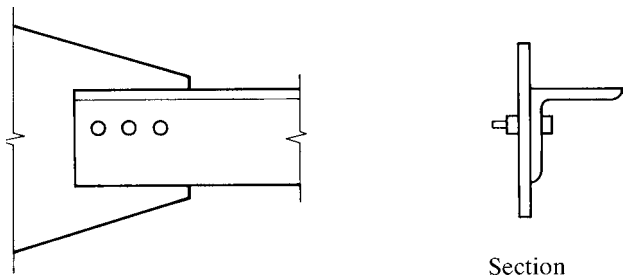
FIGURE 3.6



suggests that shear lag be accounted for by using a reduced, or effective, net area. Because shear lag affects both bolted and welded connections, the effective net area concept applies to both types of connections.

For bolted connections, the effective net area is

$$A_e = A_n U \qquad \text{(AISC Equation D3-1)}$$

For welded connections, we refer to this reduced area as the *effective area* (rather than the effective *net* area), and it is given by

$$A_e = A_g U$$

where the reduction factor U is given in AISC D3, Table D3.1. The table gives a general equation that will cover most situations as well as alternative numerical values for specific cases. These definitions of U will be presented here in a different format from that in the Specification. The rules for determining U fall into five categories:

1. A general category for any type of tension member except plates and round HSS with $\ell \geq 1.3D$ (See Figure 3.7e.)
2. Plates
3. Round HSS with $\ell \geq 1.3\ D$
4. Alternative values for single and double angles
5. Alternative values for W, M, S, and HP shapes

1. For any type of tension member except plates and round HSS with $\ell \geq 1.3D$

$$U = 1 - \frac{\bar{x}}{\ell} \qquad (3.1)$$

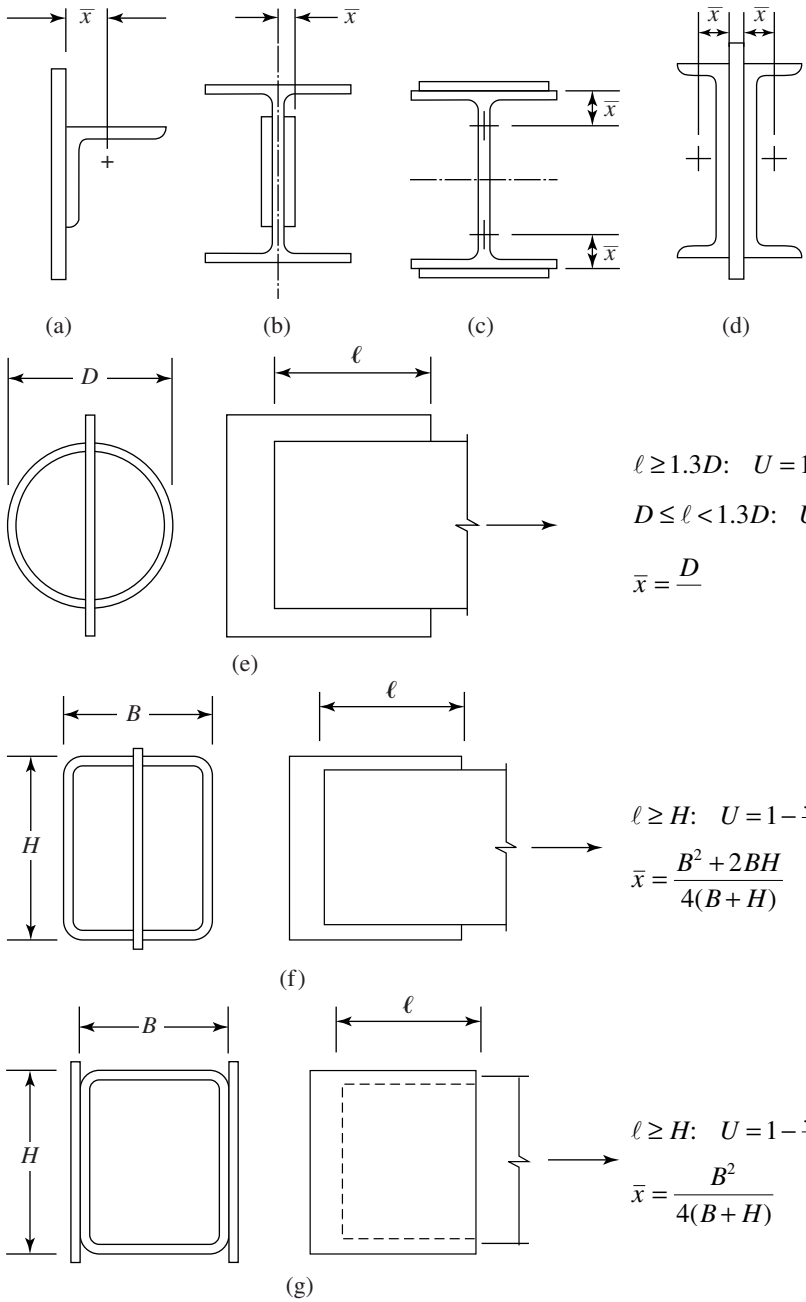
where

$\bar{x}$ = distance from centroid of connected area to the plane of the connection
ℓ = length of the connection

This definition of $\bar{x}$ was formulated by Munse and Chesson (1963). If a member has two symmetrically located planes of connection, $\bar{x}$ is measured from the centroid of the nearest one-half of the area. Figure 3.7 illustrates $\bar{x}$ for various types of connections.

The length ℓ in Equation 3.1 is the length of the connection in the direction of the load, as shown in Figure 3.8. For bolted connections, it is measured from the center of the bolt at one end of the connection to the center of the bolt at the other end. For welds, it is measured from one end of the weld to the other. If there are weld segments of different lengths in the direction of the load, use the average length.

FIGURE 3.7


$\bar{x}$
(a)
(b)
(c)
(d)
D
ℓ
$\ell \geq 1.3D$: $U = 1.0$
$D \leq \ell < 1.3D$: $U = 1 - \frac{\bar{x}}{\ell}$
$\bar{x} = \frac{D}{}$
(e)
B
H
$\ell \geq H$: $U = 1 - \frac{\bar{x}}{\ell}$
$\bar{x} = \frac{B^2 + 2BH}{4(B+H)}$
(f)
$\ell \geq H$: $U = 1 - \frac{\bar{x}}{\ell}$
$\bar{x} = \frac{B^2}{4(B+H)}$
(g)