A High-Strength Partnership

High-strength steel-concrete composite research aims to lower the construction industry's carbon footprint.

Professor Mark Bradford, from the School's Centre for Infrastructure and Engineering Safety (CIES), and his collaborators have their sights set high (30 storeys at least!) in this recently awarded Australian Research Council (ARC) Linkage Project. His team have been granted $380,000 to investigate the use of high-strength steel in building frames of composite steel-concrete, for use in buildings from a few storeys to skyscrapers.

Mild or structural steel is currently the most commonly used in construction, but high-strength steel is increasingly being utilised overseas due to its greater strength-to-weight ratio. Using high-strength steel means a lighter composite structure, less material usage and smaller foundations, which, in turn, leads to a reduction in the cost and carbon footprint of steel-framed buildings.

Our research has the potential to have an immense impact in the steel manufacturing, construction and building sectors. It's a really exciting project.

"Ordinary Portland cement is the most common type of cement in general use around the world," says Professor Bradford. "But it is also one of the biggest anthropogenic sources of CO2. A key outcome of our research would be developing a design guidance which expands the use of high-strength steel and significantly reduces the amount of cement needed in construction by focusing on a new generation of low-carbon cement alternatives."

Professor Bradford and his research team will be collaborating with researchers and industry partners at Tsinghua University and China Construction Steel Structure Corp Ltd (CCSSC) in China. "Both UNSW and Tsinghua have enviable track records of excellence in research in this area," says Professor Bradford, and his colleague Professor Lin-Hai Han from Tsinghua couldn't agree more: "There is no group internationally who can complement our high-strength steel team better than CIES in

Australia," he says. "This opportunity is exciting for us all, bringing together the best researchers in the world in this particular discipline."

CCSSC is the leading steel construction company in China and they are well aware of the opportunities that using high-strength steel presents. Frank Wang, CEO, explains that his R&D team is very interested in advancing their knowledge and expertise. "This project aligns completely with our belief that this type of composite beam system is the future of steel building construction in China, Australia and elsewhere."

With an incredible personal track record of academic collaborative achievement, Professor Bradford is confident of their success.

Professor Mark Bradford was recently presented by NSW Premier Mike Baird with the "Excellence in Engineering & Information and Communications Technology" prize in the 2015 NSW Premier's Prizes for Science and Engineering. Mark has been proactive in embedding university research into industry practice, specially through design standards and textbooks. Having built a team of critical mass through his Federation and Laureate Fellowships in the areas of steel and steel-concrete structural engineering, Mark has been concentrating in recent times on progressing these disciplines into the broader paradigms of sustainable and low-carbon full-life cycle structural engineering practice, which is a challenge of immense significance in the construction sector.