Graz University of Technology

■ *Staff in Full-Time Equivalents 2014*

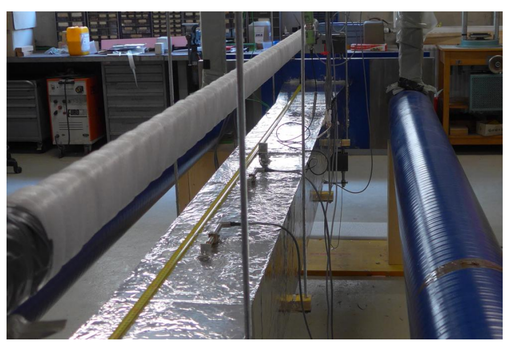
Data Source: Personnel Data, TUGRAZonline, as of 31.12.2014

♀	♂	Total	
206,50	**1.009,39**	**1.215,89**	***Academic Staff***
8,21	102,90	111,11	*of whom are professors*
6,50	97,97	104,47	*of whom are associate professors*
6,70	26,08	32,78	*of whom are assistant professors*
94,48	290,00	384,48	*of whom are assistants[1]*
90,61	492,44	583,05	*of whom are project staff*

Institute of Structural Concrete / Research group “Crack width control in restrained concrete members”

Experimental testing

Simulation of the whole stress history of concrete



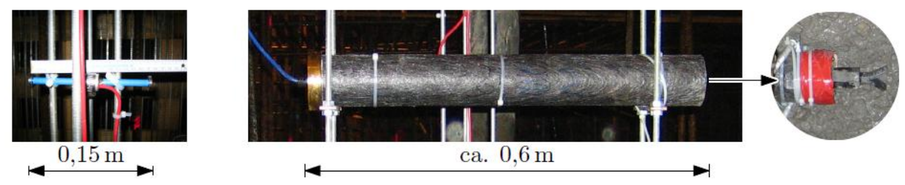
Restraint frames for reinforced concrete

- stress monitoring during hardening phase
- simulation of service life with additional deformation impacts applied with hydraulic cylinders
- crack width development during service life

In-situ measurements

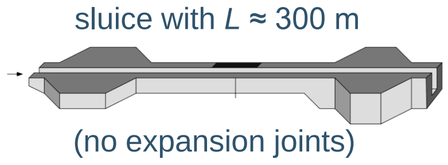
Measuring restraint stresses in the hardening phase

- redundant measuring system allowing compatibility check
- vibrating wires combined with stressmeters (MPA Braunschweig)



Crack width monitoring in jointless structures

sluice with $L \approx 300$ m



(no expansion joints)

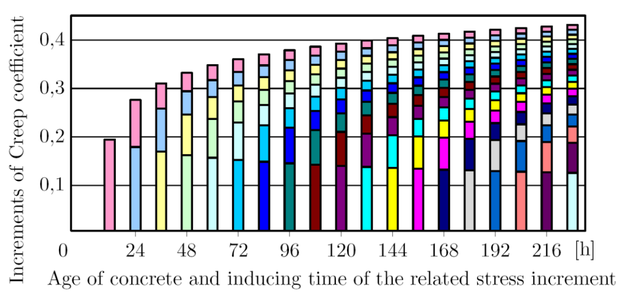
Measurements

Modelling

Reinforcement design

Material models

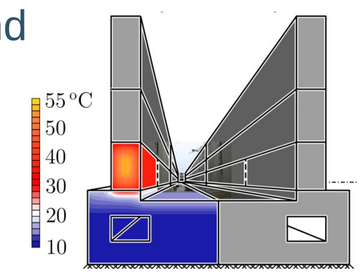
Deformation based approach for consideration of viscoelasticity on base of pure creep curves



3D-FEM simulations

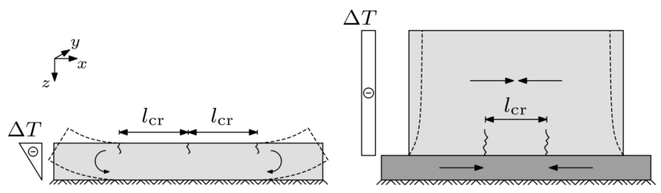
Quantification of temperature and restraint due to hardening with transient time-discrete multi-physical 3D-FEM models (verified by measurements)

SOFiSTiK

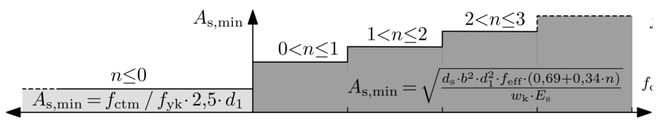


Minimum reinforcement

Mechanical based crack width control considering the real member behavior



Reinforcement on basis of number n of secondary cracks needed for deformation compatibility

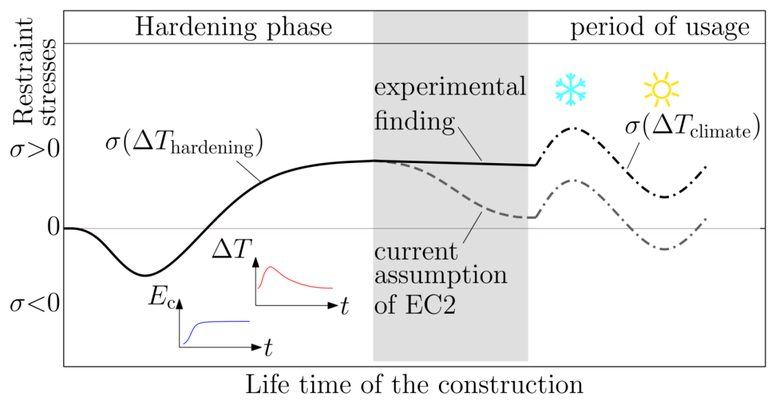


Unreinforced concrete

Mass concrete structures with minor stressing due to loading but intense temperature increase during hydration

Stress history

Superposition of hardening induced restraint with restraint during service life



Relevant publications

[1] Schlicke, D. and Tue, N.V.: Minimum reinforcement for crack width control in restrained concrete members considering the deformation compatibility. in: Structural Concrete, June 2015, DOI: 10.1002/suco.201400058

[2] Turner, K.; Schlicke, D. and Tue, N.V.: Restraint and crack width development during service life regarding hardening caused stresses, in: Proceedings of *fib* 2015 symposium in Copenhagen.

[3] Schlicke, D. and Tue, N.V.: Consideration of Viscoelasticity in Time Step FEM-Based Restraint Analyses of Hardening Concrete, in: Journal of modern physics, October 2013. DOI: 10.4236/jmp.2013.410A2002

[4] Heinrich, P.J. and Schlicke, D.: Serviceability and Stability of Unreinforced Mass Concrete Structures. in: Proceedings of CONCREEP-10 conference 2015 in Vienna

Scientific Participation:

WG2 + WG3 + STSM

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