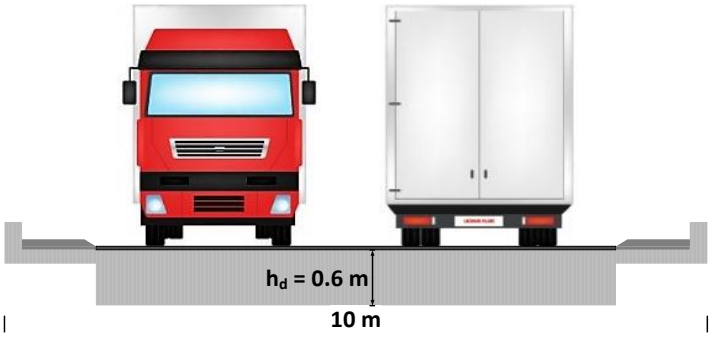
Ex.1: For the bridge section shown; the compressive strength of concrete (f_c') = 28 MPa the yield stress of steel (f_y) = 420 MPa, simple span with effective length (S) = 12 m, HS-93 load and distributed weight of future wearing surface = 2 kN/m^2. Determine the equivalent width of interior design strip (E_{int}).



Sol:

$N_L = 2 \rightarrow \therefore check\ both\ E_{si}\ and\ E_{mi}$

$L_1 = S = 12\ m \quad \leftarrow governs$

$\leq 18\ m$

$W_1 = W = 10\ m \quad \leftarrow governs$

$\leq 18\ m$

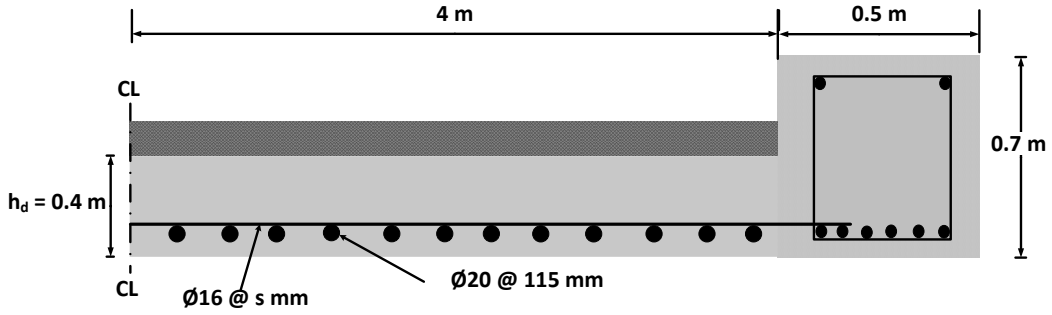
$E_{si} = 250 + 0.42\sqrt{L_1 W_1} = 0.25 + 0.42\sqrt{12\ x\ 10} \cong 4.8\ m$

$E_{mi} = 2100 + 0.12\sqrt{L_1 W_1} = 2.1 + 0.12\sqrt{12\ x\ 10} \cong 3.4\ m$

$\leq W/N_L = 10/2 = 5\ m$

$\rightarrow E_{int} = 3.4\ m$

Ex.2: For the bridge section shown; the compressive strength of concrete (f_c') = 38 MPa, the yield stress of steel (f_y) = 420 MPa, simple span with effective length (S) = 7 m and the ultimate moment capacity (M_u) of the superstructure = 360 kN.m/m. Determine the required spacing (s) for the distribution reinforcement of Ø16 mm when the main reinforcement is Ø20 mm.



Sol:

$A_s = 1.25M_u/f_y.d_s = 1.25\ x\ 360x10^6/(420\ x\ 365) = 2936\ mm^2/m$

$\% = 17.5/\sqrt{S} = 17.5/\sqrt{7000} = 0.21 < 0.5 \qquad \therefore OK$

$A_{s,Dist} = \%A_s = 0.21\ x\ 2936 = 614\ mm^2/m$

$A_b = 201\ mm^2$

$s = 1000A_b/A_{s,Dist} = 1000\ x\ 201/614 = 327\ mm\ \ say\ 300\ mm$

Q.1: For the bridge section shown in Figure (1); the compressive strength of concrete (f_c') = 28 MPa, the yield stress of steel (f_y) = 420 MPa, simple span with effective length (S) = 12 m, HS-93 load and distributed weight of future wearing surface = 2 kN/m^2. Determine the ultimate moment capacity (M_u) of the superstructure.

