MBS School of Planning & Architecture, Dwarka, New Delhi

Site Visit Report

Building Construction – IInd Year (2019-20)

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Site Visit Report

Project: Construction of Office Building for Chief Labor Commission & Regional Labor Commissioner at Sector-09, Dwarka

Date of Visit: 18.10.2019

Object: To study RCC Construction technology, raft foundation, RCC retaining wall, reinforcement of columns, beams, slabs and water proofing as per syllabus/curriculum.

Project Details:

Plot area	= 92.5 X 43.5 M = 4033 SQ.M.
Permissible Ground Coverage @ 30%	= 1210 SQ.M.
Permissible FAR @200	= 8068 SQ.M.
Proposed Ground Coverage	= 800 SQ.M.
Proposed Built-up area	= 6645.24 SQ.M.
No. of Floors	= G + 8 storeys

Building under Swachh Bharat Abhiyan

Building Design: L-shaped building

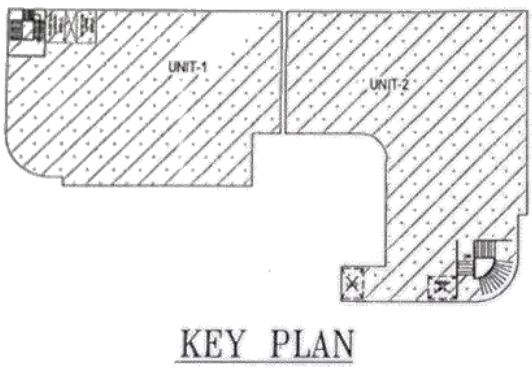


Figure 1: Key Plan of the building

Project Status: Under-construction

- Basement with raft foundation have been laid
- Retaining walls around & along the building envelop is in completion process with 75% completion
- Basement roof is ground floor slab at rear portion is 90% complete
- Slab casted for 1st floor at rear portion and columns is in progress of 2nd floor
- Ramp slab shuttering is in process
- Reinforcement of beams laid up in front portion

Observations:

- Solid raft or mat type footing has been provided
- Footing is 1300mm deep for tower area and 900mm deep for non-tower area
- The raft comprises of 2 layers of crisscross reinforcement – one on the top and other on the bottom of the raft
- The top reinforcement layer is of 25mm dia. Bars provided both ways at 130 c/c distance over the entire area of the raft
- In the bottom layer, reinforcement under the tower – alternate bars of 32 & 25mm dia bars have been provided both ways @160 c/c distance whereas for non-tower area – 25mm dia bars have been provided both ways @160 c/c distance
- All the vertical structural members like columns, shafts, etc. originates from the raft base
- External Tanking technique for waterproofing basement has been provided below the raft as well as on the faces along the length, width and height of the footing upto the plinth level; So, practically, the entire substructure has been wrapped by waterproofing treatment so as to arrest any possibility of seepage. For external tanking, kota stone with mortar laid on both the sides of stone is provided as per CPWD specification.

  Specification: To start with, 700mm PCC bed is provided below raft over which 75mm waterproofing has been provided comprising of 25mm rough kota stone laid over 25mm rich 1:3 mortar and topped with same mortar. For vertical surface, 65mm layer is provided (20mm mortar + 25mm kota stone + 20mm mortar) and Dr. fixit 101 LW water proofing solution is added @ 200ml per bag of 50 kg of cement.

Figure 2: Retaining wall with external finish of Kota stone for External Tanking waterproofing

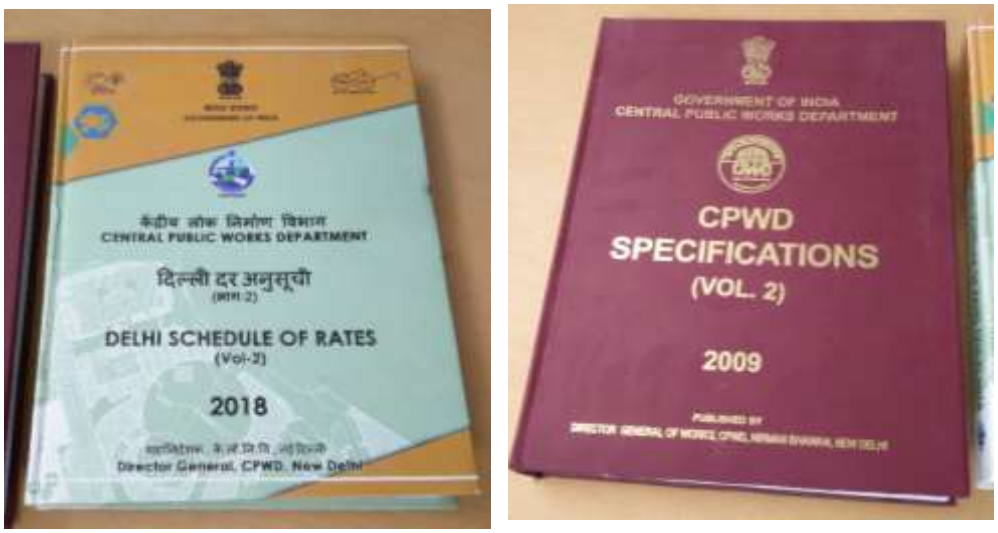


Figure 3: CPWD Specification books

- Concrete mix – M30 & M35 have been used

Site Restrictions:

- Due to Govt. restrictions, boring is not allowed at site of construction. As a result, water has to be obtained through tankers from nearby areas. This results in cost acceleration and also it becomes difficult to get the water tested from different sources again & again. Since water table is same, boring should be allowed at the site.
- Established water harvesting techniques may be deployed to enhance the soil water storage.
- Retarder is required to be added in ready mix concrete as it is provided from distant source. The travel time is 2 hrs. and approx. pouring time is also 2 hrs. So care has to be taken that concrete maintains its fluidity for more than 4 hrs.

