

## Case Study: NZEB home brings family in from the cold

Building Type  
Detached House

BER  
A2

Location  
Co. Meath

Completion Date  
2020





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### Project Summary

Building Type  
Detached House

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Co. Meath

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## NZEB home brings family in from the cold

One Self Builder's uncompromising approach to thermal performance is reflected in his family home achieved a high **A2 rating**, with its primary energy score of 28.01 kWh/m<sup>2</sup>/yr coming within a whisker of an **A1 rating**.

**BER** **A2** BER Rating



- ✓ Stunning Self Build project situated in Co. Meath conceived by Arthur and Aoife Lambert.
- ✓ The build uses 78.3% less energy and emits 79.9% less carbon emissions than the same house.
- ✓ The dwelling reached airtightness test result at 50 Pa of 1.14 m<sup>3</sup>/hr/m<sup>2</sup>
- ✓ Design by Mullingar-based architect Ronan O'Halloran
- ✓ Xtratherm's Technical Team and consultants collaborated with Evulusion Innovation to create a detailed, efficient design.

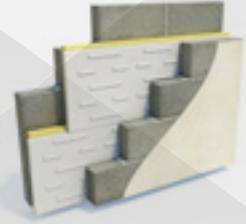
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## Product Specification

### How Xtratherm was employed throughout the project



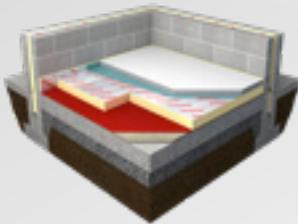
**XO/PR**  
Pitched Roof  
75mm



**CT/PIR**  
Built-in Full Fill Wall  
150mm CavityTherm



**SAFE-R CLOSE-R**  
Cavity Closers  
xxmm



**XT/UF**  
Under Floor  
75mm

**XT/UF**  
Under Floor  
Strip insulation



**CT/PIR**  
Built-in Full Fill Wall  
150mm CavityTherm

Product Specification		
<b>Roofs</b>	<b>XT/UF</b> Under Floor	75mm
<b>Cavity Closers</b>	<b>SAFE-R CLOSE-R</b>	xxmm
<b>Walls</b>	<b>CT/PIR</b> Built-in Full Fill Wall	150mm
<b>Floors</b>	<b>XT/UF</b> Under Floor	Strip

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## Getting Started...

If there was an opposite phenomenon to frostbite, Arthur and Aoife Lambert and their young family would surely have suffered it when they move from what Arthur describes as “the coldest house in Ireland” into their toasty new self build in Kilcloon, Co. Meath, earlier this year.

Arthur, who works as a technical specialist for construction materials manufacturer Roadstone, took over running the family farm and used the opportunity to build a new 3,500 ft<sup>2</sup> home on the land. During the build, the family lived not 50 metres from the site in the old family farmhouse. The uninsulated 1959 Land Commission house dared to combine a suspended timber floor and a heating “system” comprised of four open fires via three chimneys – conditions which conspired to turn the home into a proverbial wind tunnel.

**“I don’t think you could find a colder house in Ireland if you looked for it,” says Arthur, who decided to install an oil-fired central heating system to make the old house liveable while the new house was under construction – but at a significant cost. “I was on a first name basis with the sales rep from Dunboyne Oil. He used to come up almost monthly.”**

The Lambert experience of thermal discomfort had deeper roots. The couple had bought a timber frame semi-d in their mid 20s – a house in a 500 unit scheme built during the Celtic Tiger years, a time when thermal performance wasn’t exactly a high priority in construction. “We couldn’t go back to that,” says Arthur. “It’s hard to see the love in every one of those units.”



With hard-won experience of what the couple didn’t want, Arthur set about finding out what would work for them, getting first hand experience of a variety of different build methods by visiting the self build homes of friends and clients. “We were lucky in that a number of our friends had recently finished similar projects,” says Arthur, “and we had spent an extensive amount of time in their houses and learned from their experiences. This would have led us to a preference, basically, for as much concrete as possible.”

## Working Closely with Architects

Armed with a design by Mullingar-based architect Ronan O’Halloran, the couple applied for planning for the storey and a half house. “We chose him because He’s somewhat local and had a good reputation for quality,” says Arthur. “Within a two mile radius of this house he probably has five or six projects. He knew the brief of what we wanted but also knew the thought processes behind the planning officers in Co Meath. The whole entire process was done and dusted in 11 weeks, and there’s people out there who are fighting planning for 11 years. We were really lucky, really lucky.”

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With planning granted, Arthur set about project managing the build himself, working out detailed design collaboratively with Xtratherm’s technical team and consultants, Evolusion Innovation.

Arthur, with his belief in traditional concrete construction stuck to his convictions and opted for cavity wall construction, finished inside and out with a sand and cement render, along with concrete roof tiles, hollow core floors and blockwork internal walls too.

“We went for cavity wall and the concrete option I suppose for noise, comfort, thermal mass, and fire rating you couldn’t get much better,” says Arthur.

