

MATERIALS AND GEOMETRY

CHAPTER IV

Article 14 Principles

Both the structural response and the effect of the actions shall be determined using design values for the material properties and structure's geometric data.

Article 15 Materials

15.1 Characteristic values

For the purpose of this Instruction, the characteristic values for the strength of the materials (concrete compressive strength and the compressive and tensile strengths of steel) are defined as those below which 5% of all possible strength measurements may be expected to fall.

Two characteristic values are used for the concrete's tensile strength, one upper and one lower, respectively associated with probabilities of 5 and 95 per cent of obtaining strength measurements greater than such characteristic values.

Mean or nominal values are employed as the characteristic values for certain properties used in the design.

For the purpose of defining the characteristic fatigue property values of the materials, the special criteria defined in Article 48 are to be followed.

COMMENTS

For the modulus of elasticity, creep coefficient and shrinkage deformation of concrete, together with certain properties of the steel, the mean values defined in Chapter VIII are taken as the characteristic values.

15.2 Design values

The design values for material properties are obtained by dividing the characteristic values by a partial safety factor.

15.3 Partial safety factors for materials

The values of the partial safety factors of materials for Ultimate Limit State studies are given in Table 15.3

Table 15.3. Partial safety factors for materials for Ultimate Limit States

Design situation	Concrete γ_c	Prestressing and reinforcing steels γ_s
Persistent or transient	1.5	1.15
Accidental	1.3	1.0

The factors provided by Table 15.3 are not applicable to the verification of the Fatigue Ultimate Limit State, which is checked in accordance with the criteria established in Article 48.

For the serviceability limit states, partial safety factor values shall be taken as being equal to unity.

Article 16 Geometry

16.1 Characteristic and design values

The nominal values as defined on the project drawings shall be adopted as the characteristic and design values for the geometric data.

$$a_k = a_d = a_{nom}$$

In certain situations, where the lack of precision with regards to geometry has a significant effect on the structure's reliability, the following shall be taken as the design value for the geometric data:

$$a_d = a_{nom} + \Delta a$$

where Δa takes into account any possible unfavourable deviations from the nominal values, and is defined in accordance with the permitted tolerances.

16.2 Imperfections

In those situations where geometric imperfections have a significant effect, they shall be taken into account when assessing the effects of actions on the structure.