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Front covers of The Structural Engineer are subject to a fee. If you are interested in taking a front cover in a future issue of the Journal please contact the Advertisement Manager, Steve Jackson (tel: +44(0)1778 391 108).

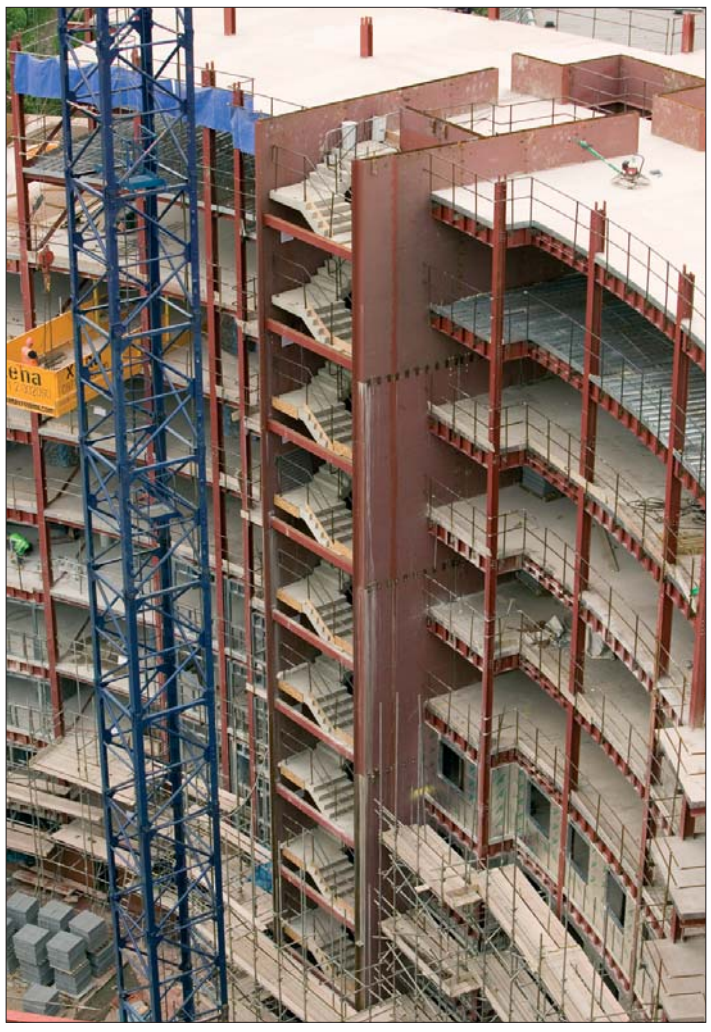
The tallest building to be constructed to date using the Corefast modular structural building core system from Corus Bi-Steel is currently underway in Birmingham.

An 18-storey glass and zinc clad tower is the centrepiece of this four-block student halls of residence development, conceived by Opal Property Group and being built by Ocon Construction Ltd. When finished the steel-framed structure, being erected by Henry Smith (Constructional Engineers) Ltd, will house 604 students who will take up residence in September 2007.

Corefast is being used to create the central lift/stair core in the tower. The system uses Bi-Steel, a patented high performance steel/concrete composite material developed by Corus. Corefast modules are fabricated off-site, erected on-site quickly and accurately and then filled with ready-mixed concrete (photograph shows the Corefast core under construction with a module being craned into position). Ocon estimates that it will save around 5 weeks on the original 86-week programme using Corefast. In addition, instead of four reinforced concrete cores required by the original design only one Corefast core was needed due to the high strength and rigidity of the system.

Visit www.oconconstruction.co.uk for the latest onsite progress photographs.

Further information: Corus Bi-Steel (tel: +44 (0)1344 751670; web: www.corusconstruction.com/bi-steel).



The Structural Engineer

- promotes the learned society role of the Institution by publishing refereed papers aimed at advancing structural engineering which is the science and art of designing and making, with economy and elegance, buildings, bridges, frameworks, and other similar structures so that they can safely resist the forces to which they may be subjected.
- provides structural engineers worldwide with information on practice, design, development and research, education and training associated with the profession of structural engineering and offers a forum for discussion on these matters
- assists The Institution of Structural Engineers in maintaining its internationally recognised high standards
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Birmingham 1 – the tallest Corefast development so far

An innovative prefabricated steel/concrete composite panel construction system is making inroads into the traditional reinforced concrete core method of building. Earlier this year Ian Farmer visited Birmingham to see one such project.

