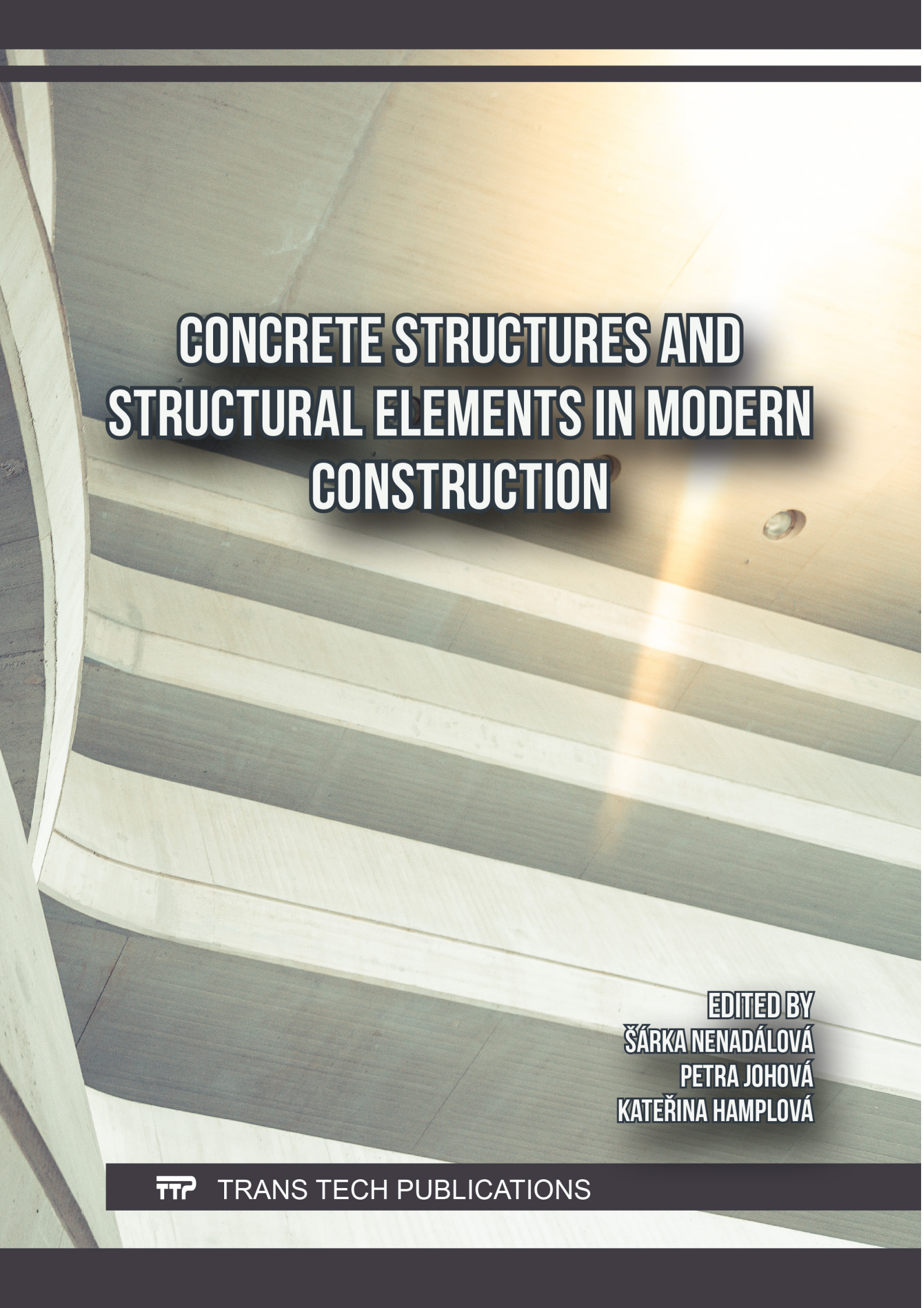

CONCRETE STRUCTURES AND STRUCTURAL ELEMENTS IN MODERN CONSTRUCTION

EDITED BY
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KATEŘINA HAMPLOVÁ

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Preface

The presented special edition is dedicated to the actual issues of designing, researching specific features and analysing load-bearing properties of concrete-based structural elements and functional structures that are applied in modern construction.

Special emphasis is placed on the investigation properties of structural elements and, in general, finished structures that are made using steel-concrete composites and fiber-reinforced polymer materials.

The issue also pays close attention to the analysis of mechanical and especially load-bearing properties of concrete structures under static and blast loads.

There is no doubt that this special edition will be useful to civil engineers and architects.

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Implementation of Large-Format 3D Façade Components Using Glass Fibre Reinforced Concrete: ČSOB Hradec Králové, C&A Zürich, Illuster Uster

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Keywords: Glassfibre reinforced concrete, GRC, large-area façade elements, façade, mock-up.

Abstract. Glassfibre reinforced concrete (GRC) is a close-grained concrete material reinforced with glass fibres that allows architects complete freedom in designing rear-ventilated façades. It can be shaped, coloured, surface-treated or otherwise tailored to the specific needs of their projects without significant limitations.

The main properties of GRC material include its long life-time and sustainability. The results are visually appealing façade panels that can withstand adverse weather conditions for decades.

The characteristic high strength and durability is achieved by dispersing glass fibres within the base mixture of Portland cement, sand, water and further refining additives. Fine-grained particles in the composite structure ensure low water absorbency and high frost resistance.

This article is an overview of the technical solution and process of GRC façade design. It deals with the design possibilities for anchoring large-format and 3D shaped façade panels. The article further presents all of the above-mentioned characteristics and process details as they are used on three specific structures. The first presented project is the ČSOB Central Office in Hradec Králové, with its typical distinct ledges combined with glazed surfaces. The cascading entrance portal is a significant element of its façade. The next implementation chosen is the renovation of the C&A department store building in Zürich, Switzerland. This building's façade is comprised of structured large-area panels with distinctive frames. The article concludes with the creatively implemented renovation of the Illuster shopping centre in Switzerland, with its kaleidoscopic façade made up of glassfibre reinforced concrete panels.

Large Format GRC Components

Glassfibre reinforced concrete (GRC) is a premium façade component, mainly due to its natural origin, appearance, almost limitless shaping possibilities and large format dimensions.

The history of this material goes back to the mid-20th century, when a number of components reinforced with various fibres began to be produced worldwide. Through long-term research, technological development and testing of individual materials, a concrete reinforced with glass fibres was successfully developed in the early 1970s – so-called glassfibre reinforced concrete. Originally, the components were produced by casting – which is now usually replaced with the more effective technology of sprayed GRC.

The main properties of a GRC material are its strength and durability. The results are visually striking façade panels that have no problem withstanding adverse weather conditions for decades. The first such façade made of GRC material is 30 Cannon Street in London, which has survived over forty years without the need of renovation.

Compared to prefab technology, GRC components reach roughly one tenth the weight, being significantly lighter on the structural elements of the building. These are 12–20 mm shells, created by spraying a specially prepared mixture into a prepared mould. When creating such a component, one must first conceptualise and prepare its design (i.e., the internal construction and anchoring), then design and produce the mould and finally deposit the GRC mixture for a resulting unified surface without hollows, pores or visible micro-fractures.