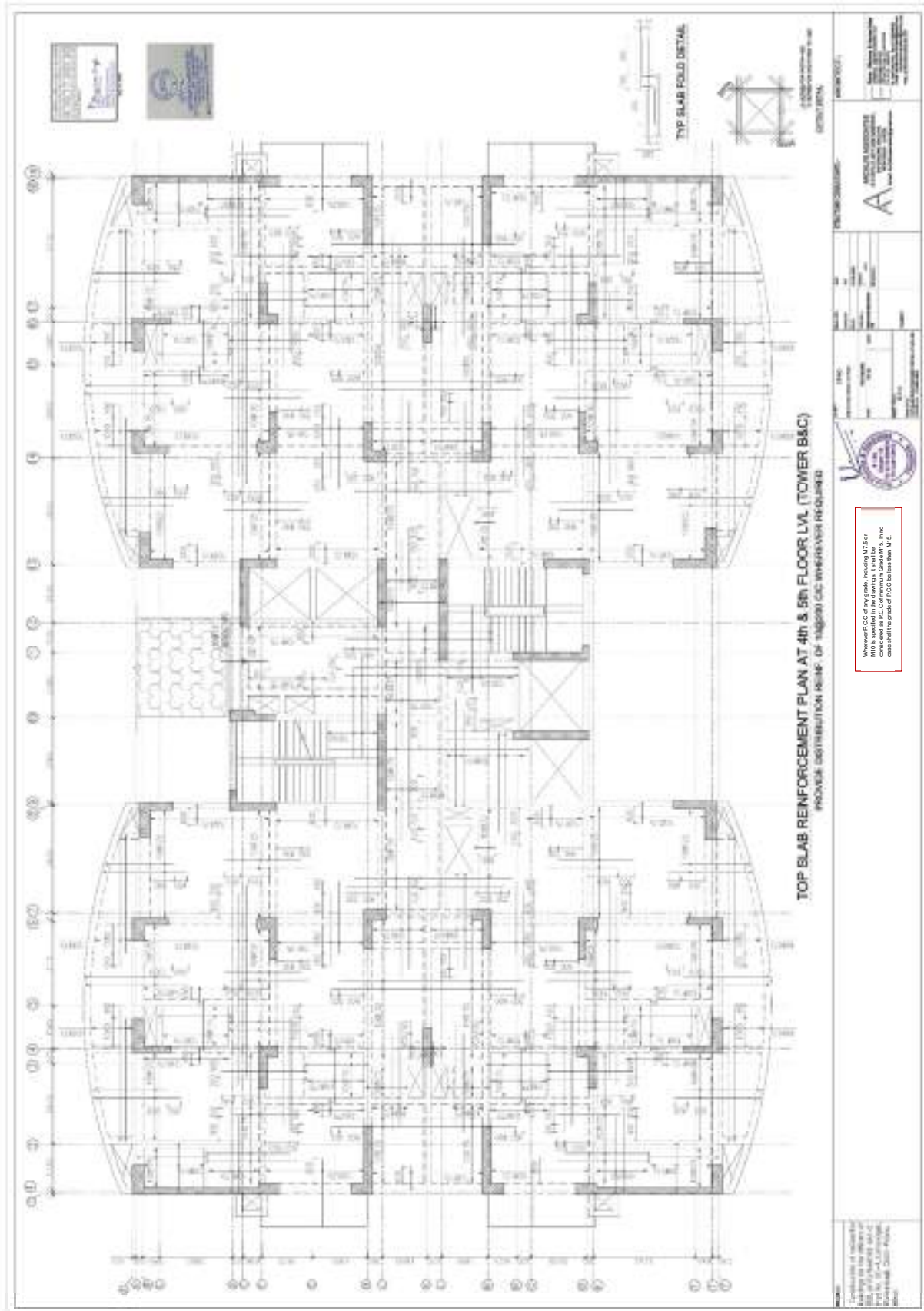


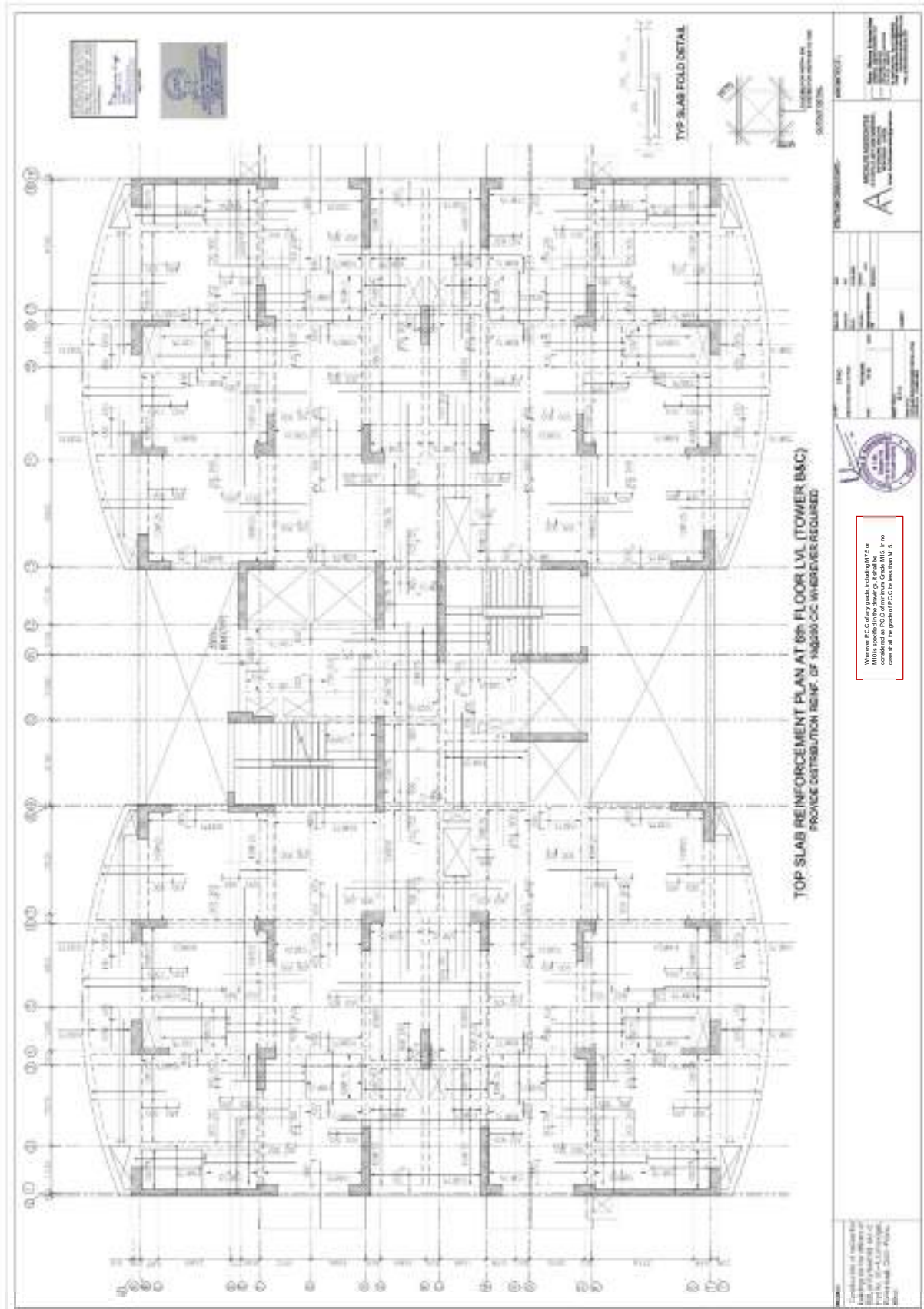


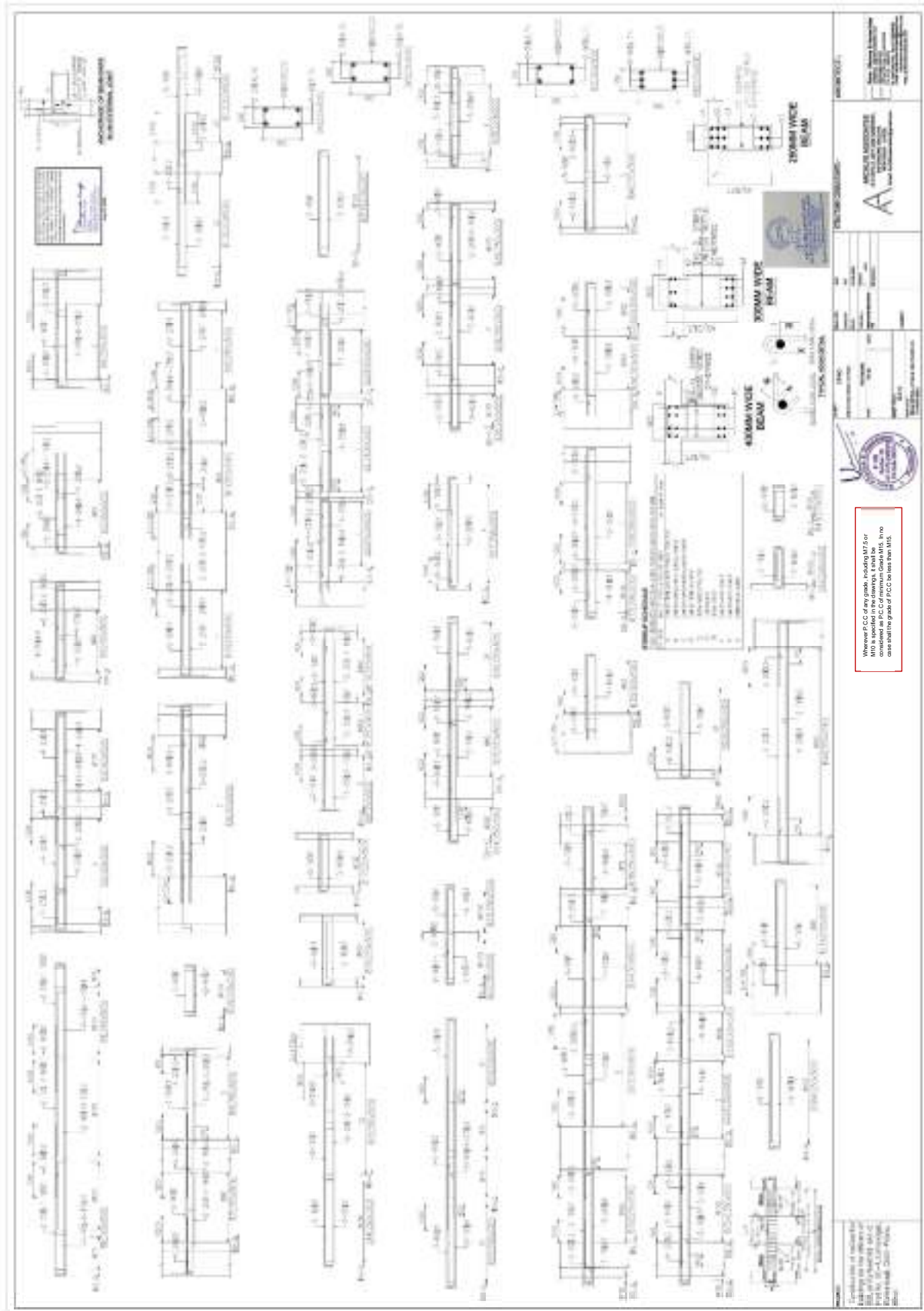


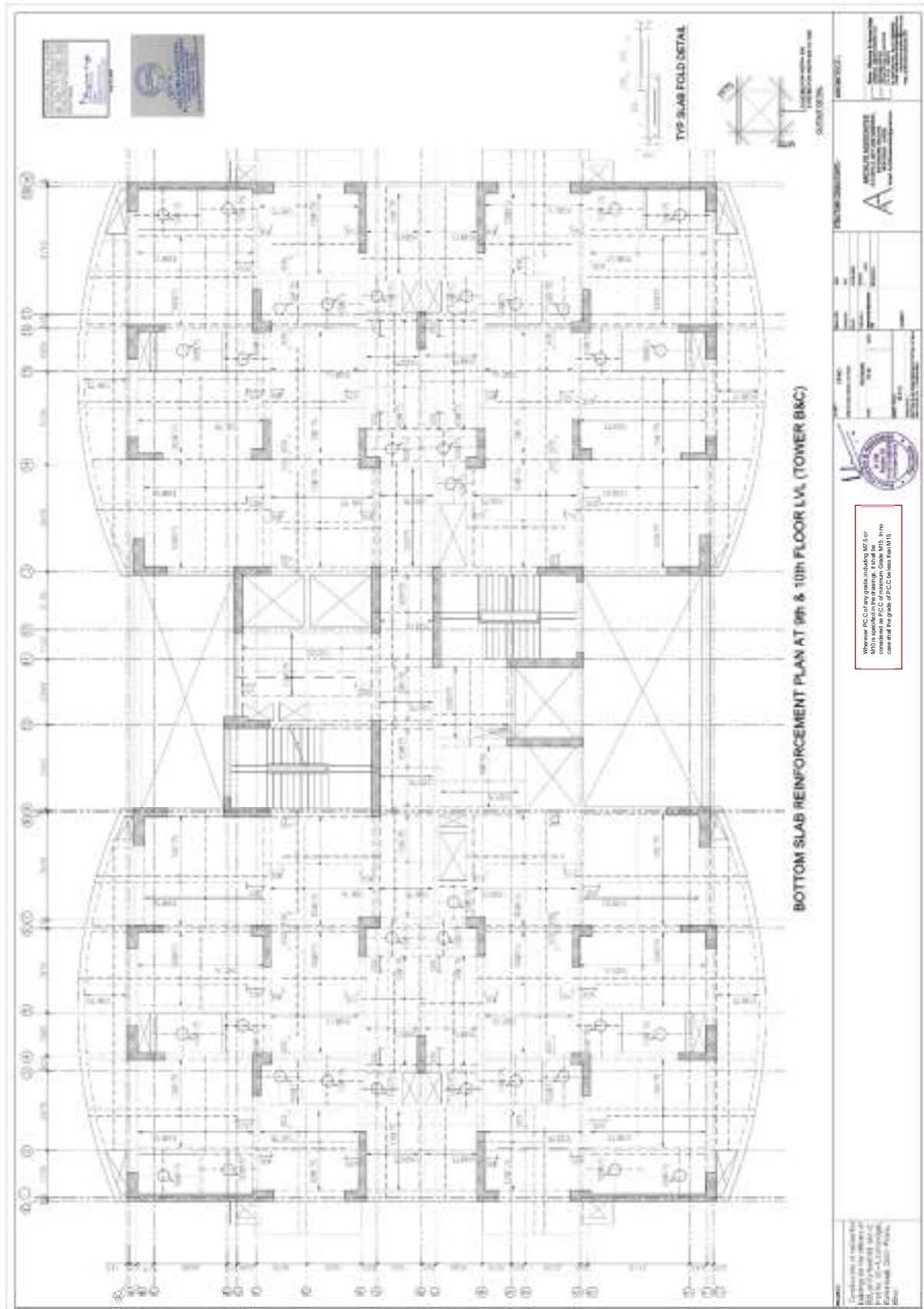


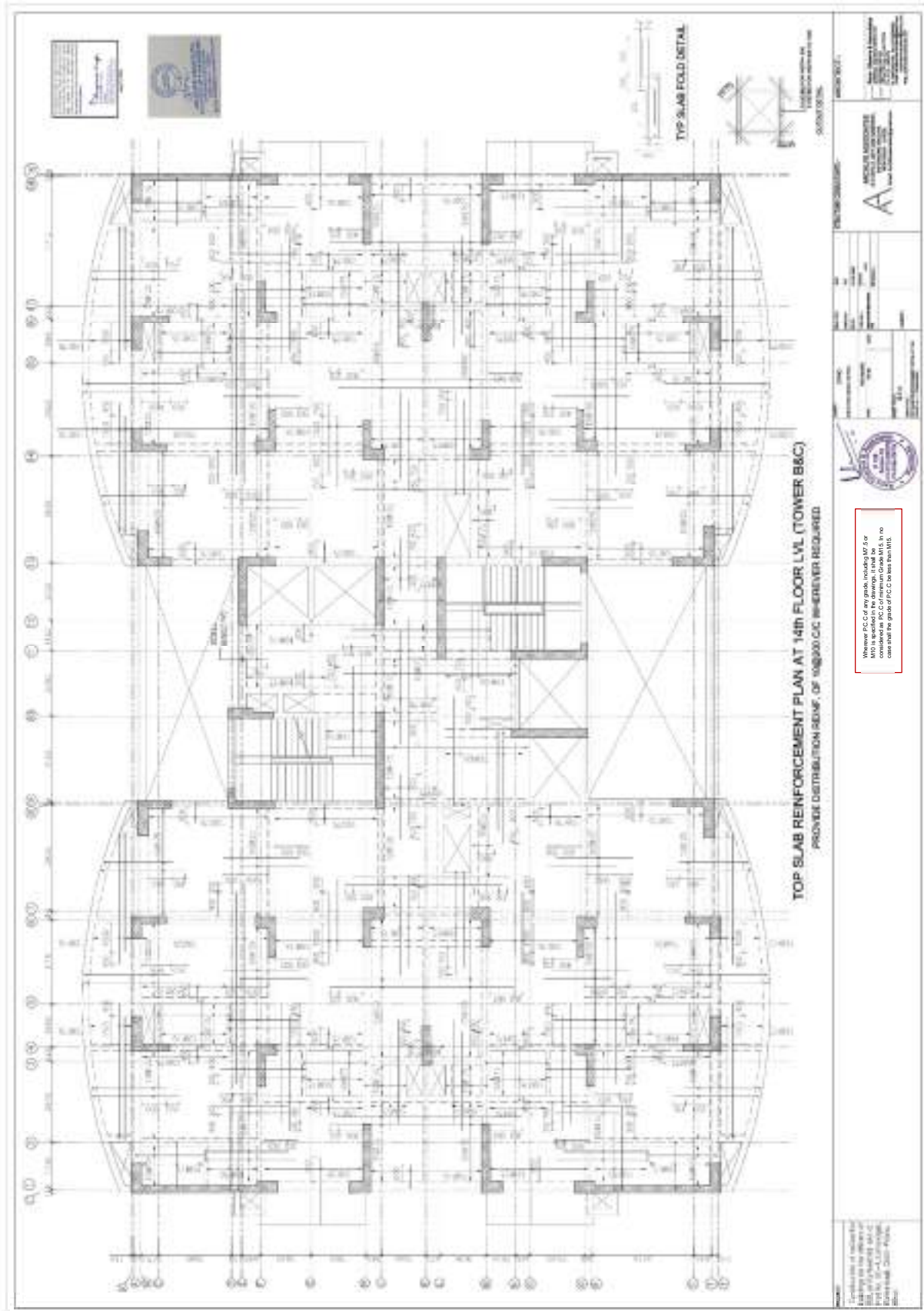


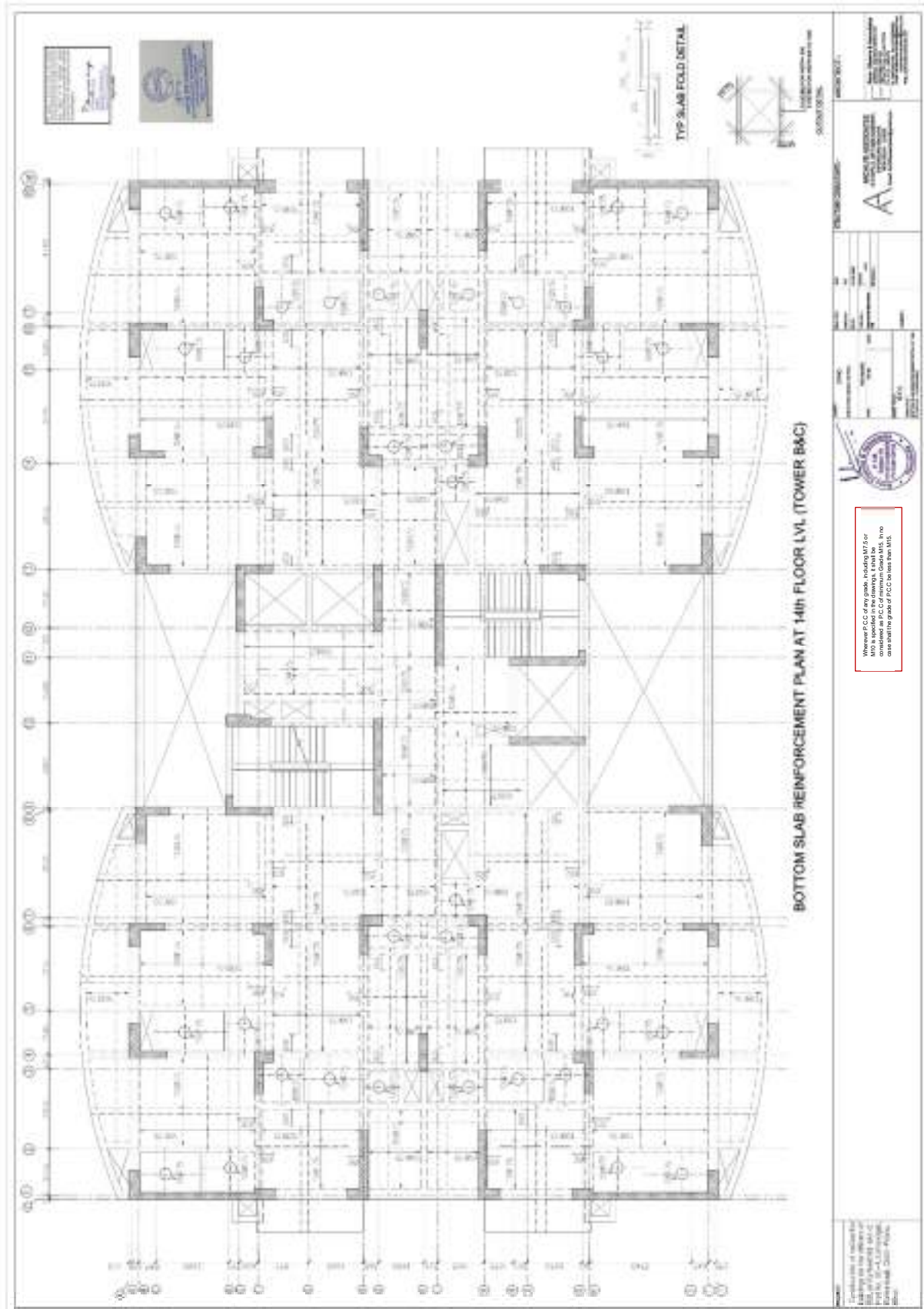


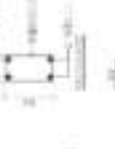


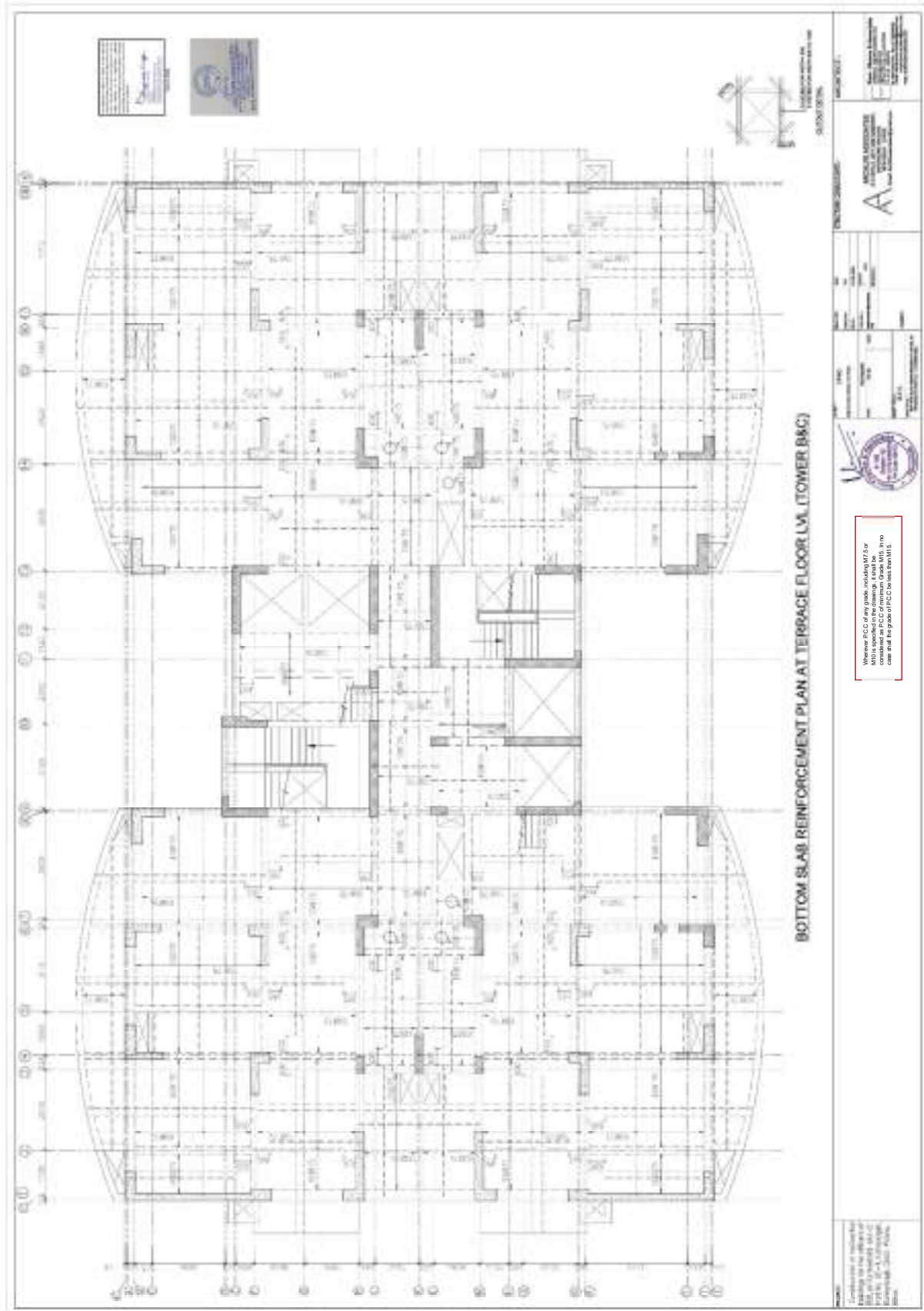


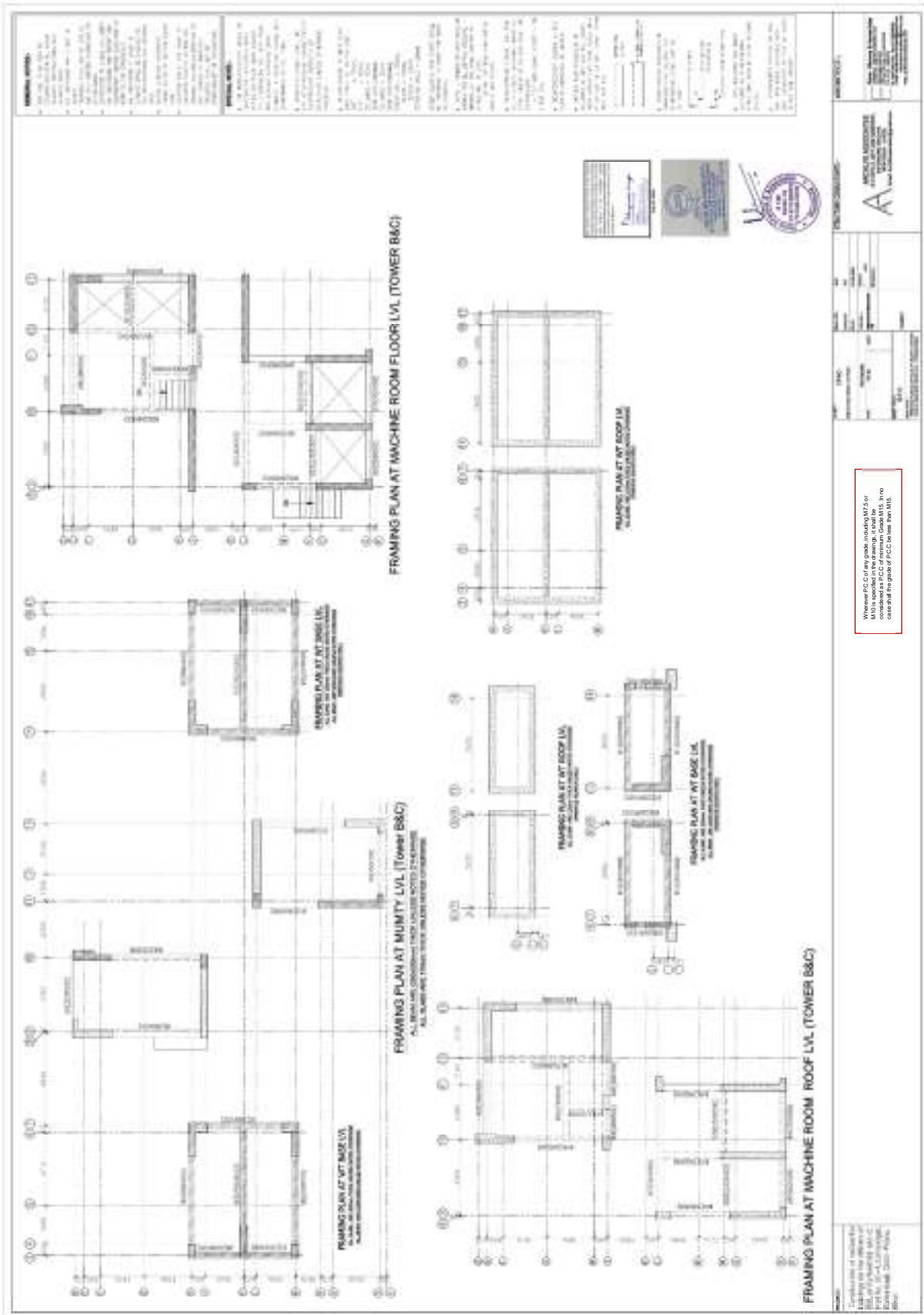


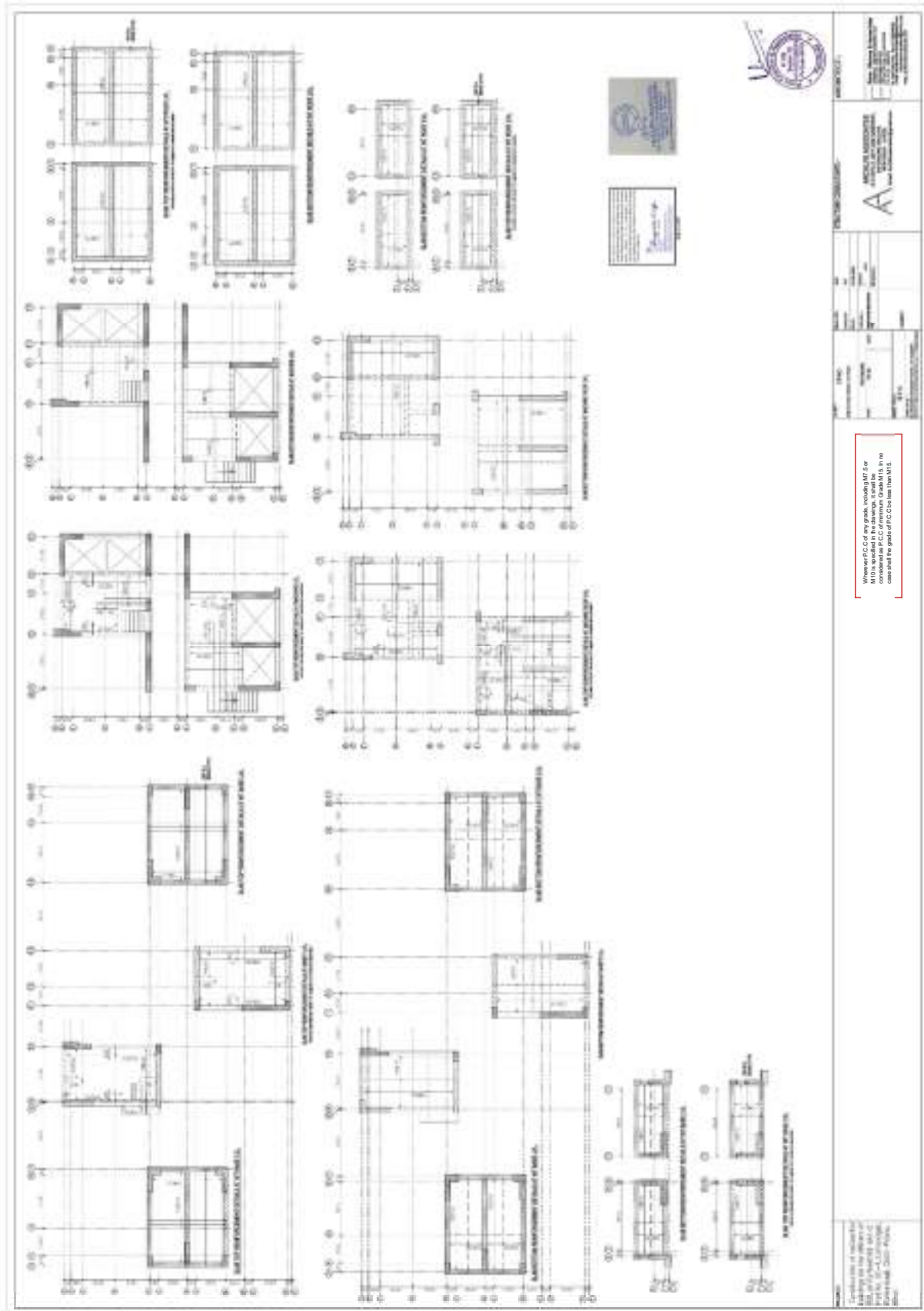


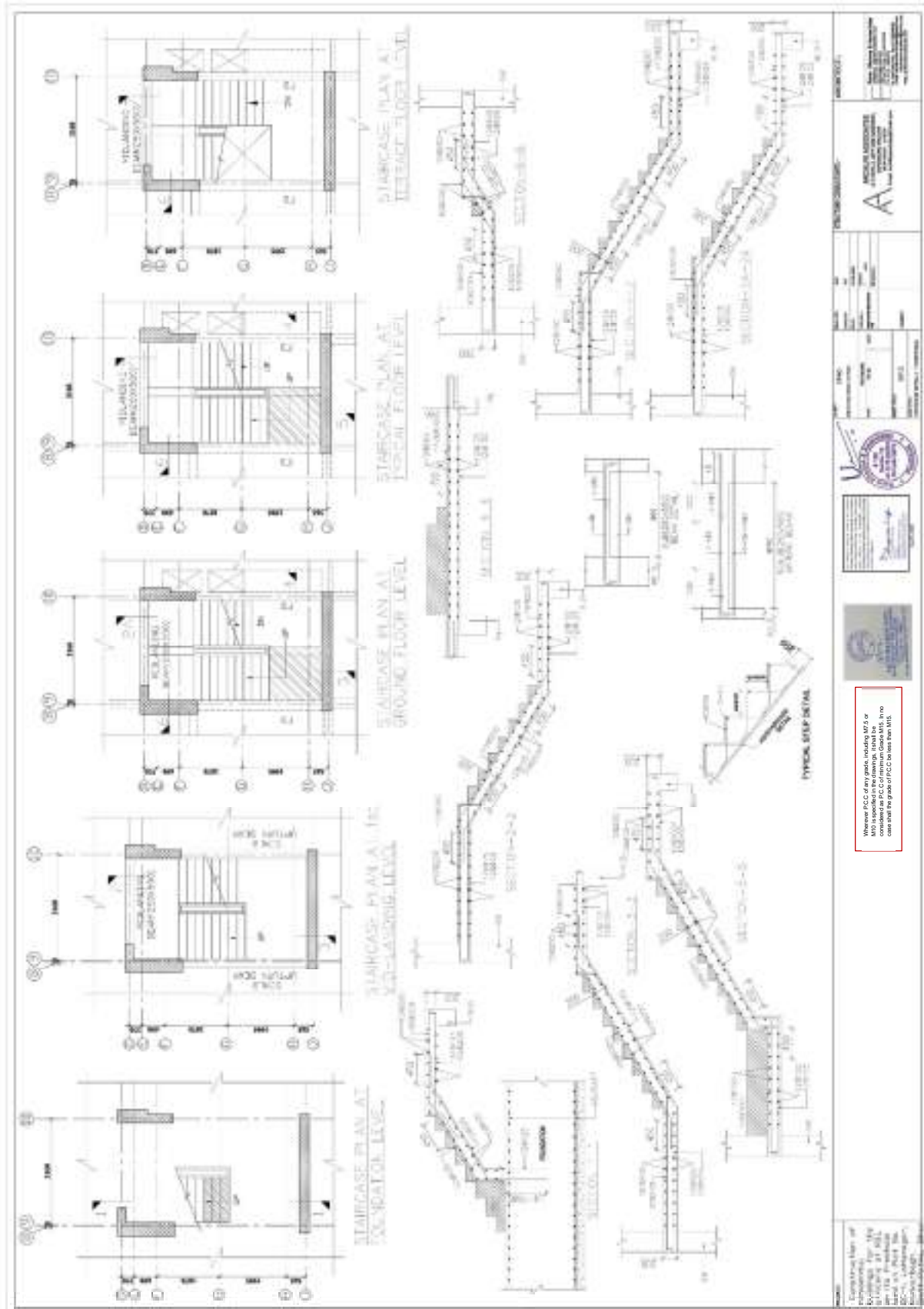


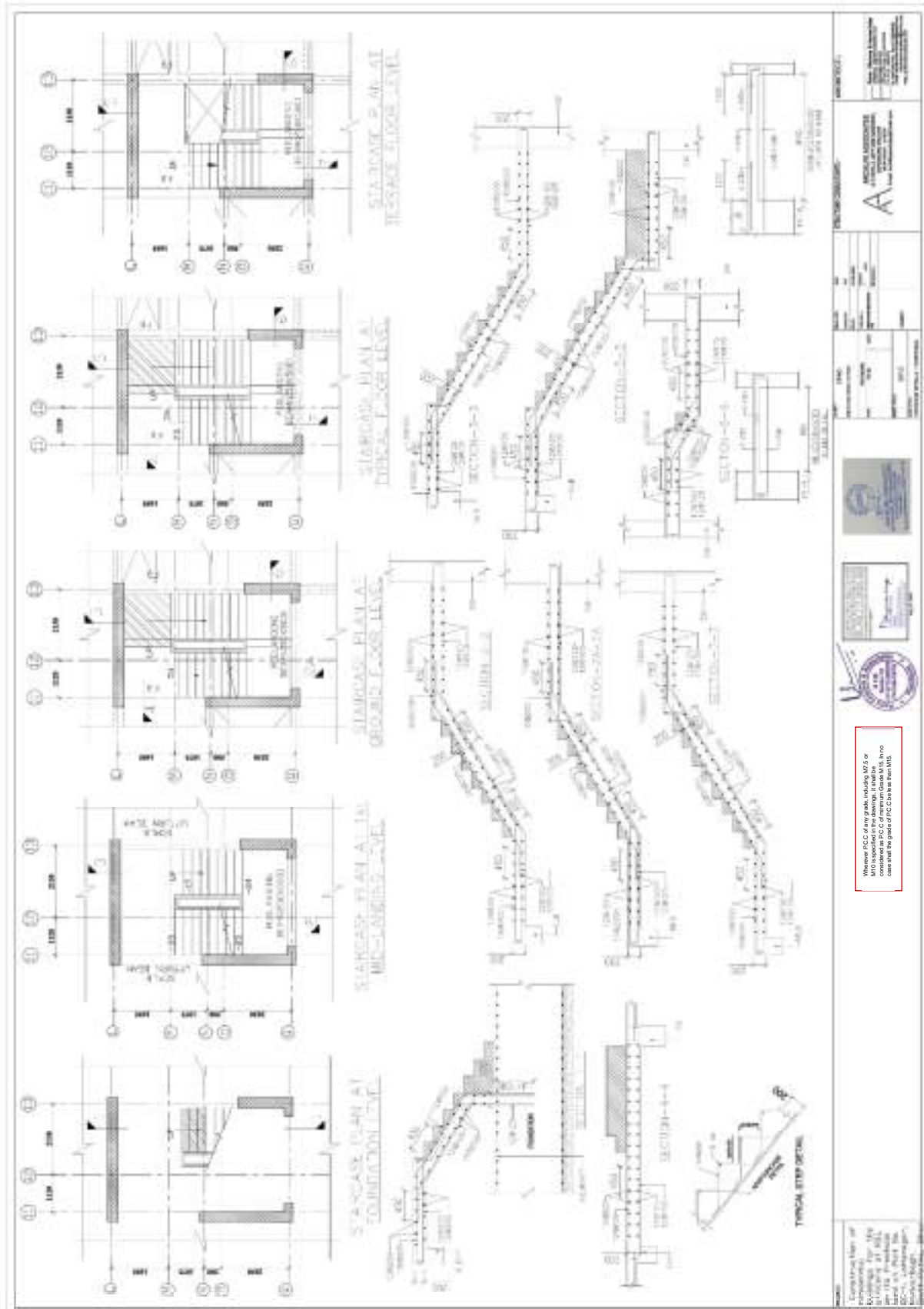
																																																																																																																																																																																											
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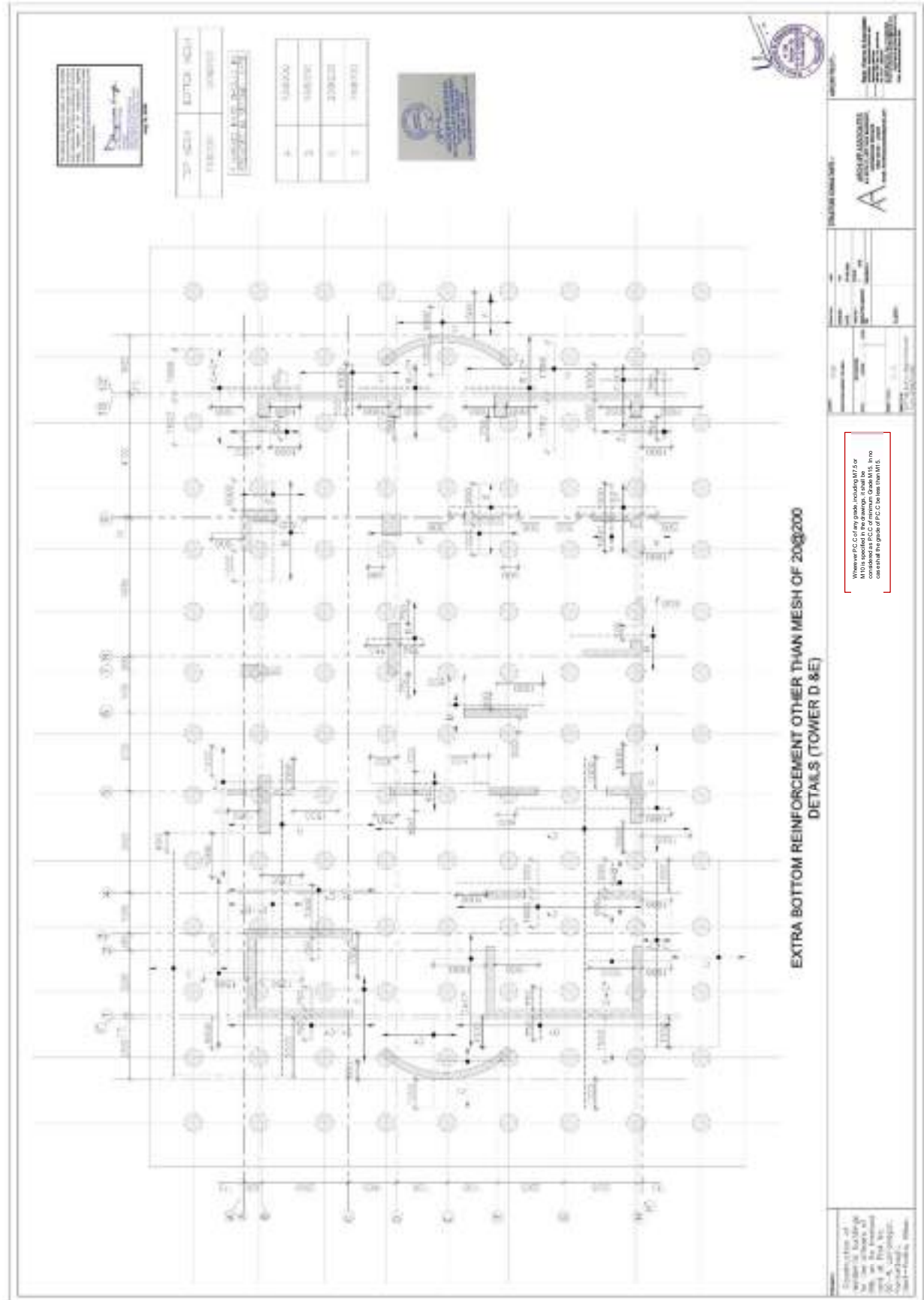


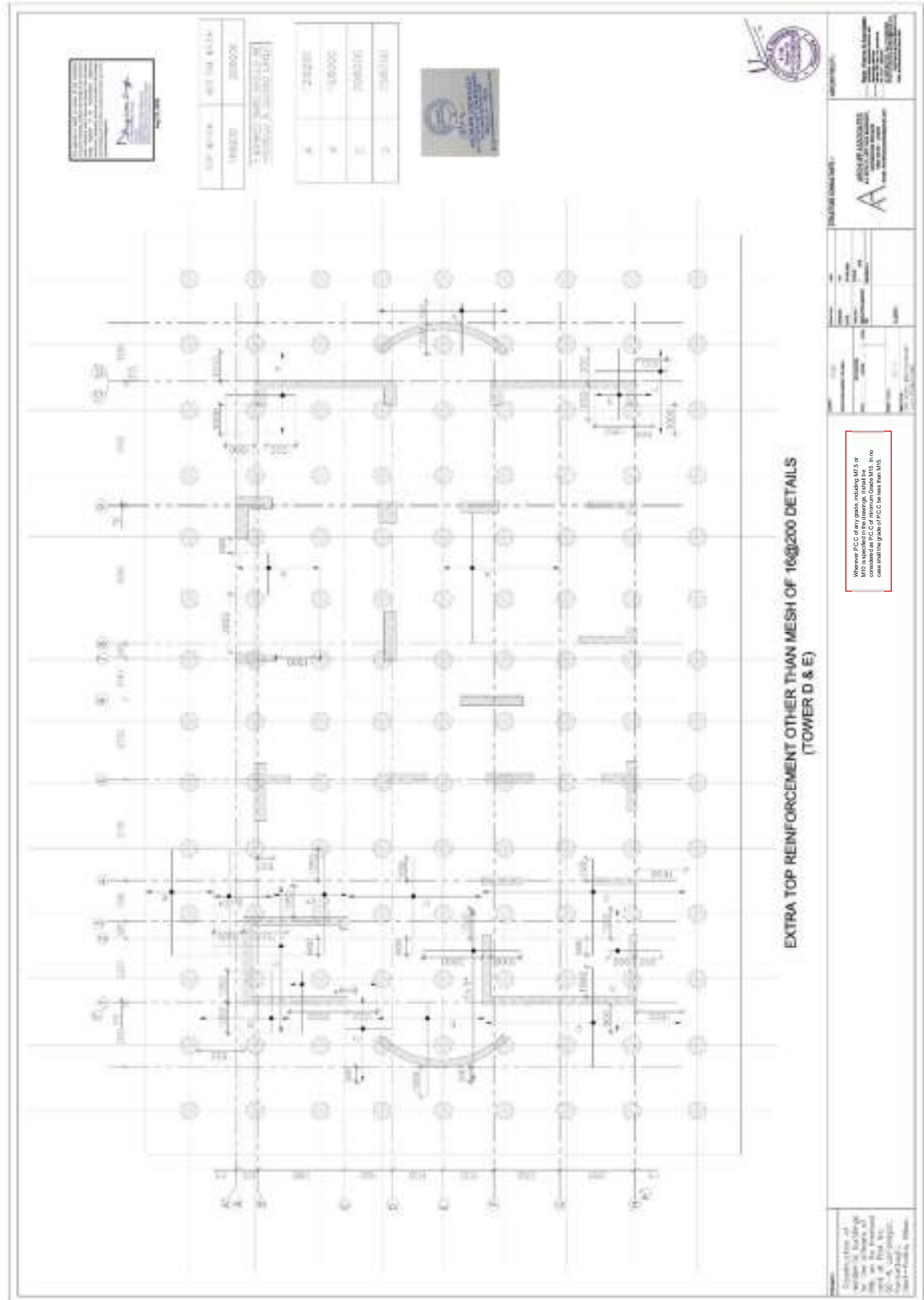


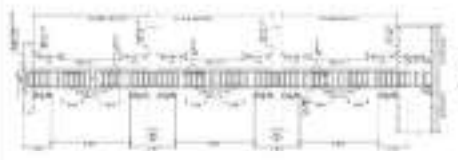
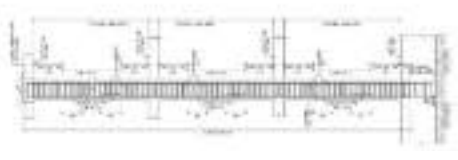
