# Structural Protection of Long Span Bridges

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## Summary

This paper addresses the special and additional requirements that a structural protection system has to cope with when it has to protect large span bridges. In large span bridges it is the often the service state (e.g., wind, traffic) rather than the ultimate limit state that dictates the characteristics of suitable structural protection elements, like shock transmitters with force limiters, or bridge bearings, or expansion joints. We come to conclude that extending the limits of large span bridges requires the input of additional design parameters for their structural protection systems. Which, if not considered, may lead to excessive wear and consequently to frequent maintenance or even replacement. Case studies will prove that point.

**Keywords:** structural protection, suspension bridges, cable stayed bridges, expansion joints, bridge bearings, viscous dampers, tuned mass dampers, shock transmission units

## 1. Introduction

Extending the limits of bridge construction, like in terms of main span, can be likened to a pioneering venture. Although numerous statical and dynamical calculations may provide the designer the certainty that yes the strains resulting from a new extension of the limit are under control, the structural protection system of the bridge may exhibit undesired phenomena which are linked to excessive wear.

As it turns out, the causes of this excessive wear are of rather profane nature, as they are wind loads and traffic loads which cause a dynamic behavior of the bridge that has to be controlled by its elements of structural protection. Even a dynamical calculation may not provide the desired data, when for example the displacement velocity or the accumulated movement of the bridge bearing should govern the design of the bridge bearings. These data are neither investigated let alone forwarded to the manufacturer of those structural elements, which leads to an insufficient wear resistance of these elements in question. Furthermore, if not expressively requested, competition will prevent manufacturers to voluntarily adapt their products when the accompanied costs may price them out of competition. The table below summarizes the usual input parameters for the various elements of structural protection, as well as the “missing parameters”, for which awareness has to be created.

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