

RILEM Bookseries

Richard Buswell
Ana Blanco
Sergio Cavalaro
Peter Kinnell *Editors*

Third RILEM International Conference on Concrete and Digital Fabrication

Digital Concrete 2022



 Springer

**Third RILEM International Conference
on Concrete and Digital Fabrication**

RILEM BOOKSERIES

Volume 37

RILEM, The International Union of Laboratories and Experts in Construction Materials, Systems and Structures, founded in 1947, is a non-governmental scientific association whose goal is to contribute to progress in the construction sciences, techniques and industries, essentially by means of the communication it fosters between research and practice. RILEM's focus is on construction materials and their use in building and civil engineering structures, covering all phases of the building process from manufacture to use and recycling of materials. More information on RILEM and its previous publications can be found on www.RILEM.net.

Indexed in SCOPUS, Google Scholar and SpringerLink.



More information about this series at <https://link.springer.com/bookseries/8781>

Richard Buswell · Ana Blanco ·
Sergio Cavalaro · Peter Kinnell
Editors

Third RILEM International Conference on Concrete and Digital Fabrication

Digital Concrete 2022

 Springer

Editors

Richard Buswell
School of Architecture,
Building and Civil Engineering
Loughborough University
Loughborough, Leicestershire, UK

Ana Blanco
School of Architecture,
Building and Civil Engineering
Loughborough University
Loughborough, Leicestershire, UK

Sergio Cavalaro
School of Architecture,
Building and Civil Engineering
Loughborough University
Loughborough, Leicestershire, UK

Peter Kinnell
School of Mechanical,
Electrical and Manufacturing Engineering
Loughborough University
Loughborough, Leicestershire, UK

ISSN 2211-0844

RILEM Bookseries

ISBN 978-3-031-06115-8

<https://doi.org/10.1007/978-3-031-06116-5>

ISSN 2211-0852 (electronic)

ISBN 978-3-031-06116-5 (eBook)

© RILEM 2022

No part of this work may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording or otherwise, without written permission from the Publisher, with the exception of any material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Permission for use must always be obtained from the owner of the copyright: RILEM.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The RILEM Digital Concrete conference series was inaugurated at ETH Zurich, Switzerland, in 2018, in response to the growing interest of digital manufacturing technologies and in particular, those based on large-scale additive manufacturing. Since the first exploration of these technologies in the 2000s, there has been an exponential growth of commercial and academic activity and in 2020, TU Eindhoven, Netherlands, hosted the second in the series which was online due to the COVID-19 pandemic. The conference has become the focus for materials and process led research, with historically high interest in extrusion-based additive manufacturing, but always with solid representation of alternative fabrication methods and techniques.

Now in 2022, the third conference is hosted by Loughborough University, UK, between 27 June and 29 inclusive. This is the first conference to be held in person for four years, and the response to the call for contributions was high with over 240 abstracts submitted, from 101 organisations in 27 countries. These translated into 202 full papers and extended abstracts being submitted for full peer review. These proceedings contain a selection from the best full papers submitted to the conference arranged in topic sets that reflect the parallel oral presentation sessions.

Work relating to the wet material used in extrusion technologies is presented in three sessions: one on *wet material property control* and two on *printability and set control*. The progression over the three conferences is the shift from understanding the fundamentals, towards quality control and testing: at the centre of the current RILEM technical committee on performance requirements and testing of fresh printable cement-based materials (PFC).

Binders and aggregates are also topical where the body of work is developing rapidly. These are split into three sessions on: *aggregates*, *strain hardening materials* and *alternative binders*, aligning with the parallel RILEM technical committee on Assessment of Additively Manufactured Concrete Materials and Structures (ADC). The performance of the materials and creating structural elements in particular is significantly represented, mirroring the next steps for the production technology to deliver in real applications.

Reinforcement, structures and hardened properties have total of eight sessions: three on *reinforcement*, one on *structural design and optimisation*, one on *durability* and two on *heterogeneities and defects*. These topics all lay pathways to enable more competent design for materials that are produced through additive manufacturing.

In addition, other digital fabrication approaches are explored in three sessions on: *material jetting, particle bed binding and alternative processes*, showcasing the continued innovation in this exciting area of research. Finally, the digital aspects of design and process control are key to a successful future for digital fabrication, and two sessions presented the latest innovations in *design and digital workflow* and *process control, toolpath and inspection*.

The organising team offers a warm welcome to all delegates to the conference. To have the opportunity to invite colleagues to share in this event at Loughborough where we started our journey in 3D concrete printing 18 years ago is a real honour. To celebrate, the conference showcases these articles, alongside poster presentations and other oral presentations, framed by 12 invited and keynote speakers—all leading lights in the field. It would not be possible without the tremendous effort of the scientific committee, whose review task was huge. Everyone responded rapidly to requests, as did the contributing authors: to everyone—a big thank you. Finally, we acknowledge and give thanks our sponsors, whose support is vital to maintaining the quality of these events. These were at the time of writing: COBOD, in partnership with the NEXCON project and SIKA (Platinum), Synthomer (Silver), Elkem (Bronze). We would also gratefully acknowledge support from our workshop sponsors HAL Robotics, the enabling support of UK Research and Innovation and our partners, the Institute of Concrete Technology.

We hope you enjoy the proceedings and conference.

June 2022

Richard Buswell
Ana Blanco
Sergio Cavalaro
Peter Kinnell

Organisation

Conference Chair

Richard Buswell

Loughborough University, UK

International Scientific Committee

Chair of the Committee

Nicolas Roussel

Gustave Eiffel University, France

Co-chairs of the Committee

Freek Bos

Eindhoven University of Technology,
The Netherlands

Viktor Mechtcherine

Dresden University of Technology, Germany

Dirk Lowke

Technical University of Braunschweig, Germany

Members of the Committee

Abdelhak Kaci

CY Cergy Paris University, France

Aileen Vandenberg

Technical University of Braunschweig, Germany

Alexandre Pierre

CY Cergy Paris University, France

Ali Kazemian

Louisiana State University, USA

Arnaud Perrot

Southern Brittany University, France

Asko Fromm

Hochschule Wismar University of Applied
Sciences, Germany

Behzad Nematollahi

The University of Sheffield, UK

Branko Šavija

Delft University of Technology, The Netherlands

Claudiane

University of Quebec, Canada

Ouellet-Plamondon

Costantino Menna

University of Naples Federico II, Italy

Dietmar Stephan	Technical University of Berlin, Germany
Domenico Asprone	University of Naples Federico II, Italy
Emmanuel Keita	Gustave Eiffel University, France
Geert De Schutter	Ghent University, Belgium
Gideon van Zijl	Stellenbosch University, South Africa
Harald Kloft	Technical University of Braunschweig, Germany
Jacques Kruger	Stellenbosch University, South Africa
Jaime Mata Falcon	ETH Zurich, Switzerland
Jay Sanjayan	Swinburne University of Technology, Australia
Jolien Van Der Putten	Ghent University, Belgium
Kim Van Tittelboom	Ghent University, Belgium
Ksenija Vasilic	DBV · German Society for Concrete and Construction Technology, Germany
Liberato Ferrara	Polytechnic University of Milan, Italy
Manu Santhanam	Indian Institute of Technology Madras, India
Mohammed Sonebi	Queens University Belfast, UK
Rob Wolfs	Eindhoven University of Technology, The Netherlands
Robert Flatt	ETH Zurich, Switzerland
Richard Buswell	Loughborough University, UK
Sandra Nunes	TU Delft, The Netherlands
Steffen Mueller	Dresden University of Technology, Germany
Timothy Wangler	ETH Zurich, Switzerland
Vitor Cunha	University of Minho, Portugal
Wilson Ricardo Leal da Silva	Danish Technological Institute (Concrete Centre), Denmark
Xiangming Zhou	Brunel University London, UK
Yamei Zhang	Southeast University, China