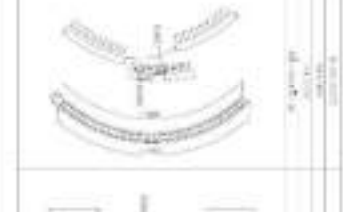
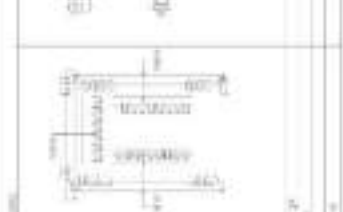
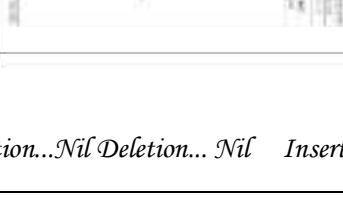
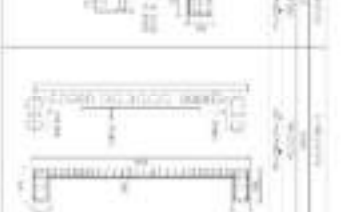
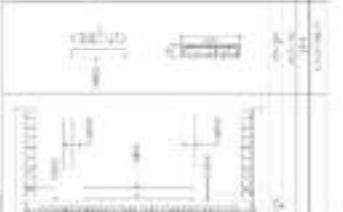
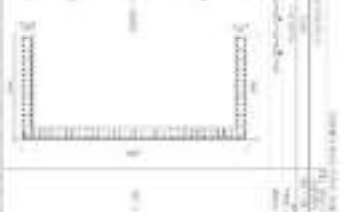
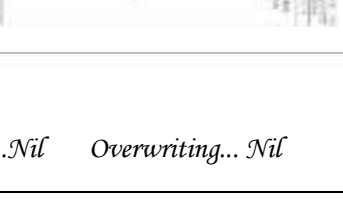
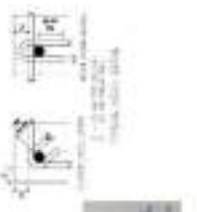
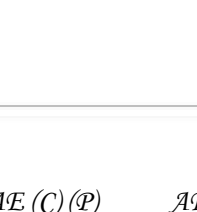
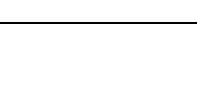




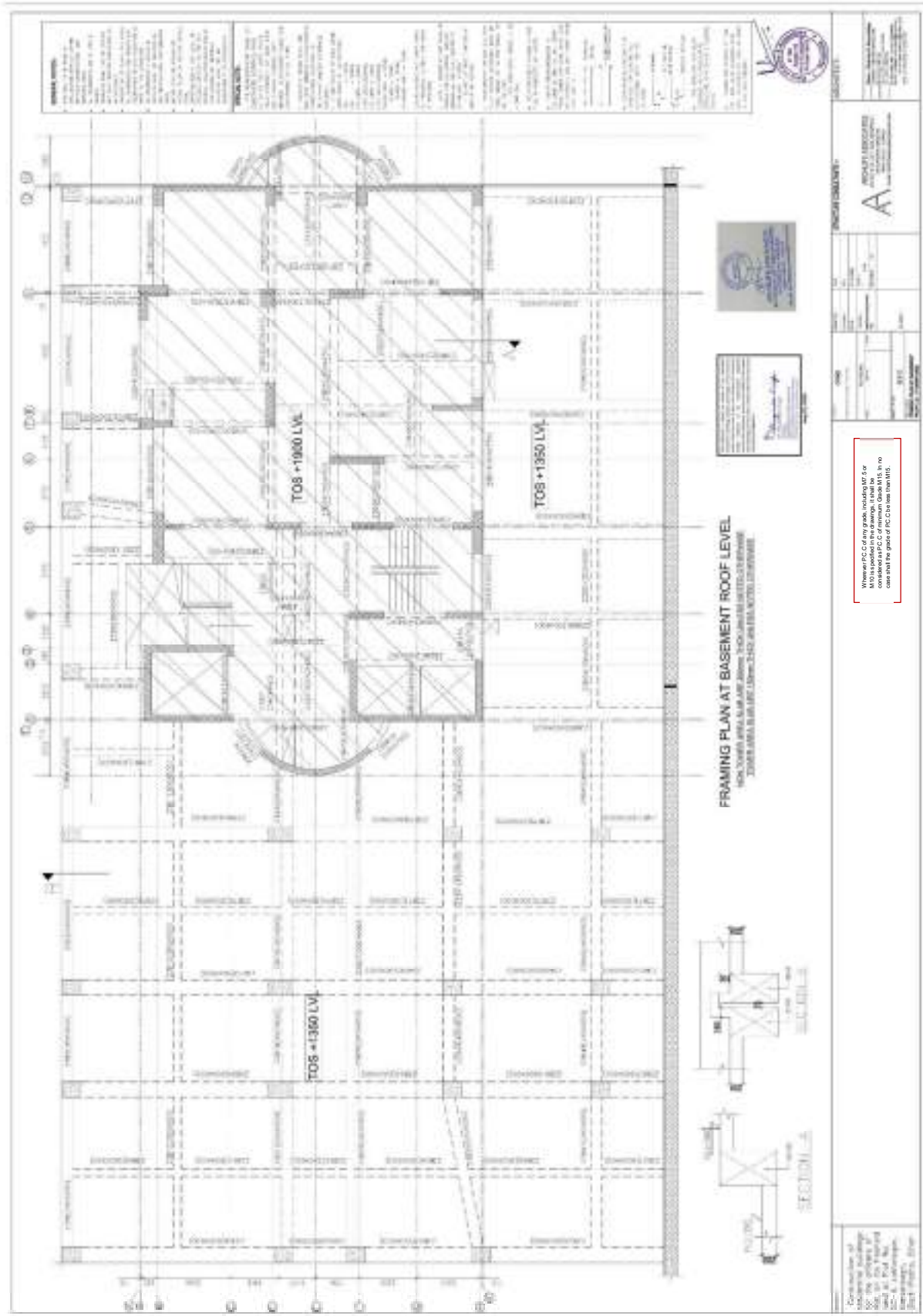


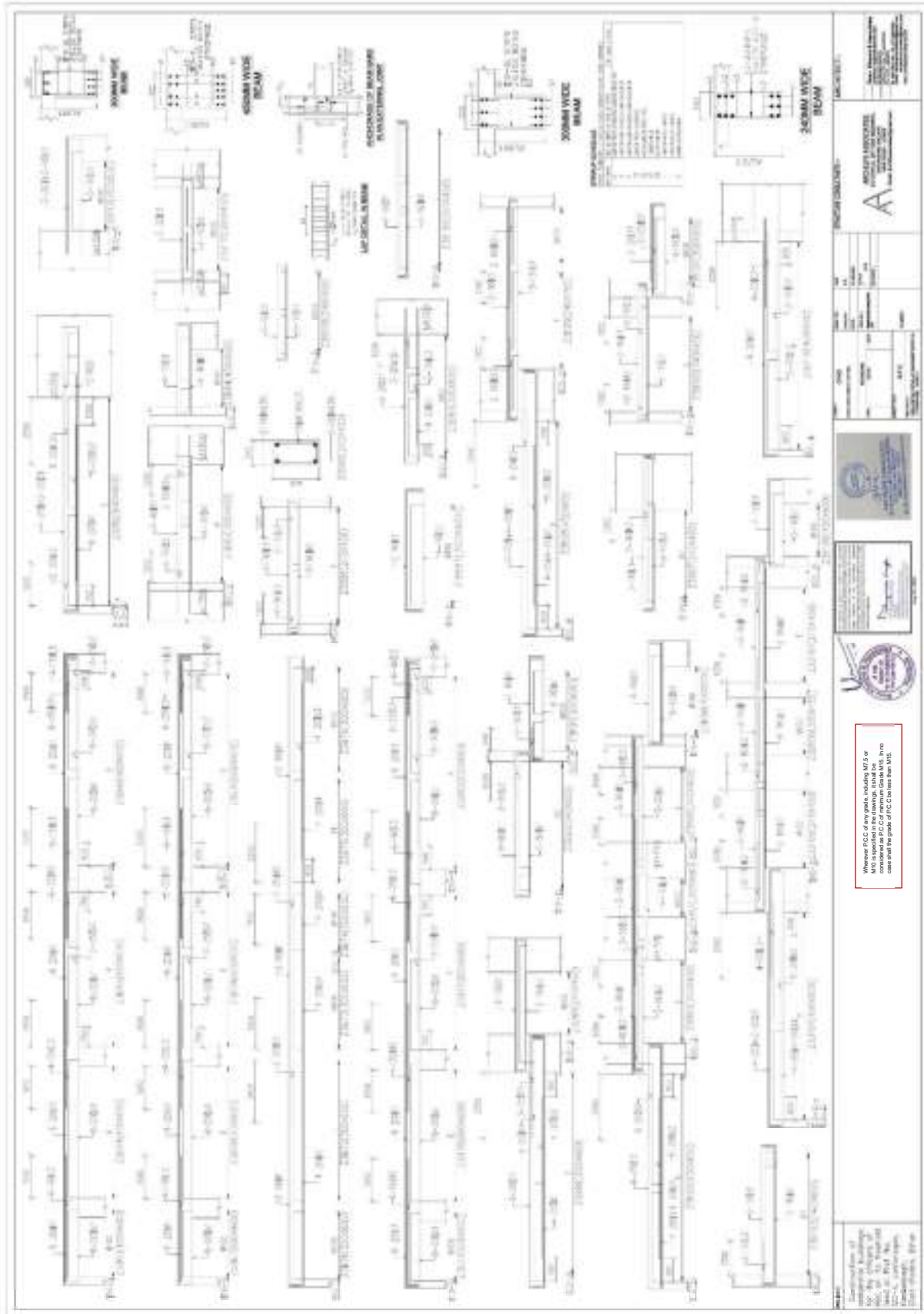


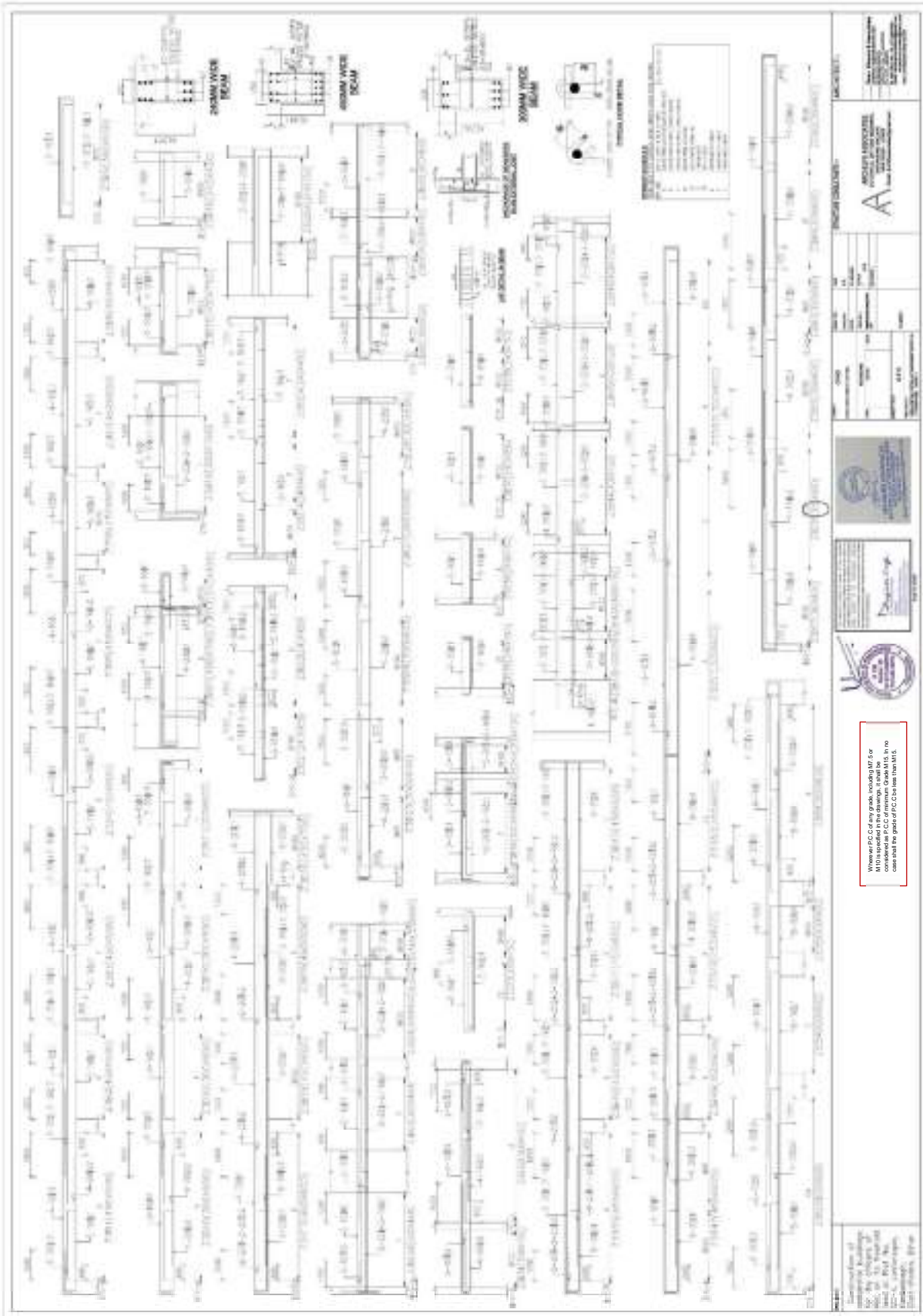


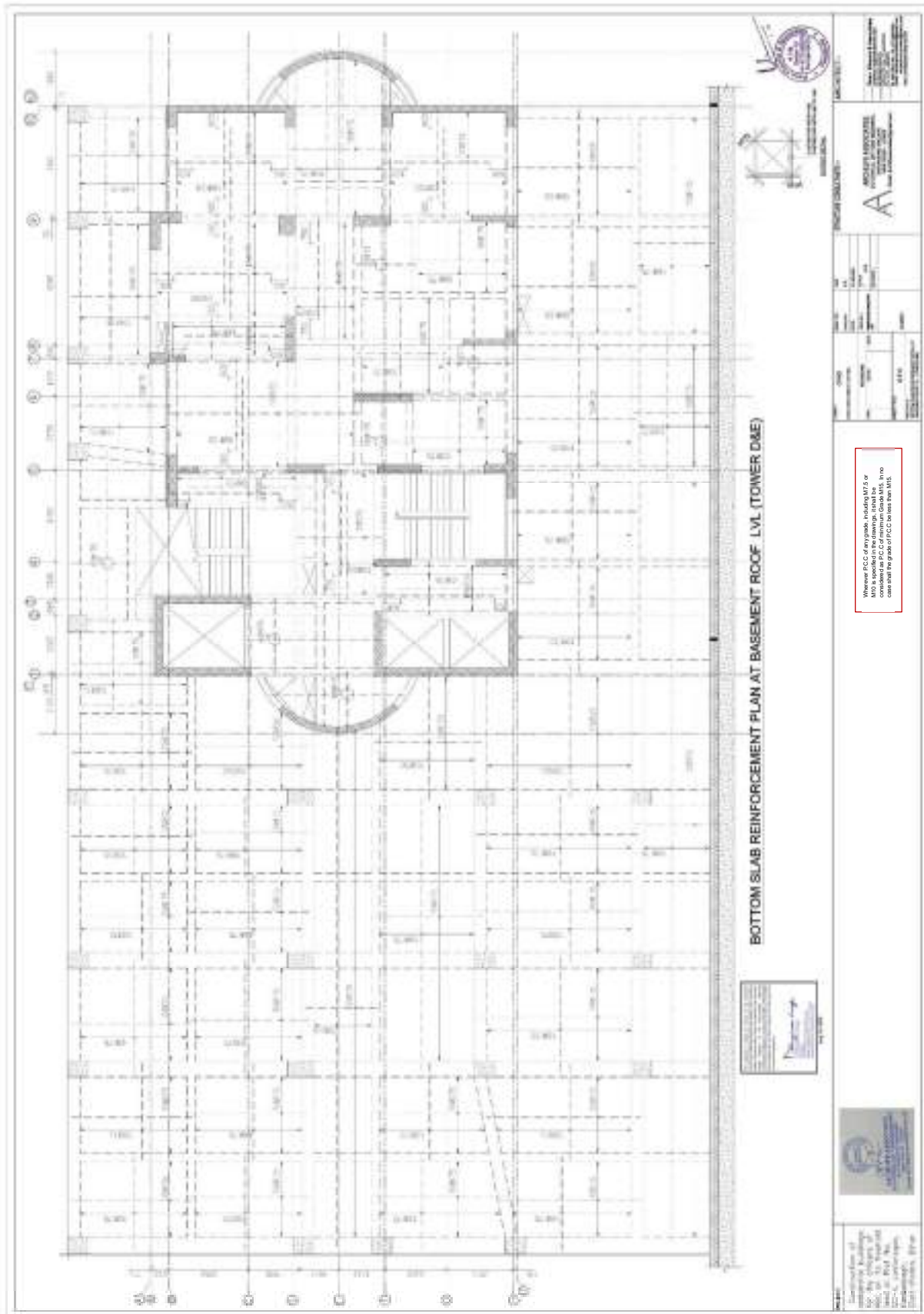
																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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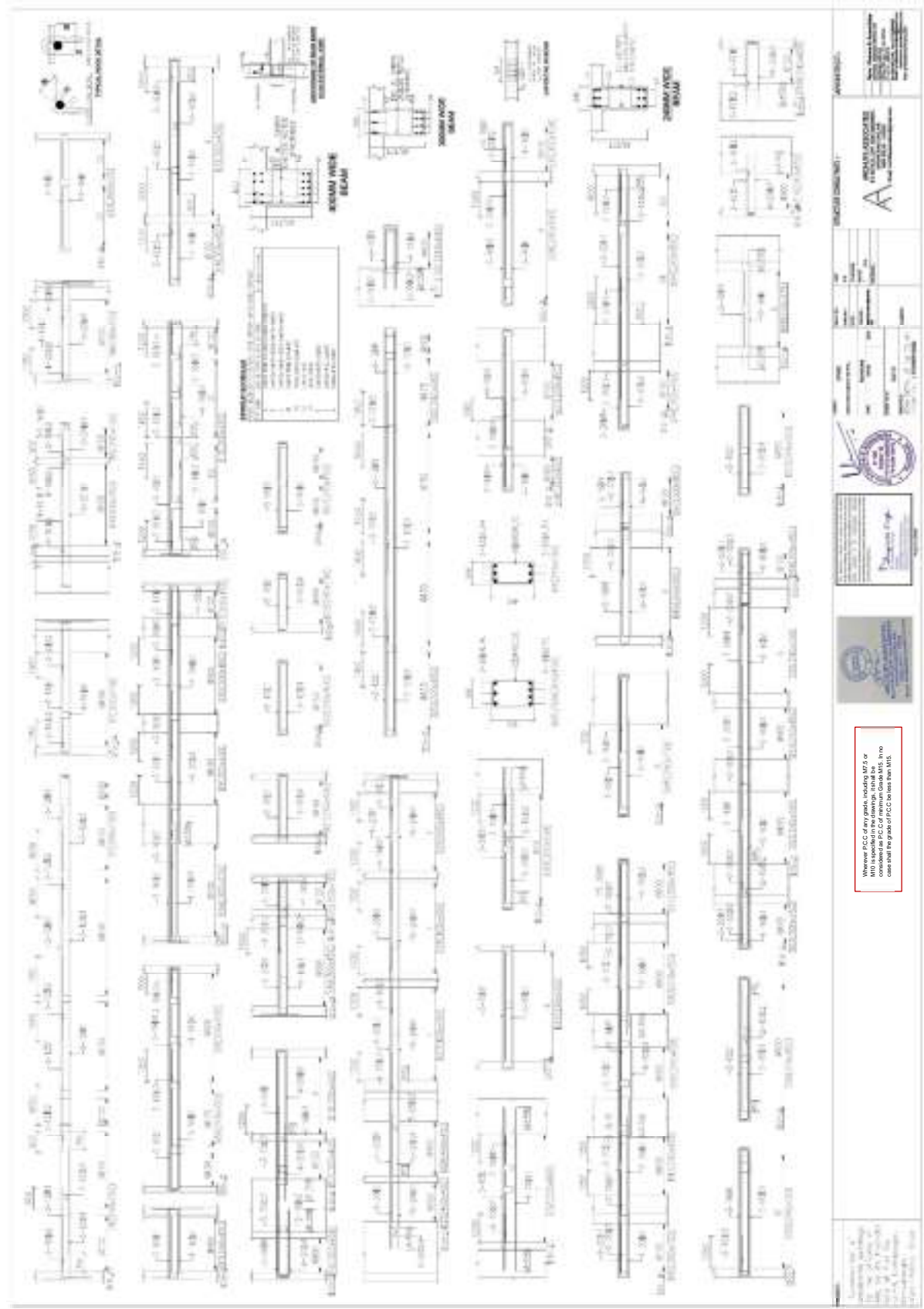
Whenever P.C.C. of any grade, including M7.5 or M10 is specified in the drawings, it shall be considered as P.C.C. of minimum Grade M15. In no case shall the grade of P.C.C. be less than M15.

