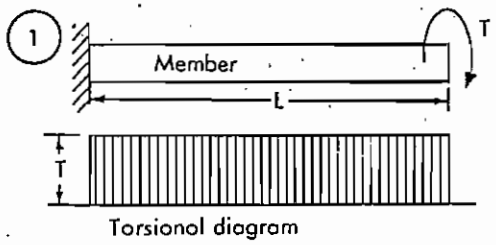
Torsion Diagrams and Formulas

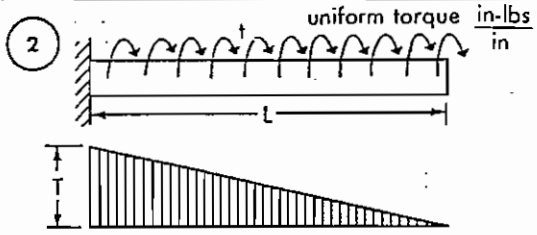
1



$$T = T$$

At support, $\theta = \dfrac{T\,L}{E_s\,R}$

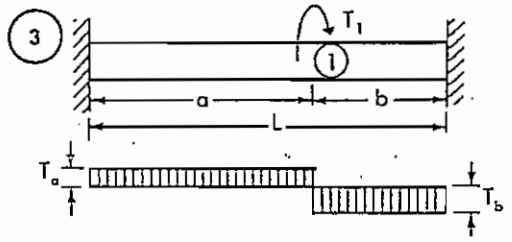
2



At support, $T = t\,L$

$$\theta = \frac{t\,L^2}{2\,E_s\,R}$$

3



Section a: $T_a = \dfrac{T_1\,b}{L}$

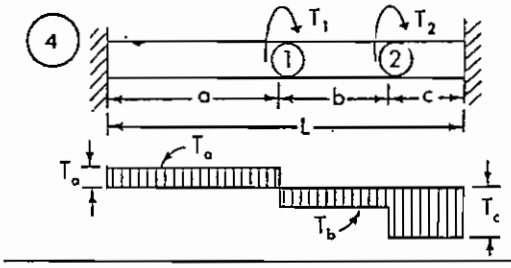
Section b: $T_b = \dfrac{T_1\,a}{L}$

$$\theta_1 = \frac{T_1\,a\,b}{L\,E_s\,R}$$

When $a = b = L/2$

$$\theta_L = \frac{T\,L}{4\,E_s\,R}$$

4



Section a: $T_a = \dfrac{T_1\,(b+c) + T_2\,c}{L}$

Section b: $T_b = \dfrac{T_2\,c - T_1\,a}{L}$

Section c: $T_c = -\dfrac{T_1\,a + T_2\,(a+b)}{L}$

$$\theta_1 = \frac{T_a\,a}{E_s\,R}$$

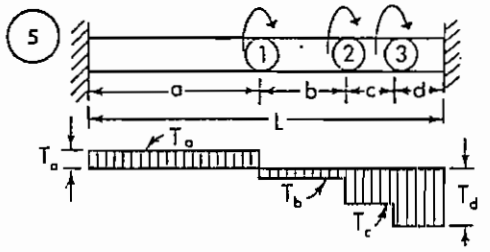
$$\theta_2 = \frac{T_c\,c}{E_s\,R}$$

When $a = b = c = L/3$

$T_1 = T_2 = T/2$

and $\theta_1 = \theta_2 = \dfrac{T\,L}{6\,E_s\,R}$

5



$$T_a = \frac{T_1\,(b+c+d) + T_2\,(c+d) + T_3\,d}{L}$$

$$T_b = \frac{-T_1\,a + T_2\,(c+d) + T_3\,d}{L}$$

$$T_c = \frac{-T_1\,a - T_2\,(a+b) + T_3\,d}{L}$$

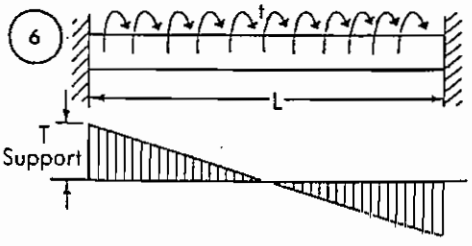
$$T_d = \frac{-T_1\,a - T_2\,(a+b) - T_3\,(a+b+c)}{L}$$

$$\theta_1 = \frac{T_a\,a}{E_s\,R}$$

$$\theta_2 = \frac{T_b\,b + T_a\,a}{E_s\,R}$$

$$\theta_3 = \frac{T_d\,d}{E_s\,R}$$

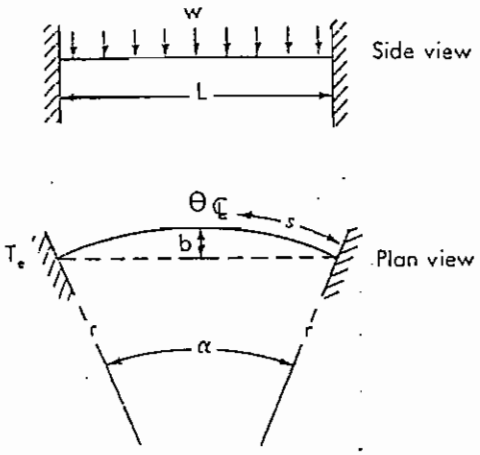
6



$$T_{support} = \frac{t\,L}{2}$$

$$\theta_L = \frac{t\,L^2}{8\,E_s\,R}$$

FIGURE 1 – BEAMS ON A HORIZONTAL CURVE, UNDER UNIFORM LOAD (w)



$$T_{end} = r^2 w \left| \alpha \sin^2 \frac{\alpha}{4} - \frac{\alpha}{2} + \sin \frac{\alpha}{2} \right| = A r^2 w$$

$$\Theta_{℄} = \frac{r^3 w}{E, R} \left| \frac{\alpha}{2} \sin \frac{\alpha}{2} + 2 \cos \frac{\alpha}{2} - 2 \right| = \frac{B r^3 w}{E, R}$$

α	A	B
6	.000 004 83	.000 001
8	.000 113 35	.000 002
12	.000 382 36	.000 010 2
16	.000 905 58	.000 031 4
20	.001 766 78	.000 076 9
24	.003 048 90	.000 159 7
28	.004 833 90	.000 295 8
32	.007 202 46	.000 504 1
36	.010 233 79	.000 806 3
40	.014 005 52	.001 224 4
44	.018 593 41	.001 793 2
45	.019 876 78	.001 961 7

$$\sin \frac{\alpha}{2} = \frac{L}{2r}$$

$$b = 2r \sin^2 \frac{\alpha}{4}$$

$$s = r\alpha$$