No design stresses are actually given in BS 4978; the code simply provides grading rules to enable timber suppliers to categorize timber. Reference should be made to BS 5268 for the relevant grade stresses to be adopted and for guidance on various aspects that should be considered in the structural design of timber elements.

2.2 Structural design of timber

Guidance on the use of timber in building and civil engineering structures is given in BS 5268 'Structural use of timber'. This is divided into the following seven parts:

Part 1 Limit state design, materials and workmanship.

Part 2 Code of practice for permissible stress design, materials and workmanship.

Part 3 Code of practice for trussed rafter roofs.

Part 4 Fire resistance of timber structures.

Part 5 Preservation treatments for constructional timber.

Part 6 Code of practice for timber frame walls.

Part 7 Recommendations for the calculation basis for span tables.

The structural design of timber members in this manual will be related to Part 2 of the standard, which is based on permissible stress philosophy. This follows the principles of elastic behaviour, from which are derived both the theory of bending and the behaviour of compression members that were discussed in Chapter 1.

2.3 Symbols

Those symbols used in BS 5268 that are relevant to this manual are as follows:

Bending

BM, M	bending moment
$\sigma_{m,a,par}$	applied bending stress parallel to grain
$\sigma_{m,g,par}$	grade bending stress parallel to grain
$\sigma_{m,adm,par}$	permissible bending stress parallel to grain

Shear

F_v	vertical external shear force
r_a	applied shear stress parallel to grain
r_g	grade shear stress parallel to grain
r_{adm}	permissible shear stress parallel to grain

Deflection

δ_p	permissible deflection
δ_m	bending deflection
δ_v	shear deflection

E modulus of elasticity
E_{mean} mean value of E
E_{min} minimum value of E
G shear modulus (modulus of rigidity)

Section properties

A total cross-sectional area
b breadth
h depth of a beam
h_e effective depth of a beam
i radius of gyration
I second moment of area
L length, span
L_e effective length of a column
$\lambda = L_e/i$ slenderness ratio (expressed in terms of radius of gyration)
$\lambda = L_e/b$ slenderness ratio (expressed in terms of breadth of section)
Z section modulus

Compression

$\sigma_{c,a,par}$ applied compression stress parallel to grain
$\sigma_{c,g,par}$ grade compression stress parallel to grain
$\sigma_{c,adm,par}$ permissible compression stress parallel to grain

2.4 Strength classes

By reference to BS 5268 Part 2, timber that has been categorized by stress grading may be further classified into strength classes in relation to the grade and species of the timber. There are nine strength classes from the weakest, lowest grade, softwood SC1 to the densest, highest grade, hardwood SC9. Softwoods are covered by classes SC1 to SC5, and hardwoods by classes SC6 to SC9.

The various timber species are assigned into strength classes by Tables 3–8 of BS 5268. Table 3, which is that for softwood species and grade combinations graded in accordance with BS 4978, is reproduced here as Table 2.1. Tables 4, 5, 6 and 7 relate to North American timbers and Table 8 to tropical hardwoods.

It is possible for stress grading machines to be set to allot timber directly into strength classes. Timber graded in this way would be marked with the relevant strength class reference SC1, SC2 and so on.

Strength class classification is intended to simplify the design, specification and supply of structural timber.

2.5 Grade stresses

Grade stresses for each of the nine strength classes are given, without reference to timber species, in Table 9 of BS 5268. This is reproduced here as Table 2.2. By choosing one of the strength classes from the table, the designer can determine the size of a timber member without specifying its species. The supplier may then provide any species from within the stipulated strength class.