MOUNT OSWALD STUDENT ACCOMMODATION

CLIENT - Durham University & Equitix
COST CONSULTANT - Equitix
ARCHITECT - Willmore Isles
STRUCTURAL ENGINEER - Curtins Consulting
M&E ENGINEER - JCP
SPECIALIST STRUCTURAL FRAME CONTRACTOR – PCE Limted
PCE were responsible for the Design, Manufacture and Construction of the 5 student accommodation blocks using:

- Composite brick faced and reconstructed stone sandwich panel Façade's
- Precast concrete crosswall construction consisting of all internal wall and suspended floors
- Precast concrete Ground Beam and Ground Floor suspended slabs
- Precast concrete wall units for stair and lift shaft cores
- Precast concrete stairs and landings
- Pre-stressed concrete floor units
- Brick faced precast concrete insulated sandwich panels

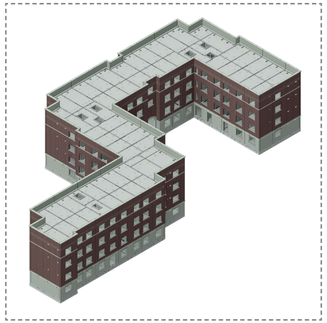
PCE CONTRACT VALUE - £18M

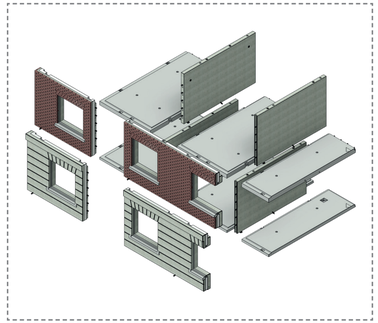
Introduction

PCE Ltd were appointed by Interserve Construction to provide structural solutions on a design and build basis for 5 student accommodation buildings containing over 700 student bedrooms using their offsite HybriDfMA crosswall construction and architectural façade solution approach. The aspiration was to mix Georgian architecture with contemporary design to create a link between the existing student accommodation in Durham and the newer, more recently constructed modern University Buildings.
The external façades of the buildings were critical in terms of quality and variation of appearance and the architectural sandwich panels were manufactured with a range of finishes dependent upon which building they were being installed on. The finishes to the external leaf of the panels included the casting in of bricks, reconstructed stone finishes and architectural relief patterns created from the mouldage during the casting processes. PCE was awarded the contract, worth over £18 million, for delivering the HybriDfMA structures for the 5 four storey blocks using offsite manufactured precast concrete ground beams, internal wall panels, flooring units, stairs and landings, structural steelwork, and precast insulated architectural finished sandwich panels to form the facades. In total over 4,000 offsite manufactured structural components were designed, manufactured and assembled on site.

Hybrid Living Structure

The initial design processes for all of the structural components was driven to achieve an amalgamation of element interfaces with high repeatability. These interfaces were developed in a 3D environment for cost effective ease of product manufacture and on-site build using PCE's proven structural system philosophies. One key benefit provided to the client by this approach was the use of fully integrated architectural precast concrete sandwich panel units to form all the building's façade solutions. These units were manufactured in a controlled offsite factory environment thus enabling the very high architectural finish specification requirements to be achieved. Other key benefits included a reduction in the number of other trades on-site that a project of this scope would normally have required, whilst improved co-ordination of the complete build process maximized efficiencies with regards to quality, programme, and waste and resultant carbon footprint.





Project Features

An innovative precast concrete ground beam solution was developed, 'socketing' directly onto the as cast pile tops thus eliminating the need for formation of pile caps. This enabled the foundations above pile top level for each of the buildings to be completely manufactured under factory-controlled conditions away from the construction site. Delivered on a planned just in time delivery basis the foundations for each building were assembled before being assembled on site in under 5 working days for each of the buildings.
The superstructure above foundations was configured using PCE's HybriDfMA Living System 'kit of parts' approach for all the structural components. The precast concrete floor units were cast with high quality finishes and integrated M&E containment allowing the soffit to be painted directly removing the need for suspended ceilings. The top surfaces were manufactured to receive direct application of floor finishes, without the need for any structural toppings or levelling screeds thus negating additional on site works and the risk of subsequent drying times. The internal precast concrete crosswall panels were cast vertically in battery mouldage, ensuring that both sides of the wall components were suitable for paint to be applied directly, which removed the need for additional finishes such as plasterboard and such associated tradework.
The composite façade panels were of sandwich construction, comprising an internal structural leaf of precast reinforced concrete, an insulative core, and an outer thinner leaf of precast concrete which either had cut bricks bonded into it as part of the casting process, or was formed with a decorative, patterned, reconstructed stone finish, the three leaves being structurally connected during the casting process to form one unit for delivery to site.

Key Metrics

- **Only a 40-week on-site construction programme**
- **Only 70,000 on-site man hours for assembly of the 5 blocks**
- **No Health and Safety incidents**
- **Defect free**
- **No requirement for any external scaffolding**
- **Reduction in use of over 1,250 tonnes of concrete by removing the need for insitu casting of pile caps**
- **Over 700 ensuite bathroom pods integrated within the assembly of the structures**
- **Significant reductions in noise, dust and disruption to the existing University Campus**

Large, preformed openings in some of the façade sandwich panels were pre-glazed at the manufacturing factory prior to delivery enabling the enhanced benefits of the factory engineered offsite manufacture approach adopted by reducing following trades on site, the need for external scaffolding, improved quality and Health and Safety with reduced waste. Some of the façade panels also included structural steel sections cast in to facilitate the appearance of continuous glazing at the wrapround corners of the building.

Project Delivery

The on site assembly of the 5 blocks was executed with an average of only 35 of PCE's multi-skilled operatives who assembled over 26,000 tonnes of offsite manufactured concrete components to complete the project in just over 70,000 on-site man hours, without any Health and Safety incidents.

PCE's flexible delivery model meant that a holistic system build strategy could be adopted, with everything, including foundations, being delivered utilising offsite engineered precast concrete components. This resulted in significant reductions in the construction period, on site man hours, site deliveries and carbon footprint compared to that of a traditional construction approach.