

Feature – Insulshell - Floors, Walls & Roofs Systems

TTJ – January 2013

2nd January 2013 – final

Breaking the Pre-Fab Mould

Developers need to build more efficiently and cost effectively than ever before, leading system manufacturers to respond with solutions which directly address this market demand. John Green, Insulshell, explains why pre-fabricated and ready-insulated timber-based panel systems are increasing in popularity and discusses how continued advances in system engineering are delivering a new breed of timber panel construction that overcomes many of the challenges traditionally associated with timber frame.

Time and cost remain the driving forces in the delivery of any project. However, sustainability also continues to be a key factor in the specification of building materials. Traditional timber frame has always fared well against these criteria, providing an efficient and competitive build solution which offers a low carbon footprint and materials from sustainable sources. At the same time, it is no secret that timber frame has come under some scrutiny because of the potential fire risks during construction – compounded by the examples seen in recent years. Importantly, these risks have not gone unnoticed by the insurance or fire safety/protection industries.

Whilst the use of SIPs (Structural Insulated Panels) with timber frame presents a semi-prefabricated solution, in some cases the working of the panels is still required on-site and so introduces a margin for workmanship error.

It is these challenges which sometimes lead developers to favour fully pre-fabricated or modular systems, particularly for the construction of high rise buildings. To prevent the timber industry missing out on these opportunities, manufacturers need to continually push the boundaries of what can be achieved with timber system construction, which was a major driver behind the development of Insulshell - a new fire rated engineered structural cassette panel system which incorporates robust insulation technology.

Next generation

Insulshell is a composite structural cassette which integrates superior levels of insulation with high performance panels to create an innovative fast build system for floors, walls and roofs.

Suitable for use as a standalone structural balloon frame system or as an infill to structurally framed buildings, the system has been designed to provide comprehensive protection as the cassette panels already provide a minimum of 60 minutes through-wall fire integrity before installation – which arguably eliminates the risk of spread of fire during and post construction.

Designed for buildings which aim to achieve high levels of thermal insulation whilst maintaining speed of construction, Insulshell, incorporating its patented jointing system, delivers pre-fabricated panels to site which minimise thermal bridging and maximise air tightness (typically less than $1.0\text{m}^3/\text{hr}/\text{m}^2$ @ 50Pa recorded).

From a U-value perspective, Insulshell will achieve a minimum of $0.2\text{W}/\text{m}^2\text{K}$ but can be as low as $0.09\text{W}/\text{m}^2\text{K}$, depending on the system specification.

Finally, Insulshell delivers a total through-wall construction, which makes it more predictable on-site as the design is less likely to be compromised by the interfacing of multiple trades.

Opening up new markets

As a timber-based and fully pre-fabricated cassette system, Insulshell is not designed to compete with traditional platform frame construction. Instead, its engineering is aimed at opening new markets for timber-based construction.

In the words of Simon Tuddenham, Associate Director for Colliers International: “We believe the technology offers a real opportunity to help meet the UK’s current housing shortage due to the speed, quality and cost of construction that is possible. What we have found is that this new system allows for very competitive build costs and has helped make a number of previously unviable sites financially viable by significantly reducing the build costs without a deterioration in the quality of residential accommodation provided.”

Whilst traditional timber frame is widely used in the residential market, the engineering of Insulshell makes it a viable specification for retail, education, multi-storey residential and high performance residential projects. A key factor in this is the total cost of build as Insulshell offers cost parity with existing methods such as SFS (Structural Framing System) and SIPs, but with the additional benefit of flexible design as well as integrated thermal, acoustic and fire insulation.

As a result, Insulshell has already been specified by two major UK retailers over traditional build methods.

Aiming higher

Unlike standard platform frame construction which uses typical panel sizes of $2.4\text{m} \times 2.4\text{m}$, Insulshell incorporates large panel technology of up to $4.5\text{m} \times 24\text{m}$. In doing so, this significantly opens up the market opportunity for multi-storey construction.

Whilst this is facilitated by the large panel technology, from a technical perspective the interfacing of the floor details is also a major contributor. This is because the intermediate or separating floor cassettes do not penetrate the external structural core panel, they are simply lowered into position and fitted to a bespoke locking ledge. In doing so this removes the platform junctions which are necessary in a traditional timber construction and as a consequence, significantly reduces the cross grain shrinkage potential.

Peter Steer, Consulting Structural Engineer, explains: "Although designers are aware of cross grain shrinkage when using platform frame, there always remains the risk of human error. The engineering of Insulshell means there is very little cross grain and this is only apparent at the sole plate. A six storey building at 18m to 20m metres high would be expected to shrink by a nominal 5mm when constructed with Insulshell, as compared with an approximate 30mm with traditional platform frame. In conclusion, Insulshell significantly reduces cross grain shrinkage."

Low-tech manufacture, high tech design

Although there is high demand in the market for pre-fabricated systems which increase the speed of construction, reduce the risk of workmanship error and offer superior levels of insulation, there is also some resistance based on the perceived lack of flexibility. Pre-fabricated is generally confused with 'modular', which often evokes visions of linear construction (which will not necessarily fit with the client's design vision). This is where the flexibility of Insulshell's timber-based cassette panel system comes into its own, as by its nature it facilitates virtually any design.

Moreover, as the performance of the system is engineered at design stage, manufacture and installation remain extremely simple and straightforward. A further benefit of this is the potential for local assembly units to be established to support the delivery of projects nationwide or even globally. Given community engagement and supporting the local economy are emerging as considerations in the awarding of contracts, the use of Insulshell has the potential to support this.

As a specifier with experience of these circumstances, Andy Partridge, Associate Partner, Roger Stirks Harbor + Partners, comments: "Part of our social initiatives within new schemes is to use local labour wherever possible. The simplicity of Insulshell means it would be very easy to create local jobs to specifically deliver the panels required for projects. Moreover, it is virtually limitless in terms of design potential which makes it an ideal system for us to use."

From design to reality

With Insulshell due to be officially launched to market early 2013, its design flexibility has been put through its paces during London 2012 as 'The Pavilion' – a temporary construction at Lancaster House. Conceptualised as an extension to the existing building so that the site could accommodate

UKTI delegations during the Olympics, architects Waugh Thistleton specified a vast glazed area with a timber floor and roof. Tasked with delivering this on-site, events contractors Innovision were faced with the challenge of constructing the single storey 4m x 50m structure against tight timescales and an agreed budget.

Offering a full turnkey solution to this challenge, Insulshell designed and manufactured a fully demountable system that could be re-deployed after the Games.

Manufactured in 18 sections, the system was fully pre-fabricated off-site with the glazing installed on-site. Taking just four weeks to manufacture, two weeks to install and four days to demount, the flexibility and speed of construction of Insulshell were well demonstrated.

[Box out]

In a nutshell

- Product warranty 25 years
- Design life 60 years
- Full height panels up to 8 storeys
- Fire rated panels up to 90 minutes directly from the factory
- Excellent thermal performance, reducing CO2 emissions and running costs
- Fast track construction with off-site quality assurance