Courtesy of HOK International

Heavy Lifting

- There are 252 beams and 40 columns for each floor.
- More than 370 crane picks were made per floor for the steel and concrete contractors.
- There were three tower cranes on the project; each crane lifted 112 pieces of steel every week.
- The frame consists of 4,200 tonnes (4,629 tons) of steel and was erected in 24 weeks.

— Courtesy of Marcel Feuchter, Structural Project Manager, Canary Wharf Contractors Limited

CWCL

What Lies Beneath

Under-floor building services drive floor member design in a London office building.

BY JAMES CASSON

CANARY WHARF, FOR SOME TIME, HAS BEEN A LEADING EPICENTER OF OFFICE HIGH-RISE CONSTRUCTION. And a new development in the area continues this trend.

BP2, a new 15-story office building, is nearing completion on the northern edge of Canary Wharf over the former West India Import Dock. It is on the second of four plots in an area called Blackwall Place. The building will be the future home of an investment bank, securities trading, and brokerage firm.

There are considerable structural challenges associated with the project, which stands on an irregularly shaped site of approximately 4,690 sq. m (50,482 sq. ft). It is being built partially over a 1990s parking ramp and partially over water, with the podium access shared with an adjacent site.

The development will comprise a total internal area of approximately 36,450 m^2 (392,344 sq. ft), including two roof plant areas, a double-height reception area, and ancillary areas at ground level. Twelve office floors provide a total net internal area of approximately 29,150 m^2 (313,767 sq. ft).

Foundations

The pile foundations for BP2 were constructed in three separate stages. The first stage was built during the construction of Churchill Place car park (1989), located beneath the southern end of the plot. The second stage was installed across the northern end of the site during construction of the One Churchill Place car park and loading bay ramp (2002). The third stage took place during 2006, when a single 1,500-mm-diameter (4.9-ft) pile was constructed to allow the proposed new BP2 footprint to be fully supported without overloading of the existing piles.

Superstructure

The steel frame for the BP2 project springs from the reinforced concrete foundation at the ground-floor level.

"The column locations for the building vary from being on a uniform grid at the southern end of the building to a seemingly random arrangement elsewhere," states Graham Pocock, Senior Structural Engineer, WSP. "Essentially, columns had to be

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Opposite and above: The building's cladding panels will be top hung and fixed off of channel inserts into the concrete floor slab.

Top, left: BP2's frame consists of 4,200 tonnes (4,629 tons) of structural steel.

Top, right: The building, offering views of the Millenium Dome, is part of the Canary Wharf development.

The typical floor-to-floor height in BP2 is 4 m (13 ft).

located wherever they could, to avoid clashes with the access ramps to Blackwall Place and BP1 Car Parks. This also results in a number of significant cantilever details in many of the corners. There were no column transfers in the superstructure, as there just is not sufficient space in the typical floor zones."

The typical floor-to-floor height of an office floor in BP2 is 4 m (13 ft), the allowable zone for floor structure being 810 mm (2.65 ft), consisting of a 140-mm (0.46-ft) lightweight concrete floor slab on trapezoidal profiled metal decking, a 610-mm (2-ft) structural steel beam zone, and 60-mm (2.36-in.) allowance for sprayed fire protection, tolerance, and deflection. The steel beams are designed to act compositely with the concrete floor slab. The building's cladding panels are top hung and fixed off of channel inserts into the concrete floor slab.

The building systems are located within the structural zone under the floors, following the current trend with many commercial office buildings. The systems are actually routed through the beams, which have holes cut in them, rather than under them, resulting in a lower floor-to-floor height. The criteria for designing the steel floor members aim to achieve minimum depth rather than minimum weight. Because of the corner details, column arrangement, and the requirement for building service/structural integration, many floor beams are heavy plate girders with web openings. Where possible, the beams were kept to a minimum of 310 mm (1 ft) deep to allow for the passage of services below.

The level of complexity for design and detailing of the steelwork floors increases at the plant room and roof levels, the main reason for this being the increased story height at these levels. The architectural design called for joints in the cladding panel system every 4,050 mm (13.3 ft) vertically. Therefore, the cladding panels could not be supported off of the floor slabs. Instead, they are supported by a secondary steel framing system. This involved a significant amount of coordination between all the design and construction team members to ensure the whole variety of cladding panel supports was provided at the correct position.

At roof level there is a building maintenance unit (BMU) rail track for support around the building perimeter. Typically, stub posts pick up the rails at 3 m (9.8 ft) on center; these posts are at closer spacing around tight corners. Because of the long reach required of the BMU, the loadings from the unit are significant, and this—together with the strict deflection limits for the members supporting the posts and the fact that these members invariably also pick up the cladding—make the design, detailing, and construction quite complex. MSC

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