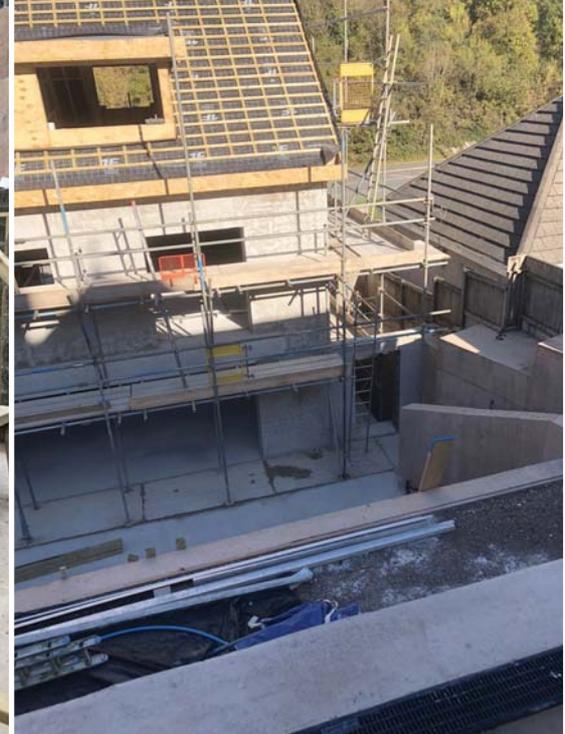Figure 1: A modern contemporary self-build.

Figures 2 and 3: Terracing formed behind the built-in shuttered concrete.

The Durisol House

The clients' brief for this project was to create a contemporary, thermally efficient house on a sloping site to a tight budget. Additionally, one of the clients is a professional renderer and polished concrete specialist, and envisaged using the finished property to showcase what is achievable through these mediums. **Neil Bussey** *of* **Durisol UK** *reports.*

In true self-build style, the clients also had a preference to save money by using construction methods that could be undertaken personally, without the need for specialised trades such as brick and block layers. For this reason, the client chose ICF and specifically woodcrete ICF for this project.

Challenges

The site has a large hill behind the proposed footprint of the build with the potential for instability. It was not feasible to excavate and construct a reinforced earth retaining wall, so instead the hillside was stabilised using shuttered concrete to form terracing up the slope. This in turn became usable outdoor space where none had existed before.

The build is in a 'zone 4' location in terms of weather exposure. As the clients intended to live in the property, they had a preference for high thermal performance and opted to use a 365mm-deep Durisol unit. The core of concrete on this unit is 120mm thick with 165mm of PIR insulation, to provide a 'U' value down as low as 0.15 and beyond, depending on the finishes applied. It is often the case that self-builders who intend to occupy the finished property are more inclined to go the extra mile in terms of performance and comfort.

The design called for both areas of render and also cladding to the exterior. Given the profession of one of the clients and the site location, having a substrate that could be readily rendered and made weathertight in an aggressive 'zone 4' environment was important. Equally, the ability to fix cladding externally in such a way that it handled wind loadings and other weather effects was crucial.

To be able to show off polished concrete floors, it was also important to select a method of constructing the envelope that allowed for the use of solid beam-and-block floors. In ICF construction, the walls are concrete within an insulated form and this solid monolithic concrete structure can be used to carry substantial structural floors such as beam-and-block and/or concrete plank floors.

A high thermal mass structure, such as concrete, absorbs and releases heat to maintain a stable temperature inside and minimise heating and cooling costs. In a temperate climate, the best way to use

Figure 5: Beam-and-block floors bearing directly onto the Durisol walls.

Figure 6: Reinforcement bar introduced where required into empty Durisol units.

Figure 4: The exterior was partly rendered and partly clad.

thermal mass in a building is to insulate on the outside of the frame. This arrangement protects the concrete from swings in external daily temperatures. The configuration of the Durisol units with insulation predominantly on the outside fitted the brief well. As can be seen (Figure 1), the finished build is highly exposed and prone to extremes of temperature, often within a single day.

Construction

An element of the house is retaining, so the client was looking for a retaining solution that could become part of the envelope to save cost. ICF walls can be readily reinforced to perform retaining functions. In the case of Durisol, the insulation can be reduced or removed entirely to increase the available

core of concrete. This adaptation requires careful modelling as a reduction in insulation becomes a trade-off between structural and thermal performance. In this instance, 100mm was used within a D365 block, which increased the concrete core to 185mm, which was sufficient (once reinforced) to perform the retaining function.

In other areas, where appropriate, the insulation was removed altogether and the full depth of the block used to create a retaining wall (Figure 6).

The retaining area was tanked below ground to provide structural waterproofing. While water-resistant concretes are available, woodcrete ICF systems have webs spanning the concrete core. Woodcrete contains a lot of trapped air and has low thermal conductivity

Figure 7: Services recessed into the woodcrete.

Figures 8 and 9 (above and below): The build nearing completion.

but is inherently porous. As such, structural waterproofing of woodcrete ICF below ground is dependent on separate tanking systems. Due to the inert nature of the woodcrete, bituminous sealants can be readily applied directly to the blocks to achieve this function.

The clients always wanted the house to be a statement piece and chose a striking Dazzle Ship cladding design using imported cement board. The Durisol units take a coarse threaded screw without the need for drilling and plugging, which sped up the build and once again enabled the clients to do more themselves. With the substrate able to take wet render and plaster directly, all the finishes were applied by the clients, again saving time and money.

Additionally, the internal face of the woodcrete was chased out to create channels for services to allow for wet plaster on the inside for good airtightness and a quality finish. The inner skin of woodcrete is 40mm thick, which provides space to bury services without having to touch the structural concrete behind (Figure 7).

Outcome

The finished result was a quality build that achieved the aspirations of the client for an efficient, comfortable and striking home on a budget.

The advantage of using an ICF system on a project such as this is that it allowed a self-builder to access the thermal mass and structural benefits of a concrete frame without the need to enlist specialist contractors and tradespeople. In so doing, all the elements of the client's brief could be met within the budget, proving that ICF certainly has a part to play in both the self-build and developer market landscapes. ∎