

Award

n2 Nova Evolved, London

PROJECT TEAM

Architects: **Lynch Architects, Veretec**

Structural Engineer: **Robert Bird Group**

Steelwork Contractor: **William Hare Limited**

Main Contractor: **Mace**

Client: **Landsec**

n2 Nova Evolved is a 17-storey commercial building in the heart of Victoria, located on a very congested subsurface infrastructure with Thames Water and London Underground Limited assets underneath. This second phase of the Nova development offers 14,800m² of office space along with terraces on the upper levels.

Built on top of the major assets, the building is an excellent example of how engineering excellence can unlock value in heavily constrained sites without compromising on quality and sustainability. The existing Victoria Line station, along with the Thames Water sewer, presented significant constraints to the provision of foundations, only allowing for the installation of big diameter piles down to approximately 79m – the deepest pile in London – at a few locations.

The core is located on the west side of the building where there are no underground constraints. The building includes a basement on this side which is linked to Nova's basement. The four areas where piling was possible, were within the works exclusion zones specified by London Underground and Thames Water, so derogations were needed for these interventions.

A proposed single pile in the centre of the building needed to be just 1.6m away from the Victoria line tunnels. The south side of the building is supported by piles at each end. The pile cap on the west side cantilevers over the passenger access tunnel and shaft. The east side is supported in one place by two 1.8m diameter piles and the southeast corner is on a pile cap that bridges over the passenger access tunnel close to the north ticket hall.



A pile test was carried out onsite to optimise and reduce the pile diameter. Completion of the test justified a reduction of the diameter required from the original 2.4m down to 1.8m, which saved 50% use of concrete. For one of the anchor pile tests, Earth Friendly Concrete was used marking the first time for zero cement concrete to be utilised. In addition, considerable cement replacement was used in the substructure, achieving up to 75% ground granulated blast furnace slag replacement in the deep pile caps.

For the superstructure, an optimised grid of 9m by 10.5m for the office space was proposed. The typical arrangement consists of composite secondary beams spaced at 3m with overlaid 130mm thick composite flooring.

The limited number of support points at foundation level meant that the substructure supports are not aligned with the building's superstructure vertical elements, so a transfer system was required. A series of trusses positioned between level 0 and level 3 were used to transfer the force from the superstructure into the foundation piles.

The depths of the trusses vary from single to double storey in height and consist of steel plate fabricated box or H-sections. With a span of up to 45m, the use of steelwork for the truss system was key to delivering a sustainable design solution.



Three internal full height trusses at level 2, span between the core and the eastern perimeter truss. They were integrated with the plant room that is located at level 1 and level 2. The south and east architectural V shape trusses span over the passenger access tunnel and north ticket hall. They are key visual elements, so were cast in situ and sanded to highlight its colour and expose the aggregate.

Most of the trusses were fabricated from steel plate ranging in thickness from 25mm to 75mm in transportable sections, then erected with bolted connections in situ. The eastern truss needed a different erection approach. The bottom chord was fabricated with 150mm thick plate due to design loads, and a bolted connection was not feasible. To avoid site welding, a 27m long section was installed overnight during the weekend using a 450-tonne capacity mobile crane.

Due to the congested site and structural complexity, the steel contractor and main contractor were appointed by the client under a pre-construction service agreement to minimise risks. The early engagement of the contractor, working together with the design team, allowed the steel frame to be erected without any site amendments.

The n2 Nova Evolved project is an excellent example of unlocking the opportunity offered by land, in the heart of London, in a heavily constrained environment. It is thus a high-risk project where collaboration is key, allowing for piles to be placed in locations that would have not been previously considered and enables the operation of the London Underground.



Judges' comment

A complex site with congested services restricted building supports to just a few points, resulting in steel trusses creating a distinctive double-height feature at ground floor. Secondary transfer trusses between first and second floors house the plant, with the rest of the building free to create a unique, top-class office space.