ASSESSING THE ROBUSTNESS OF A LONG SPAN SUSPENSION BRIDGE

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ABSTRACT

The robustness of a structure, interpreted as its ability “not to suffer disproportionate damage as a result of a limited initial failure”, is a requirement that strongly depends on the characteristics of the structural system. Thus design for robustness shall take into account the structural response to different patterns of damage and cannot be limited to considering additional accidental load cases.

In this paper, the numerical evaluation of the degree of robustness of the structure, as quantified by the ratio between the decrement of the ultimate global resistance and the increment of damage (expressed, for example, by the number of failed components), is dealt with.

The proposed methodology is based on the analysis of the response of the structural schemes resulting from various damage patterns. However, to limit the number of structural analyses, an optimization algorithm is applied to identify the more significant distributions of damages.

The procedure allows to evaluate the lower and upper bounds of the degree of robustness; moreover it allows to identify the critical components, and to improve the structural design by changing the structural scheme or by increasing the resistance of some elements. The procedure is applied to the design of a long span suspension bridge.