Organising Committee

Richard Buswell (Chair)
 Ana Blanco (Co-chair)
 Sergio Cavalaro (Co-chair)
 Peter Kinnell (Co-chair)
 Jie Xu (Co-chair)
 James Dobrzanski
 John Temitope Kolawole
 Muhammad Nura Isa
 Xingzi Liu
 Siduo Lei
 Liam White
 Renata Monte
 Ivy Pedrosa-Cavalcante-P-Quintella
 Eduardo Quintella-Forencio

Keywords

RILEM

Digital Concrete

3D Concrete Printing

Cementitious Materials

Shotcrete 3D Printing

Powder Bed Printing

Printing Technologies

Structural Engineering

Contents

Alternative Processes

Zero-Waste Production of Lightweight Concrete Structures with Water-Soluble Sand Formwork	3
Daria Kovaleva, Maximilian Nistler, Alexander Verl, Lucio Blandini, and Werner Sobek	
An Early Trial on Milling 3D Printed Concrete Geometries: Observations and Insights of the Process	9
Jie Xu, John Temitope Kolawole, John Provis, James Dobrzanski, Peter Kinnell, Sergio Cavalaro, Weiqiang Wang, and Richard Buswell	
Mobile Additive Manufacturing: A Case Study of Clay Formwork for Bespoke in Situ Concrete Construction	15
Gido Dielemans, Lukas Lachmayer, Tobias Recker, Lidia Atanasova, Christian Maximilian Hechtl, Carla Matthäus, Annika Raatz, and Kathrin Dörfler	
Adaptive Foam Concrete in Digital Fabrication	22
Robert Schmid, Georg Hansemann, Michael Autischer, and Joachim Juhart	

Structural Design and Optimisation

Mesh Mould Prefabrication	31
Ammar Mirjan, Jaime Mata-Falcón, Carsten Rieger, Janin Herkrath, Walter Kaufmann, Fabio Gramazio, and Matthias Kohler	
The Production of a Topology-Optimized 3D-Printed Concrete Bridge	37
Ticho Ooms, Gieljan Vantyghem, Yaxin Tao, Michiel Bekaert, Geert De Schutter, Kim Van Tittelboom, and Wouter De Corte	

Injection 3D Concrete Printing (I3DCP) Combined with Vector-Based 3D Graphic Statics	43
Yinan Xiao, Noor Khader, Aileen Vandenberg, Dirk Lowke, Harald Kloft, and Norman Hack	
3DCP Structures: The Roadmap to Standardization	50
Jolien Van Der Putten, Maartje J. Hoogeveen, Marijn J. A. M. Bruurs, and Hans L. M. Laagland	
Binders and Aggregates 1: Aggregates	
Mix Design for a 3D-Printable Concrete with Coarse Aggregates and Consideration of Standardisation	59
Markus Taubert and Viktor Mechtcherine	
Fresh and Hardened Properties of 3D Printable Foam Concrete Containing Porous Aggregates	65
Kirubajiny Pasupathy, Sayanthan Ramakrishnan, and Jay Sanjayan	
Sustainable 3D Concrete Printing with Large Aggregates	71
Wilson Ricardo Leal da Silva, Martin Kaasgaard, and Thomas J. Andersen	
Design and Fabrication of Spatially Graded Concrete Elements with Ice Aggregate Method	78
Vasily Sitnikov, Lena Kitani, Artemis Maneka, Ena Lloret-Fritsch, Juney Lee, and Benjamin Dillenburger	
Binders and Aggregates 2: Alternative Binders	
Accelerating Early Age Properties of Ultra-Low Clinker Cements for Extrusion-Based 3D Printing	87
Rutendo Rusike, Michael Sataya, Alastair T. M. Marsh, Sergio Cavalaro, Chris Goodier, Susan A. Bernal, and Samuel Adu-Amankwah	
Developing Printable Fly Ash–Slag Geopolymer Binders with Rheology Modification	93
Tippabhotla A. Kamakshi and Kolluru V. L. Subramaniam	
Formulation and Characterization of a Low Carbon Impact Cementitious Ink for 3D Printing	99
Estelle Hynek, David Bulteel, Antoine Urquizar, and Sébastien Remond	
Strategies for Reducing the Environmental Footprint of Additive Manufacturing via Sprayed Concrete	105
Aurélie Favier and Agnès Petit	
Mechanical Performance of 3-D Printed Concrete Containing Fly Ash, Metakaolin and Nanoclay	111
Ahmed Abdalqader, Mohammed Sonebi, Marie Dedenis, Sofiane Amziane, and Arnaud Perrot	

Binders and Aggregates 3: Strain Hardening Materials

Incorporation and Characterization of Multi-walled Carbon Nanotube Concrete Composites for 3D Printing Applications 119
 Albanela Dulaj, Monica P. M. Suijs, Theo A. M. Salet, and Sandra S. Lucas

Properties of 3D-Printable Ductile Fiber-Reinforced Geopolymer Composite 126
 Shin Hau Bong, Behzad Nematollahi, Venkatesh Naidu Nerella, and Viktor Mechtcherine

Feasibility of Using Ultra-High Ductile Concrete to Print Self-reinforced Hollow Structures 133
 Junhong Ye, Yiwei Weng, Hongjian Du, Mingyang Li, Jiangtao Yu, and Md Nasir Uddin

Development of Cementitious Metamaterial with Compressive Strain Hardening Characteristics 139
 Keisuke Nishijo, Motohiro Ohno, and Tetsuya Ishida

Consistency of Mechanical Properties of 3D Printed Strain Hardening Cementitious Composites Within One Printing System 145
 Karsten Nefs, A. L. van Overmeir, Theo A. M. Salet, A. S. J. Suiker, B. Šavija, E. Schlangen, and Freek Bos

Design and Digital Workflow

Uncertainty Quantification of Concrete Properties at Fresh State and Stability Analysis of the 3D Printing Process by Stochastic Approach 155
 Zeinab Diab, Duc Phi Do, Sébastien Rémond, and Dashnor Hoxha

Simulation of 3D Concrete Printing Using Discrete Element Method . . . 161
 Knut Krenzer, Ulrich Palzer, Steffen Müller, and Viktor Mechtcherine

Influence of Infill Pattern on Reactive MgO Printed Structures 167
 AlaEddin Douba, Palash Badjatya, and Shiho Kawashima

Durability

Evaluation of Durability of 3D-Printed Cementitious Materials for Potential Applications in Structures Exposed to Marine Environments 175
 Fabian B. Rodriguez, Cristian Garzon Lopez, Yu Wang, Jan Olek, Pablo D. Zavattieri, Jeffrey P. Youngblood, Gabriel Falzone, and Jason Cotrell

