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PREPARATION OF BBS OF COLUMN RESTING ON PILE CAP AT CONSTRUCTION SITE

Rehan Ali Khan[1], Furqan Ahmad Siddiqui[2], Shahbaz Ahmad[3]

[1]*Head of Civil Engineering Department, Integral University ,Shahjahanpur*

[2]*Lecturer, Civil Engineering Department, Integral University ,Shahjahanpur*

[3]*Lecturer, Civil Engineering Department, Integral University ,Shahjahanpur*

ABSTRACT

In the present construction industry, the preparation of the bar bending schedule for the reinforcement work is by site engineers or the supervisors which is being done in India is becoming a bad practice. Due to lack of quality supervisors and unskilled labours at the site, our quality control in bar bending and laying is not up to the standard. Also proper cutting of bars is not done which results in cutting wastage .The fact is that the site engineers or the supervisors are not fully aware of all the design considerations that was made for the project, regarding the anchoring, curtailment and lapping of reinforcement bars and their positions, particularly in respect of ductile detailing for earthquake-resistant structures. So these schedules are to be prepared by the engineers in the design office only. Detailed schedule of bar bending is prepared as per code IS456: 2000

Keywords: ***Cutting length, lap length, stirrups, development length***

Image.1

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BAR BENDING SCHEDULE OF COLUMN

I INTRODUCTION

Bar Bending Schedule, commonly referred to as "BBS" is a comprehensive list that describes the location, mark, type, size, length and number, and bending details of each bar or fabric in a Reinforcement Drawing of a Structure.

This process of listing the location, type and size, number of and all other details is called "Scheduling". In context of Reinforcement bars, it is called bar scheduling. In short, Bar Bending Schedule is a way of organizing rebars for each structural unit, giving detailed reinforcement requirements.

Advantages of the Bar Schedule: By preparing a bar schedule, and arranging them according to the lengths, it will lead to an economical bar cutting, reduce the bar cutting wastages.

- It is easy to manage the reinforcement stock required for identified time duration.