Site Photos & Observations: Drawings & Site visit with detailed observations

Figure 4: Site Photo showing work basement and casting of above floors

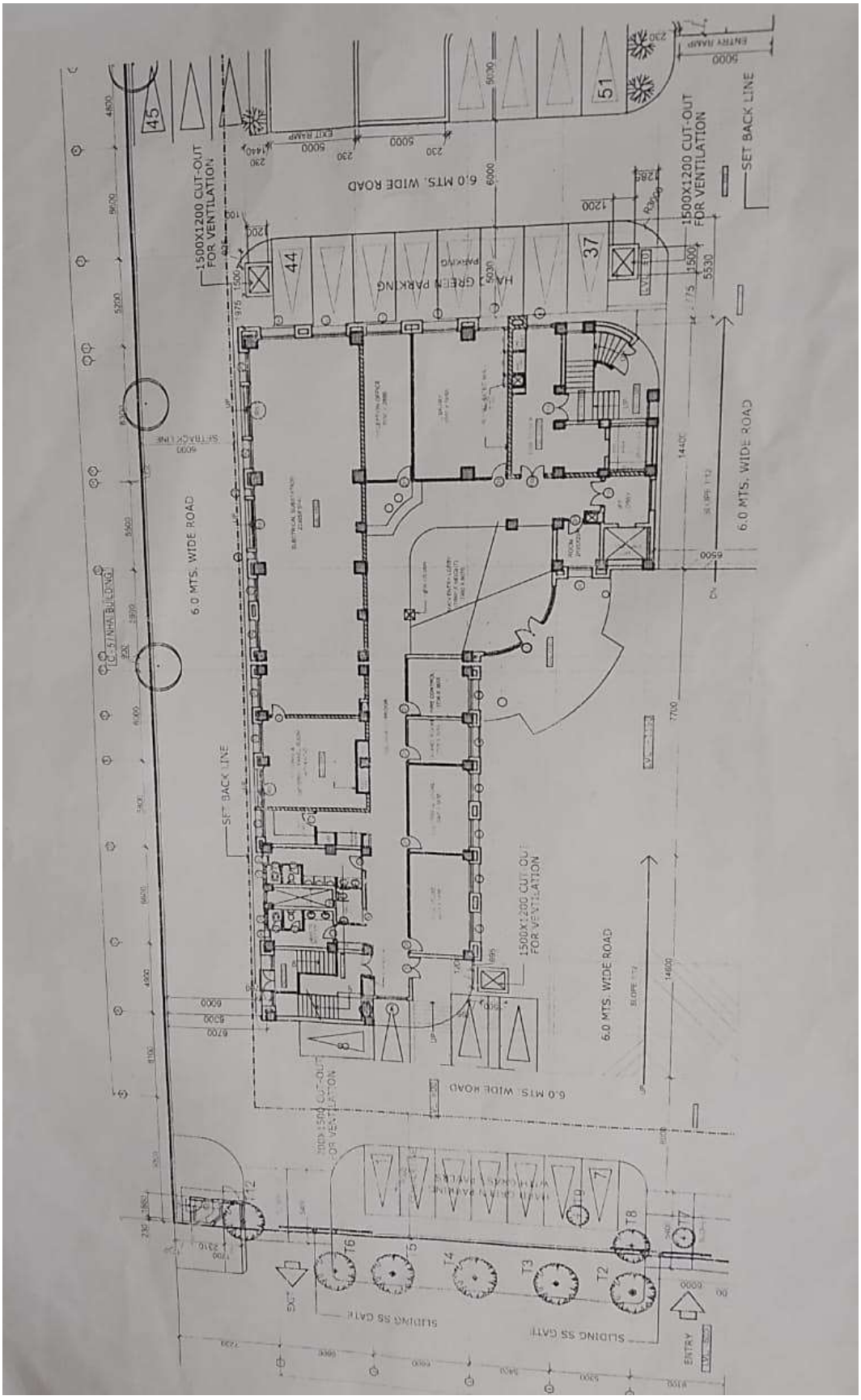


Figure 5: Image showing ground floor plan of the building

1. Column Details:

Vide schedule of columns for reinforcement details of columns going from foundation to first floor, it may be observed that the outer columns size of all the columns has been kept same i.e. – 600 x 600mm. also the reinforcement pattern is same i.e. each column is having total 16 no. of bars – 4 bars on each face. But the diameter of the reinforcement varies. Also, similar columns in all respect have been grouped together.