Two Year Exposure of 3D Printed Cementitious Columns in a High Alpine Environment	182
Timothy Wangler, Asel Maria Aguilar Sanchez, Ana Anton, Benjamin Dillenburger, and Robert J. Flatt	
Salt Scaling Resistance of 3D Printed Concrete	188
Manu K. Mohan, A. V. Rahul, Geert De Schutter, and Kim Van Tittelboom	
Influence of the Print Process on the Durability of Printed Cementitious Materials	194
Jolien Van Der Putten, M. De Smet, P. Van den Heede, Geert De Schutter, and Kim Van Tittelboom	
Freeze-Thaw Performance of 3D Printed Concrete: Influence of Interfaces	200
Arnesh Das, Asel Maria Aguilar Sanchez, Timothy Wangler, and Robert J. Flatt	
Heterogeneities and Defects	
Mechanical Properties and Failure Pattern of 3D Printed Hollow Cylinders and Wall Segments Under Uniaxial Loading	209
Shantanu Bhattacharjee, Smrati Jain, Manu Santhanam, and G. Thiruvengatamani	
Impact of Drying of 3D Printed Cementitious Pastes on Their Degree of Hydration	216
Rita M. Ghantous, Yvette Valadez-Carranza, Steven R. Reese, and W. Jason Weiss	
The Environment's Effect on the Interlayer Bond Strength of 3D Printed Concrete	222
Gerrit M. Moelich, J. J. Janse van Rensburg, Jacques Kruger, and Riaan Combrinck	
Evaluation of the Bond Strength Between 3D Printed and Self-compacting Concrete	228
Michiel Bekaert, Kim Van Tittelboom, and Geert De Schutter	
Interlocking 3D Printed Concrete Filaments Through Surface Topology Modifications for Improved Tensile Bond Strength	235
Jean-Pierre Mostert and Jacques Kruger	
Digitally Fabricated Keyed Concrete Connections	241
Patrick Bischof, Jaime Mata-Falcón, Joris Burger, and Walter Kaufmann	

Material Jetting

A 3D Printing Platform for Reinforced Printed-Sprayed Concrete Composites 249

Lex Reiter, Ana Anton, Timothy Wangler, Benjamin Dillenburger, and Robert J. Flatt

Influence of Material and Process Parameters on Hardened State Properties of Shotcrete 3D-Printed Elements 255

David Böhler, Inka Mai, Niklas Freund, Lukas Lachmayer, Annika Raatz, and Dirk Lowke

Shotcrete 3DCP Projection Angle and Speed Optimization: Experimental Approaches and Theoretical Modelling 261

Benjamin Galé, Thierry Ursenbacher, Agnès Petit, and Vincent Bourquin

ARCS: Automated Robotic Concrete Spraying for the Fabrication of Variable Thickness Doubly Curved Shells 267

Mishael Nuh, Robin Oval, and John Orr

Particle Bed Binding

Particle Bed Technique for Hempcrete 277

V. Danché, A. Pierre, K. Ndiaye, and T. T. Ngo

Effect of Curing in Selective Cement Activation 283

Friedrich Herding, Inka Mai, and Dirk Lowke

Evaluating the Effect of Methyl Cellulose on Hardened State Properties in Selective Cement Activation 289

Inka Mai, Friedrich Herding, and Dirk Lowke

Selective Paste Intrusion: Stability of Cement Paste Mixtures Towards Changing Ambient Temperature 296

A. Straßer, Carla Matthäus, D.Weger, T. Kränkel, and C. Gehlen

Printability and Set Control

Set-On Demand Concrete by Activating Encapsulated Accelerator for 3D Printing 305

Sasitharan Kanagasuntharam, Sayanthan Ramakrishnan, and Jay Sanjayan

Using Limestone Powder as a Carrier for the Accelerator in Extrusion-Based 3D Concrete Printing 311

Yaxin Tao, Karel Lesage, Kim Van Tittelboom, Yong Yuan, and Geert De Schutter

Printability Assessment of Cement-Based Materials Using Uniaxial Compression Test	318
Ilhame Harbouz, Ammar Yahia, Emmanuel Rozière, and Ahmed Loukili	
Monitoring Strain Using Digital Image Correlation During Compressive and Tensile Loading: Assessment of Critical Strain of Cement-Based Materials Containing VMA	324
Yohan Jacquet, Arnaud Perrot, and Vincent Picandet	
Temperature Impact on the Structural Build-Up of Cementitious Materials – Experimental and Modelling Study	330
Alexander Mezhov, Annika Robens-Radermacher, Kun Zhang, Hans-Carsten Kühne, Jörg F. Unger, and Wolfram Schmidt	
Early Age Shear and Tensile Fracture Properties of 3D Printable Cementitious Mortar to Assess Printability Window	337
Andrea Marcucci, Sriram K. Kompella, Francesco Lo Monte, Marinella Levi, and Liberato Ferrara	
A Strain-Based Constitutive Model Ensuring Aesthetic 3D Printed Concrete Structures: Limiting Differential Settlement of Filaments	343
Jacques Kruger, Jean-Pierre Mostert, and Gideon van Zijl	
Process Control, Toolpath and Inspection	
Process Control for Additive Manufacturing of Concrete Components	351
Lukas Lachmayer, Robin Dörrie, Harald Kloft, and Annika Raatz	
Generative Structural Design: A Cross-Platform Design and Optimization Workflow for Additive Manufacturing	357
Saqib Aziz, Ji-Su Kim, Dietmar Stephan, and Christoph Gengnagel	
A Closed-Loop Workflow for Quality Inspection and Integrated Post-processing of 3D-Printed Concrete Elements	364
Norman Hack, Carsten Jantzen, Leon Brohmann, Markus Gerke, Karam Mawas, and Mehdi Maboudi	
Force Flow Compliant Robotic Path Planning Approach for Reinforced Concrete Elements Using SC3DP	370
Robin Dörrie and Harald Kloft	
Reinforcement	
Integrating Reinforcement with 3D Concrete Printing: Experiments and Numerical Modelling	379
Jon Spangenberg, Wilson Ricardo Leal da Silva, Md Tusher Mollah, Raphaël Comminal, Thomas Juul Andersen, and Henrik Stang	

Flow-Based Pultrusion of Anisotropic Concrete: Mechanical Properties at Hardened State 385
 Léo Demont, Malo Charrier, Pierre Margerit, Nicolas Ducoulombier, Romain Mesnil, and Jean-François Caron

Core Winding: Force-Flow Oriented Fibre Reinforcement in Additive Manufacturing with Concrete 391
 Stefan Gantner, Philipp Rennen, Tom Rothe, Christian Hühne, and Norman Hack

Integration of Mineral Impregnated Carbon Fibre (MCF) into Fine 3D-Printed Concrete Filaments 397
 Tobias Neef, Steffen Müller, and Viktor Mechtcherine

Flexural Behaviour of Steel-Reinforced Topology-Optimised Beams Fabricated by 3D Concrete Printing 404
 Costantino Menna and Laura Esposito

Fundamental Study on Automated Interlayer Reinforcing System with Metal Fiber Insertion for 3D Concrete Printer 411
 Tomoya Asakawa, Tomoya Nishiwaki, Kazunori Ohno, Shigeru Yokoyama, Yoshito Okada, Shotaro Kojima, Youichi Satake, Yoshihiro Miyata, Yuki Miyazawa, Youhei Ito, and Hideyuki Kajita

Robotically Placed Reinforcement Using the Automated Screwing Device – An Application Perspective for 3D Concrete Printing 417
 Lauri Hass and Freek Bos

Proof-of-Concept: Sprayable SHCC Overlay Reinforcement Regime for Unreinforced 3D Printed Concrete Structure 424
 Seung Cho, Marchant van den Heever, Jacques Kruger, and Gideon van Zijl

Pre-installed Reinforcement for 3D Concrete Printing 430
 Lukas Gebhard, Patrick Bischof, Ana Anton, Jaime Mata-Falcón, Benjamin Dillenburger, and Walter Kaufmann

Wet Material Property Control

Material Design and Rheological Behavior of Sustainable Cement-Based Materials in the Context of 3D Printing 439
 Silvia Reißig, Venkatesh Naidu Nerella, and Viktor Mechtcherine

Measuring Plastic Shrinkage and Related Cracking of 3D Printed Concretes 446
 Slava Markin and Viktor Mechtcherine

Automated Visual Inspection of Near Nozzle Droplet Formation for Quality Control of Additive Manufacturing 453
 Derk Bos and Rob Wolfs

Selected Test Methods for Assessing Fresh and Plastic-State 3D Concrete Printing Materials 460
John Temitope Kolawole, Danny De-Becker, Jie Xu, James Dobrzanski, Sergio Cavalaro, Simon Austin, Nicolas Roussel, and Richard Buswell

Author Index 467

RILEM Publications

The following list is presenting the global offer of RILEM Publications, sorted by series. Each publication is available in printed version and/or in online version.

