The Joint Committee on Structural Safety

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Scope and History

The Joint Committee on Structural Safety (JCSS for short) is concerned with fundamental and prenormative research in the field of Structural Reliability and Risk Analysis. The basic idea is that reliability and safety principles should be the same for all types of materials and for all types of elements encountered in civil and building engineering structures. Therefor, already in 1971, a number of international professional associations created the JCSS to coordinate and harmonise the (prenormative) research activities in this field. Presently, the JCSS is supported by:

CIB	: Conseil International du Batiment
ECCS	: European Convention for Constructional Steelwork
fib	: Fédération Internationale de Béton
IABSE	: International Association for Bridge and Structural Engineering
RILEM	: Réunion Internationale des Laboratoires d'Essais et de Rechereches sur les Matériaux et les Constructions

The JCSS acted for a long time under the continuous presidency of the famous Prof. Julio Ferry-Borges. In 1989 he was succeeded by Prof. J. Schneider and later by Prof. R. Rackwitz. Last year the author of this note was selected for this task. During its existence the JCSS has had at least a 50 meetings and has discussed a large number of reliability related documents. As direct output of the JCSS one may refer to a set of documents, the ones published after 1990 can be found in the attached list of publications. The two most recent documents are discussed in detail in separate sections. Indirectly the JCSS has had a large influence on the contents of many reliability related reports by the various associations (e.g CIB publications by WG18, WG32, WG81, the CEB and ECCS Model Codes, IABSE Structural Engineering Document 5, etc) and on official code type documents like ISO2394 and the Eurocode Basis of Design.

The message that has been spread continuously by the JCSS was (and still is) that decisions with respect to structural design and assessment should be based on the theory of probabilistic decision making. It is claimed that such an approach offers the best framework to combine theory, observations, experience and judgement into consistent and rational decisions. The depth of the analysis may of course vary from case to case. In some cases advanced probabilistic analysis is advocated, in other cases it may be sufficient to be aware of some simple principles.

More detailed information on the JCSS can be found on: http://www.jcss.ethz.ch/

Publications since 1990

IABSE-publications, 1989-1990:

- Proposal for a code for the direct use of reliability methods in structural design.
- Estimation of structural properties by testing for use in limit state design
- Design for durability including deterioration and maintenance procedures.
- Geometrical variability in structural members and systems.
- Structural performance criteria.
- Bayesian decision analysis as a tool for structural engineering decisions.
- Stochastic modelling of material properties and quality control.
- Action scenarios and logic trees.

ECCS Publication 94, March 1996:
- Background documentation, Eurocode 1, Part 1: Basis of Design.

Structural Safety, vol. 19, no. 3, 1997:
- The JCSS probabilistic model code
- Structural reliability codes for probabilistic design - a debate paper based on elementary reliability and decision analysis concepts.
- Report of the working group on dynamics.
- Uncertainties in probabilistic numerical analysis of structures and solids
- Stochastic finite elements.

RILEM publication 2001
- Probabilistic Assessment of Existing Structures (isbn 2-912143-24-1)
  Rilem Publishing Sarl, Ens, F-94235 Cachan Cedex France

Internet Publication
- The JCSS Probabilistic Model Code (http://www.jcss.ethz.ch/)

Short Summary of the two most recent publications

(1) Probabilistic Assessment of Existing Structures (2000)

It is well known, but often forgotten, that the assessment of an existing structure may differ very much from the design of a new one. Existing structures, for instance, have been inspected or can be inspected, reducing the uncertainties sometimes substantially. Another point is that the strengthening of an existing structure may be quite expensive. As a result the safety levels to be maintained and the margins necessary to reach those levels may be completely different for design and assessment.

Having this in mind the JCSS has written a report on the specific procedures and tools that are required in order to judge the safety of existing structures. The following basic goals for this document have been set:

a) to standardise methods and terminology;
b) to be operational for the consulting engineers;
c) to be generally applicable for various materials and various structural types;
d) to be useful as guidelines of pre-codification state i.e. to build the basis of future codes, standards or code type of recommendations.

Although the nature of the report is educational, it contains practical and operational recommendations and rules for the assessment of existing structures also illustrated in characteristic examples and real case studies. The document consists out of 4 parts. Part 1 discusses the general issues and procedures and can easily be read without a mathematical probabilistic background. The Parts 2 - 4, however, are of a more specialist nature and contain many formulas from probability decision theory.

(2) The JCSS Probabilistic Model Code 2001

The present ISO 2394 document on Reliability of Structures considers the Partial Factor Method and the Full Probabilistic Methods as equivalent procedures for the verification of structural reliability. In fact, the partial factor method is considered as a simplification of the probabilistic method. Also the Draft version Eurocode EN1990, Basis of Design, now under vote for acceptance, offers for the member states of the European Union the possibility to accept probabilistic methods as an alternative procedure for the verification of structural reliability.

In practice, however, only the partial factor method is directly operational as it is supported by a set of action and material codes that provide adequate information on calculation models, characteristic values, partial factor values, load combinations and so on. At this moment the full probabilistic procedures clearly lacks such a follow up.

Therefore, the JCSS have written a Probabilistic Model Code. The model code exists out of three main parts: a Basis of Design part, an Action part and a Material part. The paper discusses these parts in some detail and gives some examples of the use of the code. It should be noted that the code is not intended as a text book on structural or reliability engineering. The code is written in a condensed way and little or no educational explanations are given.

Of course, this first version may have many shortcomings. Researchers and designers are therefore invited to read and use the document and to make comments so that a better draft can be issued within one or two years. The code also needs extensions, in particular for items like loads and materials not yet covered and models for fatigue and other durability aspects. The JCSS makes a general invitation to bring in documents that can be of a help.

The task to write a Probabilistic Model Code is quite an ambitious one. We still face a number of unsolved problems and lack of data. On the other hand, it is the JCSS's firm belief that it is worth while to bring together the many research achievements and experiences of the past in a document that standardises models and methods to facilitate the use of probabilistic methods in practice.

For more information about JCSS, please click here