

Design of Stiffeners Under Loads

As per AISC guidelines, the combined effect of forces from moment and shear should be considered while designing fasteners or welds for end connections of girders, beams, and trusses. When flanges or moment connection plates for end connections of beams and girders are welded to the flange of an I- or H-shape column, a pair of column-web stiffeners having a combined cross-sectional area A_{st} not less than that calculated from the following equations must be provided whenever the calculated value of A_{st} is positive:

$$A_{st} = P_{bf} F_{yc} t_{wc} (t_b + 5K) / F_{yst}$$

where

F_{yc} = Column yield stress, ksi (MPa)

F_{yst} = Stiffener yield stress, ksi (MPa)

K = Distance, in (mm), between outer face of column flange and web toe of its fillet, if column is rolled shape, or equivalent distance if column is welded shape

P_{bf} = Computed force, kip (kN), delivered by flange of moment-connection plate multiplied by 5/3, when computed force is due to live and dead load only, or by 4/3, when computed force is due to live and dead load in conjunction with wind or earthquake forces

t_{wc} = Thickness of column web, in (mm)

t_b = Thickness of flange or moment-connection plate delivering concentrated force, in (mm)

Notwithstanding the preceding requirements, a stiffener or a pair of stiffeners must be provided opposite the beam compression flange when the column-web depth clear of fillets d_c is greater than

$$d_c = (4100 t_{wc}^3 F_{yc}^{1/2}) / P_{bf}$$

and a pair of stiffeners should be provided opposite the tension flange when the thickness of the column flange t_f is less than

$$t_f = 0.4 (P_{bf})^{1/2} / F_{yc}$$

Stiffeners required by the preceding equations should comply with the following additional criteria:

1. The width of each stiffener plus half the thickness of the column web should not be less than one-third the width of the flange or moment-connection plate delivering the concentrated force.
2. The thickness of stiffeners should not be less than $t_b/2$.
3. The weld-joining stiffeners to the column web must be sized to carry the force in the stiffener caused by unbalanced moments on opposite sides of the column.

Source: <http://www.engineeringcivil.com/design-of-stiffeners-under-loads.html>