

BATTLE McCARTHY ©

Consulting Engineers & Landscape Architects



PROJECT:

Newcastle University, Devonshire Building, UK

CLIENT:

Newcastle University

ARCHITECTS:

The DEWJOC Partnership

BM SERVICES:

Sustainability Consultants, MEP Engineers
& Structural Engineers

VALUE:

£11million/5400m²

DESIGN BRIEF

The Devonshire Building is a major new six storey building in the heart of the campus of Newcastle University and it was the Client's requirement that the building should be considered a landmark building. It has been an important requirement that the Structural Engineering is integrated with the Architecture, the Building Services Engineering and the Landscape Architecture to reflect the Client's aspirations and concern towards the environment.

The building houses laboratories and office spaces for the University's Multidisciplinary Environmental and E-science Research Centre. The building became fully operational in March 2004.

The environmental strategy and sustainable design is currently being used as a case study by the HEFCE in their policy document 'Sustainable Development in Higher Education'.

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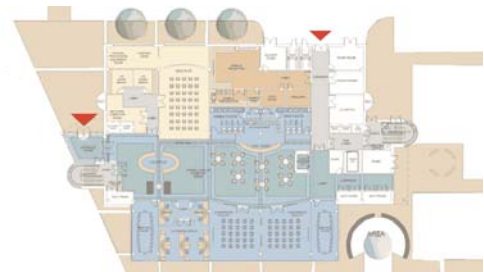
DESIGN INITIATIVES/ACTIONS UNDERTAKEN

The structural and services schemes are based upon the innovative use of proven technology combined with progressive designs for flexibility and has the following attributes:

- Provision of high thermal mass floor allowing a reduction to the cooling load during the summer and the regulation of the internal temperature during the winter.
- Integration of Structure and Service routes to optimise useable space and hence minimise materials.
- High acoustic isolation standards.

The building is the first laboratory building to be awarded a BREEAM excellent rating, presented by Energy Minister Stephen Timms.

Because of the range of functions the building was assessed under the bespoke BREEAM scheme, and achieved the highest ever score in this category.



The building is designed to the highest internal quality and with energy demands low enough to exceed current United Kingdom best practice targets by circa 30%.

The building is designed to capitalise on the local climate and is predominately daylit and naturally ventilated. Wind tunnel studies were utilised for optimised massing to aid natural ventilation. The building massing responds to the local microclimate and prevailing wind systems and positively impacts the microclimate and local wind environment without reducing solar access and passive solar heating to existing buildings.

Within the building, there are a number of different spaces, ranging from the closely controlled laboratories to a very loosely controlled central atrium. This atrium acts as a climatic buffer that whilst benefiting from passive solar heating, serves to reduce heat loss and heat gain to the adjacent spaces.

Climate responsive façade systems optimise the levels of daylight and solar penetration, according to time of day and season. Highly efficient active services solutions are employed, such as displacement ventilation and geothermal cooling to meet the cooling loads associated with some of the laboratories.

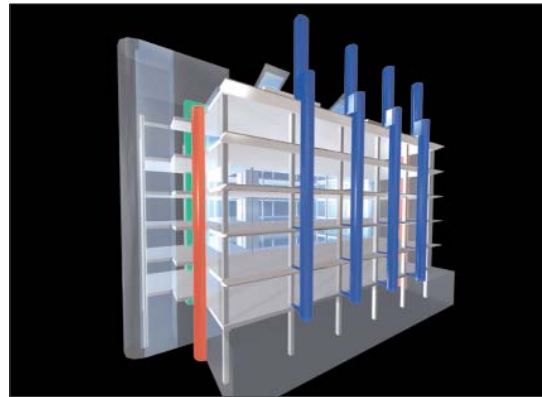
Renewable energy is harvested on site with rooftop PVs, and micro CHP meets baseline electrical and thermal cooling/heating loads. Geothermal heating and cooling is also used.

The southern elevation of the building contains a glazed façade, shaded by louvers, that extends to a lightweight barrel vault roof over the building featuring integrated photovoltaic panels. The 269 panels installed over 184m² generate a peak 25kW of electricity.

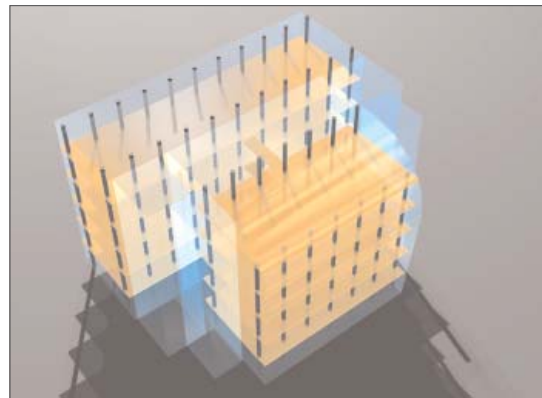
Typically the heavy items of mechanical plant, i.e. chiller units, water tanks, etc are located on the external roof. The building avoids the use of ozone depleting refrigerants, and has a low NOx emitting boiler.

The main structure of the building comprises a braced steel frame, which supports concrete hollow core floor units. Vertical loads from the floors are transferred via the steel beams to columns. The columns are supported at foundation level on reinforced concrete pile-caps above 600mm diameter concrete piles, 18m in length. Lateral stability is provided by a combination of the floor slabs acting as diaphragms to transfer applied horizontal loads to the vertical steel cross bracing located at distinct perimeter bays of the structural frame.

The façade and roof are supported on a continuous structural steelwork tubular support frame. Shading to the glazed façade is provided by louvers, which will be fixed to the main steelwork supports in prefabricated panels approximately 4.0m x 7.2m.



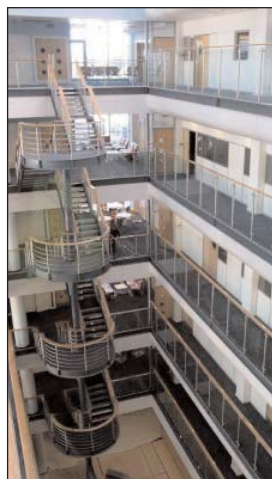
Service Risers



Structural Columns & Floor Layout. Floor Slab



The lightweight roof with PV array, external shading louvers and atrium rooflights



External view, the atrium, external service risers and external access walkway behind shading louvers