InfraBuild

Primo Smallgoods Sydney Showgrounds

July 1998

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

Steel gets the Show on the road

The flexibility and speed of steel construction ensured that Primo Smallgoods could relocate production facilities, to allow the new Sydney Showground site to be prepared in time for the 1998 Royal Agricultural Show.

The contemporary building designs at Sydney's new Showground at Homebush have received considerable publicity, yet little is known about the extensive relocation project of the Primo Smallgoods facility that once occupied part of the Showground's original Moore Park site.

It was quite an exercise for Civil and Civic to design and construct Primo's new state-of-the-art facility at Chullora. The process of constructing the new facility, demolishing the original smallgoods factory and relocating Primo was only allocated 15 months from start to completion, to allow for the grand opening of the 1998 Royal Easter Show at Homebush.

Two Storey Factory

The new 28,000 m^2 factory consists of two levels, a processing area of 16,000 m^2 on ground level, with a further 12,000 m^2 of plant area suspended above. Production equipment is located on the ground floor, while the upper storey houses all the plant, services and cooling systems to drive production units and maintain required low temperatures. Steel sandwich panels suspended from the steel roof divide the two levels. The panels consist of expanded polystyrene sandwiched on each face with 0.6 mm BHP COLORBOND® steel, and form both a hygienic ceiling for the production area and a trafficable floor for the plant area above. This means that the production area is 'clean' of all plant, providing a substantially sterile production and storage area.

Maximise Flexibility, Minimise Cost

The design brief provided by Primo required maximum flexibility for the floor space within the structure, while still working to a very stringent budget. "Primo wanted to maximise flexibility and minimise cost" said Chris Bulmer, Civil & Civic Project Manager.

The Smallgoods facility currently produces some 250 different products, but is always developing and introducing new ones. This, coupled with changing consumer diet over time, means that configuration and size of production lines are regularly changed. Primo found that the lack of flexibility at the existing factory caused inefficient production which would not be acceptable at its new state-of-the-art facility. The requirement for flexibility in the structure was not limited to the ground floor production area, but had to be mirrored in the upper level by plant and services.

Process consultants, Lend Lease Process Services together with the structural engineers from SCP Consulting and architects from Peter Brooks Architects tackled the issue of maximum flexibility in two ways, given the budgetary constraints:

1. The production areas should have maximum flexibility:

To meet this objective, where practicable, these areas were to be made column free.

This meant that the insulated wall panels forming the internal walls and production equipment could be moved, without the constraint of columns.

Transfer trusses were used to enable columns to be removed from the typical frame, producing large areas of column-free space.

The structural scheme developed to achieve the column-free space was quite simple which helped keep the project within budget. Typically portal frames ran north-south spanning 95m with internal columns at approximately 25m centres. Bay spacing for these portals was 8.4m. The trafficable ceiling and the heavy plant loads (some equipment being over two tonnes) located on the upper level are all hung from the rafters. This large roof load necessitated portals typically fabricated from 460UB67 300PLUS haunched rafters, 800WB122 300PLUS external columns and 250UC46 300PLUS internal columns. In the areas where column free space was required, the internal columns were removed in two consecutive bays providing a column free bay width of 25.2m.

Where the columns were removed, support of the rafters was provided by a transfer truss spanning east-west between the internal columns of the typical bays on either side. In some areas consecutive internal columns in a line running north-south were removed to provide a column free area of 75m x 25m. The transfer trusses carry axial loads in their chords of up to 1400kN. To carry this load the structural engineers designed the chords from 300PLUS universal column sections ranging in size from 200UC60 to 310UC198. The column section was orientated so that the weak axis of the member was restrained from buckling by the verticals and diagonals of the truss. The use of this particular section also meant that connections to the columns and the stiffeners required to transfer loads of this magnitude were easy to fabricate and install.

The concept of making the entire building free of internal columns was neither viable, given the budgetary constraints, nor necessary given the fixed location of certain production lines.

Column free space was not provided in areas with flexibility already limited by other factors such as egress stairs, smoke houses with special requirements in the concrete floors and storage racking etc.

2. The plant area above the trafficable ceiling was divided into zones. A zone was allocated for each of the following :
a) Purlins b) Roof Bracing c) Services / Plant
d) Trafficable Ceiling

By allocating zones for each of the four types of elements above, the problem of co-ordinating the steelwork in the roof was limited. This means that if roof-mounted plant is to be moved or introduced, there is a zone where beams can be installed without clashing with roof bracing or the purlins. The relative ease with which new steel members are able to be connected to existing steel members either by site welding, bolting or clipping to the flanges, again enhances the flexibility.

Speed of Design, Speed of Construction

The short period allocated to construct the facility meant that the structural design, documentation, fabrication, and erection of the portal frames had to be completed prior to the plant and services and their subsequent loads and locations being finalised. Preliminary plant loads and their locations were provided by the Services Engineers for the design of the portals and plant support beams.

As expected, the final loads and locations of plant varied from the preliminary values provided. However, the upper storey where the plant was to be housed had sufficient flexibility, due to the use of steel beams in a dedicated zone, allowing beams to be added, changed in size or moved to suit the final plant locations and loads.

As a result of this fast tack construction, the 600 tonnes of steelwork required for the project was designed and erected in 35 weeks, enabling external and internal walls, concreting and other building works to proceed concurrently with the installation of plant beams and plant. By taking advantage of the flexibility which steel provided, design and construction could commence before the plant loads were finalised. Had this not been possible, the programme would have been extended by a further 16 weeks.

Conclusion

The design and construction of this building highlights the benefits of careful planning to take advantage of the flexibility offered by structural steel.

Client:	P & M Smallgoods (Primo)
Project Managers & Builders:	Civil & Civic
Process Consultant:	Lend Lease Process Services
Architect:	Peter Brooks Architects
Structural Engineers:	SCP Consulting
Fabricator:	Universal Steel
Detailer:	South Line Drafting