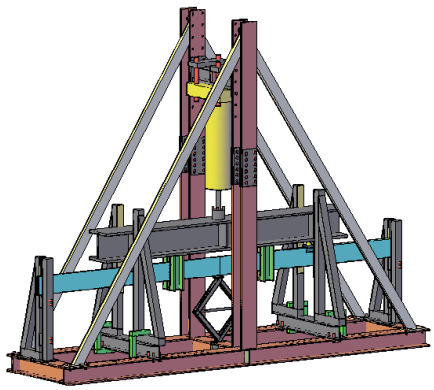
	Project sheet	
Research project :	Robustness and accidental loading of reinforced glass beams under statically indeterminate support conditions	
Images :		
	Figure 1: Test setup	Figure 2: steel connected glass beams
Keywords :	Structural glass, reinforced, robustness, transparent connection	
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Time span :	2013 – ongoing	
Description :	Structural glass is evolving as a feasible concept in modern construction. In particular, reinforced structural glass beams are very promising as they show ductile failure behaviour and significant post-breakage strength. However, as the production of glass panes and the lamination process impose dimensional limits on the size of these beams, it is important to investigate the connection possibilities between them. Especially at the supports, which can fail by an accidental action for example, it is important that a connection provides sufficient robustness to avoid immediate collapse of the system. The goal is to develop a connection element that shows ductile failure behaviour, but which does not compromise the overall transparency too much. In a first step of the developing process, it is investigated which requirements are to be satisfied by the connection. Therefore, a four-point bending test setup including a central removable support is used to test two types of beam specimens (Figure 1). This setup is used to simulate the behavioural change when the support conditions of a beam system evolve from a statically indeterminate to a statically determinate situation. As the behaviour is temperature-dependent, the setup is placed in a climate chamber where the tests will be performed at 23°C and 65°C. The main focus is situated at the centre of the beams, where the connection is to be applied. A first type of beam specimens exists of two 1.5 m reinforced laminated glass beams that are connected by using reinforcement that spans both beams. Analysis of the test results will yield insight in the ability of the reinforcement to be used as a part of the connection element. The second type of beam specimens exists of 3m continuously reinforced glass beams. From these tests, insight in the behavioural change of a normal reinforced glass beam is obtained. The combination of the outcomes of both tests provides important properties for the connection to be developed. Next, different ductile connections will be developed. These connections will be investigated according to a prescribed series of tests in order to assess their ability to serve as a robust connection element. Important characteristics are the failure load, ductility and the mechanism by which the loads are transferred through the connection. Finally, one or more connections will be withheld and further improved.	

	Then, connected beam specimens will be produced and investigated in the same testing procedure as described above in order to evaluate their failure behaviour. Also, exemplary large scale applications will be built and tested in the lab. In a final step, an attempt will be made to quantify the robustness of these connected glass beam systems in a deterministic way. Performing this quantification for other beam systems such as unconnected statically determinate systems or statically indeterminate supported beams allows to easily compare the safety of these alternatives.
Most important publications:	
Working group :	WG 3: Post-fracture performance WG 4: Novel glass assemblies
Category :	TG 9: Learning from failure TG 10: Connections TG 13: Hybrid components
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