UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

Bradford Centre for Sustainable Environments

Ashraf Ashour

School of Engineering, Design and Technology
University of Bradford

UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

Meet The Team (BCSE)

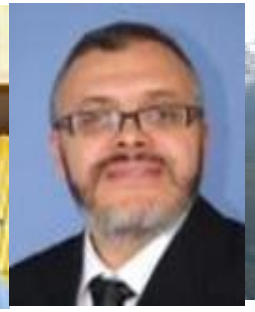
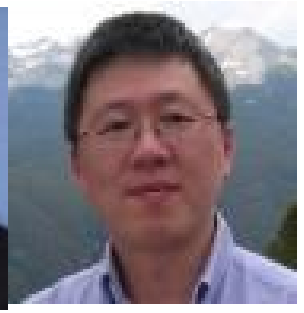


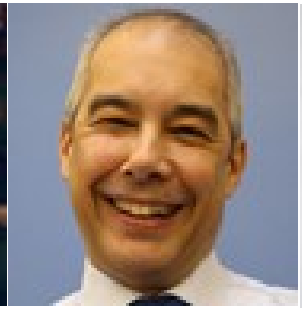






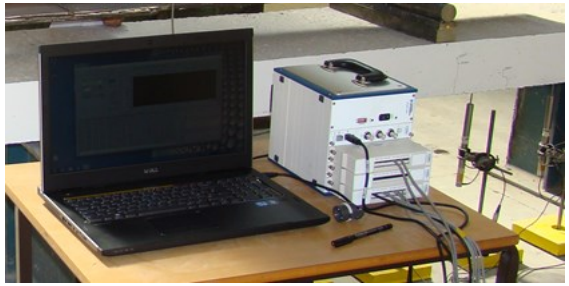



UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

Recent investment in the heavy structural laboratory



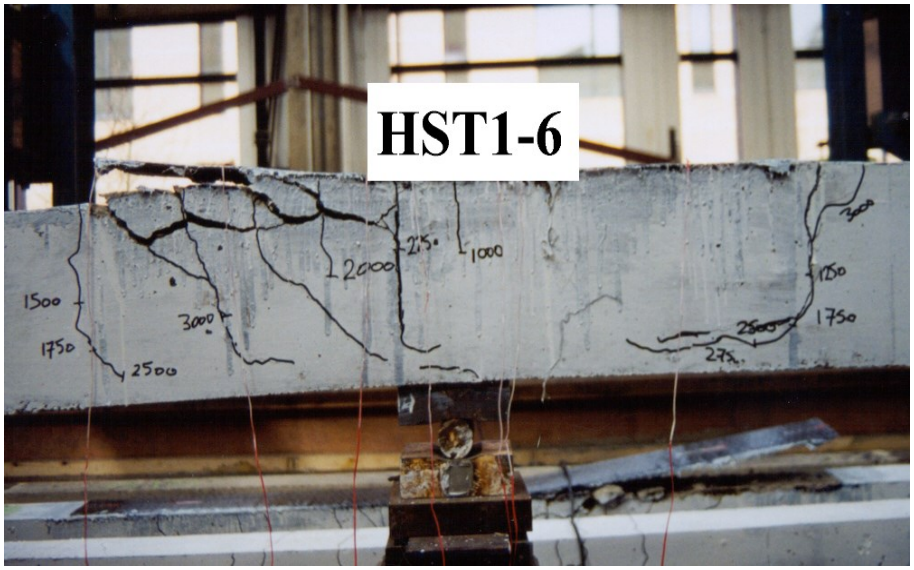
Recently completed projects

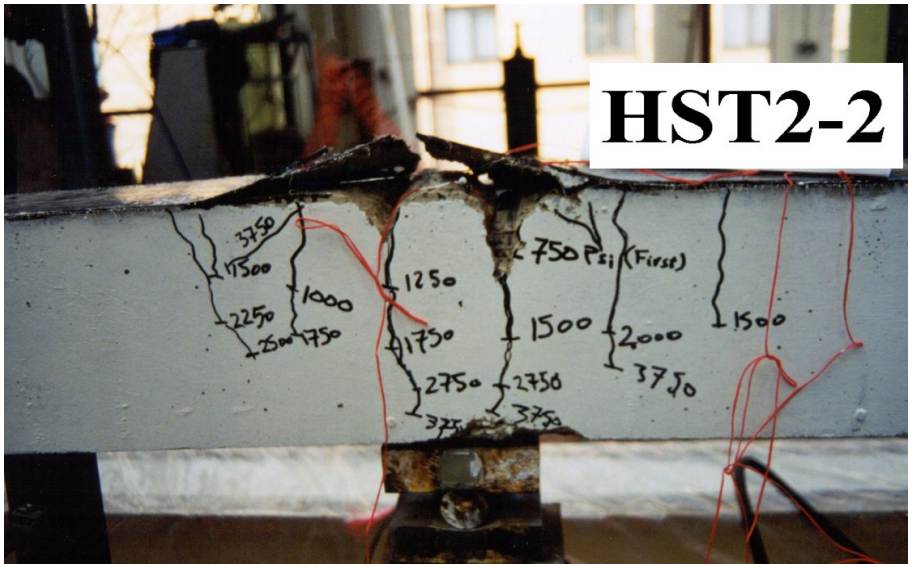
Strengthening of concrete and masonry structures

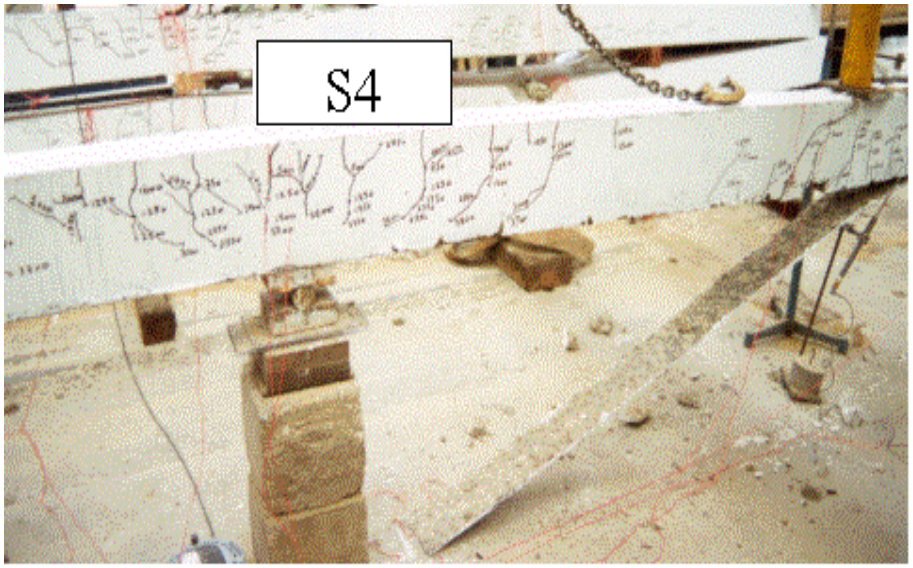
- RC continuous beams with external FRP laminates;
- Near surface reinforcement to strengthen masonry arches;
- Wire rope units to strengthen RC columns and beams.

