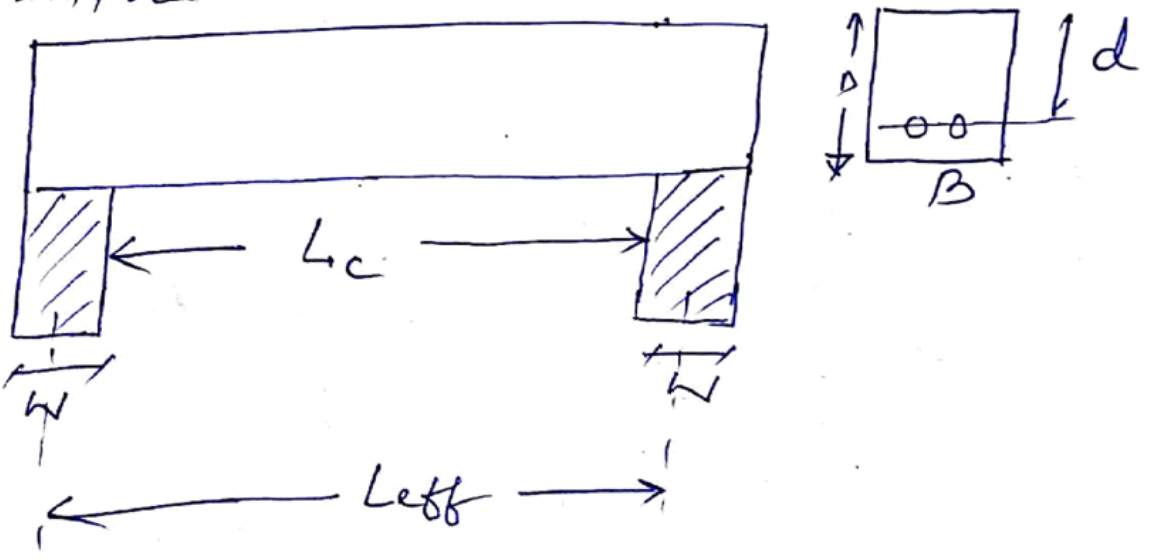
Department of Civil Engineering
Katihar Engineering College, Katihar

Subject: Design of Concrete Structure-I
Topic: Design of Slab
Lecture: 01
Course Instructor: Prof. Rashid Mustafa

⇒ Important IS Codal Provisions (IS 456 : 2000)

(1) Effective span (L_{eff})

(a) Simply Supported beam



A/c to IS 456 : 2000

$$L_{eff} = \begin{cases} (L_c + d) \\ \text{OR } (L_c + W) \end{cases} \text{ Whichever is less}$$

Where L_{eff} → Effective Span
L_c → Clear span
B → Width of Beam
W → Width / Thickness of support
d → Effective depth of the Beam

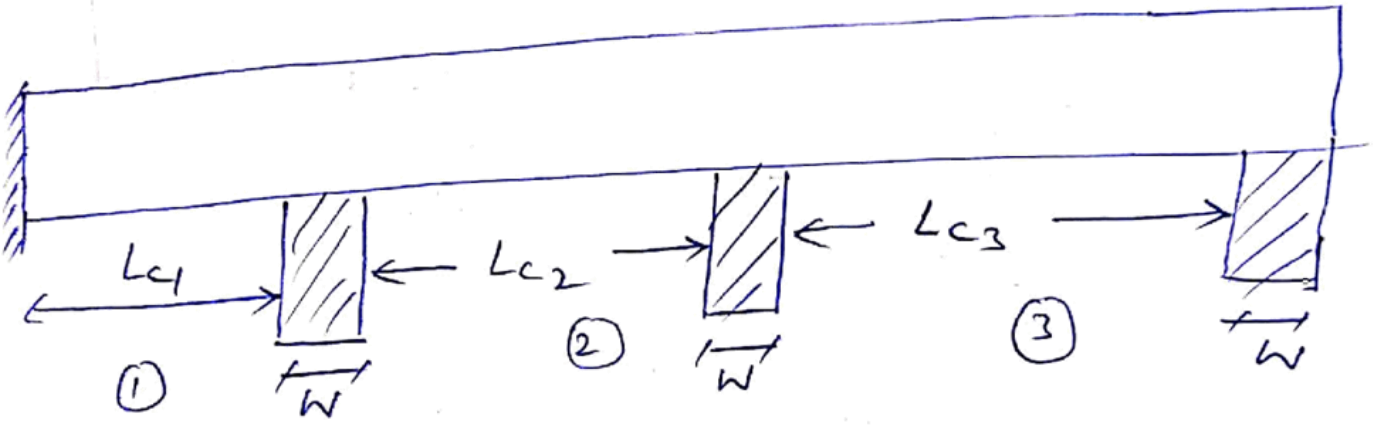
(6) Continuous beam or slab.

