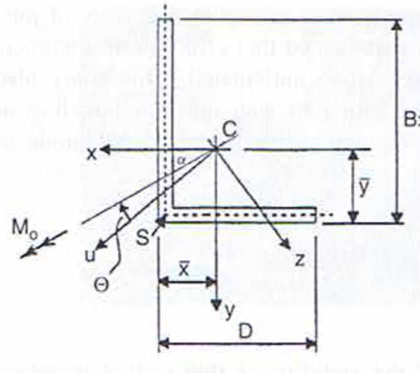

from the Handbook: α, $\bar{x}$, $\bar{y}$, I_x, I_y, r_z, A

C: centroid (0,0)

S: shear center (u_o, z_0)

x, y: non-principal axes

u, z: principal axes

t: thickness of the angle

$$x_o = \bar{x} - \frac{t}{2}$$

$$y_o = \bar{y} - \frac{t}{2}$$

$$I_z = A \cdot r_z^2 \qquad u_o = y_o \cdot \sin(\alpha) + x_o \cdot \cos(\alpha)$$

$$I_u = I_x + I_y - I_z \qquad z_o = y_o \cdot \cos(\alpha) - x_o \cdot \sin(\alpha)$$

$$J = \frac{A \cdot t^2}{3} \qquad d = D - \frac{t}{2}$$

$$r_o^2 = u_o^2 + z_o^2 + \frac{I_u + I_z}{A} \qquad b = B - \frac{t}{2}$$

$$C_1 = \frac{x_o^2}{2} \cdot [y_o^2 - (y_o - b)^2] + \frac{y_o^4 - (y_o - b)^4}{4} + \frac{y_o}{3} \cdot [x_o^3 - (x_o - d)^3] + y_o^3 \cdot d$$

$$C_2 = \frac{x_o}{3} \cdot [y_o^3 - (y_o - b)^3] + x_o^3 \cdot b + \frac{x_o^4 - (x_o - d)^4}{4} + \frac{y_o^2}{2} \cdot [x_o^2 - (x_o - d)^2]$$

$$\beta_z = \frac{t \cdot (c_1 \cdot \sin(\alpha) + c_2 \cdot \cos(\alpha))}{I_z} - 2 \cdot u_o$$

$$\beta_u = \frac{t \,.\, (c_1 \,.\, \cos(\alpha) - c_2 \cdot \sin(\alpha))}{I_u} - 2 \cdot z_o$$

FIGURE 11.7 Definition of cross-section properties.

the end-restraint effect becomes complicated. Only a few solutions are available (Trahair, 1969; Kitipornchai and Lee, 1986). An acceptable design office solution is the use of effective-length factors so that Eqs. 11.2 and 11.3 are

$$P_u = \frac{\pi^2 E I_u}{(K_u L)^2} \tag{11.7}$$

$$P_z = \frac{\pi^2 E I_z}{(K_z L)^2} \tag{11.8}$$

where $K_u L$ and $K_z L$ are the effective length in the u and z directions, respectively.

11.3.3 Inelastic Behavior

Equations 11.2 and 11.3 (or Eqs.
Inelastic behavior of angle colun
(1986) using the finite element r
replace the elastic modulus E in
the tangent modulus E_t. The sh
Approximate tangent-modulus re
Chapter 3 of this guide. Use of th
iteration. A simpler approximatio
in Appendix E3 of the AISC LR
as follows:

1. Determine the elastic critic
2. Compute an equivalent sler

$\lambda_{eq} =$

3. Determine the buckling loa
AISC LRFD specification.

It should be noted, however, tha
(AISC, 2000), does not require f
hot-rolled single angles.

Kitipornchai (1983) suggested
slenderness ratio from curve-fittin
angles

$\left(\frac{L}{r}\right)_{eq} = 0$

and for unequal-leg angles

$\left(\frac{L}{r_z}\right)_{eq} = \left[\left(\frac{L}{r_z}\right)^3 - 8\right.$

where $\alpha_1 = D/B$ and $\alpha_2 = B/t$.

Tests performed by Kennedy anc
this method provided a satisfactory
has been provided by Marsh (1969
aluminum angles with single- and
dicted by

P_c