



The new Wales Institute of Sustainable Education will provide environment-minded architects and builders with an educational facility that is both green and high spec. Sally Spencer reports

HIGH ON A HILL overlooking the Welsh town of Machynlleth, the Centre for Alternative Technology (CAT) is at the dawn of a new age: "alternative" is becoming the new mainstream.

Set up as a community in the 1970s and once regarded as "a bunch of hippies in the hills", CAT is building a 2,000m² £3.4m green mini-university and conference venue. WISE, the Wales Institute of Sustainable Education will be a teaching venue for professionals and amateurs to explore ecological technologies.

CAT is raising its game on the education front as a result of demand. In the 1980s and 1990s, its public courses, teaching plumbers how to link up solar water heating and electricians how to harness windpower energy, attracted around 150 a year – today the figure is more like 1,500.

But it's the increasing popularity of its MSc course in 'advanced architecture: energy and environment studies' that has created the new impetus. More than 300 students are registered on the course (up from 30 five years ago), resulting in an influx of up to 150 students onto the site for a week every month. The current facilities simply aren't sufficient.

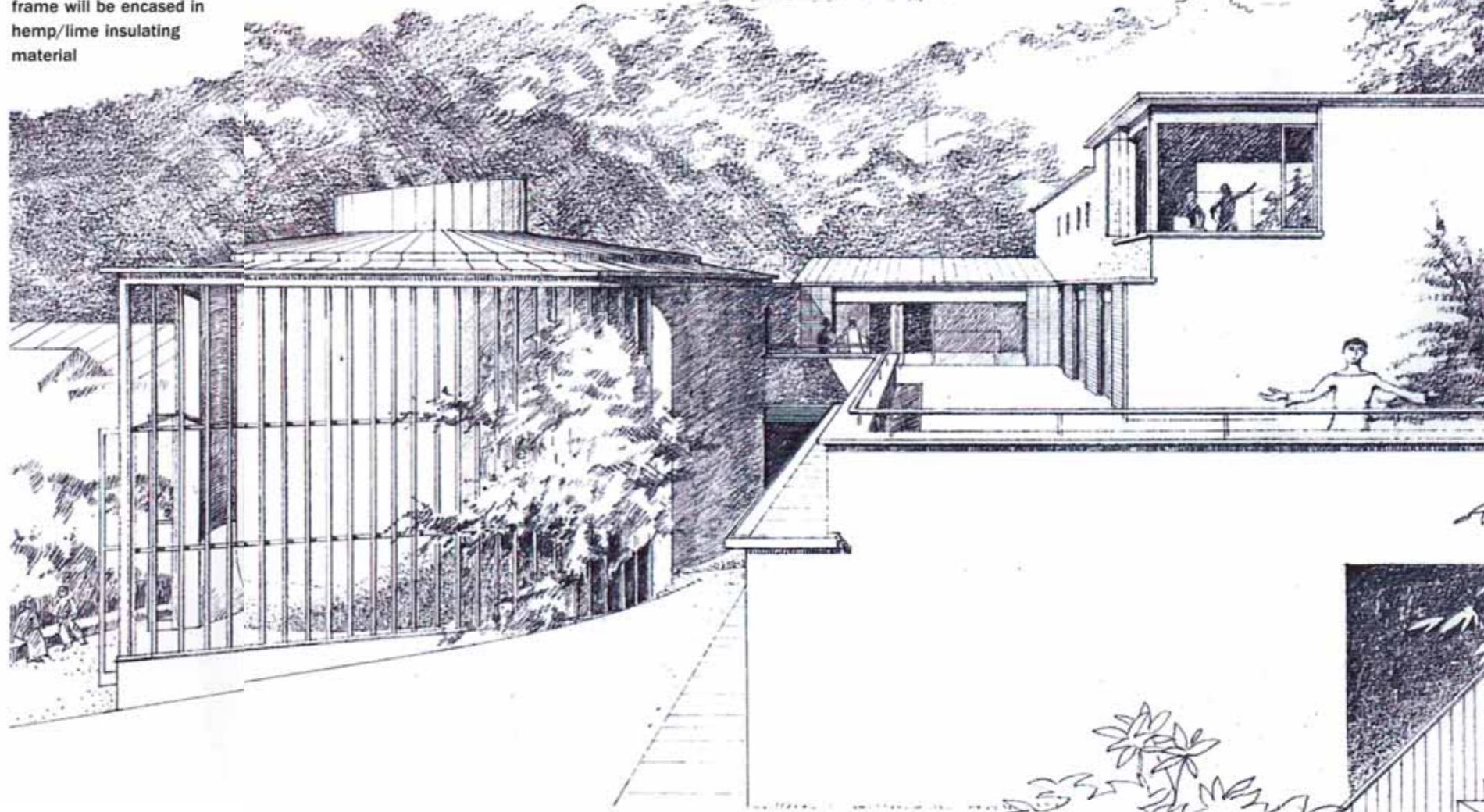
It's not just a matter of capacity, but also of style, as project co-ordinator Phil Horton explained. "We want to improve the quality of the accommodation on site because we're trying to roll out our ideas to businesses and local authorities. The object is to have people learning and staying in a very eco-building, but still having the facilities they would expect if they were staying in a hotel."

