[1i] Load Combinations

Table 1: ASCE 7-05 Load Effects

Equation No.	Load Combination
16-1	1.4(D+F)
16-2	1.2(D+F+T) + 1.6(L+H) + 0.5(Lr or S or R)
16-3	1.2(D+F+T) + 1.6(Lr or S or R) + (f1L or 0.8W)

Beam Geometry

Bending Stress [Eq 1]

$$\sigma_1 = \frac{M_1}{S_1}$$

[2v] Loads and Geometry

Table 2: Unit Loads

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-O5 LL

Table 3: Beam Geometry [file: beam1.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

Uniform Distributed Loads

dead load : ASCE7-05 2.3.2 [Eq 2]

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

dl_1	[dl_1]
1.24 klf	18.07 kN_m

D_1	D_2	D_4	D_3	W_1
3.80 psf	2.10 psf	klf	10.00 psf	2.00 ft

live load : ASCE7-05 2.3.2 [Eq 3]

$$ll_1 = 1.6 \cdot L_1 \cdot W_1$$

ll_1	[ll_1]
0.13 klf	1.87 kN_m

L_1	W_1
40.00 psf	2.00 ft

total load : ASCE7-05 2.3.2 [Eq 4]

$$\omega_1 = dl_1 + ll_1$$

omega_1	[omega_1]
1.37 klf	19.94 kN_m

ll_1	dl_1
128.00 ft·psf	1.24 klf

[3v] Beam Section Properties

[Python file read: sectprop.py **]**

function: rect sect modulus [Eq 5]

$$section_1 = rectsect(10 \cdot inch, 18 \cdot inch)$$

section_1	[section_1]
540.00 in3	8849.01 cm3

inch

inch

function: rect moment inertia [Eq 6]

$$inertia_1 = rectinertia(10 \cdot inch, 18 \cdot inch)$$

inertia_1	[inertia_1]
4860.0 in4	202288.5 cm4

inch

inch

[4v] Force and Stress

mid-span UDL moment [Eq 7]

$$m_1 = \frac{S_1^2 \cdot \omega_1}{8}$$

m_1	[m_1]
33.47 ftkip	45.38 mkN

omega_1	S_1
1.37 klf	14.00 ft

bending stress [Eq 8]

$$fb_1 = \frac{m_1}{section_1}$$

fb_1	[fb_1]
743.8 psi	5.1 MPA

m_1	section_1
33.5 ft2·klf	540.0 inch3

fb_1 < 20*ksi | ok, not ok, blue, red [Eq 9]