Case 1. If width of support is less than clear span/12 (i.e $W < \frac{L_c}{12}$)

$$L_{eff} = \begin{cases} (L_c + d) \\ \text{or } (L_c + W) \end{cases}$$ whichever is less

Case 2 If width of support exceeds the value of $\frac{1}{12}$th of clear span

i.e $W > \frac{L_c}{12}$



In (1)

If one end is fixed and other end is continuous

$$\boxed{L_{eff} = L_{c1}}$$

In (2)

If both ends are continuous

$$\boxed{L_{eff} = L_{c2}}$$

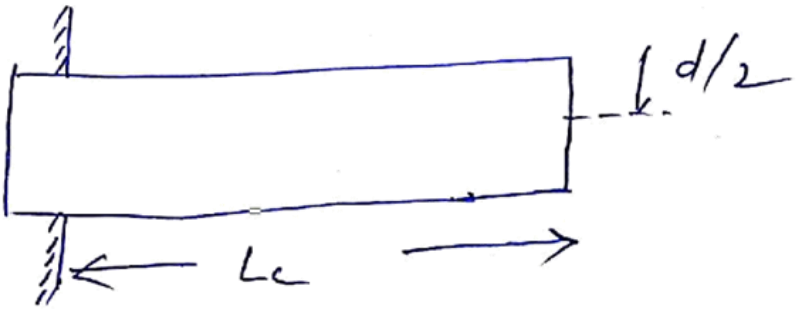
In (3)

If one end is continuous and other end is simply supported

$$L_{eff} = \left(L_{c_3} + \frac{d}{2}\right) \text{ or } \left(L_{c_3} + \frac{w}{2}\right)$$ } whichever is less

(c) For Cantilever Beam

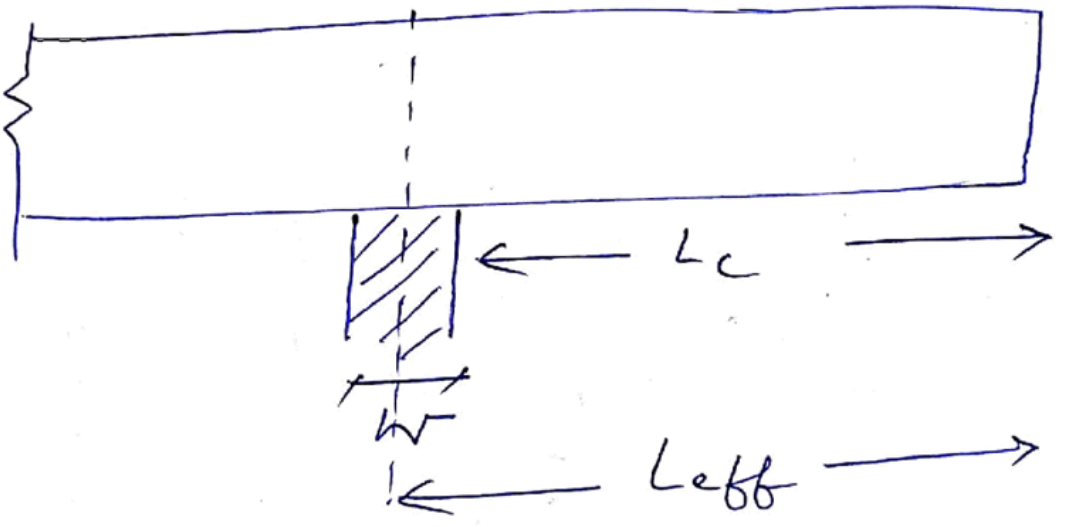
Case 1.



