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Sustainable building

- International Standard Book Number renewed for 21st century
- State-of-the-art information security management systems





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For buildings as solid as a rock

by Andrzej M. Brandt, Chair of
ISO/TC 98 and Chair of ISO/TC
98/SC 2

In recent decades, science and techniques have progressed substantially in the domain of building and civil engineering structures. New materials, methods of structural analysis and construction technologies should all be implemented in practice through standardization.

ISO technical committee ISO/TC 98, *Bases for design of structures*, is creating a coherent system of International Standards in the field of building and civil engineering works, covering basic problems of reliability, understood as safety of structures together with their serviceability and durability.

The main areas of work include:

- Reliability of structures ;
- Actions on structures ; and,
- Terminology and symbols.

“All structures should be safe and durable, while fulfilling their functions.”

Since structural reliability is an overall concept comprising models for describing actions, design rules, reliability elements, structural response and resistance, workmanship, quality control procedures and national requirements, all of which are mutually dependent, it is important for the standards to be addressed not only to national and regional code-making bodies, but also to designers of structures, university teachers and other interested groups of civil engineering specialists. It is equally as important to remember that the modification of one factor should be accompanied by a study of the implications relating to the overall reliability concept.



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Rethinking the lines of communication

Due to the increasingly complex problems needing to be treated in the building standards, the continual extension of their scopes and the further specialization of people applying them in their jobs, it has become necessary to use reliable and univocal instruments for communication: a coherent and consistent systems of terms, definitions and notations.

Sometimes definitions can be too complicated when they must cover all the possible meanings of certain expressions or allow for various traditional applications in different countries. In this case, short but precise descriptions are proposed instead of definitions.

A standard written initially in one language, in most cases English,

About the author



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must be correctly translated into numerous other languages. As an example of difficulties encountered, in many cases the word used for an object, function or property may be different in the different English-speaking countries, such as Australia, Canada or the United Kingdom.

ISO/CD 8930, *Reliability for structures – List of equivalent terms*, covers principal terms used in the field of reliability of structures in the documents prepared by TC 98. It influences the recommendations and standards published by other organizations like the European Committee for Standardization (CEN). With the increasing scope of work, the standard is being revised to include a system of more general terms and definitions, while keeping the existing and universally accepted system already adopted in several national and regional documents. The same goes for notations or symbols with their subscripts and superscripts contained in ISO 3898, *Bases for design of structures – Notations – General symbols*.

Subcommittee 1 has to improve and develop both existing systems of terms and symbols in such a way that by application of consistent principles, all present items and those that may appear in the future can be properly introduced.

The progress of work makes it possible to look forward with optimism. New standards and/or technical reports with recommendations for terms, their definitions and notations with indexes will certainly correspond well to present needs.

The Leaning Tower of Pisa: built originally to last... on unstable ground.

From reliability to durability

It goes without saying that all structures should be safe and stable, while fulfilling their functions. Since the publication of ISO 2394, *General principles on reliability for structures* in 1998, based on the following two groups of limit states, describing the situations that should be avoided:

- a structure is not safe, which means that its stability is not ensured or the resistance of certain members is insufficient ;
- a structure may be safe and stable though it cannot be used because of excessive deflections, cracking, unacceptable aspect due to discolorations, etc., in the field of design of structures new needs have arisen.

ISO 2394 should be further developed by adding more explanations and detailed recommendations, mov-



ing its contents closer toward the designers of structures and making it more user-friendly. The new ISO

standard will probably be well accepted by countries in the Pacific region that have been very active in ISO/TC 98 for a few years.

Up until now, there has not been an ISO standard related directly to the durability of building structures, although a short subchapter on basic and general recommendations is contained in ISO 2394.

Subcommittee 2 (SC 2) began working on the most important issue related to the durability of structures, which extends the meaning of reliability to also maintaining the structures' reliability throughout the entire service life. The problem of durability of structures appears in many countries at different levels of technical development and is often lacking in civil engineering structures exposed to varying weather conditions.