## Working Collaboratively with Xtratherm

In order to achieve the warm, efficient home Arthur craved, he discussed options with Xtratherm senior technical lead Mark Magennis from the off.

“To give us the opportunity to provide the kind of support that Arthur was looking for, we were brought into the project at a very early stage,” says Magennis. “That was hugely beneficial both for us and for Arthur because we were starting with more or less a blank canvas. And then we had the opportunity to showcase the benefits of our products. That cemented the relationship – that we were able to work with Arthur through the whole project at each of the different stages, whenever we were being called upon to offer advice or assistance.”



**Mark Magennis**

Senior Technical Lead  
Xtratherm



This collaborative approach helped Arthur resolve some tricky decisions, starting quite literally from the ground up. “I would have read every forum and article going on method of insulating the floor slab and avoiding thermal bridging at the wall junction,” says Arthur. “I initially considered an EPS passive foundation system but in questioning actual thermal performances with Mark in Xtratherm I opted for traditional strip foundation systems with a medium density block. The specification of Roadstone Thermal Lite blocks with an Xtratherm CavityTherm Riser Panel achieved better performances in terms of thermal bridging PSI value at the junction and an improved U-value with less material” says Arthur. “On insulating the floor itself, there was a lot of discussion on using two layers in the floor – the typical 2.4m x 1.4m board insulation – and staggering the joints and using the two different thicknesses, and using a tape, and this and that, and making sure all the areas were filled.” Magennis intervened, and recommended using 150mm Xtratherm Thin-R Hyfloor tongue and groove insulation – installed over the house’s 150mm concrete floor slab – which proved an unmitigated success, delivering a U-value of 0.12 W/m<sup>2</sup>K. “It was brilliant,” says Arthur. “We have large open square areas in this house and it really suited it. They all clicked into each other, it was a tight fit, there was no taping

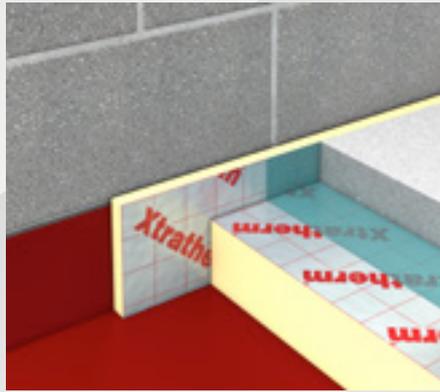
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Mark sent Arthur installation videos which he passed on to the block layers.

**“I found them absolutely invaluable because it broke down the process.”**

**Arthur Lambert**  
Co. Meath



required. There was very little cutting, there was no need for two layers. It's a really super product. The U-value of the floor reached passive levels, and we got it all done in a day. Using a thinner material than EPS is an important factor when reducing construction waste. About 80% of this results from excavation on sites. The vast majority of concrete materials are now recycled, but dig out materials end up dumped.”

## Choosing the CavityTherm System

For the walls, Arthur went with cavity wall construction, insulated with Xtratherm Cavitytherm 150mm full fill boards, resulting in a U-value of 0.13 W/m<sup>2</sup> K. Arthur took advantage of every detailing accessory in the CavityTherm range including the pre-formed corner boards to ensure continuity of insulation and achieve a highly impressive Y-value of 0.021. Here again, Arthur availed of Xtratherm's assistance to ensure the insulation system was properly installed by the block layers, via a combination of training videos, followed by toolbox talks. Mark sent Arthur installation videos which he passed on to the block layers. “I found them absolutely invaluable because it broke down the process,” says Arthur. **“There was cross sectional videos of where everything went, the important little DPC strips, and the corners. It's hard to explain it to someone and visualise it over the phone, so I thought the videos were excellent. The block layers watched all the installation videos. They knew what direction to go in, and the guys on site just confirmed everything.”**

With the videos fresh in the block layers' minds, Mark followed up by arranging personal 'toolbox talks' at the site with Niall & Eamonn from Xtratherm, ensuring the block laying team were aware of the importance of good detailing and carefully recorded that the thermal envelope was built in accordance with the Dept of Housing's Acceptable Construction Details. “It's part of the service we offer for block layers,” says Mark, “to ensure they're comfortable with how the product should be installed, making sure it's being detailed correctly and so on. That's a key part of the support.”



With Xtratherm and Evulusion collaborating to minimise thermal bridging – culminating in the house achieving an exemplary Y-value of just 0.021 – Arthur utilised Roadstone's Thermal Lite block range at key junctions. “There was a good few details where they were used,” says Arthur. This included a course of blocks in the foundations, above and below the hollow core first floor and at the eaves, as well as underneath the window board and sitting on top of the concrete lintels, along with an L block for the window jambs. “Xtratherm also supplied me with an L-shaped Safe-R Cavity Closer,” says Arthur, “which meant you had continuous insulation all the way up to the window unit itself. It's a robust detail that's very good thermally.”

