❖ What is Bar Bending Schedule(BBS)?

- **Ans:-**It is the process of cutting and bending of Reinforcement bar into required shape & making its list which describes below: -
- Location and marking of Bar
- Types of Bar
- Size of Bar
- Cutting length of Bar
- Number of Bar
- Bending details of Bar
- Total quantity of Bar

Of each bar in reinforcement drawing of a structure.
This process of listing is called **Scheduling.**

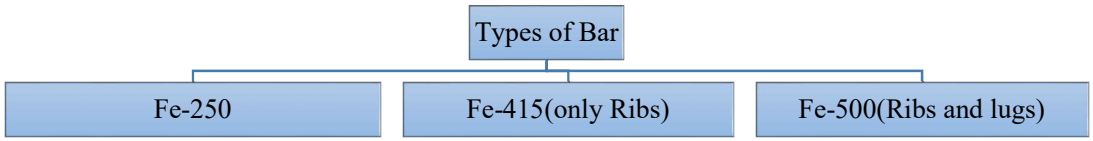
❖ Advantage of Bar Bending Schedule: -

- Cutting length & Bending reinforcement can be done.
- BBS avoids wastage of steel reinforcement & thus save project cost.
- It provides better estimation of reinforcement steel requirement for each and every structure member.
- BBS is very much useful during auditing of reinforcement & provides check or theft & pilferage (कंपनी ने छुट पुट चोरी).
- It enables easy & fast preparation of bill of construction work for clints & contractors.

❖ Why steel is used as reinforcement bar?

- Coefficient of thermal expansion characteristics similar to concrete.
- Good strength for economic design of R.C.C structure.
- Good griping or good bonding with concrete.
- Good resistant against corrosion for higher durability.
- Good bendability for providing required shape.

❖ Types of reinforcement bar: -

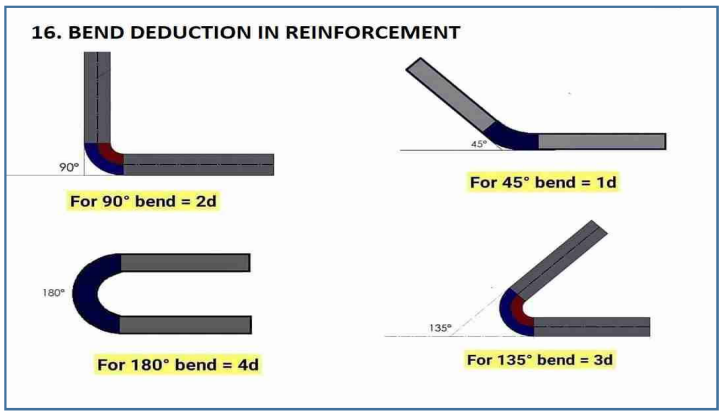


❖ Size & unit weight of bar (always remember it *): -

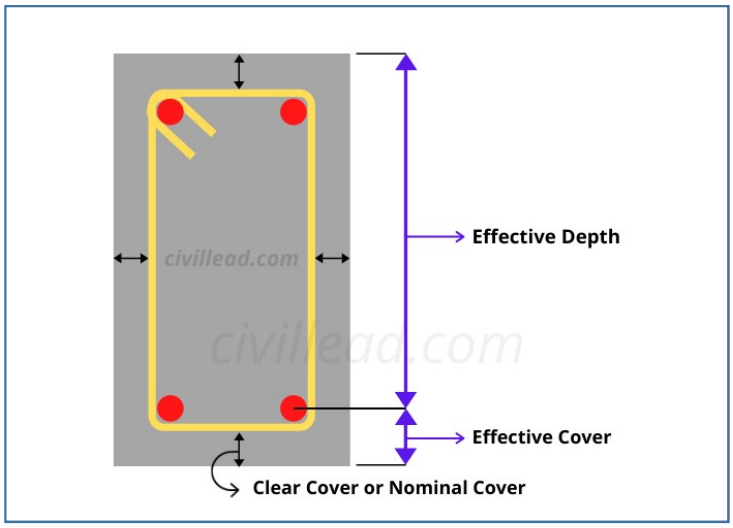
Dia of Bar	Unit Weight of Bar(=D^2/162)	unit
8	0.395	Kg/m
10	0.617	Kg/m
12	0.889	Kg/m
16	1.580	Kg/m
20	2.469	Kg/m
22	2.988	Kg/m
25	3.858	Kg/m
32	6.321	Kg/m

❖ Bend deduction and values: -

Bend increase the length of bar so we need to lesser length than we seen in drawing. So cutting length is taken lesser than the required length.



