

Simultaneous loads in structural design

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Abstract

The current codes include three load combination methods EN 1990 (2002), ISO 2394 (1996): dependent, semi-dependent and independent. These methods are mutually contradicting and inconsistently applied.

This paper explains that simultaneous loads are combined dependently. Two loads are simultaneous during a fixed reference time if the loads of the same fractile occur at the same time. All loads in structural design are simultaneous or at least almost simultaneous during the service time of structures or the distributions can be fixed in a way the loads are simultaneous. Consequently loads can always be combined dependently.

Permanent loads are independent but simultaneous and therefore combined dependently. A permanent and a variable load are almost simultaneous during the service time, 50 years and combined dependently. Two variable loads are simultaneous, too, when the distribution of the load with shorter duration is fixed to the time of the load with longer duration.

The dependent combination results in higher safety factors, γ_G , γ_Q , γ_M , and combination factors, ψ_0 , than the semi-dependent and the independent combination, Poutanen (2011).

The dependent load combination is reliable, it is simple and it requires little calculation work.

References

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