



Aerial view of Brisbane Airport Domestic Terminal long term carpark extension.

# Structural steel tops concrete

## Brisbane Airport Domestic Terminal carpark extension

The recent extension of Brisbane Airport's long-term carpark at the domestic terminal has demonstrated the major benefits of structural steel construction.

The lower carpark structure, built approximately five years ago in prestressed concrete, was designed to allow a subsequent vertical extension of two levels using the same concrete structural system.

### Options considered

A range of options was considered for the extension including post tensioned concrete, structural steel framing supporting propped precast concrete planks and structural steel framing with steel decking.

By adopting the steel framing/steel decking option, considerable weight was saved compared to the concrete option. This weight reduction allowed an additional level to be constructed, providing three new levels of carparking space without the need to strengthen the lower structure.

Structural steel with steel decking also proved to be more cost effective, fast to construct and eliminated the need for the back propping of floors. The absence of propping, coupled with the enhanced speed of construction, minimised the loss of existing carparking spaces during the construction phase and made new carparking spaces available sooner.

### Structural steel system

The project involved removing the steel roof from the existing structure, the addition of three new steel framed parking levels on top, and re-installation of the steel roof framing at the new level. Built in two stages, the total project utilised approximately 2,000 tonnes of OneSteel 300PLUS® structural steel fabricated by Beenleigh Steel Fabrications to produce 50,000 square metres of new parking floor area.

Because this project was a vertical extension, the most practical structural solution was to utilise the column grid of the existing carpark. The structural system is conventional, utilising hot dipped galvanized 530UB92 primary beams at 10.35 metre centres with 360UB51 secondary beams at 2.85 metre centres topped with a 120mm thick concrete slab supported by 1.00mm Stramit Condeck HP® steel decking. Typically, the steel floor beams were cut to length and drilled by the steel distributor, OneSteel Steel & Tube, prior to being rolled by Rollpress Proplate to achieve a cost effective and visually appealing camber.

Typically the beams are simply supported, acting compositely with the slab through shear studs. However, as there are few perimeter columns, some beams are required to cantilever up to 4.3 metres. Continuous composite beams were designed for this situation.

#### Project team

**Client:** Brisbane Airport Corporation

**Design & Construction Contractor:** Barclay Mowlem Construction Ltd

**Consulting Engineers:** Robert Bird & Partners

**Steelwork Contractor:** Beenleigh Steel Fabrications

**Steel Detailer:** TD Drafting

**Structural Steel Manufacturer:** OneSteel Market Mills

**Steel Distributor:** OneSteel Steel & Tube

**Steel Decking Supplier:** Stramit Building Products

**Galvanizer:** Industrial Galvanizers

Top right: Beams and columns. Hot dipped galvanized 530UB92 primary beams were at 10.35 metre centres with 360UB51 secondary beams.

Bottom right: Finished concrete composite floor slab supported by Condeck HP® steel decking.

### Key benefits of the structural steel solution

- the steel solution allowed three, rather than two additional levels of carparking
- with reduced back propping the steel option provided the advantage to Brisbane Airport Corporation (BAC) of operating at a higher carparking capacity during construction than would have been possible with a concrete solution
- fast tracked design and staged construction provided increased car parking capacity earlier than expected, allowing BAC to meet burgeoning market demands
- disruption to carpark users was minimised.