RILEM Proceedings (PRO)

PRO 1: Durability of High Performance Concrete (ISBN: 2-912143-03-9; e-ISBN: 2-351580-12-5; e-ISBN: 2351580125); *Ed. H. Sommer*

PRO 2: Chloride Penetration into Concrete (ISBN: 2-912143-00-04; e-ISBN: 2912143454); *Eds. L.-O. Nilsson and J.-P. Ollivier*

PRO 3: Evaluation and Strengthening of Existing Masonry Structures (ISBN: 2-912143-02-0; e-ISBN: 2351580141); *Eds. L. Binda and C. Modena*

PRO 4: Concrete: From Material to Structure (ISBN: 2-912143-04-7; e-ISBN: 2351580206); *Eds. J.-P. Bournazel and Y. Malier*

PRO 5: The Role of Admixtures in High Performance Concrete (ISBN: 2-912143-05-5; e-ISBN: 2351580214); *Eds. J. G. Cabrera and R. Rivera-Villarreal*

PRO 6: High Performance Fiber Reinforced Cement Composites - HPFRCC 3 (ISBN: 2-912143-06-3; e-ISBN: 2351580222); *Eds. H. W. Reinhardt and A. E. Naaman*

PRO 7: 1st International RILEM Symposium on Self-Compacting Concrete (ISBN: 2-912143-09-8; e-ISBN: 2912143721); *Eds. Å. Skarendahl and Ö. Petersson*

PRO 8: International RILEM Symposium on Timber Engineering (ISBN: 2-912143-10-1; e-ISBN: 2351580230); *Ed. L. Boström*

- PRO 9:** 2nd International RILEM Symposium on Adhesion between Polymers and Concrete ISAP '99 (ISBN: 2-912143-11-X; e-ISBN: 2351580249); *Eds. Y. Ohama and M. Puterman*
- PRO 10:** 3rd International RILEM Symposium on Durability of Building and Construction Sealants (ISBN: 2-912143-13-6; e-ISBN: 2351580257); *Eds. A. T. Wolf*
- PRO 11:** 4th International RILEM Conference on Reflective Cracking in Pavements (ISBN: 2-912143-14-4; e-ISBN: 2351580265); *Eds. A. O. Abd El Halim, D. A. Taylor and El H. H. Mohamed*
- PRO 12:** International RILEM Workshop on Historic Mortars: Characteristics and Tests (ISBN: 2-912143-15-2; e-ISBN: 2351580273); *Eds. P. Bartos, C. Groot and J. J. Hughes*
- PRO 13:** 2nd International RILEM Symposium on Hydration and Setting (ISBN: 2-912143-16-0; e-ISBN: 2351580281); *Ed. A. Nonat*
- PRO 14:** Integrated Life-Cycle Design of Materials and Structures - ILCDES 2000 (ISBN: 951-758-408-3; e-ISBN: 235158029X); (ISSN: 0356-9403); *Ed. S. Sarja*
- PRO 15:** Fifth RILEM Symposium on Fibre-Reinforced Concretes (FRC) - BEFIB'2000 (ISBN: 2-912143-18-7; e-ISBN: 291214373X); *Eds. P. Rossi and G. Chanvillard*
- PRO 16:** Life Prediction and Management of Concrete Structures (ISBN: 2-912143-19-5; e-ISBN: 2351580303); *Ed. D. Naus*
- PRO 17:** Shrinkage of Concrete – Shrinkage 2000 (ISBN: 2-912143-20-9; e-ISBN: 2351580311); *Eds. V. Baroghel-Bouny and P.-C. Aïtcin*
- PRO 18:** Measurement and Interpretation of the On-Site Corrosion Rate (ISBN: 2-912143-21-7; e-ISBN: 235158032X); *Eds. C. Andrade, C. Alonso, J. Fulla, J. Polimon and J. Rodriguez*
- PRO 19:** Testing and Modelling the Chloride Ingress into Concrete (ISBN: 2-912143-22-5; e-ISBN: 2351580338); *Eds. C. Andrade and J. Kropp*
- PRO 20:** 1st International RILEM Workshop on Microbial Impacts on Building Materials (CD 02) (e-ISBN 978-2-35158-013-4); *Ed. M. Ribas Silva*
- PRO 21:** International RILEM Symposium on Connections between Steel and Concrete (ISBN: 2-912143-25-X; e-ISBN: 2351580346); *Ed. R. Eligehausen*
- PRO 22:** International RILEM Symposium on Joints in Timber Structures (ISBN: 2-912143-28-4; e-ISBN: 2351580354); *Eds. S. Aicher and H.-W. Reinhardt*
- PRO 23:** International RILEM Conference on Early Age Cracking in Cementitious Systems (ISBN: 2-912143-29-2; e-ISBN: 2351580362); *Eds. K. Kovler and A. Bentur*

PRO 24: 2nd International RILEM Workshop on Frost Resistance of Concrete (ISBN: 2-912143-30-6; e-ISBN: 2351580370); *Eds. M. J. Setzer, R. Auberg and H.-J. Keck*

PRO 25: International RILEM Workshop on Frost Damage in Concrete (ISBN: 2-912143-31-4; e-ISBN: 2351580389); *Eds. D. J. Janssen, M. J. Setzer and M. B. Snyder*

PRO 26: International RILEM Workshop on On-Site Control and Evaluation of Masonry Structures (ISBN: 2-912143-34-9; e-ISBN: 2351580141); *Eds. L. Binda and R. C. de Vekey*

PRO 27: International RILEM Symposium on Building Joint Sealants (CD03; e-ISBN: 235158015X); *Ed. A. T. Wolf*

PRO 28: 6th International RILEM Symposium on Performance Testing and Evaluation of Bituminous Materials - PTEBM'03 (ISBN: 2-912143-35-7; e-ISBN: 978-2-912143-77-8); *Ed. M. N. Partl*

PRO 29: 2nd International RILEM Workshop on Life Prediction and Ageing Management of Concrete Structures (ISBN: 2-912143-36-5; e-ISBN: 2912143780); *Ed. D. J. Naus*

PRO 30: 4th International RILEM Workshop on High Performance Fiber Reinforced Cement Composites - HPRCC 4 (ISBN: 2-912143-37-3; e-ISBN: 2912143799); *Eds. A. E. Naaman and H. W. Reinhardt*

PRO 31: International RILEM Workshop on Test and Design Methods for Steel Fibre Reinforced Concrete: Background and Experiences (ISBN: 2-912143-38-1; e-ISBN: 2351580168); *Eds. B. Schnütgen and L. Vandewalle*