$$L_{eff} = \left(L_c + \frac{d}{2}\right)$$

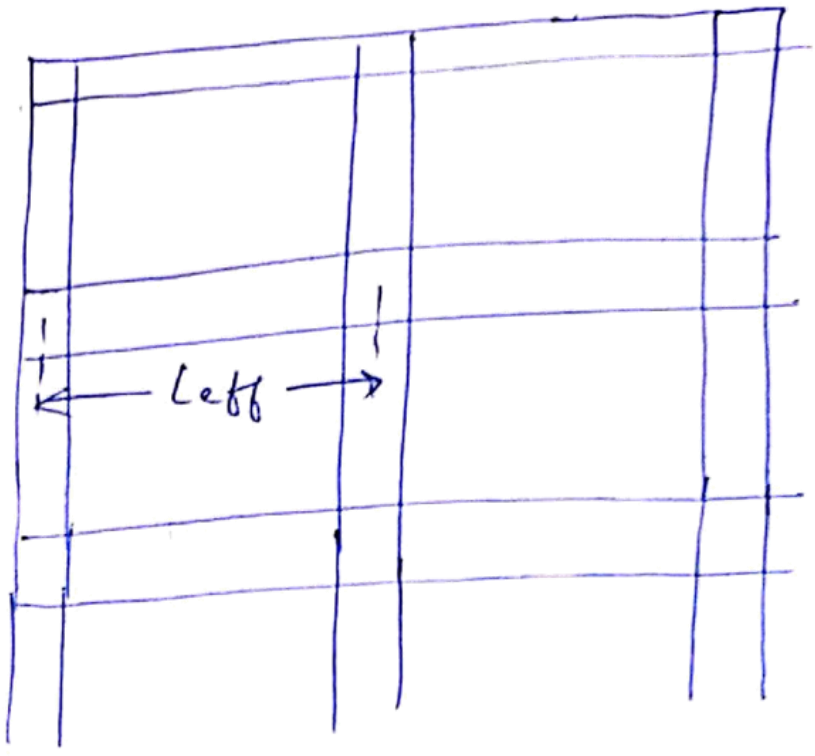
↳ with fixed support

Case 2. With a continuous support



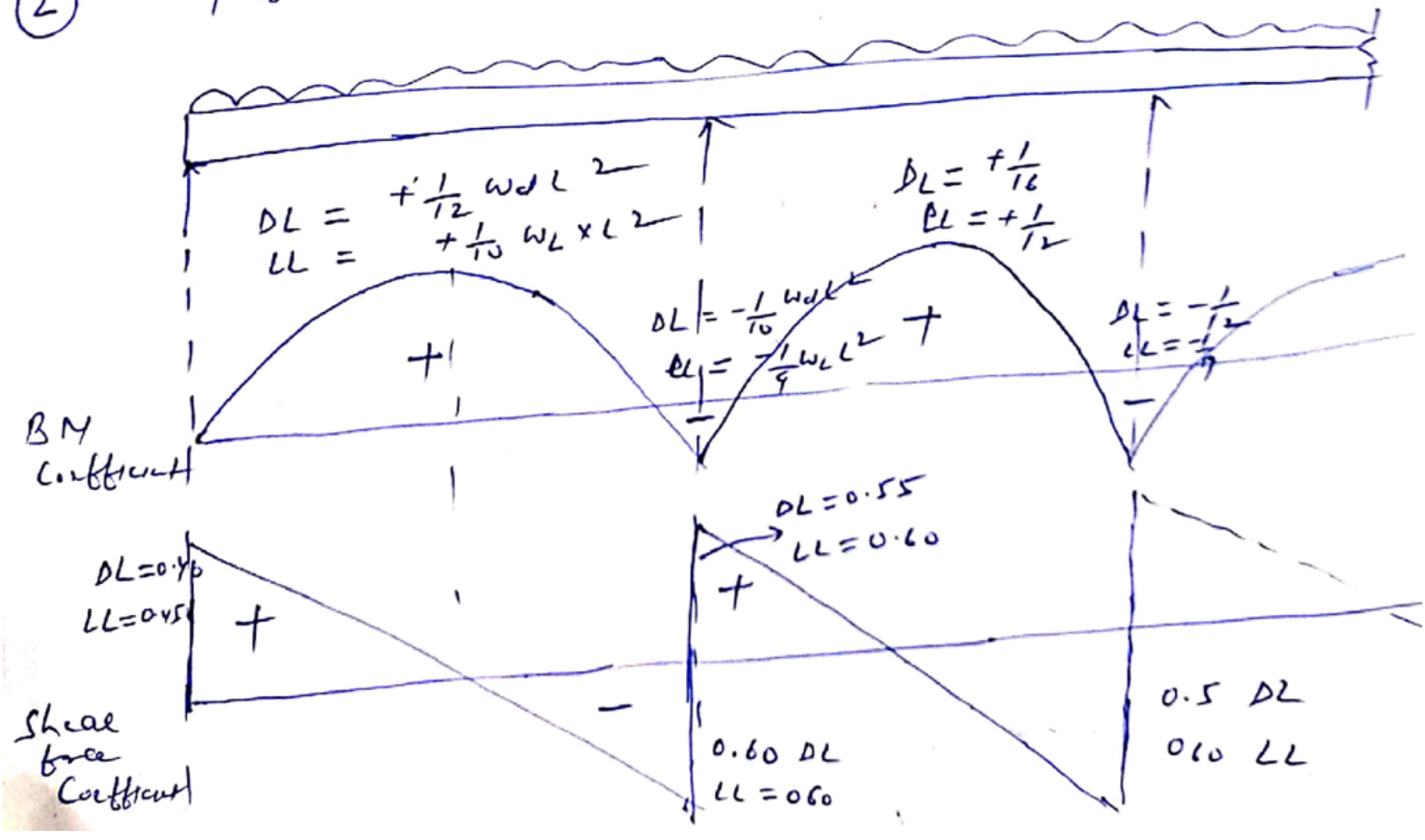
$$L_{eff} = \left(L_c + \frac{w}{2}\right)$$