Details of column and pile cap

Clear cover in footing = 50mm

Clear cover in slab = 30mm

Lateral and axial load acts on column

Joints in bars cannot be given anywhere

Pile cap thickness = 1500mm

Plinth beam thickness = 200m

Thickness of slab (1 , 2 ,and 3) = 175mm

Roof thickness = 150mm

Clear length of column = 3m

Column is divided in two zones A and B

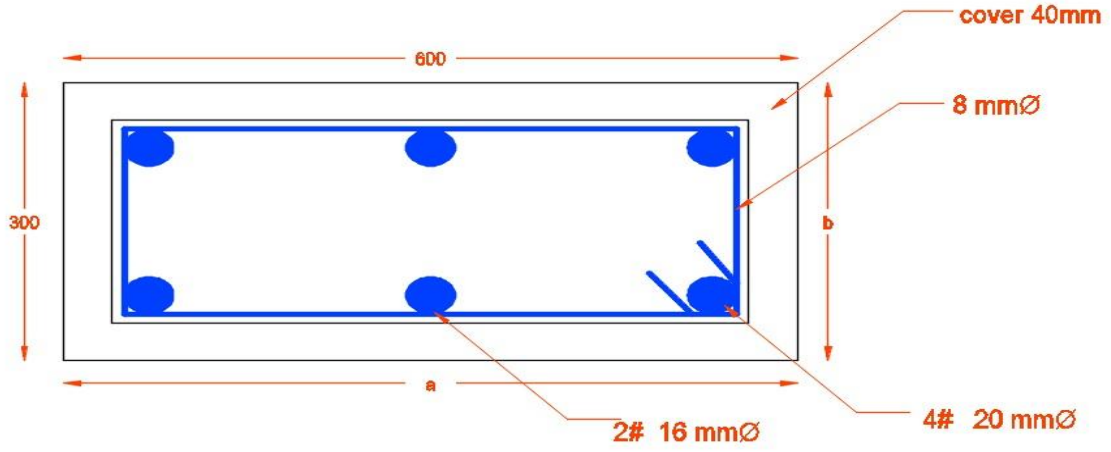

Figure .1

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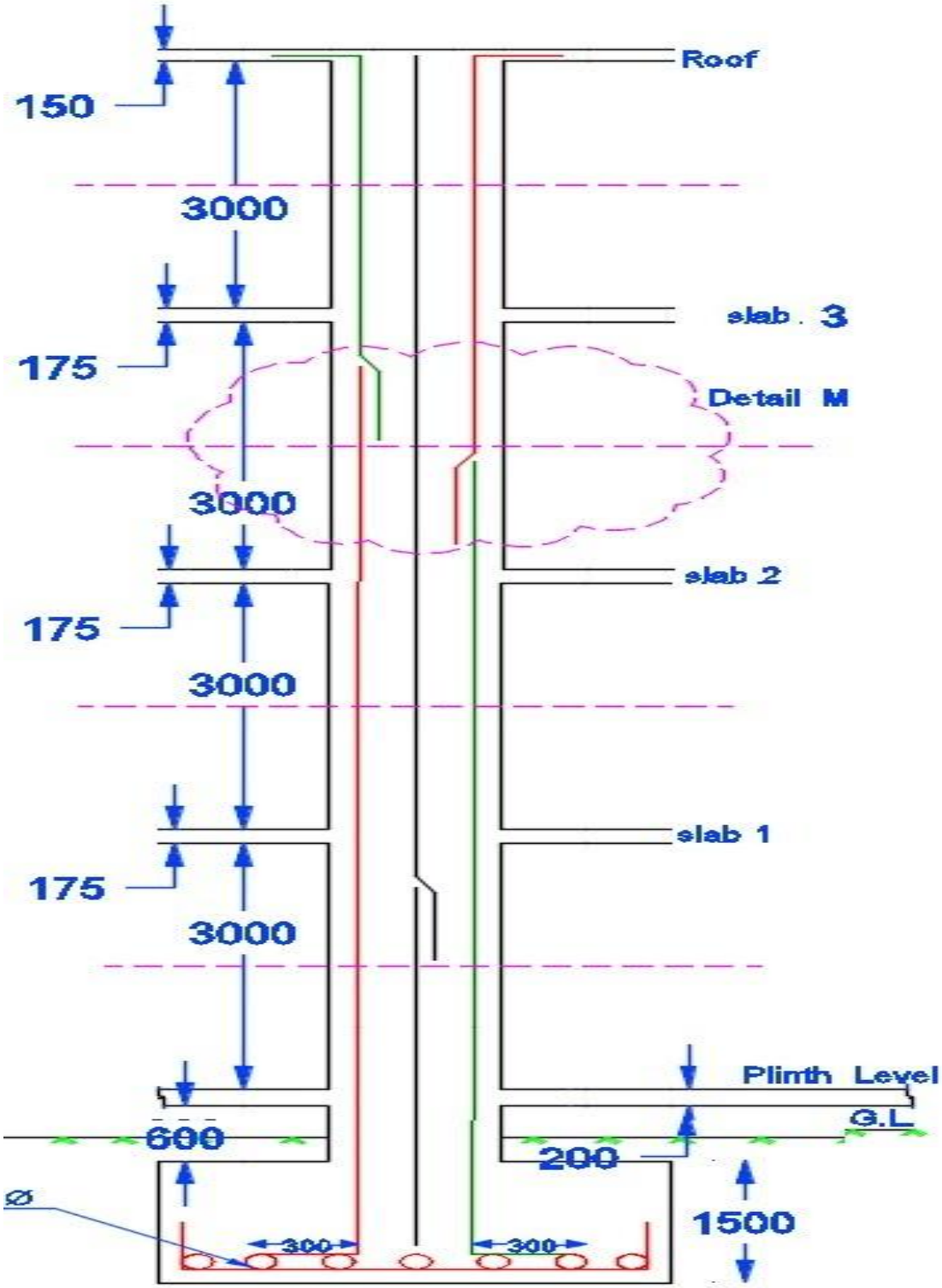

Figure.2

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Calculation of Vertical cutting steel length of column (20 mm)

Cutting length = 300 + (1500-50-25-25) +600 +200+(3000 × 4)+(175 × 3)+(50×20)-(2 ×2×20)

= 15945mm

or 15.945m > 12m i.e. provide one lap

=15.945+50d

=15.945 + 50× 20 = 16.945m

Therefore cutting length of4 # 25mm dia bar = 4 × 16.945 = 67.78m

Calculation of Vertical cutting steel length of column (16 mm)

= 300 + (1500-50-25) +600 +200 + (3000 × 4)+(175 × 3)+(50×16)-(2 ×2×16) = 15786 mm

or 15.786 m>12m i.e provide one lap

=15.786+50d

=15.786 + 50× 16

=16.586m

Therefore cutting length of 2 # 16 mm dia bar = 2 × 16.586 = 33.172m

Fundamentals of Lap provision

1. Laps should not be parallel to each other
2. Laps should be 75mm above and below the centre line i. e in middle zone
3. Laps should be staggered and alternate.

Cross check for BBS calculation

Detail M

Length of part-1 (20mm)

= 300 (1500 – 50-25-25) + 600 + 200 + (3000 x2) + (175 x2) + (b') – bend

= 10235mm

= 10.235m

b' = 1500 – 75 = 1425mm

a' = 1500 + 75 + Ld (50 x 25)

= 2575mm

Length of part -2

= a' + 175 + 3000 + Ld – (1x2d)

= 2575 + 175 + 3000 + Ld – (1x 2x20)

=6710mm

= 6.71m

Part 1 + Part 2

= 10.235 + 6.71

= 16.945m

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For 4 nos. of steel bars = 4 x 16.945 = 67.78m (hence ok)