PRO 32: International Conference on Advances in Concrete and Structures 2 vol. (ISBN (set): 2-912143-41-1; e-ISBN: 2351580176); *Eds. Ying-shu Yuan, Surendra P. Shah and Heng-lin Lü*

PRO 33: 3rd International Symposium on Self-Compacting Concrete (ISBN: 2-912143-42-X; e-ISBN: 2912143713); *Eds. Ó. Wallevik and I. Nielsson*

PRO 34: International RILEM Conference on Microbial Impact on Building Materials (ISBN: 2-912143-43-8; e-ISBN: 2351580184); *Ed. M. Ribas Silva*

PRO 35: International RILEM TC 186-ISA on Internal Sulfate Attack and Delayed Ettringite Formation (ISBN: 2-912143-44-6; e-ISBN: 2912143802); *Eds. K. Scrivener and J. Skalny*

PRO 36: International RILEM Symposium on Concrete Science and Engineering – A Tribute to Arnon Bentur (ISBN: 2-912143-46-2; e-ISBN: 2912143586); *Eds. K. Kovler, J. Marchand, S. Mindess and J. Weiss*

PRO 37: 5th International RILEM Conference on Cracking in Pavements – Mitigation, Risk Assessment and Prevention (ISBN: 2-912143-47-0; e-ISBN: 2912143764); *Eds. C. Petit, I. Al-Qadi and A. Millien*

PRO 38: 3rd International RILEM Workshop on Testing and Modelling the Chloride Ingress into Concrete (ISBN: 2-912143-48-9; e-ISBN: 2912143578); *Eds. C. Andrade and J. Kropp*

PRO 39: 6th International RILEM Symposium on Fibre-Reinforced Concretes - BEFIB 2004 (ISBN: 2-912143-51-9; e-ISBN: 2912143748); *Eds. M. Di Prisco, R. Felicetti and G. A. Plizzari*

PRO 40: International RILEM Conference on the Use of Recycled Materials in Buildings and Structures (ISBN: 2-912143-52-7; e-ISBN: 2912143756); *Eds. E. Vázquez, Ch. F. Hendriks and G. M. T. Janssen*

PRO 41: RILEM International Symposium on Environment-Conscious Materials and Systems for Sustainable Development (ISBN: 2-912143-55-1; e-ISBN: 2912143640); *Eds. N. Kashino and Y. Ohama*

PRO 42: SCC'2005 - China: 1st International Symposium on Design, Performance and Use of Self-Consolidating Concrete (ISBN: 2-912143-61-6; e-ISBN: 2912143624); *Eds. Zhiwu Yu, Caijun Shi, Kamal Henri Khayat and Youjun Xie*

PRO 43: International RILEM Workshop on Bonded Concrete Overlays (e-ISBN: 2-912143-83-7); *Eds. J. L. Granju and J. Silfwerbrand*

PRO 44: 2nd International RILEM Workshop on Microbial Impacts on Building Materials (CD11) (e-ISBN: 2-912143-84-5); *Ed. M. Ribas Silva*

PRO 45: 2nd International Symposium on Nanotechnology in Construction, Bilbao (ISBN: 2-912143-87-X; e-ISBN: 2912143888); *Eds. Peter J. M. Bartos, Yolanda de Miguel and Antonio Porro*

PRO 46: ConcreteLife'06 - International RILEM-JCI Seminar on Concrete Durability and Service Life Planning: Curing, Crack Control, Performance in Harsh Environments (ISBN: 2-912143-89-6; e-ISBN: 291214390X); *Ed. K. Kovler*

PRO 47: International RILEM Workshop on Performance Based Evaluation and Indicators for Concrete Durability (ISBN: 978-2-912143-95-2; e-ISBN: 9782912143969); *Eds. V. Baroghel-Bouny, C. Andrade, R. Torrent and K. Scrivener*

PRO 48: 1st International RILEM Symposium on Advances in Concrete through Science and Engineering (e-ISBN: 2-912143-92-6); *Eds. J. Weiss, K. Kovler, J. Marchand, and S. Mindess*

PRO 49: International RILEM Workshop on High Performance Fiber Reinforced Cementitious Composites in Structural Applications (ISBN: 2-912143-93-4; e-ISBN: 2912143942); *Eds. G. Fischer and V. C. Li*

PRO 50: 1st International RILEM Symposium on Textile Reinforced Concrete (ISBN: 2-912143-97-7; e-ISBN: 2351580087); *Eds. Josef Hegger, Wolfgang Brameshuber and Norbert Will*

PRO 51: 2nd International Symposium on Advances in Concrete through Science and Engineering (ISBN: 2-35158-003-6; e-ISBN: 2-35158-002-8); *Eds. J. Marchand, B. Bissonnette, R. Gagné, M. Jolin and F. Paradis*

PRO 52: Volume Changes of Hardening Concrete: Testing and Mitigation (ISBN: 2-35158-004-4; e-ISBN: 2-35158-005-2); *Eds. O. M. Jensen, P. Lura and K. Kovler*

PRO 53: High Performance Fiber Reinforced Cement Composites - HPRCC5 (ISBN: 978-2-35158-046-2; e-ISBN: 978-2-35158-089-9); *Eds. H. W. Reinhardt and A. E. Naaman*

PRO 54: 5th International RILEM Symposium on Self-Compacting Concrete (ISBN: 978-2-35158-047-9; e-ISBN: 978-2-35158-088-2); *Eds. G. De Schutter and V. Boel*

PRO 55: International RILEM Symposium Photocatalysis, Environment and Construction Materials (ISBN: 978-2-35158-056-1; e-ISBN: 978-2-35158-057-8); *Eds. P. Baglioni and L. Cassar*

PRO 56: International RILEM Workshop on Integral Service Life Modelling of Concrete Structures (ISBN 978-2-35158-058-5; e-ISBN: 978-2-35158-090-5); *Eds. R. M. Ferreira, J. Gulikers and C. Andrade*

PRO 57: RILEM Workshop on Performance of cement-based materials in aggressive aqueous environments (e-ISBN: 978-2-35158-059-2); *Ed. N. De Belie*

PRO 58: International RILEM Symposium on Concrete Modelling - CONMOD'08 (ISBN: 978-2-35158-060-8; e-ISBN: 978-2-35158-076-9); *Eds. E. Schlangen and G. De Schutter*

PRO 59: International RILEM Conference on On Site Assessment of Concrete, Masonry and Timber Structures - SACoMaTiS 2008 (ISBN set: 978-2-35158-061-5; e-ISBN: 978-2-35158-075-2); *Eds. L. Binda, M. di Prisco and R. Felicetti*

PRO 60: Seventh RILEM International Symposium on Fibre Reinforced Concrete: Design and Applications - BEFIB 2008 (ISBN: 978-2-35158-064-6; e-ISBN: 978-2-35158-086-8); *Ed. R. Gettu*

PRO 61: 1st International Conference on Microstructure Related Durability of Cementitious Composites 2 vol., (ISBN: 978-2-35158-065-3; e-ISBN: 978-2-35158-084-4); *Eds. W. Sun, K. van Breugel, C. Miao, G. Ye and H. Chen*

PRO 62: NSF/ RILEM Workshop: In-situ Evaluation of Historic Wood and Masonry Structures (e-ISBN: 978-2-35158-068-4); *Eds. B. Kasal, R. Anthony and M. Drdácáký*

