



Department of Civil Engineering  
The University of Hong Kong

**HKIE** Structural Division  
The Hong Kong Institution of Engineers

# The Fifth Y.K. Cheung Lecture

## Predicting the Durability of Concrete Structures

PRESENTED BY

**PROFESSOR NICK BUENFELD**

Head of Department of Civil & Environmental Engineering  
Professor of Concrete Structures, Imperial College London

**7:00 p.m. February 28, 2019 (Thursday) | Rayson Huang Theatre, The University of Hong Kong**

### ABOUT THE SPEAKER

Professor Nick Buenfeld is Head of the Department of Civil & Environmental Engineering (since 2011) and Professor of Concrete Structures (since 2000) at Imperial College London. He is an internationally leading expert in the long-term performance of concrete structures.



His research group investigates the ageing of concrete, in different environments, to develop more effective methods for the design, assessment, life prediction and repair of concrete structures. He has established uniquely well-equipped laboratories at Imperial College to help better understand and quantify the degradation of concrete and reinforcing steel and has developed computational models for predicting the long-term performance of new and existing structures. He is author of more than 200 research publications and has supervised 30 PhDs.

Nick has provided guidance to governments and to the designers and constructors of major infrastructure projects including the new Los Angeles Cathedral (USA), the Southern Expressway bridges (Sri Lanka), the Great Man-Made River Project (Libya), the Beirut Sea Front Project (Lebanon), the Channel Tunnel (UK-France), the Jubilee Line Extension (London), the new Tyne Tunnel (Newcastle), Tsing Lung Bridge (Hong Kong), Belgium's high level nuclear waste repository, Riyadh Metro (Saudi Arabia) and the UK's new nuclear power plants.

He has taught philosophy of design, design and analysis of structures, concrete technology and materials science. He is a Fellow of the Institution of Civil Engineers and the Institution of Structural Engineers, Honorary Fellow of the Institute of Concrete Technology and elected Fellow of the Royal Academy of Engineering.

### SYNOPSIS

Concrete structures are expected to remain in service for many decades, if not centuries. While compliance with clauses in structural codes and standards takes care of this for most new buildings and bridges constructed from well-proven materials, there are many scenarios where it is necessary to explicitly predict durability or at least demonstrate that a structure will be adequately durable. This applies to structures utilizing new, more sustainable, cements, structures exposed to unusual environments or with very long design lives, to most concrete-lined tunnels, to existing structures (for example in relation to life extension, changing ownership or premature deterioration) and to structures where out of specification concrete would otherwise be rejected.

Service life prediction is a multifaceted subject with many challenges that must be understood and tackled to make progress. In particular, challenges arise from the physical and chemical complexity of concrete, the range of possible exposure environments and deterioration processes, and the long design lives required.

The most promising, and also some misconceived, approaches to life prediction are presented with examples drawn from some of the major international infrastructure projects that Nick has been involved in, together with research findings from Nick's group. Approaches include the use of artificial intelligence to learn from condition surveys of existing structures, accelerated laboratory testing, short-term natural exposure followed by microstructural characterization and extrapolation, and various forms of computer-based modelling.



Attendance certificates will be available.

For further details,  
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**FREE ADMISSION - ALL ARE WELCOME**

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