(d) **Frames**



Leff = c/c distance b/w beam & Column

(2) For Continuous beam & slab.



(1) BM

Max^m +ve BM

$$= \frac{1}{12} w_d L^2 + \frac{1}{10} w_L \cdot L^2$$

Max^m -ve BM

$$= -\frac{1}{10} w_d L^2 - \frac{1}{9} w_L \cdot L^2$$

(2) Shear force

At Ist support

$$= 0.40 w_d L + 0.45 w_L \cdot L$$

Just right to 2nd support

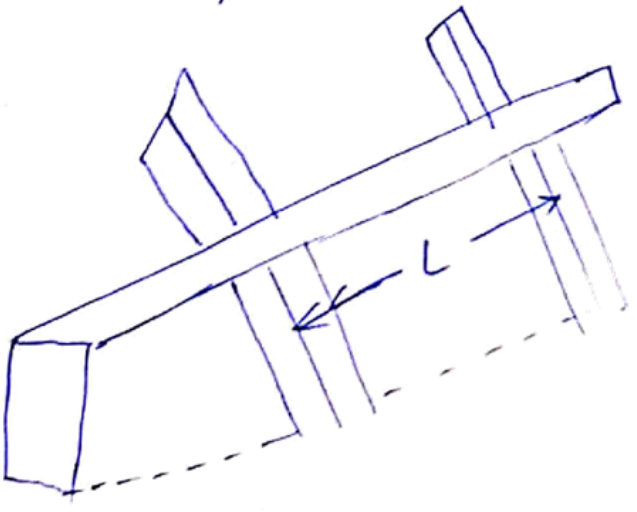
$$= 0.55 w_d L + 0.60 w_L \cdot L.$$

(3) Check for Lateral stability

(a) For a simply support or Continuous beam

Max^m clear distance b/w lateral restraint

$$L \neq (60B) \text{ or } \frac{250 B^2}{d}$$ Whichever is less

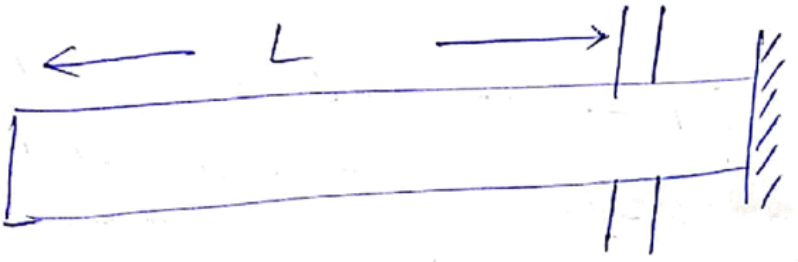


$$L \neq \underbrace{(60B) \text{ or } \left(\frac{250B^2}{d}\right)}_{\text{Whichever is less}}$$

(5) For Cantilever beam

Maximum distance from lateral restrains to free end (L)

$$L \neq \underbrace{(25B) \text{ or } \left(\frac{100B^2}{d}\right)}_{\text{Whichever is less.}}$$



Plan

P-1. A beam of size 250 x 300 mm (Effective) having span 4 m.

(a) Cantilever Beam

Maximum span $\neq (25B)$ or $\frac{100B^2}{d}$ } Which is less

$\neq (25 \times 250)$ or $100 \times \frac{250^2}{300}$

$\neq$ 5000 mm or 13333 mm

$\neq$ 5 m. or 13.33 m

$\neq$ Whichever is less.

$L \neq 5$ m (< 4 m) Safe.

Simply supported or Continuous

$L \neq (60B)$ or $\frac{250B^2}{d}$

whichever is less

$L \neq (60 \times 200)$ or $250 \times \frac{200^2}{300}$

$L \neq 12\text{ m}$ or 33.33 m

whichever is less

$L \neq 12\text{ m}$ (4 m) OK

It is ~~not~~ safe in Lateral stability in case of simply supported or continuous beam/slab