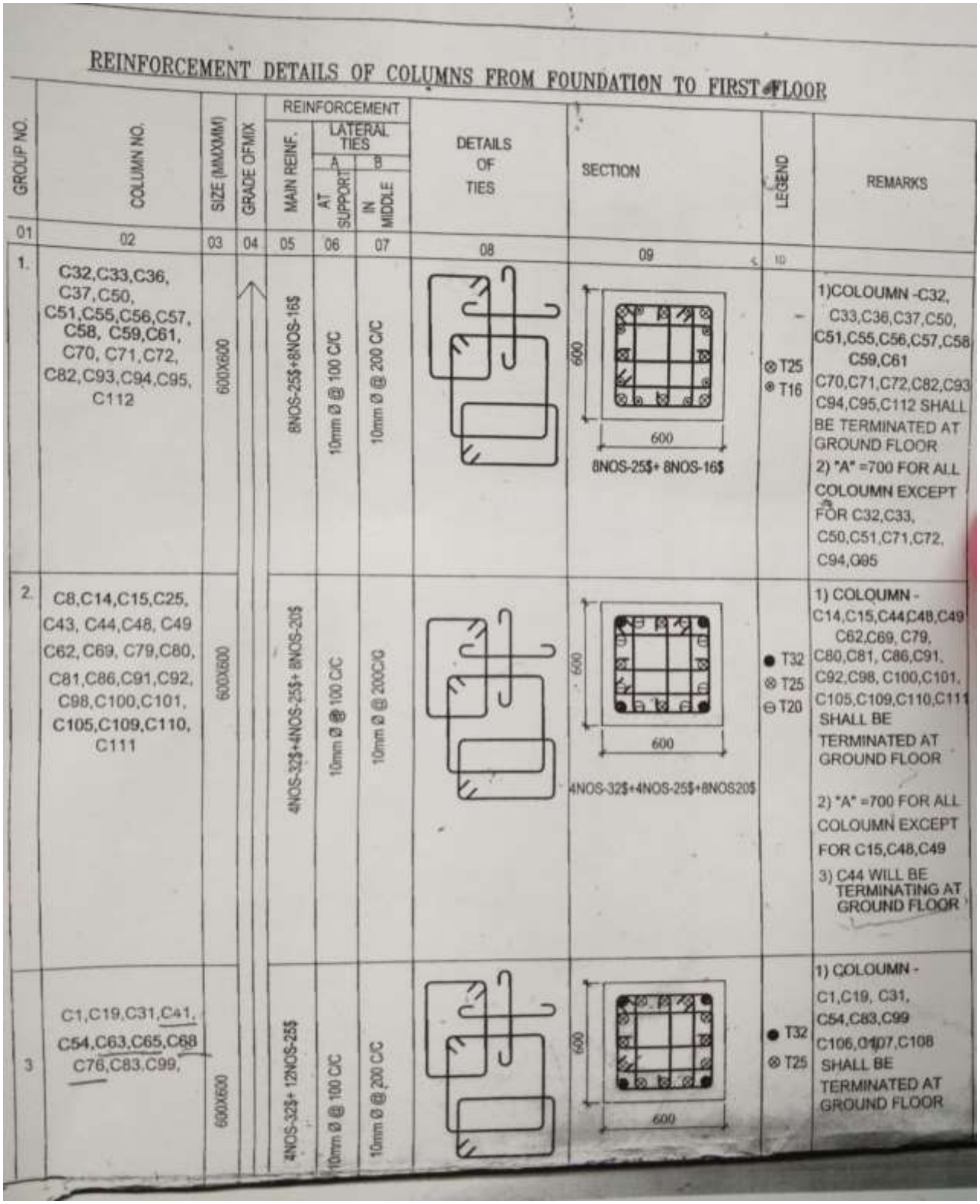
For instance, in group 2, column no: C8, C14, C15,… and others have 4 no. of 32mm dia. bars in the corners, 4 no. of 25mm dia. bars have been provided in middle of each face of the column & 8 no. of 20mm dia. bars have been provided in between the above bars. Some of the columns as above are proposed to be terminated at ground floor level & have been provided for construction of basement in the non-towering area.

2. Stirrups /Lateral Reinforcement Details:

Stirrups play an important role as these acts as lateral reinforcement &help in tying the main reinforcement together forming a rigid cage. Depending on no. of bars provided in the column, for larger columns set of stirrups has to be provided.

In the instant case, for group 2 columns described above, set of 10mm dia. 5 stirrups have been provided. The largest square stirrup, also called 'master ring' encircles the heavier corner bars & well tied up with steel wire. The other two rectangular stirrups encircle the bars next to corner bars; placed in cross formation. 2 no. of single bar stirrups are provided in the middle to tie up middle bars. Hook is required to be formed in each stirrup as per structural details.