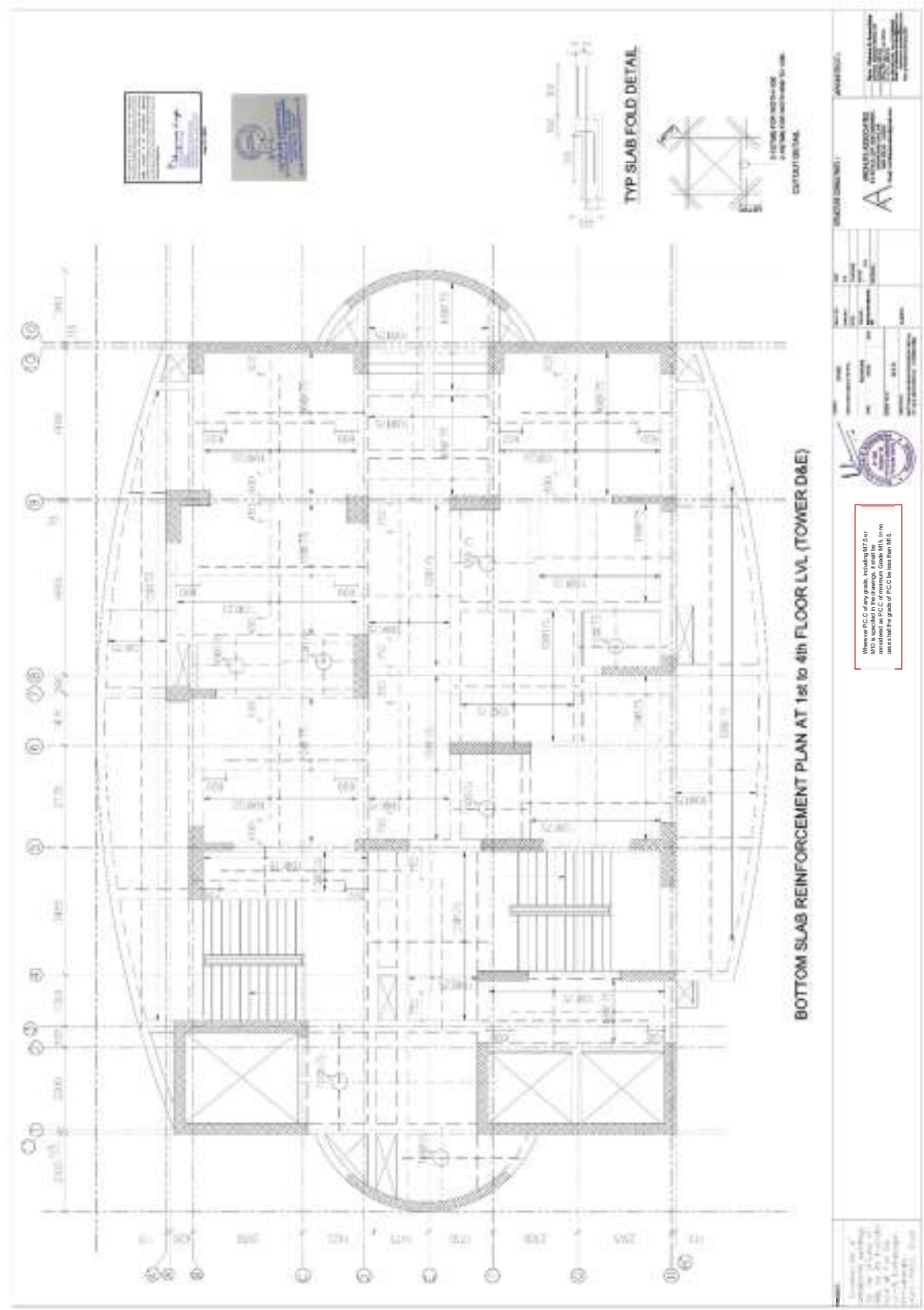


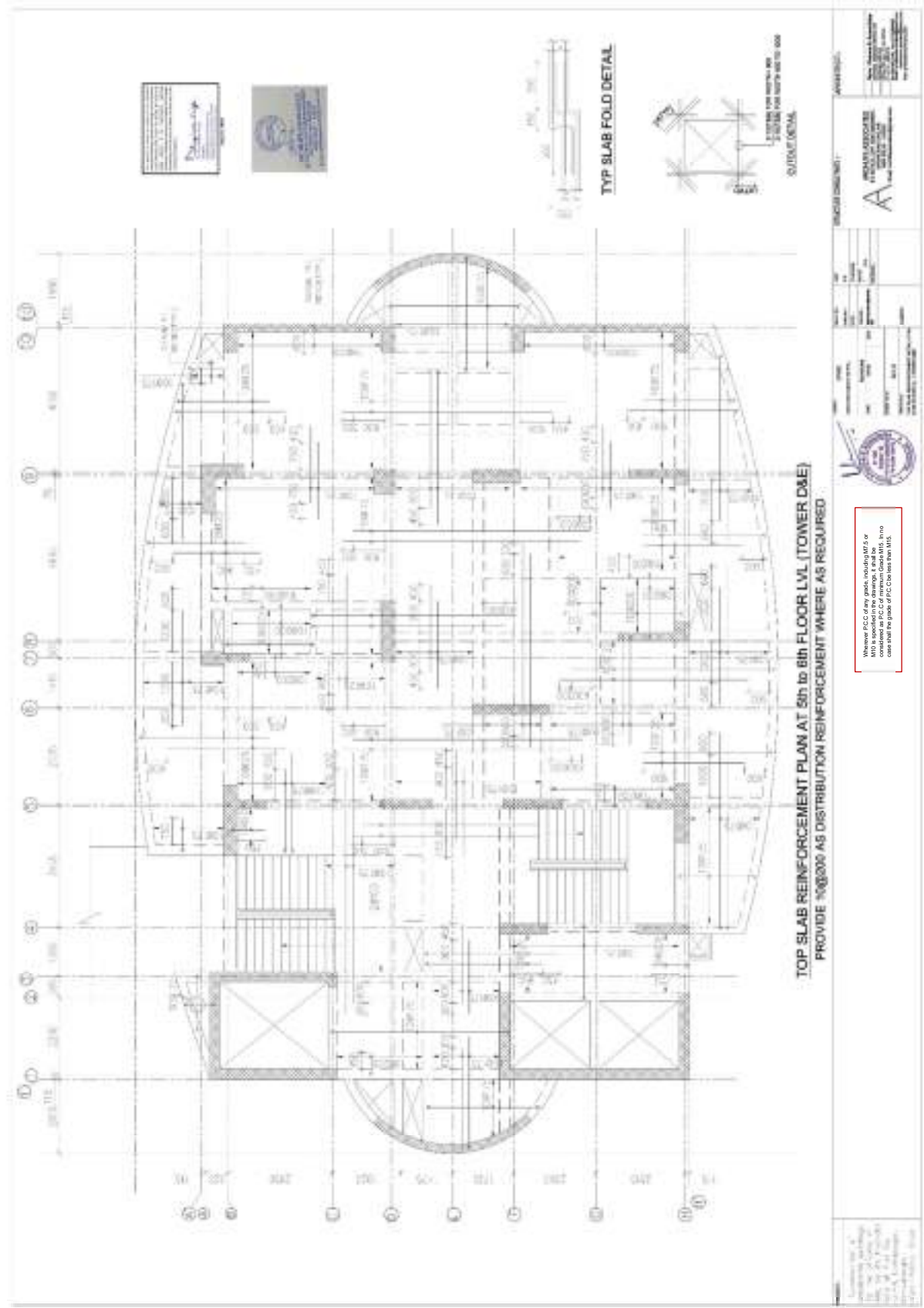


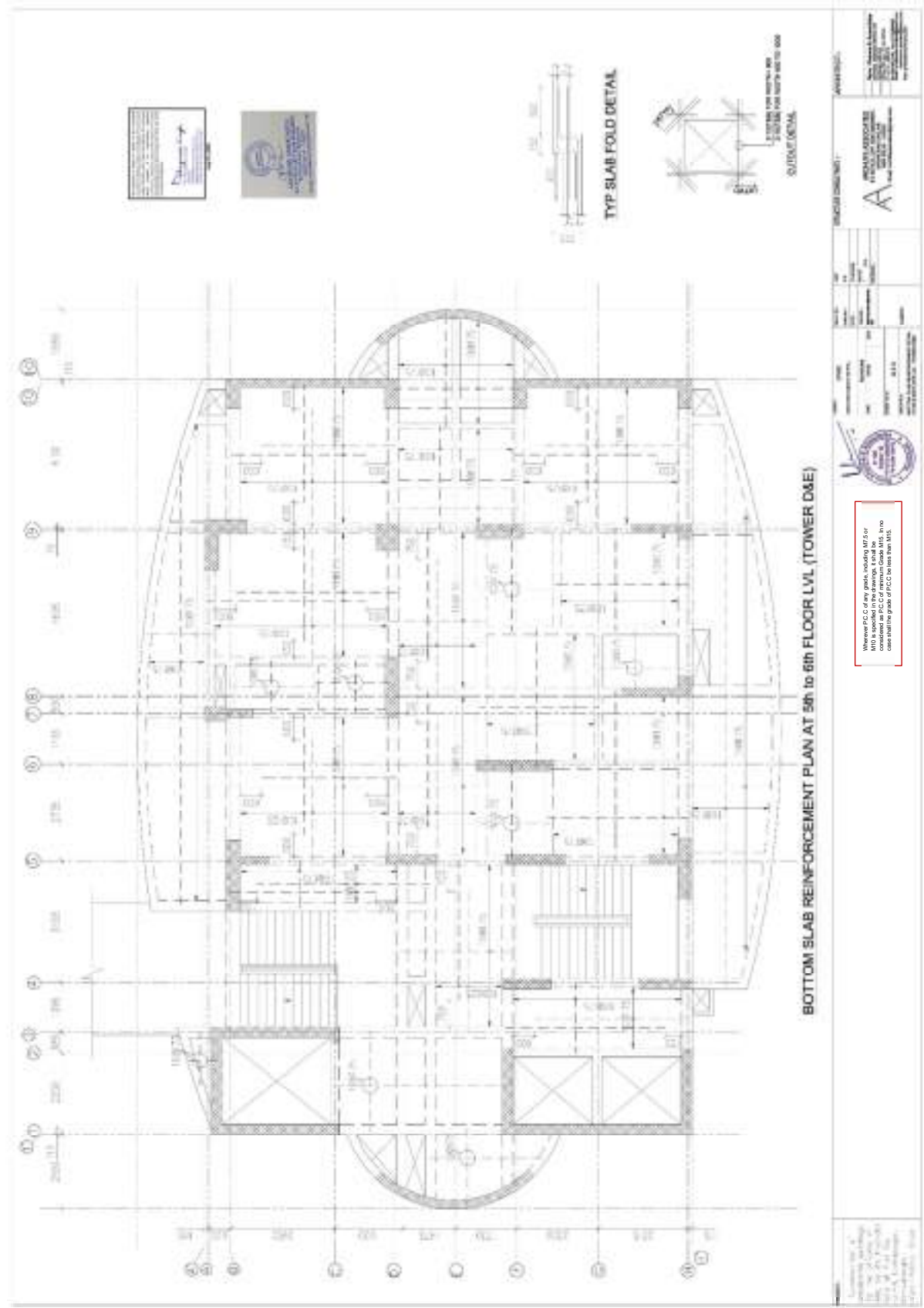


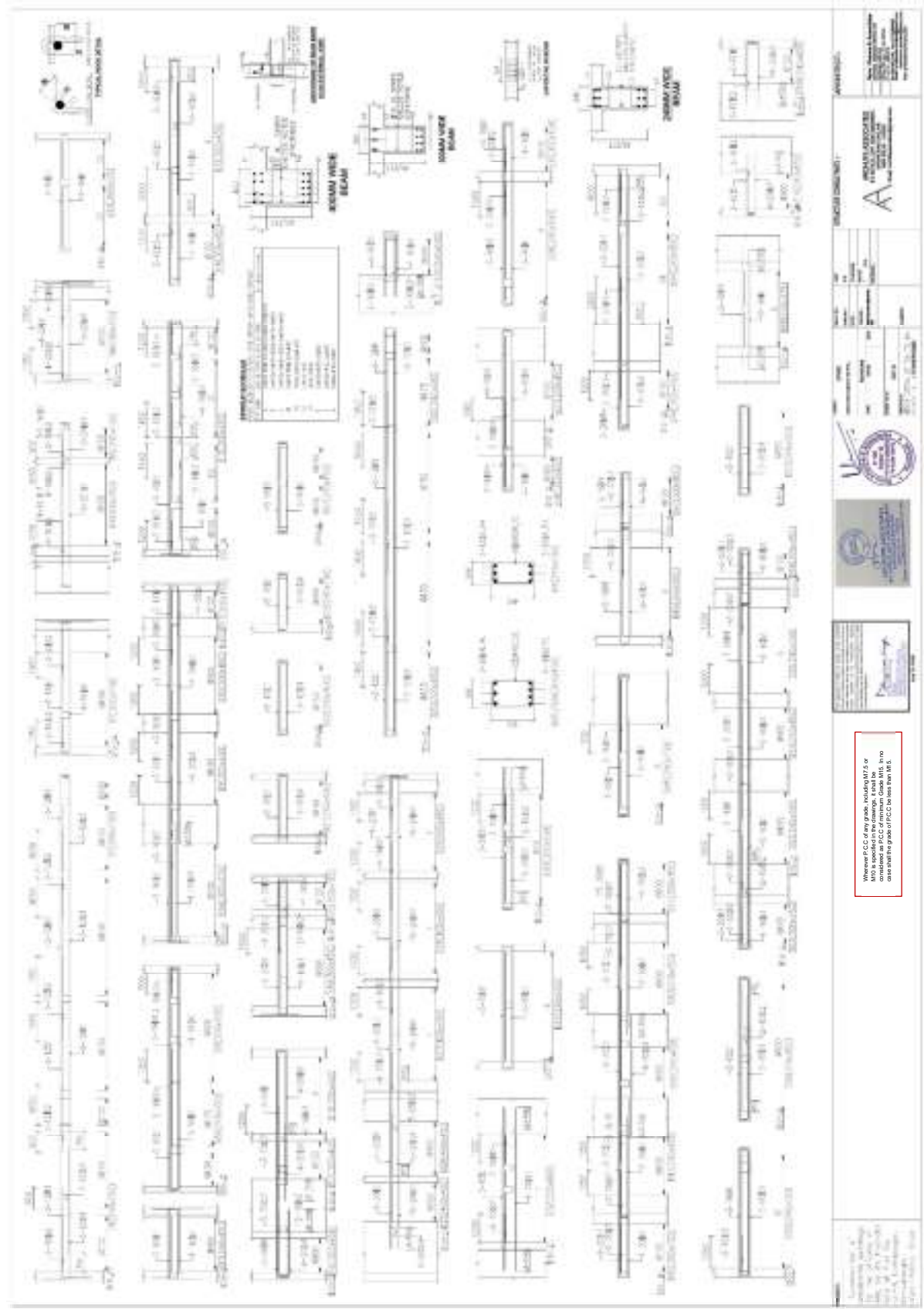


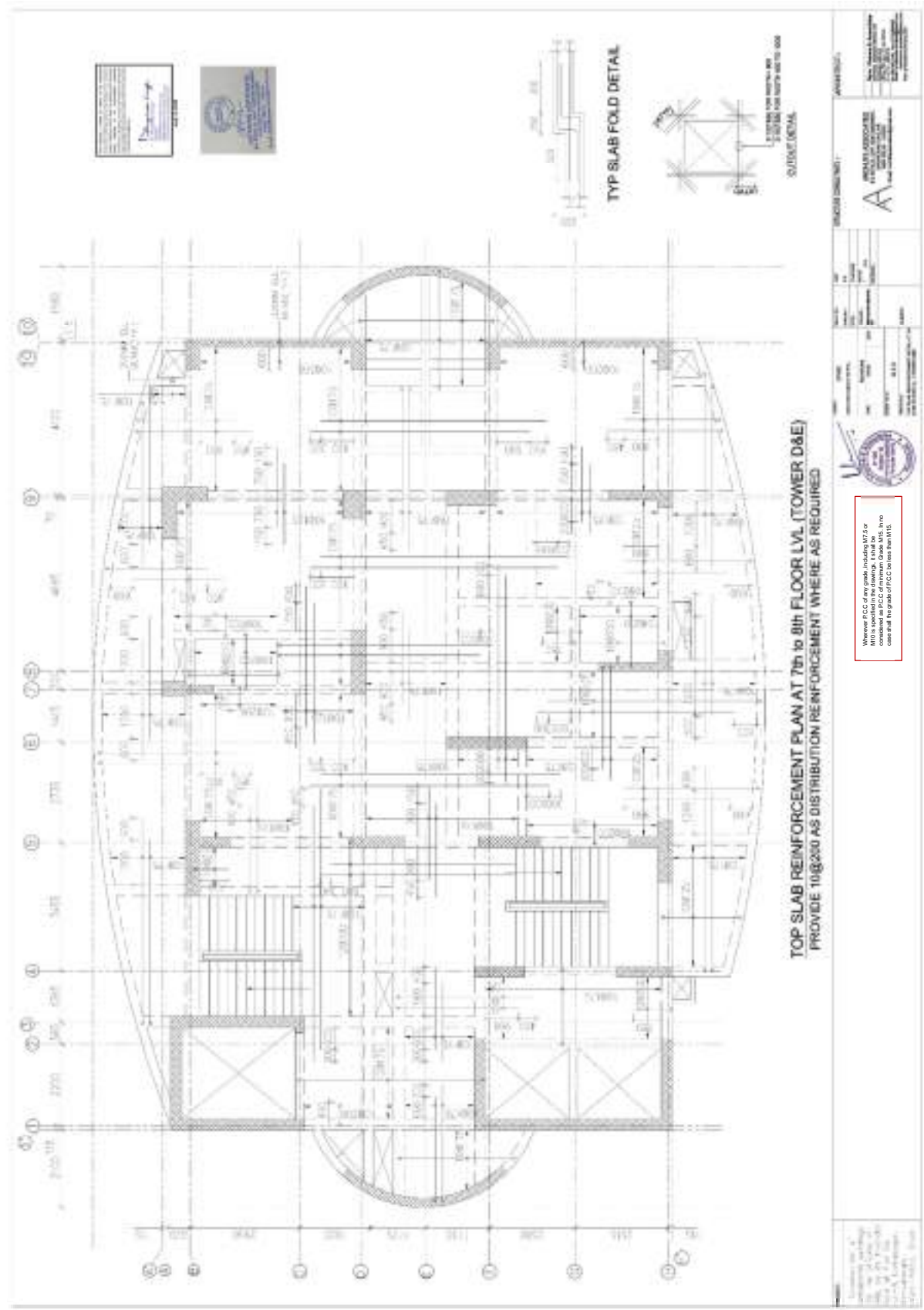


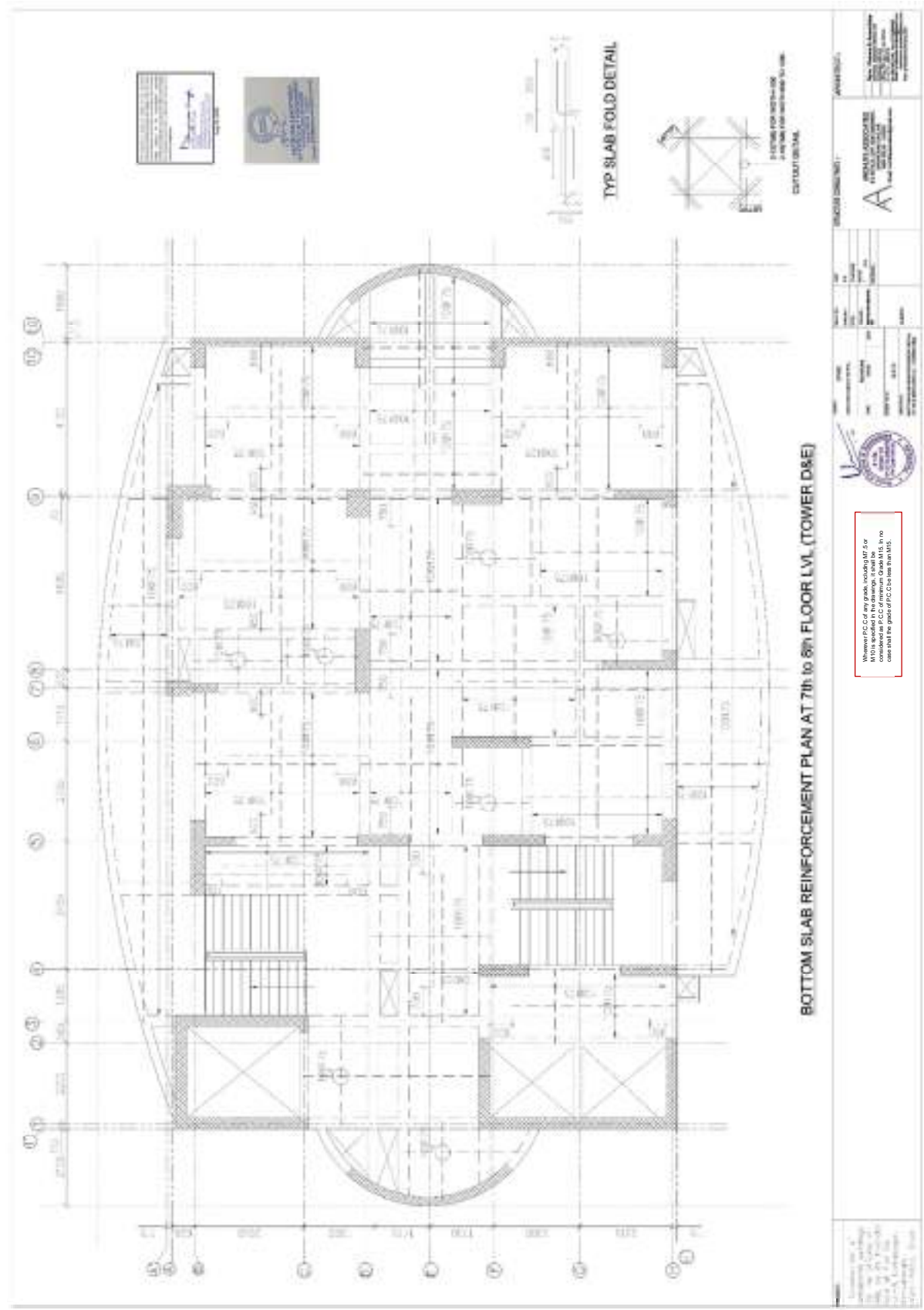


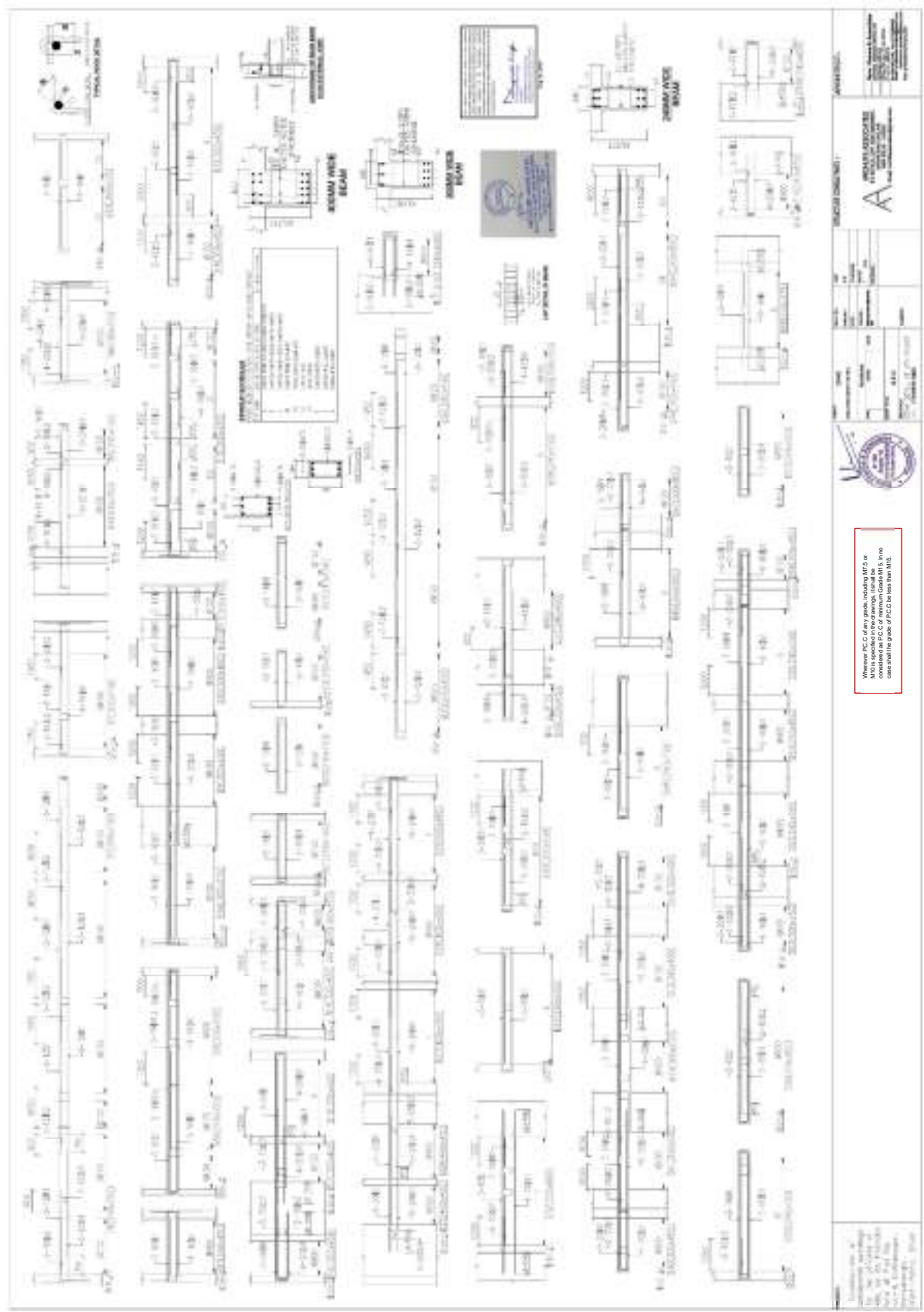


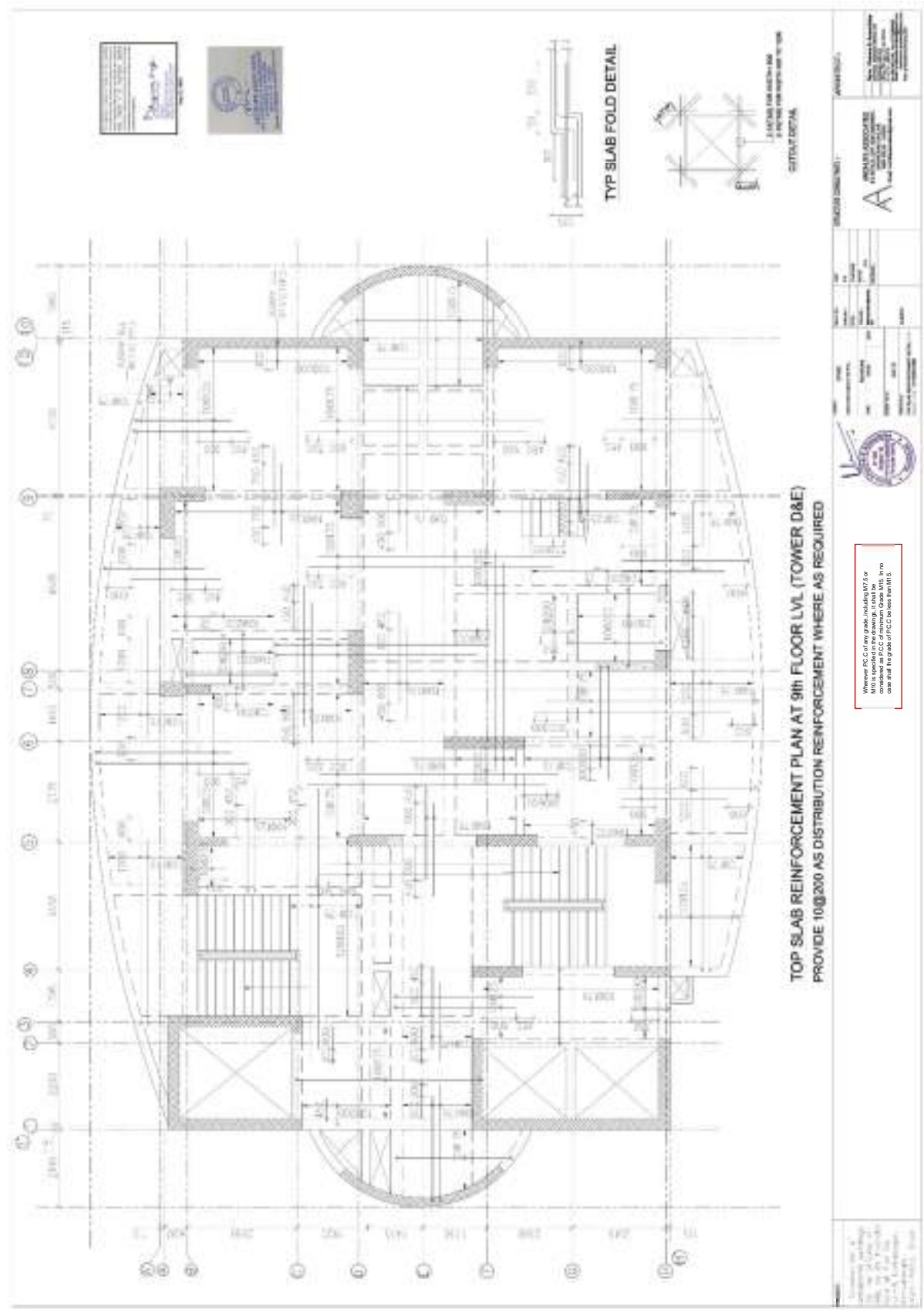


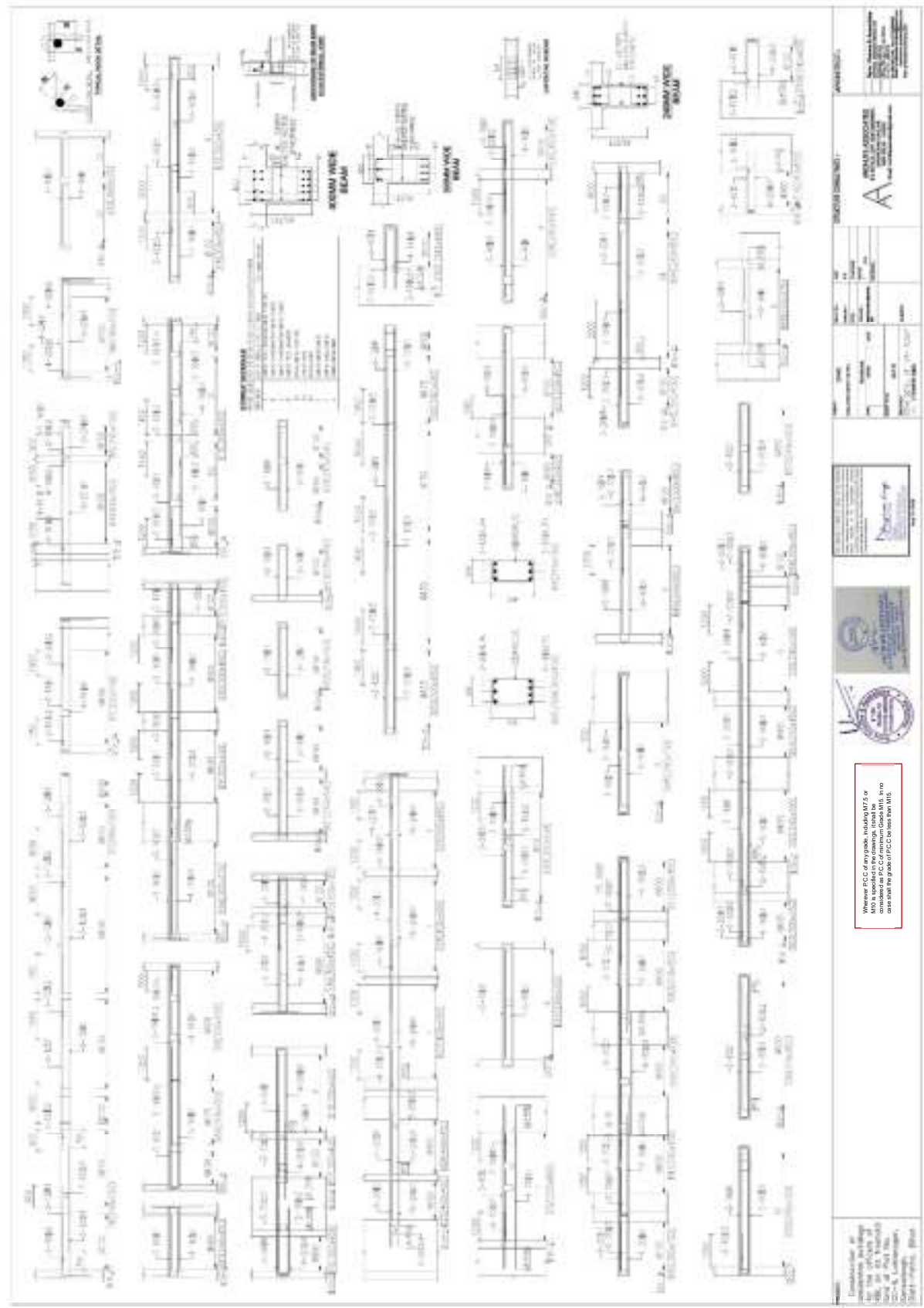


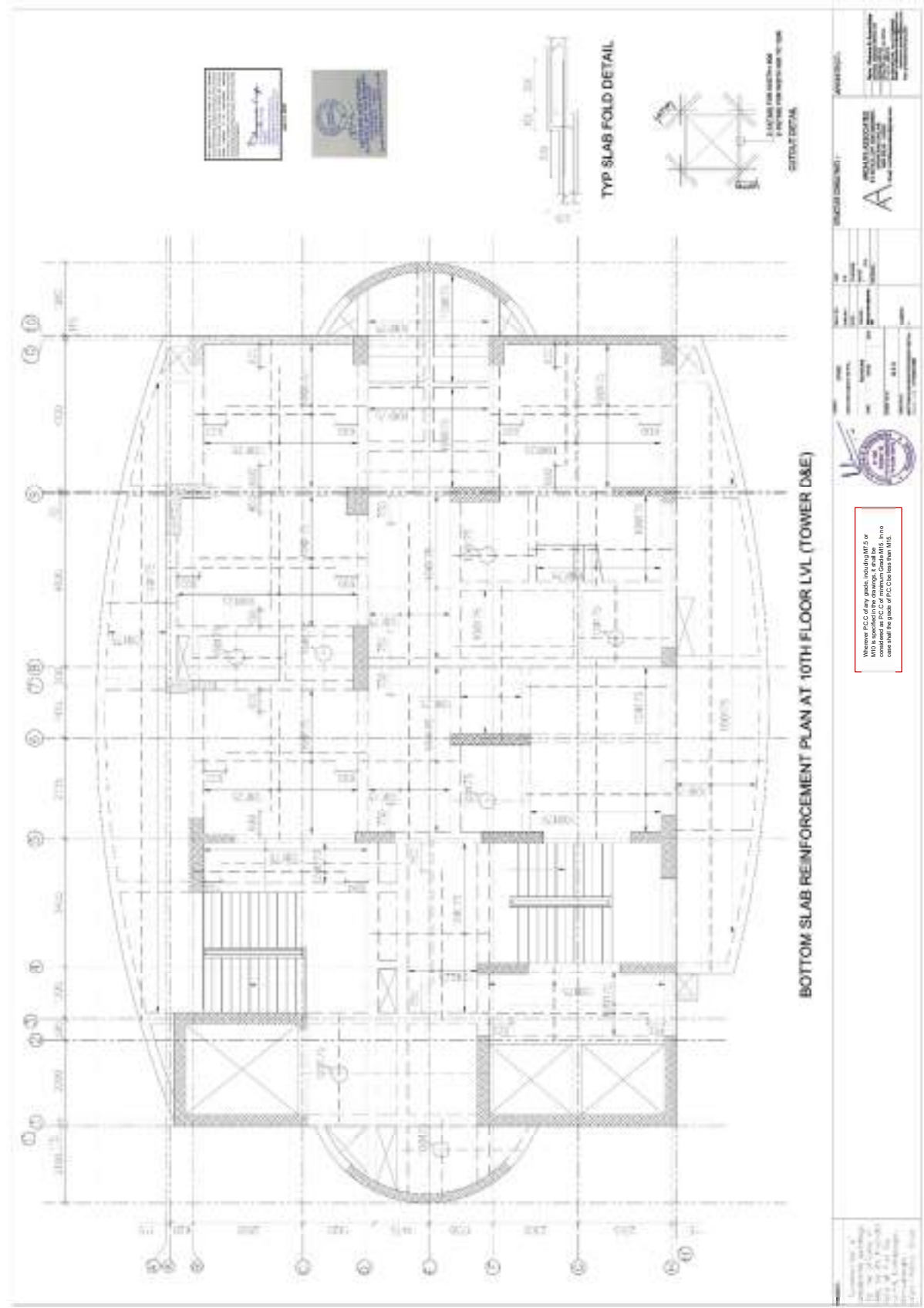


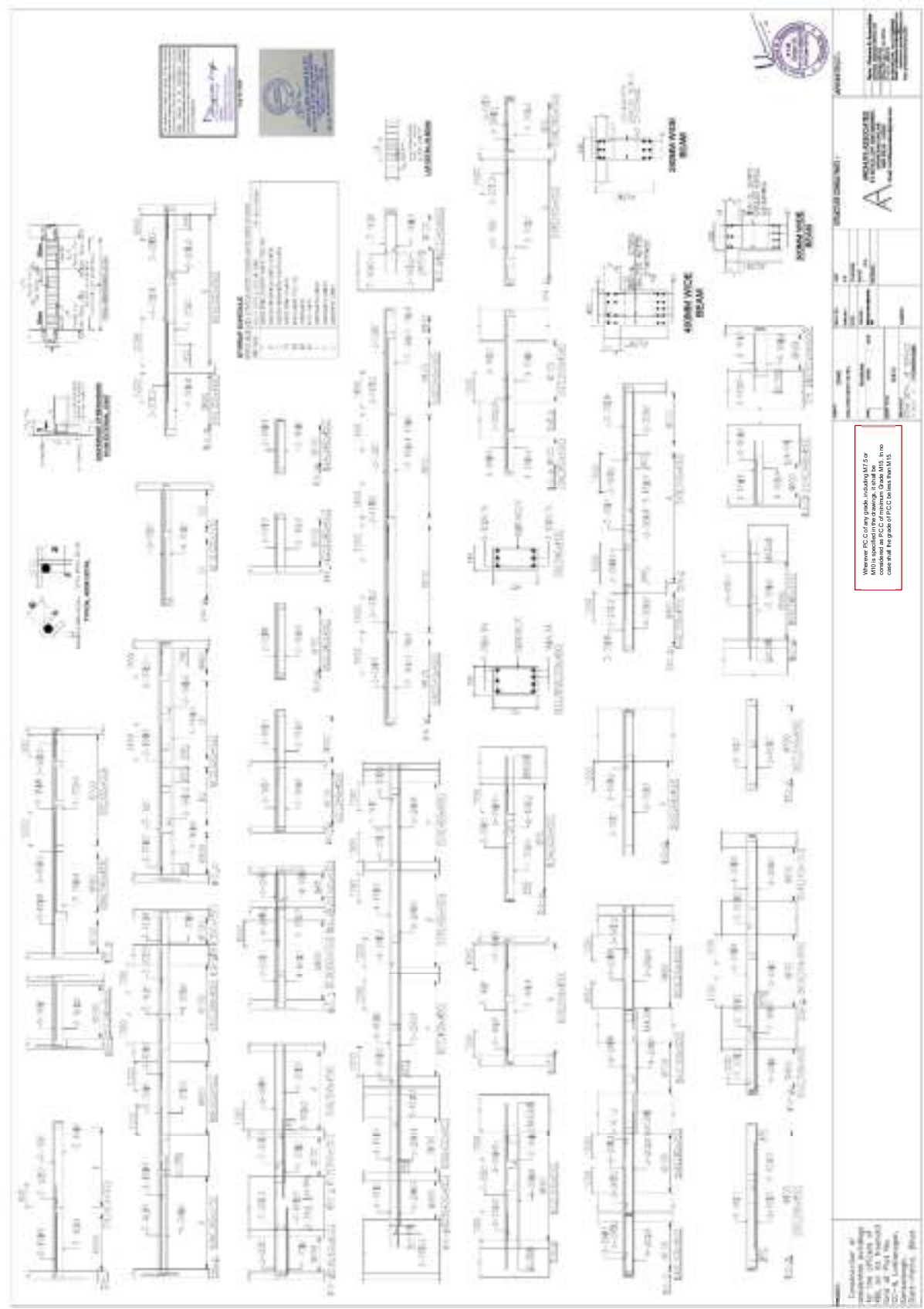


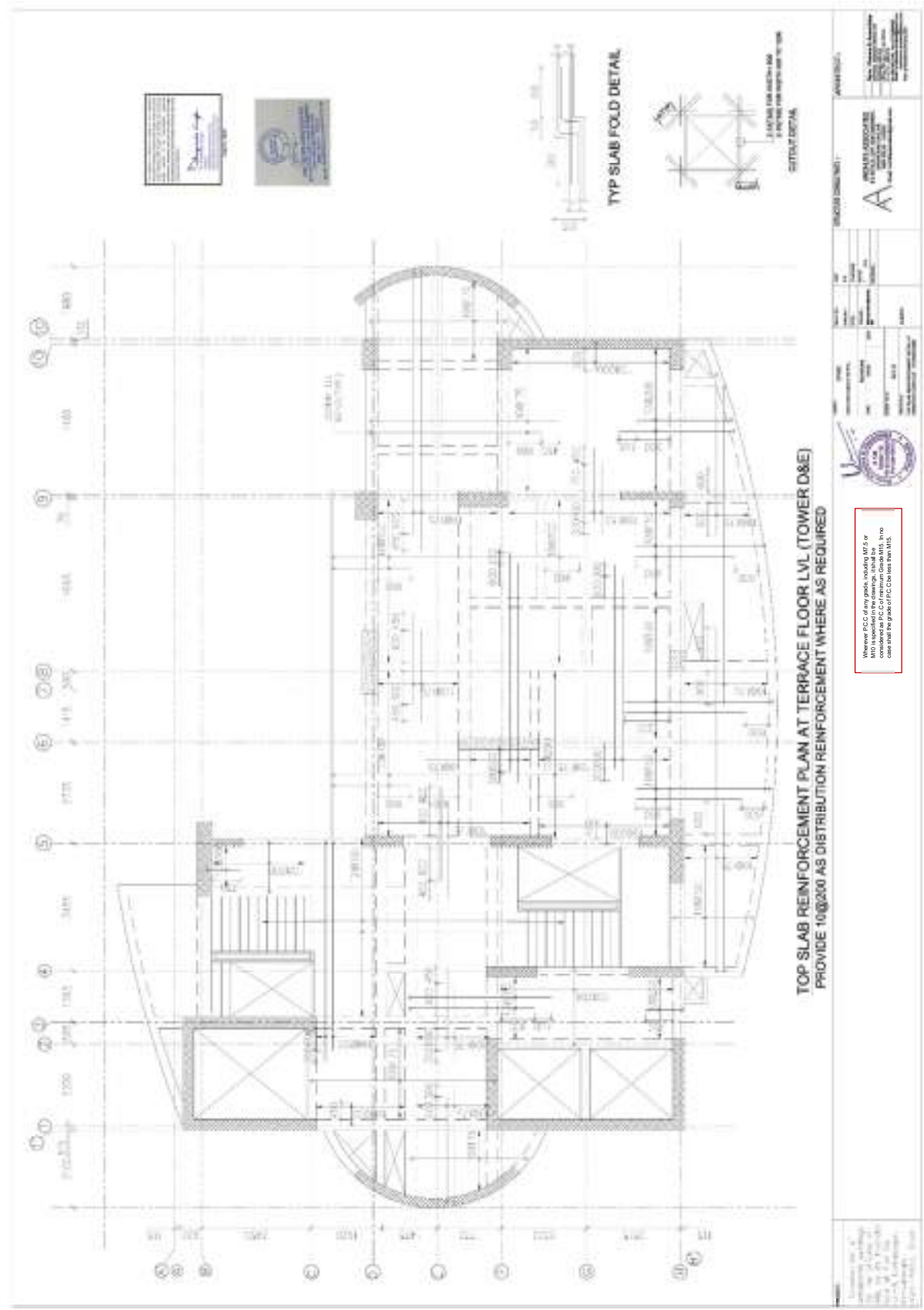


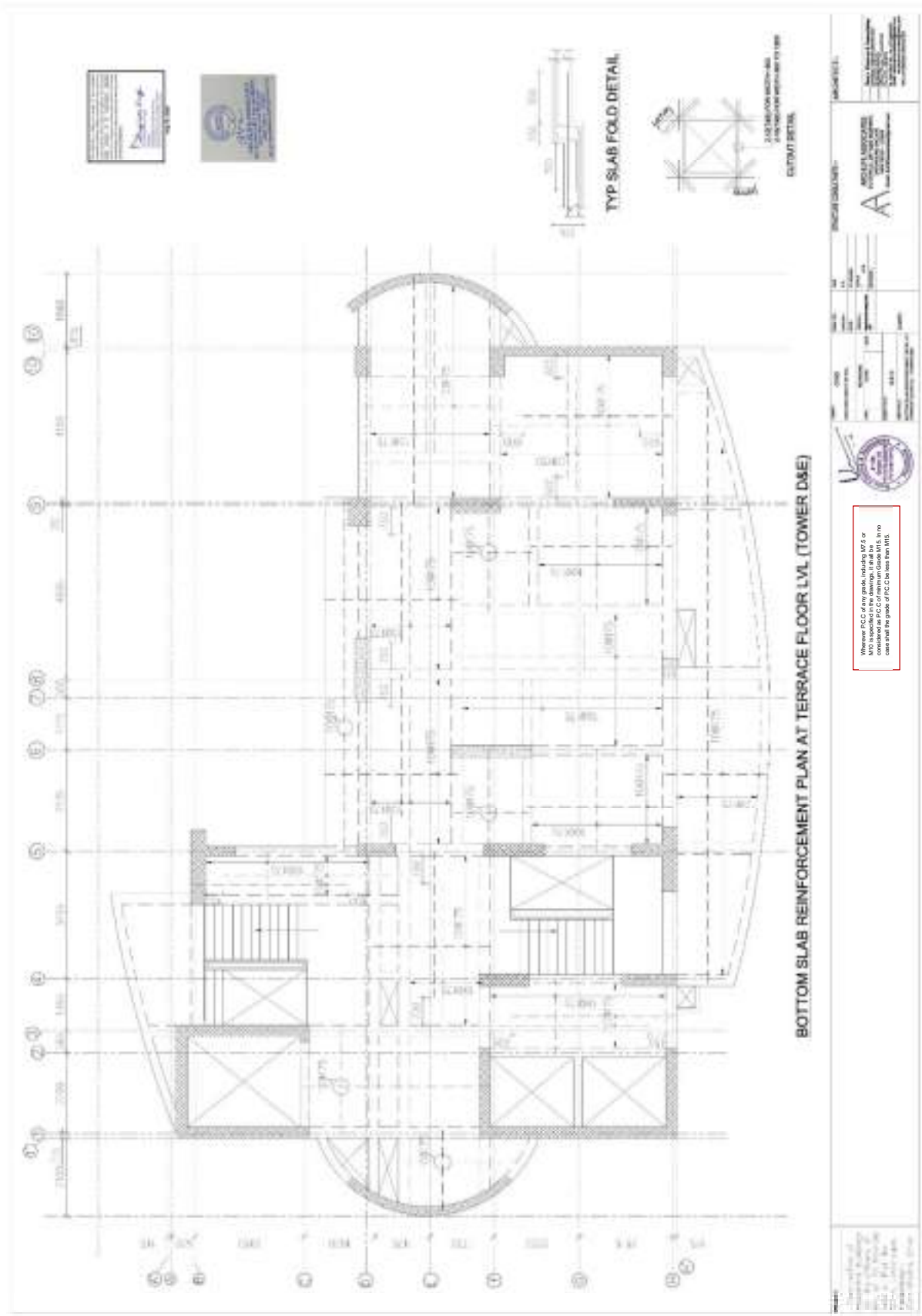


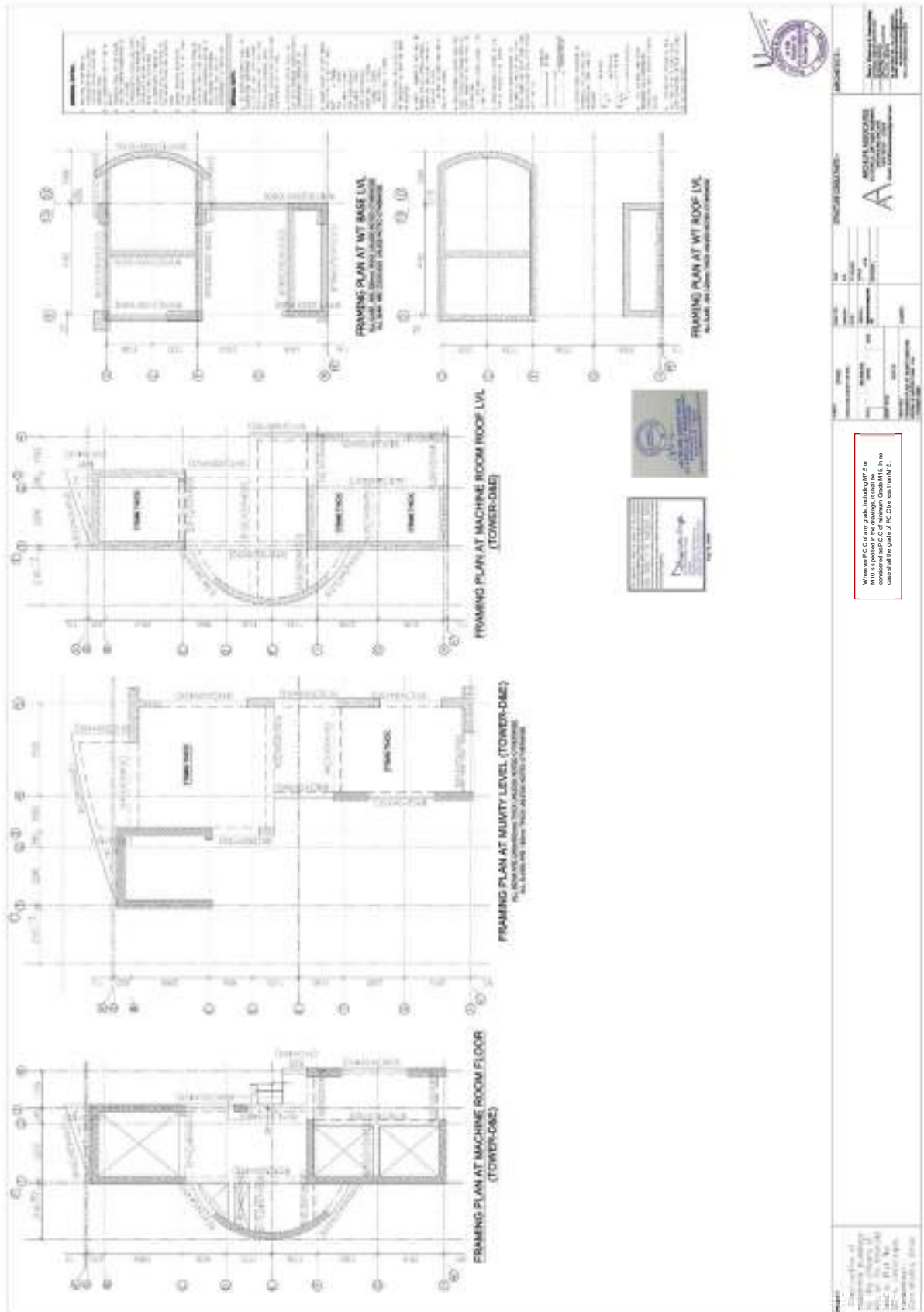


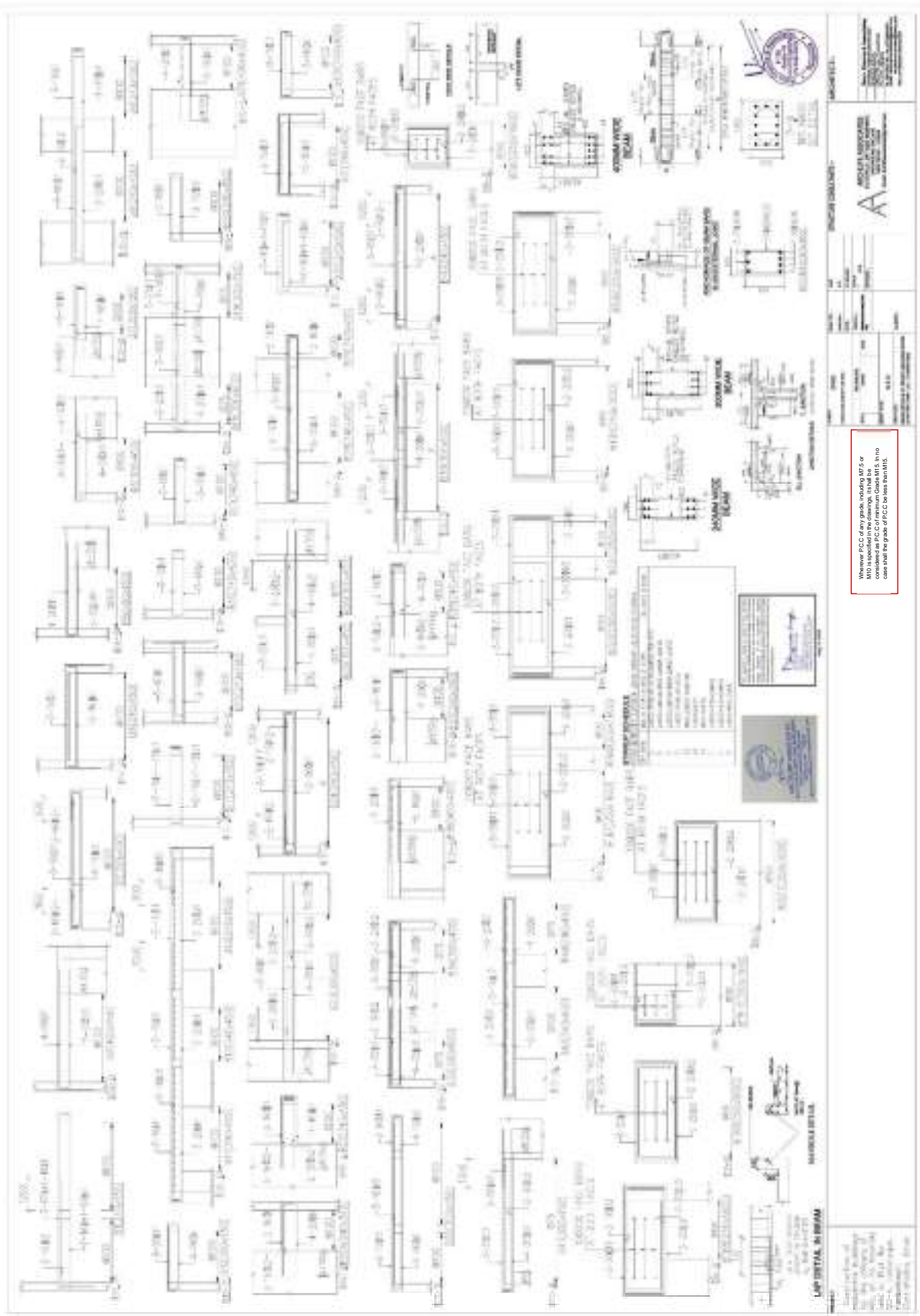


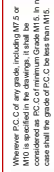


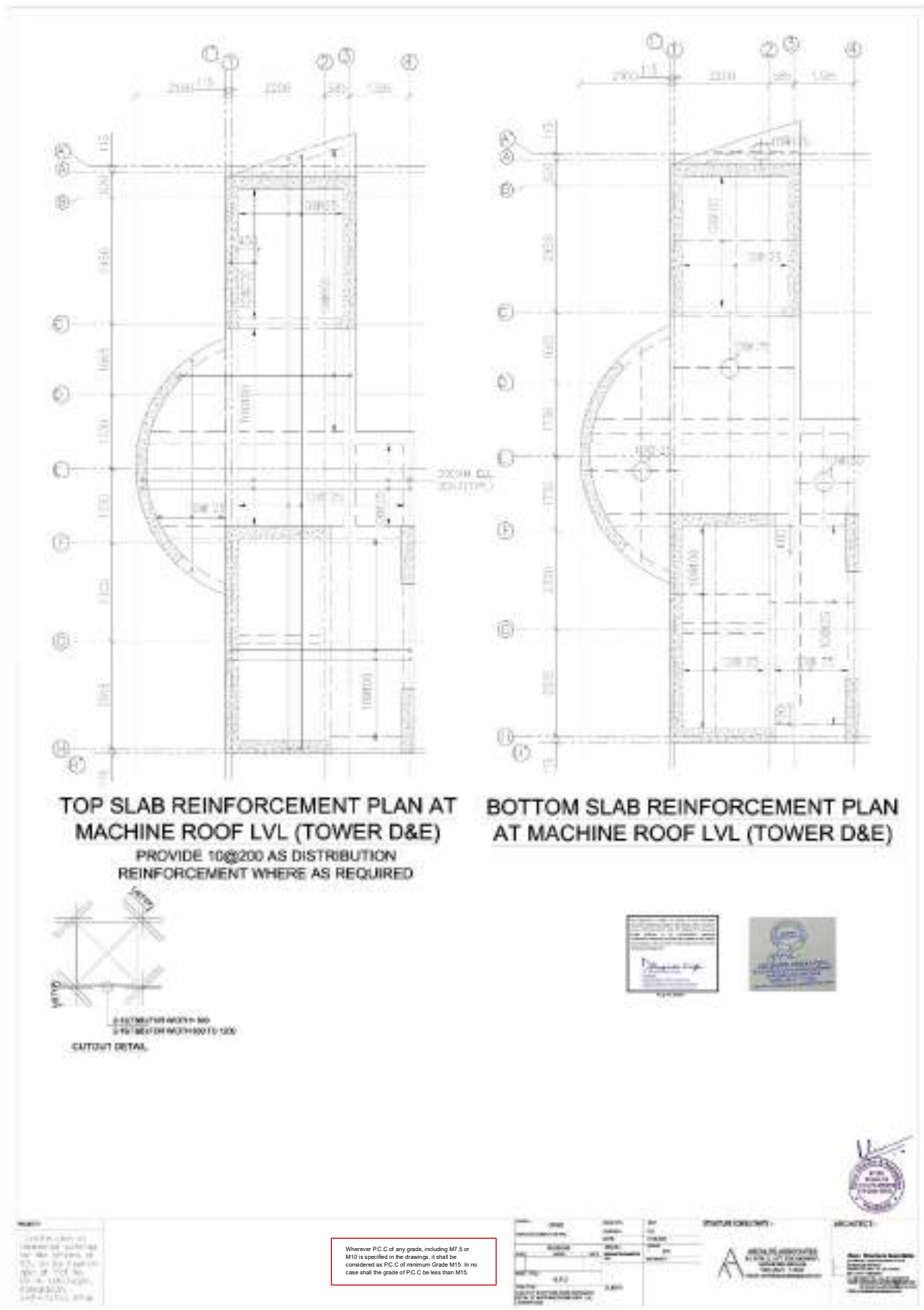


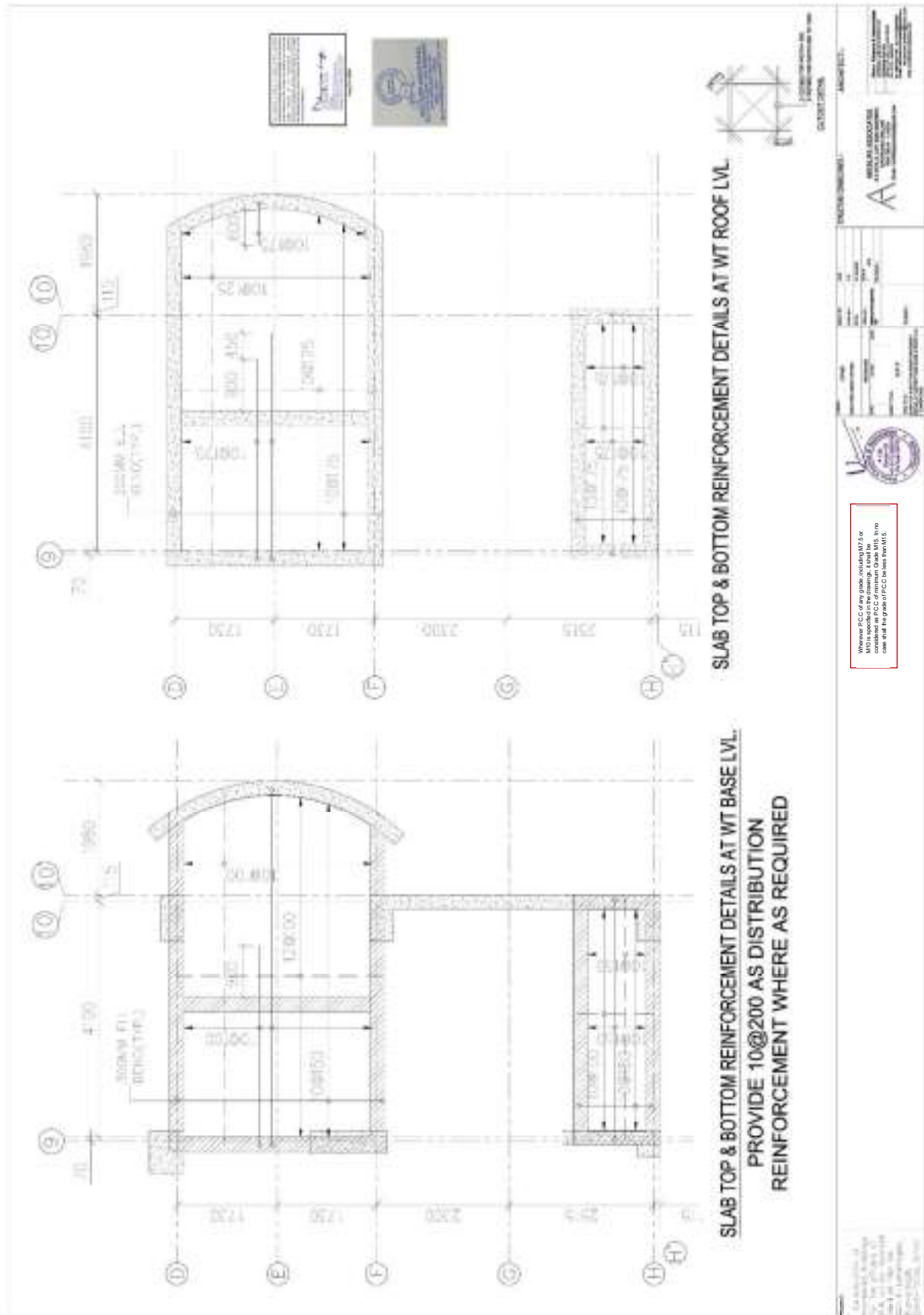












R. No.: SC/GT1/2409/0289

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REPORT ON GEOTECHNICAL INVESTIGATION

(As per IS: 1892:1979)



REPORT FOR

M/S RENU KHANNA & ASSOCIATES

CLIENT

EXECUTIVE ENGINEER

CPWD, DIGHA PROJECT, PATNA

NAME OF PROJECT

GEOTECHNICAL INVESTIGATION WORK FOR ROPOSED
"RBI STAFF QUARTER" AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR.

LOCATION

LOHIA NAGAR, KANKARBAGH, PATNA



NABL ACCREDITED / AN ISO 9001:2015 CERTIFIED LABORATORY

House No. 106/E, Rajesh Kumar Path, South S. K. Puri,
Near Satyendra Narayan Sinha Children's Park,
Boring Road, Patna (BIHAR) – 800001
Mob. +91-9204068287 / 9472880152 / 9122521976

Email: soiltechlab@gmail.com Visit us: www.soiltechconsultants.in

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		House No. 106/E, Sri Krishna Puri, Near Children's Park, Boring Road, Patna (BIHAR) – 800001 Mob. No. : 09204068287 / 9472880152 / 9122521976 Email : soiltechlab@gmail.com Visit us: www.soiltechconsultants.in
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		House No. 106/E, Sri Krishna Puri, Near Children's Park, Boring Road, Patna (BIHAR) – 800001 Mob. No. : 09204068287 / 9472880152 / 9122521976 Email : soiltechlab@gmail.com Visit us: www.soiltechconsultants.in	
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1. PROJECT DETAILS			
Name of Client	: Executive Engineer, CPWD, Digha Project, Patna		
Name of Consultants/ Contractor/Agency	: M/s Renu Khanna & Associates		
Project Name	: Geotechnical Investigation Work for Proposed "RBI Staff Quarter" at Lohia Nagar, Kankarbagh, Patna, Bihar.		
Executed By	: SOILTECH CONSULTANTS		
Ref. Code / Test Method	: IS 1498:1970, IS 1892:1979, IS 2131:1981, IS 2720, IS 2911:2010, IRC 78:2014, IS 8009, IS 6403:1981		
Report No.	: SC/GTI/2409/0289	Report Date	: 16.09.2024
Job Order No.	: SC/2409/0289		
Location	: Lohia Nagar, Kankarbagh, Patna	Bore-Hole ID	: See Bore-Logs
Sample No.	: See Summary Sheet	Depth of Borehole	: 50/30/21 m
Type of Boring	: Wash Boring with SPT	Dia. of Borehole	: 150 mm
Field Work Commencement Date	: 24.08.2024	Depth of Casing	: 1.5 m
Field Work Completion Date	: 05.09.2024	Type of Casing	: Guide Casing
No. of Bore-hole	: 06	Bentonite	: As per Requirement
For Soiltech Consultants  (Er. Ravi Kumar) Authorized Signatory 			



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2. PREFACE

In the following pages we have presented the report with analysis, prepared from the thorough study of geotechnical investigation results.

The detail scope of work was decided by the client/consultant. The test location detail is shown in the report.

A complete geotechnical investigation work was undertaken to obtain the required subsurface information to study and define the nature and behavior of soil, under application of loads of proposed structures. Such information's were obtained through following steps:

- By making test bories and collecting disturbed and undisturbed soil samples
- By SPT in the boreholes, we obtain soundings of penetration resistance
- By estimating ground water table in boreholes
- By performing required in-situ tests
- By testing soil in laboratory to classify it and to determine the engineering properties of soil
- Chemical analysis of soil/water sample to check durability of concrete

The main function of a foundation is to distribute or transmit all the loads coming over it to the strata upon which it rests.

The knowledge of the characteristics of underlying strata is therefore very essential for safe & economical design of the foundation. The performance of supporting stratum depends upon the physical properties of subsoil, type & shape of footing & structure, water table depth etc.

It is therefore necessary to have sufficient information about the arrangement & behavior of the underlying materials and their physical properties, for adopting and designing the structural foundation. Soil/Rock exploration through field investigation and relevant laboratory testing of the sub-strata materials are essential to arrive at required parameter for designing of foundation.

Recommendations are also given after thorough and careful study of present soil conditions regarding the suitability of type of foundation, and regarding the precautions and protective measures to be taken, if found necessary.





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3.0 GEOLOGICAL INFORMATION OF THE REGION

