

# Bar Bending Schedule of Column | Rectangular and Circular Column

The column is a vertical structural member which takes loads from the beam and slab and transfers it to the foundation and finally to the soil. Bar bending schedule of column means simply to calculate the quantity of steel rod used in the column with withstand safely.

I have also written an article on Complete RCC column design Guide – Numerical Example as per IS Code. Now let us move toward the calculation of reinforcement of column.

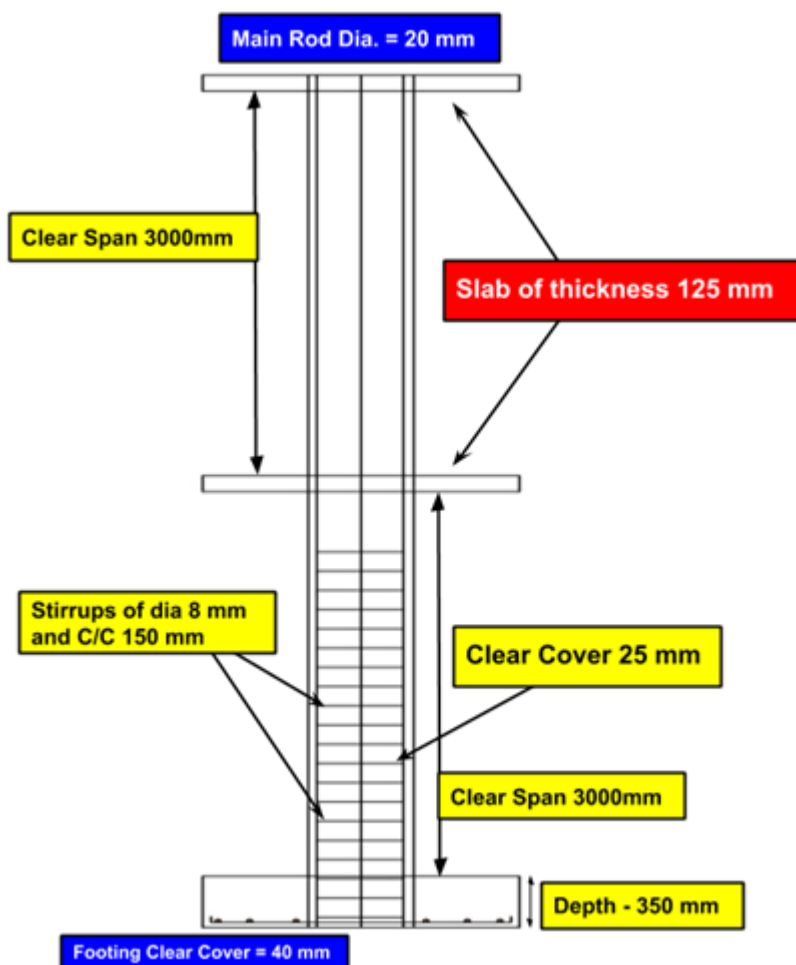
## A) Bar Bending Schedule of Rectangular Column



Before the Bar Bending schedule of the column, I would like to tell you some points to be remembered.

1. We know the standard size of the steel bars is 12 meters. So, after that, we have to add other rods if

- required more height of length.
2. Keep in mind that the steel rod should not be tied at the place where the bending moment is high. Its means at the top or bottom of the column. We should always prefer to lap the steel rod at the mid-span or nearly mid-span of the column or any structure.
  3. The lapping should be done in an alternate way of the steel rod.
  4. Sufficient lapping should be provided as per IS code to maintain safe as well as economical.



From the diagram,

Thickness of Slab = 125 mm

Thickness of Footing = 350 mm

Clear Height of floor = 3000 mm

Let, Column has 6 numbers of 20 mm dia bars

Development Length =  $50d = 50 \times 20 = 1000 \text{ mm}$

8mm stirrups @ 150 mm C/C

Footing Clear Cover = 40 mm

## **Step 1 – Find the length of Vertical Bar**

Formula,

Length of Vertical bar = Development length (Ld) + Depth of Footing + 2 x Clear Floor Heights + 2 x Slab Thicknesses + Overlap Length – Bend Length

$$= (50 \times 20) + 350 + (2 \times 3000) + (2 \times 125) - (2 \times 20)$$

$$= 7560 \text{ mm} = 7.560 \text{ meter}$$

Here, Overlapping Length should not be considered because the standard size of steel rod is found to be 12 meter. But we require only 7.56 meter.

