

**Original submission:**



Z - Z Properties			
Elastic Modulus	E	13.1000	GPa
From bottom to centroid	Y bot	135.0000	mm
From centroid to top	Y top	135.0000	mm
Area of shape	A	59,399.9963	mm <sup>2</sup>
Moment of Inertia	Iz	360.8550E+06	mm <sup>4</sup>
Section Modulus	Sz	2.6730E+06	mm <sup>3</sup>
Section Modulus (bottom)	S bot	2.6730E+06	mm <sup>3</sup>
Section Modulus (top)	S top	2.6730E+06	mm <sup>3</sup>
Radius of Gyration	rz	77.9423	mm
Plastic Modulus	Zz	4.0095E+06	mm <sup>3</sup>
Shape Factor		1.5000	
From bottom to plastic n.a.	Yp bot	135.0000	mm
From plastic n.a. to top	Yp top	135.0000	mm
Polar Moment of Inertia	J	600.4349E+06	mm <sup>4</sup>
Product of Inertia	Iyz	0.0000	mm <sup>4</sup>
Maximum Moment of Inertia	Imax	360.8550E+06	mm <sup>4</sup>
Minimum Moment of Inertia	Imin	239.5800E+06	mm <sup>4</sup>
Angle from z axis to Imax axis	θ	0.0000	degrees
		Clockwise	

**Euler Column Buckling Module**

Back Cross-Section Help

**Total Column Length**

2.0574

in  mm  
 ft  m

**Fixity at Top**

Pinned  
 Fixed  
 Free  
 Guided

**Slenderness Ratio**  
KL/r = 16.198

Intermediate Support

**Fixity at Bottom**

Pinned  
 Fixed

Buckling about the Y-axis

Buckling about the Z-axis

**Compute**

**End**

**Fixity at Top**

Pinned  
 Fixed  
 Free  
 Guided

**Slenderness Ratio**  
KL/r = 18.455

Intermediate Support

**Effective Length Factor**  
K = 0.69916

**Fixity at Bottom**

Pinned  
 Fixed

**Critical Euler Buckling Load**

22,548.54 kN

lbs  N  
 kips  kN

**Critical Euler Buckling Stress**

379.61 MPa

psi  kPa  
 ksi  MPa

**Critical Stress vs. Slenderness Ratio**

Yield Stress (optional): 0

Proportional Limit Stress (optional): 0

**Note strength (yielding) limits:**

Steel: 300 Mpa

Concrete: 70 Mpa

Timber: 50 Mpa

**Improved submission:**

Y - Y Properties			
Elastic Modulus	E	13.1000	GPa
From left to centroid	Z left	110.0000	mm
From centroid to right	Z right	110.0000	mm
Area of shape	A	59,400.0000	mm <sup>2</sup>
Moment of Inertia	I <sub>y</sub>	239.5800E+06	mm <sup>4</sup>
Section Modulus	S <sub>y</sub>	2.1780E+06	mm <sup>3</sup>
Section Modulus (left)	S left	2.1780E+06	mm <sup>3</sup>
Section Modulus (right)	S right	2.1780E+06	mm <sup>3</sup>
Radius of Gyration	r <sub>y</sub>	63.5085	mm
Plastic Modulus	Z <sub>y</sub>	3.2670E+06	mm <sup>3</sup>
Shape Factor		1.5000	
From left to plastic n.a.	Z <sub>p</sub> left	110.0000	mm
From plastic n.a. to right	Z <sub>p</sub> right	110.0000	mm
Polar Moment of Inertia	J	600.4350E+06	mm <sup>4</sup>
Product of Inertia	I <sub>yz</sub>	0.0000	mm <sup>4</sup>
Maximum Moment of Inertia	I <sub>max</sub>	360.8550E+06	mm <sup>4</sup>
Minimum Moment of Inertia	I <sub>min</sub>	239.5800E+06	mm <sup>4</sup>
Angle from y axis to I <sub>max</sub> axis	B	90.0000	degrees
Counterclockwise			

