

Multifunctional Inhomogeneous Lightweight Concrete Elements – Outline and Structural Behaviour

Claudia Lösch, Arno Richter, Mike Schlaich

Chair of Conceptual and Structural Design, Technische Universität Berlin, Germany

Contact: claudia.loesch@tu-berlin.de

Abstract

Innovations in construction, such as the development of high-performance materials, are needed to address energy and resource consumption in the building sector. The research project “MultiLC” (Multifunctional Lightweight Concrete Elements with inhomogeneous properties) works on high-performance infra-lightweight concrete elements with adaptable properties over the cross section which correspond to the required tasks. Further functions are added to provide warming, cooling and vapor-permeability and to improve air quality by photocatalytic air purification. The paper gives an outline of the project and presents the current state of work regarding the structural behavior of inhomogeneous lightweight concrete beams and wall elements. The chosen design approach for inhomogeneous beams showed conservative results compared to the experimental tests. The predicted load-bearing capacity of the inhomogeneous walls could not be reached, further research is being carried out.

Keywords: Infra-lightweight concrete, multifunctional, inhomogeneous concrete beams, inhomogeneous concrete walls, structural behavior, structural design, active thermal insulation, photocatalytic air purification

1 Introduction

The motivation of the three-year research project “Multifunctional Lightweight Concrete Elements with Inhomogeneous Properties (MultiLC)”, funded by the German Federal Ministry of Education and Research (BMBF), is to contribute to a sustainable construction technique by increasing the efficiency of building components. Starting point was Infra-Lightweight Concrete (ILC), a high-performance lightweight aggregate concrete (HPLWAC) with a dry density below 800 kg/m^3 that has been investigated at the Chair of Conceptual and Structural Design, Technische Universität Berlin (TU Berlin), for more than 10 years [1, 2]. A first single-family home was built in Berlin in 2007 (Figure 1). ILC stands out within insulating

concretes due to an exceptional combination of low density, hence good insulation properties, and comparatively good compressive strength.



Figure 1 ILC single family home in Berlin (Picture: M. Schlaich)