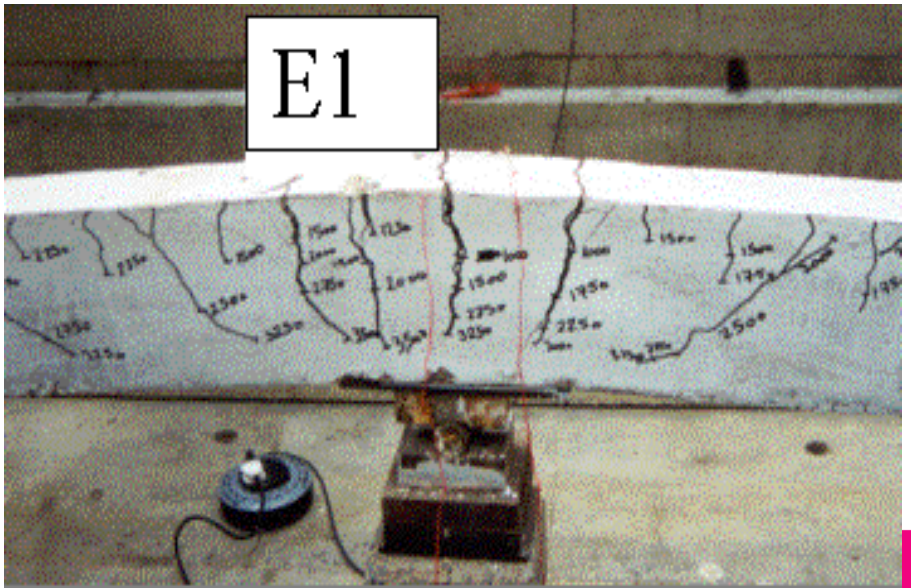
UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

RC continuous beams with external FRP laminates







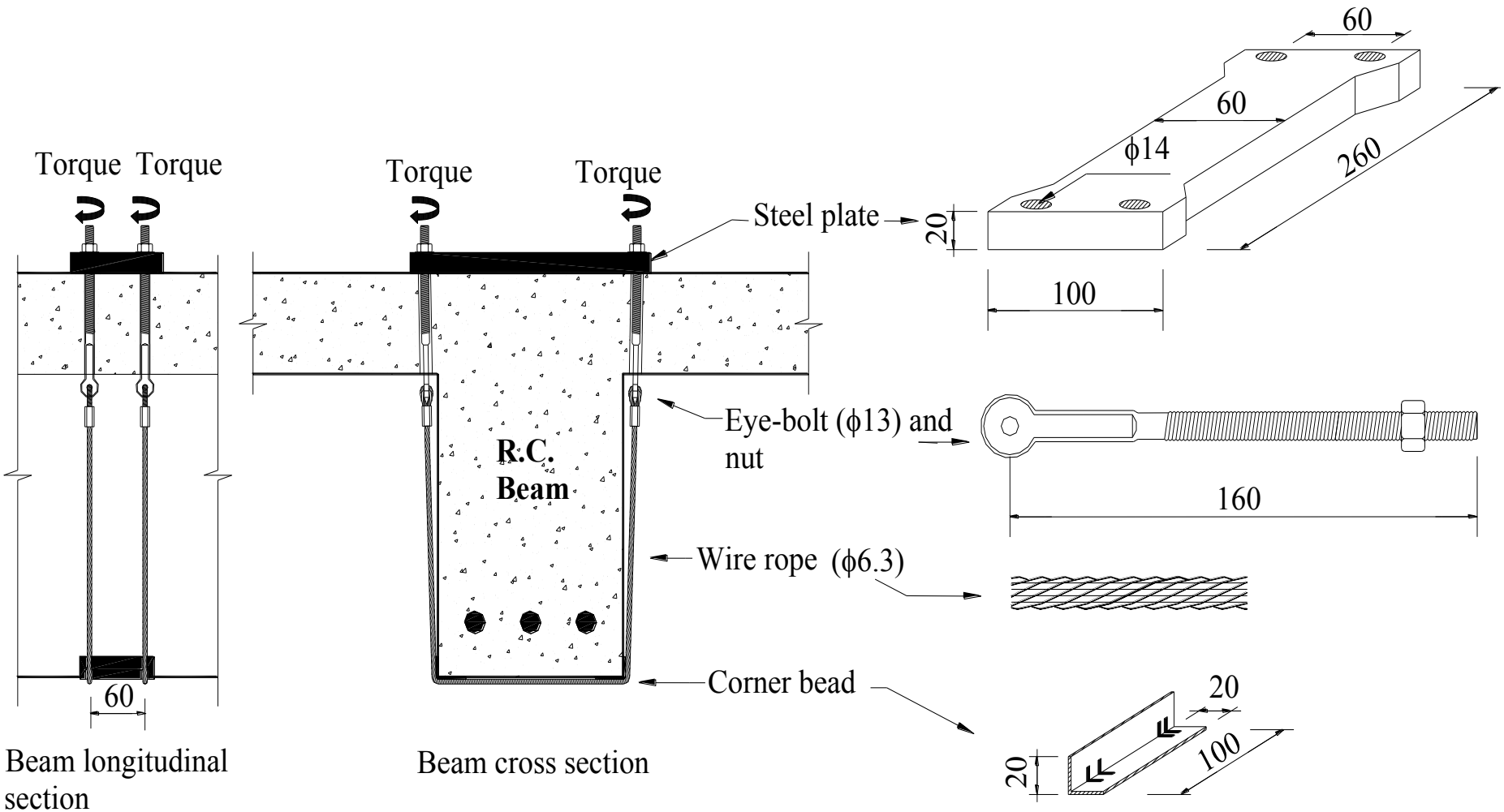


UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

Near surface reinforcement for masonry arches

UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

Wire rope units for RC columns and beams strengthening



Beam longitudinal section

Beam cross section

FRP internal reinforcing bars in concrete beams/slabs

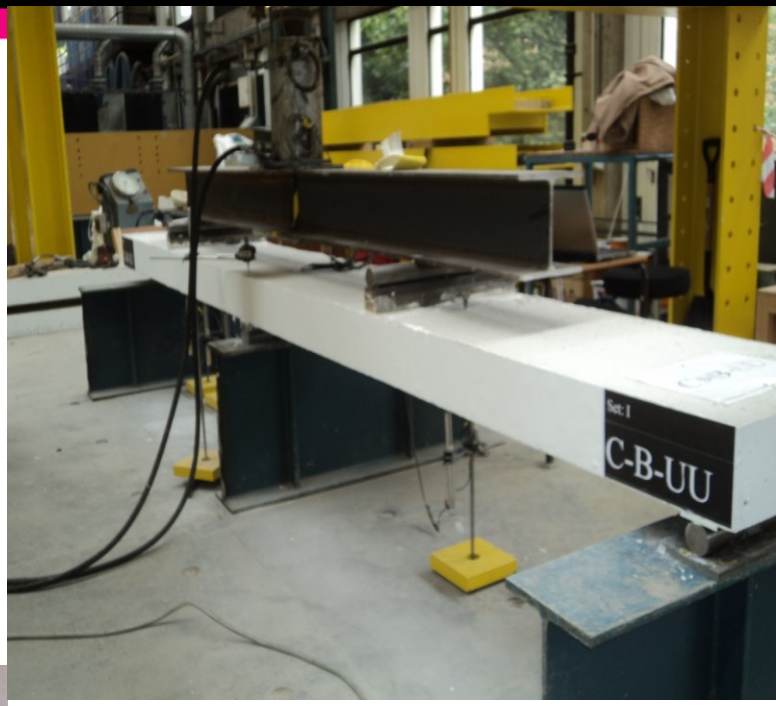
- Simply and continuously supported beams/slabs;
- Rectangle and flanged section beams;
- Glass/Carbon fibre reinforced polymer bars;
- Flexural and shear testing.

UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

Flanged section beams

UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

Continuous FRP beams/slabs



UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

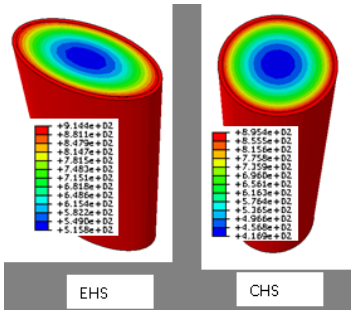
Concrete-filled steel tubular columns

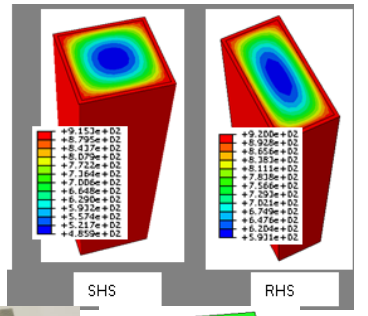
CS4-test

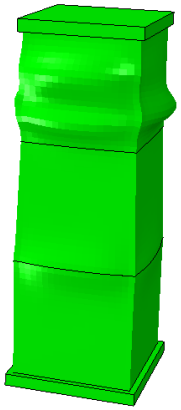
CS7-test

CS4-FEM

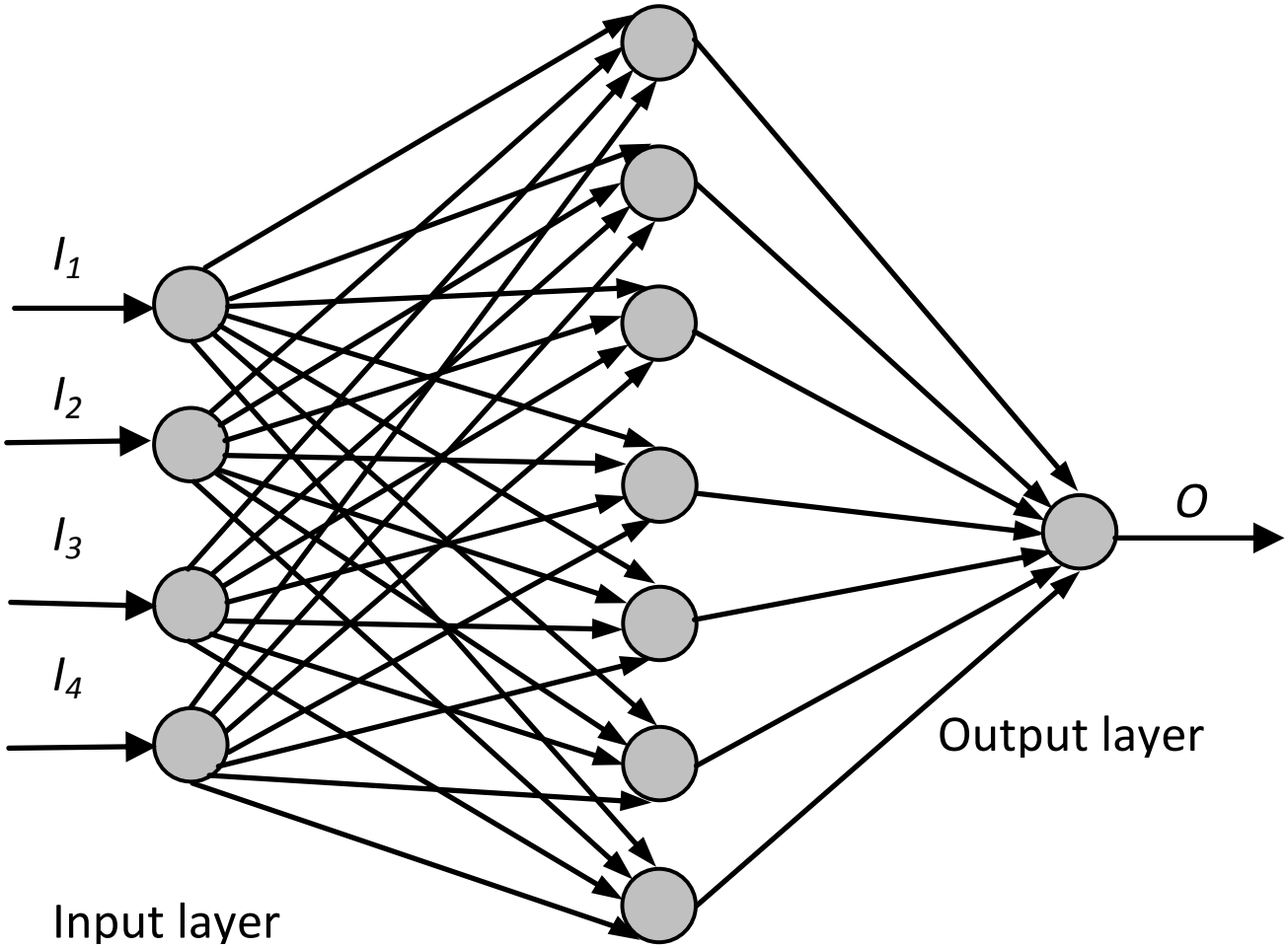
CS7-FEM







Neural network modelling of RC elements

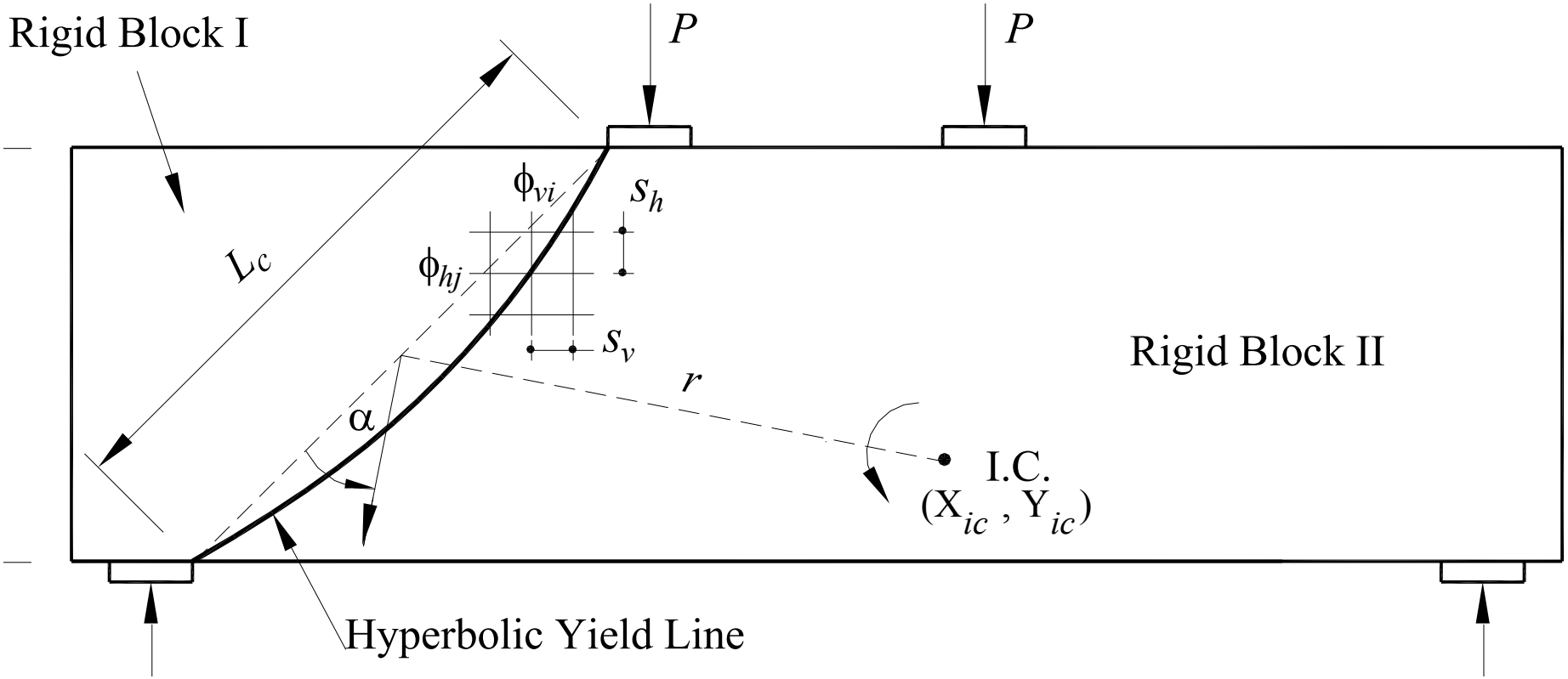


Neural network modelling of RC elements

NNs were trained and tested to model:

