

Formwork system for optical fibre concrete with integrated thermal insulation



Above: milling out the individual formwork elements from SIMONA® PVC-CAW.
Bottom left: building up the formwork with polyurethane separating strips and optical fibre mats. Bottom right: the finished formwork system.

In 2010, within the scope of a research and development project at the Faculty of Architecture, Urban Planning and Landscape Planning at the University of Kassel, an innovative formwork system was developed for the purpose of producing optical fibre concrete with integral core insulation. By inserting optical light-transmitting fibres, light, colours and movement are silhouetted through the concrete.

The project at a glance

Project

An innovative formwork system for making optical fibre concrete with integral thermal insulation.

Special features of the concrete element

- Board-marked surface in fair-faced concrete quality
- Integral thermal insulation of the block
- Curved shape

Requirements

- Good machining properties
- High strength
- High flexibility
- Excellent durability
- Long service life

Development

University of Kassel, Faculty 06,
Subject Area: Drafting and Structural Design
Univ. Prof. Dipl.-Ing. Brigitte Häntsch
Project leader: Dipl.-Ing. Lukas Kasten

Technical consultancy

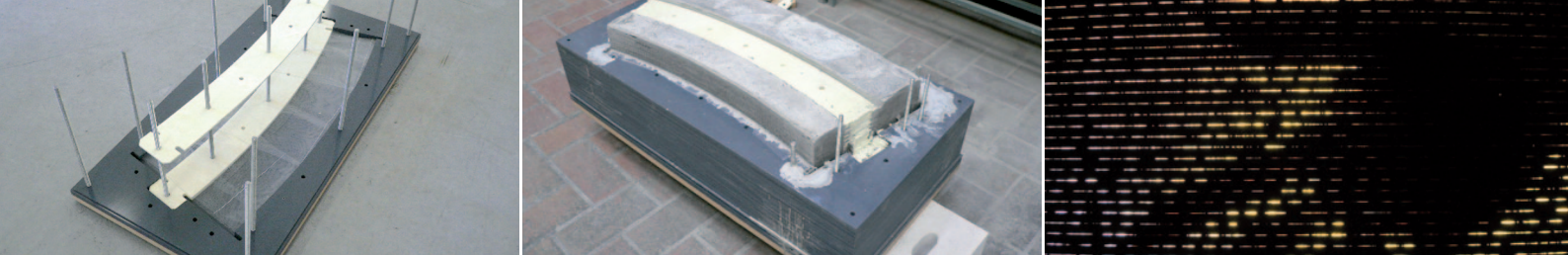
- University of Kassel, Faculty 14,
Subject Area: Materials in the Construction Industry and Construction Chemistry,
Prof. Dr.-Ing. habil. M. Schmidt
- Official Materials Testing Institute for the Construction Industry (AMPA), Dipl.-Ing. Peter Machner

Products used

- SIMONA® PVC-CAW sheets, 5 mm, extruded

Duration of project

Prototype: 2010



From left to right: building up the formwork in layers; the concrete block consists of two concrete moulds with integral core insulation and contains optical light-transmitting fibres; finished, luminous optical fibre concrete.

Innovative formwork for optical fibre concrete made from SIMONA® PVC-CAW sheets

Initial situation

The aim of the research project was to make optical fibre concrete in fair-faced concrete quality with integral core insulation and in a curved shape. With their thermal insulation properties the new blocks were to serve as a structural material for outer walls. Most conventional types of light-transmitting concrete do not have any thermal insulation properties.

Task

For the research project a formwork system was required which had to meet the following requirements:

- Good machining properties, especially for milling and drilling
- Multiple use, as opposed to wood or styrodor
- High rigidity and long-term strength

Solution

To solve the task, a formwork system was developed using SIMONA® PVC-CAW sheets 5 mm thick, in which the light-transmitting fibres are exposed on the concrete surface as soon as the formwork is removed. Consequently, there is no need to cut free the light-transmitting fibres at the surface, and the board-marked surface in fair-faced concrete quality remains intact. To construct the formwork, a tier comprising a formwork element and a polyurethane insulation strip and a tier of the light-transmitting fibre mats are stacked alternately on top of one another in layers until the formwork has reached the height required. The polyurethane insulation strip serves to separate the inner and outer concrete leaves. The light-transmitting fibres are clamped in place and immobilised by the individual formwork elements and the insulation strips. This brings about a controlled arrangement of light points and makes it possible to create motifs and lettering.

The formwork system has proved to be highly effective and suitable, also for the production of optical fibre concrete from other castable or pourable self-compacting materials or as a composite material.

SIMONA® PVC-CAW

Properties

- Very easy to process
- Chemically resistant
- High rigidity
- UV-stabilised and weather-resistant
- DIN 4102 B1 low flammability
1 mm to 4 mm (general test certificate issued by construction supervision authority)

Fields of application

- Chemical tank and apparatus construction
- Lining and composite construction
- Air-conditioning and ventilation systems
- Ceiling and wall elements
- Automotive

Product range

- Extruded sheets in thicknesses of 1 mm to 50 mm
- Welding rods
- Solid rods

Further information

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