



A Beacon of engineering

Regional director at Michael Punch and Partners **Tim Murnane** lays out the structural engineering challenges faced on the Beacon Southquarter project in Sandyford, Dublin

Beacon South Quarter is one of the largest and most prestigious mixed use developments in the country. It represents the next phase of the redevelopment of Sandyford Industrial Estate in South County Dublin, where Landmark Developments continue to lead the way with the ongoing success of their Beacon Vision. With over 23,000 square metres of upmarket retail outlets, 7,700 square metres of office space, 1,100 luxurious apartments, 2,300 car spaces and a vibrant cultural centre, Beacon South Quarter will offer a unique and inspiring combination of living, shopping and recreation.

In successfully delivering the project, structural engineers Michael Punch and Partners were presented with a significant number of complex

engineering challenges. These included triple level basements, long span retail units beneath up to eight levels of residential buildings, a towering 18 storey residential block and the unique Imaginosity Children's Museum with its daring spans and adventurous cantilevers.

Great Pyramid

To fully appreciate the scale of the 5 hectare basement it is worth considering that it is equivalent in size to the Great Pyramid of Gizeh, which was for Millennia easily the largest manmade object on earth. The structure is entirely founded on granite rock, which varies from highly weathered to extremely hard. Due to the density of the development, the basement footprint had to be



maximised to ensure car parking could be optimised. The result was a 12m deep triple level basement which extended as close to the site boundary as possible. Hence, innovative temporary works solutions had to be incorporated into the design to achieve the client's requirements.

The precast concrete solution for the basement structure, which was introduced from Belgium, involves triple height, high strength columns (95 N/mm²), prestressed beams and hollowcore slabs. The basement retaining walls have a 180mm precast concrete facing panel which acts as permanent formwork for the insitu concrete behind, to form a composite watertight retaining wall. The reinforcement is pre fixed to the rear of the precast panels and hence on site reinforcement fixing is minimised. This solution has allowed the construction programme for the basement to be optimised, while achieving the necessary high quality standards which the client requires.

Innovative jump

Block A4 is an 18 storey residential tower including two levels of basement. The structural solution consists of in-situ reinforced concrete columns, slabs and cores. The cores were constructed using innovative jump forming techniques, which saw them constructed in a very efficient time frame. The floor slabs then quickly followed behind and the contractor achieved a very impressive turn-around time per floor of less than a week.

Structurally the core was analysed using the latest 3D finite element modelling software, which resulted in a highly efficient design solution. As the core was jump formed, the building had to be designed to resist the forces in both the temporary and permanent cases and hence close

collaboration was required between the contractor and the designers Michael Punch and Partners. This close communication is critical in a structure such as this, as otherwise instability of the structure in the temporary case could result.

Children's Museum

The Imaginosity Children's Museum is a separate turn key project within the overall Beacon South Quarter development. The outcome could be considered somewhat of an architectural masterpiece. Additionally from a structural engineering perspective, the building includes a host of structural engineering innovations. A clear span of 15m is achieved by a truss structure over two stories, while a striking 7.5m cantilever supporting two floor levels is achieved using MacAlloy bars tied back to the primary structural frame. Glulam timber beams, supported at intermediate floor levels and braced with stainless steel bars, facilitate the inspiring "bubble" glazing to the front of the museum. Other interesting engineering design challenges included the dynamic/vibration modelling of the structure and the provision of lateral stability through the floor slab.

Urban centre

Beacon South Quarter sets out to inspire all those who visit it through its exciting mix of uses and exceptionally high quality design. The structural engineering challenge was to ensure that these principles could be delivered with exceptional engineering design solutions. We are confident that these ambitious aspirations have not only been met, but have been exceeded and all those who visit this new urban centre will enjoy the inspiring outcome long into the future. ■



Client
Landmark Developments

Architect
Traynor O'Toole

Civil & Structural Engineer
Michael Punch and Partners

Contractors
John Paul Construction,
PJ Hegarty's, Laing O'Rourke

Project Value
€450,000,000