So,

Cutting length is equal to the total length of vertical bars calculated above.

If the steel rod were more than 12 meter then, overlapping length would be added.

By the way let's see how to calculate the overlapping length of steel rod of column.

## **Step 2 – Find out lapping**

As we know that lapping length required is taken  $50d = 50 \times$  Diameter of the bar =  $50 \times 20 = 1000 \text{ mm}$ .

Keep in Mind

1. Never overlap bars in a column at the top & bottom.
2. Lapping should be done at alternate bars.

3. Top bars should be always lapped with bottom bars.



### Step 3 – Cutting Length of Stirrups

Formula,

Cutting length of Stirrup = Perimeter of stirrup + Length of Hooks – Length of Bends

Perimeter =  $2 \times \{ \text{Length of Column} - \text{Clear Cover} \} + \{ \text{Width of Column} - \text{Clear} \}$

$$P = 2 \times \{ (500 - 25) + (300 - 25) \}$$

$$P = 1500 \text{ mm}$$

$$\text{Length of Bends} = 3 \times (2 \times 20) + 2 \times (3 \times 20) = 240 \text{ mm}$$

$$\text{Length of One Hook} = 9d = 9 \times 20 = 180 \text{ mm (As per IS)}$$

Therefore,

Cutting length of Stirrup (L) = Perimeter of stirrup + Length of Hooks – Length of Bends

$$(L) = 1500 \text{ mm} + 180 \text{ mm} - 240 \text{ mm}$$

$$(L) = 1440 \text{ mm}$$

Cutting length of Stirrup = 1440 mm

#### **Step 4 – Number of Stirrups**

Number of stirrups required = Total Length of Vertical bars/Spacing of stirrups+ 1

Number of stirrups required = (7560/150) + 1

= 51.4 Number of stirrups      Say, 52 Nos.

#### **Step 5 – Bar Bending Schedule Table**

S.N	Diameter of Bar	Numbers	Cutting Length	Total Length	Total Weight
Vertical bar	20 mm	6	7.560 m	45.35 m	351.06 kg
Stirrups Bar	8 mm	52	1.44 m	74.88 m	92.74 kg

Use the formula to calculate the weight of the steel rod as I have told you in Part-1 of the Bar Bending Schedule.

