SIR WILLIAM HENRY BRAGG BUILDING

PROJECT VALUE - £96M
CLIENT – UNIVERSITY OF LEEDS
COST CONSULTANT – ARCADIS
MAIN CONTRACTOR – BAM CONSTRUCTION LTD
PROJECT ARCHITECT – ADP
STRUCTURAL ENGINEER – ARUP
M&E ENGINEER – BAM SERVICES
PCE SCOPE OF WORKS –

- PRECAST CONCRETE COLUMNS
- BEAMS
- SOLID AND TWIN WALLS
- DELTA BEAMS
- COMPOSITE STEEL BEAMS
- STAIRS AND LANDINGS
- COMPOSITE BASEMENT WALLS
- INSITU CONCRETE SLABS
- PRESTRESSED SOLID FLOORING UNITS

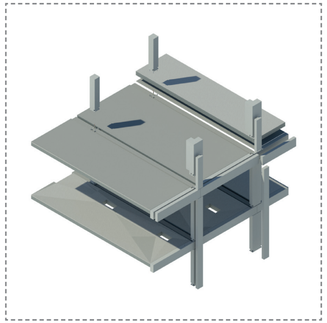
PCE CONTRACT VALUE - £6M

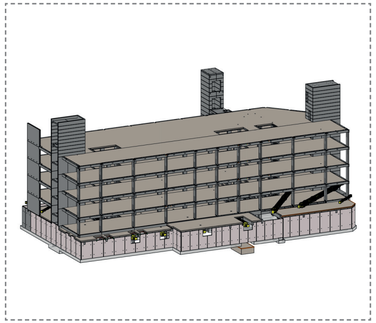
Introduction

The Sir William Henry Bragg Building, was constructed to create an integrated campus for Engineering and Physical Sciences at the University of Leeds for Leeds University Campus Developments, to build on a shared interaction between these disciplines. Located on the north east quarter of campus, the 15,700m² building enables the integration of the University disciplines of Engineering, Physics and Astronomy and Computing along with the provision of critical central teaching and social interaction spaces. PCE Ltd was instructed by Main Contractor BAM Construction Ltd to provide the design, manufacture and construction of the five storey structure using the well proven HybriDfma approach. PCE was selected for the project partly as a result of their success with Project Capella, which PCE designed and constructed for Cambridge University – a building which required specific structural performance requirements for minimising vibration, also required with this project. ADP were the architects for this project and Arup the Consulting Structural Engineer, providing building services design.

Hybrid Frame Structure

The composite precast and insitu concrete wall forms the watertight inner lining of the basement box, which has been formed by a contiguous piled outer wall. The basement is where most of the laboratory buildings specialist equipment is housed, thus the need for watertight construction. The precast wall components also provide support for the suspended ground floor slab and perimeter columns which are all part of PCE's HybriDfMA Offsite engineered structural solution. All of the precast concrete components for the basement and ground floor construction were designed so that they could be erected around the complex basement struts which remained in place until the liner wall and ground floor was constructed and structurally tied to the piled wall. The Offsite engineered Hybrid structure approach uses a range of different structural components including hot rolled and Delta Beam steel sections, insitu concrete and precast concrete components including columns, beams, twin-wall and 175mm thick pre-stressed concrete floor units with channels cast in for secondary fixing of Mechanical and Electrical services.





Project Features

ADP Architecture and Curtins Engineering were commissioned to carry out the design up to RIBA Stage 2 with BAM Design and Arup taking the design development through to completion in their respective disciplines from RIBA Stage 3. Using its holistic Digital approach for planning and designing of the ground floor structure, PCE enabled its construction around the complex temporary basement struts which remained in place until the floor is fully constructed and structurally tied to the external basement contiguous piled wall, thus acting as a diaphragm to provide the necessary horizontal strutting forces. When the insitu poured concrete element reached the required strength, it enabled the ground floor to provide the necessary diaphragm action to support the contiguous piled basement walls. The struts were then dismantled into sections for safe removal by being lifted from the basement through an opening in the ground floor by the site tower crane. Construction above ground floor commenced with precast concrete twin wall elements and the first level of PreFastCore boxes, all part of PCE's HybriDfMA Offsite engineered structural solution for this exciting project. The flooring units comprise just over 40% of the total of the offsite engineered precast concrete units used to construct the building and along with structural steel beams, Deltabeams and reinforced insitu concrete.

Key Metrics

- **Throughout the project over 1,750 off site-manufactured components were delivered to the site.**
- **The components were erected by the PCE site team of just 22 highly trained, multi skilled operatives, in just 32 weeks.**

Through the utilisation of the latest digital engineering tools, PCE's systemised engineering approach, and catalogue of standard structural components and connections, the highest levels of quality, structural performance, predictability and value were achieved along with significant programme and site logistics benefits compared with the initial insitu concrete frame design. The components, comprising structural precast concrete columns, beams, solid walls, twinwall, PreFastCore® lift core boxes, stairs, landings, normally reinforced and pre-stressed concrete floor units along with structural steel beams and Deltabeams were sourced from multiple manufacturing facilities across the UK and Europe. The placement of a further 2,400m³ of insitu reinforced structural concrete in the basement liner wall, precast twinwall cores and reinforced structural topping completed the hybrid structure.

Project Delivery

The 'kit of parts' design solution consisting of over 1,750 off-site manufactured structural components was assembled in 32 weeks by a team of just 22 of PCE's highly trained, multi-skilled operatives. ICEP's was the second research development structure by PCE following the successful completion of Project Capella, renamed Jeffrey Cheah Biomedical Centre, for the University of Cambridge. Both projects were subject to exceptionally high levels of vibration resistance within the suspended floors and following on-site dynamic testing of the as-built structure, ICEPS exceeded the target VC-A performance specified requirement. PCE and Main Contractor BAM Construction Ltd delivered the detailed design from RIBA Stage 3 carried out by the companies in house structural design team, manufacture and assembly of the five-storey superstructure and basement utilising their HybriDfMA Frame System approach. The Concrete Centre in publicising this winter edition of Concrete Quarterly, has called the project, "a precast palace of science", a most fitting commendation for this project which is just an example of PCE's extensive involvement in the higher education and scientific research sectors.