

Great King Street Carpark Dunedin

June 2001

This case study was written at the time when InfraBuild (formerly Liberty OneSteel) was part of BHP. In that context, in some instances within this case study reference may be made to BHP.

A win for New Zealand Steel

The Great King Street carpark in Dunedin, New Zealand, takes advantage of many of the features that steel construction offers. Timing and cost were critical factors in the choice of steel as the construction material. The limited construction time available required devising a structural system that could be built quickly without compromising standards of amenity or incurring carrying cost penalties. Alternatives in both reinforced concrete and steel were developed and costed, indicating a 6% cost advantage for the steel option.

The structure has eight levels and a plan area of 62.4m x 46.5m with grids at 10.4m and 15.5m respectively. Primary welded beams span 15.5m and are 600mm deep. Secondary welded beams span 10.4m at 4.9m centres and are 400mm deep.



A temporary propped Hi-Bond composite decking system was used with a 120mm concrete topping. The seismic resisting system consists of eccentrically braced frames (EBF's) on major elevations and six moment resisting frames at 10.4m centres, across the building. All columns were concrete encased as the floors were constructed.

A unique feature of the carpark is the curving of each end of the inclined ramp beams to avoid vehicles belly scraping



the concrete deck. These curves are easily incorporated into the beams as part of Steltech's welded beam manufacturing process.

Consulting engineers, Hadley & Robinson Pty Ltd, undertook specific fire engineering design to establish the necessary ratings. This showed that ten minutes was adequate for the carparking levels. The final structure, after meeting strength and serviceability criteria, was assessed as stable under fire exposure conditions for 23 minutes without



additional passive fire protection or a sprinkler system. The ground floor retail space was designed for 30 minutes rating, effected with a sprayed coating.

The site is situated in a severe marine environment with exposure to a salt laden prevailing wind causing deposits on the steel which are unwashed by rain. Durability of all exposed steelwork is achieved by application of an inorganic silicate primer, including to the shear studs and the top surface of the top flange. A top coat of chlorinated rubber was applied and the soffit of the galvanised Hi-Bond decking was also painted.



Project Participants

Client: City Property - Dunedin City Council
Architect: Oakley Gray
Structural Engineer: Hadley & Robinson Ltd
Contractor: Fletcher Construction
Fabricator: Aorangi Steel