❖ Clear cover & Effective cover: -



❖ Value of clear cover:-

Component	Required Cover	
Footing	50mm	Minimum
Column	40mm	
Beam	25mm	
Slab	20mm	
Staircase	15mm	May be Greater
Chajja	15mm	
Pile	60mm	Depend upon Size
Pile cap	60mm	

❖

Standard Code For BBS	
IS:456-2000	Plain & Reinforced concrete
IS:2502-1963	Code of Practice for Bending & fixing
IS:5525-1969	Detailing of Reinforcement in RCC work
SP:34-1987(St^{d} Publication)	Concrete reinforcement Detail

❖ **Symbol and representation in BBS:-**

SYMBOL	REPRENTATION	
ø	**Plain round Bar**	**Diameter of Bar**
#	**Deformed Bar(Fe-415/Fe-500)**	
■	**Plain Square Bar**	
@	**Centre to Centre Spacing**	

❖ **Reading practise Drawing: -**

➢ If written will be like this; **5-12#(3+2)** ,then

Where,

5 = Show the numbers of bar.

12# = Diameter of the bar.

(3+2) = Position of the bar; {3 for upper portion,2 for lower portion.}

➢ If written will be like this; **8# 2LG. ST.@130C/C,** then

Where,

8# = Diameter of the bar.

2LG. ST. = It shows "Two legged stirrups".

@130C/C = Show "Spacing of bar".

❖ **Find out cutting length of bar: -**

Shape of Bar	Cutting Length of Bar	Bend Deduction
	CL=a+L+b	

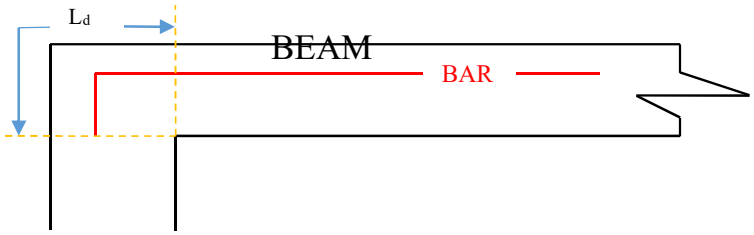
❖ **Some important formula: -**

Spacing-Distance between two reinforced Bar.

$$\text{No. of Bar} = \frac{\text{Length of Span}}{\text{Spacing}} + 1$$

$$\text{No. of Stirrup} = \frac{\text{Actual length of Beam/Column}}{\text{Spacing}} + 1$$

❖ Development length:- It is provided to transfer the load from steel to concrete from one building component to other. Development length is also known as **anchorage length**. It is denoted by **'L_d'**.



According to IS:456-2000.L_d can be calculated as given below-

Generally, we take **300-50d**, Where d= diameter of Bar

IS:456-2000;26.2.1,

$$L_d = \phi\sigma_s/4\tau_{bd}$$

Where,

ϕ = Nominal Dia. Of Bar.

σ_s = Stress in bar at the section considered design load.

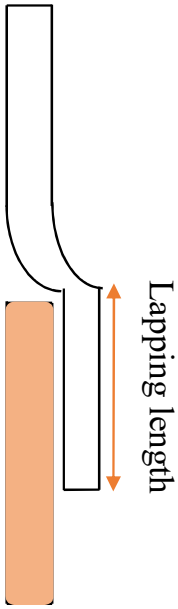
τ_{bd} = Design bond stress in 26.2.1.1

NOTE*-

- The development length include anchorage value of hooks in tension reinforcement.
- For Bar of sections other than circular the L_d should be sufficient to develop the series in the develop the stress in the bar bend.

❖ **Lap Length: -** Overlapping or Lap length is provided for maintain the continuity of bars in order to safely transfer the stress from one bar to another Bar.

Note*-As per IS:456:2000 over lapping length should be not less than 75mm.Generally we take 24d-50d.where, 'd'= dia of bar.



- **Lapping length condⁿ in column:-**
  - Lapping should be provided at the centre of column because bending moment at mid-point is zero so try to lap at mid-point.
  - Lapping of bar should be provided alternatively. Lap should not be given at same point because buckling may occur.
  - After 32mm diameter bar it should be welded.
  - Due to maximum stress we can't lap at Column/Beam/Slab joint. It should be given at L/4 distance from Top and Bottom.

- Lapping condition on beam: -
  - Lapping in top bar avoided L/3 distance from both end. For top bar lapping should be at mid-span.
  - Lapping in bottom bars lap should be provided at column junction or L/4 distance from column face but should not be mid span of beam.
  - Stirrups should be closely spaced near the column and lose/normal at mid-span.
  - Lapping of bar should be alternatively provided. Lap should not be given at same point because buckling may occur.
  - After 32mm diameter of bar it should be welded.
  - Due to maximum stress, we can't lap at column/Beam/Slab joint. Lapping should not be given at L/4 distance from Top & Bottom of the support.