GUIDE to i-SIP construction
Introduction

Structural insulated panel (SIPs) building systems have been used within the UK for over 10 years, providing sustainable buildings with high thermal performance and airtightness for a wide range of residential, leisure, commercial, healthcare and education projects.

Challenging Building Regulations and Government strategy for low and zero carbon building, such as the Code for Sustainable Homes, have driven the market for SIPs building systems, where the off-site construction and performance of the structure can deliver tangible benefits to a project and final development.

The speed of build, design flexibility and proven performance benefits of SIPs offer architects, specifiers and contractors an alternative to traditional building methods.

This Guide to SIPs Construction aims to clearly explain the concept of a SIPs building structure and provide impartial design guidance for the clear specification of a SIPs building. As with any building system, confusion, unfamiliarity and myths relating to the function and performance of the structure can often become a barrier to its adoption. Designing and constructing using SIPs requires a slightly different approach to traditional build methods, essentially system build looks to improve efficiency, where traditional build methods maintain to their original approach. The following pages of this guide cover the complete design to erection process to aid architects, specifiers and contractors in the appropriate design and on-site requirements for their SIPs solution.

No two SIPs building systems are identical, therefore this guide refers to the Innovaré i-SIP building system throughout to provide examples.

Andrew Orriss
Managing Director, Innovaré Systems
The SIPS based structure

Structural insulated panels for the building fabric, load-bearing and non load-bearing internal walls, floor cassettes and SIP roof systems or timber truss rafters.

SIP panel construction

SIP panels are constructed of orientated strand board (OSB) and expanded polystyrene (EPS) insulation, to form the inner leaf of the building and are available in a range of thicknesses, depending on the required U-value for the structure. Additional insulation board, fire protection, and waterproof membrane can also be factory-fitted during manufacture to enhance the performance of the finished panel. Door and window apertures are also cut and finished during manufacture, ready for on-site installation.

Floor and roof systems

- Three flooring options can be specified as a floor system for a SIPS building structure;
- Metal web beams allow easy access for services and ventilation ducting.
- I-beams are suitable for projects requiring longer spans.
- Hollowcore concrete is available in five metre spans where non-timber floors are preferred in favour of thermal mass.

Metal web and I-beams are assembled in large format cassettes and overlaid with chipboard. Each cassette is available with a factory-fitted peel clean cover, additional protection or left plain where additional acoustic or impact sound prevention is needed.

- Design  •  Engineer  •  Manufacture  •  Supply  •  Erect
Why use SIPS?

SIPS building systems meet the challenges of today’s construction industry through off-site manufacture and a rapid build programme to deliver thermally efficient and airtight buildings which meet modern sustainability targets. SIPS structures eliminate on-site waste and labour intensive activities, which in turn reduces overall build programmes to ensure a cost-effective building method.

Efficiency through simplicity

The components of a SIPS structure are relatively simple and by reducing the number of parts the chances of mistakes occurring during design and construction are minimised.

Benefits

- Versatility of panel enables many architectural features to be achieved
- Off-site engineering and fabrication using planned process improves on-site efficiency
- Limited post-construction settlement reduces ‘snagging’ compared with timber frame
- Reduces energy costs through excellent thermal performance and airtightness
- Limited cold bridging
- Rapid erection period
- Independent testing and accreditation, including BBA approval

i-SIP Compliance

Building Regulations 2000 (England & Wales)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>i-SIP compliance notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 / A3 Loading and Disproportionate Collapse</td>
<td>i-SIP has sufficient strength and stiffness when designed and constructed in accordance with the Innovaré BBA certificate to meet this requirement.</td>
</tr>
<tr>
<td>B3 (1) (2) (3) Internal spread of flame</td>
<td>i-SIP, when used with requisite lining can meet this requirement. Refer to BBA certificate sections 9.1 to 9.4 and 9.6.</td>
</tr>
<tr>
<td>C2 (c) Resistance to moisture</td>
<td>i-SIP can adequately limit the risk of surface condensation and contribute to minimising the risk of interstitial condensation. Refer to BBA certificate sections 7.1, 7.2 and 8.1.</td>
</tr>
<tr>
<td>E1 / E2 Protection against sound from other parts of the building and adjoining building / protection against sound within the building</td>
<td>i-SIP meets these requirements. For detailed specification refer to the BBA certificate sections 11.1 to 11.3.</td>
</tr>
<tr>
<td>L1 (a) (i) Conservation of fuel and power</td>
<td>Refer to BBA certificate sections 6.1 to 6.6 for details of how i-SIP can meet these requirements.</td>
</tr>
<tr>
<td>Regulation 7 Materials and Workmanship</td>
<td>The i-SIP building system is acceptable as approved by the BBA. Please refer to the installation guide section 14.1 and 14.2 of the BBA certificate.</td>
</tr>
</tbody>
</table>

