



## Seismic Assessment and rational renovation of the structural heritage

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### Abstract

Pliny the Elder was possibly the first “engineer” trying to give suggestions on how to construct seismic resisting buildings, but even after gigantic steps in understanding ground motion demand and structural response, any strong earthquake results in casualties and economical losses, in most cases beyond expectations.

It is thus evident that the intelligent application of Newton’s and Hooke’s laws, the development of response and design spectra and of capacity design principles have not been sufficient to protect human life and the constructed environment from nature’s whims.

Today’s frontiers are related to the impossible reconciliation of resources and needs, and consequently to the best use of the available resources, in terms of funding, but as well of time, manpower, advanced techniques.

A first difficulty is associated with the problem of defining a common measure of risk, for different kind of structures and infrastructures, including apparently distant effects, such as business interruption, traffic detour, increased pollution, value of the cultural heritage.

A second basic problem relates to our capacity of appropriately evaluating the effect of different, traditional and innovative, strengthening techniques, in the same terms of global economical benefits.

This presentation will discuss these subjects from a critical viewpoint, emphasizing the possible *criteria* for the mitigation of seismic risk and some of the *alternative choices* that may be adopted for strengthening, with reference to:

- (a) the modification of damage and collapse modes, comma strengthening individual elements or locally increasing the deformation capacity;
- (b) the insertion of additional systems resisting eliminate to horizontal actions;
- (c) the introduction of base isolation, with the objective of capacity-protecting the existing structure;
- (d) the reduction of displacement demand by added damping or introducing tuned mass systems.

Examples will refer to major bridges and historical buildings, with the aim of discussing eliminate how *Bringing Existing Structures into the Future*, with an intelligent and sustainable approach.