



Reliability, sustainability and innovation in bridges and structures

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Abstract

Structural engineers should develop new concepts for reliable structures taking into consideration sensitivity to sustainability and aesthetics as social requirements. New ideas, as part of a creative process, is a social responsibility for structural engineers. Innovative structural designs seek to answer to new challenges from architectural developments, plastic arts, and social needs.

Some “old ideas with a new twist” for new trends in bridge design are discussed. New materials (like HSS), new architecture challenges and new geometrical shapes (at structure or at cross section levels) are highlighted. Design and structural analysis issues, imposed by what may be considered as innovations, are discussed towards future social needs.

Keywords: High Strength Steels (HSS), complex geometries, steel joints, deck cross sections, bowstring bridges

Introduction

Structural engineers should develop new concepts for reliable structures taking into consideration sustainability and aesthetics. New ideas as part of a creative process are a social responsibility for structural engineers. Reliability is certainly the first demand, but designers should not be satisfied with to what is usual and more economic. Innovation challenges seek to answer to new challenges from architectural developments, plastic arts, and social needs.

New trends in bridge design involves usually new materials, new geometrical shapes, new execution methods. Steel and concrete are the main structural materials, but progress has been made towards a new generation of structural engineering materials, like aluminium, structural glass, and

fiber reinforced composites. New design ideas are always challenging for those who have the responsibility for execution. They induce a strong social impact on construction and production processes. Examples from last decades are precasted segmental construction, external and extradosed prestressing and incremental launching for bridge erection.

Innovation in structural engineering is usually the result of evolutions of previous solutions. In this paper some “old ideas with a new twist” – a reference made in many engineering and science publications – are explored towards innovation in design of bridges and structures. These topics are treated based on the design and research experience of the authors.