PRO 63: Concrete in Aggressive Aqueous Environments: Performance, Testing and Modelling, 2 vol., (ISBN: 978-2-35158-071-4; e-ISBN: 978-2-35158-082-0); *Eds. M. G. Alexander and A. Bertron*

PRO 64: Long Term Performance of Cementitious Barriers and Reinforced Concrete in Nuclear Power Plants and Waste Management - NUCPERF 2009 (ISBN: 978-2-35158-072-1; e-ISBN: 978-2-35158-087-5); *Eds. V. L'Hostis, R. Gens, C. Gallé*

PRO 65: Design Performance and Use of Self-consolidating Concrete - SCC'2009 (ISBN: 978-2-35158-073-8; e-ISBN: 978-2-35158-093-6); *Eds. C. Shi, Z. Yu, K. H. Khayat and P. Yan*

PRO 66: 2nd International RILEM Workshop on Concrete Durability and Service Life Planning - ConcreteLife'09 (ISBN: 978-2-35158-074-5; ISBN: 978-2-35158-074-5); *Ed. K. Kovler*

PRO 67: Repairs Mortars for Historic Masonry (e-ISBN: 978-2-35158-083-7); *Ed. C. Groot*

PRO 68: Proceedings of the 3rd International RILEM Symposium on 'Rheology of Cement Suspensions such as Fresh Concrete (ISBN 978-2-35158-091-2; e-ISBN: 978-2-35158-092-9); *Eds. O. H. Wallevik, S. Kubens and S. Oesterheld*

PRO 69: 3rd International PhD Student Workshop on 'Modelling the Durability of Reinforced Concrete (ISBN: 978-2-35158-095-0); *Eds. R. M. Ferreira, J. Gulikers and C. Andrade*

PRO 70: 2nd International Conference on 'Service Life Design for Infrastructure' (ISBN set: 978-2-35158-096-7, e-ISBN: 978-2-35158-097-4); *Ed. K. van Breugel, G. Ye and Y. Yuan*

PRO 71: Advances in Civil Engineering Materials - The 50-year Teaching Anniversary of Prof. Sun Wei' (ISBN: 978-2-35158-098-1; e-ISBN: 978-2-35158-099-8); *Eds. C. Miao, G. Ye, and H. Chen*

PRO 72: First International Conference on 'Advances in Chemically-Activated Materials – CAM'2010' (2010), 264 pp, ISBN: 978-2-35158-101-8; e-ISBN: 978-2-35158-115-5, *Eds. Caijun Shi and Xiaodong Shen*

PRO 73: 2nd International Conference on 'Waste Engineering and Management - ICWEM 2010' (2010), 894 pp, ISBN: 978-2-35158-102-5; e-ISBN: 978-2-35158-103-2, *Eds. J. Zh. Xiao, Y. Zhang, M. S. Cheung and R. Chu*

PRO 74: International RILEM Conference on 'Use of Superabsorbent Polymers and Other New Additives in Concrete' (2010) 374 pp., ISBN: 978-2-35158-104-9; e-ISBN: 978-2-35158-105-6; *Eds. O. M. Jensen, M. T. Hasholt, and S. Laustsen*

PRO 75: International Conference on 'Material Science - 2nd ICTRC - Textile Reinforced Concrete - Theme 1' (2010) 436 pp., ISBN: 978-2-35158-106-3; e-ISBN: 978-2-35158-107-0; *Ed. W. Brameshuber*

PRO 76: International Conference on ‘Material Science - HetMat - Modelling of Heterogeneous Materials - Theme 2’ (2010) 255 pp., ISBN: 978-2-35158-108-7; e-ISBN: 978-2-35158-109-4; *Ed. W. Brameshuber*

PRO 77: International Conference on ‘Material Science - AdIPoC - Additions Improving Properties of Concrete - Theme 3’ (2010) 459 pp., ISBN: 978-2-35158-110-0; e-ISBN: 978-2-35158-111-7; *Ed. W. Brameshuber*

PRO 78: 2nd Historic Mortars Conference and RILEM TC 203-RHM Final Workshop – HMC2010 (2010) 1416 pp., e-ISBN: 978-2-35158-112-4; *Eds. J. Válek, C. Groot, and J. J. Hughes*

PRO 79: International RILEM Conference on Advances in Construction Materials Through Science and Engineering (2011) 213 pp., ISBN: 978-2-35158-116-2, e-ISBN: 978-2-35158-117-9; *Eds. Christopher Leung and K.T. Wan*

PRO 80: 2nd International RILEM Conference on Concrete Spalling due to Fire Exposure (2011) 453 pp., ISBN: 978-2-35158-118-6, e-ISBN: 978-2-35158-119-3; *Eds. E. A. B. Koenders and F. Dehn*

PRO 81: 2nd International RILEM Conference on Strain Hardening Cementitious Composites (SHCC2-Rio) (2011) 451 pp., ISBN: 978-2-35158-120-9, e-ISBN: 978-2-35158-121-6; *Eds. R.D. Toledo Filho, F. A. Silva, E. A. B. Koenders and E. M. R. Fairbairn*

PRO 82: 2nd International RILEM Conference on Progress of Recycling in the Built Environment (2011) 507 pp., e-ISBN: 978-2-35158-122-3; *Eds. V. M. John, E. Vazquez, S. C. Angulo and C. Ulsen*

PRO 83: 2nd International Conference on Microstructural-related Durability of Cementitious Composites (2012) 250 pp., ISBN: 978-2-35158-129-2; e-ISBN: 978-2-35158-123-0; *Eds. G. Ye, K. van Breugel, W. Sun and C. Miao*

PRO 84: CONSEC13 - Seventh International Conference on Concrete under Severe Conditions – Environment and Loading (2013) 1930 pp., ISBN: 978-2-35158-124-7; e-ISBN: 978-2-35158-134-6; *Eds. Z. J. Li, W. Sun, C. W. Miao, K. Sakai, O. E. Gjorv & N. Banthia*

PRO 85: RILEM-JCI International Workshop on Crack Control of Mass Concrete and Related issues concerning Early-Age of Concrete Structures – ConCrack 3 – Control of Cracking in Concrete Structures 3 (2012) 237 pp., ISBN: 978-2-35158-125-4; e-ISBN: 978-2-35158-126-1; *Eds. F. Toutlemonde and J.-M. Torrenti*

PRO 86: International Symposium on Life Cycle Assessment and Construction (2012) 414 pp., ISBN: 978-2-35158-127-8, e-ISBN: 978-2-35158-128-5; *Eds. A. Ventura and C. de la Roche*

PRO 87: UHPFRC 2013 – RILEM-fib-AFGC International Symposium on Ultra-High Performance Fibre-Reinforced Concrete (2013), ISBN: 978-2-35158-130-8, e-ISBN: 978-2-35158-131-5; *Eds. F. Toutlemonde*

PRO 88: 8th RILEM International Symposium on Fibre Reinforced Concrete (2012) 344 pp., ISBN: 978-2-35158-132-2, e-ISBN: 978-2-35158-133-9; *Eds. Joaquim A. O. Barros*

PRO 89: RILEM International workshop on performance-based specification and control of concrete durability (2014) 678 pp, ISBN: 978-2-35158-135-3, e-ISBN: 978-2-35158-136-0; *Eds. D. Bjegović, H. Beushausen and M. Serdar*

PRO 90: 7th RILEM International Conference on Self-Compacting Concrete and of the 1st RILEM International Conference on Rheology and Processing of Construction Materials (2013) 396 pp, ISBN: 978-2-35158-137-7, e-ISBN: 978-2-35158-138-4; *Eds. Nicolas Roussel and Hela Bessaies-Bey*