Regional Geology is the geological study of large-scale regions which encompasses multiple geological disciplines to piece together the history of an area. The size and the border of each region are defined by geologically significant boundaries and by the occurrence of geological processes.

The erstwhile State of Bihar covers an area of 1,73,976 sq. km. bounded between latitudes 22° 00' N and 27° 31' N and longitudes 83° 20' E and 88° 15' E being bordered with Nepal in the north, Orissa in the south, West Bengal in the east, Uttar Pradesh in the west and Madhya Pradesh in the southwest. After bifurcation of the state in the year 2000, presently the state of Bihar covers an area of 94,163 sq. km. bounded between latitudes 24° 20' 10" – 27° 31' 15" N and longitudes 83° 19' 50" – 88° 17' 40" E being bordered with Nepal in the north, West Bengal in the south-east, Uttar Pradesh in the west and Jharkhand in the south, while the state of Jharkhand lying between latitudes 22° 00' N and 24° 15' N and longitudes 83° 20' E and 87° 55' E, covers an area of 79,714 sq. km.

3.1 LOCATION

Muzaffarpur lies in North Bihar (i.e. North of Ganga). It covers a geographical area of 3,132 sq. km. and lies between North Latitude 25° 54' 00" – 26° 23' 00" and East Longitude 84° 53' 00" – 85° 45' 00". It is surrounded by Sitamarhi and East Champaran in north and Vaishali and Saran in south whereas in east. It is surrounded by Darbhanga and Samastipur and in west by Saran and Gopalganj district.

North Ganga plain is a major physiographic unit of the Indian landmass. It extends from the Himalayan terrain in the north to the river Ganga in the south covering about 56,980 sq. km. A roughly quadrilateral shape, generally recognized as "a water-surplus area", this quadrilateral region is bounded by a northern piedmont belt where water oozes to the surface, followed by a broad belt of swampy lands, depressions and lakes, and finally an aggregation of alluvial fans as all these northern streams bend to form confluence points with the Ganga.

During Pre monsoon and Post monsoon season, the minimum and maximum water levels were observed as 2 to 10 m bgl respectively and same in post monsoon season.

3.2 CHEMICAL QUALITY OF GROUND WATER

Quality of Water Samples from Budhi Gandak Belt, the pH of groundwater is varied from 7.33 to 7.65. The Electric Conductivity (EC) varied from 540 to 951 μScm^{-1} . The TDS of the groundwater varied from 355 to 572 mg/L. Calcium and Magnesium dissolved in water are the two most common minerals that make water "Hard" along with their carbonates, sulphates and chlorides in groundwater. Total Hardness varied from 130 to 237 mg/L.

(Note – Water should be tested before the start of the project for relevant test parameter for construction purpose.)



3.3 SEISMICITY

Bihar region has prolonged seismic history and available records indicate the occurrence of earliest recorded (historically) seismic event. In 1934 Bihar earthquake or 1934 Bihar-Nepal earthquake was one of the worst earthquakes in India's history. Munger (Begusarai was part of Munger at that time) and Muzaffarpur were completely destroyed. This 8.0 magnitude earthquake occurred on 15 January 1934 at round 2.13 PM IST (08:43 UTC) and caused widespread damage in the northern Bihar and Nepal. The epicentre of this event was located in the eastern Nepal about 9.5 km south of Mount Everest. The frequent earthquake ranging in magnitude somewhere around 7.8 – 8.1 has again hit the area of Nepal and Bihar during April and May 2015.

Bihar is located in the high seismic zone that falls on the boundary of the tectonic plate joining the Himalayan tectonic plate near the Bihar-Nepal Border and has six sub-surface fault lines moving.



References:

- Geological Survey of India
- Annual Report, 2013-Central Ground Water Board (Ministry of Water Resources, Govt. of India)
- IS : 1893 – Criteria for Earthquake Resistant Design of Structures
- IS 2911 (Part 1/Sec 2) : 2010



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4. INTRODUCTION This report deals with geotechnical investigation work for Proposed "RBI Staff Quarter" at Lohia Nagar, Kankarbagh, Patna, Bihar. The work of geotechnical investigation has been awarded to us, from the side of M/s Renu Khanna & Associates. The objective of the investigation was to determine sub-soil characteristic at site and evaluate soil parameter for design and construction of foundation. The number and depth of borehole was decided by the client/consultant. ❖ Six boreholes executed up to the depth of maximum 50, 30 & 21 meter below ground level in order to know the sub-surface stratification, conducting necessary field tests and to collect disturb and undisturbed soil samples for laboratory testing. The report has been prepared after careful study of all field and laboratory test data, and it deals with the geotechnical investigation properties of sub-soil. The remaining part of this report covers Bore Log Sheet, Laboratory Test Summary Results, and Sub-Soil Stratification and Graphical representation to evaluate safe bearing capacity (SBC) of the soil for given foundation sizes and necessary recommendations for foundation design and construction. The actual investigation work was started on 24th August 2024 and completed on 05th September 2024.	
	



