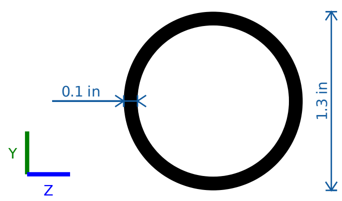
Scaffolding Design - AISC 360-16

SkyCiv

Input Summary

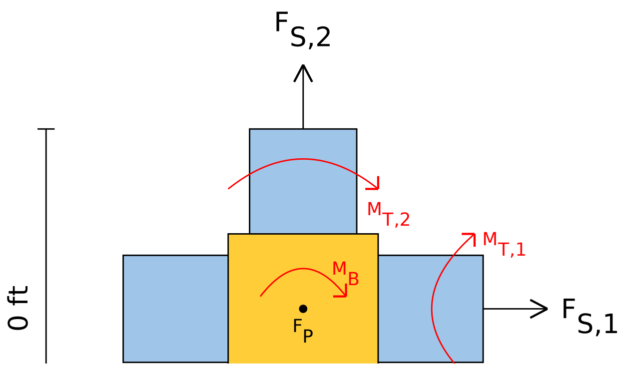
Input	Description	Value
d	**Outside Diameter (d)**	1.3 in
t_w	**Wall Thickness (t_w)**	0.1 in
L	**Span (L)**	0 ft
f_y	**Yield Strength of Member (f_y)**	38 ksi
f_u	**Ultimate Strength of Member (f_u)**	59 ksi
E	**Modulus of Elasticity (E)**	29000 ksi
c_t	**Type Of Coupler (c_t)**	Right Angle Coupler
C_{cb}	**Capacity in Bending (Cc_b)**	7 kip-ft
C_{ct}	**Capacity in Torsion (Cc_t)**	7 kip-ft
C_{cs}	**Capacity in Shear (Cc_s)**	10 kip
C_{ca}	**Capacity in Axial (Cc_a)**	20 kip
M	**Max Bending Force in Member (M)**	0.003 kip-ft
M_e	**Max Bending Force at Coupler End (M_e)**	0.002 kip-ft
V	**Max Shear Force in Member (V)**	0.002 kip
V_e	**Max Shear Force at Coupler End (V_e)**	-0.001 kip
N	**Max Axial Force in Member (N)**	0.041 kip
T	**Torsional Moment in Member (T)**	0 kip-ft
r_d	**Limiting Deflection Ratio (r_d)**	100
L_{LT}	**Unbraced Length for Lateral-Torsional Buckling (L_{LT})**	6 ft
K_y	**Effective Length Factor for Flexural Buckling about Y-axis (ky)**	1
K_z	**Effective Length Factor for Flexural Buckling about Z-axis (kz)**	1

Section Properties



Section Area	$A =$	0.37699in^2
Moment of Inertia	$I =$	0.06833in^4
Radius of Gyration	$r_z =$	0.42573in
Elastic Section Modulus	$S_e =$	0.10512in^3
Plastic Section Modulus	$Z_p =$	0.14433in^3

Coupler Diagram



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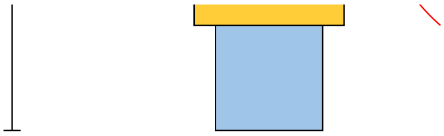


Step-I: Section Classification-Compression

Cl. E7-6, AISC360-16

$$r = \left(\frac{d}{t_w}\right) = \left(\frac{1.3}{0.1}\right)$$

$$r = 13$$

$$\lambda_{rc} = 0.11 \times \left(\frac{E}{f_y}\right) = 0.11 \times \left(\frac{29000}{38}\right)$$

$$\lambda_{rc} = 83.947$$

Table E1.1

As $L_{LT} < \lambda_{rc}$, Section Class = NON-SLENDER

Section Classification-Flexure

$$\lambda_p = 0.07 \times \left(\frac{E}{f_y}\right) = 0.07 \times \left(\frac{29000}{38}\right)$$

$$\lambda_p = 53.421$$

$$\lambda_{rf} = 0.31 \times \left(\frac{E}{f_y}\right) = 0.31 \times \left(\frac{29000}{38}\right)$$

$$\lambda_{rf} = 236.579$$

Table E1.1

As $r < \lambda_p$, Section Class = COMPACT

Step-II: Axial Capacity In Compression

Effective Length of the Member for Bending about Y-axis

Cl. E2, AISC360-16

$$L_{cy} = K_y \times L = 1 \times 0$$

$$L_{cy} = 0\ ft$$

Effective Length of the Member for Bending about Z-axis

Cl. E2, AISC360-16

$$L_{cz} = K_z \times L = 1 \times 0$$

$$L_{cz} = 0\ ft$$

Slenderness Ratio for Bending about Y-axis

$$\lambda_y = \frac{L_{cy} \times 12}{r_z} = \frac{0 \times 12}{0.426}$$

$$\lambda_y = 0$$

Slenderness Ratio for Bending about Z-axis

$$\lambda_z = \frac{L_{cz} \times 12}{r_z} = \frac{0 \times 12}{0.426}$$

$$\lambda_z = 0$$

Max. Slenderness Ratio

$$\lambda_m ax = Max(\lambda_y, \lambda_z) = Max(0.000, 0.000) = 0.000$$

Elastic Buckling Stress

Cl. E3-2, AISC360-16

$$F_e = \frac{(\pi)^2 \times E}{(\lambda_{max})^2} = \frac{(3.142)^2 \times 29000}{(0)^2}$$

