The design of hardwood flexural members follows exactly the same procedure as that for softwoods, but of course the higher grade stresses given in BS 5268 for hardwood species are used. Proprietary timber beams will be discussed in more detail in the following section.

2.13 Proprietary timber beams

These are generally used in situations where the structural capacity of solid softwood timber sections is exceeded, perhaps due to long spans or wide spacing. They are available from a number of timber suppliers and consequently their exact shape or form will depend on the individual manufacturer. Three of the types generally offered are illustrated in Figure 2.5: (a) glued laminated or glulam, (b) plywood box beams and (c) ply web beams.

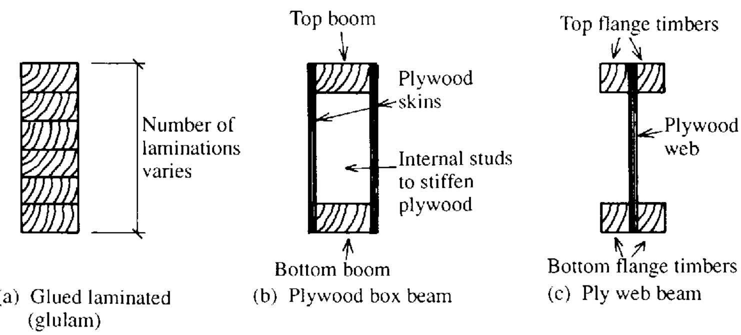

Figure 2.5 *Proprietary timber beams*

Such beams are designed in accordance with BS 5268, but the supplier normally produces design literature in the form of safe load tables. These give the safe span for each beam profile in relation to the applied loading. The user therefore only needs to calculate the design load in the usual manner and then choose a suitable beam section from the tables.

If desired the structural engineer could of course design individual beams in accordance with BS 5268 to suit his own requirements. The production of the beams would then be undertaken by a specialist timber manufacturer.

2.14 Compression members: posts

Compression members include posts or columns, vertical wall studs, and the struts in trusses and girders. The design of single isolated posts and load bearing stud walls will be considered in this manual, beginning in this section with posts.

It is important when selecting suitable pieces of timber for use as columns that particular attention is paid to straightness. The amount of bow permitted by most stress grading rules is not usually acceptable for the selection of column material. The amount of bow acceptable for column members should be limited to 1/300 of the length.

Timber posts may be subject to direct compression alone, where the loading is applied axially, or to a combination of compression loading and bending due to the load being applied eccentrically to the member axes. A timber post may also have to be designed to resist lateral bending resulting from wind action. However, the effects of wind loading on individual structural elements will not be considered in this manual.

The structural adequacy of an axially loaded post is determined by comparing the applied compression stress parallel to the grain with the permissible compression stress parallel to the grain.

2.14.1 Applied compression stress

The applied stress parallel to the grain is obtained by dividing the applied load by the cross-sectional area of the timber section:

$$\sigma_{c,a,par} = \frac{\text{applied load}}{\text{section area}} = \frac{F}{A}$$

The section area is the net area after deducting any open holes or notches. No deduction is necessary for holes containing bolts.

For the section to be adequate, the applied stress must be less than the permissible stress:

$$\sigma_{c,a,par} < \sigma_{c,adm,par}$$

2.14.2 Permissible compression stress

The permissible stress $\sigma_{c,adm,par}$ is obtained by modifying the grade compression stress parallel to the grain, $\sigma_{c,g,par}$ (Table 2.2), by any of the previously mentioned K factors that may be applicable, that is

K_1 wet exposure geometrical property modification factor

K_2 wet exposure stress modification factor

K_3 load duration modification factor

Timber posts, as opposed to wall studs, are not normally part of a load sharing system as defined by BS 5268 and therefore the load sharing modification factor K_8 does not apply.

2.14.3 Slenderness of posts

To avoid lateral buckling failure a further modification factor must also be applied in post calculations when the slenderness ratio is equal to 5 or more. This is obtained from BS 5268 Table 22, reproduced here as Table 2.9. It is dependent on the slenderness ratio and on the ratio of the modulus of elasticity to the compression stress (E/σ).