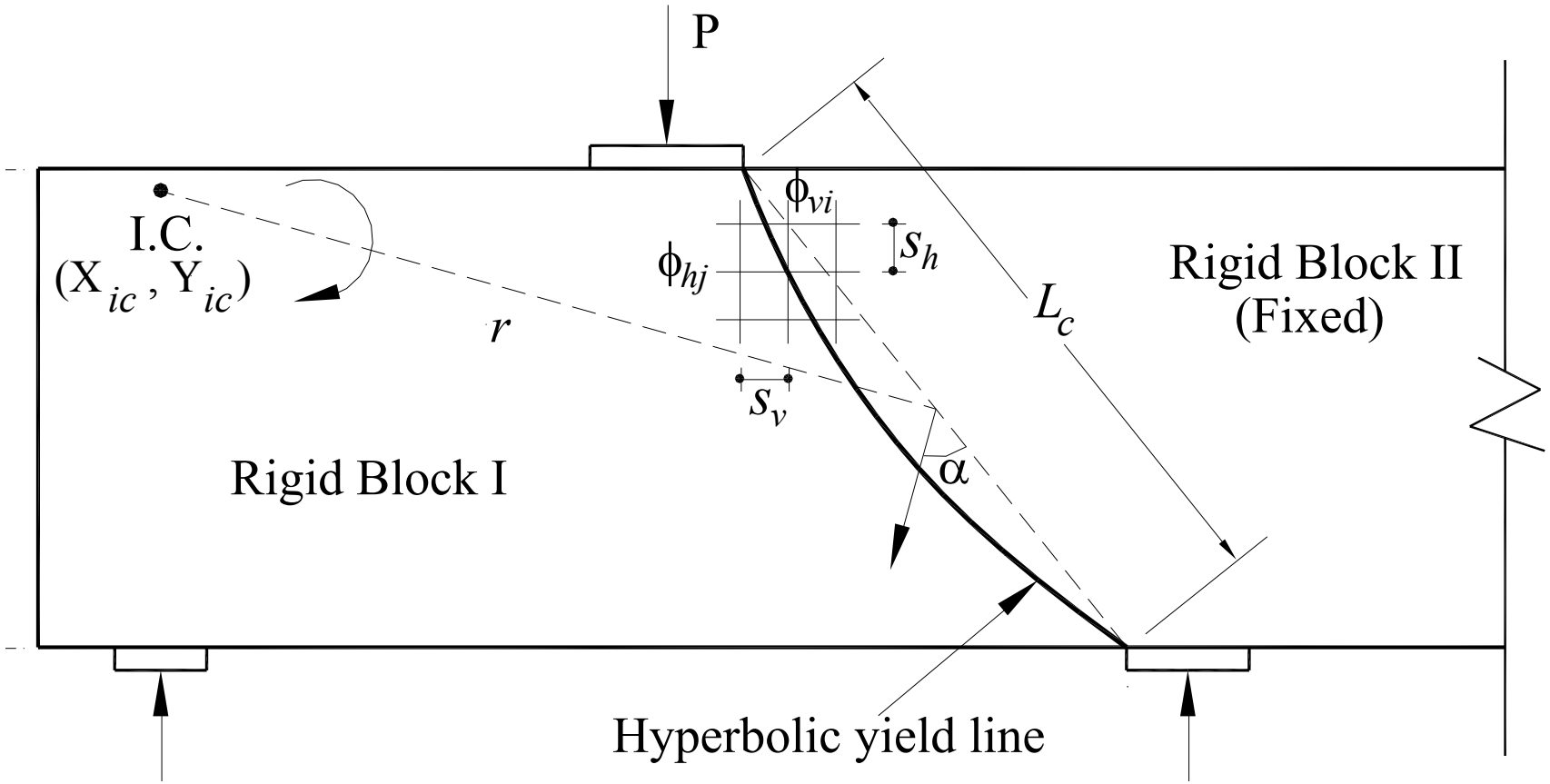
- Concrete breakout shear/tensile capacities of cast-in and post installed anchors;
- Concrete tensile capacity of adhesive anchors;
- Shear capacity of reinforced concrete beams;
- Initial flow and 28-day compressive strength of alkali activated mortars.

Mechanism analysis for deep beams



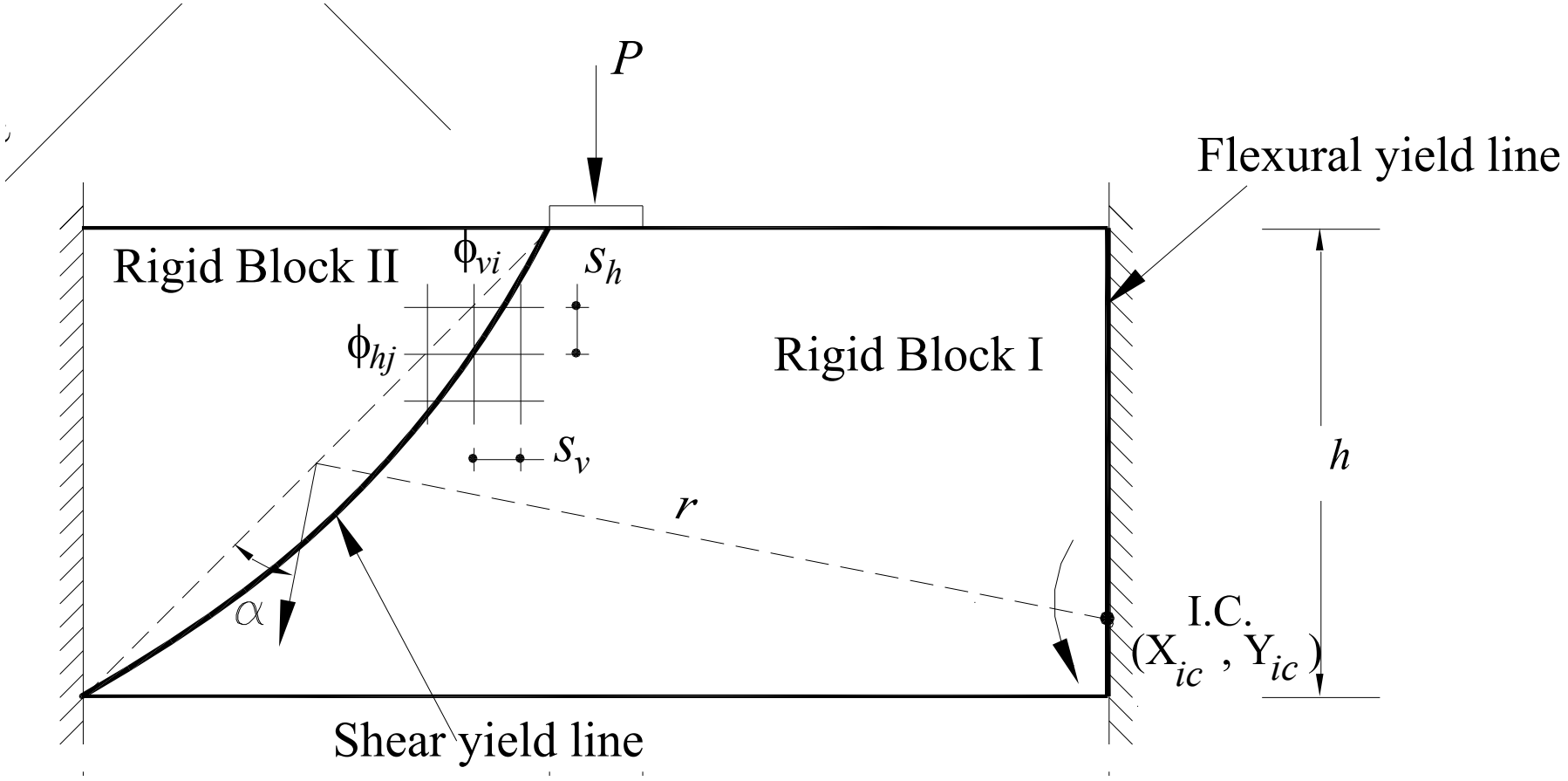
Unsymmetrical failure mechanism of simple deep beams

