λ slenderness, that is the effective length divided by the radius of gyration

λ_{LT} equivalent slenderness

5.3   Definitions

The following definitions which are relevant to this manual have been abstracted from BS 5950 Part 1:

Beam   A member predominantly subject to bending.

Buckling resistance   Limit of force or moment which a member can withstand without buckling.

Capacity   Limit of force or moment which may be applied without causing failure due to yielding or rupture.

Column   A vertical member of a structure carrying axial load and possibly moments.

Compact cross-section   A cross-section which can develop the plastic moment capacity of the section but in which local buckling prevents rotation at constant moment.

Dead load   All loads of constant magnitude and position that act permanently, including self-weight.

Design strength   The yield strength of the material multiplied by the appropriate partial factor.

Effective length   Length between points of effective restraint of a member multiplied by a factor to take account of the end conditions and loading.

Elastic design   Design which assumes no redistribution of moments due to plastic rotation of a section throughout the structure.

Empirical method   Simplified method of design justified by experience or testing.

Factored load   Specified load multiplied by the relevant partial factor.

H-section   A section with one central web and two equal flanges which has an overall depth not greater than 1.2 times the width of the flange.

I-section   Section with central web and two equal flanges which has an overall depth greater than 1.2 times the width of the flange.

Imposed load   Load on a structure or member other than wind load, produced by the external environment and intended occupancy or use.

Lateral restraint   For a beam: restraint which prevents lateral movement of the compression flange. For a column: restraint which prevents lateral movement of the member in a particular plane.

Plastic cross-section   A cross-section which can develop a plastic hinge with sufficient rotation capacity to allow redistribution of bending moments within the structure.

Plastic design   Design method assuming redistribution of moment in continuous construction.

Semi-compact cross-section   A cross-section in which the stress in the extreme fibres should be limited to yield because local buckling would prevent development of the plastic moment capacity in the section.

Serviceability limit states   Those limit states which when exceeded can lead to the structure being unfit for its intended use.

Slender cross-section   A cross-section in which yield of the extreme fibres cannot be attained because of premature local buckling.

Slenderness   The effective length divided by the radius of gyration.

Strength   Resistance to failure by yielding or buckling.

Strut   A member of a structure carrying predominantly compressive axial load.

Ultimate limit state   That state which if exceeded can cause collapse of part or the whole of the structure.

5.4   Steel grades and sections

As mentioned in Chapter 1, steel sections are produced by rolling the steel, whilst hot, into various standard profiles. The quality of the steel that is used must comply with BS 4360 'Specification for weldable structural steels', which designates four basic grades for steel: 40, 43, 50 and 55. (It should be noted that grade 40 steel is not used for structural purposes.) These basic grades are further classified in relation to their ductility, denoted by suffix letters A, B, C and so on. These in turn give grades 43A, 43B, 43C and so on. The examples in this manual will, for simplicity, be based on the use of grade 43A steel.

It is eventually intended to replace the present designations with grade references related to the yield strength of the steel. Thus, for example, grade 43A steel will become grade 275A since it has a yield stress of 275 N/mm^2.

The dimensions and geometric properties of the various hot rolled sections are obtained from the relevant British Standards. Those for universal beam (UB) sections, universal column (UC) sections, rolled steel joist (RSJ) sections and rolled steel channel (RSC) sections are given in BS 4 Part 1. Structural hollow sections and angles are covered by BS 4848 Part 2 and Part 4 respectively. It is eventually intended that BS 4 Part 1 will also become part of BS 4848.

Cold formed steel sections produced from light gauge plate, sheet or strip are also available. Their use is generally confined to special applications and the production of proprietary roof purlins and sheeting rails. Guidance on design using cold formed sections is given in BS 5950 Part 5.

5.5   Design philosophy

The design approach employed in BS 5950 is based on limit state philosophy. The fundamental principles of the philosophy were explained in Chapter 3 in the context of concrete design. In relation to steel structures, some of the ultimate and serviceability limit states (ULSs and SLSs) that may have to be considered are as follows