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5.0 SUB – SURFACE EXPLORATION

5.1 BOREHOLES

Six numbers of boreholes of diameter 150 mm were made within the proposed layout. The boreholes were drilled up to the depth of 50, 30 & 21 meter or if rocks were encountered up to that depth. Where caving of the borehole occurred, casing and Bentonite was made to keep the borehole stable. The work was in general accordance with IS 1892:1979. The locations of boreholes have been reported in Bore-Logs Sheet.

5.2 DISTURBED SAMPLES

In all boreholes, disturbed soil samples were taken at every 1.5 m interval and at significant change of stratum (or as per specified). Disturbed samples were collected from split spoon sampler after conducting SPT. These samples were placed without delay in adequately sealed polythene bags. The results have been reported under the title "Summary of Laboratory Test Results".

5.3 UNDISTURBED SAMPLES

Undisturbed samples were collected using 100 mm dia. and 450 mm long thin walled "Shelby" tubes and driving the sampler using a 63.5 kg hammer in accordance with IS 2132:1986. Collection of UDS in very hard cohesive soils/dense granular soils/gravels/cobbles/pebbles/boulders, refusal strata is practically not possible and such collected samples will not truly represent the undisturbed conditions.

Immediately after taking an undisturbed sample in a tube, the adapter head was removed along with the disturbed material. The visible ends of the sample shall each be trimmed off any wet disturbed soil. The tubes were sealed with wax at both ends. The results have been reported under the title "Summary of Laboratory Test Results".

5.4 DEPTH OF WATER TABLE

The water table at this site was encountered at 3.0 meter during the boring operation. Depth of water table was recorded as per IS 6935:1973.

5.5 METHOD OF SAMPLING

Sampler is coupled together with a sampler head to form a sampling assembly. The sampler head provides an on-flexible connection between the sampling tube and the drill rods. Vent holes are provided in the sampler head to allow escape of water from the top of sampler tube during penetration. The sampling tubes are made free from dust and rust. Coating of oil is applied on both sides to obtain the undisturbed samples in best possible manner. The sampler is then lowered inside the borehole on a string of rods and driven to a pre-determined level.

On completion of driving the sampler is first rotated within the borehole to shear the soil sample at bottom and then pulled out. Upon removal of the sampling tubes, the length of sample in the tube is recorded. The disturbed material in the upper end of the tube, if any, is completely removed before sealing. The soil at the lower end of the tube is trimmed to a distance of about 10 to 20 mm. After cleaning and inserting an impervious disc at each end, both ends are sealed. The empty space in the sampler, if any, is filled with the moist soil, and the ends covered with tight wrapper. The identification mark is then made on each sample.



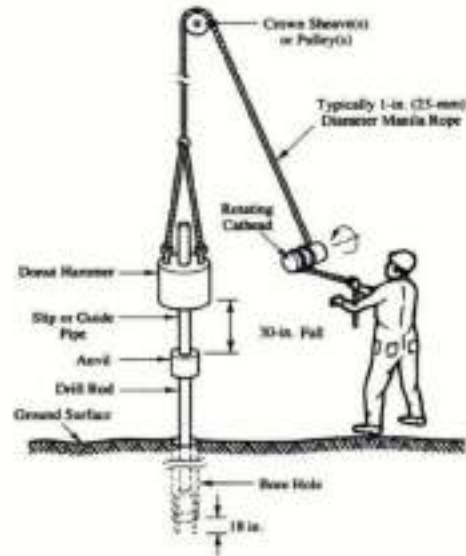
5.6 STANDARD PENETRATION TEST

The standard penetration tests are conducted at 1.5 meter interval as per IS 2131:1981 in each bore. For conducting the test, the bottom of the borehole was properly cleaned and split spoon sampler was properly seated in position in the borehole. The split spoon sampler resting on the bottom of borehole was allowed to sink under its own weight; then the sampler was seated 15 cm with the blows of the hammer of 63.5 Kg weight falling through 75 cm. Thereafter, the split spoon sampler was further driven by 30 cm. The number of blows required to affect each 15 cm of penetration was recorded. The first 15 cm of drive is considered to be seating drive.

The total blows of penetration for the second and third 15 cm of penetration is termed the penetration resistance N value. The 'N' values are indicative of the compactness / relative density of cohesion less soils and consistency of cohesive soils.

In case, where the 'N' value exceeds 50, the penetration of split spoon sampler (after initial seating) is recorded together with the number of blows given of the sampler. Where the seating blow count exceeds 50, the 'N' value is recorded as "Refusal". The N-value for each borehole is given in Bore-logs.

SPT 'N' values are correlated with relative density of non-cohesive stratum as per BS 5930:2015 - for sandy strata and with consistency of cohesive stratum.



Correlation for Clay/Plastic Silt		Correlation for Sand/Non-Plastic Silt	
Consistency	Penetration Value (Blows)	Consistency	Penetration Value (Blows)
Very Soft	0 - 2	Very Loose	0 - 4
Soft	3 - 4	Loose	5 - 10
Medium Stiff	5 - 8	Medium Dense	11 - 30
Stiff	9 - 16	Dense	31 - 50
Very Stiff	17 - 32	Very Dense	Above 50
Hard	Above 32		





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6.0 DESCRIPTION OF VARIOUS LABORATORY TESTS

6.1 Natural Moisture Content Test (Water Content) – IS 2720 Part-2 : 1973

A moisture cap is loosely filled with soil sample and weighed with lid. It is then kept in oven with lid removed and maintained at temperature of oven at $110 \pm 5^\circ\text{C}$ for 24 hours. The lid of the container is then replaced and the dry weight found out.

The % of NMC is calculated as :

$$w = \frac{W_2 - W_1}{W_3 - W_1} \times 100$$

Where, w = Moisture Content

W_1 = mass of container with lid, g.

W_2 = mass of container with lid + wet soil, g.

W_3 = mass of container with lid + dry soil, g.

6.2 Bulk and Dry Density Test – IS 2720 Part-29 : 1975

The unit weight of soil in gm/cm^3 is its weight per unit volume. Soil is filled in container and its weight determined. Knowing the volume of Sampler, the ratio of weight to volume represents bulk density (γ_b). The soil is then oven dried and weighed and dry density (γ_d) is computed using formula:

$$\gamma_d = \frac{100\gamma_b}{100 + w}, \text{ gm/cm}^3$$

Where, w = Moisture Content, %

γ_b = Bulk Density of wet soil, g/cm^3

6.3 Specific Gravity Test – IS 2720 Part-3 : 1980

The specific gravity of soil is determined by a 50 ml density bottle. The weight (m_1) of the empty dry bottle is taken first. Samples of oven-dried soil about 5-10 g transfer it to the density bottle, and weight (m_2) of the bottle and the soil taken. The bottle is then filled with distilled water gradually removing the entrapped air either by applying (m_3) of the bottle, soil and water (full up to the top) is then taken. Finally, the bottle is emptied completely and thoroughly washed and clean water is filled to the top and the weight (m_4) is taken.

$$G = \frac{m_2 - m_1}{(m_3 - m_1) - (m_4 - m_2)}$$

6.4 Grain Size Analysis – IS 2720 Part-4 : 1985

Sieve Analysis: Sieve analysis is done by wet sieving method. Oven dried soil is washed through 75 μm IS sieve. Fraction retained was oven dried and particle size analysis carried out using sieve shaker by passing through the following IS sieve: 10.00 mm, 4.75 mm, 2.36 mm, 2.00 mm, 1.18 mm, 600 μm , 425 μm , 300 μm , 150 μm and 75 μm respectively.

Hydrometer Analysis: 50g of soil 75 μm passing IS sieve was mixed with 3.3g passing sodium Hexametaphosphate and 0.7g sodium carbonate and soil suspension prepared. Suspension was made up to 1000 ml distilled water and then shaken thoroughly. Hydrometer is immersed to a depth slightly below its floating position and then allowed to float freely. Hydrometer readings are taken at 15, 30 sec and 1, 2, 4 min. subsequently at 8, 15, 30 min. and 1, 2, 4 hour and finally at 8, 16 and 24 hours interval. Diameter of the particle in suspension at any sampling time's is calculated using "Stokes" formula and the percentage finer was calculated. In the semi log graph, silt and clay fractions are indicated along with coarser fractions.

6.5 Atterberg's Limit Tests – IS 2720 Part-5 : 1985

Liquid Limit: Liquid limit test on cohesive has been done using the more "reliable cone penetrometer", method where errors of grove cutting involved in Casagrande's device are minimized. In cone penetrometer test about 200 g of passing 425 μm sieves is taken mixed with requisite water, placed in cup and compacted lightly in 3 layers. The tip of penetrometer is adjusted such that it just touches soil surface. The needle is allowed to plunge slowly under its own weight for 5 seconds and penetration in mm is recorded. The water content is adjusted such that penetration is between 20-30 mm. The following relationship is used to evaluate liquid limit.





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Plastic Limit: About 15g of oven dried soil passing through 425 µm sieve is mixed with sufficient quantity of water to become plastic enough to be easily shaped into a ball. A portion of this ball is rolled on a glass plate with the palm into a thread of uniform diameter of 3mm. The corresponding water content represents the plastic limit of the soil.

Plastic Index: PI = Liquid limit – Plastic limit.

6.6 Shrinkage Limit Tests – IS 2720 Part-6 : 1972

It is the maximum water content expressed as percentage of oven-dry weight at which any further reduction in water content will not cause a decrease in volume of the soil mass is calculated as follows:

$$SL = W - \frac{V - V_d}{W_d} \times 100$$

Where,

SL = Shrinkage limit in %.

W = Moisture content of wet soil pat in %.

V = Volume of wet soil pat in ml.

V_d = Volume of dry soil pat in ml.

W_d = Weight of oven-dried soil pat in gm.

6.7 Unconfined Compressive Strength Tests – IS 2720 Part-10 : 1991

For the determination of shearing strength, a specimen may or may not be subjected to a lateral pressure during the test. When it is not, the test is known as unconfined compression test. The purpose of this test is to obtain a quantitative value of compressive and shearing strength of soils in an undrained state. After placing the specimen under the plate, force shall be applied so as to produce axial strain at a rate of 0.5 to 2 percent per minute causing failure with 5 to 10. The force reading shall be taken at suitable intervals of the deformation dial reading.

The specimen shall be compressed until failure surfaces have definitely developed, or the stress-strain curve is well past its peak, or until an axial strain of 20 percent is reached. The failure pattern shall be sketched carefully and shown on the data sheet or on the sheet presenting the stress-strain plot. The angle between the failure surface and the horizontal may be measured, if possible, and reported.

6.8 Triaxial Shear Test (Unconsolidated Un-drained) – IS 2720 Part-11 : 1993

The extracted specimen is then placed in triaxial cell pedestal. The cell is assembled and placed on loading machine. A cell pressure through an operating fluid (oil) was applied. The plunger was made to have proper contact with specimen. A compressive force at a constant strain rate of 1.25mm/min is applied, till the failure occurred within a period of 5 - 15 minutes or till the failure of 20% strain was removed, cell chamber cleaned and test continued on a new specimen. The test was repeated on three different specimens at three different cell pressures as per standard practice.

Mohr-Coulomb envelopes were drawn for three stress values recorded and total stress parameters interpreted from the Mohr-Coulomb graph.

6.9 Direct Shear Test – IS 2720 Part-13 : 1986

Direct shear test is carried out using shear box with the specimens (60x60 mm). Specimen with plain grid plate at the bottom of the specimen and plain grid plate at the top of the specimen is fitted in to position in the shear box housing and assembly placed on the load frame. The serrations of the grid plates are kept at right angle to the direction of shear. The loading pad is kept on the top grid plate. The required normal stress is applied and the rate of longitudinal displacement shear stress application so adjusted that no drainage can occur in the sample during test (1.25mm/min). The upper part of the shear box is raised such that a gap of about 1mm is left between the two parts of the box. The test is conducted by applying horizontal shear load to failure or to 20 % longitudinal displacement whichever occurs first. The test is repeated on identical specimens.





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6.10 Consolidated Test – IS 2720 Part-15 : 1986

Consolidation test was done to evaluate compressibility behaviour of stiff/hard clayey silt.

The empty consolidation ring W_1 is weighed. Representative sample for testing is extruded and cut off; care being taken to ensure that the two plane faces of the resulting soil is care parallel to each other. The soil sample thus obtained is trimmed flush with the top and bottom edges of the ring. A sample of soil similar to that in the ring taken from the trimmings is used for determining moisture content. The thickness of the specimen (H_0) is measured and it is weighed immediately (W_2). The bottom porous stone is centred on the base of the consolidation cell. The ring and specimen is placed centrally on the bottom porous stone and then the loading cap is placed on top. The consolidometer is placed in position in the loading device and suitably adjusted. The dial gauge is then clamped into position for recording the relative movement between the base of the consolidation cell and the loading cap. A seating pressure of 0.05 kg/cm^2 is applied to the specimen. The consolidation cell is filled with distilled water. The specimen is then allowed to reach equilibrium for 24 hrs. The test is continued using a loading sequence, which would successively apply stress of 0.1, 0.2, 0.4, 0.8, 1.6, 3.2 kg/cm^2 etc. on the soil specimen. For each loading increment, after application of load, readings of the dial gauge are taken using a time sequence such as 0, 0.25, 1, 2.25, 4, 6.25, 9, 12.25, 16, 20.25, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225 min., up to 24 hr or 0, $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 4, 8, 15, 30, 60 min, and 2, 4, 8 and 24 hr. These time sequences facilitate plotting of thickness or change of thickness of specimen against square root of time or against log time. The loading increment is left until readings become more or less constant. On completion of the final loading stage the specimen is unloaded by suitable pressure decrements. Dial gauge readings are taken as necessary during each stage of unloading. On completion of the decrement, the water is siphoned out of the cell and the consolidometer is rapidly dismantled after release of the final load. The specimen, preferably with in the ring, is wiped free of water, weighed (W_3) and thereafter placed in the oven for drying. Following drying, the specimen plus ring is reweighed (W_4). E-log P curve is drawn and consolidation parameters deduced.

6.11 Free Swell Index Test – IS 2720 Part-40 : 1977

In this test 10 gm of soil passing IS sieve 425 μm is taken. Two graduated cylinders of 100 ml capacity are taken. One cylinder is filled with Kerosene oil and the other with distilled water and soil. Remove entrapped air by shaking well and stirring using a glass rod. Allow the soil in both the jars to settle for a sufficient time (not less than 24 hours) for the soil sample to attain equilibrium state of volume without any further changes. Free swell index is calculated as follows:-

$$F.S.I., \% = \frac{V_d - V_k}{V_k} \times 100$$

6.12 Swelling Pressure Test – IS 2720 Part-41 : 1977

The swell pressure tests are carried out at field dry density with zero percent moisture content and by constant and volume method. An oven dry soil specimen is compacted into the specimen ring with the specimen kept in between two porous stone saturated in boiling water providing a filter paper between the soil specimen and the porous stones. The loading block is then positioned centrally on the top of the porous stone. The assembly is then placed on the platen of loading unit.

The load measuring proving ring is attached to the load frame and placed in contact with the consolidation cell without any eccentricity. A direct strain measuring dial gauge is fitted to the cell. The specimen is then inundated with distilled water and allowed to swell. The initial reading of the proving rings noted. The swelling of the specimen with increasing volume is obtained in the strain measuring load gauge. The specimen is kept at constant volume by adjusting the strain dial gauge always at original reading. This adjustment is done at every 0.1 mm of swell or earlier. The swell pressure is then calculated from the difference between the final and initial dial readings of the proving ring. Swell pressure (kg/cm^2) is calculated as follows:

SP = [(Final dial gauge reading - Initial dial gauge reading) / Area of specimen] x Calibration factor of the proving ring.





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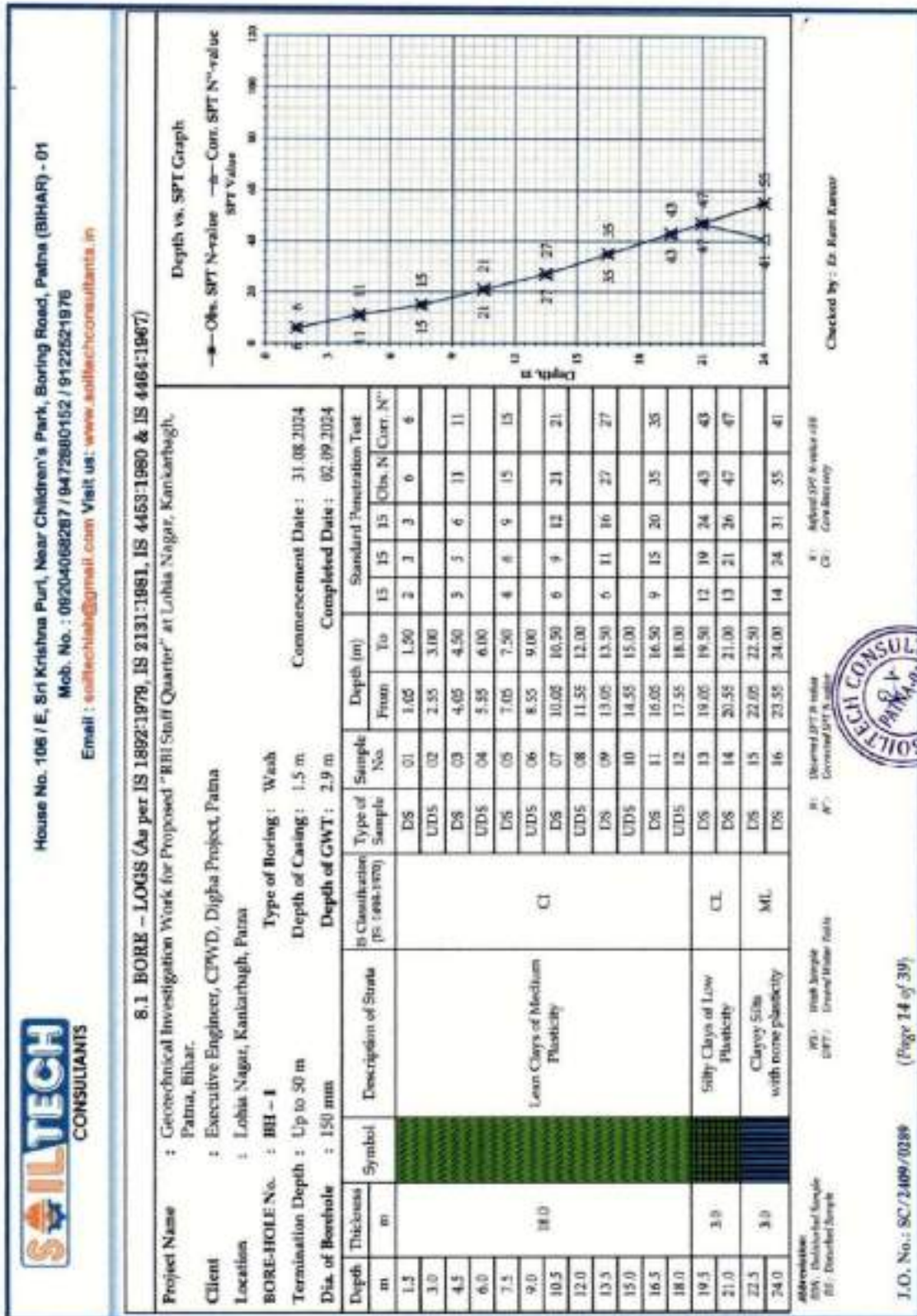
7. SOIL STRATIFICATION

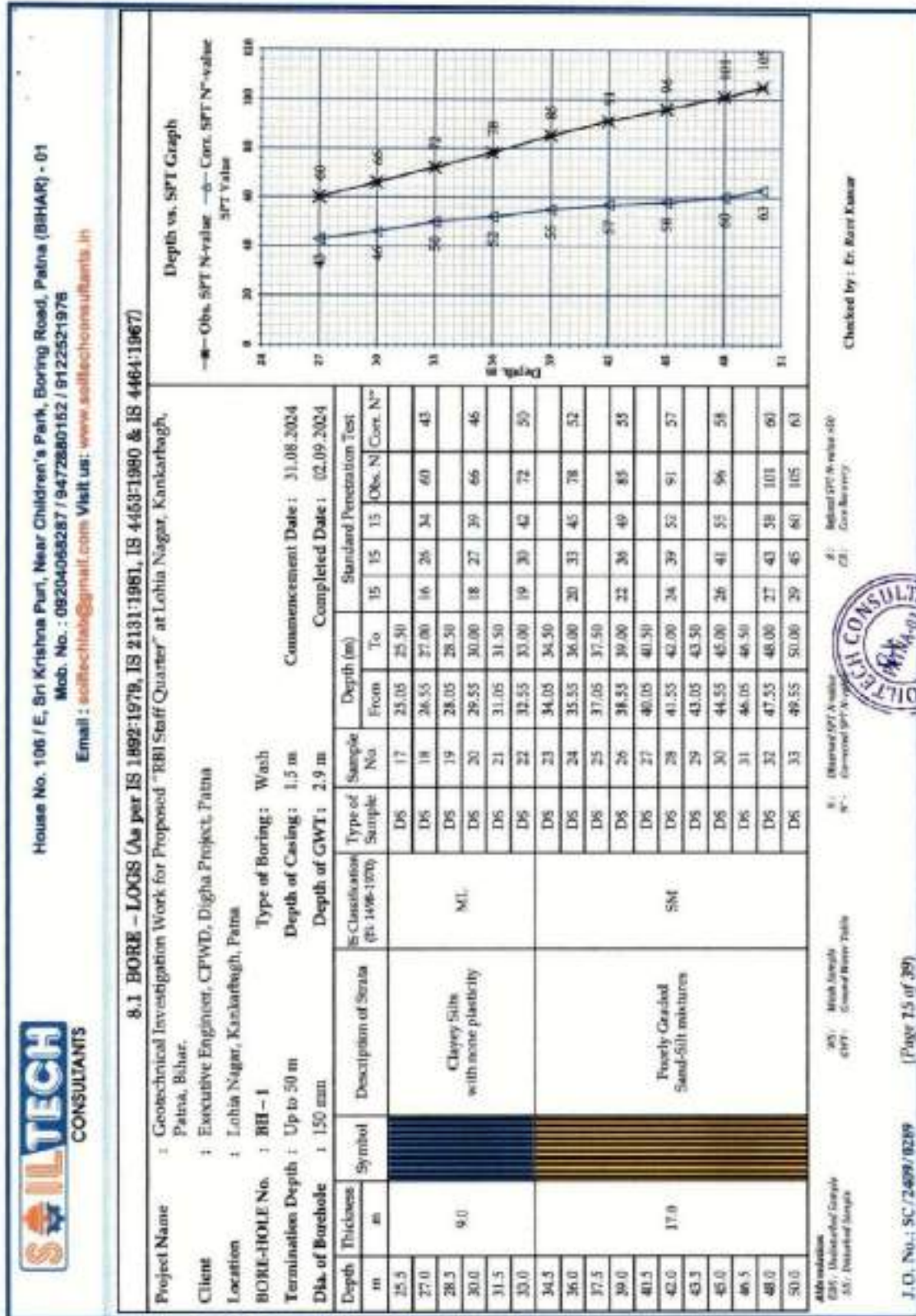
The salient features of the soil strata at different boreholes as inferred from field and laboratory tests are indicated below:

Chainage / Boreholes No.	Depth of Strata, (Meter)	Soil Type	Soil Characteristic
BH – 1	0.0 – 18.0 m	Lean Clays of Medium Plasticity	Medium to Very Stiff
	18.0 – 21.0 m	Silty Clays of Low Plasticity	Hard
	21.0 – 33.0 m	Clayey Silts with none plasticity	Very Dense
	33.0 – 50.0 m	Poorly Graded Sand-Silt mixtures	Very Dense
BH – 2	0.0 – 18.0 m	Lean Clays of Medium Plasticity	Medium Stiff to Hard
	18.0 – 50.0 m	Poorly Graded Sand-Silt mixtures	Very Dense
BH – 3 & 4	0.0 – 33.0 m	Lean Clays of Medium Plasticity	Soft to Hard
	33.0 – 50.0 m	Poorly Graded Sand-Silt mixtures	Very Dense
BH – 5	0.0 – 24.0 m	Lean Clays of Medium Plasticity	Soft to Hard
	24.0 – 30.0 m	Poorly Graded Sand-Silt mixtures	Dense to Very Dense
BH – 6	0.0 – 21.0 m	Lean Clays of Medium Plasticity	Medium Stiff to Hard

The results of field tests in Six boreholes sunk at the site, the results of Laboratory tests conducted on the collected soil samples indicate that the soil stratification at the site is as described above table.







A.2 HORE - LOGS (As per IS 1842:1979, IS 2181:1981, IS 4453:1980 & IS 4484:1987)

Project Name	Geotechnical Investigation Work for Proposed "RBI Staff Quarter" at Lohia Nagar, Kamla Bagh, Palna, Bihar.
1	Geotechnical Investigation Work for Proposed "RBI Staff Quarter" at Lohia Nagar, Kamla Bagh, Palna, Bihar.

Client: : Executive Engineer, CPWD, Disha Project, Patna

Location : Lohia Nagar, Kanbarbath, Patna

E-III : ON JOURNALISM

Form	Number	Date	E
Depth of Cut:		1	5

Dts. of Bloods	= 145 mm.	Depth of Cavity	= 70 mm.
Circumference of Chest	= 69 cm.	Weight on Admission	= 42 kg.

Depth of monochrome	Depth of grey	Depth of black
1.50 mm	2.00 mm	2.50 mm

Symbol	Description of Strata	IS Classification (IS 1498-1970)	Type of Sample	Sample No.
--------	-----------------------	----------------------------------	----------------	------------

 文部科学省 Ministry of Education, Culture, Sports, Science and Technology	 国立高等産業科学研究所 National Institute of Advanced Industrial Science and Technology	 国立高等産業科学研究所 National Institute of Advanced Industrial Science and Technology	 国立高等産業科学研究所 National Institute of Advanced Industrial Science and Technology	 国立高等産業科学研究所 National Institute of Advanced Industrial Science and Technology	 国立高等産業科学研究所 National Institute of Advanced Industrial Science and Technology	 国立高等産業科学研究所 National Institute of Advanced Industrial Science and Technology	 国立高等産業科学研究所 National Institute of Advanced Industrial Science and Technology
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[illegible]

100	100
100	100

	6.0	LIDS	M
	6.0	LIDS	M

7.5	125	105
-----	-----	-----

9.0	Loan Class of Medium	UDS	06
-----	----------------------	-----	----

10.5	Plasticity	138	07
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120		105	105
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CUT		(B)
	ST	

[illegible]

	
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[illegible]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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6.0		Poaty Gravel	S&M	15
72.5		Sand-Silt mixture	D85	15

2000	105	16
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[illegible]

U25: Unfractionated Sample	W: Whole Sample	A: Amino Acids
D: Depleted Sample	W: Whole Sample	A: Amino Acids
D: Depleted Sample	W: Whole Sample	A: Amino Acids
U25: Unfractionated Sample	W: Whole Sample	A: Amino Acids
D: Depleted Sample	W: Whole Sample	A: Amino Acids
D: Depleted Sample	W: Whole Sample	A: Amino Acids

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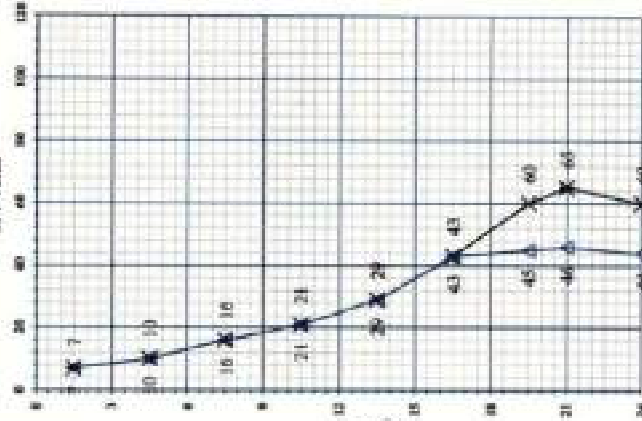
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117 No. 927,400/1033
(Page 16 of 30)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE	EF	EG	EH	EI	EJ	EK	EL	EM	EN	EO	EP	EQ	ER	ES	ET	EU	EV	EW	EX	EY	EZ	FA	FB	FC	FD	FE	FF	FG	FH	FI	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	FU	FV	FW	FX	FY	FZ	GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT	GU	GV	GW	GX	GY	GZ	HA	HB	HC	HD	HE	HF	HG	HH	HI	HJ	HK	HL	HM	HN	HO	HP	HQ	HR	HS	HT	HU	HV	HW	HX	HY	HZ	IA	IB	IC	ID	IE	IF	IG	IH	II	IJ	IK	IL	IM	IN	IO	IP	IQ	IR	IS	IT	IU	IV	IW	IX	IY	IZ	JA	JB	JC	JD	JE	JF	JG	JH	JI	IJ	JK	KL	JM	JN	JO	JP	JQ	JR	JS	JT	JU	JV	JW	JX	JY	JZ	KA	KB	KC	KD	KE	KF	KG	KH	KI	KJ	KK	KL	KM	KN	KO	KP	KQ	KR	KS	KT	KU	KV	KW	KX	KY	KZ	LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	LL	LM	LN	LO	LP	LQ	LR	LS	LT	LU	LV	LW	LX	LY	LZ	MA	MB	MC	MD	ME	MF	MG	MH	MI	MJ	MK	ML	MM	MN	MO	MP	MQ	MR	MS	MT	MU	MV	MW	MX	MY	MZ	NA	NB	NC	ND	NE	NF	NG	NH	NI	NJ	NK	NL	NM	NN	NO	NP	NQ	NR	NS	NT	NU	NV	NW	NX	NY	NZ	OA	OB	OC	OD	OE	OF	OG	OH	OI	OJ	OK	OL	OM	ON	OO	OP	OQ	OR	OS	OT	OU	OV	OW	OX	OY	OZ	PA	PB	PC	PD	PE	PF	PG	PH	PI	PJ	PK	PL	PM	PN	PO	PP	PQ	PR	PS	PT	PU	PV	PW	PX	PY	PZ	QA	QB	QC	QD	QE	QF	QG	QH	QI	QJ	QK	QL	QM	QN	QO	QP	QQ	QR	QS	QT	QU	QV	QW	QX	QY	QZ	RA	RB	RC	RD	RE	RF	RG	RH	RI	RJ	RK	RL	RM	RN	RO	RP	RQ	RR	RS	RT	RU	RV	RW	RX	RY	RZ	SA	SB	SC	SD	SE	SF	SG	SH	SI	SJ	SK	SL	SM	SN	SO	SP	SQ	SR	SS	ST	SU	SV	SW	SX	SY	SZ	TA	TB	TC	TD	TE	TF	TG	TH	TI	TJ	TK	TL	TM	TN	TO	TP	TQ	TR	TS	TT	TU	<th>TW</th> <th>TX</th> <th>TY</th> <th>TZ</th> <th>UA</th> <th>UB</th> <th>UC</th> <th>UD</th> <th>UE</th> <th>UF</th> <th>UG</th> <th>UH</th> <th>UI</th> <th>UJ</th> <th>UK</th> <th>UL</th> <th>UM</th> <th>UN</th> <th>UO</th> <th>UP</th> <th>UQ</th> <th>UR</th> <th>US</th> <th>UT</th> <th>UU</th> <th>UV</th> <th>UW</th> <th>UX</th> <th>UY</th> <th>UZ</th> <th>VA</th> <th>VB</th> <th>VC</th> <th>VD</th> <th>VE</th> <th>VF</th> <th>VG</th> <th>VH</th> <th>VI</th> <th>VJ</th> <th>VK</th> <th>VL</th> <th>VM</th> <th>VN</th> <th>VO</th> <th>VP</th> <th>VQ</th> <th>VR</th> <th>VS</th> <th>VT</th> <th>VU</th> <th>VV</th> <th>VW</th> <th>VX</th> <th>VY</th> <th>VZ</th> <th>WA</th> <th>WB</th> <th>WC</th> <th>WD</th> <th>WE</th> <th>WF</th> <th>WG</th> <th>WH</th> <th>WI</th> <th>WJ</th> <th>WK</th> <th>WL</th> <th>WM</th> <th>WN</th> <th>WO</th> <th>WP</th> <th>WQ</th> <th>WR</th> <th>WS</th> <th>WT</th> <th>WU</th> <th>WV</th> <th>WW</th> <th>WX</th> <th>WY</th> <th>WZ</th> <th>XA</th> <th>XB</th> <th>XC</th> <th>XD</th> <th>XE</th> <th>XF</th> <th>XG</th> <th>XH</th> <th>XI</th> <th>XJ</th> <th>XK</th> <th>XL</th> <th>XM</th> <th>XN</th> <th>XO</th> <th>XP</th> <th>XQ</th> <th>XR</th> <th>XS</th> <th>XT</th> <th>XU</th> <th>XV</th> <th>XW</th> <th>XX</th> <th>XY</th> <th>XZ</th> <th>YA</th> <th>YB</th> <th>YC</th> <th>YD</th> <th>YE</th> <th>YF</th> <th>YG</th> <th>YH</th> <th>YI</th> <th>YJ</th> <th>YK</th> <th>YL</th> <th>YM</th> <th>YN</th> <th>YO</th> <th>YP</th> <th>YQ</th> <th>YR</th> <th>YS</th> <th>YT</th> <th>YU</th> <th>YV</th> <th>YW</th> <th>YX</th> <th>YY</th> <th>YZ</th> <th>ZA</th> <th>ZB</th> <th>ZC</</th>	TW	TX	TY	TZ	UA	UB	UC	UD	UE	UF	UG	UH	UI	UJ	UK	UL	UM	UN	UO	UP	UQ	UR	US	UT	UU	UV	UW	UX	UY	UZ	VA	VB	VC	VD	VE	VF	VG	VH	VI	VJ	VK	VL	VM	VN	VO	VP	VQ	VR	VS	VT	VU	VV	VW	VX	VY	VZ	WA	WB	WC	WD	WE	WF	WG	WH	WI	WJ	WK	WL	WM	WN	WO	WP	WQ	WR	WS	WT	WU	WV	WW	WX	WY	WZ	XA	XB	XC	XD	XE	XF	XG	XH	XI	XJ	XK	XL	XM	XN	XO	XP	XQ	XR	XS	XT	XU	XV	XW	XX	XY	XZ	YA	YB	YC	YD	YE	YF	YG	YH	YI	YJ	YK	YL	YM	YN	YO	YP	YQ	YR	YS	YT	YU	YV	YW	YX	YY	YZ	ZA	ZB	ZC</
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Depth vs. SPT Graph

