



Resource consumption in construction as a global challenge

Matthias Lieboldt, Wiebke Seifert, Matthias Tietze

Technische Universität Dresden, Germany

Contact: matthias.lieboldt@tu-dresden.de

Abstract

The construction industry plays a central role in the design of our environment. Global population growth is associated with an increase in material resource consumption and CO₂ emissions. Sustainable ideas and developments to reduce the need for resources and CO₂ emissions as well as to increase the service life of buildings are becoming more important. Carbon Concrete Composite – C³ is made of a high-tensile reinforcement with carbon fibers and concrete is particularly convincing due to its high durability and long service life. In practice, its suitability has already been proven in numerous projects, so that carbon reinforced concrete is an integral part of research and application. The selected example illustrates the potential of carbon concrete construction. For this purpose, a material-related and systemic comparison of steel and carbon reinforced concrete is carried out using the example of a carbon reinforced concrete bridge.

Keywords: carbon reinforced concrete; sustainability; fiber reinforced concrete; textile reinforced concrete.

1 Introduction

Global population growth and urbanization are leading to greater land use and increasing demand for housing and infrastructure. This is directly related to an intensified use of resources and the release of CO₂ during the entire life cycle of a building. According to Wallbaum, the building industry causes 70 % of all land changes, 50 % of resource consumption and 40 % of total energy consumption and greenhouse gas emissions [1].

Sustainable ideas and developments to reduce the need for resources and CO₂ emissions as well as to extend the service life of buildings are becoming more and more the focus of attention. The project consortium C³ – Carbon Concrete Composite has been developing the innovative high-performance composite material carbon concrete in cooperation with more than 160 partners from research and practice for some years now.

In order to classify the topic, the current global raw material situation in steel and reinforced concrete construction is represented numerically. The occurrence, availability and consumption of the individual raw materials are examined and an estimate of the annual global concrete consumption is made. The energy consumption of individual resources is then broken down and the resulting global challenges for the construction industry with regard to the importance of sustainable construction methods are presented.

2 Raw material input and emissions in the concrete industry

2.1 Binders

Mainly aggregate, binder (cement) and water are used for the production of concrete. The clinkers were produced by sintering the most important