Table 3.4 Values of γ_m for the ultimate limit state (BS 8110 Part 1 1985 Table 2.2)

Reinforcement	1.15
Concrete in flexure or axial load	1.50
Shear strength without shear reinforcement	1.25
Bond strength	1.4
Others (e.g. bearing stress)	$\geqslant 1.5$

3.6.3 Ultimate design strength of materials

The ultimate design strength of a material is obtained by dividing its characteristic strength by the appropriate partial safety factor referred to in Section 3.6.2:

$$\text{Ultimate design strength of concrete} = \frac{f_{cu}}{1.5} = 0.67 f_{cu}$$

$$\text{Ultimate design strength of reinforcement} = \frac{f_y}{1.15} = 0.87 f_y$$

It is important to appreciate that the formulae and design charts given in BS 8110 have been derived with the relevant partial safety factors for strength included. Therefore it is only necessary for the designer to insert the relevant characteristic strength values f_{cu} or f_y in order to use the formulae and charts.

3.7 Practical considerations for durability

Before proceeding to the actual structural design of concrete elements, a number of important practical considerations related to durability are worthy of mention since they can influence the size of members.

Durable concrete should perform satisfactorily in its intended environment for the life of the structure. To achieve durable concrete it is necessary to consider several interrelated factors at different stages in both the design and construction phases. Guidance is given in BS 8110 on various factors that influence reinforced concrete durability. They include:

(a) Shape and bulk of concrete
(b) Amount of concrete cover to reinforcement
(c) Environmental conditions to which the concrete will be exposed
(d) Cement type
(e) Aggregate type
(f) Cement content and water to cement ratio
(g) Workmanship necessary to attain full compaction and effective curing of the concrete.

Factors (a) and (b) must be considered at the design stage because they influence the member size and the location of the reinforcement. These are therefore discussed in more detail below. The remaining factors listed may be catered for by including suitable clauses in the specification and by adequate site management.

3.7.1 Shape and bulk of concrete

If the concrete will be exposed when the building is finished, adequate thought should be given at the design stage to its shape and bulk to prevent the ingress of moisture. The shape should be detailed to encourage natural drainage and hence avoid standing water.

3.7.2 Concrete cover to reinforcement

All reinforcement must be provided with sufficient cover to avoid corrosion and guard against distortion in the event of fire. The amount of cover to protect against fire is discussed in Section 3.7.3.

The amount of cover necessary to protect reinforcement against corrosion depends on both the exposure conditions that prevail and the quality of concrete used. BS 8110 Table 3.2 defines exposure conditions, and Table 3.4 gives the nominal cover to be provided with respect to the concrete quality. These tables are reproduced here as Tables 3.5 and 3.6 respectively.

Table 3.5 Exposure conditions (BS 8110 Part 1 1985 Table 3.2)

Environment	Exposure conditions
Mild	Concrete surfaces protected against weather or aggressive conditions
Moderate	Concrete surfaces sheltered from severe rain or freezing whilst wet Concrete subject to condensation Concrete surfaces continuously under water Concrete in contact with non-aggressive soil (see class 1 of Table 6.1 of BS 8110)*
Severe	Concrete surfaces exposed to severe rain, alternate wetting and drying, or occasional freezing or severe condensation
Very severe	Concrete surfaces exposed to sea water spray, de-icing salts (directly or indirectly), corrosive fumes or severe freezing conditions whilst wet
Extreme	Concrete surfaces exposed to abrasive action, e.g. sea water carrying solids or flowing water with pH $\leqslant$ 4.5 or machinery or vehicles

* For aggressive soil conditions see clause 6.2.3.3 of BS 8110.