

# CASE STUDY

## Carbon Fibre Strengthening

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### PROJECT

Merrion Centre MSCP

### STRUCTURE

Multi-storey Car Park

### CLIENT

Citipark / GMI Group

### CONTRACT VALUE

£3,250,000

### CONTRACT



Built in 1964, the Merrion Shopping Centre car park was the first multi-storey of its kind to be built in Leeds and was the 1st phase of the Merrion Centre's construction, the 2nd phase of the shopping centre being built in 1972.

The car park is 110m long by 48m wide overall and is a split level deck design with a one-way flow configuration. Prior to the structural refurbishment, it provided parking for 1050 vehicles over eight separate decks.

The structure comprises a combination of pre-cast and in-situ reinforced concrete elements with the decks constructed from precast, pre-stressed concrete planks spanning between precast, pre-stressed inverted-T bridge beams. The beams are supported simply on corbels on columns or primary beams running between columns. The planks are overlaid with an in-situ reinforced concrete topping providing the wearing surface for the decks which for the large part were in very poor condition

Following a series of condition reviews, testing & investigative works, a series of structural deficiencies were identified. As well as large areas of the reinforced structural topping having delaminated from the supporting pre-cast planks, there were also a number of isolated supporting beams throughout that were showing signs of excessive deflection, resulting in a complete change in the car park's structural performance.



Before



Before

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## Association Membership



## Accreditations

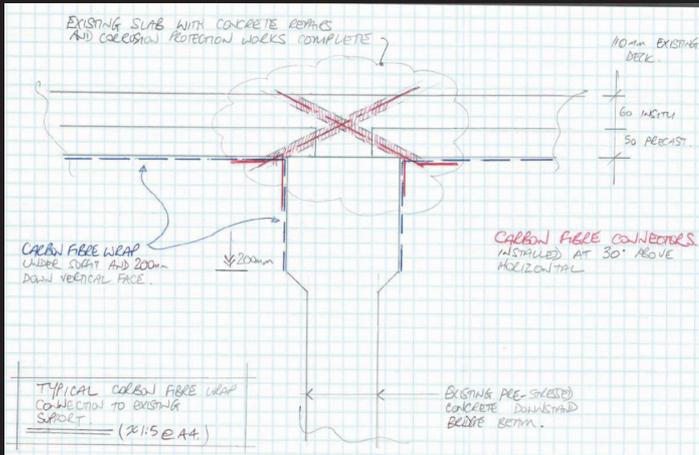


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Strengthening was required to areas of the existing primary structure that had or was showing signs of structural distress, and there were TWO proposed areas of application:

- Strengthen isolated reinforced concrete beams which were showing signs of excessive deflection. It was proposed that carbon plates would be applied to these beams subject to detailed design
- Wholesale strengthening of the existing floor decks whose support conditions had been relaxed over the life span of the car park.

Some 37,000 holes – 180mm deep at 300mm centres – were drilled diagonally upwards through the top of the pre-cast inverted-T beams to accommodate Sika's Anchor-C carbon fibre ropes. Prior to their insertion, 18,000m<sup>2</sup> of SikaWrap carbon fibre mat was adhered to all soffits using Sikadur epoxy resin with the fibre mat returned 200mm down the vertical side faces of the beams. Once inserted, the carbon fibre strands of the Anchor-C ropes were spread like crow's feet and whilst still wet, an encapsulation layer of Sikadur epoxy resin was applied overall.

For the deflecting beams, the Sika Carbodur plate was pulled through a 'bath' of Sikadur epoxy adhesive ensuring that the bond face of the plate had the correct amount of adhesive applied. The carbon fibre plates were then pressed into position on the underside of the beams using a seam roller to ensure 100% bond. Two coats of Sikagard protective coatings were subsequently applied to all areas to mask the plates and fibre mat.



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