$$F_e = Infinity\, ksi$$

Cl. E3-2, AISC360-16

As

$$\lambda_{max} < \sqrt{(4.71 * \frac{E}{f_y})}$$

Critical Stress

Cl. E3-4, AISC360-16

$$F_{cr} = (0.658)^{\frac{f_y}{F_e}} \times f_y = (0.658)^{\frac{38}{Infinity}} \times 38$$

$$F_{cr} = 38\, ksi$$

Nominal Compressive Strength

Cl. E3-1, AISC360-16

$$P_n = F_{cr} \times A = 38 \times 0.377$$

$$P_n = 14.326\, kip$$

Utilization for Axial Compression

$$UR_{am} = \frac{N}{(0.9 \times P_n)} = \frac{0.041}{(0.9 \times 14.326)}$$

$$UR_{am} = 0.003$$

UTILITY: 0.003

Step-III: Shear Capacity

Critical Shear Stress in Shear Yielding

$$Fcr_{shear} = 0.6 \times f_y = 0.6 \times 38$$

$$Fcr_{shear} = 22.8\, ksi$$

Nominal Shear Strength

G5-1

$$V_n = \frac{Fcr_{shear} \times A}{2} = \frac{22.8 \times 0.377}{2}$$

$$V_n = 4.298\, kip$$

Utilization for Shear Capacity

$$UR_{sh} = \left(\frac{V}{(0.9 \times V_n)}\right) = \left(\frac{0.002}{(0.9 \times 4.298)}\right)$$

$$UR_{sh} = 0.001$$

UTILITY: 0.001

Step-IV: Moment Capacity

As

$$\frac{d}{t_w} < 0.5 * \frac{E}{f_y}$$

Moment Capacity can be calculated as per Section F.8.

a) Nominal Flexural Strength - Yielding Criteria

F8-1

$$Mn_{yield} = \frac{(f_y \times S_e)}{12} = \frac{(38 \times 0.105)}{12}$$

$$Mn_{yield} = 0.333\ kip$$

Table F1.1 As S_{cf} = COMPACT

F8-2 Governing Nominal Flexural Strength

$$Mn = 0.333 kip - ft$$

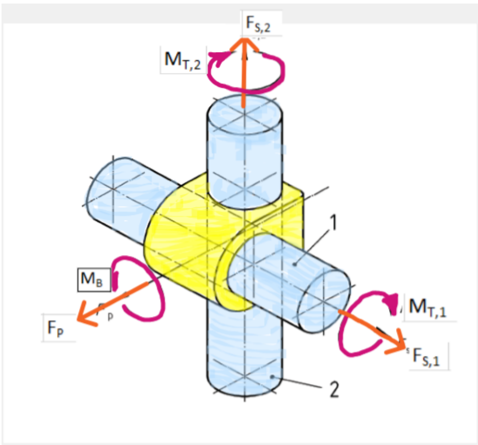
Utilization for Moment Capacity

$$UR_{mc} = \frac{M}{(0.9 \times Mn)} = \frac{0.003}{(0.9 \times 0.333)}$$

$$UR_{mc} = 0.01$$

UTILITY: 0.01

Step-V: Coupler Capacity Check



Right Angle Coupler

Utilization for Bending Capacity

$$UR_{bc} = \left(\frac{M_e}{Cc_b}\right) = \left(\frac{0.002}{7}\right)$$

$$UR_{bc} = 0$$

UTILITY: 0.000

Utilization for Shear Capacity

$$UR_{sc} = \frac{V_e}{Cc_s} = \frac{-0.001}{10}$$

$$UR_{sc} = 0$$

UTILITY: 0.000

Utilization for Slipping Capacity

$$UR_{slc} = \frac{N}{Cc_a} = \frac{0.041}{20}$$

UTILITY: 0.002

$$UR_{slc} = 0.002$$

Utilization for Torsion Capacity

$$UR_{tc} = \frac{T}{Cc_t} = \frac{0}{7}$$

UTILITY: 0.000

$$UR_{tc} = 0$$

Results Summary

Result Name	Results
MEMBER UTILITY RATIOS	
Bending Capacity (UR_{am})	0.00
Shear Capacity (UR_{sh})	0.00
Moment Capacity (UR_{mc})	0.01
COUPLER UTILITY RATIOS	
Bending Capacity (UR_{bc})	0.00
Shear Capacity (UR_{sc})	0.00
Slipping Capacity (UR_{slc})	0.00
Slipping Capacity (UR_{tc})	0.00

About this Calculator

Calculator Name: AISC 360-16 Scaffolding Design
Description: This tool allows you to perform design of members, couplers and joints of a steel scaffolding structures as per AISC 360-16.

Powered by SkyCiv

URL: https://platform.skyciv.com/quick-design?uid=2005-aisc360-scaffolding-calculator

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