Minimum and Maximum number of bars in a single layer in Beam

Table: Maximum number of bars in a single layer.

Bar Size	Beam Width (in)												
	12	14	16	18	20	22	24	26	28	30	36	42	48
No.4	5	6	8	9	10	12	13	14	16	17	21	25	29
No.5	5	6	7	8	10	11	12	13	15	16	19	23	27
No.6	4	6	7	8	9	10	11	12	14	15	18	22	25
No.7	4	5	6	7	8	9	10	11	12	13	17	20	23
No.8	4	5	6	7	8	9	10	11	12	13	16	19	22
No.9	3	4	5	6	7	8	8	9	10	11	14	17	19
No.10	3	4	4	5	6	7	8	8	9	10	12	15	17
No.11	3	3	4	5	5	6	7	8	8	9	11	13	15

$$n_{max}=1+\frac{bw-2(Cs+ds+r)}{(minimum\ clear\ space)+db}$$

Where,

b_w=beam width, in.

c_c=clear cover to tension reinforcement, in.

c_s=clear cover to stirrups, in.

d_b=diameter of ain flexural bar, in.

d_s=diameter of stirrups.

$$r=\begin{cases}\frac{3}{4}\text{in. for No. 3 stirrups}\\ 1\text{in. for No. 4 stirrups}\end{cases}$$

Table: Minimum number of bars in a single layer (ACI 10.6)

Bar Size	Beam Width (in)												
	12	14	16	18	20	22	24	26	28	30	36	42	48
No.4	2	2	3	3	3	3	3	4	4	4	5	5	6
No.5	2	2	3	3	3	3	3	4	4	4	5	5	6
No.6	2	2	3	3	3	3	3	4	4	4	5	5	6
No.7	2	2	3	3	3	3	3	4	4	4	5	5	6
No.8	2	2	3	3	3	3	3	4	4	4	5	5	6
No.9	2	2	3	3	3	3	3	4	4	4	5	5	6
No.10	2	2	3	3	3	3	3	4	4	4	5	5	6
No.11	2	2	3	3	3	3	3	4	4	4	5	5	6

Formula: $n_{min}=\frac{bw-2(Cc+0.5db)}{s}+1$

Where, s = 15(40,000/fs)-2.5Cc ≤12*(4,000/fs)
fs = 2/3fy
Where,
b_w=beam width, in.
c_c=clear cover to tension reinforcement, in.
c_s=clear cover to stirrups, in.
d_b=diameter of ain flexural bar, in.
d_s=diameter of stirrups.

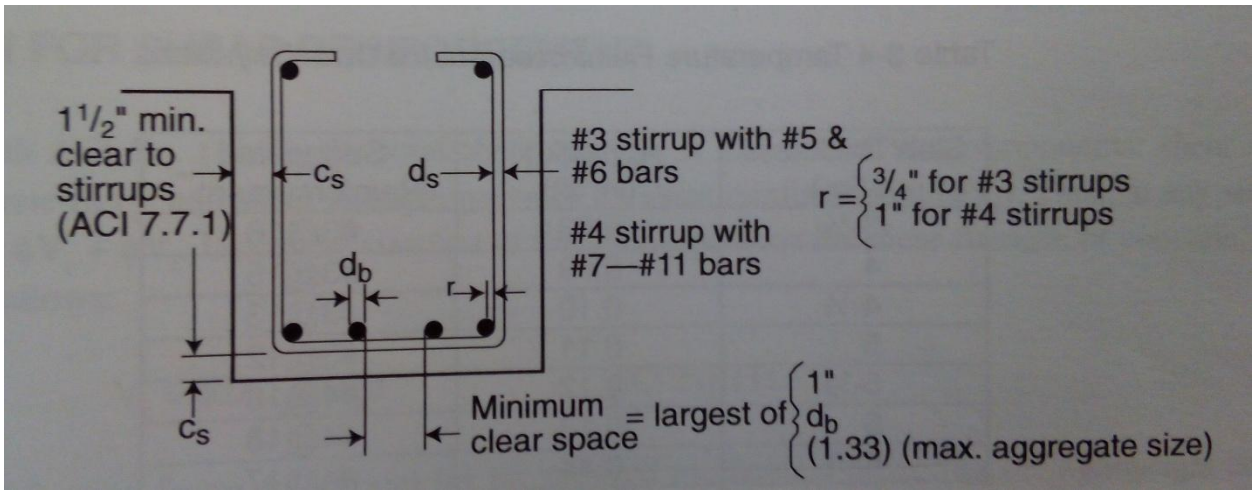

Figure: Cover and Spacing Requirement