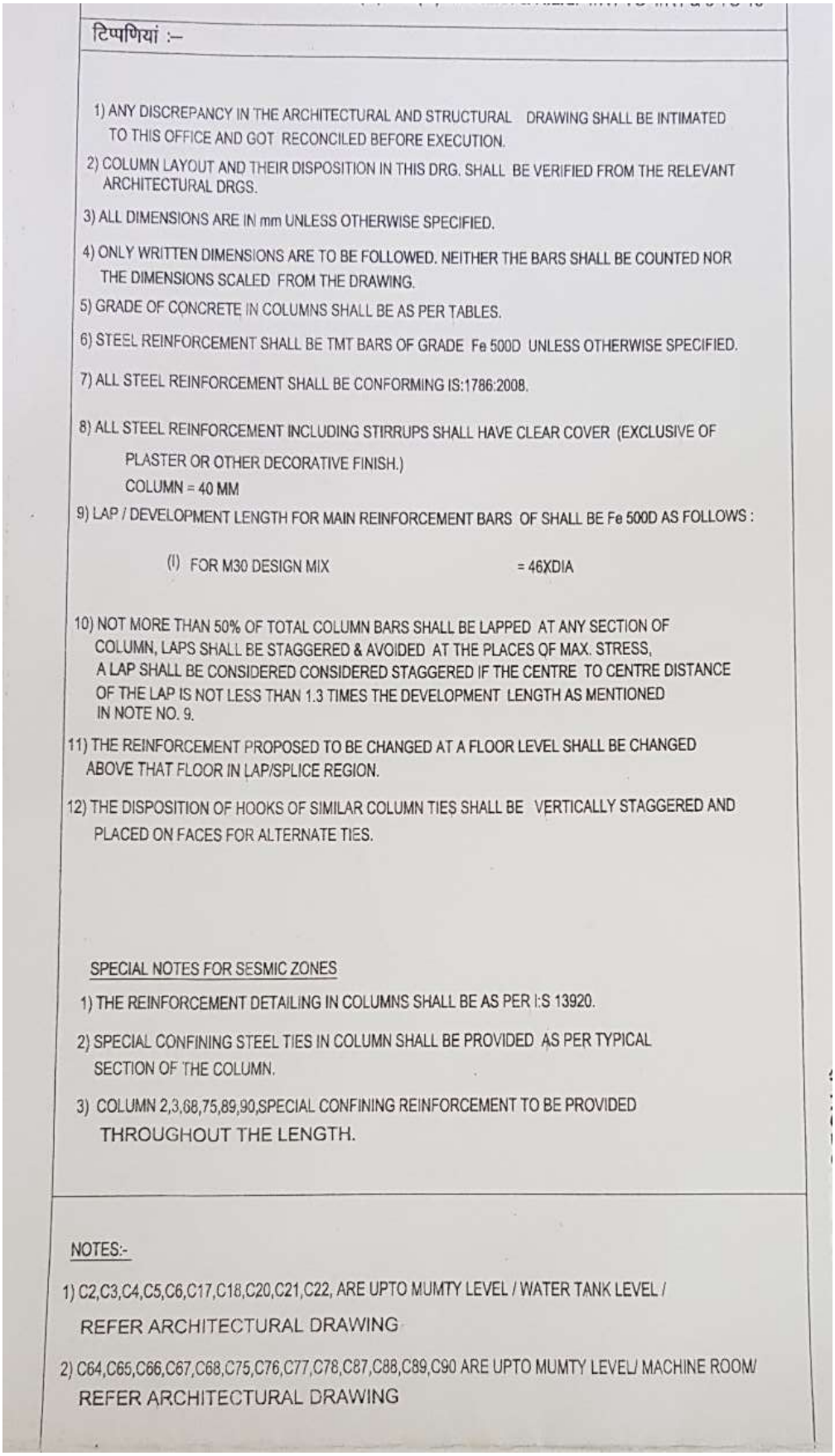
Spacing of stirrups – It was conveyed that since shear forces act more at the junction of columns & beams, the spacing of set of stirrups is kept close near the junctions and bit apart in the middle. This theory applies to columns as well as beams. In the instant case, spacing of 10mm dia. stirrups has been provided @ 100mm c/c at junction and @ 200mm c/c in the middle.



REINFORCEMENT DETAILS OF COLUMNS FROM FOUNDATION TO FIRST FLOOR

GROUP NO.	COLUMN NO.	SIZE (MMXMM)	GRADE OFMIX	REINFORCEMENT			DETAILS OF TIES	SECTION	LEGEND	REMARKS
				MAIN REINF.	LATERAL TIES A AT SUPPORT	LATERAL TIES B IN MIDDLE				
01	02	03	04	05	06	07	08	09	10	
1.	C32,C33,C36, C37,C50, C51,C55,C56,C57, C58, C59,C61, C70, C71,C72, C82,C93,C94,C95, C112	600X600		8NOS-25$+8NOS-16$	10mm Ø @ 100 C/C	10mm Ø @ 200 C/C		600 600 8NOS-25$+ 8NOS-16$	⊗ T25 ⊛ T16	1)COLOUMN -C32, C33,C36,C37,C50, C51,C55,C56,C57,C58 C59,C61 C70,C71,C72,C82,C93 C94,C95,C112 SHALL BE TERMINATED AT GROUND FLOOR 2) "A" =700 FOR ALL COLOUMN EXCEPT FOR C32,C33, C50,C51,C71,C72, C94,C95
2.	C8,C14,C15,C25, C43, C44,C48, C49 C62, C69, C79,C80, C81,C86,C91,C92, C98,C100,C101, C105,C109,C110, C111	600X600		4NOS-32$+4NOS-25$+ 8NOS-20$	10mm Ø @ 100 C/C	10mm Ø @ 200C/C		600 600 4NOS-32$+4NOS-25$+8NOS20$	● T32 ⊗ T25 ⊖ T20	1) COLOUMN - C14,C15,C44,C48,C49 C62,C69, C79, C80,C81, C86,C91, C92,C98, C100,C101, C105,C109,C110,C111 SHALL BE TERMINATED AT GROUND FLOOR 2) "A" =700 FOR ALL COLOUMN EXCEPT FOR C15,C48,C49 3) C44 WILL BE TERMINATING AT GROUND FLOOR
3	C1,C19,C31,C41, C54,C63,C65,C68 C76,C83,C99,	600X600		4NOS-32$+ 12NOS-25$	10mm Ø @ 100 C/C	10mm Ø @ 200 C/C		600 600	● T32 ⊗ T25	1) COLOUMN - C1,C19, C31, C54,C83,C99 C106,C107,C108 SHALL BE TERMINATED AT GROUND FLOOR

Figure 6: Image showing columns with reinforcement & stirrups details



टिप्पणियां :–

1) ANY DISCREPANCY IN THE ARCHITECTURAL AND STRUCTURAL DRAWING SHALL BE INTIMATED TO THIS OFFICE AND GOT RECONCILED BEFORE EXECUTION.

2) COLUMN LAYOUT AND THEIR DISPOSITION IN THIS DRG. SHALL BE VERIFIED FROM THE RELEVANT ARCHITECTURAL DRGS.

3) ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.

4) ONLY WRITTEN DIMENSIONS ARE TO BE FOLLOWED. NEITHER THE BARS SHALL BE COUNTED NOR THE DIMENSIONS SCALED FROM THE DRAWING.