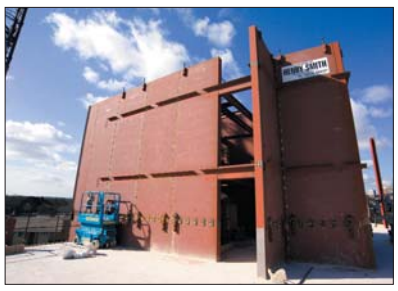
On a busy intersection with the A38 in southwest Birmingham, Ocon Construction has designed and is building an 18-storey development for students, which uses the Corefast system for its central lift stair core. This makes it the tallest development to date that uses Corefast in its construction.

Construction started on the restricted Bristol Road site at the beginning of January 2006 and the whole development is scheduled for handover for occupation at the end of August 2007 ready for the new university term in September. When completed the steel-framed construction, by architect LOC Associates, will provide accommodation/ bedrooms for 604 students and feature a leisure suite, internet café, an internal courtyard, underground parking and a swimming pool. The buildings will be finished in a mixture of zinc panels (for the tower) and traditional brickwork. The development site consists of four blocks with Block A the 18-storey glass and zinc clad central tower providing the focal point of the development.

The original design for the development, using a RAM Structural Systems package to model the buildings in 3D, had two traditional concrete cores, However, during the tendering phase, steelwork contractor Henry Smith (Constructional Engineers) (HS), at the behest of Tier Consult, tendered two schemes – one based on a fully compliant bid using the reinforced concrete cores and a second based on replacing the rc cores with a Corefast alternative. The differences between the schemes was that the enhanced stiffness of the latter meant that the extent of the 'stability core' could be reduced through the scheme and the previously specificied shear walls could be replaced with steel and stud arrangements.

After Ocon Construction had been appointed the scheme was revised to adjust the layouts/floor areas and at this stage Tier Consult was talking to Ocon about the steelwork and the fabricator.

The two scheme tender arose out of discussions Henry Smith was having with Corus on using Corefast on another scheme. Corus enquired of HS if it would



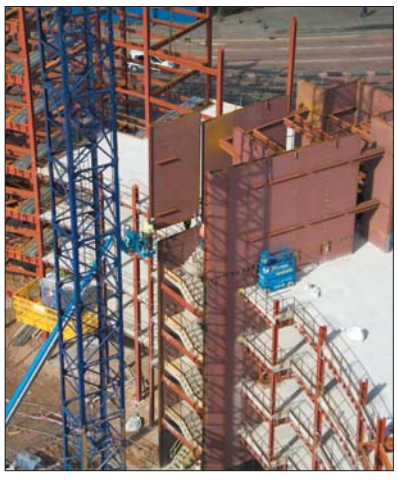
be interested in using the system on Birmingham 1 as well. HS then got back to Tier to 'have a look' at the 'alternative' system and Tier saw that there were a number of potential benefits using Corefast for the central/ stairway core. The firm was attracted by the speed of construction, structural rigidity and the fact that all the interfaces between the core and frame would be steel, thereby eliminating involvement of different trades at this stage of the project.Tier responded to HS with a favourable report, and HS then redesigned the plans to use the mixture of plain bracing and Corefast for Block A only.

Developer Ocon estimated that it would save approximately 5 weeks on the original construction programme.

Construction

The whole development sits on a 1.5m thick pile cap, comprising 265m^3 of concrete, supported by 65 piles.

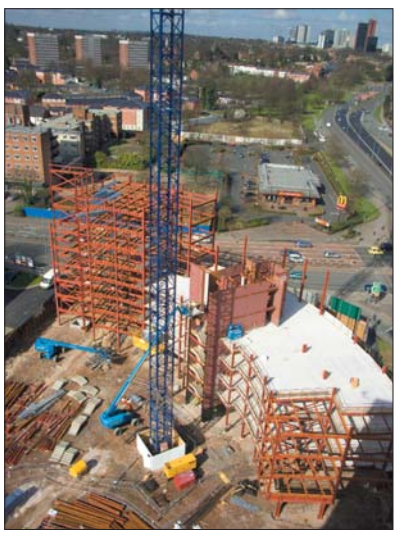
The central core was composed of 10



High level view of the site illustrating the central core with the prefabricated stairways installed up to the fourth level

Left: Corefast central core showing pre-formed doorways and adjustable screw levelling

Right: Aerial view of the site showing the central core and the steelwork radiating out from it



large Bi-Steel panels at each level, which were prefabricated offsite from smaller panels. the first level installed was 15m high, subsequently levels were 6m (2-storeys) high to suit the main steel work splices.

Starter bars, standard T32 rebar, stood proud of the pile cap ready to receive the first craned in sections. Phase one involved positioning the initial sections that made up the first four floors (15m in height with a 1m overlap ready for the next section to bolted into place). The sections have the risers for services included in the design, as well as all the necessary pre-drilled holes, from the outset.

