

More Is Less – The Integral Mass Timber Bridge

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1 Abstract

Today, few new bridges are made of timber. Since the industrialization, timber bridges have increasingly lost ground to steel and later concrete bridges. In addition, timber bridges developed a reputation of high maintenance and low durability from many crossings built between the 1970s and 1990s.

Interest in timber bridges has recently grown due to new motivations in design, including an increased focus on sustainability. Efforts in research and engineering to reexamine timber bridges have led to the development of the “Integral mass-timber bridge”. The bridges will be a first: timber integral bridges without any movement joints or bearings between the superstructure and the concrete abutments.

These structures were developed taking into account the efficient use of natural resources as well as the carbon-emissions during the entire life span of the bridge: from the design and manufacturing to maintenance and operation. The body of the bridge is made of block-laminated timber beams and articulates the guiding principle of mass timber: the sequestration of carbon within the massive timber construction.

Currently, the first three of these bridges are being constructed in Germany, with completion in May 2019. The concept has been awarded with the German Timber Construction Award 2017.

Keywords: timber; mass timber; bridge; pedestrian bridge; timber bridge; innovation; sustainability; glued laminated timber; textile reinforced concrete; fiber reinforced concrete

2 Introduction

2.1 Background

Only a small percentage of existing bridges and newly built bridges are designed in timber. This may be due to the large amount of damage to timber bridges built in the 1970s to the 1990s. Although the damage usually resulted from poor detailing and could have been avoided, it left skepticism at

building authorities and hindered further developments. A missed opportunity, especially in light of a paradigm shift that recently prevailed in the construction industry: The relevant parameters for design and optimization of bridges are no longer solely derived from technical, economical and efficiency criteria. Above all, it is the conscious use of resources and control of emissions resulting from the entire life-cycle of the construction. Starting with fabrication, installation, then throughout its use and maintenance and finally demolition.