

STRUCTURAL PERFORMANCE BEYOND FIRST USE

Speaker

Dr Dan Bompa

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Abstract

The construction sector remains a major contributor to global emissions and resource depletion because buildings and infrastructure are typically designed for a single life. In a circular engineering context, this seminar presents research that repositions structural engineering around resource efficiency, demonstrating how performance-based assessment and targeted testing can enable structures to deliver multiple lives. The seminar is structured around three interlinked pillars of circular structural engineering: low-carbon, lean design, and zero waste. Low-carbon is addressed through research-validated material- and structural-level solutions, including low-carbon and waste-derived materials and performance-based strategies for retaining and reusing structural capacity. Lean design is presented as a performance-driven process in which existing capacity is revealed rather than discarded; nonlinear analysis, selective testing, and demand-capacity reassessment show that components often retain significant reserve performance suitable for reuse. Zero waste is framed as engineering for retention and reuse rather than end-of-life recycling, illustrated through testing and requalification strategies for reclaimed structural components and connections, including staged and repeat-use testing that demonstrates safe redeployment.

Biography

Dr Dan Bompa is a Chartered Structural Engineer and Senior Lecturer in the School of Engineering at the University of Surrey. He previously held postdoctoral and visiting research-focused roles at Imperial College London, École Polytechnique Fédérale and ETH Zürich. Dan has published over 100 peer-reviewed papers on structural materials and engineering, is the lead author of an award-winning paper, Structures Best Paper Prize, and part of the team recognised with an Award of Excellence for Innovation for pioneering work on concrete reuse. He leads research initiatives on net-positive building systems, structural reuse, and decarbonisation in seismic design, and is active in developing methodologies that enable structures and infrastructure to deliver multiple lives, combining experimental testing, nonlinear modelling, and life-cycle assessment. He has led international knowledge-transfer and mentoring activities through research-led workshops across four continents. He is a Fellow of the Institution of Structural Engineers, a European Engineer (Eur Ing) of FEANI, and serves on several professional and expert committees and advisory groups in UK and Europe.



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