Mechanism analysis for deep beams



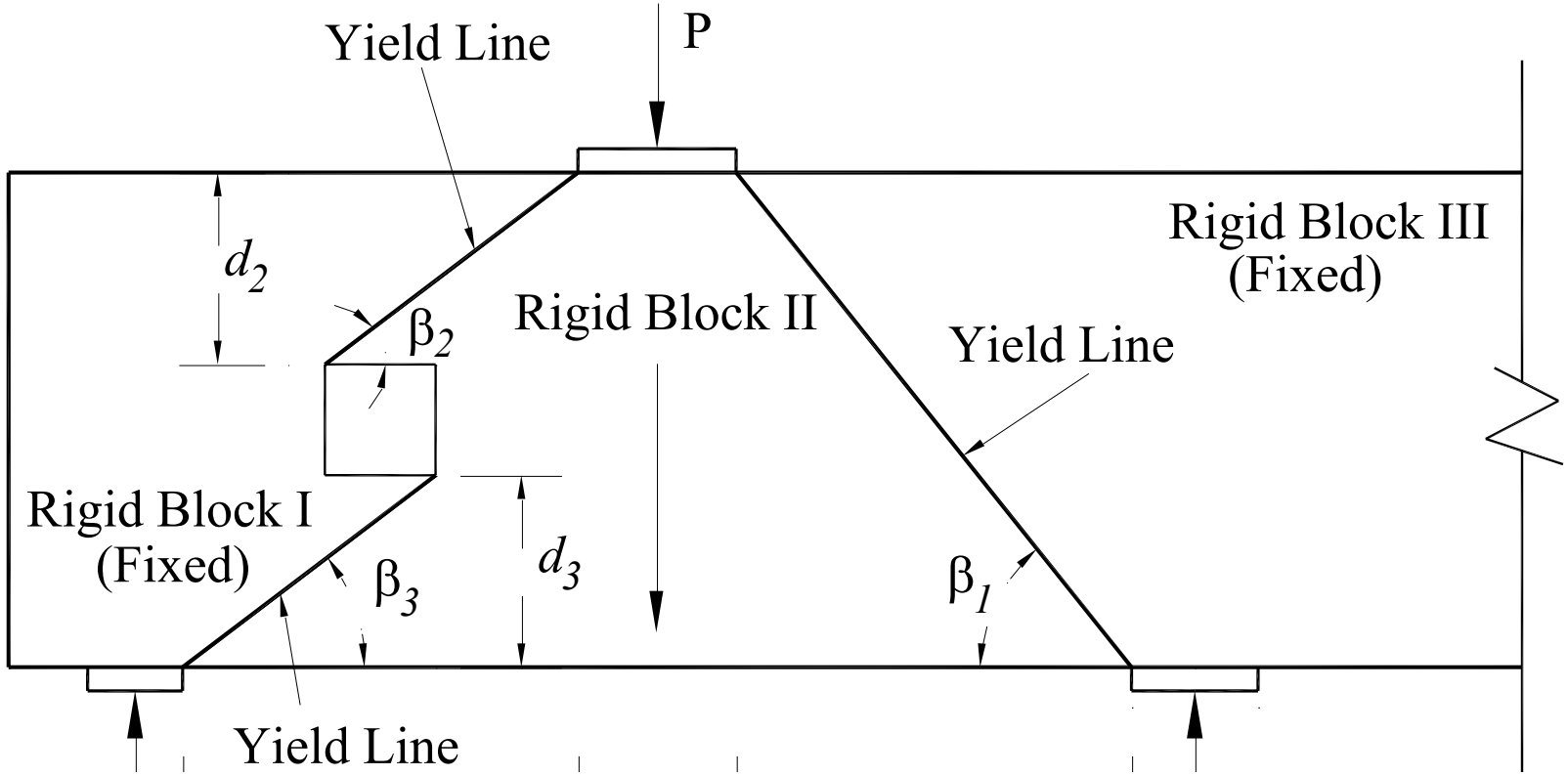
Unsymmetrical failure mechanism of continuous deep beams

Mechanism analysis for deep beams



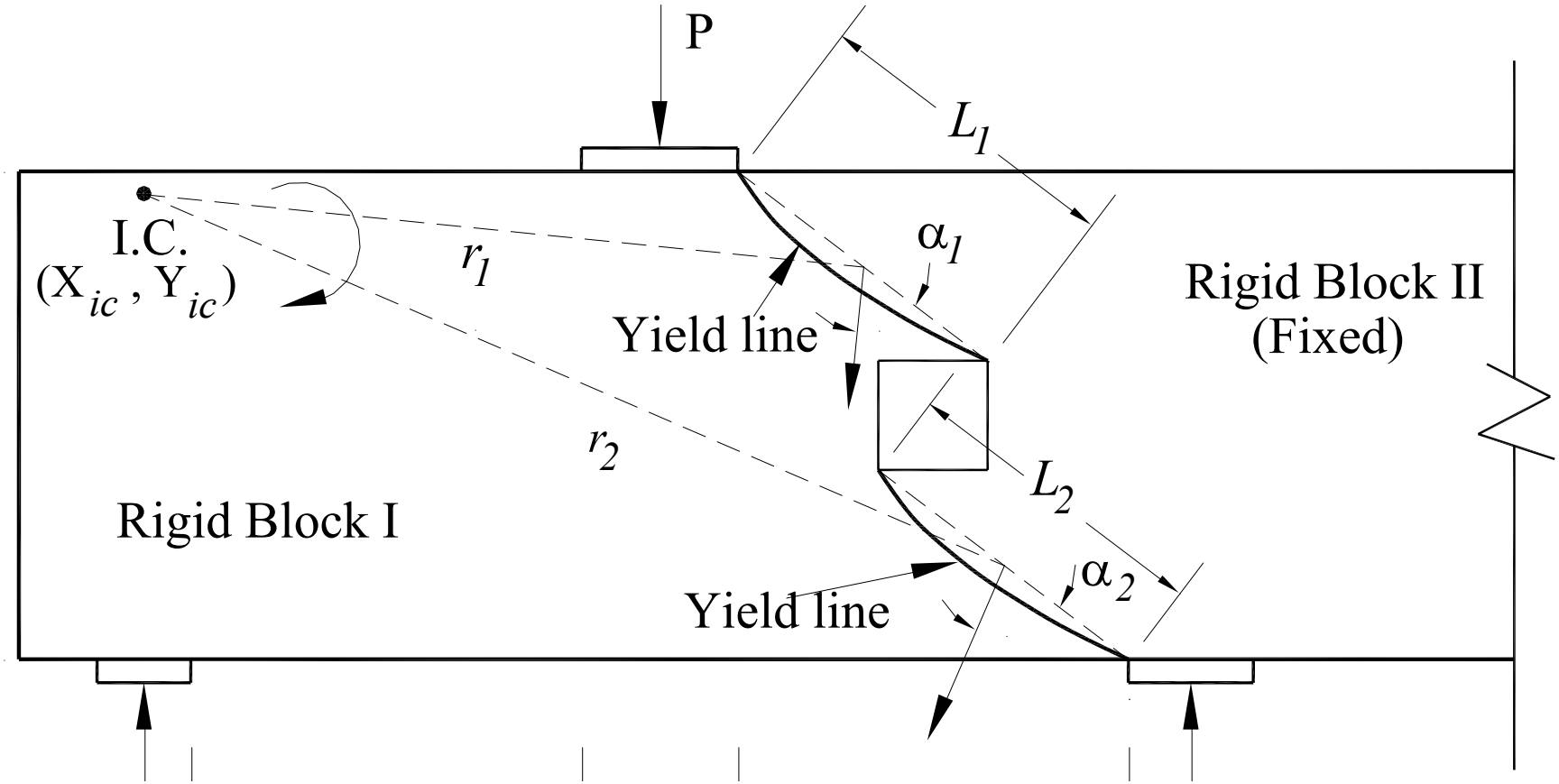
Combined shear-flexural mechanism of deep beams with fixed end supports

