Worldwide, many existing reinforced concrete structures are in urgent need of structural repair or strengthening due to:

- deterioration and growing load capacity demands.

In the UK alone, the vast majority of concrete bridges built since the 1930’s are deemed no longer capable of sustaining increased traffic volumes.

It is estimated that there are approximately:

- 10,000 trunk road and motorway bridges and
- 150,000 local road bridges.

Investigation of the most commonly used design assumption of load sharing in shear:

\[ V_{\text{ultimate}} = V_{\text{concrete}} + V_{\text{steel}} + V_{\text{composite}} \]

Studied parameters:

- Varying percentage of shear reinforcement
- Varying thickness of applied composite materials
- Bond length and anchorage influence on strength
- Load distribution and sharing between components
- Various strengthening solutions using bars and sheets

A number of mechanical tests on realistically sized reinforced concrete elements are necessary in order to develop reliable composite strengthening design guidelines.

Intermediate conclusions:

Advanced composites can contribute significantly to the ultimate shear capacity of reinforced concrete elements. Performance of strengthened reinforced concrete elements is dependent on strengthening solution, bond length and anchorage of the CFRP materials.

Experimental investigation on push-off specimens revealed that

\[ V_{\text{ultimate}} \neq V_{\text{concrete}} + V_{\text{steel}} + V_{\text{composite}} \]