—●— Obs. SPT N-value —○— Cor. SPT N'-value
SPT Value

Checked by: Dr. David Korman

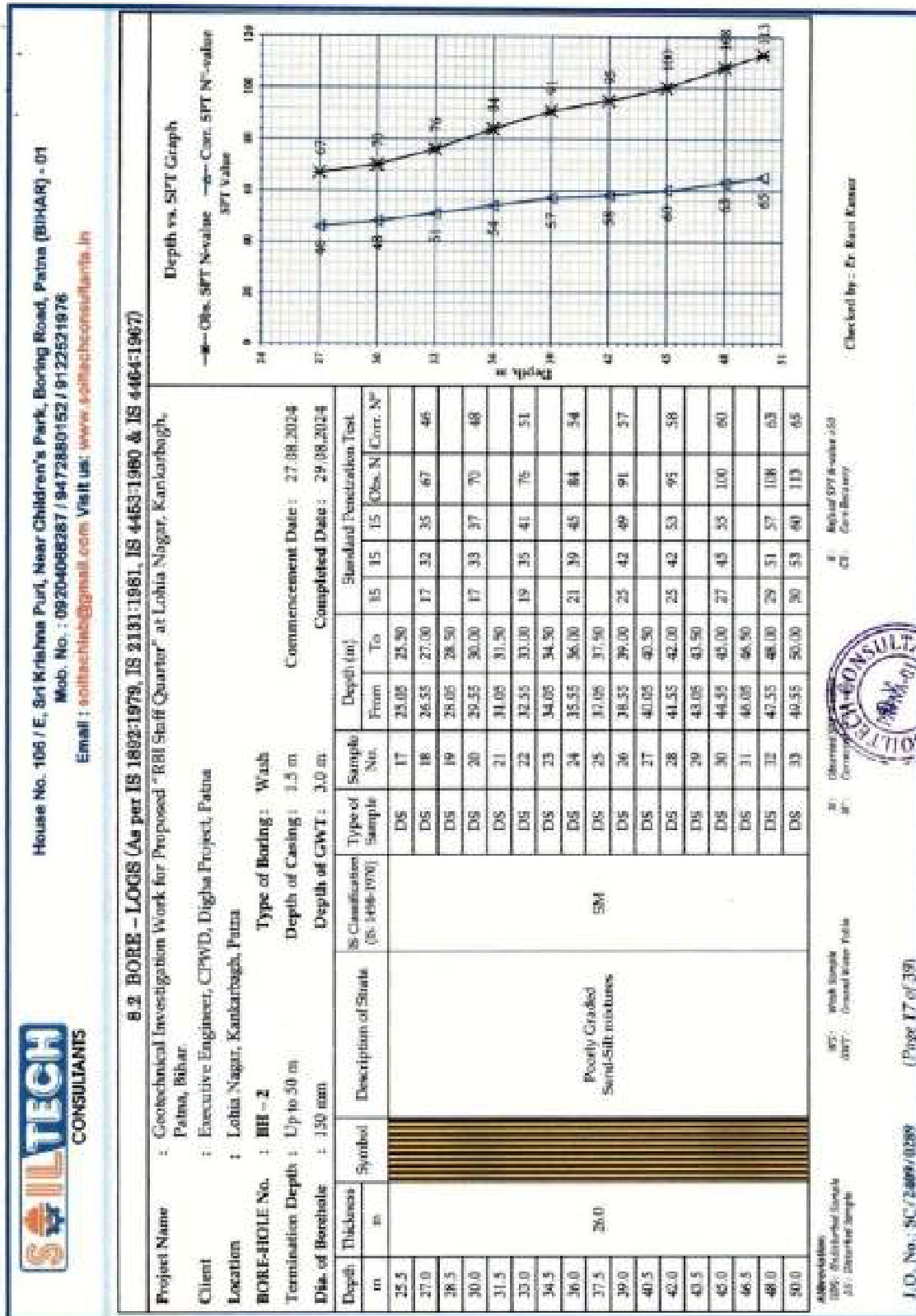
(B) Regional 1990 Initiative - 400
 Core Documents

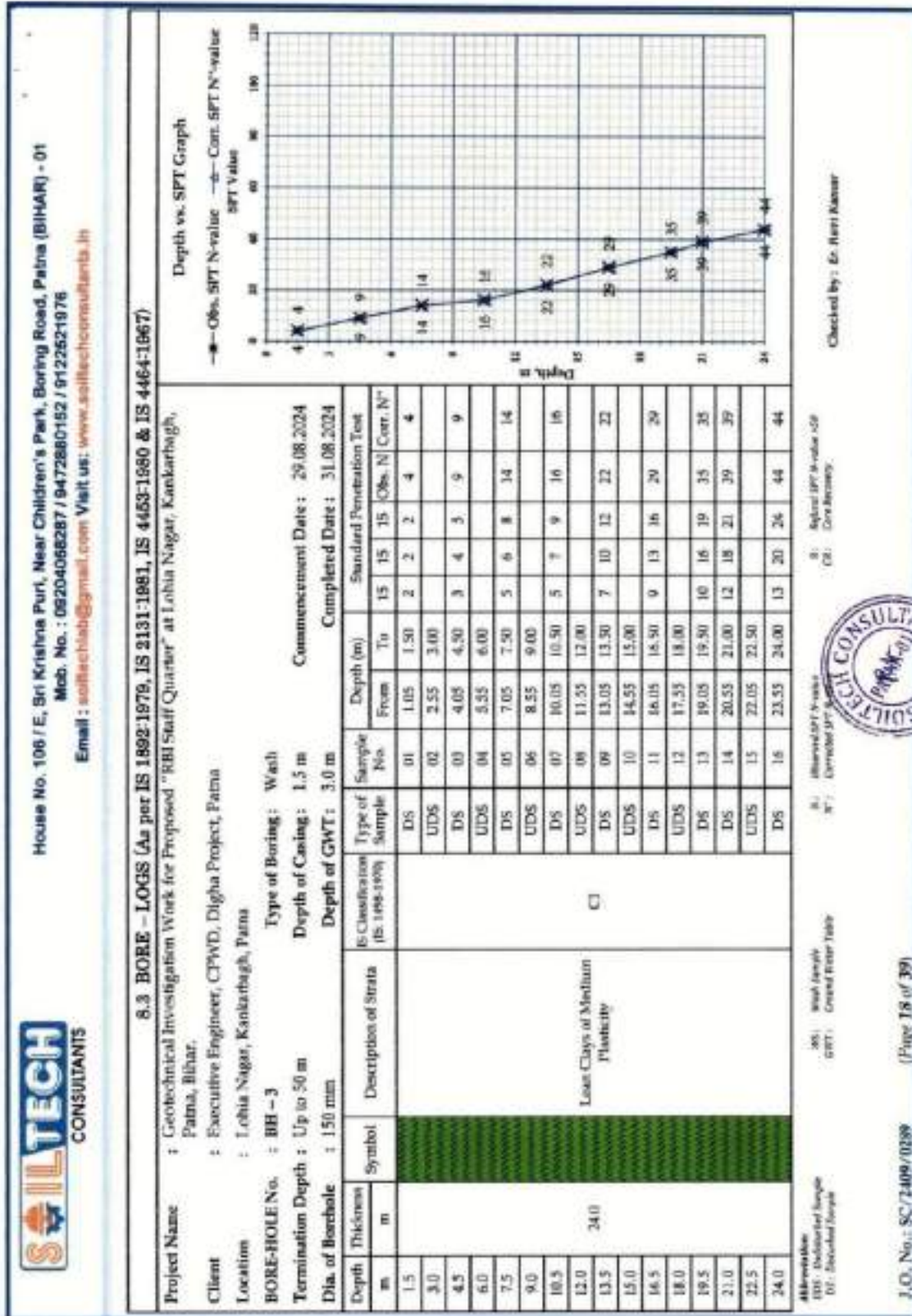
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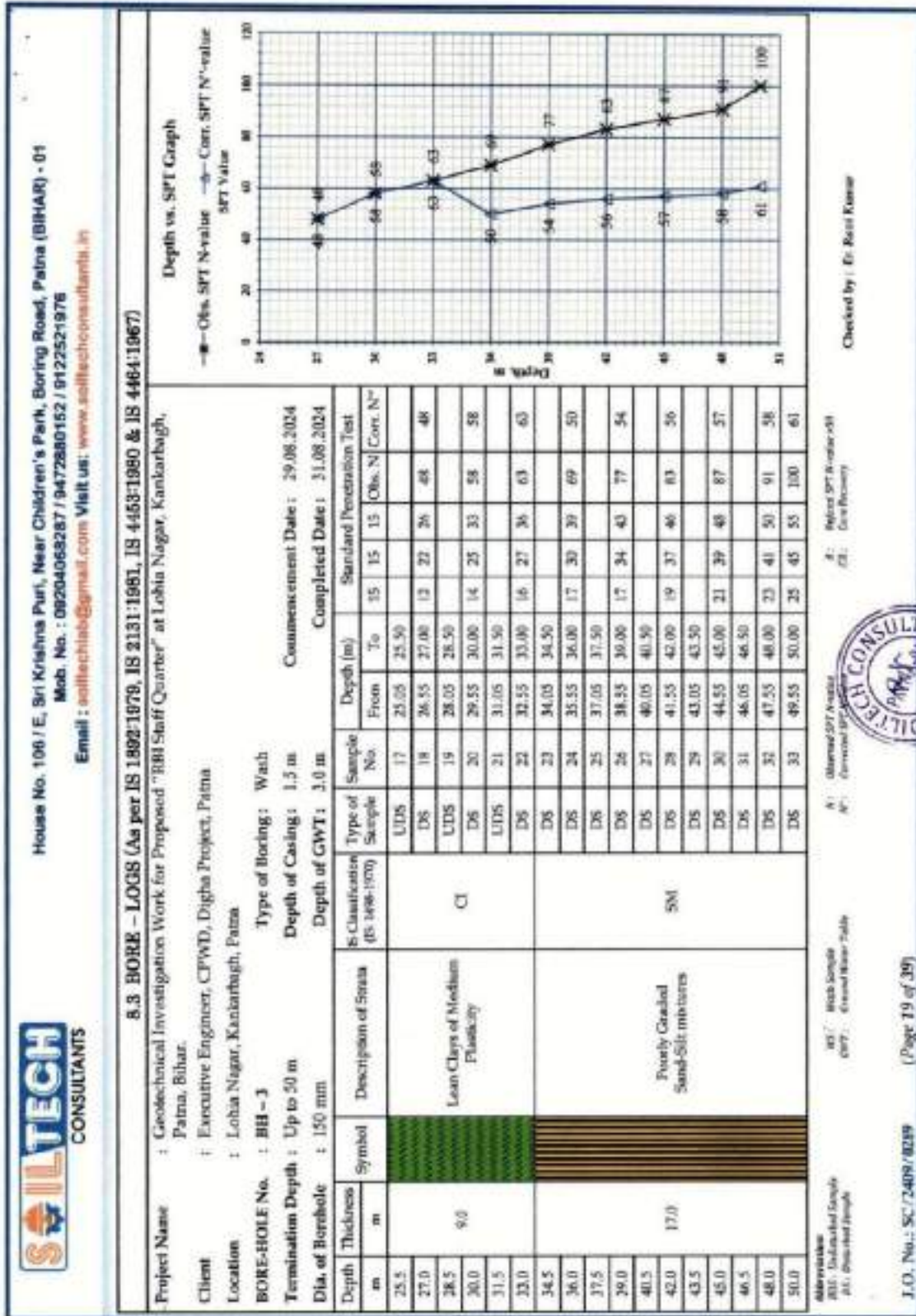
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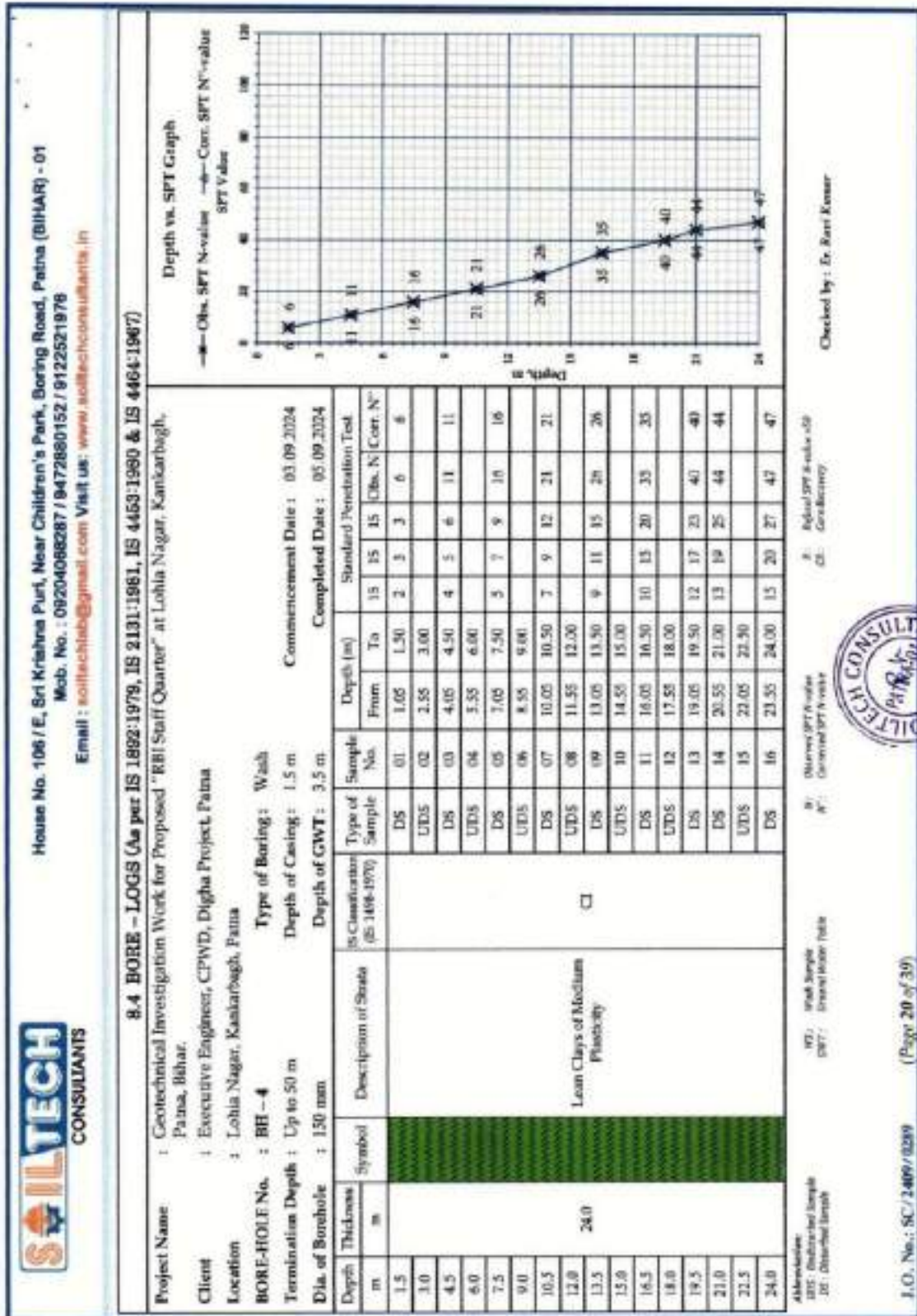
11. *Information Systems*
 12. *Local Government Services*
 13. *Public Works*

I.D. No.: SC72409/0239









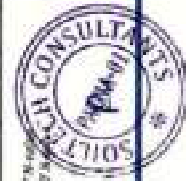
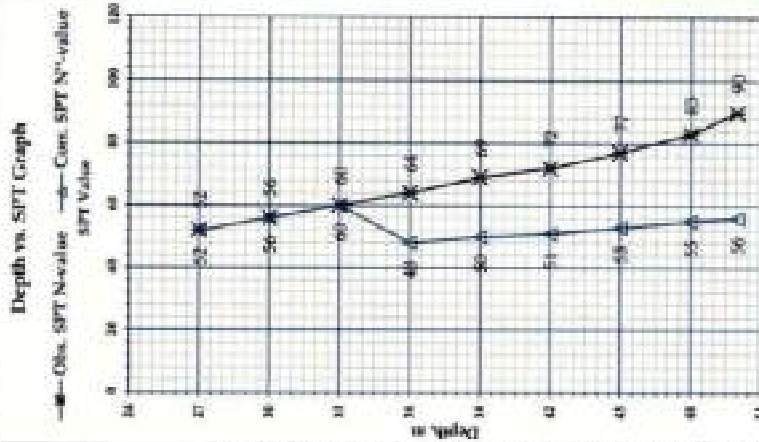


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8.4 BORE - LOGS (As per IS 1892-1979, IS 2131-1981, IS 4463-1980 & IS 4464-1987)

Project Name : Geotechnical Investigation Work for Proposed "RBI Staff Quarter" at Lohia Nagar, Kankarbagh,
 Patna, Bihar
Client : Executive Engineer, CPWD, Digha Project, Patna
Location : Lohia Nagar, Kankarbagh, Patna
BORE-HOLE No. : BE - 4
Type of Boring : Wash
Termination Depth : Up to 50 m
Depth of Casing : 1.5 m
Commencement Date : 03.09.2024
Completed Date : 05.09.2024
Dia. of Borehole : 150 mm
Depth of GWT : 3.5 m

Depth m	Thickness m	Symbol	Description of Strata	IS Classification (IS 1498-1970)	Type of Sample No.	Depth (m)		Standard Penetration Test					
						From	To	15	15	15	15	Obs. N	Corr. N*
25.5	9.0		Lean Clays of Medium Plasticity	CI	UDS	17	25.05	25.50					
27.0					DS	18	26.55	27.00	16	22	30	52	52
28.5					UDS	19	28.05	28.50					
30.0					DS	20	29.55	30.00	16	23	33	56	56
31.5					UDS	21	31.05	31.50					
33.0	17.0		Poorly Graded Sand-Silt mixtures	SM	DS	22	32.55	33.00	18	25	35	60	60
34.5					DS	23	34.05	34.50					
36.0					DS	24	35.55	36.00	19	27	37	64	64
37.5					DS	25	37.05	37.50					
39.0					DS	26	38.55	39.00	20	30	39	69	50
40.5					DS	27	40.05	40.50					
42.0					DS	28	41.55	42.00	20	31	41	72	51
43.5					DS	29	43.05	43.50					
45.0					DS	30	44.55	45.00	22	33	44	77	53
46.5					DS	31	46.05	46.50					
48.0					DS	32	47.55	48.00	24	36	47	81	53
50.0					DS	33	49.55	50.00	26	39	51	90	56

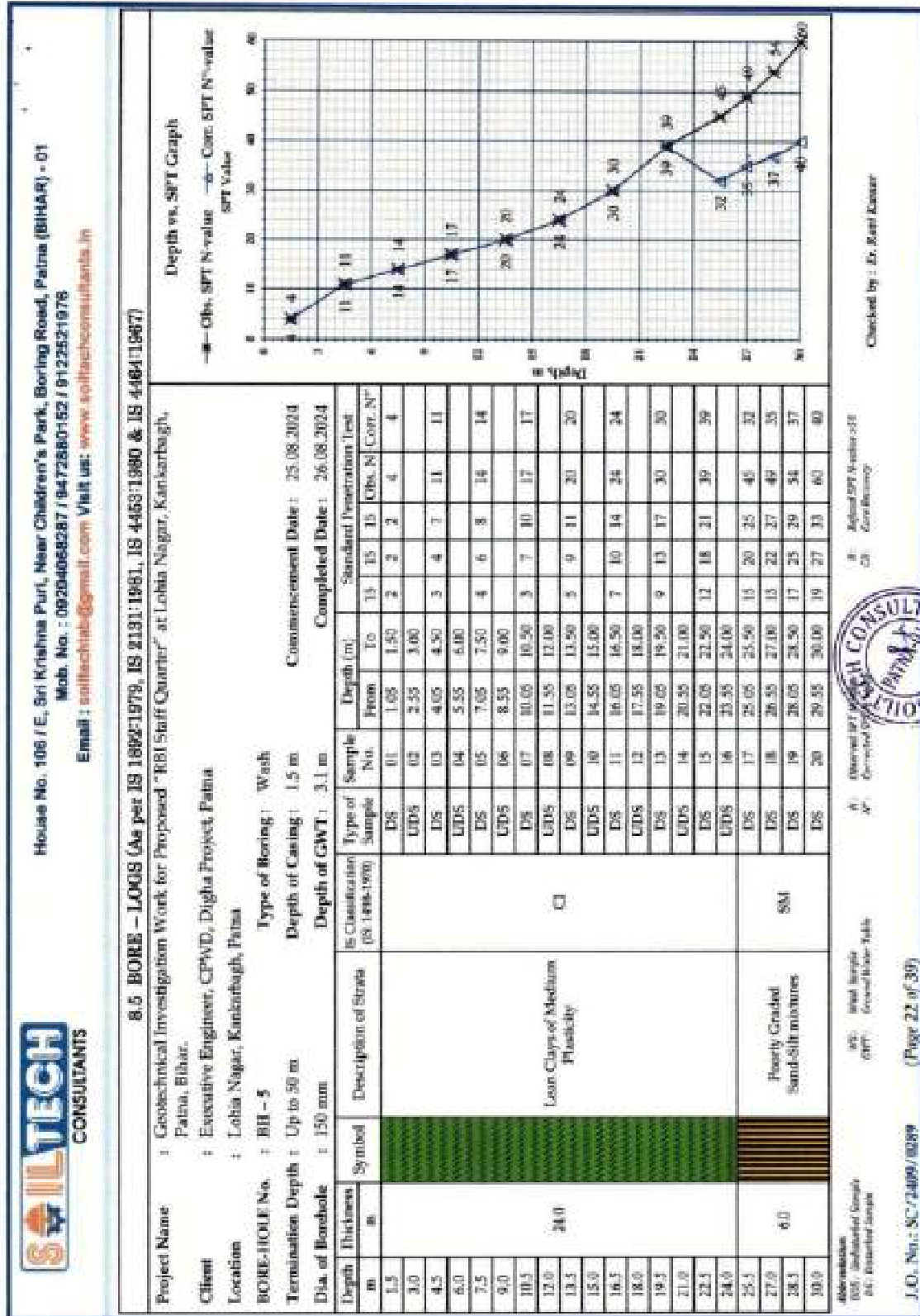


Abbreviations
 UDS : Undisturbed Sample
 DS : Disturbed Sample
 BS : Block Sample
 GWT : Ground Water Table

Notes
 * : Observed SPT N-value
 Cor. : Corrected SPT N-value

Checked by : En. Rami Karwar

J.O. No.: SC/2409/0249 (Page 21 of 39)



8.6 BORE - LODS (A₁ per IS 1892:1979, IS 2131:1991, IS 4453:1980 & IS 4464:1967)

¹ Geotechnical Investigation Work for Proposed "RBI Staff Quarter" at Lohia Nagar, Kamlabagh,

Talmon, Robert

Client : Executive Engineer, C^WD, Dighe Project, Patna

Location : Lohia Nagar, Kankarbagh, Patna

BORE-HOLE No. : BH - 6

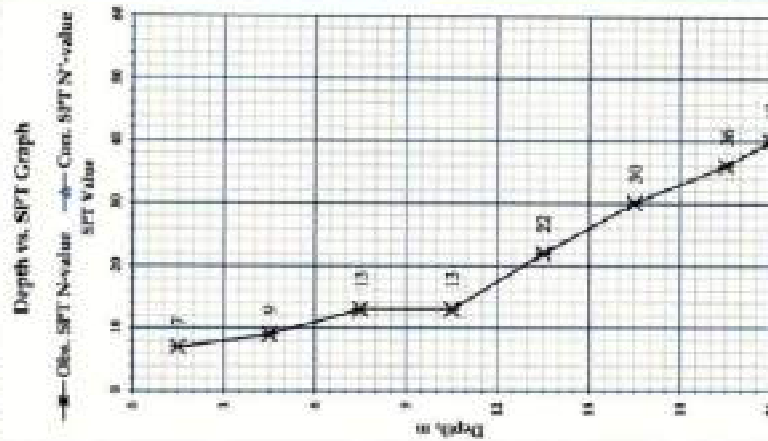
Type of Boring: Wash

Depth of Curing: 1.5 m
Commencement Date: 24.08.2024

Depth of GWT: 3.0 m

Completed Date: 25.08.2024

Depth	Thickness		Symbol	Description of Strata	IS Classification (IS: 1498-1970)	Type of Sample	Sample No.	Depth (m)		Standard Penetration Test						
	m	in						From	To	T5	T15	T15	Obs. N	Corr. N*		
1.5	21.0		Lean Clays of Medium Plasticity		CI	DS	01	1.05	1.50	3	3	4	7			
3.0						UDS	02	2.55	3.00							
4.5						DS	03	4.05	4.50	3	4	5	9			
6.0						UDS	04	5.55	6.00							
7.5						DS	05	7.05	7.50	4	6	7	13			
9.0						UDS	06	8.55	9.00							
10.5						DS	07	10.05	10.50	4	6	7	13			
12.0						UDS	08	11.55	12.00							
13.5						DS	09	13.05	13.50	7	9	13	22			
15.0						UDS	10	14.55	15.00							
16.5						DS	11	16.05	16.50	9	13	17	30			
18.0						UDS	12	17.55	18.00							
19.5						DS	13	19.05	19.50	11	16	20	36			
21.0						DS	14	20.55	21.00	11	18	22	40			



10. *Chlorophyll a* (mg/g)
11. *Chlorophyll b* (mg/g)
12. *Chlorophyll a + b* (mg/g)
13. *Chlorophyll a/b ratio*

INT: Great example
CUT TO: Grand Water Falls

79) *Colony-forming unit, 48 hours*
 80) *Colony-forming unit, 72 hours*

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DOI: 10.1037/0893-3200.11.1.101



Checked by: Dr. Paul Bennett

I.D. No.: SC/2009/0289 (Page 23 of 39)



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Location - Lohia Nagar, Kankarbagh, Patna		9.1 LABORATORY TEST RESULTS OF GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED "RBI STAFF QUARTER" AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR.														BOREHOLE NO. - 1												
Sample No.	Depth, meter	Core SPT No. Value	Sample Type	Classification (IS:1498-1970)	Grain Size Distribution (Sieve Analysis) % of Passing on IS Sieve										% of Particle			Atterberg's Limit			Shear Tests (CU/CDST)		Specific Gravity	Bulk Density γ_s (mg/cm ³)	N.M.C. %			
					4.75 mm	75 μ m	150 μ m	212 μ m	300 μ m	425 μ m	600 μ m	1.18 mm	2.00 mm	2.36 mm	4.75 mm	Gravel, %	Sand, %	Silt, %	Clay, %	LL, %	PL, %	PL, %				e, kg/cm ²	ϕ , $^\circ$ deg	
BH-1/1.5-01	1.5	8	D6		97.4	96.3	94.2	93.4	92.7	91.7	89.8	88.1	87.0	8.6	10.4	57.3	25.7	39	22	17	0.22	16	2.700	1.833	23.2			
BH-1/3.0-02	3.0	8	UD6																									
BH-1/4.5-03	4.5	11	D6		97.1	95.8	93.5	94.2	92.8	92.8	92.3	92.1	91.2	8.9	57.4	33.8	48	24	22									
BH-1/6.0-04	6.0	14	UD6																									
BH-1/7.5-05	7.5	15	D6		96.0	94.5	94.4	94.0	93.6	93.2	92.3	91.1	90.4	88.6	4.0	7.4	57.5	31.3	44	23	21	0.27	14	2.715	1.885	23.6		
BH-1/9.0-06	9.0	18	UD6																									
BH-1/10.5-07	10.5	21	D6		95.8	93.9	93.8	92.7	92.0	91.3	90.9	90.4	88.2	4.2	7.6	57.3	30.9	41	22	19	0.38	13	2.709	1.933	24.2			
BH-1/12.0-08	12.0	24	UD6																									
BH-1/13.5-09	13.5	27	D6		95.3	93.8	93.8	93.2	92.5	92.0	91.8	91.0	88.5	4.7	8.8	55.8	32.2	45	23	22	0.32	12	2.688	1.964	25.0			
BH-1/15.0-10	15.0	30	UD6																									
BH-1/16.5-11	16.5	25	D6		95.4	94.1	94.1	93.7	93.0	92.9	92.0	91.0	89.8	4.6	5.8	60.9	28.7	42	22	18	0.39	10	2.699	1.983	25.5			
BH-1/18.0-12	18.0	29	UD6																									
BH-1/19.5-13	19.5	43	D6		92.3	87.8	87.6	85.8	84.7	83.4	82.0	80.0	79.2	76.1	7.7	16.2	60.9	15.2	33	19	11	0.44	8	2.625	2.032	25.9		
BH-1/21.0-14	21.0	47	D6																									
BH-1/22.5-15	22.5																											
BH-1/24.0-16	24.0	41	D6		94.3	89.3	88.9	81.4	75.8	71.2	69.1	64.3	60.3	5.8	39.2	53.0												
Abbreviation : D6: Disturbed Sample UD6: Undisturbed Sample R6: Not Applicable					M: Observed SPT Value A: Corrected SPT Value R: Right SPT value only					LI: Liquid Limit PL: Plastic Limit PI: Plasticity Index					UBT: Unconsolidated Undisturbed Triaxial DUT: Direct Shear Test NMC: Natural Moisture Content					C: Cohesion Intercept ϕ : Angle of Internal Friction α : Angle of Inclination					Checked by: En. Rishi Kumar			

J.O. No.: SC/2409/0289

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 House No. 108 / E, Sri Krishna Puri, Near Children's Park, Boring Road, Patna (BIHAR) - 01 Mob. No. : 09204068287 / 9472880152 / 912321978 Email : soiltechb@gmail.com Visit us: www.soiltechconsultants.in										9.1 LABORATORY TEST RESULTS OF GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED "RBI STAFF QUARTER" AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR.										BOREHOLE NO. - 1																					
Location - Lohia Nagar, Kankarbagh, Patna		Sample No.		Depth, meter		Corr. SPT N° Value		Sample Type		Classification (IS:1472-1970)		Grain Size Distribution (Sieve Analysis) % of Passing on IS Sieve										% of Particle				Atterberg's Limit				Shear Tests (UU/OU)		Sp. Gravity		Bulk Density γ_s		N.M.C. %					
																						</																			



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Email : soiltechb@gmail.com Visit us: www.soiltechconsultants.in

Location - Lohia Nagar,
Kankarbagh, Patna

9.2 LABORATORY TEST RESULTS OF GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED
'RBI STAFF QUARTER' AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR.

BOREHOLE
NO. - 2

Sample No.	Depth, meter	Corr. SPT N° Value	Sample Type	Classification (IS:1406-1970)	Grain Size Distribution (Sieve Analysis) % of Passing on IS Sieve										% of Particle			Atterberg's Limit			Shear Tests (ULTIMATE)		Specific Gravity	Bulk Density γ_s (mg/cm ³)	N.M.C. %	
					4.75 mm	7.5 mm	150 μ m	212 μ m	300 μ m	425 μ m	600 μ m	1.18 mm	2.00 mm	2.36 mm	4.75 mm	Gravel, %	Silt, %	Clay, %	LL, %	PL, %	c, kg/cm ²	ϕ , deg.				
BH-2/1.5/01	1.5	7	D6		100	100	99.9	99.6	98.7	97.7	95.9	94.5	92.3	9.0	7.7	59.1	33.2	43	23	26	0.26	16	2.709	1.800	21.9	
BH-2/3.0/02	3.0	8	LD05																							
BH-2/4.5/03	4.5	10	D6		100	100	100	99.0	97.3	95.3	94.6	93.2	9.0	6.8	27.8	29.4	47	24	23		0.30	12	2.717	1.860	22.3	
BH-2/6.0/04	6.0	16	LD05																							
BH-2/7.5/05	7.5	16	D6		100	100	100	99.8	99.7	99.1	98.0	96.4	95.0	92.4	0.0	7.6	60.0	32.4	44	23	21	0.36	12	2.725	1.905	23.0
BH-2/9.0/06	9.0	17	LD05																							
BH-2/10.5/07	10.5	21	D6		98.6	97.8	97.8	96.5	94.9	94.0	92.6	90.7	88.0	1.8	8.6	58.5	31.5	45	34	21	0.43	9	2.710	1.945	24.0	
BH-2/12.0/08	12.0	26	LD05																							
BH-2/13.5/09	13.5	29	D6		95.6	95.1	95.1	95.0	95.0	94.5	93.5	92.3	91.7	89.7	4.4	5.9	60.1	29.6	38	22	16					
BH-2/15.0/10	15.0	33	LD05																							
BH-2/16.5/11	16.5	40	D6		96.2	95.8	95.8	95.7	95.7	95.2	94.2	93.0	92.2	90.4	3.8	5.8	57.8	32.8	42	20	18	0.48	6	2.703	1.978	23.8
BH-2/18.0/12	18.0	40	LD05																							
BH-2/19.5/13	19.5	45	D6		83.1	76.2	75.2	87.9	63.0	63.7	59.7	55.9	49.6	44.0	14.9	41.1	44.0				0.53	5	2.688	1.991	24.5	
BH-2/21.0/14	21.0	46	D6																							
BH-2/22.5/15	22.5		D6	SM	89.5	86.2	84.3	77.8	67.8	63.8	62.3	50.9	43.3	31.0	28.3	31.0					0	29.0	2.666	2.804	25.7	
BH-2/24.0/16	24.0	44	D6																		0	30.0	2.650	1.889	26.8	

Abbreviations:

LD05: Undisturbed Sample
D6: Disturbed Sample
N/A: Not Applicable

N: Blurred SPT value
P: Corrected SPT Value
R: Reputed SPT value > 50

L.L.: Liquid Limit
P.L.: Plastic Limit
P: Plasticity Index

ASTM: American Association of Highway Engineers
D157: Standard Test
N.M.C.: Natural Moisture Content

C: Cohesion Intercept
 ϕ : Angle of Internal Friction
RQD: Rock Quality Designation



Checked by : Ex. Engr Kumar

J.O. No.: SC/2409/6239

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Checked by : Ex. Baris Kumar

 C: Collision Intercept
 ϕ : Angle of Internal Friction
 RMC: Rock Quality Designation

 AEP: Unconsolidated Undrained Triaxial
 EEP: Direct Shear Test
 RMC: Natural Moisture Content

 LL: Liquid Limit
 PL: Plastic Limit
 PI: Plasticity Index

 N: Blottered SPT value
 P: Corrected SPT value
 d: Depth of SPT value (m)

 BS: Bulk Density Sample
 N: Not Applicable

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J.O. No.: SC/2409/0209



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Email : soltechlab@gmail.com Visit us: www.soltechconsultants.in

Location - Lohia Nagar, Kankarbagh, Patna			9.2 LABORATORY TEST RESULTS OF GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED "RBI STAFF QUARTER" AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR													BOREHOLE NO. - 2										
Sample No.	Depth, meter	Corr. SPT No. Value	Sample Type	Classification (IS:1486-1970)	Grain Size Distribution (Sieve Analysis) % of Passing on IS Sieve										Atterberg's Limit			Shear Tests (unit/cst)		Specific Gravity	Bulk Density, g/cm ³	N.M.C. %				
					4.75 mm	7.5 mm	150 µm	300 µm	425 µm	600 µm	75 µm	Gravel, %	Sand, %	Silt, %	Clay, %	LL, %	PL, %	PI, %	c, kg/cm ²				φ, deg			
BH-2-22.5/17	25.5		D5	SM	85.5	80.5	80.3	76.1	74.2	72.6	71.5	54.1	53.0	38.4	14.5	47.1	38.4									
BH-2-27.5/18	27.8	46	D5																							
BH-2-28.5/19	28.5		D5			97.5	92.5	92.3	87.1	84.8	82.4	80.4	52.1	48.3	34.0	2.5	63.5	34.0								
BH-2-30.0/20	30.0	48	D5			100	98.9	98.0	96.6	94.7	91.8	89.3	52.9	48.3	34.0	0.0	66.0	34.0								
BH-2-31.5/21	31.3		D5																							
BH-2-33.0/22	33.8	51	D5																							
BH-2-34.5/23	34.3		D5			100	98.6	98.6	96.3	94.2	91.2	88.5	45.6	33.8	0.0	66.2	33.8									
BH-2-36.0/24	36.0	34	D5																							
BH-2-37.5/25	37.3		D5			100	98.6	98.4	95.6	93.3	90.1	86.4	43.6	31.6	0.0	68.4	31.6									
BH-2-39.0/26	39.0	57	D5			100	99.4	98.4	96.7	94.0	91.5	88.5	50.6	31.7	0.0	68.3	31.7									
BH-2-40.5/27	40.5		D5																							
BH-2-42.0/28	42.0	58	D5			100	98.8	98.5	95.5	93.1	90.0	87.1	43.4	29.1	0.0	70.9	29.1									
BH-2-43.5/29	43.5		D5																							
BH-2-45.0/30	45.0	60	D5																							
BH-2-46.5/31	46.3		D5			100	98.8	98.8	96.0	93.7	90.3	86.7	41.4	27.5	0.0	72.3	27.5									
BH-2-48.0/32	48.0	63	D5			94.5	92.6	92.4	90.8	89.7	87.0	83.3	46.7	33.9	2.5	56.9	27.6									
BH-2-50.0/33	50.0	65	D5		97.2	96.3	96.2	95.0	92.7	90.3	85.6	44.4	31.0	2.8	68.2	31.0										