Mechanism analysis for deep beams



Continuous deep beams having openings within exterior shear

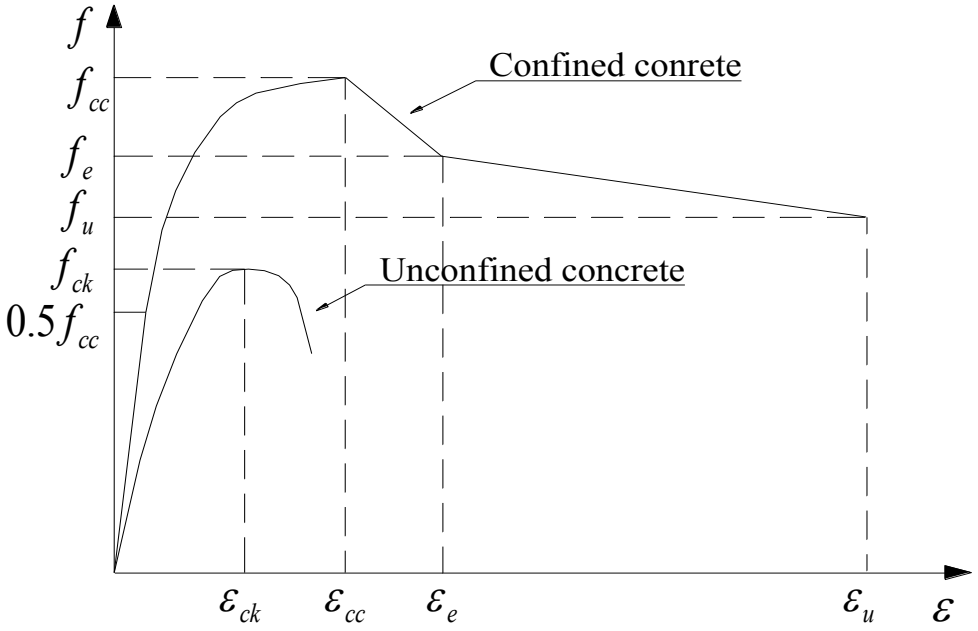
Mechanism analysis for deep beams

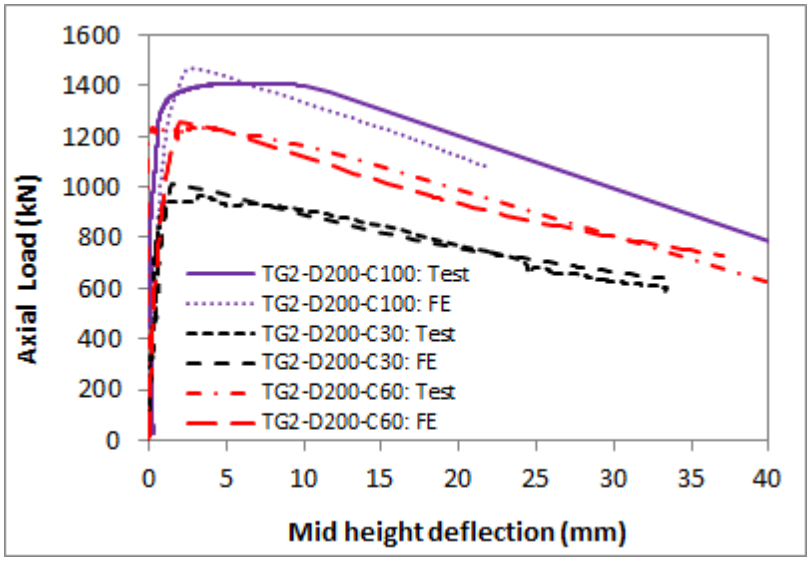


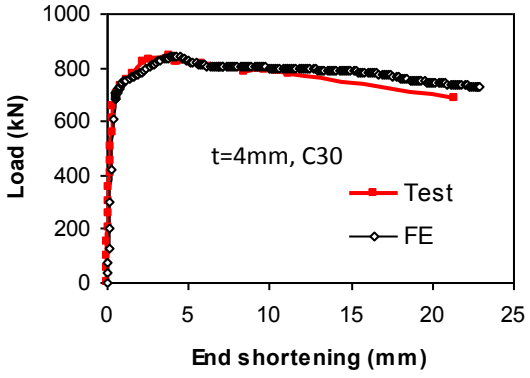
Continuous deep beams having openings within interior shear

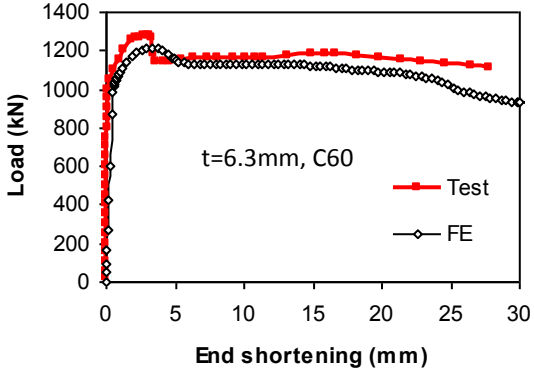
UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

