



Template and Guidelines for Conference Papers

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Abstract

This paper explores different approaches to integrated structural design concepts and architectural form based on recent case studies. Against the background of the historic context of structural form development, it argues that the definition of the integration of structure and form may be widened and seen in an explorative and playful way, whilst the basic principles of clear structural thinking and designing for construction are becoming increasingly important to maintain the integrity and validity of the structural engineer's contribution.

Keywords: Structural Engineering Design, Architectural Form, Design Integration, Design for Construction.

1 Introduction

The architectural form of large enclosures has, for millennia, been dictated by materials working in compression and, in doing so, creating an aesthetic that lives on. The advent of iron and steel in the 19th century changed how buildings could be built – it became possible to divide structural action into tension and compression, and to have large structures work in bending. However, as direct forces are still the most economical way to carry loads, purity of structural form in architecture continued to be expressed in shell or tensile structures well in to the 20th century and beyond.

Being able to work with more advanced analytical tools has allowed experimentation with other types of structural forms in the expression of architecture, working with hybrids and in finding new ways of making the structure an integral part of the architectural aesthetic. This paper explores the playful and creative relationship between structure and architecture, first with some of background and then through three case studies.

2 Background

The history of architecture and bridge building is also the history of long-span structures. For millennia, stone, only able to work in compression, was the building material available to enable large enclosures or the spans needed in bridge building. We have a rich history of arches, vaults and shells and these forms have evolved over time into increasingly elaborate architecture. Initially this was based on an empirical understanding of structure. This was slowly replaced, from the 16th century, by a scientific one.

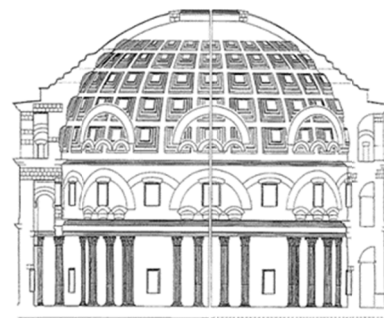


Figure 1. Pantheon, Rome