PRO 91: CONMOD 2014 - RILEM International Symposium on Concrete Modelling (2014), ISBN: 978-2-35158-139-1; e-ISBN: 978-2-35158-140-7; *Eds. Kefei Li, Peiyu Yan and Rongwei Yang*

PRO 92: CAM 2014 - 2nd International Conference on advances in chemically-activated materials (2014) 392 pp., ISBN: 978-2-35158-141-4; e-ISBN: 978-2-35158-142-1; *Eds. Caijun Shi and Xiadong Shen*

PRO 93: SCC 2014 - 3rd International Symposium on Design, Performance and Use of Self-Consolidating Concrete (2014) 438 pp., ISBN: 978-2-35158-143-8; e-ISBN: 978-2-35158-144-5; *Eds. Caijun Shi, Zhihua Ou, Kamal H. Khayat*

PRO 94 (online version): HPRCC-7 - 7th RILEM conference on High performance fiber reinforced cement composites (2015), e-ISBN: 978-2-35158-146-9; *Eds. H. W. Reinhardt, G. J. Parra-Montesinos, H. Garrecht*

PRO 95: International RILEM Conference on Application of superabsorbent polymers and other new admixtures in concrete construction (2014), ISBN: 978-2-35158-147-6; e-ISBN: 978-2-35158-148-3; *Eds. Viktor Mechtcherine, Christof Schroeffl*

PRO 96 (online version): XIII DBMC: XIII International Conference on Durability of Building Materials and Components(2015), e-ISBN: 978-2-35158-149-0; *Eds. M. Quattrone, V. M. John*

PRO 97: SHCC3 – 3rd International RILEM Conference on Strain Hardening Cementitious Composites (2014), ISBN: 978-2-35158-150-6; e-ISBN: 978-2-35158-151-3; *Eds. E. Schlangen, M. G. Sierra Beltran, M. Lukovic, G. Ye*

PRO 98: FERRO-11 – 11th International Symposium on Ferrocement and 3rd ICTRC - International Conference on Textile Reinforced Concrete (2015), ISBN: 978-2-35158-152-0; e-ISBN: 978-2-35158-153-7; *Ed. W. Bramehuber*

PRO 99 (online version): ICBBM 2015 - 1st International Conference on Bio-Based Building Materials (2015), e-ISBN: 978-2-35158-154-4; *Eds. S. Amziane, M. Sonebi*

PRO 100: SCC16 - RILEM Self-Consolidating Concrete Conference (2016), ISBN: 978-2-35158-156-8; e-ISBN: 978-2-35158-157-5; *Ed. Kamal H. Kayat*

PRO 101 (online version): III Progress of Recycling in the Built Environment (2015), e-ISBN: 978-2-35158-158-2; *Eds. I. Martins, C. Ulsen and S. C. Angulo*

PRO 102 (online version): RILEM Conference on Microorganisms-Cementitious Materials Interactions (2016), e-ISBN: 978-2-35158-160-5; *Eds. Alexandra Bertron, Henk Jonkers, Virginie Wiktor*

PRO 103 (online version): ACESc'16 - Advances in Civil Engineering and Sustainable Construction (2016), e-ISBN: 978-2-35158-161-2; *Eds. T.Ch. Madhavi, G. Prabhakar, Santhosh Ram and P. M. Rameshwaran*

PRO 104 (online version): SSCS'2015 - Numerical Modeling - Strategies for Sustainable Concrete Structures (2015), e-ISBN: 978-2-35158-162-9

PRO 105: 1st International Conference on UHPC Materials and Structures (2016), ISBN: 978-2-35158-164-3, e-ISBN: 978-2-35158-165-0

PRO 106: AFGC-ACI-fib-RILEM International Conference on Ultra-High-Performance Fibre-Reinforced Concrete – UHPFRC 2017 (2017), ISBN: 978-2-35158-166-7, e-ISBN: 978-2-35158-167-4; *Eds. François Toulemonde & Jacques Resplendino*

PRO 107 (online version): XIV DBMC – 14th International Conference on Durability of Building Materials and Components (2017), e-ISBN: 978-2-35158-159-9; *Eds. Geert De Schutter, Nele De Belie, Arnold Janssens, Nathan Van Den Bossche*

PRO 108: MSSCE 2016 - Innovation of Teaching in Materials and Structures (2016), ISBN: 978-2-35158-178-0, e-ISBN: 978-2-35158-179-7; *Ed. Per Goltermann*

PRO 109 (2 volumes): MSSCE 2016 - Service Life of Cement-Based Materials and Structures (2016), ISBN Vol. 1: 978-2-35158-170-4, Vol. 2: 978-2-35158-171-4, Set Vol. 1&2: 978-2-35158-172-8, e-ISBN : 978-2-35158-173-5; *Eds. Miguel Azenha, Ivan Gabrijel, Dirk Schlicke, Terje Kanstad and Ole Mejlhede Jensen*

PRO 110: MSSCE 2016 - Historical Masonry (2016), ISBN: 978-2-35158-178-0, e-ISBN: 978-2-35158-179-7; *Eds. Inge Rörig-Dalgaard and Ioannis Ioannou*

PRO 111: MSSCE 2016 - Electrochemistry in Civil Engineering (2016), ISBN: 978-2-35158-176-6, e-ISBN: 978-2-35158-177-3; *Ed. Lisbeth M. Ottosen*

PRO 112: MSSCE 2016 - Moisture in Materials and Structures (2016), ISBN: 978-2-35158-178-0, e-ISBN: 978-2-35158-179-7; *Eds. Kurt Kielsgaard Hansen, Carsten Rode and Lars-Olof Nilsson*

PRO 113: MSSCE 2016 - Concrete with Supplementary Cementitious Materials (2016), ISBN: 978-2-35158-178-0, e-ISBN: 978-2-35158-179-7; *Eds. Ole Mejlhede Jensen, Konstantin Kovler and Nele De Belie*

PRO 114: MSSCE 2016 - Frost Action in Concrete (2016), ISBN: 978-2-35158-182-7, e-ISBN: 978-2-35158-183-4; *Eds. Marianne Tange Hasholt, Katja Fridh and R. Doug Hooton*

PRO 115: MSSCE 2016 - Fresh Concrete (2016), ISBN: 978-2-35158-184-1, e-ISBN: 978-2-35158-185-8; *Eds. Lars N. Thrane, Claus Pade, Oldrich Svec and Nicolas Roussel*

PRO 116: BEFIB 2016 – 9th RILEM International Symposium on Fiber Reinforced Concrete (2016), ISBN: 978-2-35158-187-2, e-ISBN: 978-2-35158-186-5; *Eds. N. Banthia, M. di Prisco and S. Soleimani-Dashtaki*

PRO 117: 3rd International RILEM Conference on Microstructure Related Durability of Cementitious Composites (2016), ISBN: 978-2-35158-188-9, e-ISBN: 978-2-35158-189-6; *Eds. Changwen Miao, Wei Sun, Jiaping Liu, Huisu Chen, Guang Ye and Klaas van Breugel*

PRO 118 (4 volumes): International Conference on Advances in Construction Materials and Systems (2017), ISBN Set: 978-2-35158-190-2, Vol. 1: 978-2-35158-193-3, Vol. 2: 978-2-35158-194-0, Vol. 3: ISBN:978-2-35158-195-7, Vol. 4: ISBN:978-2-35158-196-4, e-ISBN: 978-2-35158-191-9; *Eds. Manu Santhanam, Ravindra Gettu, Radhakrishna G. Pillai and Sunitha K. Nayar*