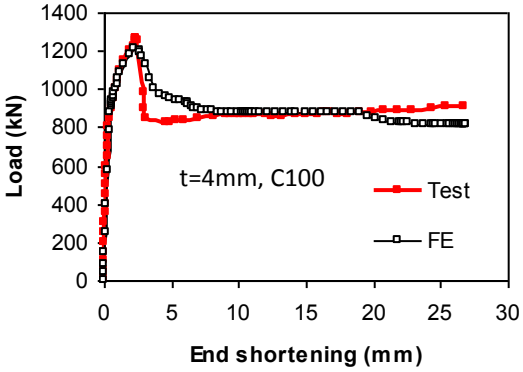
Concrete-filled steel tubular columns









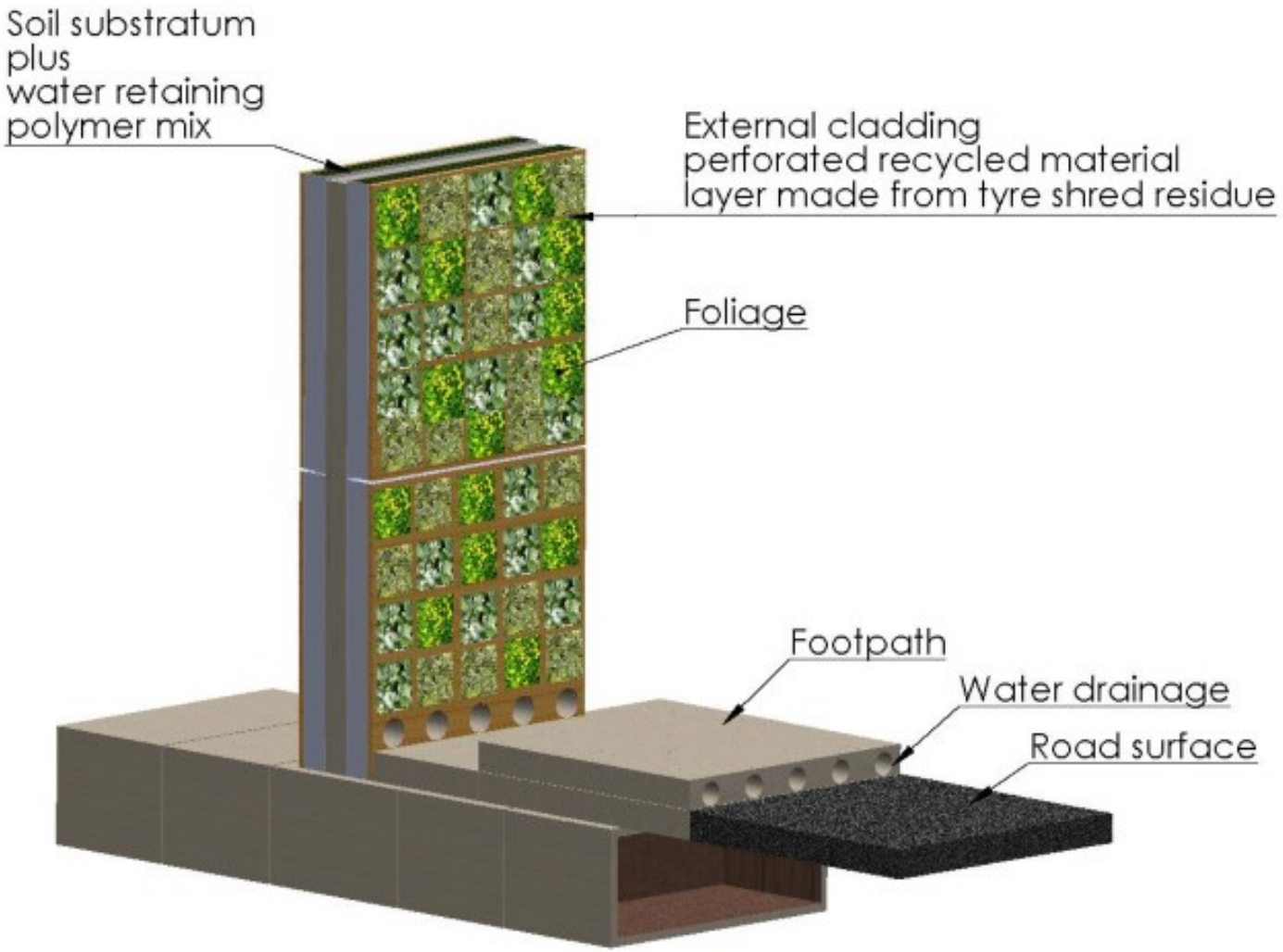


UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

Current/Future Projects

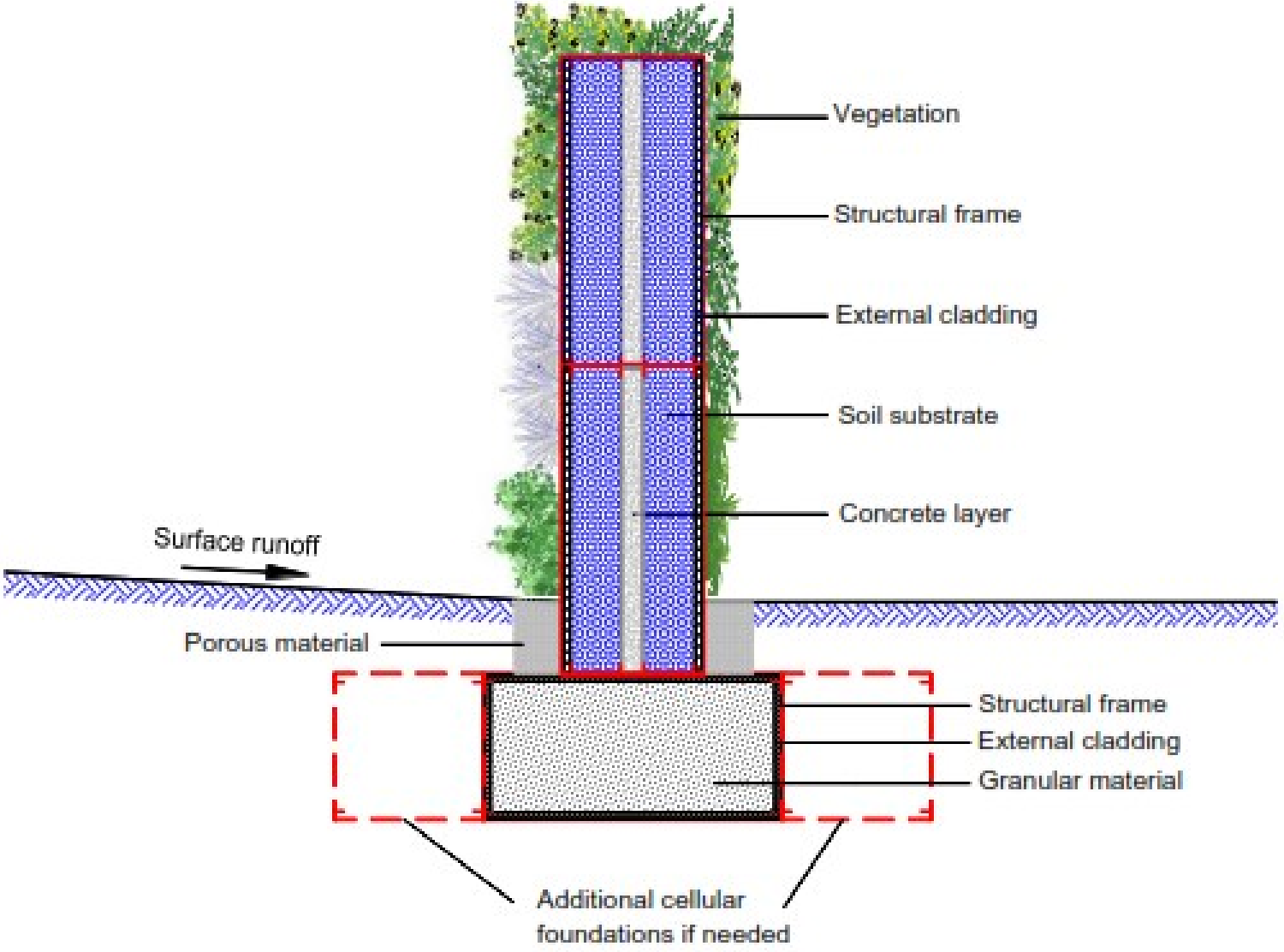
UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

Multifunction flood defence infrastructure

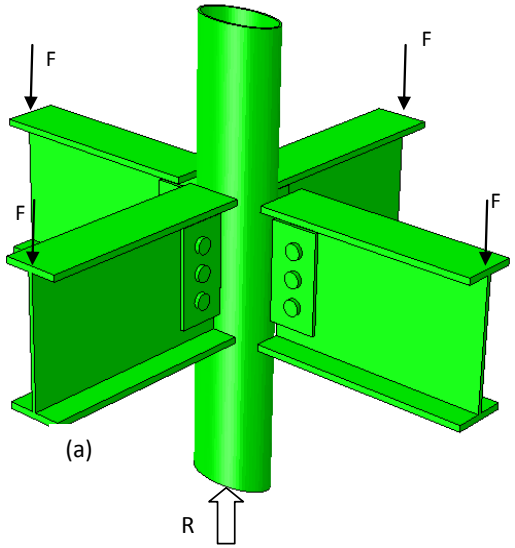


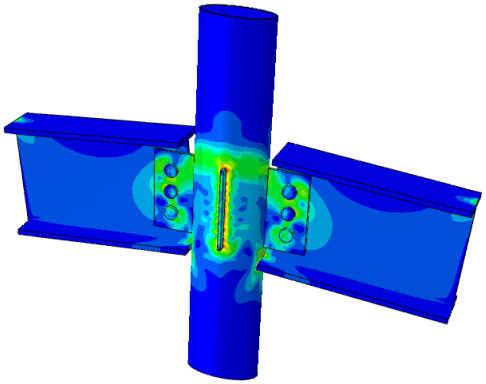
UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

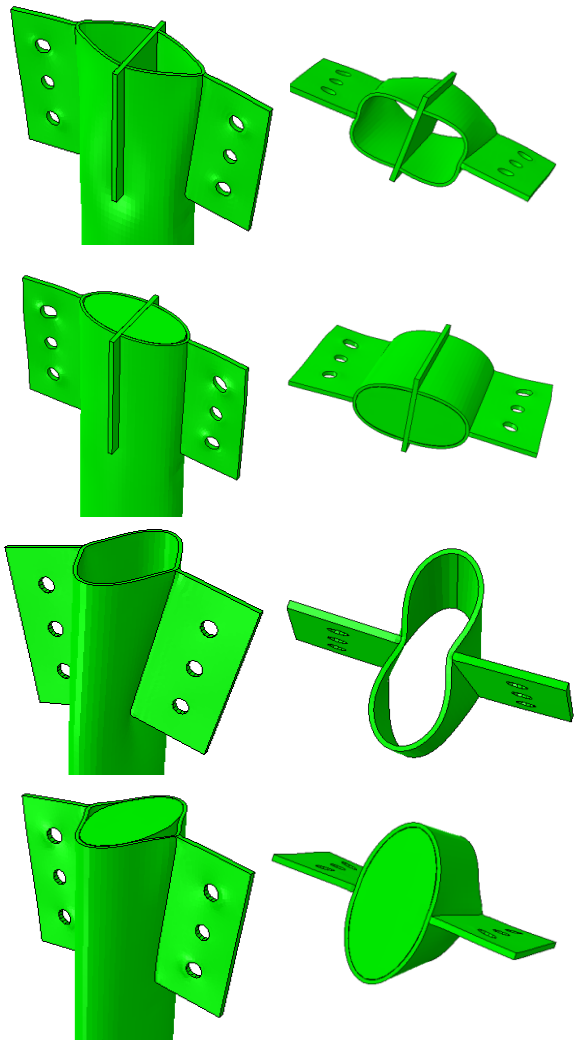
Multifunction flood defence infrastructure

