

'Passive' house raises the



Carrigaline house won't be suffering from any heating bills this winter

BY Lenny Antonelli

The unique infra-red heating system can be activated individually in selected rooms, allowing the O'Learys to maintain comfort as required on a room-by-room basis.



Find Wain Morehead Architects Ltd at the NSC Campus, Mahon, Cork; Tel: 021-230 7150; e-mail: wma@wma.ie Web: <http://www.wma.ie>

A STRIKING new house in Carrigaline proves that meeting the passive house standard needn't mean sacrificing good design, while the dwelling also boasts an innovative infra-red heating system, green materials, plus a unique approach to using climate data in low energy construction.

Sally O'Leary says that when a site became available near the site of an old family home, she couldn't pass up the opportunity to buy it. She'd been looking for a site to build on with her husband John. "We always wanted energy efficiency, I think nowadays that's something that people have to do," she says.

They spent a few years trying to get planning permission before turning to Cork-based Wain Morehead Architects. For Sally, it was important their design showed respect for their site — an awkward, sloping patch of land overlooking the river.

Energy efficiency was important to the O'Learys, but architect John Morehead suggested taking things further and aiming for the more onerous passive house standard. "Passive was a complete dream," Sally says.

The couple wanted a timber frame house, but as the design envisaged the house partially nestling into the ground, using timber wasn't structurally feasible for the lower floor.

John Morehead originally planned to use concrete



block with external insulation here, but contractor Twomey Construction suggested going with insulated concrete formwork (ICF) instead. "It's very accurate," the company's Brian Twomey says of ICF. "You can get it very precise."

He's also drawn by the fact that the structural, insulation and airtightness components of the wall are built in one system by one type of tradesperson.

Killarney-based Thermo-house supplied the ICF system — essentially two vertically-stacked walls of polystyrene block, built up like Lego, with concrete poured between.

The walls have a 100mm service cavity on the inside — this is insulated with Rockwool and lined with Fermacell board, a mixture of gypsum, recycled paper and water.

The ICF system features 100mm of grey EPS insulation on the outside and 50mm on the inside, with a 150mm concrete core sandwiched between. The concrete layer was beefed up to 200mm for structural support where the wall was built into the ground, and the walls are reinforced with extra steel here too.

The first floor was built

with a timber frame system manufactured by local firm Eco Timber Frame. The company's Donal Spillane calls the project a "flagship house" for the company. The timber frame walls feature 235mm of cellulose insulation — essentially recycled newspaper — with a further 50mm of Rockwool insulation inside the service cavity. Outside, the walls are finished with Austrian larch cladding.

The roof boasts 345mm of cellulose insulation, and is finished externally with Tegral cement fibre slate. Eco Timber Frame — who previously worked with Cyril Mannion of Passive House Builders on a certified passive house in Athenry, say they can deliver U-values as good as 0.09 W/m²K with their system.

"It's always a balance between cost and extremely low U-values," says Donal Spillane. "Once it's below 0.15 W/m²K, that's adequate for most situations."

While designing the house, architect John Morehead started examining the Irish climate data in the Passive House Planning Package, the software used to design passive houses. Wain Morehead Architects

now produce location-specific data using a methodology suitable for use in low energy and passive house buildings, taking into account data from local weather stations, satellite data and local topography — all processed with specialist software.

Using site-specific climate data for the Carrigaline passive house allowed Morehead to design the house with a lot more glazing than you might expect possible.

Meanwhile, an airtightness test at the house produced a result just under the required passive house standard.

"Airtightness was a major issue," says John Kiely, electrician on the project. He says building airtight meant all electrical runs had to be planned in detail with the architect and contractor before work started. "It obviously took longer than usual, but attention to detail was very important. I would have made all my staff aware of airtightness and how important it was."

John Morehead adds: "There's quite a busy road across the river, and you can't hear a squeak. I think it's a lot to do with the airtightness achieved. It's absolutely silent in there."



Backfilling of earth against the ground floor, which was built with insulated concrete formwork, allows the house to nestle into the ground.

bar for eco-friendly design



Morehead took an unconventional approach when deciding how to heat the house — he designed a unique infra-red heating system that he's since patented. "We've got localised infra-red emitters using ceramic elements manufactured in west Cork," he explains.

He says infrared radiation has a wavelength that's easily absorbed by the skin, meaning it can heat the

occupants of the house easily at a lower temperature than is usually required.

The house should be run at 18C — in contrast 20C or 22C might be typical in a conventionally heated house. Morehead says that because it only generates a wavelength that is "useful", it's extremely efficient. "It heats the person but not the air, permitting the ambient temperature to be maintained throughout the

dwelling."

The system can be activated individually in selected rooms, allowing the O'Learys to maintain comfort as required on a room-by-room basis. Powered by mains electricity, it's also integrated with the house's heat recovery ventilation system.

Sally was happy to be a guinea pig for the infra-red system. "[John Morehead] lent me a prototype that I

put in the kitchen and I didn't want to give it back," she laughs. "If he could design one for every woman's handbag he'd be the richest man in the country."

Three square metres of Kingspan Thermomax solar thermal collectors help provide hot water, and a Paul Santos 370 DC heat recovery ventilation system supplied by Ollie McPhillips Ltd features too.

The unit is certified by the Passive House Institute to deliver a heat recovery rate of 84%, and achieves 92.7 % efficiency, according to the EN 308 testing standard. The Santos unit was installed along with Paul Octopus Easy Flex flexible ducting.

The O'Learys moved in to the house last April. "At the moment we're running at a comfortable 20 degrees of temperature constantly,

and that's without heating," Sally said in June. "We're looking forward to -10 this year. We don't have any worries." She jokes that when it does get cold they can "always do something mad like turn on a towel rail."

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