



## ArtStructures, From competition to completion using the synthetic design method

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### Abstract

In Switzerland, the process of building large carrying structures is often initiated by setting up a competition.

Reconsidering conceptual design to place an emphasis on creative work, a specific conceptual design method called the “synthetic design method” has been developed. It consists of creating a structure that simultaneously addresses all requirements with a global synthetic approach. It is not a case of being restricted to stacking individual structural elements, but rather of integrating all required data into a single comprehensive structure. It is not a question of composing or assembling parts, but rather of cutting and carving a structure without losing its singular monolithic aspect. The carrying structure has to be considered in a global and synthetic way, encompassing all requirements and constraints, so that structural engineers can engage in an innovative process to create an ArtStructure.

The synthetic design method is described and its application to several competition-winning bridge designs is illustrated.

**Keywords:** Conceptual design, synthetic design, design strategy, competition, non-composition, bridges, viaduct, pre-stressed concrete, cable stayed bridges.

### 1 Introduction

Firstly, the term ArtStructures is equivalent to “ouvrages d’art” in French and “Kunstbauten” in German, consisting of major constructions built along roads, such as bridges, tunnels and stations. These constructions are qualified as “art” because their design and construction require structural engineers to use their experience, skill and sensibilities to produce creative work, as described by Menétrey [1].

By extension, the carrying structures of stadiums, halls, towers and buildings also require structural engineers to have an understanding of structural art, because they need to address the challenges of contemporary architecture such as rational and economic use of materials, flexibility, optimization of structures, and management of complex geometries. These structures are thus also considered to be ArtStructures.

However, this paper focuses on bridges.