Observation:
 100% : Bulkhead Sample
 100% : Battered Sample
 100% : Not Applicable

R : Observed SPT value
 R₁ : Corrected SPT value
 R₂ : Adjusted SPT value

L1 : Liquid Limit
 PL : Plastic Limit
 PI : Plasticity Index

C : Cohesion (kN/m²)
 φ : Angle of Internal Friction
 AG : Back Quality Designation

Checked by : Ex. Exec. Officer

100% : Bulkhead Sample
 100% : Battered Sample
 100% : Not Applicable

100% : Bulkhead Sample
 100% : Battered Sample
 100% : Not Applicable

100% : Bulkhead Sample
 100% : Battered Sample
 100% : Not Applicable

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I.O. No.: SC/3409/0259



Checked by : En. Rami Ramar

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I.O. No.: SC/2409/1289



House No. 106 / E, Sri Krishna Puri, Near Children's Park, Boring Road, Patna (BIHAR) - 01
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Location - Lohia Nagar, Kankarbagh, Patna				9.3 LABORATORY TEST RESULTS OF GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED "REI STAFF QUARTER" AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR.														BOREHOLE NO. - 3										
Sample No.	Depth, meter	Core SPT N° Value	Sample Type	Classification (IS:1498-1970)	Grain Size Distribution (Sieve Analysis) % of Passing on IS Sieve												% of Particle				Atterberg's Limit			Shear Tests (CU/UT/TEST)		Specific Gravity	Bulk Density γ_b (mg/cm ³)	N.M.C. %
					4.75 mm	7.5 mm	150 μ m	300 μ m	425 μ m	600 μ m	1.18 mm	2.00 mm	2.36 mm	Gravel, %	Sand, %	Silt, %	Clay, %	LL, %	PL, %	c, kg/cm ²	ϕ , Deg.							
BB-3/1.5/01	1.5	4	D5		99.8	99.7	99.6	98.3	97.7	96.7	95.5	94.1	93.1	91.2	0.2	8.6	59.3	31.9	40	22	16							
BB-3/3.0/02	3.0	9	UD5																			0.24	13	2.702	18.30	21.8		
BB-3/4.5/03	4.5	8	D5		100	100	100	100	99.9	99.2	98.7	98.3	95.7	93.8	0.0	6.2	58.2	35.6	44	24	20							
BB-3/6.0/04	6.0	10	UD5																			0.32	18	2.714	18.55	22.9		
BB-3/7.5/05	7.5	14	D5		100	100	100	100	99.9	98.6	97.2	96.6	94.5	90.5	0.0	9.5	57.1	33.4	47	25	22							
BB-3/9.0/06	9.0	16	UD5																			0.35	13	2.710	19.21	23.5		
BB-3/11.5/07	11.5	16	D5		100	100	100	100	99.9	99.5	98.4	87.7	86.7	83.5	8.0	8.5	62.6	30.9	45	24	21							
BB-3/12.0/08	12.0	18	UD5																			0.32	14	2.709	19.41	24.1		
BB-3/13.5/09	13.5	22	D5		99.4	97.6	97.3	95.5	94.6	93.4	90.5	89.5	87.4	85.2	1.6	13.2	57.6	27.6	39	22	17							
BB-3/15.0/10	15.0	22	UD5																			0.38	12	2.660	19.80	24.7		
BB-3/16.5/11	16.5	29	D5		98.3	98.1	98.1	97.7	97.3	96.7	95.6	94.2	92.5	90.7	1.5	2.8	61.7	29.0	42	23	19							
BB-3/18.0/12	18.0	33	UD5																			0.36	14	2.702	19.93	25.1		
BB-3/19.5/13	19.5	25	D5		99.2	99.2	99.1	94.4	94.0	93.2	92.0	90.9	89.3	87.8	3.7	8.5	57.0	32.8	42	21	19							
BB-3/21.0/14	21.0	39	D5																			0.44	8	2.689	20.03	25.5		
BB-3/22.5/15	22.5		UD5		99.9	99.0	98.8	97.5	96.3	94.9	94.3	93.5	91.2	88.2	8.1	11.7	58.2	32.6	49	23	21							
BB-3/24.0/16	24.0	44	D5																			0.69	6	2.760	20.26	25.8		

Abbreviation:

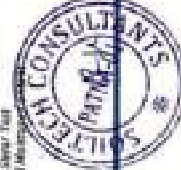
UD5: Unconsolidated Sample
 D5: Disturbed Sample
 N/A: Not Applicable

W: Observed SPT value
 W₆₀: Corrected SPT Value
 W₁₀₀: Adjusted SPT value (kN)

LL: Liquid Limit
 PL: Plastic Limit
 PI: Plasticity Index

UT: Unconsolidated Undisturbed Sample
 UT₁: Direct Shear Test
 NMC: Natural Moisture Content

C: Cohesion (kN/m²)
 ϕ : Angle of Internal Friction
 NMC: Moisture Content



Checked by: Dr. Bani Kumar



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Location - Lohia Nagar, Kankarbagh, Patna		9.3 LABORATORY TEST RESULTS OF GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED "RBI STAFF QUARTER" AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR.													BOREHOLE NO. - 3												
Sample No.	Depth, meter	Coar. SPT No. Value	Sample Type	Classification (IS-1408-1970)	Grain Size Distribution (Sieve Analysis) % of Passing on IS Sieve										% of Particle		Atterberg's Limit		Shear Tests (UUT/0.001)		Specific Gravity	Bulk Density γ_b (mg/cm^3)	N.M.C. %				
					4.75 mm	7.5 mm	150 μm	212 μm	300 μm	425 μm	600 μm	1.18 mm	2.00 mm	2.36 mm	Gravel, %	Sand, %	Silt, %	Clay, %	LL, %	PL, %				PI, %			
B01-3-25.5/17	25.5		LC05	CT	99.9	98.5	98.3	97.2	96.5	95.9	95.0	92.1	90.8	88.1	0.1	11.8	56.3	31.8	43	23	30	0.32	5	2.697	3.043	26.1	
B01-3-27.0/18	27.0	48	D05																								
B01-3-28.5/19	28.5		LC05			100	99.4	99.6	96.2	97.2	96.2	95.2	93.3	91.9	90.2	0.0	9.8	33.9	34.5	46	24	22	0.43	10	2.707	2.035	23.6
B01-3-30.0/20	30.0	58	D05																								
B01-3-31.5/21	31.5		LC05	SM	99.8	98.5	98.3	97.5	94.5	93.3	91.2	89.8	87.5	85.2	0.2	12.5	56.7	30.6	38	22	18	0.30	18	2.688	2.006	28.3	
B01-3-33.0/22	33.0	43	D05																								
B01-3-34.5/23	34.5		D05			100	98.7	98.7	96.3	94.4	91.4	89.5	83.1	40.8	32.0	1.1	66.9	32.0									
B01-3-36.0/24	36.0	30	D05																								
B01-3-37.5/25	37.5		D05		100	98.7	98.7	95.3	93.6	90.2	87.6	81.6	38.0	27.8	0.0	72.1	27.9										
B01-3-39.0/26	39.0	54	D05																								
B01-3-40.5/27	40.5		D05		100	98.9	98.8	95.4	93.5	90.7	88.0	82.8	35.5	26.0	0.0	74.0	26.0										
B01-3-42.0/28	42.0	56	D05																								
B01-3-43.5/29	43.5		D05		100	99.2	99.1	96.8	94.8	92.0	88.2	83.8	42.0	30.3	0.0	69.7	30.3										
B01-3-45.0/30	45.0	57	D05																								
B01-3-46.5/31	46.5		D05		97.4	90.3	90.0	88.3	87.5	86.3	84.1	80.7	38.3	27.4	2.0	70.0	27.4										
B01-3-48.0/32	48.0	59	D05		95.4	92.1	91.9	89.9	88.5	87.8	85.3	80.1	39.5	28.1	1.0	60.3	28.1										
B01-3-50.0/33	50.0	61	D05		99.1	93.8	93.6	91.4	90.3	89.3	83.3	87.6	56.7	25.3	0.9	63.8	35.3										

Abbreviation :
 B02: Bulkhead Sample
 D0: Disturbed Sample
 N0: Not Applicable

UUT: Unconsolidated Undrained Triaxial
 D07: Direct Shear Test
 N.M.C.: Natural Moisture Content

C: Collarage Material
 P: Angle of Internal Friction
 q: Basic Quality Designation

L: Liquid Limit
 PL: Plastic Limit
 PI: Plasticity Index

N: Observed SPT value
 N': Corrected SPT value
 N': Refused SPT value (kN)

Checked by : Ex. Engr. Kumar



J.O. No.: SC/2409/0239

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		House No. 106 / E, Sri Krishna Puri, Near Children's Park, Boring Road, Patna (BIHAR) - 01 Mob. No. : 99204068287 / 9472880152 / 9122521976 Email : solitechlab@gmail.com Visit us: www.solitechconsultants.in										BOREHOLE NO. - 4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
Location - Lohia Nagar, Kankarbagh, Patna		9.4 LABORATORY TEST RESULTS OF GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED "RBI STAFF QUARTER" AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
Sample No.	Depth, meter	Corr. SPT N° Value	Sample Type	Classification (IS-1498-1970)	Grain Size Distribution (Sieve Analysis) % of Passing on IS Sieve										% of Particle				Atterberg's Limit		Shear Tests (UC/TCST)		Specific Gravity	Bulk Density γ_b mg/cm^3	N.M.C. %																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
					4.75 mm	75 μm	150 μm	212 μm	300 μm	425 μm	600 μm	1.18 mm	2.00 mm	2.36 mm	4.75 mm	Gravel %	Sand, %	Silt, %	Clay, %	LL, %	PL, %	PL, %				c, kg/cm^2	ϕ , $^{\circ}$ deg																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
BB-4/1.5/01	1.5	6	D5		98.1	97.8	97.8	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
BB-4/3.0/02	3.0	9	UC5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									



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Location - Lohia Nagar, Kankarbagh, Patna			9.4 LABORATORY TEST RESULTS OF GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED "RBI STAFF QUARTER" AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR.															BOREHOLE NO. - 4											
Sample No.	Depth, meter	Corr. SPT N° Value	Sample Type	Classification (IS:1088-1973)	Grain Size Distribution (Sieve Analysis)										% of Particle			Atterberg's Limit		Shear Tests (CU/UCS)		Specific Gravity	Bulk Density γ _b	N.M.C. %					
					4.75 mm	7.5 mm	2.36 mm	2.00 mm	1.18 mm	600 μm	425 μm	300 μm	212 μm	150 μm	75 μm	Gravel, %	Sand, %	Silt, %	Clay, %	LL, %	PL, %				c, kg/cm²	φ, °deg.			
BH-4-23.5/27	23.5		UDS	CL	96.5	97.8	97.7	97.2	96.2	94.2	94.2	94.2	93.0	92.2	89.7	1.9	8.8	57.4	32.3	40	23	20							
BH-4-27.0/28	27.0	53	DS																				0.50	4	2.990	2.026	26.0		
BH-4-24.5/19	24.5		UDS			99.2	99.0	99.0	98.4	98.1	97.2	96.0	94.7	93.2	92.2	90.3	0.7	9.0	54.0	34.3	46	24	22						
BH-4-20.0/20	20.0	56	DS																										
BH-4-31.5/21	31.5		UDS	SM	99.5	97.9	97.9	97.2	95.8	94.3	92.6	89.8	88.3	86.2	84.5	0.5	13.5	56.0	30.3	39	22	17							
BH-4-23.0/22	23.0	60	DS																										
BH-4-24.5/23	24.5		DS			100	100	100	99.7	99.0	97.2	93.2	69.4	46.0	30.9	0.0	65.3	34.7							0.19	16	2.687	2.054	25.8
BH-4-24.0/24	24.0	48	DS																										
BH-4-37.5/23	37.5		DS	SM	100	99.9	99.9	99.7	98.9	97.5	89.7	69.7	61.6	38.7	27.3	0.0	72.5	27.5							0	29.7	3.657	2.018	25.4
BH-4-23.0/26	23.0	50	DS																										
BH-4-40.5/27	40.5		DS			100	100	100	99.8	99.0	97.1	90.8	59.0	36.2	24.8	0.0	75.2	24.8							0	31.0	3.447	2.009	25.3
BH-4-42.0/28	42.0	41	DS																										
BH-4-43.5/29	43.5		DS	SM	100	100	100	99.9	99.8	99.1	92.4	59.9	38.7	29.0	0.0	71.0	29.0								0	32.0	2.638	2.031	25.0
BH-4-43.0/30	43.0	33	DS																										
BH-4-46.5/31	46.5		DS			99.4	98.8	98.7	98.1	97.3	93.9	92.4	92.4	92.2	49.7	25.4	0.0	74.0	25.4										
BH-4-48.0/32	48.0	55	DS			99.3	99.1	99.1	98.5	97.5	94.4	88.9	63.1	45.0	27.1	0.7	72.2	27.1								0	30.2	2.633	2.043
BH-4-50.0/33	50.0	56	DS	SM	99.5	99.2	99.1	98.6	97.7	94.5	91.1	63.4	41.6	25.4	0.5	74.1	25.4												

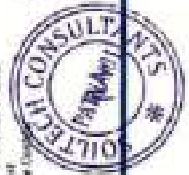
1. C: Cohesive Element
 2. D: Direct Shear Test
 3. M.C.: Moisture Content
 4. LL: Liquid Limit
 5. PL: Plastic Limit
 6. PI: Plasticity Index

7. UDS: Undisturbed Sample
 8. DS: Disturbed Sample
 9. L: Not Applicable

10. Checked by : **Dr. Ravi Kumar**

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Checked by : En. Ravi Kumar

C: Calculation Instrument
 φ: Angle of Internal Friction
 NMC: Natural Moisture Content

LL: Liquid Limit
 PL: Plastic Limit
 PI: Plasticity Index

UDS: Undisturbed Sample
 DS: Disturbed Sample
 NA: Not Applicable

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9.6 LABORATORY TEST RESULTS OF GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED "RBI STAFF QUARTER" AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR.

Location - Lohia Nagar, Kankarbagh, Patna			BOREHOLE NO. - 6																			
Sample No.	Depth, meter	Corr. SPT N° Value	Sample Type	Classification (IS:1498-1970)	Grain Size Distribution (Sieve Analysis)										Atterberg's Limit			Shrink Tests (IS:7305)		Specific Gravity	Bulk Density γ_s (mg/cm ³)	N.M.C. %
					% of Passing on IS Sieve										LL, %	PL, %	PI, %	e, kg/cm ²	μ , °deg			
4.75 mm	7.5 mm	150 μ m	212 μ m	300 μ m	425 μ m	600 μ m	1.18 mm	2.00 mm	2.36 mm	4.75 mm	75 μ m	Gravel, %	Sand, %	Silt, %	Clay, %	LL, %	PL, %	PI, %	e, kg/cm ²	μ , °deg		
BH-6/1.5/01	1.5	7	D5		100	100	99.8	99.1	97.4	94.6	92.8	88.6	0.0	11.4	58.5	30.1	40	22	18			
BH-6/3.0/02	3.0	8	LD5																			
BH-6/4.5/03	4.5	9	D5		100	100	99.9	98.8	97.2	95.9	95.3	93.9	0.0	6.1	60.1	33.8	43	23	20	0.31	12	
BH-6/6.0/04	6.0	12	LD5		100	100	99.9	98.7	97.4	96.6	95.6	92.6	0.0	6.4	58.2	35.4	46	24	22	0.38	11	
BH-6/7.5/05	7.5	13	D5		100	100	99.9	99.3	98.2	96.5	95.4	92.4	0.0	7.6	61.1	32.3	42	23	19	0.32	12	
BH-6/9.0/06	9.0	10	LD5		100	100	99.9	99.3	98.2	96.5	95.4	92.4	0.0	7.6	61.1	32.3	42	23	19	0.35	10	
BH-6/10.5/07	10.5	13	D5		99.4	99.4	99.3	98.8	97.7	96.4	95.0	91.8	0.6	7.6	62.4	29.4	38	21	17			
BH-6/12.0/08	12.0	18	LD5																			
BH-6/13.5/09	13.5	22	D5		98.4	98.4	98.3	97.8	96.2	94.9	93.8	90.4	1.6	8.0	59.7	30.7	41	22	19	0.43	8	
BH-6/15.0/10	15.0	25	LD5																			
BH-6/16.5/11	16.5	30	D5		97.5	96.7	96.3	95.5	94.4	93.2	92.5	90.7	2.5	6.8	58.2	32.5	44	24	20			
BH-6/18.0/12	18.0	33	LD5		97.8	96.6	96.4	95.1	93.8	92.4	91.7	89.7	2.2	11.6	59.5	28.7	39	22	17	0.44	5	
BH-6/19.5/13	19.5	36	D5																			
BH-6/21.0/14	21.0	40	D5																			

Abbreviation:
D50 : Median of Sample
D10 : Finest Sample
D60 : Coarsest Sample
PI : Plasticity Index
N : Observed SPT value
N₆₀ : Corrected SPT value
A : Adjusted SPT value x 10

Legend:
L₅₀ : Liquid Limit
P₅ : Plasticity Limit
P₂₀ : Plasticity Index

Grain Size Distribution (Sieve Analysis):
L₅₀ : Liquid Limit
P₅ : Plasticity Limit
P₂₀ : Plasticity Index

Grain Size Distribution (Sieve Analysis):
L₅₀ : Liquid Limit
P₅ : Plasticity Limit
P₂₀ : Plasticity Index

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10.1 SAFE BEARING CAPACITY & SETTLEMENT CALCULATION

Six Boreholes up to 50/30/21 m depth was explored and based on all the field and laboratory tests following calculation and recommendations were made -

Calculation of SAFE BEARING CAPACITY as per IS : 6403 - 1981

Sample Design Data for Proposed "RBI Staff Quarter" at Lohia Nagar, Kankarbagh, Patna.

Type of Footing : Isolated Footing

Foundation Size : Depth - 300 cm Width- 300 cm Length- 300 cm

Failure Mode (Void Ratio), $e_s = (G_{\gamma_s} / \gamma_d) - 1$, $e_s = (2.706 \times 1 / 1.500) - 1 = 0.80$

It is > 0.75 , hence it is a **Local Shear Failure**

Shape and Depth Factor : To Be Considered

Direction of Load with Vertical : 0.0° deg

Dry Density of Foundation Soil : 0.0015 kgf/cm^3

Density of Surcharge : 0.001 kgf/cm^3

Actual Depth of Water Table : 300 cm (below EGL)

Design Depth of Water Table : 200 cm (100 cm rise for Seasonal water level fluctuations)

Factor of Safety : 2.5

Cohesion (c) : 0.23 kgf/cm^2

Angle of Internal Friction (ϕ) : 16° deg

Bearing Capacity Factors				Shape Factor			Depth Factor			Inclination Factor		
ϕ°	N_c	N_q	N_γ	S_c	S_q	S_γ	d_c	d_q	d_γ	i_c	i_q	i_γ
10.88	8.81	2.73	1.47	1.30	1.20	0.80	1.27	1.13	1.13	1.00	1.00	1.00
Effective Subcharge at the Base Level of Foundation (kgf/cm^2)				Bulk Unit Weight of Foundation Soil (kgf/cm^3)			Effective Unit Wt. of Soil			Correction Factor For Location of Water Table		
q				γ			γ'			W'		
0.25				0.00183			8E-04			0.50		

The Ultimate Net Bearing Capacity in case of Local Shear Failure is given by :

$$q'_{\text{ult}} = (2/3) c N_c S_c d_c i_c + q (N_q - 1) S_q d_q i_q + (1/2) B \gamma N_\gamma S_\gamma d_\gamma i_\gamma W'$$

$$q'_{\text{ult}} = 2.999 \text{ kgf/cm}^2$$

$$q'_{\text{ult}} = 29.99 \text{ T/m}^2$$

Where, $d_c = 1 + 0.2 (D_f/B) \sqrt{N_q}$

$d_q = d_c = 1$ for $f < 10^\circ$

$d_\gamma = d_c = 1 + 0.1 (D_f/B) \sqrt{N_q}$ for $f > 10^\circ$

$N_q = \tan^2(\pi/4 + \phi/2)$

ϕ' for Local Shear Failure = $\tan^{-1} (0.67 \tan \phi)$

Net Safe Bearing Capacity, $q'_s = 12.00 \text{ T/m}^2$



Calculation of SETTLEMENT as per IS 8009 (Part-1) : 1976

Settlement analysis has been simplified into one or more layers depending upon the extent of uniformity. For each layer, the average compressibility is estimated with IS 8009 (Part-1) : 1976. This has been cross-checked with the settlement computed from the classical analysis as sum of the elastic settlement and consolidation settlement.

Elastic (Immediate) Settlement has been computed using the following equation :-

(From Clause 9.2.3.2 of IS 8009 Part-1), $S_e = \rho B \frac{(1-\mu^2)}{E} I$

Where, ρ = Assumed Foundation Pressure, kg/cm ²	:	1.50
B = Width of Footing or Foundation, m	:	3.0
μ = Poisson's Ratio	:	0.5
E = Modulus of Elasticity, kg/cm ²	:	400
I = Influence Factor (Centre value for square shape)	:	1.12
(From Table 2 of IS 8009 Part-1)		
S_e =		9.45 mm

Consolidation Settlement has been computed using the following equation :-

From Clause 9.2.2.2 of IS 8009 Part-1, $S_c = \lambda \times S_{nd}$

Where, D = Depth of Footing or Foundation, m	:	3.00
H = Thickness of Compressible Stratum, m	:	6.00
γ_s = Avg. Bulk Density, t/m ³	:	1.95
$\bar{p}$ = Effective Pressure at bottom of foundation, t/m ²	:	1.91
C_c = Compression Index	:	0.14
e_0 = Initial void ratio at mid-height of soil layer	:	0.80
$\bar{p}_0$ = Initial effective pressure at mid-height of layer, t/m ²	:	6.96
Δp = Pressure increment, t/m ²	:	4.80
$S_{nd} = \frac{H}{1+e_0} C_c \log_{10} \left[\frac{\bar{p}_0 + \Delta p}{\bar{p}_0} \right]$, mm	:	106.34
λ = Correction Factor for Pore Pressure	:	0.81
(From Table 1 of IS 8009 Part-1 for normally consolidated clay)		
S_c =		86.14 mm

Total Settlement, S_t = Immediate Settlement S_e + Consolidation Settlement S_c = 95.59 mm

Applying correction for depth factor (Fox's Correction) of 0.98 from fig. 12 of IS : 8009 Part-1 and rigidity factor of 0.8

Therefore, S_{fd} = Final Corrected Settlement = 74.94 mm < 75 mm, O.K

For permissible settlement of 75 mm, the SBP is 15.0 T/m², which is above the SBC value.

So, pressure on foundation shall be SBC value.

Looking to all above, Permissible Bearing Capacity is SBC value.

Hence, the net allowable Safe Bearing Capacity (Design) of 12.00 T/m² is recommended.





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10.2 SAFE LOAD CARRYING CAPACITY FOR PILE IS ESTIMATED WITH FOLLOWING ASSUMPTION

Factor of Safety: 2.5

Water Table is considered at 3.0 m below ground

Cut-off level is considered 1.5 m below GL

Method Used: IS 2911 (Part 1) Sec 21:2010

1. ULTIMATE CAPACITY OF PILE

For Granular Soil

$$Q_u = A_p (1/2 D \gamma N_\gamma + P_D N_q) + \sum_{i=1}^n K_i P_{di} \tan \delta_i A_s$$

For Clayey Soil

$$Q_u = A_p N_c c_p + \sum_{i=1}^n \alpha_i c_i A_s$$

Where,

 A_p = Cross-sectional area of pile tip, in cm^2 D = Diameter of pile shaft (stem diameter), in m γ = Effective unit weight of the soil at pile tip, in kg/cm^3 N_γ & N_q = Bearing Capacity Factors depending upon the angle of internal friction, ϕ at pile tip P_D = Effective overburden pressure at pile tip, in kg/cm^2 $\sum_{i=1}^n$ = Summation for layers 1 to n in which pile is installed K = Coefficient of earth pressure applicable for the i th layer P_{di} = Effective overburden pressure for the i th layer, in kg/cm^2 δ_i = Angle of Wall friction between pile and soil for the i th layer, in degree A_s = Surface area of pile shaft (stem) in the i th layer, in cm^2 N_c = Bearing Capacity Factor usually taken as 9 c_p = Average cohesion at pile tip, in kg/cm^2 α = Adhesion (Reduction) factor for the i th layer depending on the consistency of soil c = Average Cohesion throughout the length of pile for the i th layer, in kg/cm^2

Friction on Pile Shaft

Adopted Pile Diameter = 0.800 m

Factor of Safety = 2.5

Pile Depth		Thickness of Layer	Design Data Adopted		Design Factor Adopted		Overburden Pressure	Ultimate Friction	Safe Friction	Density, γ
From	To		c	ϕ	α	K				
m	m	m					kg/cm^2	kg	kg	kg/cm^3
0.0	1.5	1.5	Cut-off level							0.0016
1.5	12.0	10.5	0.35	12	0.4	1.00	0.633	60377	24151	0.0008
12.0	24.0	12.0	0.47	15	0.3	1.00	1.572	141300	56520	0.001
24.0	33.0	9.0	0.00	31	0.0	1.05	2.517	299328	119731	0.001
33.0	42.0	9.0	0.00	33	0.0	1.15	3.327	468348	187339	0.001
Total Safe Friction =									3,87,741	Kg



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<i>End Bearing Resistance</i>							
Design Parameter Adopted					Overburden Pressure	Ultimate Resistance	Safe Resistance
c	ϕ	N_c	N_q	N_γ	kg/cm ²	kg	kg
0.00	32		24.36	32.65	2.925	283184	1,13,274
Total Safe Pile Capacity Friction on Pile Shaft + End Bearing Resistance = 387741 + 113274 kg = 5,01,015 kg = 501.0 t							
<i>Note : Safe Pile Capacity should be checked by Pile Load Test as per specification.</i>							





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10.3 RECOMMENDATIONS:

All boreholes generally contained soft to hard layered silty clay [CI/CL] up to a depth of 24.0 m from ground level followed by silty sand [type SM] from 24.0 m to the termination depth of 50.0 m. At the time of soil testing during boring operation, the water level was observed to be 3.0 m below the natural ground level. After careful observation of the soil profile, Net Safe Bearing Capacity (q_{mw}) for various sizes of individual rigid footings (Shallow Foundation) with vertical static load intensity have been evaluated in Table - 1 and Pile Foundation capacity has been evaluated in Table - 2. Any alternative foundation size may be used depending upon seismic condition, structural requirement and economic considerations.

TABLE-1|Recommended Safe Bearing Capacity|

Foundation Details			Safe Bearing Capacity (SBC), T/m ²	Permissible Settlement of 75mm for Isolated & 125mm for Raft Footing (SBP), T/m ²	Recommended Safe Bearing Capacity, T/m ²
Type	Depth(m)	Size(m)			
RCC Isolated Footing	2.0	1.5×1.5	9.57	20.0	9.57
		2.0×2.0	9.14	20.0	9.14
		3.0×3.0	8.72	20.0	8.72
	2.5	1.5×1.5	11.42	20.0	11.42
		2.0×2.0	10.77	20.0	10.77
		3.0×3.0	10.17	20.0	10.17
	3.0	1.5×1.5	13.79	20.0	13.79
		2.0×2.0	12.84	20.0	12.84
		3.0×3.0	12.00	20.0	12.00
	3.5	1.5×1.5	15.43	20.0	15.43
		2.0×2.0	14.25	20.0	14.25
		3.0×3.0	13.15	20.0	13.15
	4.0	1.5×1.5	16.95	20.0	16.95
		2.0×2.0	15.48	20.0	15.48
		3.0×3.0	14.18	20.0	14.18
	4.5	1.5×1.5	18.79	20.0	18.79
		2.0×2.0	17.05	20.0	17.05
		3.0×3.0	15.43	20.0	15.43
RCC Raft Footing	2.0	8×8	8.00	+20.0	8.00
		10×10	8.21	+20.0	8.21
	2.5	8×8	9.17	+20.0	9.17
		10×10	9.37	+20.0	9.37
	3.0	8×8	10.67	+20.0	10.67
		10×10	10.84	+20.0	10.84
	3.5	8×8	11.54	+20.0	11.54
		10×10	11.65	+20.0	11.65
	4.0	8×8	12.39	+20.0	12.39
		10×10	12.53	+20.0	12.53
	4.5	8×8	13.34	+20.0	13.34
		10×10	13.41	+20.0	13.41

We have not taken into account any enhancement in SBC Value which is allowed as per codes in seismic condition. The same may be considered as per relevant codes.



TABLE - 2 [Safe Capacity of Piles, Tonnes]

Length of Pile below Cut-off level 1.5 m

Pile Diameter, (mm)	Length = 24 m		Length = 27 m		Length = 30 m		Length = 33 m		Length = 36 m		Length = 39 m		Length = 42 m	
	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)
500	112.4	57.5	130.2	65.0	145.9	76.0	167.5	87.5	193.2	105.4	229.6	123.8	275.4	143.7
600	140.4	66.4	160.0	76.4	179.4	93.3	206.9	104.8	238.6	127.5	285.2	150.7	344.8	175.9
700	172.2	74.7	193.8	88.3	217.0	105.4	251.0	123.2	289.1	151.0	347.1	179.5	422.1	210.3
800	205.3	85.1	228.7	100.2	255.6	120.6	296.3	141.8	340.4	174.8	410.0	208.7	501.0	245.3

Note:

1. We have not taken into account any enhancement in SBC Value, which is allowed as per codes in seismic condition. The same may be considered as per relevant codes.
2. DMC and Tremie method of pile concreting should be adopted as the water table is near the ground surface.
3. *Shallow Foundations or Pile Caps should be isolated from the surrounding expansive soil of type CI by layers of compacted local sand.*
4. *Pile Capacity should preferably be confirmed by Initial Load Tests [see IS: 2911 (Part 4) 2013]. Pile load test is the most direct method for determining the safe loads on piles including its structural capacity with respect to soil in which it is installed.*
5. *As per the provisions of the IS Code, an appropriate number of piles must be subjected to routine load tests to check the veracity of the above recommended values of the safe capacities of piles.*

LIMITATIONS:

This Geotechnical Investigation has been carried out at locations in the site chosen by the client as representing the entire site. The recommendations provided in this report are hence valid only for those test locations. However, if there is any change in sub-soil conditions and properties at places between or beyond the chosen test locations; Soiltech Consultants may be contacted for further actions. Fresh Investigations will have to be carried out at such locations.

Ravi Kumar
(Er. Ravi Kumar)
Authorized Signatory
Technical Manager



*** End of Report ***

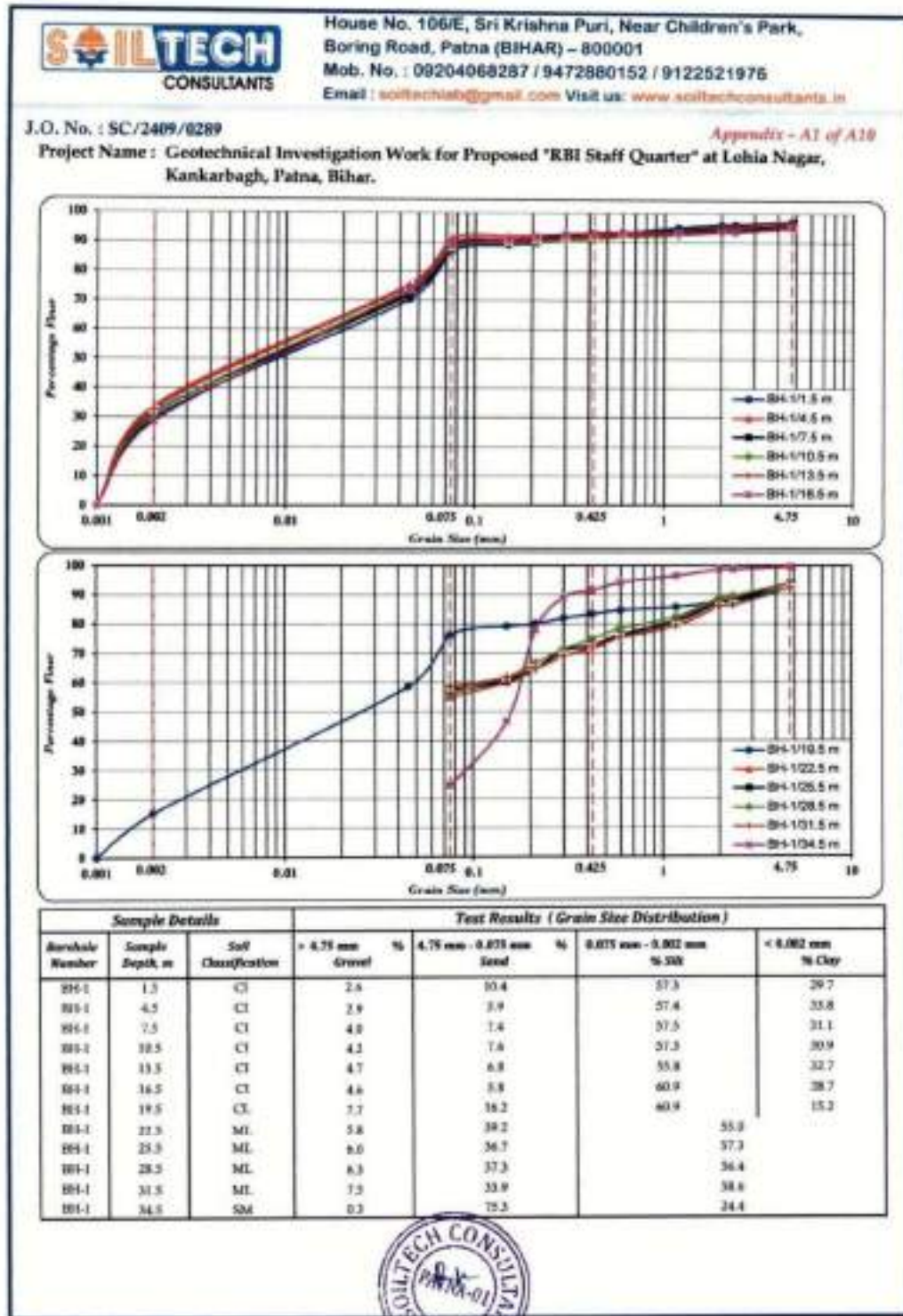
RA

APPENDIX – A

GRAIN SIZE DISTRIBUTION CURVE

Name of Work

Geotechnical Investigation Work for Proposed
"RBI Staff Quarter" at Lohia Nagar, Kankarbagh, Patna, Bihar.



