Amid the mighty mountains of Snowdonia National Park, a green revolution is underway. For over 40 years, the Centre for Alternative Technology (CAT) has led pioneering research into renewable energy sources and sustainable building techniques, and today it is a bastion of eco-conscious learning and development.

WISE represents all that CAT has achieved over the years, distilled into one building that showcases the highest standards of green building and energy conservation. Over two storeys, it houses a 200-seat lecture theatre, offices, seminar rooms, and 24 double bedrooms with en suite facilities – providing residential students and visiting professionals alike with an inspirational taste of what can be achieved using sustainable construction principles.

Although CAT is known as a leader in the field of sustainable building practices in the UK, WISE was a far more ambitious project than had previously been attempted. The Centre wanted to prove that non-conventional materials could be adapted to suit mainstream construction, and in doing so establish a new era of eco-building.

As structural engineers, BuroHappold was challenged to develop a design that married non-conventional building materials with mainstream construction practices. Our solution had to deliver exceptionally high performance standards while retaining a distinctly modern aesthetic. As the site itself was a redundant slate quarry, we also had to mitigate concerns around rock fall and general stability.

To meet our client’s brief for a building that is as close to zero carbon as possible, our team chose structural materials with very low embodied energy. These include FSC certified timber for the building frame, rammed earth for load-bearing walls and Hemcrete® for non-loadbearing walls. Made from a mixture of lime and treated hemp, Hemcrete® is a remarkable material that not only provides excellent insulation but actually absorbs CO2 in

THE WALES INSTITUTE FOR SUSTAINABLE EDUCATION (WISE)
MACHYNLLETH, WALES
its manufacture – resulting in negative embodied carbon.

To achieve the required levels of strength and stability for the site, we had to use conventional reinforced concrete for the building’s foundations. We did, however, ensure it was the most environmentally friendly reinforced concrete available.

The majority of the primary structure consists of a braced glulam frame. Our design comprised a series of mighty timber beams, ranging from 200 x 350mm to 200 x 560mm in size, supported on 200mm square sawn Douglas fir posts with super-strong galvanized steel connectors. Where additional stability was required, we fastened galvanized steel cross-bracing to the connectors. This gave the structure the embodied strength required to support the large spans that realised the expansive, open plan public areas.

As the walls of this external structure are non-loadbearing, they were filled with Hemcrete® and finished on both sides with breathable lime render. As well as allowing moisture to pass easily through the wall, this solution was simple to construct as it used methods that were familiar to a mainstream contractor.

Standing at the heart of the WISE building, the lecture theatre is the only part of the structure that has load-bearing walls. We used rammed earth to encircle this hub of learning with solid, impenetrable walls – measuring 500mm thick x 7200mm high – which provide vital thermal mass and ensure excellent sound insulation and acoustics within the theatre. A deep, rich brown in colour, the walls are rendered with a shiny, textured finish that elevates the humble material from which they were hewn to create a quite exceptional architectural feature.

Elegant, modern and cost effective to build, WISE represents a tectonic shift in the way we approach eco-building. Proving that green construction can be achieved on a large-scale by mainstream contractors, this project paves the way for the adoption of more sustainable practices across the UK, and indeed the world. Our reliance on fossil fuels, and the effect this has on our environment, is now an international concern – and it is projects such as this that provide a viable path forward with proven benefits for people and planet.

**CLIENT**
Centre for Alternative Technology

**ARCHITECT**
Pat Borer and David Lea Architects

**PROJECT VALUE**
£6 million

**DURATION**
2006 – 2010

**SERVICES PROVIDED BY BUROHAPPOLD**
Structural engineering and fire engineering