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1. OBJECTIVES AND GENERAL RECOMMENDATIONS

Structures or structural elements should be designed such that, with appropriate degrees of reliability, they
- sustain actions liable to occur during construction and use
- perform adequately in normal use
- maintain sufficient structural integrity during and after accidents (such as fire, explosions and local failure).

These requirements should apply throughout the anticipated life of each structure (including the period of construction), which means that structures should be designed and maintained so that they
- have adequate durability (for example, against biological, chemical and other influences).

The choice of the various degrees of reliability should take into account the possible consequences of failure in terms of risk to human life or injury, the number of human lives endangered in the case of failure, economic losses and the degree of social inconvenience resulting from failure. It should also take into account the amount of expense and effort required to reduce the risk of failure.

Thus, as an example, the consequences of failure may be classified according to the following:
- risk to life negligible and economic consequences small or negligible;
- risk to life exists and/or economic consequences considerable;
- risk to life great and/or economic consequences very great.

The objects of a national code are presumed to be the achivement of structures which are optimal with regard to the state of economy and development and the general values of the nation.

The measures that can be taken to achieve the required degrees of structural reliability include not only the relevant design calculations and the choice of associated safety elements but also the choice of general arrangement of the structure (and in particular the degree of redundancy and robustness), the degree of quality assurance, the degree to which actions are controlled and the standard of maintenance.

The assignment of a structure to a particular reliability classification requires the selection of the relevant safety requirements and the selection of appropriate standards of control and maintenance.

In order to control the effects of human error and negligence, higher control levels should generally be required for higher safety classes (corresponding to a greater risk to life).

2. PRINCIPLES OF LIMIT STATE DESIGN

2.1 Limit states

The structural performance of a whole structure or part of it should be described with reference to a limited set of limit states beyond which the structure no longer satisfies the design requirements.

Limit states can be regarded as a discretisation of a more general and often continuous loss function.

The limit states are classified into the following two categories, which in turn may be subclassified:

a) the ultimate limit states, which are those corresponding to the maximum load carrying capacity or where exceedande results in complete unserviceability.
b) the serviceability limit states, which are those related to the criteria governing normal use.

Ultimate limit states may for example correspond to:

- loss of static equilibrium of the structure, or of a part of the structure, considered as a rigid body (overturning).
- rupture of critical sections of the structure due to exceedance of the material strength (in some cases reduced by repeated loading) or by deformations.
- transformation of the structure into a mechanism (collapse).
- loss of stability (buckling etc).
- qualitative change in the configuration of the system.
- states which prevent the full use of the structure until a damaged part has been repaired. Such states may occur by plastic deformation of the material, creep or excessive cracking.