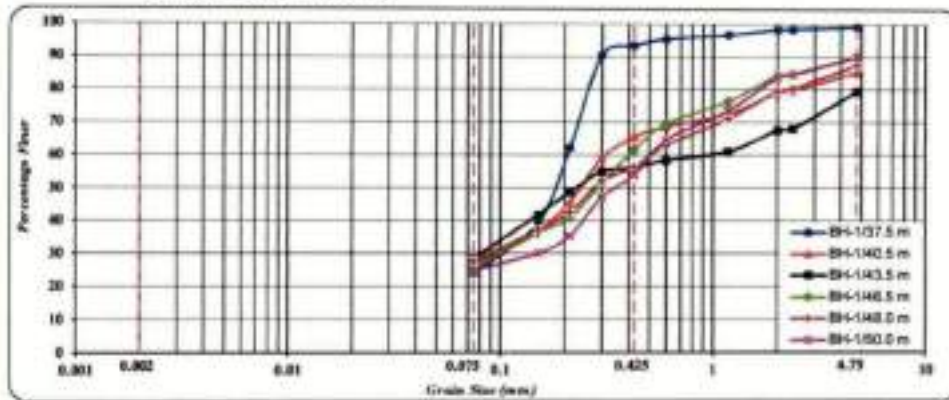


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J.O. No. : SC/2499/0289

Appendix - A2 of A19

Project Name : Geotechnical Investigation Work for Proposed "RBI Staff Quarter" at Lohia Nagar,
Kankarbagh, Patna, Bihar.



Sample Details			Test Results (Grain Size Distribution)			
Borehole Number	Sample Depth, m	Soil Classification	> 4.75 mm Gravel	%	4.75 mm - 0.075 mm Sand	%
B9-1	37.5	SM	0.7	75.2		24.1
B9-1	40.5	SM	14.6	39.8		26.4
B9-1	43.5	SM	20.6	31.1		28.3
B9-1	46.5	SM	9.8	34.4		25.8
B9-1	48.0	SM	12.5	39.9		27.8
B9-1	50.0	SM	9.9	65.3		24.9



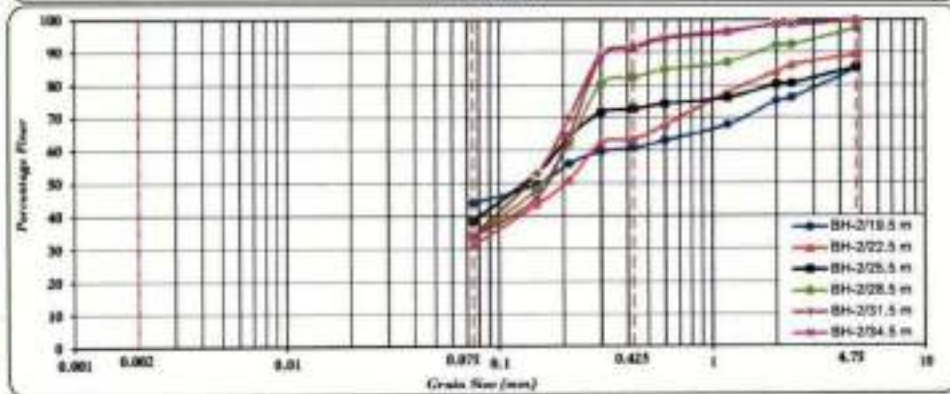
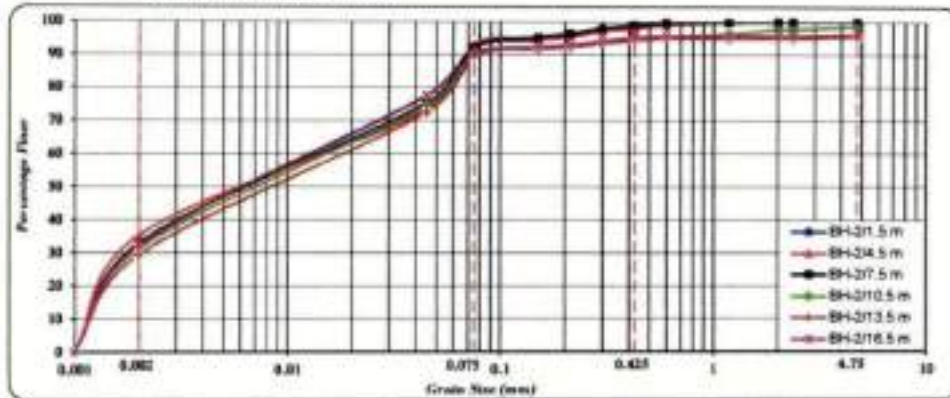


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J.O. No. : SC/2409/0289

Appendix - A3 of A19

Project Name : Geotechnical Investigation Work for Proposed 'RBI Staff Quarter' at Lohia Nagar,
Kankarbagh, Patna, Bihar.



Sample Details			Test Results (Grain Size Distribution)			
Borehole Number	Sample Depth, m	Soil Class/Position	> 4.75 mm Gravel %	4.75 mm - 0.075 mm Sand %	0.075 mm - 0.001 mm % SS	< 0.001 mm % Clay
BH-2	1.5	CI	0.0	1.7	59.1	31.2
BH-2	4.5	CI	0.0	6.8	57.8	33.4
BH-2	7.5	CI	0.0	7.6	60.0	32.6
BH-2	10.5	CI	1.4	8.6	58.5	31.5
BH-2	13.5	CI	4.4	3.9	80.1	29.6
BH-2	16.5	CI	3.8	5.8	57.8	32.6
BH-2	19.5	SM	14.9	41.1	44.0	
BH-2	22.5	SM	10.5	58.5	31.0	
BH-2	25.5	SM	16.5	47.1	36.4	
BH-2	28.5	SM	2.5	63.5	34.0	
BH-2	31.5	SM	0.0	66.0	34.0	
BH-2	34.5	SM	0.0	66.2	33.8	



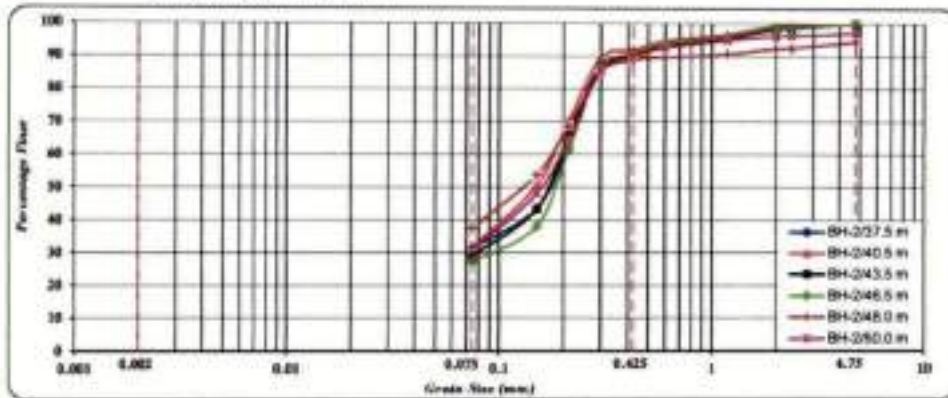


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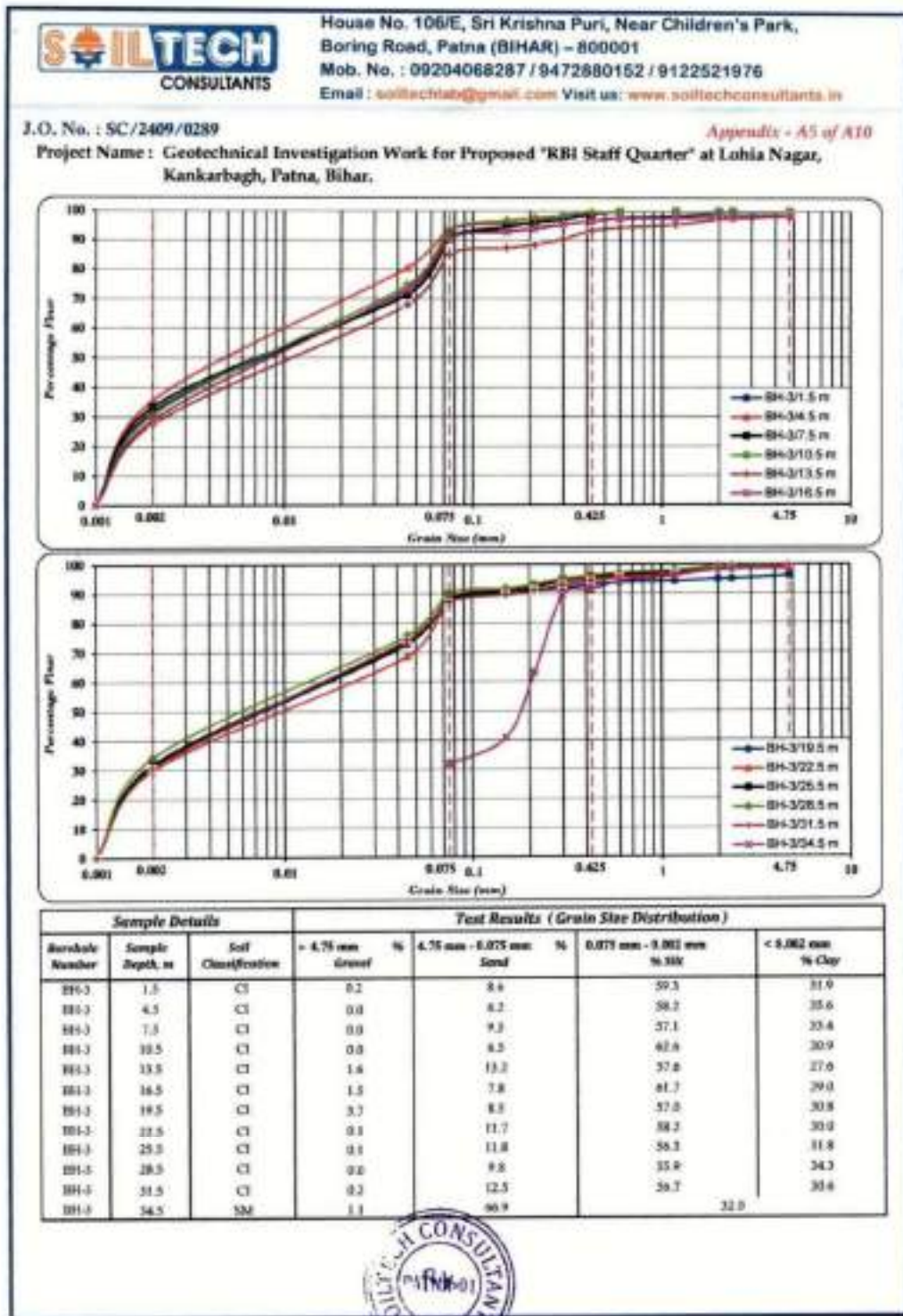
Appendix - A4 of A10

Project Name : Geotechnical Investigation Work for Proposed "RBI Staff Quarter" at Lohia Nagar,
Kankarbagh, Patna, Bihar.



Sample Details			Test Results (Grain Size Distribution)			
Borehole Number	Sample Depth, m	Soil Classification	> 4.75 mm Gravel	%	4.75 mm - 0.075 mm Sand	%
BH-2	37.5	SM	0.0	66.4		31.4
BH-2	40.5	SM	0.0	68.3		31.7
BH-2	43.5	SM	0.0	70.9		29.1
BH-2	46.5	SM	0.0	72.5		27.5
BH-2	48.0	SM	5.5	36.9		37.6
BH-2	50.0	SM	2.8	66.3		30.9





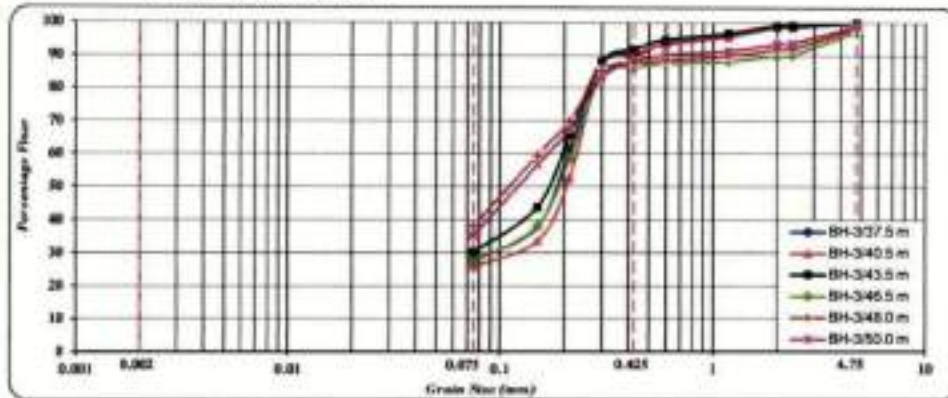


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J.O. No. : SC/2409/0289

Appendix - A6 of A10

Project Name : Geotechnical Investigation Work for Proposed "RBI Staff Quarter" at Lohia Nagar,
Kankarbagh, Patna, Bihar.



Sample Details			Test Results (Grain Size Distribution)			
Borehole Number	Sample Depth, m	Soil Classification	> 4.75 mm Gravel	%	4.75 mm - 0.075 mm Sand	%
BH-3	37.5	SM	0.0	72.1		27.9
BH-3	40.5	SM	0.0	74.0		26.0
BH-3	43.5	SM	0.0	69.7		30.3
BH-3	46.5	SM	2.6	70.0		27.4
BH-3	48.0	SM	1.6	68.3		30.1
BH-3	50.0	SM	0.9	63.8		35.3



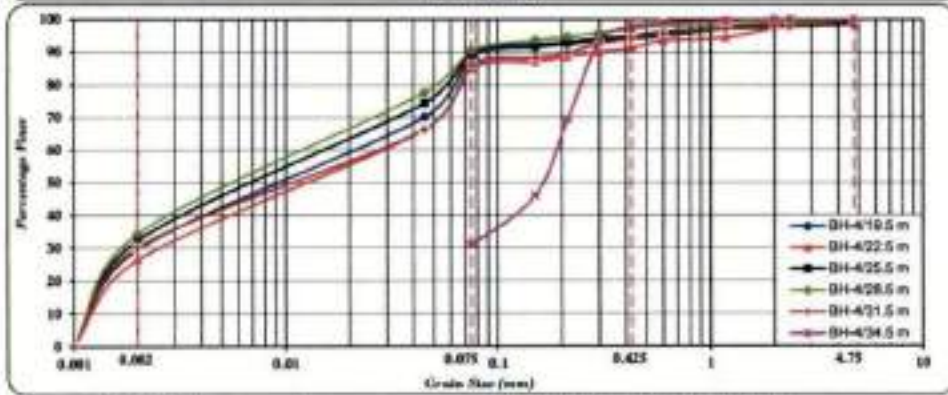
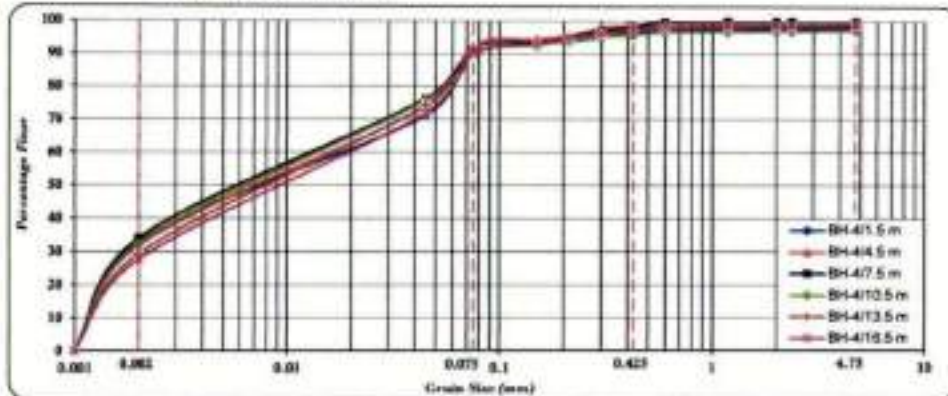


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J.O. No. : SC/2409/0289

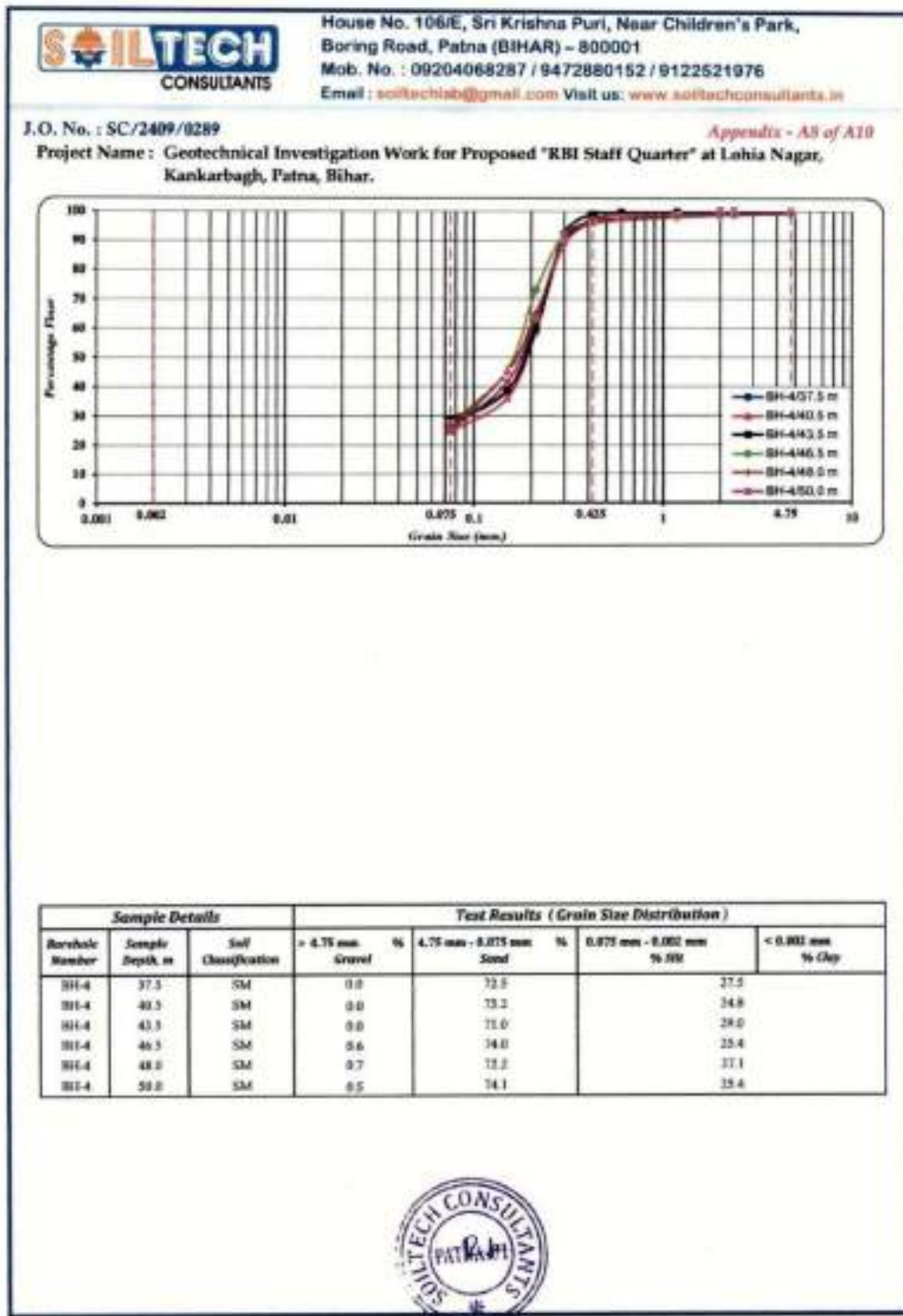
Appendix - A7 of A10

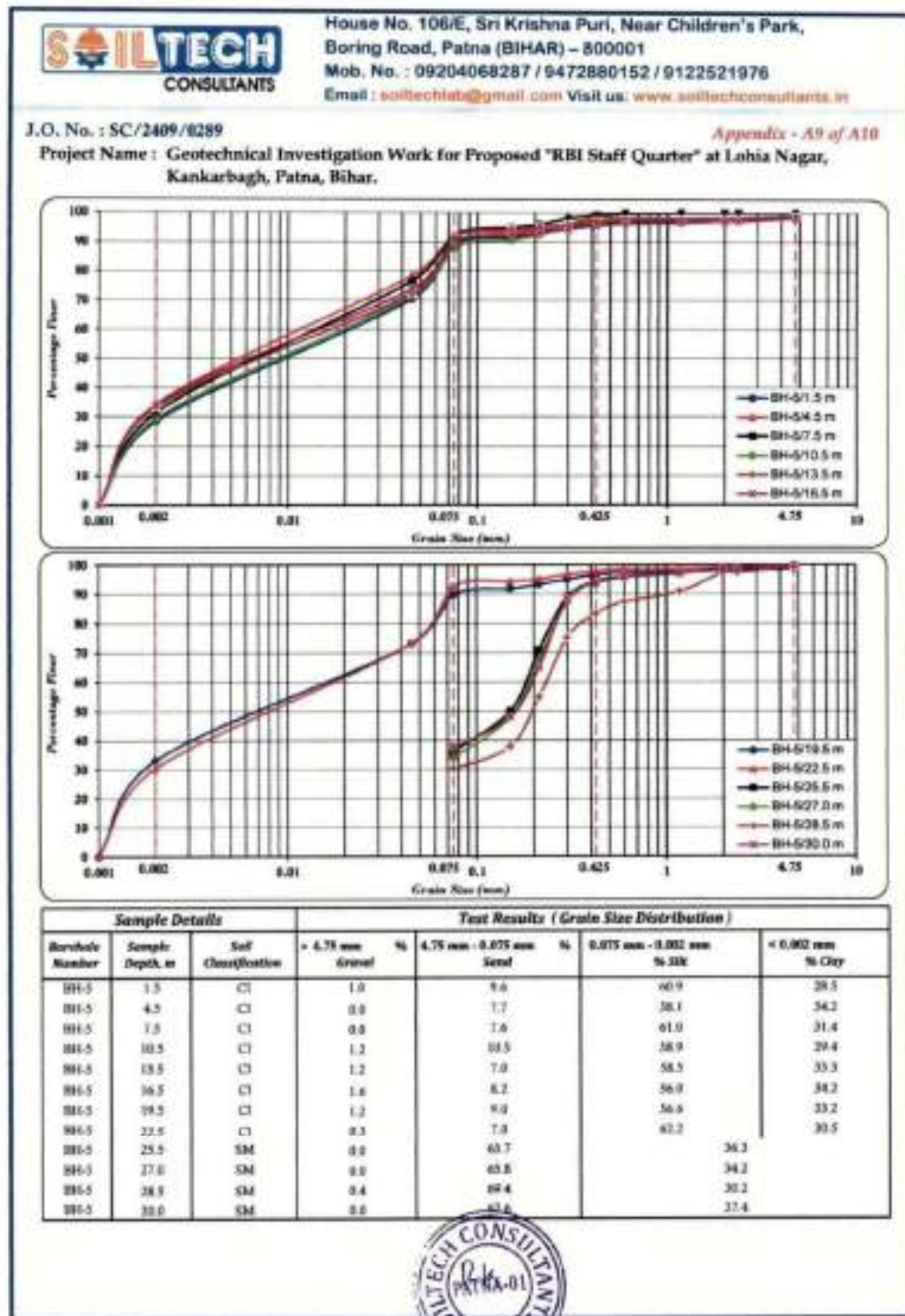
Project Name : Geotechnical Investigation Work for Proposed "RBI Staff Quarter" at Lohia Nagar,
Kankarbagh, Patna, Bihar.

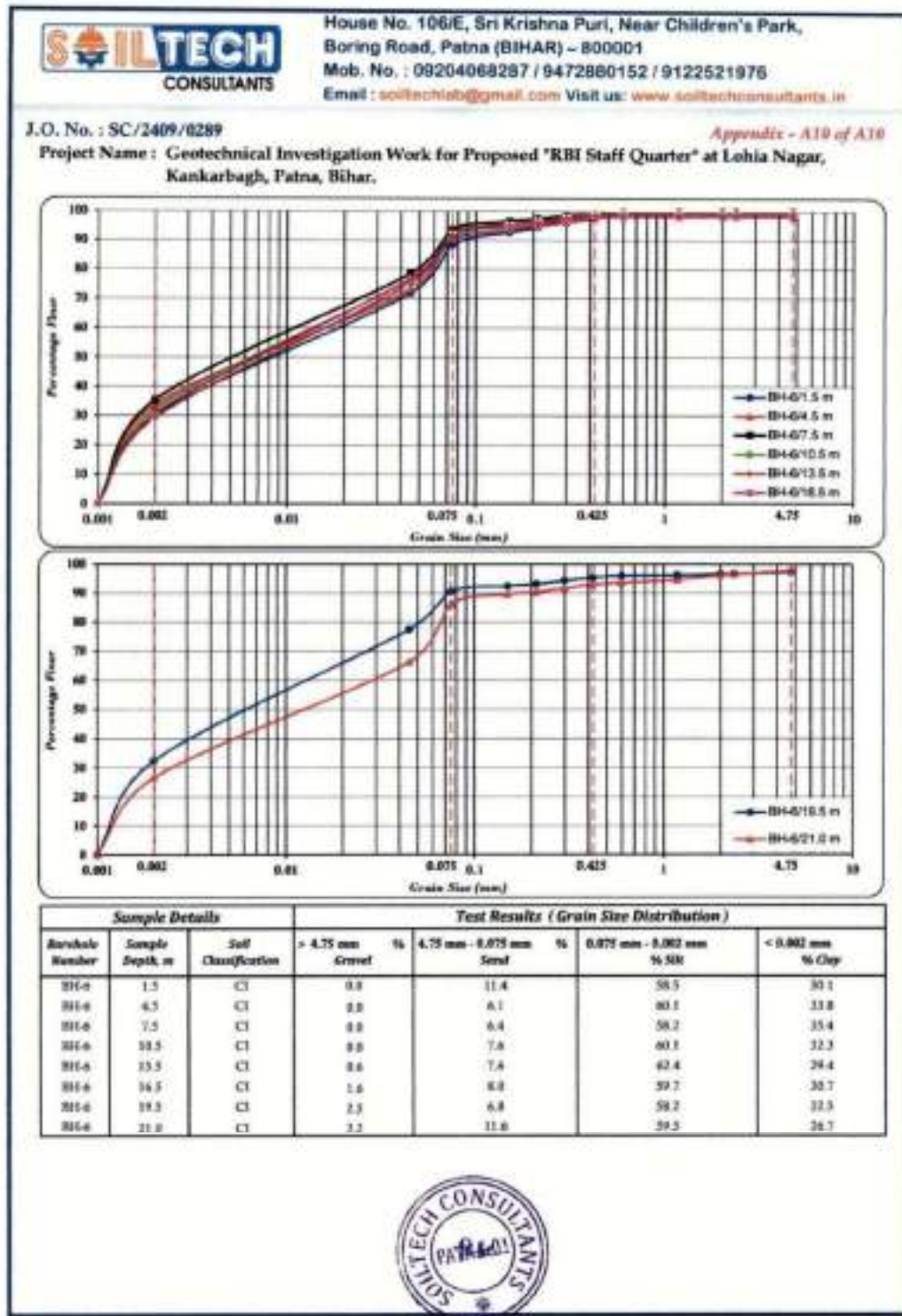


Sample Details			Test Results (Grain Size Distribution)					
Borehole Number	Sample Depth, m	Soil Classification	> 4.75 mm Gravel	%	4.75 mm - 0.075 mm Sand	%	0.075 mm - 0.002 mm % Silt	< 0.002 mm % Clay
BH-4	1.5	CI	1.9	6.5	58.9			33.0
BH-4	4.5	CI	0.0	7.3	60.8			31.9
BH-4	7.5	CI	0.0	8.1	57.9			34.0
BH-4	10.5	CI	2.6	7.0	57.9			32.5
BH-4	13.5	CI	1.1	7.3	62.4			29.4
BH-4	16.5	CI	0.9	9.1	62.2			27.8
BH-4	19.5	CI	0.4	10.8	59.2			29.6
BH-4	21.5	CI	0.7	14.2	58.7			26.4
BH-4	25.5	CI	1.5	8.8	57.4			32.3
BH-4	28.5	CI	0.7	9.0	56.0			34.3
BH-4	31.5	CI	0.5	13.3	54.0			30.2
BH-4	34.5	SM	0.0	69.1			30.9	









APPENDIX – B

SITE PHOTOGRAPH

Name of Work

Geotechnical Investigation Work for Proposed

"RBI Staff Quarter" at Lohia Nagar, Kankarbagh, Patna, Bihar.



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CONSULTANTS

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J.O. No.: SC/2409/0289 Appendix B1 of B1



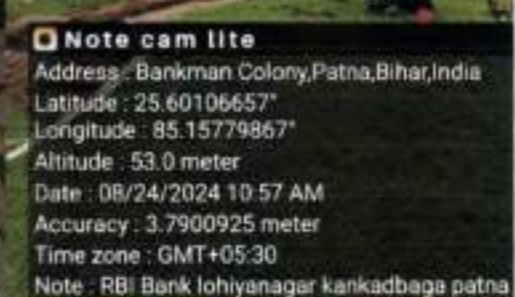
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Longitude : 85.15745132°
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Date : 08/26/2024 10:54 AM
Accuracy : 3.7900925 meter
Time zone : GMT+05:30
Note : RBI Staff Quarter at Lohiya Nagar,
Kankarbagh, Patna



Note cam lite
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Latitude : 25.60106657°
Longitude : 85.15779867°
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Date : 08/24/2024 10:57 AM
Accuracy : 3.7900925 meter
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Note : RBI Bank lohiyanagar kankadbage patna



Note cam lite
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Latitude : 25.60086552°
Longitude : 85.15751944°
Altitude : 53.0 meter
Date : 09/03/2024 02:18 PM
Accuracy : 3.7900925 meter
Time zone : GMT+05:30
Note : RBI Staff Quarter at Lohiya Nagar,
Kankarbagh, Patna BH no B4



Note cam lite
Address : Bankman Colony, Patna, Bihar, India
Latitude : 25.60086552°
Longitude : 85.15751944°
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Accuracy : 3.7900925 meter
Time zone : GMT+05:30
Note : RBI Staff Quarter at Lohiya Nagar,
Kankarbagh, Patna BH no B4



ATTACHMENT – I
ADDITIONAL
SAFE BEARING CAPACITY
DESIRED BY CLIENT

Name of Work

Geotechnical Investigation Work for Proposed
"RBI Staff Quarter" at Lohia Nagar, Kankarbagh, Patna, Bihar.

ADDITIONAL SAFE LOAD CARRYING CAPACITY FOR PILE

"RBI STAFF QUARTER AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR"

Recommendations: As per desired by Client.

Proposed Structure may be provided with Pile Foundation at different depth and size is tabulated below:

[Safe Capacity of Piles, Tonnes]								
Length of Pile below Cut-off level 1.5 m								
Pile Diameter, (mm)	Length = 10 m		Length = 12 m		Length = 15 m		Length = 20 m	
	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)
600 ϕ	25.9	17.0	29.8	20.9	36.6	27.6	48.5	39.1
750 ϕ	35.2	21.3	40.0	26.2	48.6	34.5	63.5	48.9
900 ϕ	45.5	25.5	51.4	31.4	61.8	41.3	79.8	58.7

Note:

1. We have not taken into account any enhancement in SBC Value, which is allowed as per codes in seismic condition. The same may be considered as per relevant codes.
2. DMC and Tremie method of pile concreting should be adopted as the water table is near the ground surface.
3. *Shallow Foundations or Pile Caps should be isolated from the surrounding expansive soil of type CI by layers of compacted local sand.*
4. *Pile Capacity should preferably be confirmed by Initial Load Tests [see IS: 2911 (Part 4): 2013]. Pile load test is the most direct method for determining the safe loads on piles including its structural capacity with respect to soil in which it is installed.*
5. As per the provisions of the IS Code, an appropriate number of piles must be subjected to routine load tests to check the veracity of the above recommended values of the safe capacities of piles.

(Er. Ravi Kumar)
Authorized Signatory

*** End of Report ***

ATTACHMENT – II
ADDITIONAL
SAFE BEARING CAPACITY
DESIRED BY CLIENT

Name of Work

Geotechnical Investigation Work for Proposed
"RBI Staff Quarter" at Lohia Nagar, Kankarbagh, Patna, Bihar.

ADDITIONAL SAFE LOAD CARRYING CAPACITY FOR PILE

"RBI STAFF QUARTER AT LOHIA NAGAR, KANKARBAGH, PATNA, BIHAR"

Recommendations: As per desired by Client.

Proposed Structure may be provided with Pile Foundation at different depth and size is tabulated below:

[Safe Capacity of Piles, Tonnes]								
Length of Pile below Cut-off level 1.5 m								
Pile Diameter, (mm)	Length = 10 m		Length = 12 m		Length = 15 m		Length = 20 m	
	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)	Vertical (Compression)	Uplift (Tension)
300 ϕ	10.7	8.5	12.7	10.5	15.9	13.9	21.9	19.6
450 ϕ	17.8	12.8	20.7	15.7	25.7	20.7	34.6	29.4

Note:

1. We have not taken into account any enhancement in SBC Value, which is allowed as per codes in seismic condition. The same may be considered as per relevant codes.
2. DMC and Tremie method of pile concreting should be adopted as the water table is near the ground surface.
3. *Shallow Foundations or Pile Caps should be isolated from the surrounding expansive soil of type CI by layers of compacted local sand.*
4. *Pile Capacity should preferably be confirmed by Initial Load Tests [see IS: 2911 (Part 4): 2013]. Pile load test is the most direct method for determining the safe loads on piles including its structural capacity with respect to soil in which it is installed.*
5. As per the provisions of the IS Code, an appropriate number of piles must be subjected to routine load tests to check the veracity of the above recommended values of the safe capacities of piles.

(Er. Ravi Kumar)
Authorized Signatory

*** End of Report ***



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ADDENDUM REPORT-1

TO THE REPORT No. SC/GTI/2409/0289

The addendum report is being issued based on the requirement of the client that the Lateral capacity & depth of fixity is required for the following pile diameter and length.

1. In accordance with the requirement, the value of Lateral load carrying

Sl No.	Pile Diameter (in mm)	Pile Cut-off Length in m	Pile Length below Cut-off Level in m	Safe Pile capacity (Compression) in Tonnes	Safe Pile capacity (Uplift) in Tonnes	Lateral Load Capacity of Pile in Tonnes	Depth of Fixity (Z _f) in m
1	300	1.50	10.00	10.70	8.50	1.43	3.12
2			12.00	12.70	10.50	1.47	
3			15.00	15.90	13.90	1.53	
4			20.00	21.90	19.60	1.61	
5	450	1.50	10.00	17.80	12.80	3.22	4.61
6			12.00	20.70	15.70	3.31	
7			15.00	25.70	20.70	3.44	
8			20.00	34.60	29.40	3.61	
9	600	1.50	10.00	25.90	17.00	-	6.01
10			12.00	29.80	20.90	5.89	
11			15.00	36.60	27.60	6.12	
12			20.00	48.50	39.10	6.42	
13			24.00	140.40	66.40	6.42	
14			27.00	160.00	76.40	11.63	
15			30.00	179.40	90.30	11.91	
16			33.00	206.90	104.80	12.46	
17	750	1.5	10.00	35.20	21.30	-	7.42
18			12.00	40.00	26.20	-	
19			15.00	48.60	34.50	9.56	
20			20.00	63.50	48.90	10.04	
21			24.00	172.20	74.70	20.78	
22			27.00	193.80	88.30	21.28	
23			30.00	217.00	105.40	22.26	
24			33.00	251.00	123.20	22.73	

Note:- The above recommendations are based on the field investigation data results and the laboratory tests results of the samples collected from the boreholes and our experience in this regard. If the actual sub-soil conditions during excavation for the foundations differ from that has been reported, a reference should be made to us for suggestions.

(Er. Ravi Kumar)
Authorized Signatory

*** End of Report ***