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Comments

Commentaires

Erläuterungen

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Traditional procedures used in the synthesis of structural schemes have inherently guarded against an unacceptably high, but undefined probability of failure and have afforded satisfactory performance. Acceptance of statistical reasoning has been hindered by lack of reliable data. Moreover the designer must allow for factors not yet amenable to mathematical treatment - for example inaccuracy of calculation, errors in communication, variability of workmanship and inspection, and prediction of future usage. Recourse must therefore at present be made to hybrid bases of design, employing empirically assessed load factors against attainment of limit states.

A statistical approach is leading to more rational specification of "characteristic" strength and may currently be used to treat certain types of loading, such as that due to wind. The margin of safety to be provided between design load and strength remains chosen to maintain the standard of performance provided by traditional methods.

Limit states, other than that of collapse, are seldom clearly defined owing to inadequate "feed-back" from users. It is the responsibility of the designer and user jointly to establish the performance requirements and the design life.

Analytical methods adopted should aim to represent the behaviour of a statistical sample of identical structures both under service conditions and up to the stage of loading at which collapse occurs. Idealized "elastic" treatment may provide lower bound estimates of strength but may seriously waste potential capacity of ductile

structures. Plastic theories may be applied to simple systems but prove intractable in many instances where premature instability may govern safety. The statistical distributions of structural strengths and serviceability limits can at present only be assumed to be similar in form to those of the material of which the structures are composed.

In an attempt to translate recent thinking on safety matters into workable directives for designers the Study Committee on Structural Safety of C.I.R.I.A. has published guidance to Codes of Practice committees and others in the use of limit state procedures. While not explicitly commending a probability basis, the recommendations include the variation of load factor with nature of collapse and with accuracy of calculation, and characteristic strengths of materials are statistically defined. Both the new unified Concrete Code and the new Code of Practice for Bridges, currently being drafted, are adopting these procedures. Design studies have indicated that significant economies in amortized cost may be expected to result from the more rational approach.

Major users are actively studying the limit states to be considered for their structures and are accepting the principle of design on a probability basis. The climate of opinion is therefore favourable to change. It remains for the designer to be provided with the data he needs to put into effect the philosophy under discussion.