GSK Centre for Sustainable Chemistry
Carbon Neutral Laboratory

Scope of Works

Working in collaboration with Anthesis (formally Best Foot Forward), KLH Sustainability provided carbon footprinting expertise to ensure this BREEAM Outstanding and LEED Platinum chemistry laboratory achieved full carbon neutrality within a 25-year period. To achieve this vision, we worked closely with the design team, analysing the carbon impact of each design iteration. We subsequently supported the University through the competitive tender process to select a principal contractor and provided an assurance role on site.

Challenges

'As-built' versus 'as-burnt'

Unfortunately the building was subject to a massive fire in September 2014 prior to completion. Deciding how to treat the carbon impact of the fire was a unique challenge for the carbon footprinting. Emissions from the fire include the embodied carbon of materials lost as well as the emissions of sequestered carbon from the incinerated timber.

The decision was taken to exclude the fire from the final carbon calculations as it was a force majeure and therefore not representative of buildings of this nature.

The final 'as-built' audit demonstrates an 11 year payback period for the building, excluding the fire. This is well within the 25 year target.

Ensuring a fit-for-purpose laboratory

Several changes were made during the design development to accommodate the University of Nottingham's requirements and deliver a laboratory that was fit for purpose over its lifetime. These included higher density of equipment and fume cupboards, and cellularisation of office space, which necessitated the use of mechanical ventilation instead of natural ventilation. In addition, specialist equipment including Nuclear Magnetic Resonance spectrometers, was introduced. These changes increased the power demand beyond that which could be provided by the PV panels and the low carbon, bio-fuel Combined Heat and Power Plant (CHP) sized to meet the building heat demands. Subsequently the size of the CHP was increased to provide the additional electricity requirement with associated surplus heat exported to other campus users.

Outcomes

Embodied carbon

Throughout the design development process, design options were reviewed to ensure that carbon was a key factor in the decision making. Examples include the substitution of mineral wool insulation with wood fibre insulation: although the thickness required increased, the embodied carbon was significantly reduced. For the foundations, a raft slab with vibro-stone columns was selected due to its lower embodied carbon.

Operational energy

Operational efficiencies were created through building design, such as insulation, as well as changing user behaviour, such as laboratory operating hours. Comprehensive energy demand modelling conducted by AECOM was used together with DEFRA emission factors to determine the cumulative carbon impact of operation over the 25 year analysis period. By generating more solar and other low carbon energy each year than it consumes, the building gradually pays back the carbon cost of construction and maintenance of the building.

Contractor engagement

The requirements for delivering a low-carbon building were integrated into the procurement process, with guidance given to the successful contractor, Morgan Sindall. Regular audits were undertaken in a collaborative manner to ensure delivery of the carbon neutral vision. Over 60% of the building elements, by value (excluding MEP) were procured with Environmental Product Declarations. Error factors were applied to all other carbon data, depending on the robustness and quality of the carbon datasets used.

Client
University of Nottingham

Architect
Fairhursts Design Group

Engineer
AECOM

Contractor
Morgan Sindall

Year
2012-2016

CSC from Triumph Road

Main entrance to CSC

Laboratories