The standard panels were manufactured at Corus' Scunthorpe plant and fabricated into the required formats for the Birmingham 1 project by Hallcalm.

At the time of visiting the first four levels of the central core (installed in four storey high panels) had been infilled with concrete (using a superflow concrete, so no vibration compaction was necessary) and the rest of the steelwork and floor decks are added up to the fourth level. This acts as a stable work base for the rest of the construction, as each level adds extra loading on to the structure. Two more levels of prefabricated sections were added to the central core in stages. The fit-out work is then completed and the surrounding steel work erected and integrated into the core. Work then repeats – the steelwork is erected and fixed to the core for stability and rigidity in two-storey stages. The steel panels were already pre-drilled (with nuts fixed inside the holes) ready to accept the bolts from the steel work. Edge protection rails on the floor decks are installed at ground level before being raised into position. Once all the steelwork

Left: Bolted together panels in the central core
Far right: Architect's visualisation of finished project

Right: Central Corefast core showing steelwork, floor decking and preform openings

and decking have been laid and the floors concreted then this can be used as a 'working platform' for the rest of the build. Setting the increment rises at two floors (the next splice level) also fits in with the speed of the rest of the working conditions.

For example as the steelwork rises and the decking and floors are being installed, the modularised bathroom units are being craned into position and plumbed in simultaneously.

Within the central core, pre-fabricated concrete stairways are swung into place using the cranes and bolted into place using the predrilled holes as each section of Corefast rises. The first stairway was dropped and bolted into position just 5 days after the initial core structure was started.

Before the next section is positioned for the next level the panel sections are levelled off using a series of removable screw adjustable levelling bolts. Connections can be either welded or bolted.

The higher Corefast storeys are being

completed at a storey per day, which is estimated at six times quicker then would be achievable using traditional reinforced concrete cores.

The system has been previously used on the Dundrum cinema and leisure development south of Dublin, the Pollockshaw Road Housing project in Glasgow and Forty Springardens office complex in Manchester. se

Corefast

The Corefast panels and sections are a development of Corus' rapid build Bi-Steel panel system that has been available for a few years. Corefast arrives on site as lightweight modules ready to use for construction. Each module comprises two steel plates joined together and spaced apart by friction welded spacer bars. Depending on the project, the dimensions for the plates and bar can vary as can the distance between the plates and the bar spacing itself. Plate thickness ranges between 6-20mm, the plate separation between 200-700mm, with a minimum bar spacing of 200mm. The standard Corefast dimensions are 8mm thick plate with 200mm separation and 300mm spacing of the bar. Once the sections are in position on site the central space is infilled with the free flow concrete, which is then allowed to cure before the next sections are positioned. The Birmingham 1 project employed two, 8mm thick steel plates separated by a 200mm spacer bar, at a distance of 300mm. Side panels can be side connected where widths exceed 2m and corners made to create 'L', 'C' or rectangular plan modules.

Getting to the core of the matter – rapidly

Corefast is an innovative construction system that embraces off-site, modular construction methods. The system uses Bi-Steel, a unique, patented steel/concrete composite material developed by Corus for high performance applications. It comprises two steel plates connected together by an array of friction welded transverse bars to form panels which are then filled with ready-mixed concrete on-site.

The process is said to be up to six times faster to construct a core than an equivalent concrete core and the off site prefabrication helps reduces site congestion. As no formwork is required, fewer hours are spent working at height, so risks are reduced. The system, which has prefixed, adjustable levelling bolts enables increased accuracy in matching up the core and steelwork and the slimmer walls free up additional floor space.

Right: Corefast is an innovative, off-site construction product for the rapid creation of structural cores in multi-storey buildings

Openings for doors and services can be created in the workshop, and the attachment of bolted connections for incoming beams and floor angles are completed prior to arrival of the panels on-site.

Modules are typically around 6-9m, or 2-3 storeys, in height, and a these cores can be erected in tandam with the main frame steelwork.

A number of projects have already used Corefast cores for both commercial and residential developments – Dundrum Town Centre, south of Dublin; a striking new multi-storey residential scheme in Glasgow; a prestigious 9-storey commercial development in central Manchester; and an 18-storey tower in a new student halls of residence currently under construction in Birmingham (see front cover). In the Birmingham project, main contractor Ocon Construction Ltd estimates it will save around 5 weeks on the original 86-week programme.

- **Further information: Corus Bi-Steel (tel: + 44 (0) 1344 751 670; web: www.corusconstruction.com/bi-steel)**

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