Building Regulations (Scotland) 2004

<table>
<thead>
<tr>
<th>Requirement</th>
<th>i-SIP compliance notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 (1) (2) Fitness and Durability of Materials and Workmanship</td>
<td>i-SIP satisfies this requirement. Refer to BBA certificate sections 13.1 to 13.3 and 14.1 to 14.2.</td>
</tr>
<tr>
<td>1.1 (a) Structure</td>
<td>i-SIP using the appropriate lining can achieve a period of fire resistance of ‘medium’ duration with references to clauses 2.1.1 and 2.2.3. Refer to sections 9.1 to 9.6 of the Innovaré BBA certificate.</td>
</tr>
<tr>
<td>2.2 Separation</td>
<td>Reference section 2.3.1 of the Innovaré BBA certificate for details.</td>
</tr>
<tr>
<td>2.3 Structural</td>
<td>i-SIP constructed using appropriate approved cavity barriers satisfy this requirement of sections 2.4.1 to 2.4.7. Reference 9.1 to 9.6 of Innovaré BBA certificate.</td>
</tr>
<tr>
<td>2.6 Spread to neighbouring buildings</td>
<td>Refer to section 2.6.1 of the Innovaré BBA certificate for details.</td>
</tr>
<tr>
<td>3.15 Condensation</td>
<td>i-SIP can adequately limit the risk of surface condensation and contribute to minimising the risk of interstitial condensation. Refer to BBA certificate sections 7.1 and 7.2.</td>
</tr>
<tr>
<td>5.1 Resisting sound transmission to dwellings using appropriate construction.</td>
<td>i-SIP walls adequately satisfy this standard 5.1.1 to 5.1.6. Please refer to BBA certificate sections 11.1 to 11.3.</td>
</tr>
<tr>
<td>6.1 (b) CO₂ Emissions 6.2 Building Insulation Envelope</td>
<td>The i-SIP system will contribute to enabling clauses 6.2.0, 6.2.3 and 6.2.4. Refer to the BBA certificate sections 6.1 to 6.6.</td>
</tr>
</tbody>
</table>

For details of the Building Regulations specific to Northern Ireland and how i-SIP meet these requirements, please contact Innovaré directly on 0845 674 0020. A downloadable version of the BBA certificate referenced above is available at www.innovaresystems.co.uk Information contained in the BBA certificate may assist in addressing obligations under Construction (Design Management) Regulations 2007 (CDM).
SIPs design considerations

Getting the best out of SIPs technology
As an off-site designed and engineered building system, the guiding principle for SIPs construction is the elimination of complex concepts and the promotion of efficient and cost effective design.

Design for Manufacture
By designing a building with a particular build method in mind, inefficiencies and incompatibilities at the design process can be engineered out, without the need to compromise on ambitious architectural design or vision. Essentially, understanding how a building is assembled can act as a driver for efficient design, which ultimately delivers a more cost effective solution for the client.

Manufacture for Assembly
SIPs design and manufacture is often driven by the on-site requirements of the project, which in turn determine the build sequence. This on-site assembly dictates the manufacturing sequence of the SIPs building system and ‘pulls’ the product through the factory. Specialist software optimises the usage of the materials in the overall building, reducing inefficiency at the design stage and unnecessary waste during production.

i-SIP design process
Engaging with Innovaré at the earliest stages of a project, often before the design process has begun can lead to improved efficiencies throughout the scheme and eliminate unnecessary changes during later stages. It’s important to remember that it is often easier to switch from a SIPs based design back to traditional build, than trying to replace traditional building methods with a SIPs design.
DESIGN

SIPs design guidance

When aiming to maximise project efficiencies through any system build, consideration should be given during the design process to the suitability of SIPs. The following design principles, whilst not exhaustive, are intended to give architects, specifiers and design teams an indication of good and bad practice.

