

Reinforced High Performance Fiber Concrete



Speerpunt
BOUW

RESEARCH SCHOOL
INTEGRAL DESIGN OF STRUCTURES



Round Panel Test
3 Points Bending Test



Tension
Stiffening Test



Expected Results

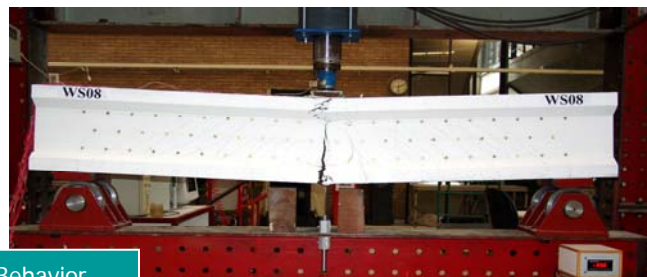
A general theoretical model for the behavior of reinforced high performance fiber concrete under most importance actions; Optimum combination of reinforcing steel and fibers with regard to mechanical properties and costs.

Subject

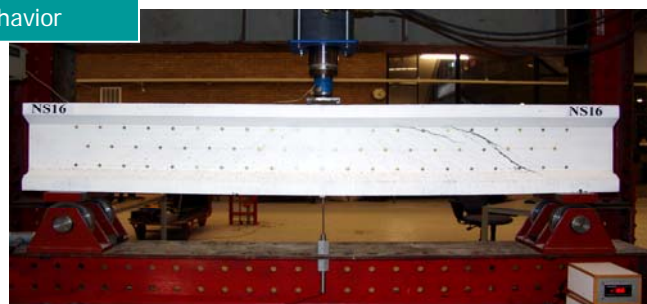
The research tends at developing a sound basis of the application of reinforced high performance fiber concrete. By applying traditional reinforcing bars in combination with fibers optimum use is made by using the best properties of both types of reinforcement. The traditional reinforcing bars reinforce the structure in the most effective way, because they are oriented into the main bearing directions. The fibers are randomly distributed and cope, such as, with local tensile and splitting effects in any direction.

Goal

To find an optimum combination of reinforcing steel and steel fibers; To derive mechanical properties, like stress-strain relations and cracking behavior in order to provide appropriate design rules; To deal with rheology for robust mixes.



Bending Behavior
Shear Behavior



Structural application



3TU.

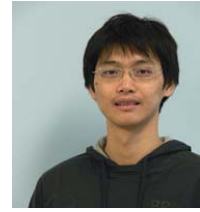
Researcher
Supervisor
Program/Subprogram
Host University

Yang Yuguang / Yuguang.Yang@tudelft.nl / 015-2782277
Prof. dr. Ir. J.C. Walraven
Structural Engineering / Concrete Structures
Delft University of Technology / Faculty of CiTG

TU Delft

Delft University of Technology

Reinforced High Performance Fiber Concrete (HPRFC)



Yuguang Yang¹, Prof. dr. ir. J. C. Walraven², ir. J. A. den Uijl²

¹ PhD Researcher, yuguang.yang@tudelft.nl

² Supervisors, j.c.walraven@tudelft.nl, j.a.denuijl@tudelft.nl

Delft University of Technology, Faculty of Civil Engineering and Geosciences,
Department Design and Construction, Delft, The Netherlands, yuguang.yang@tudelft.nl

Subject

The research tends at developing a sound basis of the application of reinforced high performance fibre concrete. By applying traditional reinforcing bars in combination with fibres optimum use is made by using the best properties of both types of reinforcement. The traditional reinforcing bars reinforce the structure in the most effective way, because they are oriented into the main bearing directions. The fibres are randomly distributed and cope, such as, with local tensile and splitting effects in any direction.

Goals

To find an optimum combination of reinforcing steel and steel fibres;
To derive mechanical properties, like stress-strain relations and cracking behaviour in order to provide appropriate design rules;
To deal with rheology for robust mixes.

Research Question

How to get the best combination of reinforcing steel and steel fibres with regard to mechanical properties and costs?

Strategy

An unambiguous standard testing method is defined first for steel fibre reinforced concrete. The constitutive relationship derived there is then applied to verify the conceptional theory for the results of two external sources. Further experiments on thin slabs with orthogonal reinforcement subjected to bending in two directions and reinforced fiber concrete panels subjected to biaxial in-plane loading are then carried out to derivation of a design recommendation for reinforced fiber concrete structures.

Expected Results

A general theoretical model for the behavior of reinforced high performance fiber concrete under most importance actions;
Optimum combination of reinforcing steel and fibers with regard to mechanical properties and costs.

Preferred Partners Applications / Sponsors

Rijkswaterstaat, Structural designers, Architects, Precast concrete firms, etc.

Prime Publication / Prototyping

-Yang, Y., Walraven, J. C., den Uijl, J. A. (2008), Study on the bending behaviour of an UHPC overlay on a steel orthotropic deck, International Symposium on Ultra High Performance Concrete, Kassel, March 5-7, 2008

-Yang, Y, Walraven, JC, & den Uijl, J. A. (2008), Overlaging hoogwaardig vezelbeton op een orthotropo stalen brugdek. Cement, 71-75.

Research Period

2007 - 2011