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**The net effect? An excellent airtightness test result of 1.14 m<sup>3</sup>/hr/m<sup>2</sup> at 50 Pa – over six times tighter than the applicable regulatory target at the time of construction.**

**Mark Magennis**  
Xtratherm

Arthur spent four months choosing windows, eventually deciding on uPVC Future Proof Passiv house triple glazing from Munster Joinery, with a U-value of 0.7, along with five Munster Joinery triple glazed Aluclad doors downstairs – including two large sliders with a level threshold to the external.

On top of the walls sits a pitched roof, insulated with 150mm Xtroliner XO/PR pitched roof insulation between the rafters, allowing a 50mm gap above for the windtight membrane and roof tiles. A 75mm Xtroliner XO/PR board follows below, directly screwed onto the rafters. The combination results in a U-value of 0.11 W/m<sup>2</sup>K.

**“A couple of areas with sloped ceilings, where it enters the bedroom they have 60mm Xtratherm insulation with 12.5m plasterboard,” says Arthur.**



The storey and a half planning requirement means the house has dormers upstairs – no fewer than seven dormers, to be precise. Arthur says particular care was taken to ensure the dormers – which can be notoriously tricky to detail for airtightness and continuity of insulation – didn't trip the building up. “Basically anywhere there was any sort of a cavity it was filled with the pitch roof insulation. We boxed the dormers in, made them a bit smaller to get a robust detail and to get more insulation over and around the window units.” The dormers and pitched roof ceiling were then sealed with Gerband airtightness tapes and membranes supplied locally by Gripfix Ireland. “A lot of time was taken,” says Arthur. “Intricate detailed work.” Other than tapes at junctions, the main airtight layer in the walls is a 25mm sand and cement render on the inner face of the walls, with Blowerproof paint-on airtight membrane used at wall chases, and the ends of the hollowcore floor wrapped in membrane, sat in a bed of mortar and taped to blockwork. The net effect? An excellent airtightness test result of 1.14 m<sup>3</sup>/hr/m<sup>2</sup> at 50 Pa – over six times tighter than the applicable regulatory target at the time of construction.

## Pushing the Envelope

With the thermal envelope fully insulated, Arthur wasn't done yet – laying 50mm of Xtratherm insulation on the hollowcore first floor structure. This enabled a consistent approach to heating upstairs and downstairs: approximately four kilometres of underfloor heating pipes encased in a high thermal conductivity Roadstone Quick Floor screed. The heat is generated by a Samsung 16kW heat pump from Joule – supplied and installed by local contractors “Maynooth Plumbing and Heating” who also supplied the home's Joule heat recovery ventilation system – with the heating system divided into 15 heating zones.

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**“I found Mark Magennis to be very professional, and super on performance and constituents and materials. He was a great help. He spent a lot of time looking at my drawings. And there was great feedback between him and Evolution as well.”**

**Arthur Lambert**  
Co. Meath



“It’s quite common where people have underfloor heating upstairs floors to separate the zones,” says Mark. “That’s another reason people will typically put in a thin layer of insulation at first floor level.”

“However” Mark continued, you will often find within a really well insulated house that low temperatures are simply not reached with comfortable ambient temperatures being achieved by normal activities such as cooking etc, meaning thermostat kick in temperatures are not often achieved, particularly in areas such as kitchens. Heating systems need to be matched with the house performance so work closely with you system provider to achieve your desired result.”

Arthur’s uncompromising approach to thermal performance is reflected in its results in DEAP, the software tool used to generate Building Energy Ratings and determine compliance with Part L of the building regulations. The home achieved a high A2 rating, with its primary energy score of 28.01 kWh/m<sup>2</sup>/yr coming within a whisker of an A1 rating. Meanwhile the house achieved an energy performance co-efficient (EPC) of 0.217 and a carbon performance co-efficient (CPC) of 0.201 – indicating that the house should require 78.3% less energy and emit 79.9% less carbon emissions than the same house design built to the 2005 regulations. Even though the house was built before the requirement for nearly zero energy building standard had kicked in, it blitzes the NZEB targets of 70% energy reductions and 65% carbon reductions. But results on a spreadsheet are one thing. According to Arthur, the house is performing like a dream.

**“The heating hasn’t been coming on yet much at all,” he says, adding that he turns it on in the bathroom for comfort when coming out of the shower onto warm tiled floors. “It’s really, really nice, the warm floor. But that’s the only reason really we’re turning it on. The house hasn’t been calling the heating system to come on a whole lot, if at all.” And what of the rep from Dunboyne Oil who made such frequent visits when the Arthur’s were in the cold house next door? “He drives by the new house and probably sheds a tear.”**

Arthur says Xtratherm’s Mark Magennis was a great asset in achieving his goal: “I found Mark Magennis to be very professional, and super on performance and constituents and materials. He was a great help. He spent a lot of time looking at my drawings. And there was great feedback between him and Evolution as well.”

Magennis points out that this level of service is available to all customers, and the market is responding: “We are finding with a lot of self builds, people are coming to us at an early stage. It gives us the opportunity to showcase the benefits of our products and come up with solutions that will work. What we try and convey to our customers is that as you’re going through your construction process we’re here to assist you in any way we can from the technical aspect and support you through the project. It’s part of the service.”



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## Talk to our Technical Team about your next Self Build Project

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