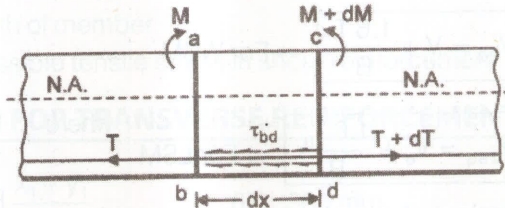# 5. BOND, ANCHORAGE & DEVELOPMENT LENGTH

BOND STRESS, (τ_{bd})

$$\tau_{bd} = \frac{V}{\Sigma 0.jd}$$

where   V = Shear force at any section

d = Effective depth of the section

$\Sigma 0$ = Sum of all perimeter of reinforcement

    = $n \cdot \pi \, (\phi)$

where   n = Number of reinforcement

and ϕ = diameter of reinforcement

PERMISSIBLE BOND STRESS

As per IS 456 : 2000

	M15	M20	M25	M30	M35	M40
WSM	0.6	0.8	0.9	1.0	1.1	1.2
LSM	—	1.2	1.4	1.5	1.7	1.9

These value of bond stress is for plain bar in tension.

For deformed bar the above value should be increased by 60%.

For bar in compression the above value should be increased by 25%.

DEVELOPMENT LENGTH (L_d)

$$L_d = \frac{\phi \sigma_{st}}{4 \cdot \tau_{bd}} \rightarrow \text{FOR WSM}$$

$$L_d = \frac{\phi \cdot 0.87 \, f_y}{4 \cdot \tau_{bd}} \rightarrow \text{FOR LSM}$$

■■■