# BUILDING GREENER: THE ROLE OF DESIGN AND ALTERNATIVE MATERIALS IN THE DELIVERY OF SUSTAINABLE CONCRETE INFRASTRUCTURE

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## ABSTRACT

This address delves into the decarbonisation of concrete infrastructure via innovative design and the adoption of substitute materials that have the potential for substantial reductions in concrete's carbon footprint. It will focus on the crucial role of design in sustainable building, particularly in reducing the environmental impact of concrete. Discussion will centre on alternative binder concretes as a strategy for reducing greenhouse gas emissions and the role of high-performance materials like high-strength steels and Ultra-High-Performance Concrete (UHPC), which have the potential to deliver lighter, more efficient construction. Measures for pre-determining the potential of new materials will be described, along with sustainability performance criteria.

Furthermore, the presentation will assess barriers to the broad uptake of new, innovative materials and design approaches, alongside methods to overcome these barriers. It highlights the necessity for adaptive design codes and standards that support the integration of sustainable materials and methods, while ensuring no detrimental long-term impacts arise, such as excessive creep, shrinkage, or loss of durability—or that such impacts can be confidently assessed. This allows designers and decision-makers to make informed judgements and provides engineers, builders, and contractors with the essential tools needed for implementation in mainstream practice. The presentation concludes with a call to action, underlining the significance of cooperative efforts among researchers, governments, and industry stakeholders. It accentuates the need for substantial investment in research and development, clear policy guidance, and the rapid introduction of new codes and standards. This collective approach is crucial for realising the ambitious aim of reducing the construction sector's carbon footprint, ultimately contributing to carbon neutrality in the building industry.

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## Presenter

Stephen Foster a Professor of Structural Engineering at The University of New South Wales, Sydney, and the former Dean of Engineering (2020-23). He received his PhD from the University of New South Wales in 1993 and has over 40 years' experience as a structural engineer in practice and in teaching.

He is a Fellow of the Australian Academy of Technological Sciences and Engineering, Fellow of Engineers Australia, Fellow of fib, Honorary Member of the Concrete Institute of Australia (CIA), a member Australian Standards Committee BD2, Chairman of sub-committee BD2/1 "Strength and Analysis"BD2/6 "Fibre Reinforced Concrete", BD2/9 "Geopolymer Concrete", Member of Australia Standards Committee BD90.5 "Bridge Design – Concrete" and chaired the BD90.5 working group on "Fibre Reinforced Concrete" and he is a Member of Canadian Standards Association Task Force on "Canadian Highway Bridge Design Code Ultra High Performance Concrete".

He is the elected President of the International Federation for Structural Concrete (fib) (2023-24) and member of the fib Presidium.

Stephen has over 400 publications in the field of structural concrete and concrete materials, with textbooks on Reinforced Concrete and Prestressed Concrete. His main research interests are in the fields of bringing new materials technologies to the design concrete structures, including fibre and ultra-high-performance concrete, low carbon construction materials such as Geopolymer and alkaline activated concretes and high strength reinforcing steels.

He chaired committee that developed the first national Standards Australia Technical Specification "Design of geopolymer and alkali activated binder concrete structures" (SA TS 199.