PRO 119 (online version): ICBBM 2017 - Second International RILEM Conference on Bio-based Building Materials, (2017), e-ISBN: 978-2-35158-192-6; *Ed. Sofiane Amziane*

PRO 120 (2 volumes): EAC-02 - 2nd International RILEM/COST Conference on Early Age Cracking and Serviceability in Cement-based Materials and Structures, (2017), Vol. 1: 978-2-35158-199-5, Vol. 2: 978-2-35158-200-8, Set: 978-2-35158-197-1, e-ISBN: 978-2-35158-198-8; *Eds. Stéphanie Staquet and Dimitrios Aggelis*

PRO 121 (2 volumes): SynerCrete18: Interdisciplinary Approaches for Cement-based Materials and Structural Concrete: Synergizing Expertise and Bridging Scales of Space and Time, (2018), Set: 978-2-35158-202-2, Vol.1: 978-2-35158-211-4, Vol.2: 978-2-35158-212-1, e-ISBN: 978-2-35158-203-9; *Eds. Miguel Azenha, Dirk Schlicke, Farid Benboudjema, Agnieszka Knoppik*

PRO 122: SCC'2018 China - Fourth International Symposium on Design, Performance and Use of Self-Consolidating Concrete, (2018), ISBN: 978-2-35158-204-6, e-ISBN: 978-2-35158-205-3; *Eds. C. Shi, Z. Zhang, K. H. Khayat*

PRO 123: Final Conference of RILEM TC 253-MCI: Microorganisms-Cementitious Materials Interactions (2018), Set: 978-2-35158-207-7, Vol.1: 978-2-35158-209-1, Vol.2: 978-2-35158-210-7, e-ISBN: 978-2-35158-206-0; *Ed. Alexandra Bertron*

PRO 124 (online version): Fourth International Conference Progress of Recycling in the Built Environment (2018), e-ISBN: 978-2-35158-208-4; *Eds. Isabel M. Martins, Carina Ulsen, Yury Villagran*

PRO 125 (online version): SLD4 - 4th International Conference on Service Life Design for Infrastructures (2018), e-ISBN: 978-2-35158-213-8; *Eds. Guang Ye, Yong Yuan, Claudia Romero Rodriguez, Hongzhi Zhang, Branko Savija*

PRO 126: Workshop on Concrete Modelling and Material Behaviour in honor of Professor Klaas van Breugel (2018), ISBN: 978-2-35158-214-5, e-ISBN: 978-2-35158-215-2; *Ed. Guang Ye*

PRO 127 (online version): CONMOD2018 - Symposium on Concrete Modelling (2018), e-ISBN: 978-2-35158-216-9; *Eds. Erik Schlangen, Geert de Schutter, Branko Savija, Hongzhi Zhang, Claudia Romero Rodriguez*

PRO 128: SMSS2019 - International Conference on Sustainable Materials, Systems and Structures (2019), ISBN: 978-2-35158-217-6, e-ISBN: 978-2-35158-218-3

PRO 129: 2nd International Conference on UHPC Materials and Structures (UHPC2018-China), ISBN: 978-2-35158-219-0, e-ISBN: 978-2-35158-220-6;

PRO 130: 5th Historic Mortars Conference (2019), ISBN: 978-2-35158-221-3, e-ISBN: 978-2-35158-222-0; *Eds. José Ignacio Álvarez, José María Fernández, Iñigo Navarro, Adrián Durán, Rafael Sirera*

PRO 131 (online version): 3rd International Conference on Bio-Based Building Materials (ICBBM2019), e-ISBN: 978-2-35158-229-9; *Eds. Mohammed Sonebi, Sofiane Amziane, Jonathan Page*

PRO 132: IRWRMC'18 - International RILEM Workshop on Rheological Measurements of Cement-based Materials (2018), ISBN: 978-2-35158-230-5, e-ISBN: 978-2-35158-231-2; *Eds. Chafika Djelal and Yannick Vanhove*

PRO 133 (online version): CO2STO2019 - International Workshop CO2 Storage in Concrete (2019), e-ISBN: 978-2-35158-232-9; *Eds. Assia Djerbi, Othman Omikrine-Metalssi and Teddy Fen-Chong*

PRO 134: 3rd ACF/HNU International Conference on UHPC Materials and Structures - UHPC'2020, ISBN: 978-2-35158-233-6, e-ISBN: 978-2-35158-234-3; *Eds. Caijun Shi and Jiaping Liu*

RILEM Reports (REP)

Report 19: Considerations for Use in Managing the Aging of Nuclear Power Plant Concrete Structures (ISBN: 2-912143-07-1); *Ed. D. J. Naus*

Report 20: Engineering and Transport Properties of the Interfacial Transition Zone in Cementitious Composites (ISBN: 2-912143-08-X); *Eds. M. G. Alexander, G. Arliguie, G. Ballivy, A. Bentur and J. Marchand*

Report 21: Durability of Building Sealants (ISBN: 2-912143-12-8); *Ed. A. T. Wolf*

Report 22: Sustainable Raw Materials - Construction and Demolition Waste (ISBN: 2-912143-17-9); *Eds. C. F. Hendriks and H. S. Pietersen*

Report 23: Self-Compacting Concrete state-of-the-art report (ISBN: 2-912143-23-3); *Eds. Å. Skarendahl and Ö. Petersson*

Report 24: Workability and Rheology of Fresh Concrete: Compendium of Tests (ISBN: 2-912143-32-2); *Eds. P. J. M. Bartos, M. Sonebi and A. K. Tamimi*

Report 25: Early Age Cracking in Cementitious Systems (ISBN: 2-912143-33-0); *Ed. A. Bentur*

Report 26: Towards Sustainable Roofing (Joint Committee CIB/RILEM) (CD 07) (e-ISBN 978-2-912143-65-5); *Eds. Thomas W. Hutchinson and Keith Roberts*

Report 27: Condition Assessment of Roofs (Joint Committee CIB/RILEM) (CD 08) (e-ISBN 978-2-912143-66-2); *Ed. CIB W 83/RILEM TC166-RMS*

Report 28: Final report of RILEM TC 167-COM 'Characterisation of Old Mortars with Respect to Their Repair' (ISBN: 978-2-912143-56-3); *Eds. C. Groot, G. Ashall and J. Hughes*

Report 29: Pavement Performance Prediction and Evaluation (PPPE): Interlaboratory Tests (e-ISBN: 2-912143-68-3); *Eds. M. Partl and H. Piber*

Report 30: Final Report of RILEM TC 198-URM 'Use of Recycled Materials' (ISBN: 2-912143-82-9; e-ISBN: 2-912143-69-1); *Eds. Ch. F. Hendriks, G. M. T. Janssen and E. Vázquez*

Report 31: Final Report of RILEM TC 185-ATC 'Advanced testing of cement-based materials during setting and hardening' (ISBN: 2-912143-81-0; e-ISBN: 2-912143-70-5); *Eds. H. W. Reinhardt and C. U. Grosse*

Report 32: Probabilistic Assessment of Existing Structures. A JCSS publication (ISBN 2-912143-24-1); *Ed. D. Diamantidis*

Report 33: State-of-the-Art Report of RILEM Technical Committee TC 184-IFE 'Industrial Floors' (ISBN 2-35158-006-0); *Ed. P. Seidler*