

CEF IT headquarters, Durham

An innovative two-storey off-site engineered hybrid concrete structure constructed in Durham provides a new data, IT and marketing office for CEF. Internal exposed concrete surfaces, clear spans, and with the concrete units providing control of the building's internal environment the use of concrete for smaller-sized buildings is beyond doubt. Norman Brown reports.

CEF is a UK supplier of electrical products and services with a national network of 390 stores and an award-winning website with 35,000 products available online for next-day delivery. Established in 1951, it remains privately owned and also operates in the USA, Canada, Ireland, Spain and Australia.

Due to the company's growth it required a new data, IT and marketing office located in Durham and chose FaulknerBrowns Architects to provide an architectural solution, encouraging the firm from the outset to develop a contemporary workplace solution that embodied and reflected CEF's drive and commitment for innovation.

For the two-storey building, with a plan area of 2100m², FaulknerBrowns chose structural concrete as the principal construction material, including for the roof structure.

As regards the floor, the first floor had two separate and distinct floor areas separated by an atrium area, one being rectangular of 52 × 15m, the second being L-shaped with side lengths of 70 and 31m with a 9m width. Both suspended areas were linked at floor level by three bridging walkways.

Three important aspects of the design requirements were:

- clear span requirements of the working floor areas, with flat soffits to both the

- suspended first floor and roof structure
- the incorporation into the structure of an embedded pipework system in the soffits of the concrete first floor and concrete roof to provide thermal control of the internal environment
- the need to have high-quality exposed concrete finishes.

Stephen McIntyre, partner at FaulknerBrowns, says, "This building embodies CEF's continual drive for innovation, providing one of the most advanced workspaces in the north-east."

Main contractor Sir Robert McAlpine won the tender competition to bring the design to life and PCE put forward an off-site engineered hybrid structural design, using its 'kit of parts' approach to develop a bespoke solution that met the overall design requirements for the project. The company was subsequently appointed on a design-and-build basis to construct the structural frame.

Over the past few years, the company has designed and built many types of hybrid off-site engineered concrete structures for many different uses and this has led to a rationalised design solution approach for the various elements of any structure and their connections, providing a 'kit of parts' philosophy, which reduces the need to start

View of ground-floor office area, with exposed precast columns and exposed soffit of GT floor units above supporting architectural finishes.



View down central atrium, 15m-wide structure to the left, 9m-wide structure to the right; the GT floor link bridge is in the distance.



Composite Deltabeam steel section spanning between precast columns with safety barrier preinstalled.

each project design from scratch and using, where possible, standardised sections. This provides a low-waste, fast programme and cost-efficient approach.

Cores

The two lift and stair cores were constructed using PCE's PreFastCore modular system. This provided a safe, fast and dimensionally accurate solution, erected full height at the start of the construction process, which gave stability to the structure as well as providing safe access for construction personnel to the first-floor level as work proceeded. Additional precast concrete shear walls were also used to provide stability where required.

Precast concrete columns using the Piekko column shoe/holding-down bolt concept enabled them to be accurately positioned and plumbed without the need for any propping. This saved on propping bases, so increasing the erection efficiency and removing potential trip hazards and access obstructions during the construction phase.

For the precast concrete flooring and roofing units, PCE chose its GT flooring system, which was initially developed to provide a long (up to 16m), clear-span option

for car parks and has been extensively used for such.

The GT floor unit, being wet cast, easily enabled incorporation of the Velta system Uponor-supplied pipework into its soffit to provide the building's internal environmental thermal control system, while enabling a high-class soffit finish to be achieved. While this form of building environment control has been in use – capitalising on the thermal capacity benefits of concrete – for nearly 20 years, the GT flooring unit has an enhanced thermal resistivity above its soffit concrete layer and thus gives improved performance for this approach.

The individual GT units, being 1.6m wide, also reduced the overall number of visible joints in the floor and ceiling soffits compared with other potential prestressed flat soffit systems, while their mechanical edge shear connection system removes any differential camber between individual units, thus providing an architecturally pleasing flat soffit.

No toppings required

Some 1424m² of 400mm-deep GT units were used for the 14m clear span, while 1441m² of 250mm-deep units were used for the 8m clear span. The GT units are designed so that no structural concrete toppings are required and thus their use reduced further additional on-site activities and programme time.

The bridging walkways between the two first-floor areas were also formed of GT units.

Composite in-situ concrete – steel Deltabeams were used to span between columns and support the GT flooring. The PCE/PERI safety hand railing system was fixed directly to the composite steelwork beams at ground level prior to their erection, thus providing a safe working platform as soon as the floor units were erected. A further advantage of this form of composite

14m-long GT roof units installed.





The hybrid concrete frame has enabled the architect to achieve both functionality and aesthetic excellence.



Atrium view showing shear walls and GT floor units forming the link bridge.

beam construction is that no downstands are formed, as would be the case if a fully precast beam solution had been used, thus again meeting the architect's design aspirations.

In total, 316 off-site engineered precast concrete units were used in the frame construction, with 88 composite in-situ concrete – steel beams.

A BIM approach was used to ensure an efficient design process and co-ordination with the other specialist packages involved, alongside an in-house-developed IT management control systems, to deliver the project with a total on-site construction period of only nine weeks.

To ensure quality requirements were achieved, including accuracy of fit requirements, stringent factory production quality control and checking procedures were implemented. This enabled the delivered product to be incorporated into the project on a first-lift basis without the need for any modifications or adjustments. The off-site supply chain for this project included Banagher, Bison, Shay Murtagh, SWP and Peikko. The on-site in-situ concrete was supplied by CEMEX.

This CEF project demonstrates that the economic use of an off-site engineered principally hybrid concrete solution – to give a unique structural frame providing

clear-span solutions, internal high-quality visible concrete surfaces and incorporating environmental control solutions – need not be constrained to significantly large projects. The success of this solution was due to the 'kit of parts' approach and this is a significant step forward in gaining greater market share for concrete frames versus structural steelwork for similar-sized projects. ■

CEF IT HQ, Durham

Client	City Electrical Factors
Architect	FaulknerBrowns
Consulting engineer	Curtins Consulting
Specialist hybrid structural frame contractor	PCE

Precast columns with Peikko column shoe connection detail.



Commencement of erection of PreFastCore stair unit.

