The aim of this feature is to share up-dates, design tips and answers to queries. The Steel Construction Institute provides items which, it is hoped, will prove useful to the industry.

AD 251

Equivalent Uniform Moment Factor, *m*

BS 5950-1: 2000 sees the demise of the n factor method when calculating buckling resistance M_b. In Section 4, the m factor method is the only approach available, and will become a familiar friend.

The equivalent uniform moment factor, m, allows for the fact that for two identical beams with the same maximum applied bending moment, the buckling resistance is greater for a varying bending moment diagram than for a uniform bending moment diagram.

In the two examples shown below, with the same maximum applied moment, the lateral displacement of the compression flange is more pronounced when the member is subject to a uniform bending moment. Thus the member will buckle at a lower maximum moment if the moment is uniform. Alternatively, the buckling resistance of a member subject to a varying bending moment is larger than when the same member is subject to a uniform bending moment.

In BS 5950-1: 1990, the m factor method could only be used if there were no intermediate loads. In BS 5950-1: 2000 the method has wide application. Table 18 contains members subject to end moments only, some standard cases of intermediate loads and a formula to establish m_{LT} for a general loadcase.

BS 5950-1: 2000 distinguishes between the equivalent uniform moment factor for lateral torsional buckling, m_{LT}, and the equivalent uniform moment factors for flexural buckling, m_x, m_y, and m_{yx}. Lateral torsional and flexural buckling are different (one does not have the torsional component) and thus different Tables for m are required. Table 26 covers m values for flexural buckling, presenting cases for end moments only, standard cases of intermediate load, and a general case.

m Factor for General Case

To use the general case formula, one needs to know the bending moment at quarter points, and the maximum moment on the segment. Software may already provide this information (or may be configured to provide this information). No doubt new software to BS 5950-1: 2000 will automatically determine this information to calculate m.

Flexural buckling *m* factors when used with Sway-Sensitive frames

Clause 4.8.3.3.4, in the section covering member buckling checks, contains important information about the use of flexural buckling m factors m_x, m_y, and m_{yx}, when designing sway-sensitive frames.

If using Annex E (effective length factors greater than 1.0), the minimum value of the factors m_x, m_y, and m_{yx} is 0.85. If amplifying the sway moments, the factors m_x, m_y, and m_{yx} can only be applied to the non-sway component of the total bending moment. Neither of these restrictions applies to m_{LT}.

Designers should note the potential for misapplication of the m factors, particularly if applying them to sway sensitive frames. The following table summarises the position.

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Table

Factor	m_{LT}	m_x, m_y, m_{yx}
Association	Lateral-torsional buckling	Flexural buckling
Use with	M_{LT}	M_x, M_y
Determined from:	Table 18	Table 26
Restrictions	– –	In sway-sensitive frames: i) minimum 0.85 if using Annex E ii) only applied to non-sway moments if amplifying sway effects

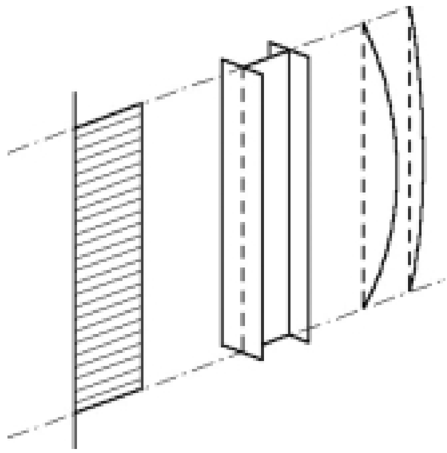

Fig. 1. Member with a uniform applied moment.

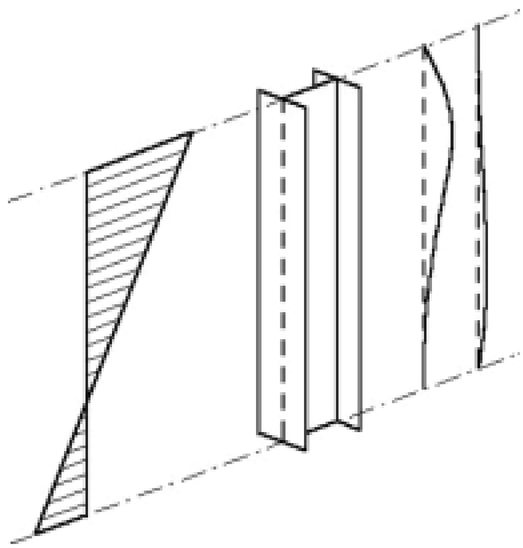

Fig. 2. Member with a varying applied moment.