## **B) Bar Bending Schedule for Circular Column**



## **Step 1 – Find the length of Vertical Bar**

Given,

Diameter of column = 300 mm

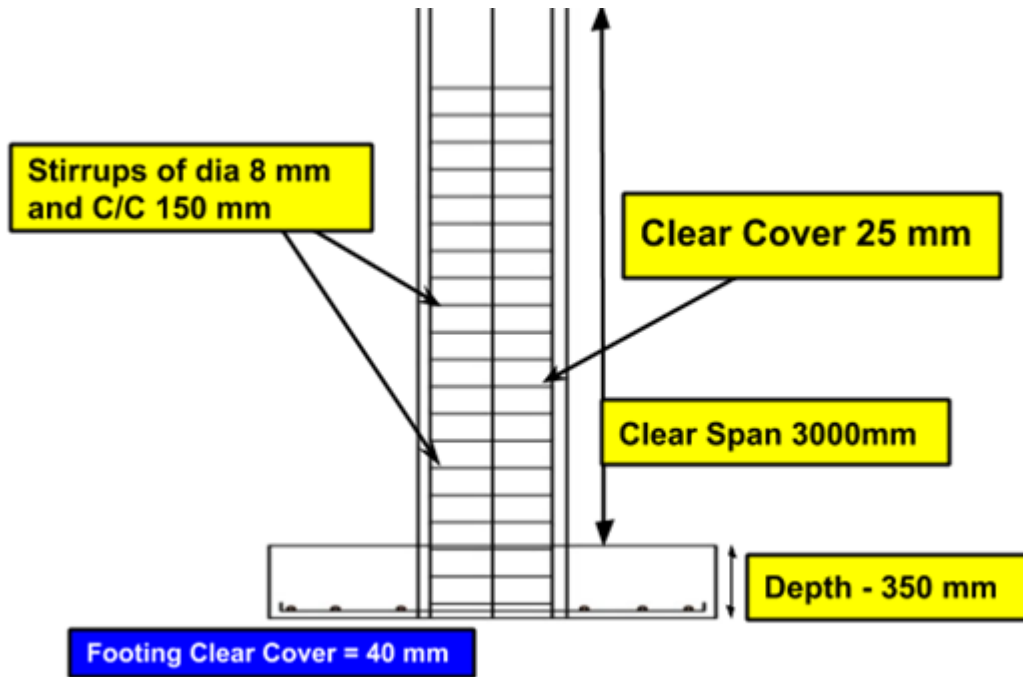
Diameter of Main Rods = 20 mm

Diameter of stirrups = 8 mm

C/C of stirrups = 150 mm

Clear Span or Height of column above foundation = 3000 mm

Depth of Foundation = 350 mm Clear Cover of Footing = 40 mm



Formula,

Length of Vertical bar = Development length ( $L_d$ ) + Depth of Footing + Height of column + Overlap Length – Bend Length

$$= 50d + 350 + 3000 + 0 - 2d$$

$$= (50 \times 20) + 350 + (3000) - (2 \times 20)$$

$$= 4310 \text{ mm} = 4.310 \text{ meter}$$

Here, Overlapping Length should not be considered because the standard size of steel rod is found to be 12 meter. But we require only 4.310 meter.

So,

Cutting length is equal to the total length of vertical bars calculated above.

If the steel rod were more than 12 meter then, overlapping length would be added.

By the way let's see how to calculate the overlapping length of steel rod of column.

So,

Weight of main rods =  $\frac{\pi}{4} d^2 / 162.25 \times \text{Length of Main bars}$

$$W1 = 3.14 \times 20^2 / 162.25 \times 4.310$$

$$W1 = 33.36 \text{ kg}$$

## **Step 2 – Find out lapping**

As we know that lapping length required is taken  $50d = 50 \times$   
Diameter of the bar =  $50 \times 20 = 1000 \text{ mm}$ .

## **Step 3 – Find out no. of Stirrups.**

Number of stirrups required = (Total length of verticle bar/Spacing of stirrups) + 1

$$\text{Number of stirrups required} = (350 + 3000) / 150 + 1$$

$$= 23.33 \text{ Number of stirrups} \quad \text{Say, 24 Nos.}$$

## **Step 4 – Calculate Cutting Length of Circular Stirrups**

Formula,

Cutting length of one Circular Stirrup or Ring (L) =  
Circumference of Circular Stirrup + Total Hook length – Total  
Bend Length

$$L = \pi D + (2 \times 9d) - (2 \times 3d)$$

Where, D = Diameter of Column – Clear cover – Clear cover =  
 $300 - 25 - 25 = 250 \text{ mm}$ , and d is diameter of stirrups.

So,

$$L = 3.14 \times 250 + (2 \times 9 \times 8) - (2 \times 3 \times 8) = 881 \text{ mm}$$

Hence,



Total Cutting length of Circular Stirrup or Ring = L x No. of Stirrups = 881 x 24 = 21144 mm = 21.144 meter

## Step 5 – Calculate Cutting Length of Circular Stirrups

Total Weight of Stirrups =  $\frac{\pi}{4} \times d^2 \times \text{Length of Main bars}$

$$W_2 = 3.14 \times 8^2 / 162.25 \times 21.144$$

$$W_2 = 26.18 \text{ kg}$$

S.N	Diameter of Bar	Numbers	Cutting Length	Total Length	Total Weight
Vertical bar	20 mm	6	7.560 m	45.35 m	33.36 kg
Circular Stirrups	8 mm	24	0.881 m	21.144 m	26.18 kg

Total weight of steel rod used in circular column = 33.36 + 26.18 = 59.54 kg

I hope this article on “Bar Bending Schedule of Column” remains helpful for you.

Happy Learning – Civil Concept

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How to calculate bar Bending Schedule for Slab | One way and Two way

Complete Bar Bending Schedule for Different Structure (Free e-Book)

Bar bending schedule for footing- Step by Step Procedure to Calculate