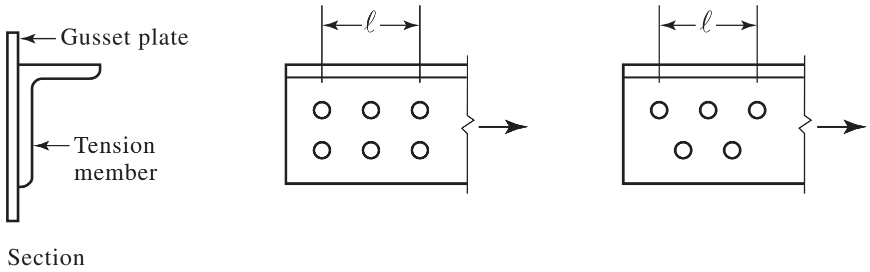
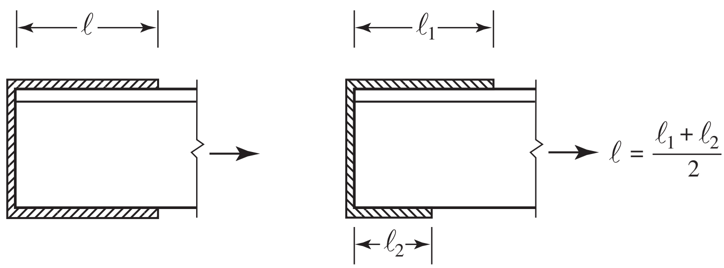
FIGURE 3.8



(a) Bolted



(b) Welded

The Commentary of the AISC Specification further illustrates $\bar{x}$ and ℓ. Figure C-D3.2 shows some special cases for $\bar{x}$, including channels and I-shaped members connected through their webs. To compute $\bar{x}$ for these cases, the Commentary uses the concept of the plastic neutral axis to explain the procedure. Since this concept is not covered until Chapter 5 of this book, we will use $\bar{x}$ for channels as shown in Case 2 of Specification Table D3.1 and in Figure 3.7b of this book. For I-shaped members and tees connected through the web, we can use Case 2 or Case 7 of Specification Table D3.1.

2. Plates

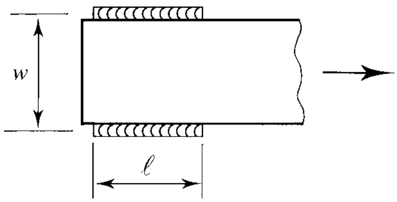
In general, $U = 1.0$ for plates, since the cross section has only one element and it is connected. There is one exception for welded plates, however. If the member is connected with longitudinal welds on each side with no transverse weld (as in Figure 3.9), the following values apply:

- For $\ell \geq 2w$ $\quad U = 1.0$
- For $1.5w \leq \ell < 2w,$ $\quad U = 0.87$
- For $w \leq \ell < 1.5w,$ $\quad U = 0.75$

3. Round HSS with $\ell \geq 1.3D$ (see Figure 3.7e):

$U = 1.0$

FIGURE 3.9



4. Alternatives to Equation 3.1 for Single and Double Angles:

The following values may be used in lieu of Equation 3.1.

- For four or more fasteners in the direction of loading, $U = 0.80$.
- For three fasteners in the direction of loading, $U = 0.60$.

5. Alternatives to Equation 3.1 for W, M, S, HP, or Tees Cut from These Shapes:

If the following conditions are satisfied, the corresponding values may be used in lieu of Equation 3.1.

- Connected through the flange with three or more fasteners in the direction of loading, with a width at least ⅔ of the depth: $U = 0.90$.
- Connected through the flange with three or more fasteners in the direction of loading, with a width less than ⅔ of the depth: $U = 0.85$.
- Connected through the web with four or more fasteners in the direction of loading: $U = 0.70$.

Figure 3.10 illustrates the alternative values of U for various connections.

If a tension member is connected with only transverse welds, $U = 1.0$, and A_n is the area of the connected element. Figure 3.11 illustrates the difference between transverse and longtitudinal welds. Connections by transverse welds alone are not common.

There are some limiting values for the effective area:

- For bolted *splice plates,* $A_e = A_n \le 0.85A_g$. This limit is given in a user note and is from a requirement in Chapter J of the Specification "Design of Connections."
- For open cross-sectional shapes (such as W, M, S, C, HP, WT, and ST) and (angles), the value of U need not be less than the ratio of the connected element gross area to the total gross area.

EXAMPLE 3.4

Determine the effective net area for the tension member shown in Figure 3.12.

SOLUTION

$$A_n = A_g - A_{\text{holes}}$$

$$= 5.77 - \frac{1}{2}\left(\frac{5}{8} + \frac{1}{8}\right)(2) = 5.02 \text{ in.}^2$$

Only one element (one leg) of the cross section is connected, so the net area must be reduced. From the properties tables in Part 1 of the *Manual,* the distance from the centroid to the outside face of the leg of an L6 × 6 × ½ is

$\bar{x} = 1.67$ in.