Steel Beam Calculation

Beam details

W8X10
Beam effective span length: 12 feet
Minimum yield stress: 36,000 psi

Width: 3.94 in
Depth: 7.87 in
Web: 0.17 in
Flange: 0.21 in
Mass per foot: 10.08 lbs/ft

Lateral bracing & deflection limits

Top flange of beam is laterally braced at least every 2 feet along its length
Live load deflection limit: \( \text{Span}/360 = 0.4 \text{ in} \)
Total load deflection limit: \( \text{Span}/240 = 0.6 \text{ in} \)

Load details

UDL 1: Residential Floor
Dead load per square foot: 15 psf
Live load per square foot: 40 psf
Width of load perpendicular to beam, or height of load supported by beam: 13 feet

Calculations

Bending moments
\( Mc = 15.47 \text{ kip-ft} > 13.05 \text{ kip-ft}, \text{ Therefore OK} \)
The top flange of the beam is to be laterally braced along its full length. To ensure adequate lateral bracing, bracing members should be attached with fasteners that provide a positive connection. Lateral bracing members should generally be regularly spaced at least every 2 feet.

Shear forces
Shear capacity \( V_c = 19.28 \text{ kip} > 4.35 \text{ kip}, \text{ Therefore OK} \)
Allowable shear = \( 0.4 \times \text{minimum yield stress} \times d \times t_w \)
Project: The House
Calcs for: Steel Beam
Project number: 777
Date: 10 Jul 2018

Deflection
Live load deflection = 0.27 in < 0.4 in, Therefore OK
Total load deflection = 0.38 in < 0.6 in, Therefore OK

Notes
These calculations are based on the Manual of Steel Construction, Allowable Stress Design, Ninth Edition by the American Institute of Steel Construction.
Modulus of Elasticity, E = 29,000 ksi