



Bridges and Special Structures: Towards an Innovative and Sustainable Built Environment

A.J.Reis

GRID International and IST University of Lisbon. Portugal

Contact: antonio.reis@grid.pt

Abstract

Design of bridges and special structures like long span roofs, is not only a structural exercise. Integration and aesthetics are a challenge for structural engineers towards a sustainable and innovative built environment. Structural engineers are facing new architectural demands for geometrical shapes. Bridges have a multifunction social use, being part of human life and should be interpreted as such. Author's design experience worldwide, for more than 40 years, is reflected and illustrated by design cases in this paper.

Keywords: bridges, special structures, roofs, stadiums, environment, aesthetics, bow-strings, suspension bridges.

1 Design Challenges

Bridges and special structures like long span roofs, require from design engineers sensitivity to environmental constraints, historical heritage, landscape integration and aesthetics. The shape of structures should reflect a balance between aesthetics and architectural options, structural function, cost/economy and execution feasibility. No matter the complexity of a structure, modelled nowadays by powerful FEM, the concept design should be based on simple structural models and hand calculations. Structural engineers are facing nowadays new architectural demands for geometrical shapes and details. Besides, extending lifespan of bridge structures, keeping social functions of existing bridges and historical

heritage values, is a design challenge for structural engineering.

Designing a bridge or a special structure is not only a structural exercise. This is a key aspect to succeed in a design or design-construction tender.

Engineers have neglected in many projects, aesthetics and environmental integration. Cost and construction easiness cannot justify structures destroying sustainability of urban spaces and landscapes. Bridges should reflect the art of structural engineering towards an innovative and sustainable built environment.