The questions asked are: what are the sources of such a situation, by what means may the situation be changed and who should initiate and control all actions to avoid the frequently occurring premature unserviceability of concrete structures? Standardization certainly has an important role to play in this task.

The durability of a structure is considered as adequate if, throughout its entire designed life, it fulfils its intended functions related to serviceability, strength and stability, without excessive and unforeseen maintenance. Insufficient durability in many cases presents a real danger to the safety of structures, but its main influence is on the economy of the infrastructure, which requires expensive repair or reconstruction.



Durability is closely related to an important requirement imposed on our civilization – sustainable development. To a large extent, the durability of structures depends on many non-technical factors, like quality control at all stages of the building process, avoidance of excessive economies and inadequate qualification of staff.

It will clarify indications for durability of structures and their structural elements and there is a good prognosis for a useful ISO standard in 2006.

Assessing risk

Risk assessment for analysis of important structures such as nuclear power plants, offshore platforms, dams and any other structures, whose failure can have a significant effect on the population and national economy, has already been implemented in some industries. Even for ordinary buildings, accidental situations, like fires or floods may have serious consequences that should be considered in the sense of risk assessment.

Risk is necessarily involved in all structural activity and it is essential to produce rational recommendations which include: risk parameters in varying structures, acceptable risks and the conditions in which they are acceptable. The answers to these questions are needed for design and safe service of structures as well as for their maintenance.

Standardization of general principles and rules for risk assessment of civil engineering systems are very important. A new work item initiated by SC 2 is intended to provide a common methodology and clearly defined terminology that will improve the common practice of risk assessment and risk communication, which are vital components of the whole risk management system.

General principles of risk assessment and common tools used for analyzing the risks of civil engineering systems, based on the common concepts presented in different national and regional documents, will be harmonized with ISO standards and pre-

"The reliability – safety, serviceability and durability – of building structures concerns society as a whole."

pared in coordination with work at other organizations such as the Fédération Internationale du Béton (FIB), the International Council for Research and Innovation in Building and Construction (CIB) and CEN.

Subcommittee 2 is also looking into drafting a new version of ISO 10137, *Bases for the design of structures – Serviceability of buildings against vibration*. Since the publication of the first edition, researchers in various countries have formulated new proposals and the new ISO standard is expected to be of great use, mainly for standard drafting committees at national and regional levels.

Considering climatic conditions

A great number of outstanding structures are built every year all over the world, such as long span bridges and high buildings, for which the actions from wind are essential and should be correctly considered in their designs. In 2004 and 2005 particularly, we saw the devastation caused by hurricanes and typhoons. There is good reason to establish common bases for structural designs, which take into account recent research, such as the revision of ISO 4354, *Wind actions on structures*.

A new item was initiated in 2001, after a few years of informal preparations and consultations. An International Standard – to be designated ISO 21650 – is under development to describe the bases for taking account of actions from waves and currents in the design of structures situated in shallow waters. The problem is important for several countries with developed sea shores, where many structures are subjected to actions produced by these natural phenomena.

The newly published ISO 23469, *Bases for the design of structures – Seis-*

mic actions for designing geotechnical works, covers actions due to quakes. In this standard, basic recommendations are developed in more detail for large dams and other outstanding geotechnical structures, for which the forces of seismic activities are very important, and should be designed with consideration for high financial investment and significant damage should they fail. This standard will be published soon.

Now we need to address the following three new items:

- A new version of ISO 4356, *Bases for the design of structures – Deformations of buildings at the serviceability limit states*;
- Accidents caused by human activities;
- Seismic influences on non-structural elements.

We hope to initiate respective working groups, but in all these future tasks the first challenge is not to find an interested and competent group of specialists, but to ensure a material support for their work by an ISO member body. In several countries the funds allocated for standardization are progressively reduced and our partners, i.e. working groups, their convenors and secretariats are confronted with financial difficulties. This situation occurs particularly in technical committees like TC 98 that deal with general and basic issues, rather than a specific branch of industry like wood, steel or concrete. The reliability – safety, serviceability and durability – of building structures concerns society as a whole. Therefore, the activity of such basic committees should be sponsored directly and sufficiently by governmental agencies. ■