# New sustainable, flood-resilient construction materials put to the test

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Construction companies and academics can now test low carbon construction materials and systems in realistic open-air conditions. The HIVE, based at the University of Bath's Building Research Park, Swindon, is the first facility of its kind in the UK and will be officially opened by the University's Chancellor, HRH The Earl of Wessex today.

The built environment is presently responsible for 50 per cent of all carbon dioxide emissions – making it the UK's largest single emitter. The research planned at the Building Research Park will analyse the environmental impact of construction materials in the future – including their energy efficiency, flood resilience, structural capability and internal air quality.

Before being incorporated into real buildings, new building materials and systems are developed in the laboratory and must be evaluated at full scale. The HIVE offers a 'plug and play' facility and expertise to test and evaluate materials and systems in a ready-built open air environment, speeding time to market for innovative materials.

The building has eight individual cells which are carefully constructed to be completely insulated from each other, each with a single face left exposed to the external environment. The faces are used to install walls made from a whole range of materials and construction systems, and the performance of these walls is evaluated in real life conditions – creating a more accurate picture of environmental performance than the u-value assessments currently used in building regulations.

Commenting, Professor Jane Millar, Pro-Vice-Chancellor for Research said: "The HIVE is a pioneering site that will allow industry to develop future energy-efficient construction materials and systems faster, while strengthening the research capabilities of our BRE Centre for Innovative Construction Materials."

The £1m HIVE is funded by the Engineering and Physical Sciences Research Council (EPSRC). The Science Museum – which has a storage facility there – is leasing the land to the University at a peppercorn rent in order to further encourage the development of sustainable construction materials.

Lesley Thompson, EPSRC's Director of Science and Engineering, said: "Our investment in the HIVE will allow researchers to study the carbon emissions and environmental impact of construction materials and will make a real difference to the future of construction both in the UK and worldwide. This grant fits alongside a number of other strategic investments we have made in research and training in civil engineering, and these align strongly with the Government's Industrial Strategy for the construction sector."

Dr Mike Lawrence, Director of the Building Research Park said: "Finding new, sustainable methods of construction – properly tested in a real building such as the HIVE – is essential if the UK is to lead the way in low carbon homes and meet challenging emissions targets."

Some of the research already underway includes:

- testing the thermal and acoustic performance of double skin facades, along with the performance of different window types and acoustic ventilators with Mach Acoustics to help increase use of low impact natural ventilation

- testing fabricated, pre-dried, hemp-lime panels in open air buildings – contrasting thermal performance with wood fibre, mineral wool and other materials – part of the EU-funded HEMPSEC project
- understanding how effective wall panels are at addressing poor air quality, for instance by absorbing VOCs and other pollutants with EU-funded ECOSEE project
- testing the flood resilience and structural integrity of timber walls – to help flood proof future homes.

Alongside a material's hygrothermal and environmental performance, buildability and durability, researchers can evaluate the internal environment that construction materials create. The HIVE also features:

- a hygrothermal cell to evaluate movement of heat and moisture through buildings, energy efficiency, air tightness and acoustic efficiency
- a double height and width cell that can be used for flexible construction design, testing façades, internal walls and floors, together with a strong roof, allowing for load testing
- a flood cell that can be used for testing the resistance of construction materials to high water levels or for testing technologies that resolve the effects of flood damage
- a bladder cell that enables the testing of construction panels against horizontal loading such as wind load and geotechnical forces.

Alongside the HIVE is a separate facility for testing building materials, comprising 16 individual 'platforms'. These 25$m^2$ platform foundations act as bases on which small temporary structures or 'pods' of up to 125$m^3$ can be built and tested.

Provided by University of Bath