LiteSteel beam Part 4 Methods of Structual Analysis

Design Capacity Tables For LiteSteel® beam

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4.1 General

Clause 1.6.2.1 of AS/NZS 4600 requires the following two types of limit states to be considered for the design of structures and components:

- The ultimate (strength and stability) limit states
- The serviceability limit states

For the strength [ultimate] limit state, AS/NZS 4600 Clause 1.6.2.2 requires that all members and connections are proportioned so that the design capacity (R_d) is not less than the design action effect [design action] (S^*), i.e.

$$S^* \leq R_d$$

The design actions and combinations of design actions are given in AS/NZS 1170.0.

The design capacities (R_d) given in these tables have been determined by either:

(a) the nominal capacity (R_u) and the appropriate capacity [strength reduction] factor (Φ) calculated in accordance with Sections 2 to 5 of AS/NZS 4600, i.e. $R_d = \Phi R_u$; or

(b) by testing in accordance with Section 6.

For the stability limit state, the structure as a whole, and any part of it, must be designed to prevent instability due to overturning, uplift or sliding as specified in AS/NZS 1170.0.

The structure and its components must be designed for the serviceability limit state by limiting deflection, vibration, bolt slip and corrosion as appropriate.

4.2 Elastic Analysis

AS/NZS 4600 Clause 1.6.2.2 also states that the design action effects [design actions] (S^*) resulting from the strength [ultimate] limit state design loads shall be determined from an elastic analysis.

Normally a first order elastic analysis is used to determine the design action effects because second order effects are taken into account for combined actions (AS/NZS 4600 Clause 3.5.1 Combined axial compressive load and bending).

When a first order analysis is carried out, the moment amplification factor (α_n) is calculated in accordance with Clause 3.5.1 of AS/NZS 4600 and is included in the interaction equation:

$$\frac{N^*}{\Phi_c N_c} + \frac{C_{mx} M^*_x}{\Phi_b M_x \alpha_{nx}} + \frac{C_{my} M^*_y}{\Phi_b M_y \alpha_{ny}} \leq 1.0$$

If a second order analysis is used to determine the design action effects, it is recommended that the moment amplification factors (α_{nx} and α_{ny}) and the coefficients for unequal end moments (C_{mx} and C_{my}) used in this interaction equation are taken as unity.