BHP BILLITON CENTRE

CLIENT
BHP Billiton

PROJECT MANAGER
Carson Group

ARCHITECT
Lyon Architects

ENGINEER
The Bonacci Group

FACILITIES PLANNER
Woods Bagot

BUILDER
Grocon Pty Ltd

STEEL FABRICATOR
Alfasi Steel Constructions

STEEL DETAILING
PlanIt Design Group

FIRE SAFETY ENGINEERING
Arup Fire

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The BHP Billiton Centre – showcasing structural steel as a 21st century material with innovative design combined with cost and time saving initiatives.

The exciting and landmark $600 million QV project will create two commercial office buildings, two residential towers, car parking for approximately 1500 cars and a three level podium of retail stores on the site of the old Queen Victoria Hospital that covers four street frontages in Melbourne's CBD.

The residential, commercial and retail village will extend Melbourne's vibrant lane-way culture to the north, contributing to the fabric and colour of the city.

Within this project is the recently completed BHP Billiton Centre that will contain the high profile global headquarters for BHP Billiton. In addition to 21 floors of office space, the building contains three retail levels, three levels of car parking and is surrounded by a steel-framed glass clad podium. BHP Billiton will occupy 25,000 square metres of floor space in the new building.

Discussing plans for their new head-quarters, BHP Billiton confirmed that they intended to "make best use of steel in the design, to showcase steel as a 21st century material that lends itself to innovative design solutions."

The company also required that their purpose-built accommodation would also incorporate environmentally sustainable features. Double glazed windows, waterless cooling towers, light dimming systems, and state of the art technologies, materials and finishes are all contributing to this aim.

STRIKING FAÇADE IN STEEL AND GLASS

Lyons, architects for the building, worked on the design in conjunction with structural engineers, The Bonacci Group.

Adrian Stanic of Lyons said that the main façade of the building embodied the contemporary idea of transparency and openness. "A striking 28 storey clear glass façade, with spandrel steel panels expressed as a layer behind the clear glass curtain wall, forms the main façade of the building," he explained.

"This bright polished aluminium and glass facade is folded down and out over the lower levels of the building to form a series of dramatic glazed canopies of varying size. Framed in steel, this folding form gives the curtain wall a machine-like appearance of a thin folded glass and metal skin. This simple gesture connects the tower, lower levels of the building and the street," Mr Stanic said.

STRUCTURAL STEEL IN THE DESIGN PHASE

Early in the base building design phase, Woods Bagot, appointed by BHP Billiton as their Interior and Facilities Planning Consultant worked in association with Lyons' architects to maximise the design potential of the floors.

Sarah Kay of Woods Bagot explained that: "we were able to comment on the design as it affected the potential fit-out of the space, advising on such things as preferred compactus zones and tenancy stair locations, creating an efficient and fully integrated building fit-out design solution."

The column-free floor plate of the base building allowed the fit out design by Woods Bagot to incorporate a continuous subdivision module that allows all work point types to be interchangeable across the space and throughout the tenancy.

These beams, in turn, support a 120 mm thick un-propped composite slab on profiled steel decking which was laid under the fabricator's contract. The shear studs were welded to the top flanges of the beams on site, also under the fabricator's contract along with the 2,700 tonnes of structural steelwork.

Innovative long span floor framing and an eccentrically located side service core delivered a highly flexible, column free workspace.

"The side core creates an uninterrupted east/west length in the building. By providing a central community zone with an inter-tenancy stair, the building was effectively divided in two. The enormous length of the building is managed by a combination of angled corridors broken at intervals with points of interest and natural light throughout," Ms Kay said.

The final base building plan, with its large column-free internal space and symmetrical layout, facilitated a sophisticated flexible and efficient fit-out design creating maximum light and brightness within.

The 45 metre long reinforced concrete eccentric jump-formed service core is the longest to be jumped in one operation on an Australian building site.

This service core supports 18.3 metre OneSteel 300PLUS® Welded Beams, clear spanning from the walls of the core to the perimeter of the building.

The 47,500 square metres of profiled steel decking used on the building incorporated a blue anti-glare coating. This was the first time this new Australian invention had been used in the world.

Nat Bonacci of The Bonacci Group commented that "BHP Billiton set stringent deflection levels, similar to those more commonly used for beams of 10 metre span. To meet these levels the beams on the BHP Billiton tenancy floors were OneSteel 300PLUS® 800WB122, while those for the remaining office levels were typically 300PLUS® 700WB115."

Nat Bonacci went on to say: "For efficient routing of air-conditioning and other services, the floor beams were provided with standardised notched cut-outs at each end that reduced the beam depth to about half, and were reinforced with relatively inexpensive stiffening. Where cut-outs were necessary at some other locations, they were generally able to be circular, and of a diameter and location such that they did not need stiffening."

In addition, the time taken to erect an 18 metre structural steel floor beam was less than an 18 metre concrete beam, which requires a greater volume of concrete, and longer pouring time, also contributed to a faster construction program.

The concrete encased steel columns around the perimeter of the building, incorporated OneSteel 300PLUS® 200UC46 erection columns, which were able to support one level of steelwork and construction load above the level of concrete encasement.

Concrete column encasement around the ends of the beams falling on the column grids were poured at the same time as the slab concrete to ensure deflection characteristics of those beams under the weight of the wet floor slab were similar to the beams not on the column grid.

FURTHER COST & TIME SAVING INITIATIVES

At tender stage Grocon asked steel fabricator, Alfasi Steel Constructions and their nominated supplier of OneSteel products, to explore ways of further reducing the cost and construction time.

The collaboration between Alfasi and their steel distributor reduced the handling of the many hundreds of steel beams by eliminating delivery from the warehouse of the steel distributor to the fabricator's shop prior to transport to site.

The steel distributor provided the beams cut-to-length and cambered, and with all the necessary penetrations, copes and bolt holes. To reduce handling they provided a temporary fenced-off area for the Alfasi crews to carry out fabrication work, welding the necessary fitments and stiffeners to the beams, prior to direct delivery to site.

Furthermore, because sealed windows were used and the air-conditioning system kept out moisture, the structural steel framing did not need painting. This meant the cost of painting and the extra associated costs of handling and transporting the steelwork to the paint shop were saved.

Ricky Hains, Director of PlanIt Design Group, oversaw the steel detailing for the project carried out by his staff in the Alfasi fabrication workshop. This arrangement facilitated communication between the fabricator and the detailer and enabled prompt resolution of issues as they arose.

A 3-D model was created and DXF files were used to directly control profile cutting and order lists for the profiled steel decking and the special folded angle edge-form were also produced by the software.

FIRE ENGINEERING

A fire engineering study for the project, carried out by Arup Fire, determined that only the floor beams above the two retail levels were required to be sprayed with an appropriate fire-protective coating. Those above the office and carpark levels, by far the greater proportion of the building, used bare steel beams utilising the inherent fire resistance of 300PLUS® steel.

Tony O'Meagher of Arup Fire said that: "This assessment was based on the performance of similar types of composite building frames in full scale fire tests with office fuel loads. Enhancing the sprinkler system to increase its reliability reduced the likelihood of a major fire developing. The analysis of the structure also determined that the size and strength of the concrete encased steel columns was sufficient to maintain their structural stability during and after a fire."

One of the many benefits of the composite system is that it did not require propping, providing for faster construction and an un-cluttered working environment.

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