

Table 4-10. Beam Web Bearing Design Strength per Inch of Thickness (kips/in.)						
Bolts		Beam F_u (ksi)		Bolts		Beam F_u (ksi)
Number	Size (in.)	58	65	Number	Size (in.)	58
9	3/4	705	790	5	3/4	392
	7/8	822	921		7/8	457
	1	940	1,053		1	522
8	3/4	626	702	4	3/4	313
	7/8	731	819		7/8	365
	1	835	936		1	418
7	3/4	548	614	3	3/4	235
	7/8	639	717		7/8	274
	1	731	819		1	313
6	3/4	470	527	2	3/4	157
	7/8	548	614		7/8	183
	1	626	702		1	209

Check if a single-plate connection is suitable

$$HSS\ b/t = 48.7 > 37.3 \quad \text{n.g.}$$

A through-plate connection should be used.

Design the bolts and plate

The selection of the bolts and plate are the same as in Example 4.7. Use 3 rows of bolts and a 1/4-in. plate thickness. The plate is 9 inches long.

Determine the weld size

$$e_w = 3 - 1 = 2 \text{ in.}$$

$$\text{Weld force } V_f = 40(4 + 2)/4 = 60 \text{ kips}$$

$$\text{Required weld resistance} = V_f/L = 60/9 = 6.67 \text{ kips/in.}$$

From Table 4-9, a 3/16-in. weld is required but the resistance must be reduced because t of HSS is less than the minimum.

$$\phi R_n = (0.116/0.17)8.53$$

$$= 5.82 \text{ kips/in.} < 6.67 \text{ kips/in.} \quad \text{n.g.}$$

A longer weld is required.

$$L \geq 60/5.82 = 10.3 \text{ in.}$$

Use a 10 1/2-in. long plate and increase the vertical edge distances to 2 1/4-in.

Recheck the plate length

$$L = 10 1/2\text{-in.} < T = 15 1/2\text{-in.} \quad \text{o.k.}$$

Buckling with Equation 4-12.

$$t = 1/4\text{-in.} > \frac{L}{64} = \frac{10.5}{64} = 0.164 \text{ in.} \quad \text{o.k.}$$

SINGLE-ANGLE CONNECTIONS

A single-angle connection is made with an angle on one side of the beam web. In order to provide adequate flexibility, the angle is shop welded to the HSS column along the top and across the bottom of the angle with a return at the top per LRFD Specification Section J2.2b. Welding across the entire top must be avoided as it would inhibit flexibility.

A 4x3 angle is normally selected with the 3-in. leg shop welded to the HSS. A minimum angle thickness of 3/8-in. for 3/4-in. and 7/8-in. diameter bolts, and 1/2-in. for 1-in. diameter bolts should be used. For fillet welding on the flat of the HSS side and keeping the center of the beam web in line with the center of the HSS, single angle connections may be used with the following HSS:

$$B = 8 \text{ inches and } t \leq 1/4\text{-in.}$$

$$B = 9 \text{ inches and } t \leq 3/8\text{-in.}$$

$$B \geq 10 \text{ inches and any nominal thickness}$$

Alternatively, single angles can be welded to narrow HSS with a flare-bevel weld.

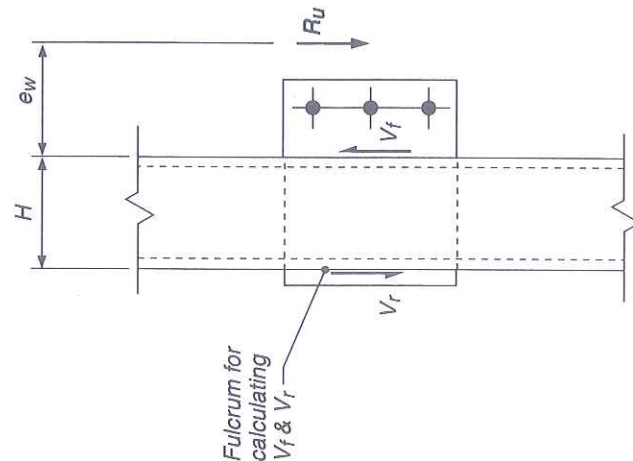


Fig. 4-5. Shear forces in a through-plate connection.