Table 1.2 Standards and codes relating to structural loading

BSI reference	Title
BS 648 1964	Schedule of weights of building materials
BS 5977 Part 1 1981 (1986)	Lintels – method for assessment of load
BS 6399 Part 1 1984	Loading for buildings – code of practice for dead and imposed loads
BS 6399 Part 3 1988	Loading for buildings – code of practice for imposed roof loads
CP 3 Chapter V Part 2 1972	Loading – wind loads

Table 1.3 Standards relating to the design of structural elements

BSI reference	Title
BS 5268 Part 2 1988	Structural use of timber – code of practice for permissible stress design, materials and workmanship
BS 5628 Part 1 1978 (1985)	Use of masonry – structural use of unreinforced masonry
BS 5950 Part 1 1990	Structural use of steelwork in building – code of practice for design in simple and continuous construction: hot rolled sections
BS 8110 Part 1 1985	Structural use of concrete – code of practice for design and construction

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In conclusion, it should be realized that whilst the theory used in the analysis of structural members (calculation of forces, bending moments and so on) may not change, British Standards and Codes of Practice do. It is therefore essential to ensure that before attempting to design any element of a structure you have the current edition and latest amendments of the relevant standard or code.

1.3 Loading

The actual calculation of the loads supported by individual structural elements is seldom given prominence in textbooks. Therefore, in this section the types of load encountered in structural design are defined and examples illustrating the calculation of such loads are given.

It is not always appreciated that perhaps the most important factor to be considered in the design of a structural member is the assessment of the loads that the member must support or resist. For this to be considered in perspective it must be realized that no matter how accurately the design procedure for a particular member is followed, the member will be either inadequate or uneconomic if the design loads assumed are incorrect.

There are three conditions of loading for which a structural member may have to be designed: dead loading, imposed loading and, when so exposed, wind loading. It is also necessary to consider the effect of combined loads.

Dead loading

This may be defined as the weight of all permanent construction. It will comprise the forces due to the static weights of all walls, partitions, floors, roofs and finishes, together with any other permanent construction.

Dead loads can be calculated from the unit weights given in BS 648 'Schedule of weights of building materials', or from the actual known weight of the materials used if they are of a proprietary type.

The dead load should also include an additional allowance for the weight of the member being designed. Since this cannot be known accurately until the size has been determined, it is necessary initially to estimate the self-weight. This may be checked after the member has been designed and if necessary the design should then be modified accordingly.

Some typical building material weights for use in assessing dead loads, based upon BS 648, are given in Table 1.4.

The unit of force, the newton (N), is derived from the unit of mass, the kilogram (kg), by the relationship that force is equal to mass times the gravitational constant of 9.81 m/s^2. That is,

$$1000\,\text{kg} = 1000 \times 9.81\,\text{kg/s}^2 = 9810\,\text{N}$$

For structural calculation purposes the load in newtons imposed by the dead weight of the materials may be obtained by multiplying by 10 (strictly 9.81) the kilogram values given in BS 648. For example, if the weight of concrete is 2400 kg/m^3, then

$$\text{Load imposed} = 2400 \times 10 = 24\,000\,\text{N/m}^3$$

Alternatively, since the structural engineer usually calculates the load imposed on a structural element in kilonewtons (kN), the tabulated values may be divided by approximately 100. For example, again if the weight of concrete is 2400 kg/m^3, then

$$\text{Load imposed} = 2400/100 = 24\,\text{kN/m}^3$$