6. TORSION

EQUIVALENT SHEAR FORCE

$$V_{eq} = V + \frac{1.6\,T}{B} \rightarrow \text{For WSM}$$

$$V_{ueq} = V_u + \frac{1.6\,T_u}{B} \rightarrow \text{For LSM}$$

where V = Shear force
T = Torsional moment
B = Width of the section

- Nominal shear stress

$$\tau_v = \frac{V_{eq}}{Bd} \not> \tau_{cmax} \quad \text{For WSM}$$

$$\tau_{vu} = \frac{V_{ueq}}{Bd} \not> \tau_{cmax} \quad \text{For LSM}$$

EQUIVALENT MOMENT

$$M_{eq} = M + \frac{T}{1.7}\left[1 + \frac{D}{B}\right] \quad \text{For WSM}$$

$$M_{ueq} = M_u + \frac{T_u}{1.7}\left[1 + \frac{D}{B}\right] \quad \text{For LSM}$$

where, M = Bending moment
D = Overall depth of the section
d = Effective depth

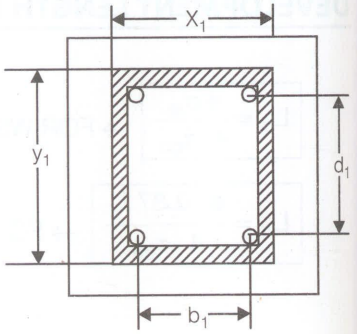
TRANSVERSE REINFORCEMENT

As per IS : 456-2000

$$A_{Sv} = \frac{S_v}{d_1 \sigma_{Sv}}\left[\frac{T}{b_1} + \frac{V}{2.5}\right]$$

Also, $$S_v = \frac{A_{sv} \cdot \sigma_{sv} \cdot d_1}{V_s}$$

where, $$V_s = \frac{T}{b_1} + \frac{V}{2.5}$$



Here, T = Torsional moment
S_v = Spacing of the stirrup reinforcement
b_1 = Centre to centre distance between corner bars in the direction of width
d_1 = Centre to centre distance between corner bars in the direction of depth of member
b = Breadth of member
σ_{sv} = Permissible tensile stress in shear reinforcement

MAXIMUM SPACING FOR TRANSVERSE REINFORCEMENT

(i) x_1 (ii) $\frac{x_1 + y_1}{4}$ (iii) 300 mm

When a beam is subjected to torsion, if depth of the beam is more than 450 mm or for beam not subjected to torsion if the depth of web exceeds 750 mm then side face reinforcement equal to 0.1% of cross-sectional area and is equally distributed on both faces of the beam.

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