Press Release:

New - More Safe, Cost Efficient and Sustainable Approach to Structural Safety in Codes and Regulations

Press Release by the Joint Committee on Structural Safety
ETH Zurich, Switzerland, May 1, 2002.

Safe, cost efficient and sustainable approach to codified design of structures
A group of internationally recognized structural reliability experts has identified and agreed on a new, more safe and cost effective approach for codifying the design of structures.

The new approach may readily be implemented into the daily business of design of new structures such as housing, industrial buildings, bridges, dams and power plants. However, experts agree that one of the most obvious first applications will be in connection with the forthcoming adoption of the Eurocodes by the individual European Community member states.

Following the new approach facilitates the design of structures with a significantly enhanced targeting of the safety of structures and consequently a far more rational use of building materials - consequently providing a basis for significant societal cost savings.

This remarkable achievement is the result of the large efforts devoted during more that 25 years by the Joint Committee on Structural Safety (JCSS) on the formulation and development of methods of structural reliability and optimization.

These efforts, synthesized at a recent workshop held by the JCSS at ETH in Zurich, Switzerland have formed the basis for a consensus agreement within the profession that it is now time that design codes are modernized. The JCSS recommended procedure for implementing the new approach into codified and regulated design of structures is described on <file://www.jcss.ethz.ch>www.jcss.ethz.ch .

The background, motivation and philosophy
Safety, reliability and durability of structures such as houses, hospitals, bridges and nuclear power plants are issues of tremendous societal importance. Such structures constitute cornerstones in the infrastructure of the industrialized world - their failure to perform safely and economically efficient and sustainable constitute a threat to the continued development of the modern society. Structural safety must be affordable. Simultaneously, investments into structural safety must be efficient. They must compete with other life saving operations. The JCSS offers assistance to preserve present national safety targets when changing to new Eurocode formats as well as to check and adjust those present targets for their cost effectivity.

The safety of structures is not a trivial matter for mainly two reasons. First of all the loading on and use of the structures is not completely known or understood at the time of the design. Secondly because the performance of the structure i.e. its present and future ability to sustain its loading and use is subject to significant uncertainty.

Decision making in regard to structural design may thus be realized to be a decision problem subject to uncertainty - the solution of which may be found in the applied Bayesian decision theory.

All decisions in regard to the design, construction, operation, maintenance and decommissioning of a structure must be made with due consideration of sustainability, i.e. the safety of personnel, the short and long term economical consequences as well as the possible direct and indirect impact to the environment. Aiming to ensure that the interests of the society in this regard are

maintained structural design traditionally has been regulated by law - prescribing the use of "design codes" as basis for the design of structures.

In the design codes so-called safety factors are commonly introduced to ensure that the probability of structural failure can be adjusted to a level resulting in a cost optimal balance between the investments into structural safety and the corresponding increased benefits gained from the structure. The process of adjusting the safety factors of the design codes is sometimes referred to as code calibration.

Traditionally the process of code calibration has rested heavily on the experience gained from the performance of structures build in the past and has so far only in part been supported by a consistent quantification of the relevant uncertainties and consequences of failures.

Furthermore the code calibration process is known to be strongly influenced by the interests of the industries supporting and promoting different building materials. In reality important decisions concerning structural safety and thus the allocation of the resources of the society are often made on the basis of voting in committees with members attempting to maintain or improve the competitiveness of a certain building material. It is clear that this situation has been less than satisfactory.

Until recently the theoretical basis allowing the structural engineering community to follow a more rational approach for regulating structural design was not available in a sufficiently operational form. However, by the completions of the first version of the Probabilistic Model Code by the JCSS this basis was made available.

Taking basis in the Probabilistic Model Code all uncertainties affecting the safety of structures may be taken into account. Thereby it is possible to identify a codified design basis, i.e. a safety format in terms of safety factors and load combination such that the structures achieve a certain optimal and desirable safety - in principle independent of the material choice and for all relevant load combinations.