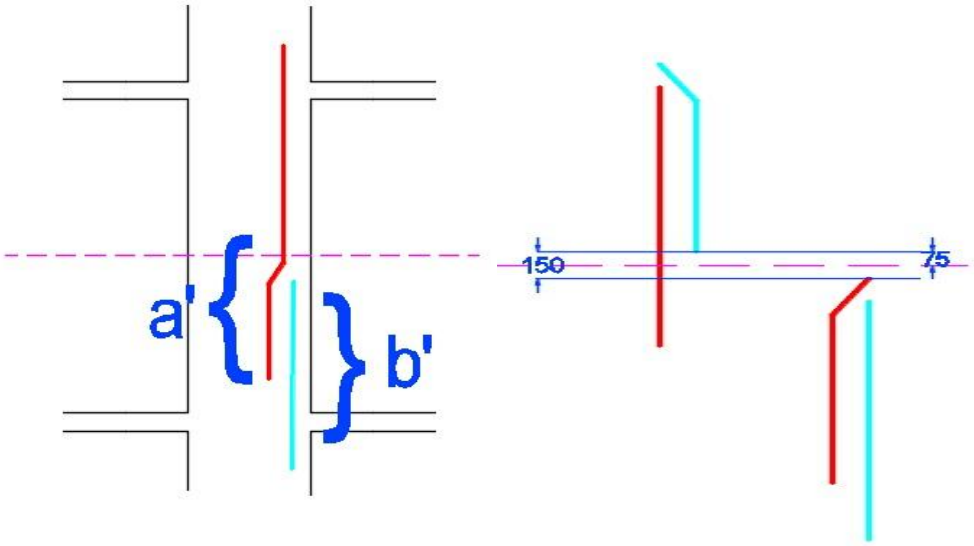

Figure.3

Detail M

Length of part-1 (16 mm)

=300 + (1500 – 50 – 25) +600 +200 + b – bend

=300 + (1500 – 50 – 25) + 600 + 200 + 2375 – (1x2x16)

=4.868m

Length of part -2 (16mm)

= a + (175 x 3) + (3000 x 3) + Ld – (1x2x16)

= 1425 + (175 x 3) + (3000 x 3) + 50 x 16 – (1x2x16)

= 11.718m

Part 1 + Part 2 = 4.868 + 11.718 = 16.586m

For 2 nos. of steel bars = 2 x16.586 = 33.172m (hence ok)

a = 1500 – 75 = 1425mm

b = 1500 + 75 + 50x 16

= 2375mm

Zones in Columns

- L/6 of 3000 = 500mm
- Lap should be in Zone B not in Zone A
- Maximum reinforcement and stirrups is in Zone A
- Lap end to end is 150mm .i.e. 75mm space should be there from end to centre and centre to end (75 + 75 =150)
- If L is not given then take { L = 300mm} assume

- Anchorage of column vertical bar in roof is Ld = 50d (taken)

Calculation for cutting length of Stirrups

a = 600 – 40 – 40 – 4 – 4 = 512mm

b = 300 – 40 – 40 – 4 – 4 = 212mm

Cutting Length = (2 x a) + (2 x b) + (2 x 10 d) – bend

= (2 x 512) + (2 x 212) + (2 x 10 x 8) – 5 x 2 x 8

= 1.528m

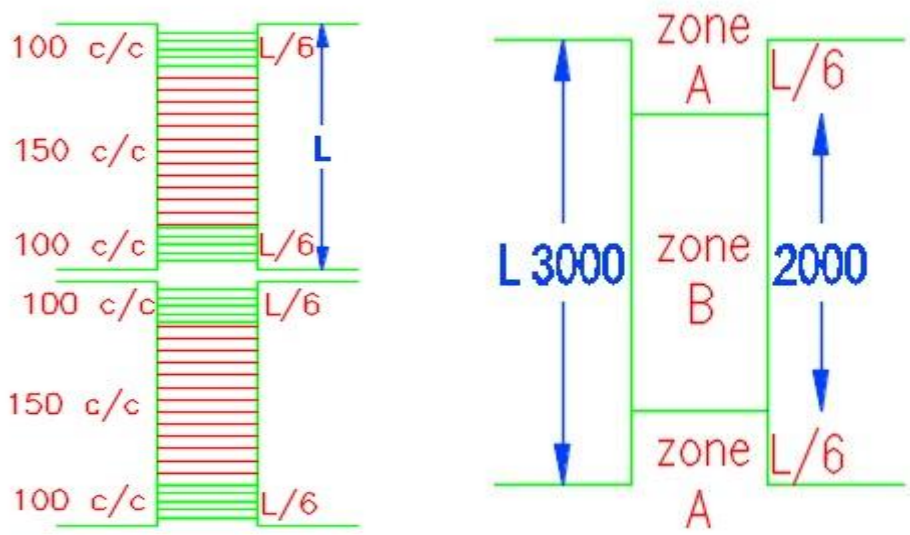

Figure.4

No. of stirrups

Zone A = 100c/c , Zone B = 150c/c

Part A = (2700/100) + 1 = 28Nos.

Part B = (2000/150) – 1 = 12 Nos. x 4 = 48 Nos.

Part C = (1175/100) + 1 = 13 Nos. x 3 = 39 Nos.

Part D =(650 – 30/100) + 1 = 7 Nos. [clear cover for slab = 30mm]

Total Stirrups = A+B + C + D = 122Nos.

Total Length of 8mm steel bar to be used for stirrups = 1.528 x 122 = 186.416 m

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