$$FLR \le r_y \left(1800 + 1500\beta_m\right)\left(\frac{b_f}{b_w}\right)\left(\frac{250}{f_y}\right)$$

where FLR = maximum segment length for full lateral restraint

$r_y = \sqrt{\left(\frac{I_y}{A_g}\right)}$ (see Tables 3.1-3 to 3.1-4)

The FLR values listed in the (A) series tables of Tables 5.2-1 to 5.2-2 are calculated using β_m = -1.0 which is the most conservative case. However, β_m = -0.8 may be used for segments with transverse loads (as in the case of Tables 5.1-3 to 5.1-4) or β_m may be taken as the ratio of the smaller to larger end moments in the length (*L*) for segments without transverse loads (positive when the segment is bent in reverse curvature).

5.2.2.3 Design Torsional Moment Section Capacity

The design torsional moment section capacity (ϕM_z) listed in the 5.2 Table series is determined in accordance with (a) and (b) as noted below.

(a) Although AS 4100 makes no provision for the design of members subject to torsion it is nevertheless considered appropriate to provide torsional capacities for hollow sections in the Tables. Hollow sections perform particularly well in torsion and their behaviour under torsional loading is readily analysed by simple procedures. An explanation of torsional effects is provided in Refs. [5.1, 5.2].

The general theory of torsion established by Saint-Venant is based on uniform torsion. The theory assumes that all cross-sections rotate as a body around the centre of rotation.

When the torsional moment that is applied is non-uniform, such as when the torsional load is applied midspan between rigid supports or when the free warping of the section is restricted, then the torsional load is shared between uniform and non-uniform torsion or warping. However, in the case of hollow sections, the contribution of non-uniform torsion is negligible and sections can be treated as subject to uniform torsion without any significant loss of precision.

(b) For hollow sections, torsional actions can be considered using the following formulae:

$M_z^* \le \phi M_z$

$\phi M_z = \phi 0.6 f_y C$

where

M_z^* = design torsional moment

ϕ = 0.9 (based on shearing loads and Table 3.4 of AS 4100)

ϕM_z = design torsional section moment capacity

f_y = yield stress used in design

C = torsional section modulus (see 3.1 Table series)

The angle of twist per unit length θ (in radians) can be determined from the following formula:

$$\theta = \frac{M_z^*}{GJ}$$

where

G = shear modulus of elasticity, 80 x 10^3 MPa

J = torsional section constant (see 3.1 Table series).

The method for determining the constants C and J is detailed in Section 3.2.1.1.

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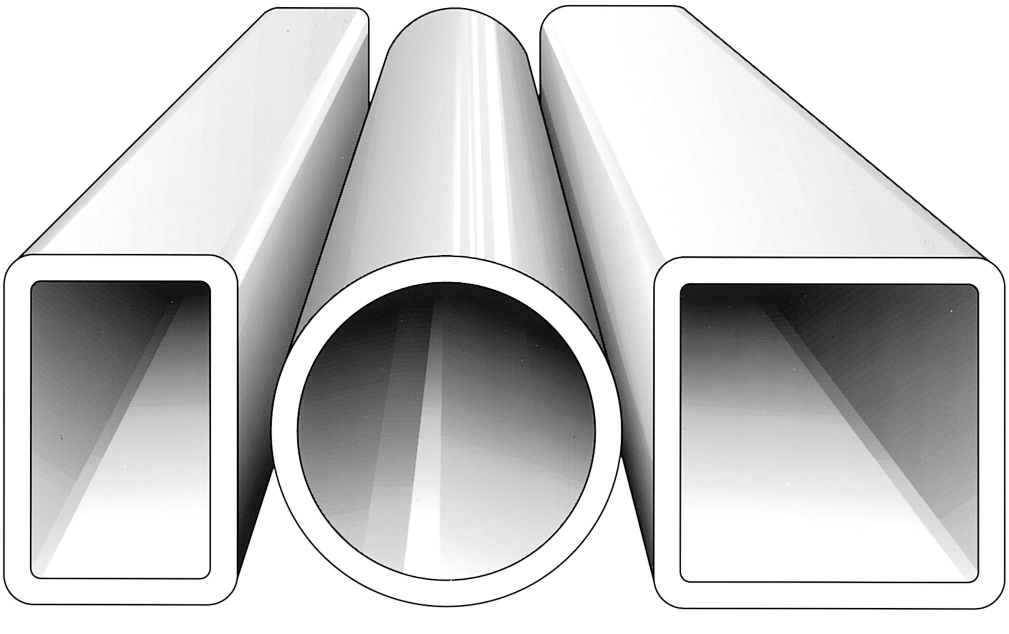

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LIMIT STATES EDITION TO AS 4100-1998 $S^* \leq \phi R_u$

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PART 5 MEMBERS SUBJECT TO BENDING

TABLES

NOTE: SEE SECTION 2.1 FOR THE SPECIFIC MATERAL STANDARD (AS 1163) REFERRED TO BY THE SECTION TYPE AND STEEL GRADE IN THESE TABLES