5) GRADE OF CONCRETE IN COLUMNS SHALL BE AS PER TABLES.

6) STEEL REINFORCEMENT SHALL BE TMT BARS OF GRADE Fe 500D UNLESS OTHERWISE SPECIFIED.

7) ALL STEEL REINFORCEMENT SHALL BE CONFORMING IS:1786:2008.

8) ALL STEEL REINFORCEMENT INCLUDING STIRRUPS SHALL HAVE CLEAR COVER (EXCLUSIVE OF PLASTER OR OTHER DECORATIVE FINISH.)
COLUMN = 40 MM

9) LAP / DEVELOPMENT LENGTH FOR MAIN REINFORCEMENT BARS OF SHALL BE Fe 500D AS FOLLOWS :

(I) FOR M30 DESIGN MIX = 46XDIA

10) NOT MORE THAN 50% OF TOTAL COLUMN BARS SHALL BE LAPPED AT ANY SECTION OF COLUMN, LAPS SHALL BE STAGGERED & AVOIDED AT THE PLACES OF MAX. STRESS, A LAP SHALL BE CONSIDERED CONSIDERED STAGGERED IF THE CENTRE TO CENTRE DISTANCE OF THE LAP IS NOT LESS THAN 1.3 TIMES THE DEVELOPMENT LENGTH AS MENTIONED IN NOTE NO. 9.

11) THE REINFORCEMENT PROPOSED TO BE CHANGED AT A FLOOR LEVEL SHALL BE CHANGED ABOVE THAT FLOOR IN LAP/SPLICE REGION.

12) THE DISPOSITION OF HOOKS OF SIMILAR COLUMN TIES SHALL BE VERTICALLY STAGGERED AND PLACED ON FACES FOR ALTERNATE TIES.

SPECIAL NOTES FOR SESMIC ZONES

1) THE REINFORCEMENT DETAILING IN COLUMNS SHALL BE AS PER I:S 13920.

2) SPECIAL CONFINING STEEL TIES IN COLUMN SHALL BE PROVIDED AS PER TYPICAL SECTION OF THE COLUMN.

3) COLUMN 2,3,68,75,89,90,SPECIAL CONFINING REINFORCEMENT TO BE PROVIDED THROUGHOUT THE LENGTH.

