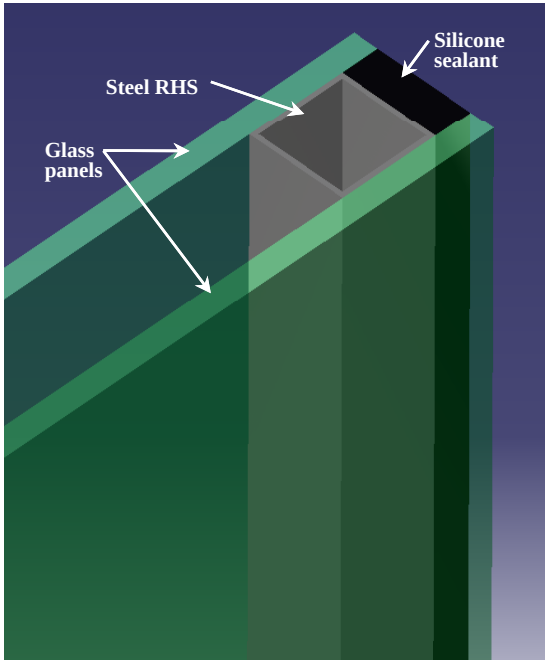
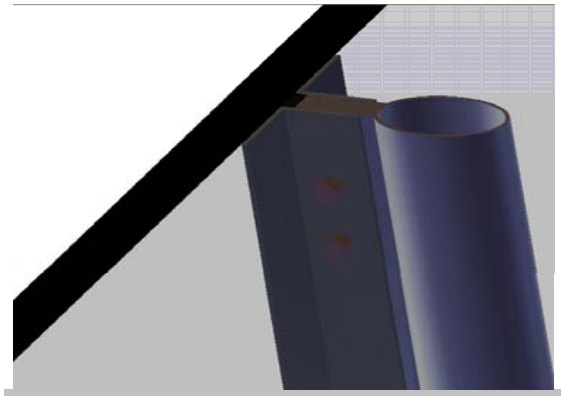
Steel-Glass Composite Structures

Research Student | Shelton Nhamoinesu
Supervisors | *Dr. Mauro Overend*

CAD visualisation of the steel-glass composite system with steel rectangular hallow sections



CAD visualisation of the steel-glass composite system with steel angles



Overview | *Glass is often used in conjunction with steel framing but the two materials rarely act in a fully composite manner. In most glazing systems including mullion and transom systems, structural silicone glazing and bolted assemblies, the load bearing potential of glass is not fully utilized making these systems structurally inefficient. The inefficiency of bolted assemblies arises from the stress raising surface flaws in the vicinity of the hole and the stress raising characteristics inherent in bolted connections. In structural silicone glazing, the characteristically low stiffness of silicone fails to provide the high strength adhesion required between the glass and the metal resulting in a joint with a relatively low load bearing capacity. To date there are no cost effective joining methods that allow efficient load transfer between glass and steel.*

Outcomes & Impact | *This research aims to develop a new generation of steel-glass composite structures that achieve optimum in-service performance. This will be achieved by developing novel high strength, durable, aesthetically pleasing and economical steel-glass connections that enable both glass and steel to contribute to the global load bearing capacity of the structure. The system will improve transparency and material efficiency in façade systems.*

Work involved | *Compression-relaxation tests on selected adhesives will be performed to obtain bulk material properties for modelling steel-glass connections. Numerical models of steel-glass adhesive and bolted connections will be developed and validated experimentally by double lap shear tests, three-point-bending peel tests and cyclic fatigue tests on small scale steel-glass connections. Computational models of full scale steel-glass composite modules will be developed followed by experimental validation through 4-point dynamic tests and static ramp tests on full-scale steel-glass composite modules.*

Sponsors & Partners | *TATA Steel, EPSRC*