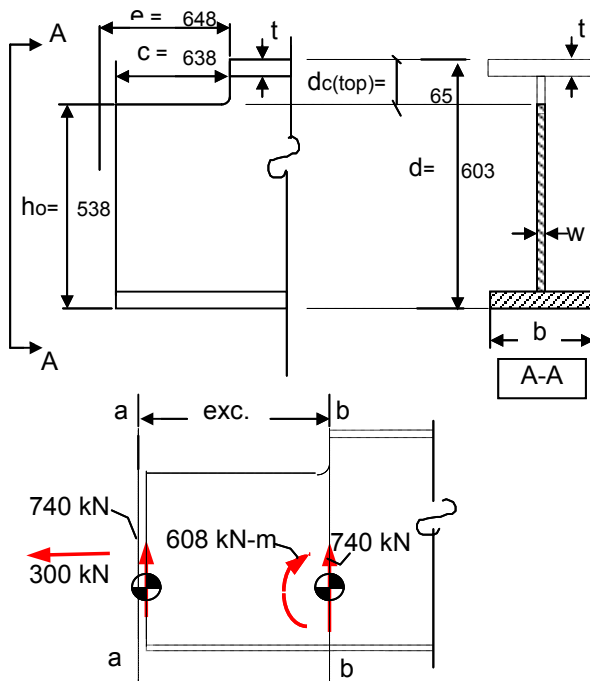


**TOP COPED BEAM: General Data**

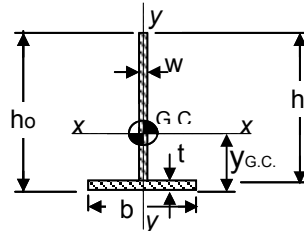


W610x101	
Fy =	350 MPa
d =	603 mm
b =	228 mm
t =	14.9 mm
w =	10.5 mm
k =	34 mm
EXC. (at b-b) = e =	648.0 mm
COPE Length = c =	638.0 mm
COPE Height = dc =	65.0 mm
ho =	538.0 mm

Forces at a-a	
Vf =	740 kN
Af =	300 kN
Forces in b-b	
Vc =	740 kN
Ac =	300 kN
Mc =	608.3 kN-m

**Geometric properties of the cope**

h = 523 mm  
A<sub>wc</sub> = 5493 mm<sup>2</sup>  
A<sub>flc</sub> = 3397 mm<sup>2</sup>  
y<sub>G.C.</sub> = 173.7 mm



I<sub>x</sub> = 277191717 mm<sup>4</sup>  
S<sub>xc</sub> = 760789 mm<sup>3</sup>  
S<sub>xt</sub> = 1596247 mm<sup>3</sup>

**Resistance the coped beam**

**Resistance in BENDING:**

$$k = 2.2 (ho / c)^{1.65} \text{ for } c / ho \leq 1.0$$

$$k = 2.2 (ho / c) \text{ for } c / ho \geq 1.0$$

$$f = 2 (c / d) \text{ for } c / d \leq 1.0$$

$$f = 1 + (c / d) \text{ for } c / d \geq 1.0$$

c / ho = 1.186  
k = 1.86  
c / d = 1.058  
f = 2.06

$$\phi F_{bc} = [(\pi^2 E) / (12(1 - \nu^2))] (w / ho)^2 f k = 162685 (w / ho)^2 f k$$

$\phi F_{bc} = 237 \text{ MPa} < \phi F_V = 315 \text{ MPa}$  (Buckling control !)  
M<sub>r</sub> = 180.0 kN-m M<sub>f</sub> / M<sub>r</sub> = 3.38 (No...!)

**Resistance in SHEAR:**

$$V_r (\text{shear}) = 0.577 \phi F_y A_w$$

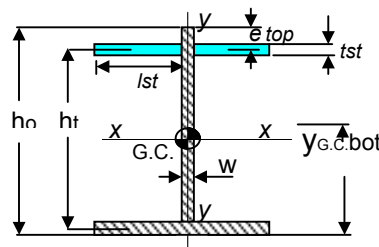
V<sub>r</sub> = 1026.7 kN V<sub>f</sub> / V<sub>r</sub> = 0.72 (o.k.)

**Resistance in combined SHEAR/TENSION/BENDING:**

$\tau = 134.7 \text{ MPa}$   
 $\sigma_1 = 54.6 \text{ MPa}$   
 $\sigma_2 = 799.6 \text{ MPa}$   
 $\sigma_{cr} = 1782 \text{ MPa} > 315 \text{ MPa}$  (No...!)

**Geometric properties of the reinforced cope**

l<sub>st</sub> = 100 mm  
t<sub>st</sub> = 19.00 mm  
e = 0.0 mm  
ho = 538 mm  
A<sub>wc</sub> = 5493 mm<sup>2</sup>  
A<sub>flc</sub> = 3397 mm<sup>2</sup>  
A<sub>st</sub> = 3800 mm<sup>2</sup>  
A<sub>tot.</sub> = 12690 mm<sup>2</sup>



Y<sub>c.g. bot.</sub> = 282.8 mm  
Y<sub>c.a. top.</sub> = 255.2 mm  
Est. c.g. = 538.0 mm  
I<sub>x</sub> = 630694521 mm<sup>4</sup>  
S<sub>r top.</sub> = 2470964 mm<sup>3</sup>  
S<sub>r bot.</sub> = 2230512 mm<sup>3</sup>  
ht = 521 mm

**Resistance the reinforced cope**

**Resistance in BENDING:**

$$M_r = \phi F_y S_r$$

M<sub>r</sub> = 702.6 kN-m M<sub>f</sub> / M<sub>r</sub> = 0.87 (o.k.)

$\phi F_V = 315 \text{ MPa}$

**Resistance in SHEAR:**

$$V_r = 0.577 \phi F_y A_w$$

V<sub>r</sub> = 1026.7 kN V<sub>f</sub> / V<sub>r</sub> = 0.72 (o.k.)

**Resistance in Tension:**

$$T_f = M_c / ht$$

T<sub>f</sub> = 1167.5 kN  
T<sub>r</sub> = 1197.0 kN (o.k.)

Minimum length for shear resistance of web 535 mm