NOTES:-

1) C2,C3,C4,C5,C6,C17,C18,C20,C21,C22, ARE UPTO MUMTY LEVEL / WATER TANK LEVEL / REFER ARCHITECTURAL DRAWING

2) C64,C65,C66,C67,C68,C75,C76,C77,C78,C87,C88,C89,C90 ARE UPTO MUMTY LEVEL/ MACHINE ROOM/ REFER ARCHITECTURAL DRAWING

Figure 7: Image shows Important notes for Column drawings

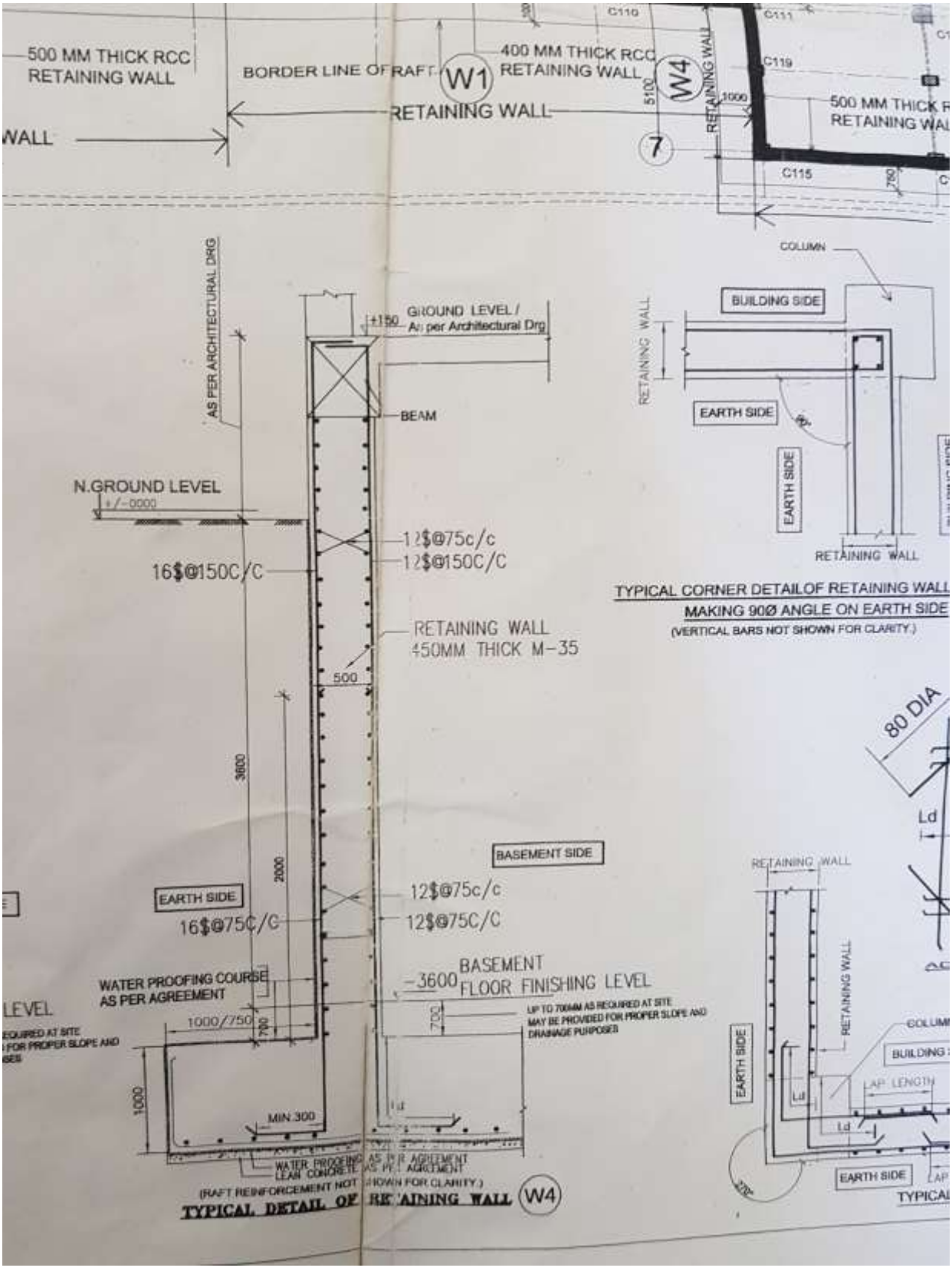


Figure 8: Image shows Typical detail of retaining wall

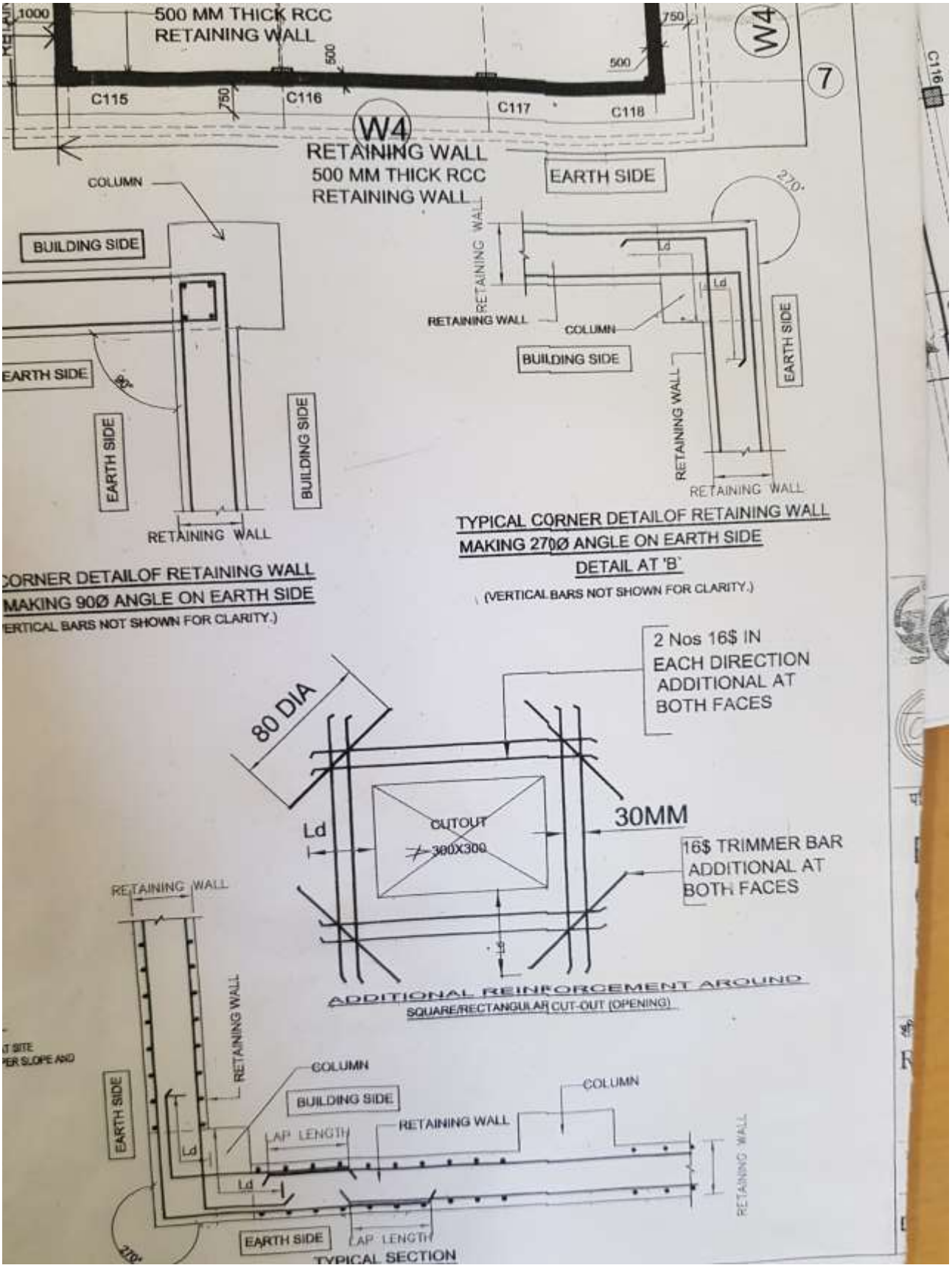


Figure 9: Image shows retaining wall reinforcement details

3. Role of Spacers*:*

Spacers of approx. size 40x40x40 or 25mm are to be provided/tied on the outer & bottom reinforcement of the columns/beams/slabs to provide concrete cover to the reinforcement. These are made of rich small size aggregates concrete or chemical compound. Each spacer is embedded with a thin steel wire for attaching it with reinforcement all around.

As per guidelines, 40mm cover is to be provided for vertical load bearing members i.e. columns & 25mm clear cover for horizontal members i.e. beams & slabs. The spacers when tied with the reinforcement ensure the desired cover gap between the reinforcement & the shuttering box/channel formwork.

