

# Smart Materials and Sustainable Technologies

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## Robust sustainable infrastructure using smart materials and technologies

**Khandaker M Anwar Hossain**  
Ryerson University, Canada

Civil infrastructure constitutes a major proportion of Canada's wealth and thus, it behooves the scientific community and relevant industries to develop superior new construction materials and technologies. During the last decades, tremendous progress has been made on the high performance concrete (HPC) technology. One such emerging HPC technology involves the family of fibre reinforced engineered concrete (EC). With intrinsically tight crack width, high tensile ductility (300 to 500 times greater than

conventional concrete) and self-healing potential, smart EC offers significant potential to resolve durability problems of concrete structures and to be used either in new construction or as repair material. Research at Ryerson University lead to the development of greener and sustainable ECs (with demonstrated self-healing ability) by incorporating supplementary cementing materials, industrial by-products, natural pozzolans, local sands, MgO expansive agent and bacteria. This paper will demonstrate the viability of using novel EC technology in building and bridge structures through using results of experimental investigations. The structural performance of robust EC-based slab-coupled shear wall system, building frames and joint-free bridge decks (with flexible EC link slab) compared

to their traditional concrete counterparts will be described based on enhancement in strength, ductility, energy absorbing capacity, post-cracking load resistance and crack width control as well as self-healing ability (in terms of crack-healing, strength/energy/ductility recovery of damaged healed specimens).

### Biography

Khandaker Hossain is Professor of Civil Engineering at Ryerson University, Canada. He received PhD from Strathclyde University, Glasgow, UK. He has over 30 years of experience as academic, researcher and consultant engineer in various parts of the world. Hossain's research interests include: high performance concrete, smart self-healing materials and RC/composite construction. He is a member of ACI Committee 213 and 232, CSCE's Structural and Materials & Mechanics division and as editorial board member of several journals. He has published over 350 publications including over 190 journal papers and received 2018 ACI Wason Medal for materials research.

[ahossain@ryerson.ca](mailto:ahossain@ryerson.ca)