The WISE project comprises a 200-seat lecture theatre, 24 twin study bedrooms with en suite facilities, workshops, seminar rooms, offices, a biology laboratory, an extension to the existing restaurant and assorted breakout spaces.

The decision to go timber frame throughout was a no-brainer as it's tried and tested at CAT. "It's a very well understood way of constructing buildings with low environmental impact – providing the timber is sustainably sourced," said Horton.

The decision was also easy for Pat Borer, an architect who worked at CAT from 1976-1990 and who works almost exclusively in timber. His brief was, theoretically, simple – an accommodation list and a request to push forward the technologies that CAT had been developing for 30 years.

Large areas of the timber frame will be encased in hemp/lime insulating material



Solid timber decks of mechanically-fixed 6x2s create a warm deck and support the roof terraces above

The timber frame, supplied by Lilleheden, is "relatively conventional glulam made from FSC-certified European white-wood and jointed with steel flitch plates, but what we're trying to do architecturally is make the structure the decoration," said Borer. "The form follows the function."



A case in point is the fixed glazing. "The frame runs through the building, forming the window frames wherever possible," said Borer. "The windows are glazed into the glulam frame – there doesn't seem to be any point having a sub-frame inside it."

The floors follow the same thought process. The three-storey rectilinear accommodation and office wings that flank the circular lecture theatre will feature roof garden terraces. "The conventional way to do a floor is to have joists, plasterboard and insulation and a deck on top, but ventilation is difficult to achieve with a roof garden," said Borer. >

CAT WISEs up



Right: the 200-seat lecture theatre will feature a self-supporting, double-skinned roof

Below: the timber frame will extend throughout the WISE buildings



was blown into cavity walls, at WISE it will form the walls themselves and encase the frame. "We'll put up shuttering, blow in the hemp/ lime mixture, let it set and become rigid, remove the shuttering and then lime render on top of it."

At around 300kg/m³ Tradical is about half the density of wood but considerably denser than sheep's wool which is around 50kg/m³. The walls will have to be 500mm thick to reach the desired insulating value but, as WISE's benchmark is the Association of Environment Conscious Building's silver standard, which is roughly twice as demanding as Building Regulations, the structure is likely to be pretty snug.

"You will only see the timber columns and beams where they come out of the hemp/lime walls to form glazing," said Borer. He adds that the lime will also protect the timber which will be largely untreated. "We try to use durable or semi-durable timber such as larch, Douglas fir, sweet chestnut and cedar," he said. "Where the glulam is exposed we'll hand treat it with borax then paint it with non-toxic OS Color woodstain."

The floors will all be hardwood, probably locally-sourced ash, laid over underfloor heating. The heating and energy supply will be provided by solar and photovoltaic panels on rooftops around the site, supplemented by the output from a wood-chip burning combined heat and power plant, due to come on stream as the building is completed in the spring/summer of 2008. Excess energy generated will be exported to the National Grid.

The building's thermal mass will be boosted by ground floor partition walls made from earth blocks. This is a variation on a theme, as rammed earth is being used for the internal walls of the circular lecture theatre, which, at 7.2m high (and 500mm thick), will be the tallest of their type in the UK.

The earth walls will be surrounded by a timber frame, but will be the sole support for the lecture theatre. This sets a challenge as the roof over the earth drum has to be self-supporting and apply only downward and no sideways force. It will be double-skinned and comprise ply-web beams.

The more straightforward roofs in the other buildings will feature Masonite beams rather than roof trusses. "We use them because we want lots of very thick insulation – about 400mm of Warmcell – and if you've got a roof that deep you can use

◀ "Also, because of the weight, the joists would have to be closer together, so we decided to have a solid timber deck of 6x2s, screwed together and spanning the glulam beams. It will create a warm deck whereby we're using the insulating values of the timber itself."

The floors will also form the ceilings below. "The soffit you'll look up at will be the actual structure," said Borer. "There will be virtually no suspended ceilings in the building. It will be harder work in terms of integrating services in the structure but the honesty of the structure will show through."

There's a similar simplification of components for the external wall structures. For Borer the standard infill panel with its umpteen different layers of breather membrane, plasterboard and so on represents "a lot of work and a lot of duplication". Even the ultra-green sheep's wool insulation has to be packed between inner and outer panels of some description, resulting in a certain amount of load-bearing duplication.

The answer at WISE is to dispense with "all the stuff between the frame" and use hemp/lime mix. Tradical "hemcrete" has been imported from France and developed in the UK by Lime Technology. It was used at the Adnams brewery distribution warehouse (*Timber Building Winter 2006*) but while there it