NIAB

NIAB InnovationFarm

EUROPEAN UNION
Investing in Your Future
European Regional Development Fund 2007-13

Sophi Taylor Building, The MacLeod Complex
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The embodiment of sustainability

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The MacLeod Complex

Set on the border of NIAB's Cambridge headquarters, the MacLeod Complex has grown from the original farm site into a modern 3,300m^2 glasshouse complex with a purpose built Visitor Centre – the Sophi Taylor Building – and service areas.

Completed in the spring of 2013, the total cost of the combined projects was some £2.16m, funded by the NIAB Trust and the European Regional Development Fund.

In keeping with the ethos of NIAB Innovation Farm, BREEAM 'Outstanding' was the primary objective for the project. The Building Research Establishment has developed the BRE Energy Assessment Methodology (BREEAM) as the world's leading building environmental assessment method. At the time of completion BRE had 52 projects in the UK within their 'Outstanding' category; the Sophi Taylor Building was one of only 15 at the 'Final' stage.

The Sophi Taylor Building was designed by RH Partnership and built by SDC Construction. The glasshouses were built by CambridgeHOK.

Sophi Taylor

Sophi Taylor was an Oxfordshire farmer's widow who left a significant legacy to NIAB after her death in 2010. A partner in the mixed arable farm business with her husband Henry, Mrs Taylor had a lifelong interest in plant breeding research and technology and it was agreed that naming the new facility after her would be a fitting tribute to her memory.

The Sophi Taylor Building – Less is More

The building is designed to meet the needs of users with minimal electrical and mechanical interference. It operates simply, making the most of the energy available to it from the sun and the users themselves, harvesting rainwater and conserving these resources for release when required.

Cross Laminate Timber

Erecting the CLT frame

The building is constructed of Cross Laminate Timber (CLT) which is environmentally sustainable and thermally efficient. It also facilitates rapid construction, an essential project requirement.

Timber is the only truly renewable construction material, with the lowest energy consumption of any building material across its lifecycle.
This form of construction reduces CO_2 emissions because trees act as a carbon 'sink' removing CO_2 from the atmosphere, releasing oxygen and storing carbon.

$1m^3$ of CLT panels will remove approximately 0.8 tonnes of CO_2. Therefore, $1m^3$ of CLT panels will have approximately 240-250kg of 'locked-in' carbon.
By comparison, the production of cement results in around 870kg of CO_2 emissions per tonne of cement and the production of steel results in around 1.75 tonnes of CO_2 emissions per tonne.

Rainwater Harvesting

$145m^2$ of the roof area (over half the area of a tennis court) is used to collect rainwater for use in the toilet cisterns. Over a year, this will save over 40% of the total water consumption of the building.

The Roof and other features

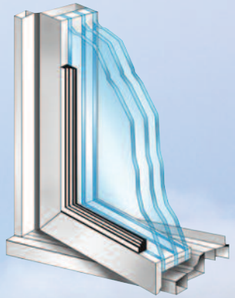
The roof is a combination of sedum, photo voltaic cells (PVCs) and zinc. The sedum helps the building to regulate rainfall flow; the capacity of the PVCs is precisely balanced to ensure the building is carbon neutral in operation. Zinc is maintenance free and has a 100 year lifespan.

Thirty-two 250W photovoltaic panels are mounted on the roof. These are capable of providing 8kW of electricity, the equivalent of saving 50,000kWhr per year (or 3.5 tonnes of CO_2 per year). 50,000kWhr per year would provide sufficient power for ten households.

Photo voltaic cells

Sedum roofing

Heating to each area of the Sophi Taylor Building and the glasshouses can be controlled via a regulated input from a biomass boiler to reflect differing user demands.



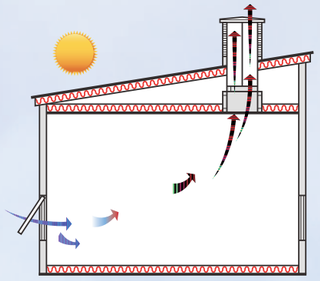
The building also benefits from high performance triple glazed windows (some 30% more efficient than standard domestic units).

The design and ecology of the garden and landscaping is an integral part of the overall design and is an important element of the BREEAM assessment process.

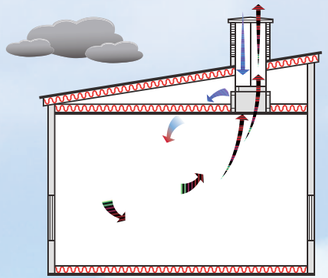
‘E’ Stack Ventilation System

The building is ventilated using an innovative low energy E-stack system. E-Stack units are a low energy method of ventilating areas of high occupancy, using less power than a 100W light bulb. They automatically adjust between the modes of ventilation for winter and summer to optimise the ventilation strategy based on the environmental conditions.

The E-Stack units have two modes of operation; mixing and displacement ventilation. Mixing mode operates when the outside temperature is cold (10°C to 17°C) and displacement ventilation operates when the outside temperature is warm (>16°C as a default). When the external temperature is below 10°C, the E-Stack units will not operate. There is also a night cool mode, which operates under displacement ventilation.



Summer



Winter

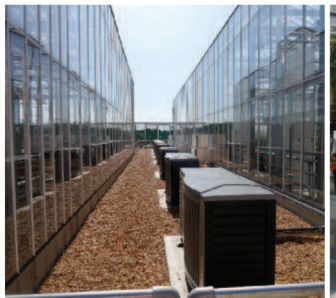
The Glasshouses

The first phase of the MacLeod Complex development opened in 2009 with the completion of eight glasshouses of the ‘Venlo’ design. The second phase of two further glasshouses was completed in 2012.
This design is used in many glasshouses, which is important given NIAB’s close connection with commercial growers.

All but two of the glasshouses are built with glass as this is still the best conductor of light and, unlike polycarbonate, does not block ultra violet light. The glasshouses benefit from a Building Management System (BMS) which uses data from the on-site weather station to control glasshouse temperature and humidity. Minimising the carbon footprint of the new installation was essential, and a biomass boiler provides 50% of the heating requirement for the complex. Blackout blinds, also controlled through the BMS, ensure that there is no overspill into adjacent compartments.

The glasshouses provide a range of soil-bedded and concrete floors, providing users with the widest possible range of growing conditions. Next door to the houses, a 3,750m^2 standing out area, complete with its own irrigation system, provides a protected and secure area for plants to grow outdoors. Immediately adjoining this are the NIAB Innovation Farm field plots.

Rainwater gathered from the house roofs is not suitable for research activity, but is instead channelled to a carefully planted swale which then discharges at a controlled rate to a nearby stream.



The NIAB Innovation Farm Glasshouse

This glasshouse was designed using the same ‘Venlo’ construction as the other glasshouses but has some special features to provide researchers and SMEs with state of the art facilities, and at the same time provide an ideal environment for visitors to see science in action.

It houses three self-contained units whose lighting and heating regimes can be managed independently through the BMS. This provides users with the ability to achieve up to 30°C of heating in winter and 10°C of cooling in summer.

24 roof ventilators, sealed with insect mesh, provide the maximum natural ventilation and reduce energy costs. Lighting is also managed by the BMS and ranges from 6,000 to 10,000 lux, with careful planning to ensure there is minimal spillage as well as an even light level over each compartment, allowing day length to be manipulated.

Particular attention was paid to noise levels to ensure that presentations made within the compartments can easily be heard by groups of up to thirty visitors. The measures taken reduced noise levels to below 50DbA, providing a comfortable environment for visitors and presenters alike.