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.

Civic success in Steel

Stone exterior hides a heart of steel at Joondalup Civic Centre.

Lot number 497 on Boas Avenue in the rapidly expanding Strategic Regional Centre of Joondalup 25kms north of Perth, was earmarked to carry the new 'civic heart' for the area. A modern metropolis is being developed there by Landcorp, and the City of Wanneroo.

The recently completed $19.2 million Civic and Cultural Facilities project built by Doric Constructions for the City of Wanneroo, comprises a Civic Chambers Building and a Regional Library with a total enclosed area of approximately 8,200m^2. Each building rises two storeys above a concrete paved podium deck which accommodates some 6,500m^2 of carparking below. The library itself is over 4,000m^2 in area and incorporates three levels of operation with an impressive main hall which will qualify it as the largest public lending library in Western Australia. It is the first stage of the civic and cultural precinct to be established in the heart of Joondalup.

Steel Meets Budget

"The original tendered sum, for an insitu concrete design, exceeded the overall budget cost by 10%" said Richard Kendall of Doric Construction. He worked closely with the architect James Christou & Partners and structural engineers Halpern Glick Maunsell to achieve savings by using a steel alternative without compromising the concept, purpose or the quality of the building. It was therefore agreed to adopt steel framing with precast floor planks above podium level to save on formwork and falsework at greater heights. The podium and deck remained as insitu concrete, as it was already committed, so that construction could commence whilst final documentation was being fast tracked.

Design and Construction

The design of the Civic and Cultural Facilities include many varied features as a centrepiece development for the City of Wanneroo. The buildings will be prominent in the general public's eye for a long time, hence a durable and sound structure was required.

External walls above podium level consist of an outer limestone blockwork leaf, a wide cavity with deep reveals at powder coated aluminium framed and glazed openings and inner leaf brickwork. The cavity was too wide for conventional brick ties and therefore non-load bearing steel mullions were used in the cavity for the lateral support of the blockwork and brickwork. The north and east edges of the podium are enclosed by externally rendered brick and concrete (tilt-up) walls. Structural steel columns and beams are expressed both internally and externally as design features .

Steel roof framing on Council Chamber.

The buildings are conventionally roofed using terracotta clay tiles with copper gutters and downpipes.

Structure

The floor plate, based on a 8.4m x 8.4m grid, consists of composite beams (530UB's) with precast slabs (Deltacore 208mm deep and 75mm topping) for suspended floors. Composite action was achieved by using 19mm diameter x 150mm high shear studs welded to the steel beams and 1200mm long concrete filled cores to the precast slabs over.

A large area of the library features a two storey column-free void. Structural support is provided by double height 360UB45 steel columns and conventional steel roof trusses spanning 17m which are tied into a steel portal frame that supports the roof mounted plant room.

Steel portal frames were used in the Library so that no internal cross bracing was necessary. The steel portals consisted of 460UB67 columns at 8.4m centres and 460UB67 beams at 4.2m centres supporting precast planks. 200UB's were used as tie beams between columns.

Other structural features within the library include a 17m wide arch to the north face, retaining walls to the future Stage 2 development and tilt-up wall panels to the external Level 1 walls.

The Civic Chamber building also includes large column free areas within the Function Room and Council Chambers. This was achieved by roof trusses and 900WB transfer beams spanning up to 13m.

In addition, the building was designed to be structurally compatible with, and linked to the adjacent City of Wanneroo Administration Building. Access between these buildings has been provided at level two with a walkway.

Columns with top plate and welded starter bars were provided for support and fast erection of the precast coping segments that run around the perimeter of each building.

The steel frame easily accommodated mechanical services via web penetrations to four of the beams without compromising the original height of the building.

Steel Saves Time

Off-site fabrication of structural steel and precast hollow core planks enabled substantial progress to be made whilst operations on site proceeded. "This system halved the number of people on site" said Richard Kendall, "work was not delayed due to the redesign, and steel erection commenced four months after work commenced on site and was erected in just two months." This saved three months of construction work.

Top: Steelwork to double storey Council Chamber above concrete podium.
Above: Library hall with steel frame complete and finishes being added.

Conclusion

The project is a testimony to the versatility and practical application of the builder and the design team, who in the face of demanding cost constraints made pragmatic construction decisions that not only fast tracked the project, but also met the budget expectations of the client.

Ray Fisher from the City of Wanneroo said that "the result is a building which meets Council design requirements, looks good and performs well, as evidenced by the high levels of use".

It represents a proud achievement of professionalism and cooperation for the entire design, construction, supplier and subcontract teams who have left their mark on Joondalup's new 'civic heart'.

Project Participants

Client:	City of Wanneroo
Engineer:	Halpern Glick Maunsell
Architect:	James Christou & Partners
Contractor:	Doric Constructions
Fabricator:	Fremantle Steel
Erector:	Perth Rigging
Distributor:	Union Steel