

5.3.2 Design Member Moment Capacity

Designers must ensure that the design bending moment (M^*) $\leq \phi M_b$ for all beam segments. The tabulated values of design member moment capacity (ϕM_b) are determined in accordance with Clause 5.6.1.4 of AS 4100 as:

$$\phi M_b = \phi \alpha_m \alpha_s M_s \leq \phi M_s$$

where $\phi = 0.9$ (Table 3.4 of AS 4100)

α_m = moment modification factor (Clause 5.6.1.1 of AS 4100)

= 1.0 **(Assumed for all entries in Tables 5.3-1 to 5.3-2 – based on uniform moment case)**

α_s = slenderness reduction modification factor (Clause 5.6.1.1 of AS 4100)

$$= 0.6 \left\{ \sqrt{\left[\left(\frac{M_s}{M_{oa}} \right)^2 + 3 \right]} - \left(\frac{M_s}{M_{oa}} \right) \right\} \quad \text{(Equation 5.6.1.1(2) of AS 4100)}$$

$M_{oa} = M_o$ – the reference buckling moment (Clause 5.6.1.1(a)(iv)(A) of AS 4100)

$$= \sqrt{\left(\frac{\pi^2 E I_y}{L_e^2} \right) GJ} \quad \text{(equation 5.6.1.1(3) of AS 4100 with } I_w = 0 \text{)}$$

L_e = effective length of beam segment.

5.3.3 Beam Effective Length

The value of ϕM_b depends on the effective length (L_e) of the flexural member. L_e is determined by:

$$L_e = k_t k_l k_r L \quad \text{(Clause 5.6.3 of AS 4100)}$$

where k_t = twist restraint factor (Table 5.6.3(1) of AS 4100)

k_l = load height factor (Table 5.6.3(2) of AS 4100)

k_r = lateral rotation restraint factor (Table 5.6.3(3) of AS 4100)

L = length of segment

Ref. [5.4] provides guidance on the restraint conditions on flexural members provided by many common structural steelwork connections. Additionally, Ref. [5.5] considers further guidance on unbraced cantilevers.

5.3.4 Other Loading and Restraint Conditions

The design member moment capacities presented in the 5.3 series tables can be used for other loading conditions. For these situations the effective length (L_e) corresponding to the actual length and restraint conditions must be assessed and the appropriate value of α_m determined in accordance with Clause 5.6.1.1(a) of AS 4100. The design member moment capacity can then be determined as the *lesser* of:

$$\phi M_{sx} = \phi Z_{ex} f_y$$

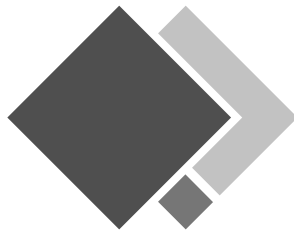
and $\phi M_b = \phi \alpha_m \alpha_s Z_{ex} f_y$

where $\phi = 0.9$ (Table 3.4 of AS 4100)

$\phi M_b = \alpha_m$ times the value of $\phi M_b (= \phi \alpha_s Z_{ex} f_y)$ given in Tables 5.3-1 to 5.3-2.

Tables 5.3-1 to 5.3-2 are based on the most critical moment distribution – i.e. uniform moment over the entire beam segment ($\alpha_m = 1.0$). For other values of α_m , designers should use the *lesser* of ϕM_{sx} and $\alpha_m (\phi M_b)$ where ϕM_b is the value given in the appropriate table for the same effective length.

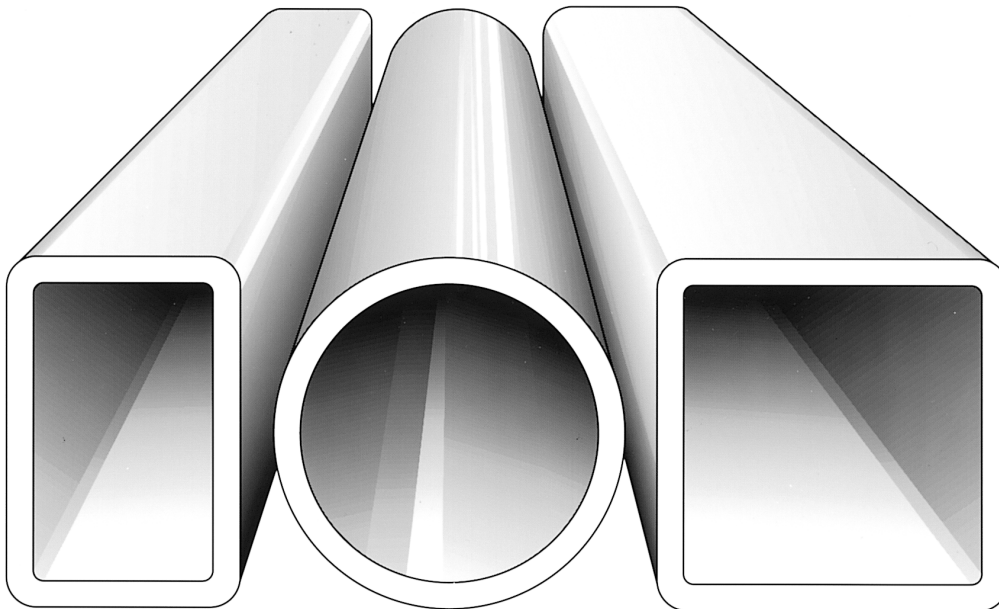
MEMBERS
SUBJECT
TO BENDING



AUSTRALIAN STEEL INSTITUTE

(ABN) / ACN (94) 000 973 839

design capacity tables for structural steel



Volume 2: Hollow Sections

second edition

CHS - Grade C250/C350 (to AS 1163)

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

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