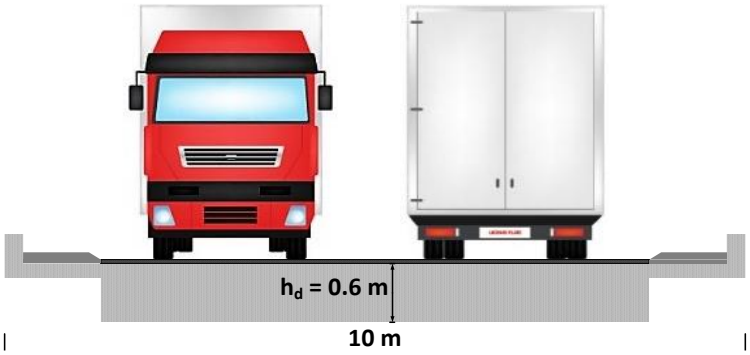


Figure (1)

Q.2: Slab bridge with deck data: compressive strength of concrete (f_c') = 28 MPa, the yield stress of steel (f_y) = 420 MPa, HS-93 load, distributed weight of future wearing surface = 1.7 kN/m^2 and slab thickness as shown in Figure (2). Design the main reinforcement of the slab using ϕ25 mm and the distribution reinforcement using ϕ16 mm.

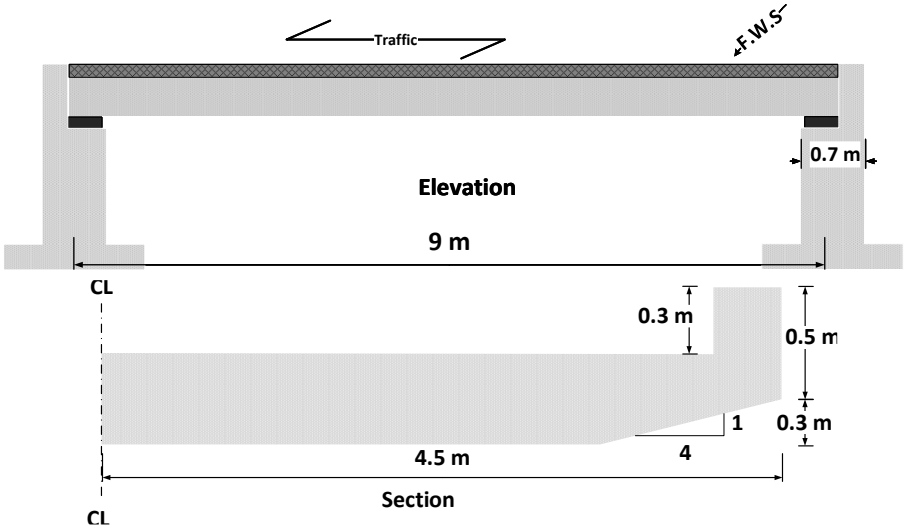


Figure (2)

Q.3: For the bridge section shown in Figure (3); the compressive strength of concrete (f_c') = 35 MPa, the yield stress of steel (f_y) = 420 MPa, simple span with effective length (S) = 8 m and the ultimate moment capacity (M_u) of the superstructure = 400 kN.m/m. Determine the required spacing (s) for the distribution reinforcement of Ø16 mm.

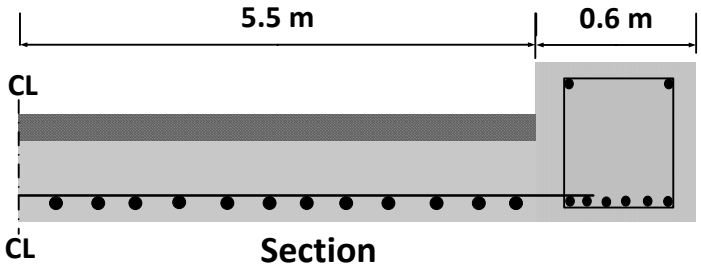


Figure (3)