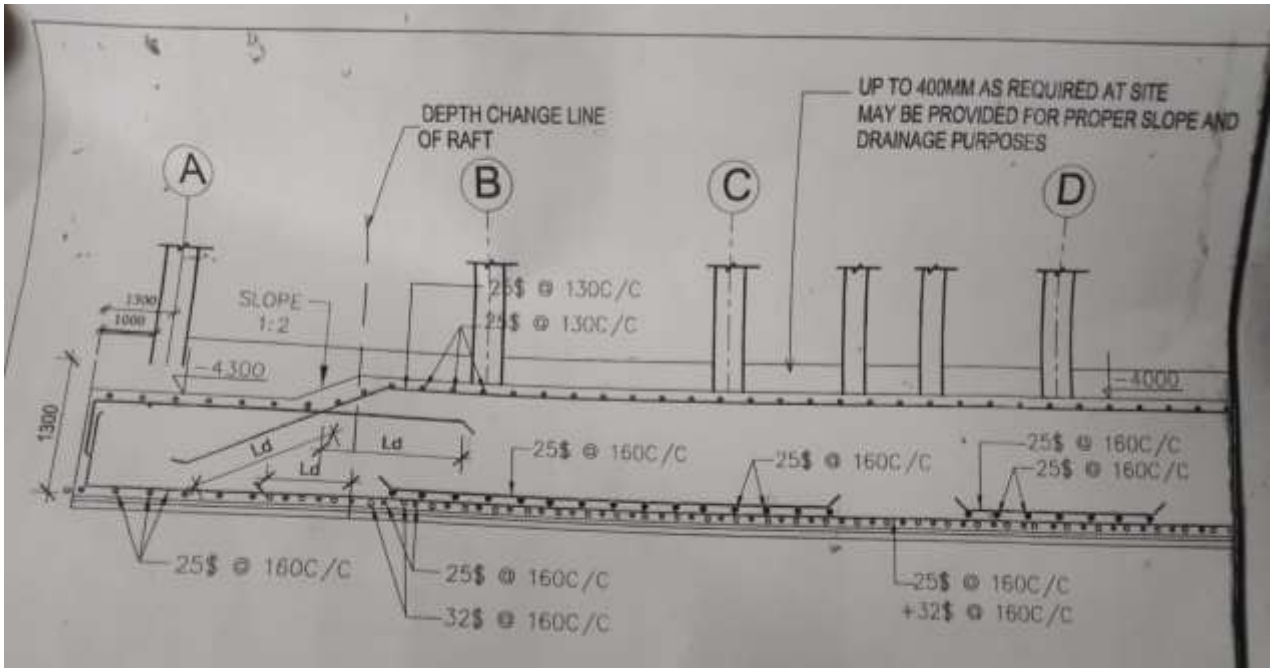


Figure 10: Image shows drawing of raft slab with reinforcement details

4. Reinforcement in Slabs*:*

The slabs are provided with double layers of reinforcement. The bottom layer is called main reinforcement or steel bars & upper layer is distribution steel bars or reinforcement. Extra bars in small lengths are provided over the beams, extending on both sides. The slab thickness & reinforcement may vary depending upon the effective span of the slab and load on it.

