5.2.4 Shear and Bending Interaction

5.2.4.1 Method

The design web shear capacity determined in Section 5.2.2.4 may be significantly reduced when the section is subject to a large design bending moment at the same location. The reduced design shear capacity (ϕV_{vm}) is determined in accordance with Clause 5.12.3 of AS 4100 as:

$\phi V_{vm} = \phi V_v$ for $M^* \le 0.75\phi M_s$

or $\phi V_{vm} = \phi V_v \left[2.2 - \left(\frac{1.6M^*}{\phi M_s}\right)\right]$ for $0.75\phi M_s < M^* \le \phi M_s$

where ϕV_v = design web shear capacity (see Sections 5.2.1 and 5.2.2.4)

M^* = design bending moment

ϕM_s = design section moment capacity (see Sections 5.2.1 and 5.2.2.1)

Designers must ensure that $V^* \le \phi V_{vm}$.

Note: If $V^* \le 0.6\phi V_v$ or if $M^* < 0.75\phi M_s$ then no check on the interaction of shear and bending is necessary.

5.2.4.2 Example

An example of a check on shear and bending interaction is given in Section 5.3.6.

5.2.5 Bending and Bearing Interaction

5.2.5.1 Method

The design web bearing capacity determined in Section 5.2.2.5 of the Tables may be significantly reduced when the section is subject to a large bending moment at the same location. The effect of this interaction of bending and bearing force in RHS and SHS is considered in AS 4100.

The bending and bearing interaction is dependent on the ratio of bearing length to the width of bearing (b_s/b) and web slenderness (d_1/t). Clause 5.13.5 of AS 4100 considers the following interaction to apply to RHS and SHS:

$$1.2\left(\frac{R^*}{\phi R_b}\right) + \left(\frac{M^*}{\phi M_s}\right) \le 1.5 \quad \text{for } \frac{b_s}{b} \ge 1.0 \text{ and } \frac{d_1}{t} \le 30$$

or

$$0.8\left(\frac{R^*}{\phi R_b}\right) + \left(\frac{M^*}{\phi M_s}\right) \le 1.0 \quad \text{otherwise}$$

where

b_s = stiff bearing length (see Figure 5.2)

b = width of section

d_1 = clear depth between flanges

t = thickness of section

R^* = maximum design bearing force

ϕ = capacity factor = 0.9 (Table 3.4 of AS 4100)

ϕR_b = design web bearing capacity (see Sections 5.2.1 and 5.2.2.5)

M^* = maximum design bending moment

ϕM_s = design section moment capacity (see Sections 5.2.1 and 5.2.2.1)

Note: These formulae only apply to bearing across the full width of section.

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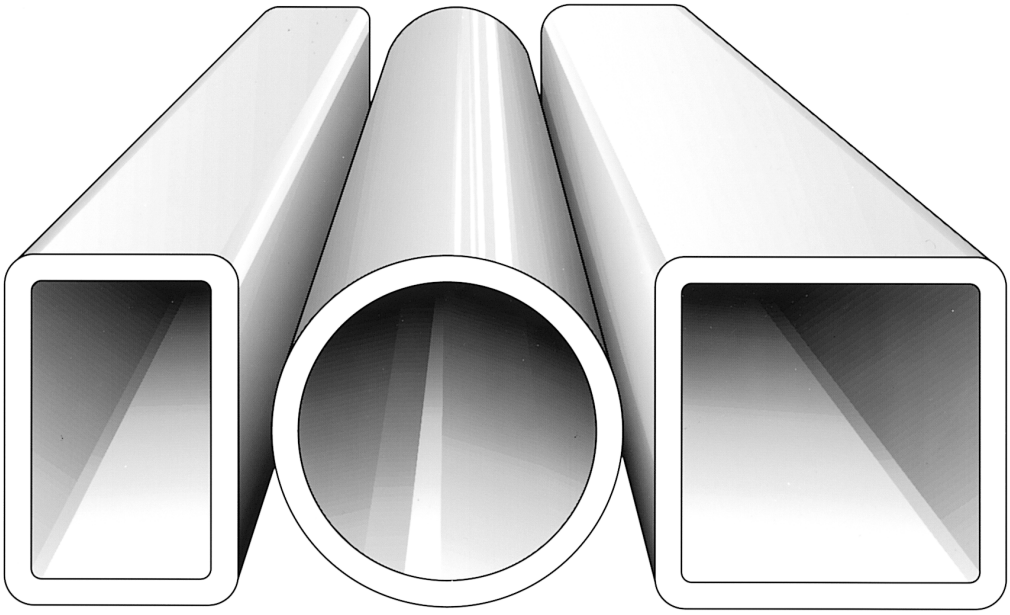

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CHS - Grade C250/C350 (to AS 1163)

RHS - Grade C350/C450 (to AS 1163)

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LIMIT STATES EDITION TO AS 4100-1998

$S^* \leq \phi R_u$

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