AWARD
OXFORD UNIVERSITY BIOCHEMISTRY BUILDING

ARCHITECT - HAWKINS BROWN
STRUCTURAL ENGINEER - PETER BRETT ASSOCIATES
STEELWORK CONTRACTOR - WILLIAM HARE LTD
MAIN CONTRACTOR - LAING O'ROURKE
CLIENT - OXFORD UNIVERSITY ESTATES DIRECTORATE

The client's brief called for an iconic building to house a state-of-the-art biochemistry facility, providing functional laboratory space alongside a high quality working environment. A flexible and adaptable building had to include interactive circulation space to promote transfer of ideas, good quality daylight and public art to set the standard for subsequent development.

The new Biochemistry building (phase 1 of 2) for Oxford University is a striking example of contemporary design co-existing with historic buildings. The choice of cladding provides a stunning yet complementary contrast to the Cotswold stone surroundings, giving the required iconic feel.

The laboratories surround a large central atrium which includes secluded study alcoves, footbridges for cross linkage and communal areas ensuring an interactive, functional yet personal atmosphere.
The atrium space also contributes to the sustainable strategy for the building by drawing in cool air at basement level and venting warm air at roof level, providing large quantities of natural daylight and including photovoltaic panels on the atrium roof feeding into the energy requirements of the building. A green roof area provides relaxation space for building users and rainwater harvesting for toilet flushing.

A highly serviced building with significant services zones presented a challenge with regard to staying within strict height limits. This was overcome by integrating the services and structural zone using a two level hybrid 'parallel beam approach', with structure at each level running alongside the services in both directions.

judges' comment

A surprisingly airy building with laboratories around an atrium. Internal bridges and generous circulation spaces encourage academic interaction.
A steelwork solution was optimal for restricted height and future services flexibility. Steel "plunge" piles and sheet piling support steelwork on split levels, with parallel services runs, behind a colourful external elevation.

A very effective steel solution to a complex and adaptable building.

Future flexibility was paramount due to the phase 2 extension of the building. Studies into the building grid concluded that a 9 x 6.6m grid provided the optimum layout for laboratory modules, economy of components based on an industry standard 600mm grid (cladding, ceiling and floor tiles) and would allow ease of future extension. A slight over-run in the basement footprint was also provided to facilitate the extension of the two level basement.

Particular constraints to construction included a congested site in central Oxford, surrounded by operational buildings and adjacent Grade 1 listed historic buildings. The use of top-down construction for the basement with the steel frame connected at basement slab level provided high speed installation of the permanent steel structure propping the secant walling. CO_2 audits of various structural framing options for the building showed that a steel composite frame produced the least CO_2 emissions for structural materials as well as the lowest haulage emissions, helping the client and team to decide that steel framing was beneficial on a number of measures.

The building required numerous cantilever areas such as atrium balconies and walkways along perimeter corridors where columns were set back from the elevation.

Ventilation requirements to laboratory areas and a high density of ancillary services also required a structure that facilitated services to an unusual degree. For these reasons, a hybrid 'parallel beam approach' was developed, where steel framing was split into two orthogonal levels, each level of steelwork running parallel to the services in that direction.

This system provided the shallowest and most economical floor zone, whilst ensuring that future refit of services is made easier by the continuous dedicated service zones in two directions. Other structural advantages of this system included a grillage of continuous beams which enhanced structural efficiency, provided a natural ability to form the required cantilevers, and a faster and safer erection process due to simplicity of connections including many 'land on' arrangements and fewer beams.

Basement construction was a major influence on the design development. Top-down construction of the two level steel-framed basement placed severe constraints on the installation of steel columns within plunge piles. However, the piling and steelwork contractors produced 18m long plunge columns with a typical plan tolerance at the top of the cantilever of +/-10mm.

Future extension of the basement steered the design to integrate a section of steel sheet piled wall into the typical secant piles in order to ease removal of the wall in the next phase, allowing an uninterrupted atrium for the entire length of the future building. Temporary propping of the secant piled retaining wall was performed by the permanent steel beams prior to the slab pour, providing some challenging connection details for the steelwork contractor in areas of high axial loads and changes in level. However, dealing with these basement details, as well as very neat countersunk column splice details to minimise column casing, showed that the steelwork contractor was equal to the task.

Geotechnical modelling of the piled wall movements during and after construction economised on the steel tonnage within the basement, and provision of a drainage layer below the basement slab reduced hydrostatic pressures and slab thickness substantially, helping to produce a more sustainable and economical design.

The steelwork design evolved with the architectural, services and construction requirements, and provided a solution which was proven to reduce embodied CO_2 emissions. The Biochemistry building delivers a design which can be regarded as truly integrated, flexible and sustainable.