Z - Z Properties			
Elastic Modulus	E	13.1000	GPa
From bottom to centroid	Y bot	135.0000	mm
From centroid to top	Y top	135.0000	mm
Area of shape	A	59,400.0000	mm <sup>2</sup>
Moment of Inertia	I <sub>z</sub>	360.8550E+06	mm <sup>4</sup>
Section Modulus	S <sub>z</sub>	2.6730E+06	mm <sup>3</sup>
Section Modulus (bottom)	S bot	2.6730E+06	mm <sup>3</sup>
Section Modulus (top)	S top	2.6730E+06	mm <sup>3</sup>
Radius of Gyration	r <sub>z</sub>	77.9423	mm
Plastic Modulus	Z <sub>z</sub>	4.0095E+06	mm <sup>3</sup>
Shape Factor		1.5000	
From bottom to plastic n.a.	Y <sub>p</sub> bot	135.0000	mm
From plastic n.a. to top	Y <sub>p</sub> top	135.0000	mm
Polar Moment of Inertia	J	600.4350E+06	mm <sup>4</sup>
Product of Inertia	I <sub>yz</sub>	0.0000	mm <sup>4</sup>
Maximum Moment of Inertia	I <sub>max</sub>	360.8550E+06	mm <sup>4</sup>
Minimum Moment of Inertia	I <sub>min</sub>	239.5800E+06	mm <sup>4</sup>
Angle from z axis to I <sub>max</sub> axis	B	0.0000	degrees
Clockwise			

### Euler Column Buckling Module

Back Cross-Section Help

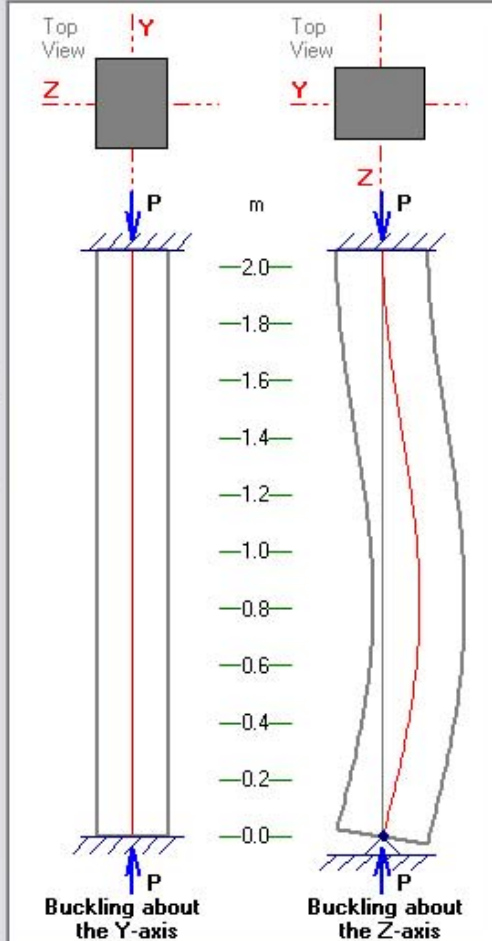
**Total Column Length**  
  
 in  mm  
 ft  m

**Fixity at Top**  
 Pinned  
 Fixed  
 Free  
 Guided

**Slenderness Ratio**  
 KL/r = 16.198

Intermediate Support

**Fixity at Bottom**  
 Pinned  
 Fixed



**Fixity at Top**  
 Pinned  
 Fixed  
 Free  
 Guided

**Slenderness Ratio**  
 KL/r = 18.455

Intermediate Support

**Effective Length Factor**  
 K = 0.69916

**Fixity at Bottom**  
 Pinned  
 Fixed

**Critical Euler Buckling Load**  
 22,548.54 kN  
 lbs  N  
 kips  kN

**Critical Euler Buckling Stress**  
 379.61 MPa  
 psi  kPa  
 ksi  MPa

Euler buckling is not a good assumption for this column since the slenderness ratios are 16.2 and 18.5. Yielding or inelastic buckling will control in this case.

