(a) Characteristic dead load, G_k: the weight of the structure complete with finishes, fixtures and fixed partitions (BS 648[3])
(b) Characteristic imposed load, Q_k (BS 6399, Part 1[4])
(c) Characteristic wind load, W_k (CP 3, Chapter V, Part 2[5])
(d) Nominal earth load, E_n (CP 2004[6])
(e) At the ultimate limit state the horizontal forces to be resisted at any level should be the greater of:

(i) 1.5% of the characteristic dead load above that level, or
(ii) the wind load derived from CP 3, Chapter V, Part 2,[5] multiplied by the appropriate partial safety factor.

The horizontal forces should be distributed between the strongpoints according to their stiffness.

The design loads are obtained by multiplying the characteristic loads by the appropriate partial safety factor γ_f from Table 1.

Table 1 Partial safety factors for loads

Load combination (including earth and water loading where present)	Load type					
	dead, G_k		imposed, Q_k		earth and water, E_n	wind W_k
	adverse	beneficial	adverse	beneficial		
1. dead and imposed	1.4	1.0	1.6	0	1.4*	—
2. dead and wind	1.4	1.0	—	—	1.4*	1.4
3. dead, wind and imposed	1.2	1.2	1.2	1.2	1.2	1.2

*For pressures arising from an accidental head of water at ground level a partial factor of 1.2 may be used.

The 'adverse' and 'beneficial' factors should be used so as to produce the most onerous condition.

2.7 Serviceability limit states

Provided that span/effective depth ratios and bar spacing rules are observed it will not be necessary to check for serviceability limit states.

2.8 Material design stresses

Design stresses are given in the appropriate sections of the *Manual*. The partial safety factors for strength of materials, γ_m, are the same as those given in BS 8110.[1]

3 Initial design

3.1 Introduction

In the initial stages of the design of building structures it is necessary, often at short notice, to produce alternative schemes that can be assessed for architectural and functional suitability and which can be compared for cost. They will usually be based on vague and limited information on matters affecting the structure such as imposed loads and nature of finishes, let alone firm dimensions, but it is nevertheless expected that viable schemes be produced on which reliable cost estimates can be based.

It follows that initial design methods should be simple, quick, conservative and reliable. Lengthy analytical methods should be avoided.

This section offers some advice on the general principles to be applied when preparing a scheme for a structure, followed by methods for sizing members of superstructures. Foundation design is best deferred to later stages when site investigation results can be evaluated.

The aim should be to establish a structural scheme that is suitable for its purpose, sensibly economical, and not unduly sensitive to the various changes that are likely to be imposed as the overall design develops.

Sizing of structural members should be based on the longest spans (slabs and beams) and largest areas of roof and/or floors carried (beams, columns, walls and foundations). The same sizes should be assumed for similar but less onerous cases – this saves design and costing time at this stage and is of actual benefit in producing visual and constructional repetition and hence, ultimately, cost benefits.

Simple structural schemes are quick to design and easy to build. They may be complicated later by other members of the design team trying to achieve their optimum conditions, but a simple scheme provides a good 'benchmark' at the initial stage.

Loads should be carried to the foundation by the shortest and most direct routes. In constructional terms, simplicity implies (among other matters) repetition; avoidance of congested, awkward or structurally sensitive details and straightforward temporary works with minimal requirements for unorthodox sequencing to achieve the intended behaviour of the completed structure.

Standardized construction items will usually be cheaper and more readily available than purpose-made items.

3.2 Loads

Loads should be based on BS 648,[3] BS 6399: Part 1[4] and CP 3: Chapter V: Part 2.[5]

Imposed loading should initially be taken as the highest statutory figures where options exist. The imposed load reduction allowed in the loading code should not be taken advantage of in the initial design stage except when assessing the load on the foundations.

Dead loading on plan should be generous and not less than the following in the initial stages:

floor finish (screed)	1.8kN/m^2
ceiling and service load	0.5kN/m^2
demountable lightweight partitions	1.0kN/m^2
blockwork partitions	2.5kN/m^2

Density of reinforced concrete should be taken as 24kN/m^3.