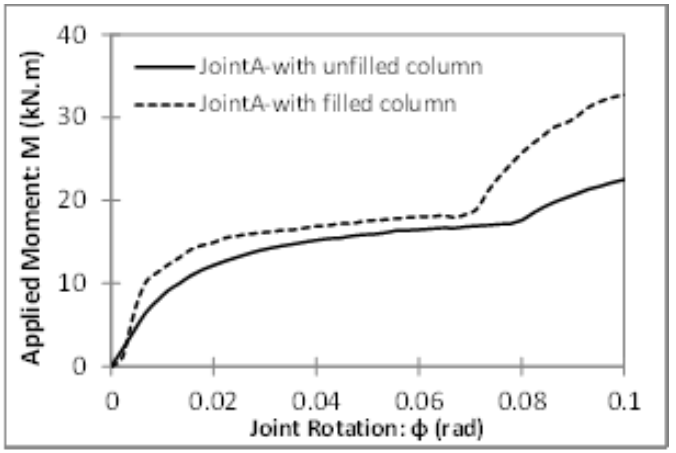


Elliptical concrete filled steel tube column to I-beam joints

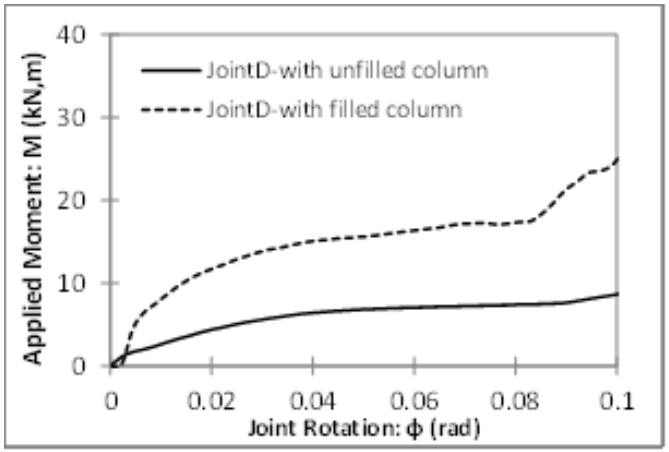








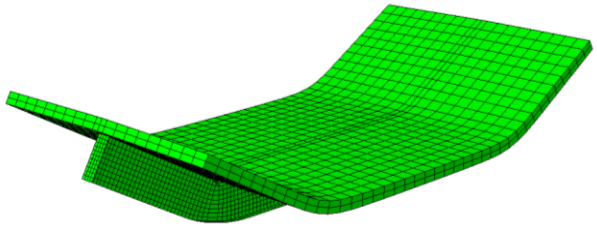
(a) Moment vs. rotation curves

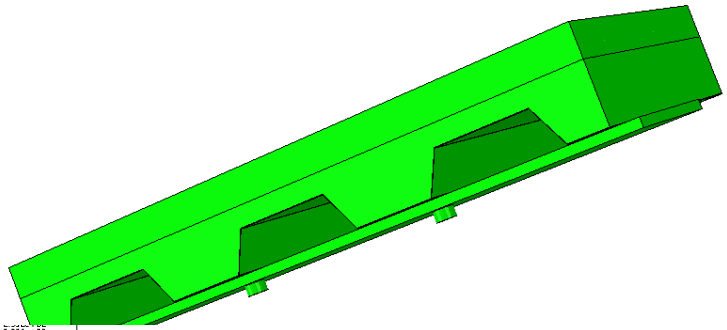


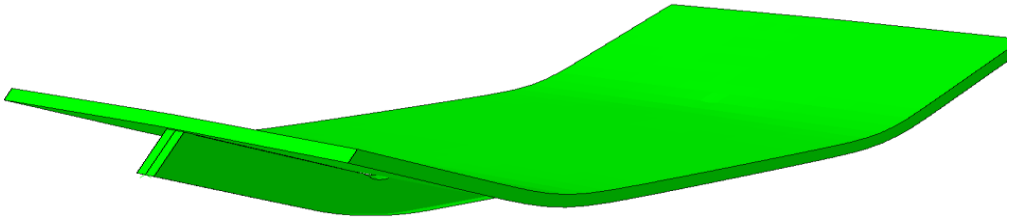
(a) Moment vs. rotation curves

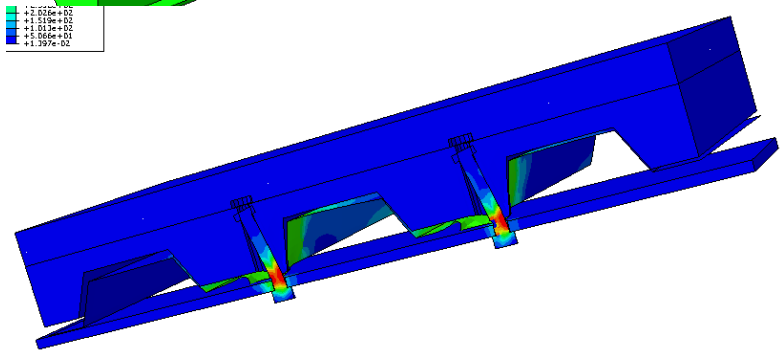
UNIVERSITY OF BRADFORD
MAKING KNOWLEDGE WORK

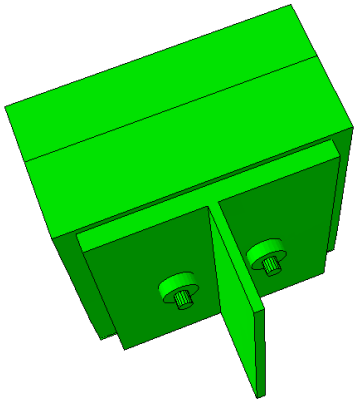
Large scale testing of composite beams

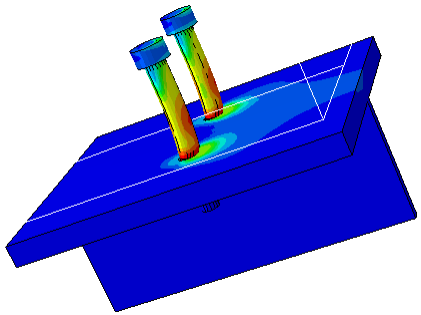


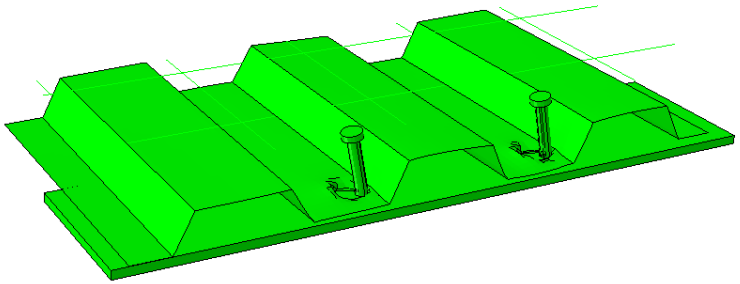












Future Projects

- Development/use of high performance fibre reinforced cementitious composites for concrete repair.
- Grid shell structures made from FRP.