Utilisation scenarios and hazard scenarios

- list of names of responsible persons connected with the work and of firms involved with the construction.

3. UTILISATION SCENARIOS AND HAZARD SCENARIOS

3.1 Utilisation scenarios

In order to ensure the serviceability and durability of a structure all relevant utilisation scenarios should be considered which may result, for example, in the following

- agreed actions during service phases, including a description of static and dynamic components
- actions during erection phases, in so far as it may influence the serviceability of the completed structure
- temperature effects arising out of use.

In addition, the accompanying influences under which the serviceability of the structure has to be ensured should be selected, as for example

- from climatic environment which may exist at the site of the structure, such as wind, water, snow, ice, temperature and combinations of them.
- tectonic and geotechnical influences, including the influence of the construction on the surroundings and viceversa.
- effects of ground water, water-bearing ground strata, running water and surface water.

For the purposes of analysis and design, utilisation scenarios have to be modelled and quantified.

It is often convenient to give the utilisation scenario models and the corresponding measures taken to ensure serviceability and durability in the form of a utilisation plan.

3.2 Utilisation plan

The utilisation plan should specify the agreed utilisation scenarios which should be catered for and lay down the requirements concerning the behaviour of the structure during service (compare 2.1). All quantitative data supplied in this connection are to be regarded as agreed values.

The utilisation scenarios and the requirements relating to the service behaviour of the structure should be used for defining design situations for the structure. All other data relating to utilisation scenarios and structural behaviour not explicitly contained in the utilisation plan should be assumed by the structural engineer in accordance with good engineering practice.

Where risks of damage to property are dealt with in the utilisation plan, it should also be clearly stated where financial liability for such damage rests. If required, such risks may need to be monitored in order to reduce the extent of consequential damage.

If the owner or the user of a structure requires that the likelihood of poor serviceability shall differ from what is accepted in the building codes this should be stated explicitly in the utilisation plan.

Building codes should as far as possible be written so that they facilitate simple and clear agreements on utilisation scenarios and the corresponding requirements regarding structural behaviour. These may be included directly as elements of the utilisation plan in the case of straightforward projects.

3.3 Hazard scenarios

In order to ensure the safety of a structure, the safety of users, persons involved in its construction and all third parties, all possible hazards should initially be considered. The hazards may occur for example as a result of

- specified values of actions being exceeded considerably
- values of strength of materials or resistance of components being considerably below the specified values
- values of geometrical parameters deviating considerably from the specified values
- deleterious effects on the resistance of the structure due to exceptionally unfavourable environmental conditions

- planning, design, construction or use getting out of control as a consequence of a gross error or an exceptional event.

The gross errors include the effect of gaps in information, omissions, misunderstandings, etc. They also include negligence regarding maintenance and repair of the structures.

> Exceptional events could for example cause actions of a type which were never specified at the design (for example explosions). They could also cause a considerable decrease in the resistance of a structure (for example fire).

In its broadest sense hazard scenarios form the basis for the specification of adequate safety measures.

> It is often convenient to describe the relevant hazard scenarios and the respective safety measures in a safety plan.

For the purposes of analysis and design, hazard scenarios have to be modelled and quantified.

Basically the measures to be adopted in response to each hazard scenario would consist of one or more of the following

- eliminating the hazards through measures directed at the source of such hazards
- bypassing the hazards through changing structural concepts, location of structure etc.
- overcoming hazards through control and/or installation of warning systems
- dimensioning for hazards
- accepting the possibility of failure due to the hazards and trying to reduce the consequences.

3.4 Safety plan

The safety plan should specify the measures to be adopted in response to the relevant hazard scenarios.

In planning and specifying measures to be adopted in response to the hazard scenarios it should be noted that the possibilities mentioned in 3.3 are often used in combination. In such cases, all measures together shall totally account for the hazard scenario under consideration.

In the safety plan the hazard scenarios should be used to define the design situations for which the structure should be designed in order to maintain sufficient structural integrity.

A data control plan containing the necessary checks, supervisory measures and procedures is also a complement to the safety plan. See 5.4.

As soon as the structure is handed over to the owner, the latter takes over the responsibility for its subsequent use and maintenance. The safety plan should provide him with all necessary information for the use and maintenance of the structure.

Where specific hazards are mentioned in the safety plan as accepted risks, the measures required to exclude danger to persons should be clearly outlined, and the bearer of financial liability defined. If required, such risk may need to be supervised according to a supervisory plan which then should also form part of the safety plan (see 5.5).

The detail and format of the safety plan i.e. whether written or oral etc, should depend on the complexity of the project and the degree of danger to human life.