

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

Liverpool City Council, in response to local community needs has redeveloped and expanded the Liverpool City Library. At 5,600 sq m this will be the largest municipal library in Australia. It has been planned and sized to accommodate its growth to the year 2015.

Design constraints on the built up site included the original 1000 sq m library and a 20 year old 3 level post-tensioned reinforced concrete Council carpark. The solution was to integrate the new library with the original library forming a foyer, and the new structure would be built back from this over the carpark.



*Top, and right:
The imposing entrance canopy features tubular steel and Spandek®*

Above: The colourful new library expansion complete

Various alternatives involving demolition of the carpark were investigated but were not as economical as retention. The carpark's structure however was incapable of handling the higher loads associated with the library floor. A successful solution was to support the library on new columns which would carry the vertical loads of the library independently of the carpark structure down to new foundations.

Positioning of the new columns was based around several criteria:

- they required placement between the car spaces to minimise any disruption to traffic

flow and to assist easy parking;

- minimum spacing from any carpark column of 1200mm was required to prevent disturbance of existing foundations; and
- a regular practical layout was required to match the interior design and shelving layout of the library.

The criteria were met with a grid of new columns at 7.8m x 13.2m.

Single height steel columns were utilised between each carpark level, therefore carpark slabs did not need alteration and columns could be easily manoeuvred into position. Large library floor loads (7kPa live load)



prepared by punching through the ground floor slab using, due to the restricted head room, a drilling rig on a Bobcat.

Construction of the library commenced on completion of the column work.

The roof

Following the 13.2x7.8m grid from the carpark layout, the roof utilises a two way system to reduce the required purlin span. 460UB74 steel primary members span the 13.2m, with secondary 310UB40 sections spanning 7.8m, spaced both between columns and at the centre of the primary beams. This system reduced the purlin span to 6.6m, which utilises Z20015 purlins spaced at 1200mm centres. Roof sheeting is BHP Spandek®.

The nature of the building required roof steel to have fire rated protection. This was achieved by providing a one hour fire rated ceiling under most of the roof and by applying fire spray to steelwork under that level. Services were run below the fire rated ceiling and concealed with an acoustic tiled ceiling.

The entrance canopy

A strikingly large, curved canopy was designed to provide sun and weather protection over the westerly facing entrance. At 17m x 6.1m, it was aesthetically matched to the scale of the building.

Four tubular steel columns were used for its support. The bottom half of each column is a substantially sized 324x6.4 CHS section, branching out to four smaller 140x5.4 CHS sections.

To complete the canopy, a double skin of Spandek® covered an internal frame of C100 purlin sections. The roof canopy frame (6.1x17m) was built in one piece and lifted into position. Wider than a standard truck load, it was transported to site during the early hours of a Sunday morning to minimise disruption to traffic.



required 400WC column sections with 550mm square cap plates made from 40-50mm plate. These columns were moved into position, then bolted, shimmed and grouted to the carpark decks. Although the carpark is open deck, columns were concrete encased for fire rating purposes because they are to support a fire rated structure.

Column bore pier type foundations were

Project participants

Client	Liverpool City Council
Builder	Reed Constructions
Architect	Stephenson & Turner
Engineer	Taylor Thompson Whitting
Fabricator	Steelmet