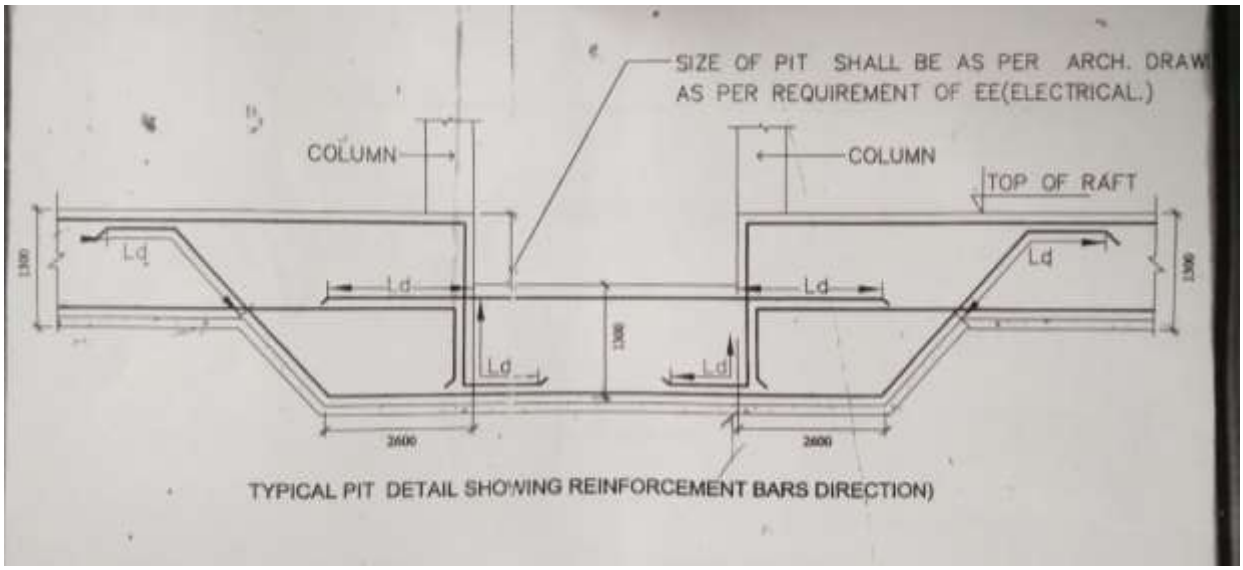


Figure 11: Image shows drawing of Typical pit detail

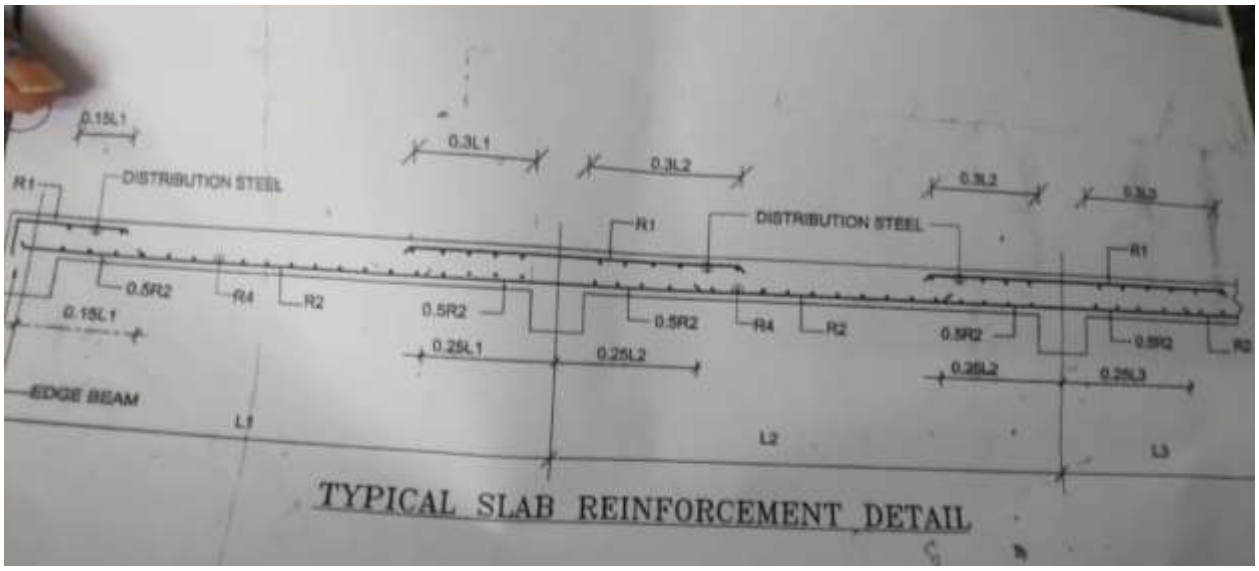


Figure 12: Image shows drawing of Typical slab reinforcement details

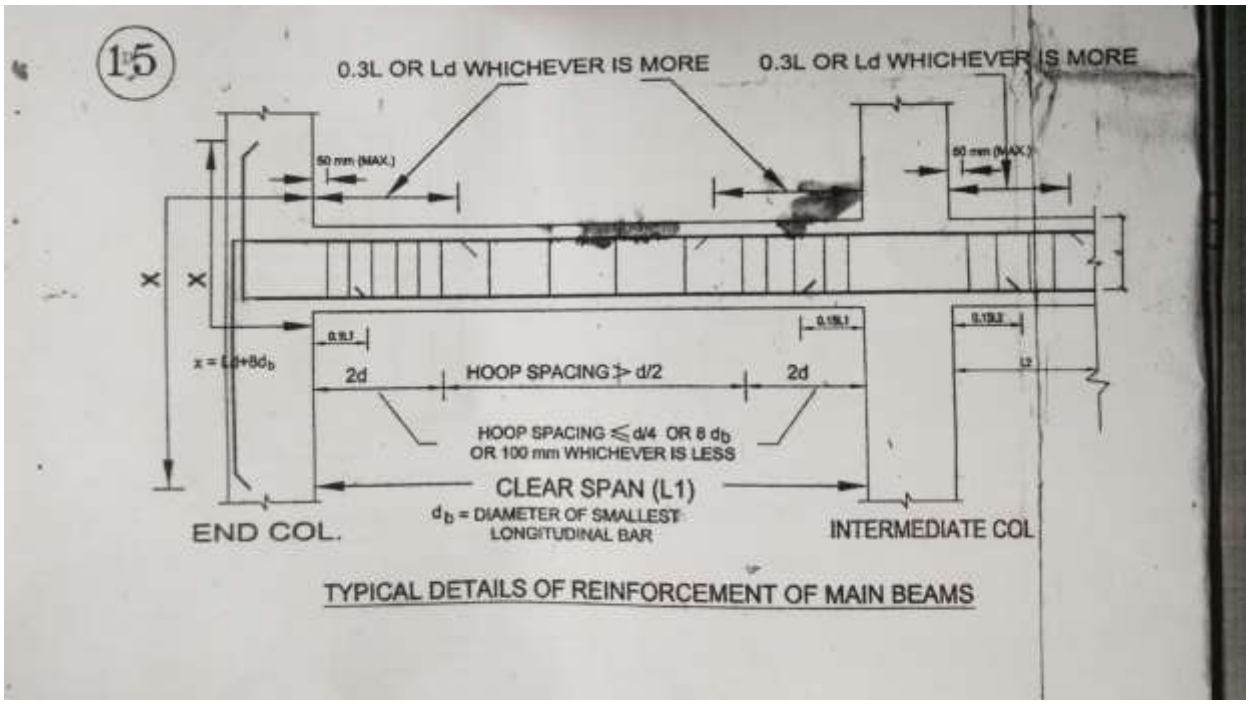


Figure 13: Image shows drawing of Typical main beam reinforcement details

Figure 14: Images showing students at site and a stirrup design for columns

Figure 15: Images showing scaffoldings & metal shuttering for the external tanking waterproofing