

Sustainable, Data Driven, Structural Rehabilitation

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When tasked with performing demolition and reconstruction of an existing car park structure within an operational hotel facility, a plan was devised to develop a sustainable, performance-based engineering solution that leveraged the inherent residual capacity within the existing structure.

After performing a structural survey and detailed 3d spatial scanning of the structure during the tender phase, it was identified that the existing structural slab deflections were well beyond those expected from initial structural analysis, indicating that distress or overstress may have occurred. Despite the supplied tender structural engineering design prescribing removal and restatement of the existing structure to match the existing; further investigation and analysis was performed upon sighting this distress, until the deflection of the slab could be emulated with a corresponding finite element analysis model and elemental stresses reviewed in this current state. This analysis process determined that the existing slab design detailing was insufficient at a critical slab support location and a full redesign of the structural system was required to appropriately address the incumbent structural state.

Through a combination of destructive and non-destructive structural investigation methods, detailed structural finite element analysis, extensive digital structural monitoring, and innovative concrete mix design; the structure was rehabilitated, and car park recommissioned with a solution with a 35% reduction in CO2 emissions, in a construction delivery program of 18 days.