



REcube workshop 1  
Mincio Swimming Pool, Milan  
By Pier Luigi Nervi



27- 6 to 1-7 2022  
hosted by Delft University of Technology

## Mincio Swimming Pool

### Problem:

The Pool is build in **1964**. There are problems with this structure. It is time for renovation. The goal is to preserve the pools for at least another 50 years.

### Your tasks:

- Make a proposal for renovation of this structure in which you make use of modern materials and techniques as explained in the lectures.
- Work in 5 groups of 7 students.
- Present the proposal at the end of the week in a presentation of about 20 minutes.
- Address the specific questions that you will get at the end of each lecture.

### What should the proposal address:

- How are you going to investigate/inspect the problem areas in this structure?
- What are the possible problems you are going to look for?
- How are you going to solve these problems (repare, strengthen, reconstruct, monitor)?
- What kind of lab-research do you need to optimise your product/solution?
- How are you going to monitor if your product will work?
- How much will your solution cost (€€, CO<sub>2</sub>, Environmental impact) Compare it with alternative repair methods.



C1v -Pathologies in Reinforced Concrete Structures + building physics + concrete chemistry

Monday 27 June - Friday 1 July 2022

5 days online lectures

35 students (MSc)

	Monday 27	Tuesday 28	Wednesday 29	Thursday 30	Friday 1
10:00 - 11:00	Erik Schlangen/Andrew Borgart Introduction people lectures / topics assignment	9:00 - 11:00 Guang Ye History of Concrete Ingredients Properties Behaviour	Oguzhan Copuroglu Characterisation lab research microscopy damage characterisation	Dessi Koleva Durability and Corrosion chloride ingress carbonation corrosion	Branko Savija Self Healing Concrete Bioconcrete self healing strategies practical examples
11:00-13:00	Andrew Borgart Structures of Nervi examples mechanics problems	11:00-13:00 Erik Schlangen Forensic Engineering damage patterns inspection prevention	Mohammad Fotouhi Monitoring health monitoring sensing smart inspection	Henk Jonkers Smart concrete strengthening 3D printing energy harvesting	Marc Ottele Sustainable Buildings green facades green materials green buildings
13:00-14:00	Lunch	13:00-14:00 Lunch	Lunch	Lunch	Lunch
14:00-16:00	working in groups on assignment	14:00-16:00 working in groups on assignment	working in groups on assignment	working in groups on assignment	Presentation of group work

Andrew Borgart is an assistant professor for Structural Mechanics at the Faculty of Architecture of Delft University of Technology. He also teaches at the Faculty of Civil Engineering. He teaches several courses in structural mechanics and structures as part of the Bachelor's degree of Architecture and the Master's degree programs for Building Engineering.

*Expertise: Structural Mechanics of spatial structures*

Erik Schlangen, professor of the chair of Experimental Micromechanics has an MSc degree in Structural Engineering from Eindhoven University of Technology and a PhD from Delft University. He worked 12 years in industry as a consultant for concrete durability problems. Since 2003 he has been teaching at the faculty of Civil Engineering and Geosciences dealing with behavior, testing and modeling of construction materials.

*Expertise: Experimental Micromechanics*

Guang Ye is an associate professor in the Section of Materials and Environment of TU Delft. He is the Chair of the research group of Concrete Modelling and Materials Behavior. He received his PhD with honor from TU Delft in 2003. After his PhD, he spent one year as postdoc in Ghent University, Belgium. In 2005 he received VENI grant from NWO and worked as senior researcher in TU Delft.

*Expertise: Advanced Construction Materials*

Oguzhan Copuroglu is an assistant professor at the faculty of Civil Engineering and Geosciences with a PhD from the same faculty. He is teaching courses on Construction Materials in the BSc-program and Forensic Materials Engineering and Applied Microscopy in the MSc program.

*Expertise: Durability and Forensic Engineering*

Mohammed Fotouhi is an assistant professor in Structural Health Monitoring of TU Delft. His research focuses on the development of structural health monitoring techniques for engineering structures. This involves the development of sensor nodes that are cheap, low-power, and reliable.

*Expertise: Health Monitoring and Inspection*

Dessi Koleva is an assistant professor 3MD, M&E, Faculty CiTG, TU Delft.

Main research field(s) and expertise: Electrochemistry; Corrosion and Cathodic protection; Concrete & reinforced concrete durability; Cement-based microstructure.

*Expertise: Durability and Corrosion*

Branko Savija is an assistant professor in the group of Materials and Environment, Faculty of Civil Engineering and Geosciences, Delft University of Technology. During my PhD study I performed experiments and developed numerical models in the field of concrete durability.

*Expertise: Smart Materials*

Henk Jonkers is professor of Bio-adapted and Sustainable Building Materials. His research focusses on the development of bio-adapted building materials. These are materials that contain, or stimulate growth of, living organisms resulting in increased functional performance and decreased environmental impact. Examples are bacteria-based self-healing concrete and moss-receptive concrete.

*Expertise: Sustainability and Self-Healing*

Marc Ottele is an assistant professor Faculty CiTG, TU Delft. His research expertise comprises the internationally upcoming scientific field "Integrated durability and sustainability of the building envelope" which explores the link and interaction between 'sustainability' and 'durability' not only on the material-, building element- and construction level but also on the level of the built environment as a whole.

*Expertise: Green Building Envelope*