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EXECUTIVE SUMMARY

Structural strengthening is the act of applying strengthening materials to a structural member to increase its flexural, shear or compression capacity. The most common reason for structural strengthening is perhaps to replace the loss of strength due to the ageing of structures, although it is not uncommon for structural strengthening to be applied to rectify mistakes made during construction. When structures are damaged, there needs to be a fast-acting and substantial structural strengthening applied to it. Achieving this with fibre-reinforced polymers (FRP), which is currently the most favoured strengthening material, is made difficult since both the FRP and the epoxy adhesive are highly vulnerable to high temperatures. In particular, the glass transition temperature of epoxy is between 50°C to 90°C, during which there will be loss of bond strength. Ultra-high performance concrete (UHPC) is a type of engineered cementitious composite that is defined by a compressive strength that is more than 150 MPa. UHPC is fast curing and can achieve compressive strength that is above 90 MPa in one day. Importantly, the UHPC have a fire resistance that is quite similar to normal concrete, especially if polypropylene fibres are added to the UHPC. This means that no loss of compressive strength should occur on the UHPC until the temperature rises above 400°C. Currently, the UHPC has been applied as a strengthening method in several studies. In one of the most recent studies, a compressive stress-strain model for UHPC confined column was proposed. However, the studies so far focused on newly made columns with no defects. Therefore, in this research, the compressive behaviour of damaged concrete that is confined with UHPC will be studied.