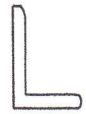
TABLE 4-14
PRINCIPAL AXIS BENDING – UNEQUAL LEG ANGLES
LONG LEG UP

Select the least value of M_n from the two limit states below and call this M_{nw}.



MAJOR AXIS: Lateral-Torsional Buckling

$$M_e = \frac{4.9EI_zC_b}{L^2}\left(\sqrt{\beta_w{}^2 + 0.052\left(\frac{Lt}{r_z}\right)^2} - \beta_w\right) \quad \text{(F10-6)}$$

$$M_y = S_{w\ Long\ Tip}F_y$$

If $M_e \le M_y$: $$M_n = \left(0.92 - \frac{0.17M_e}{M_y}\right)M_e \quad \text{(F10-2)}$$

If $M_e > M_y$: $$M_n = \left(1.92 - 1.17\sqrt{\frac{M_y}{M_e}}\right)M_y \le 1.5M_y \quad \text{(F10-3)}$$

MAJOR AXIS: Leg Local Buckling – Long Leg Only

Limit Equation	Value for F_y 36
$0.54\sqrt{E/F_y}$	15.3
$0.91\sqrt{E/F_y}$	25.8

If $\frac{b}{t} \le 0.54\sqrt{\frac{E}{F_y}}$, STOP.

If $0.54\sqrt{\frac{E}{F_y}} < \frac{b}{t} \le 0.91\sqrt{\frac{E}{F_y}}$, then

$$M_n = F_yS_{w\ Long\ Tip}\left(2.43 - 1.72\left(\frac{b}{t}\right)\sqrt{\frac{F_y}{E}}\right) \quad \text{(F10-7)}$$

If $\frac{b}{t} > 0.91\sqrt{\frac{E}{F_y}}$, then $M_n = F_{cr}S_{w\ Long\ Tip} = \frac{0.71E}{\left(\frac{b}{t}\right)^2}S_{w\ Long\ Tip}$ (F10-8) & (F10-9)

CONTINUE WITH MINOR AXIS BENDING.

TABLE 4-14, Continued
PRINCIPAL AXIS BENDING – UNEQUAL LEG ANGLES
LONG LEG UP

Notes:

In the major axis lateral-torsional buckling equations L is the span length in inches.
C_b is given by AISC equation (F1-1), but values can also be found in the AISC Steel Manual, Table 3-1. C_b shall not exceed 1.5.
$S_{w\ long\ tip}$ can be found in Appendix B.
β_w can be found in the Commentary to the AISC specification in Table C-F10.1.

In the major axis leg local buckling equations, b is the full width of the long leg, t is the thickness.
$S_{w\ long\ tip}$ can be found in Appendix B.

In the minor axis leg local buckling equations, b is the full width of the long leg, t is the thickness. Look at Table 4-9 to see if this check is necessary.
$S_{z\ long\ tip}$ can be found in Appendix B.

In the minor axis yielding equations, $S_{z\ short\ tip}$ can be found in Appendix B.

In the interaction equations, the required forces to be resisted based on the actual loads (factored moment for LRFD or service moment for ASD) are called M_{rw} and M_{rz}.

See Example 4.5 for a step-by-step use of this table.

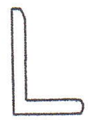
UNEQUAL LEG ANGLES

	Z Minor Axis						W Major Axis			Geometric Axis	
Shape	Iz	Sz long tip	Sz short tip	Sz heel	rz	tan α	Iw	Sw long tip	Sw short tip	Sc heel x	Sc heel y
L6x3-1/2x1/2	2.58	2.680	1.28	1.77	0.756	0.343	18.3	4.58	6.46	8.02	5.11
L6x3-1/2x3/8	2.00	2.158	0.99	1.43	0.763	0.349	14.2	3.54	5.08	6.39	4.26
L6x3-1/2x5/16	1.70	1.869	0.84	1.23	0.767	0.352	12.0	2.99	4.30	5.45	3.76

TABLE 4-14, Continued
PRINCIPAL AXIS BENDING – UNEQUAL LEG ANGLES
LONG LEG UP

MINOR AXIS: Leg Local Buckling

Check long leg only, unless this is a nonstandard shape. If so, check both legs.



If $\frac{b}{t} \le 0.54\sqrt{\frac{E}{F_y}}$, STOP. Proceed to Minor Axis Yielding.

Limit Equation	Value for F_y 36
$0.54\sqrt{E/F_y}$	15.3
$0.91\sqrt{E/F_y}$	25.8

If $0.54\sqrt{\frac{E}{F_y}} < \frac{b}{t} \le 0.91\sqrt{\frac{E}{F_y}}$, then

$$M_{nz} = F_y S_{z\ tip}\left(2.43 - 1.72\left(\frac{b}{t}\right)\sqrt{\frac{F_y}{E}}\right) \quad \text{(F10-7)}$$

If $\frac{b}{t} > 0.91\sqrt{\frac{E}{F_y}}$, then $M_{nz} = F_{cr} S_{z\ tip} = \frac{0.71E}{\left(\frac{b}{t}\right)^2} S_{z\ tip}$ (F10-8) & (F10-9)

For $S_{z\ tip}$ use $S_{z\ Long\ Tip}$ for the long leg, and $S_{z\ Short\ Tip}$ for the short leg.

MINOR AXIS: Yielding

$$M_n = 1.5M_y = 1.5F_y S_{z\ Short\ tip} \quad \text{(F10-1)}$$

SELECT THE LEAST VALUE OF M_n FROM THE TWO LIMIT STATES ABOVE, CALL THIS M_{nz}.

COMBINE THE RESULTS OF MAJOR AND MINOR AXIS BENDING IN THE INTERACTION EQUATION.

INTERACTION EQUATION

Determine Moment Capacities:

LRFD: $M_{cw} = \phi M_{nw} = 0.9M_{nw}$
$M_{cz} = \phi M_{nz} = 0.9M_{nz}$

ASD: $M_{cw} = M_{nw}/\Omega = M_{nw}/1.67$
$M_{cz} = M_{nz}/\Omega = M_{nz}/1.67$

Combine required moments, M_{rw} and M_{rz}, with capacities from above:

$$\frac{M_{rw}}{M_{cw}} + \frac{M_{rz}}{M_{cz}} \le 1.0 \quad \text{(H1-1b)}$$