

Diplomová práce: Experimental investigation of the folding behaviour of extruded cement-bound concretes

Jméno studenta: Ludwig WERUM

Datum odevzdání práce: letní semestr 2020/21

Magisterský studijní program: Civil Engineering

Student Ludwig Werum absolvoval studium na Fakultě stavební ČVUT v Praze souběžně se studiem na univerzitě Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen v rámci double degree studia na základě smlouvy uzavřené mezi oběma univerzitami. V souladu s touto smlouvou proběhlo na RWTH Aachen v rámci double degree studia zpracování diplomové práce zapsané na Fakultě stavební ČVUT a následně dne 9.6.2021 i obhajoba diplomové práce.

Abstrakt diplomové práce:

The innovative and high-performance building material textile reinforced concrete (TRC) has the potential to significantly reduce the enormous resource consumption and CO₂ emissions of the construction industry. To exploit the full potential of this revolutionary building material, however, innovative construction principles are required. Based on the form-follows-force principle, new ideas for structural component geometries can be found in nature, mathematics, and mechanics. In order to produce the found shapes, adequate manufacturing methods are required. Generative manufacturing by means of extrusion is an efficient method to produce filigree TRC components. Within the scope of this master's thesis the subsequent forming or folding behavior of extruded fiber reinforced concrete (FRC) and TRC has been investigated. Furthermore, the influence of different fiber types and contents was analyzed. For this purpose, new folding tools were developed first, which allowed the production of specimens with varying bending radii in transverse and longitudinal direction. Thus, strongly curved specimens were produced using the fold in fresh principle. TRC specimens exhibited lower flexibility, which resulted in defects at significantly larger bending radii. Moreover, double-curved specimens were produced and tested in three-point bending tests for their flexural strength. The TRC specimens showed no significant resistance after the critical crack, which led to brittle failure in the FRC specimens. This behavior can be traced back to the test setup, which allowed large horizontal deformations. A possible future use of these double-curved elements is a structural system for ceilings.

10. 7. 2021

prof. Ing. arch. Zuzana Pešková, Ph.D
proděkanka