

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.

Steel Supermarket beats Christmas rush

Builder Waldren Constructions recently completed a 5400m² combined supermarket and carpark for Woolworths Limited at the historic Elizabeth Farm Village in Parramatta, west of Sydney.



Steel Supermarket beats
Christmas rush, continued



Roof structure of retail area.

By capitalising on the advantages of steel framed construction, Waldren Constructions were able to finish the project in time for Woolworth's pre-Christmas deadline, with minimal impact on surrounding residents, and achieve cost savings through the use of steel without passive fire protection in the carparking area.

Woolworths need to open the supermarket by 20th November 1999 to capture the busy Christmas – New Year period. In order to meet this deadline, Waldren Constructions had to hand the building over to Woolworths by the end of September, in time for Woolworths' eight week internal fit-out program, involving shelving, freezers, cash registers, stock and testing. The selection of structural steel to frame both the retail area and carpark below, assisted in meeting this deadline, by maximising off

Single height carpark columns and wall structure.



Entry canopy covering ramp between retail area and carpark.



site fabrication and providing a shorter construction period.

Steel Speeds Construction

Work on the foundations began in late April 1999. Each foundation consisted of up to four Piletech screw-in piles. Each pile was screwed into the ground and then load tested in-situ. Where the piles failed to meet their design capacity due to poorer than expected ground conditions, they were removed by simply unscrewing them. A larger helix was then welded to the pile on site, rescrewed and retested.

"This provided me with great confidence that the foundations placed in questionable soil conditions would meet their required loads," said builder Stan Waldren.

Each foundation was completed by building a pile cap over each of the pile groups. Prefabricated reinforcing cages were utilised in the pile caps to minimise the on site labour.

Adua Engineering commenced steel fabrication work while the foundations were being laid. Fabricated columns had a baseplate at one end for bearing on the foundation and a cap plate at the other end to support continuous primary beams. When delivered to site, the columns were lifted from the truck into their final position using a hydraulic arm. The primary and secondary beams were erected using a single 23 tonne mobile crane.

Once the steelwork for the suspended retail level was completed, a Bondek II slab was laid on site, then shear studs were installed and reinforcement laid.

The use of steel had advantages in the area of occupational health and safety, which is sometimes overlooked as an area which affects the speed of construction.

"Using prefabricated structural steel offers many advantages with respect to safety, as it makes the site cleaner and easier to access," Stan said.

Inclement weather slowed site construction

at times, but not the fabrication of steel in Adua's workshop. This meant that the construction team could take advantage of any break in the weather to erect the steel frame. Woolworths' representatives on the site were impressed with the speed of construction, given the restricted windows of opportunity available.

"It appeared that five months of construction was rolled into one month," said quantity surveyor Andy Concliffe, of Ralf Beattie Bosworth.

In addition to off site prefabrication and faster construction, steel provided flexibility for the project. Part way through construction, Woolworths requested a change to the column layout to suit the partitioning of an office. Structural engineer George Moss, of George Moss & Associates, was able to provide a simple design solution to the clients request. Adjacent beams were spliced and strengthened by simply welding plates to them, thus providing sufficient capacity to enable the column to be relocated to the clients preferred position.

Steel a Good Neighbour

The new supermarket is located on James Ruse Drive, opposite Rosehill Racecourse. James Ruse Drive is a main arterial road, carrying 5000 vehicles per hour in each direction, during peak hour. Getting customers in and out of the store quickly and smoothly was therefore a driving factor in the architectural design of the supermarket. Both vehicle and pedestrian access is off grade, with only a single elevated ramp joining the carpark and retail level.

Meeting the amenity of local residents, both human and equine, was also taken into account for both the construction and in service periods.

The selection of structural steel to frame the building assisted in achieving this aim by maximising off site fabrication, minimising on site noise, providing a shorter construction period and reducing the number of material deliveries to the site.

Carpark Fire Engineering Yielded Cost Savings

It was determined that placing the carpark below the retail area of the supermarket would best utilise the available site area. Ninety seven covered spaces were provided in line with the carparking requirements of Parramatta City Council.

Structural steel columns and beams without passive fire protection were used to construct the carpark, in accordance with recent changes to the Building Code of Australia, which allow steel without passive fire protection in carparks below other occupancies. As it was adequately ventilated, the carpark could be classified as 'open-deck' and as such no sprinkler system was required.

Steel Aids Engineering Design

Woolworths Limited acquired the entire lease for the Elizabeth Farm building as a single

tenant, with no additional 'speciality' shops within the building envelope. This allowed them to specify and design the structure to suit their current needs and for complete flexibility for future renovations over the life of the building.

Woolworths' design criteria required all retail areas to be able to support 7.5 kPa, which is in excess of the SAA loading code requirements. George Moss used BHP Steel's design advice and Composite Design manuals to produce a cost competitive preliminary design.

"The technical support provided by BHP personnel, design guides and software, made the design and documentation of the building relatively simple," George said.

COMPBEAM™ software was used to produce the supporting calculations for the final design of the composite beams.

Supporting the retail level on a grid of 7.8m

x 8.75m, typical primary beams are 460UB82.0 300PLUS sections, with 360UB44.7 secondary beams at 2600mm spacings. All structural beams are composite, with partial shear design reducing the number of shear studs significantly. These member sizes also allowed the minimum carpark headroom of 2,300mm to be achieved. Columns in the carpark levels are 324x6.4CHS members.

Tenant:	Woolworths Ltd.
Owner:	Filmwing Pty Ltd.
Builder/PM:	Waldren Constructions
Architect:	Tony Eade and Associates
Engineer:	George Moss and Associates
Steel Fabricator:	Adua Engineering (Australia) Pty Ltd.
Steel Detailer:	A.J. Hawkins Pty Ltd
Deck Fixing:	Composite Support Systems
Steel Erector:	Harmer Rigging Pty Ltd