

## [ 1 ] Load Combinations <I>

**Table 1:** ASCE 7-05 Load Effects



Beam Geometry \_[I]

Bending Stress Formula [Eq 1]

$$\sigma = \frac{M}{S}$$

## [ 2 ] Loads and Geometry <V>

**Table 2:** Beam Loads and Properties

variable	value	[value]	description
D_1	3.80 psf	0.18 kPA	joists DL
D_2	2.10 psf	0.10 kPA	plywood DL
D_3	10.00 psf	0.48 kPA	partitions DL
D_4	1.00 klf	14.59 kN_m	fixed machinery DL
L_1	40.00 psf	1.92 kPA	ASCE7-05 LL

Beam Geometry [file: beam1-v.csv]

variable	value	[value]	description
W_1	2.00 ft	0.61 m	beam spacing
S_1	14.00 ft	4.27 m	beam span

dead load : ASCE7-05 2.3.2 [Eq 2]

$$dl_1 = 1.2 * (W_1 * (D_1 + D_2 + D_3) + D_4)$$

dl_1	[dl_1]		D_4	D_2	W_1	D_1	D_3
1.24 klf	18.07 kN_m		klf	2.10 psf	2.00 ft	3.80 psf	10.00 psf

live load : ASCE7-05 2.3.2 [Eq 3]

$$ll_1 = 1.6 * W_1 * L_1$$

ll_1	[ll_1]		W_1	L_1
0.13 klf	1.87 kN_m		2.00 ft	40.00 psf

total load : ASCE7-05 2.3.2 [Eq 4]

$$\text{omega}_1 = \text{dl}_1 + \text{ll}_1$$

<b>omega_1</b>	<b>[omega_1 ]</b>		<b>dl_1</b>	<b>ll_1</b>
1.37 klf	19.94 kN_m		1.24 klf	128.00 ft·psf

### [ 3 ] Beam Section Properties <V>

rectangular section modulus [Eq 5]

$$\text{section}_1 = \text{rectsect}(10*\text{inch}, 18*\text{inch})$$

<b>section_1</b>	<b>[section_1 ]</b>		<b>inch</b>
540.00 in3	8849.01 cm3		inch

rectangular moment of inertia [Eq 6]

$$\text{inertia}_1 = \text{rectinertia}(10*\text{inch}, 18*\text{inch})$$

<b>inertia_1</b>	<b>[inertia_1 ]</b>		<b>inch</b>
4860.0 in4	202288.5 cm4		inch

### [ 4 ] Force and Stress <V>

mid-span UDL moment [Eq 7]

$$\text{m}_1 = \text{omega}_1 * \text{S}_1^{**2} / 8$$

<b>m_1</b>	<b>[m_1 ]</b>		<b>S_1</b>	<b>omega_1</b>
33.47 ftkip	45.38 mkN		14.00 ft	1.37 klf

bending stress [Eq 8]

$$\text{fb}_1 = \text{m}_1 / \text{section}_1$$

<b>fb_1</b>	<b>[fb_1 ]</b>		<b>section_1</b>	<b>m_1</b>
743.8 psi	5.1 MPA		540.0 inch3	33.5 ft2·klf