Primary considerations

- Vertically align all load-bearing and party walls through the building structure to avoid additional support beams
- Design balconies to be self-supporting so that only lateral restraint is provided by the i-SIP structure
- SIP roof constructions are most easily and cost effectively accommodated in gable to gable designs
- The load path in an i-SIP panel is through the OSB outer facings. These must be fully supported through to foundation level
- Set windows within the SIP panel zone, rather than the cladding zone to maximise summer solar shade
- Set openings in 38mm increments when close to wall-ends to match stud thicknesses
- Generally, SIP roof constructions will require ridge and intermediate purlin supports where clear spans between ridge and eaves are in excess of 4500mm
- Prioritise architectural features and enhancements of the building
- Services are not embedded in SIP panels. For improved airtightness locate services on internal walls. Where impractical, a service void will be required.
- Minimise the staggering of elevations which result in party walls changing to external walls. Whilst this is possible it often creates awkward detailing
- Avoid openings directly below point loads and allow sufficient headroom over such openings to accommodate depth for a lintel
- To improve the stability / racking resistance of gable end walls ensure that large openings in external return walls are not too close to the gable end
- Avoid external masonry finishes above an abutting roof structure. Where this is unavoidable, a proprietary brick slip panel is the most appropriate solution
- Identify at the earliest stage possible what the requirements are for air permeability and thermal performance
- Consideration should be given to complex roof junctions as it can create additional costs where a support structure may be required.

For full details of i-SIP design considerations, please visit www.innovaresystems.co.uk or contact Innovaré Systems directly on 0845 674 0020.
ENGINEER

How the SIPs system works

i-SIP panels are engineered in accordance with four areas of consideration; structural, hygrothermal, fire and acoustic. The efficiency, capabilities and intrinsic benefits of i-SIP structural insulated panels are highlighted through their proven performance in structural and hygrothermal engineering. Performance capabilities with regards to fire and acoustics are generally covered by the internal lining build-up of each panel.

**Structural**

The materials used to construct each i-SIP panel form a composite structure that is much stronger than the sum of its parts. In instances of out-of-plane deflection, the OSB skins of the i-SIP panel support the load, whilst the EPS core stabilises the OSB and prevents deflection. Each building is individually engineered and where necessary, line loads and small point loads are dissipated by the top rail, through the OSB outer skins and transferred vertically. Specific, concentrated loads can be taken by additional structural timber studs bonded within the panel. A timber sole plate locates each panel, enabling the OSB to transfer the load of the structure directly into the screed rails. Two sheets of OSB also provide excellent racking resistance.

**Hygrothermal**

The hygrothermal performance of the i-SIP panel relates to the transport of heat, air and moisture through the building envelope. i-SIP offers flexibility in panel depths which optimises the thermal transmittance (U-value) of the building fabric to meet the client’s requirements.

The large format capability of the i-SIP system provides improved airtightness performance as part of a holistic hygrothermal strategy. In addition to this, the symmetrical build-up of each panel provides uniform vapour resistance and reduces the risk of ‘reverse condensation’.

A lightweight construction technique such as i-SIP can be balanced with increased thermal admittance (thermal mass) through the use of a wet plaster lining, which provides equivalent performance when compared to aircrete block construction (source: ‘Reducing overheating – a designer’s guide’ published by the Energy Saving Trust).

**Fire**

Fire resistance of the i-SIP structure is provided by the internal lining build-up. In full scale fire testing the i-SIP system exceeded Building Regulation requirements for both 30 and 60 minute fire resistance. Timber panel closers, framing around apertures and point-load cripple studs offer further inbuilt barriers against cavity spread and offer additional structural redundancy.

**Acoustics**

As with fire resistance, the majority of acoustic performance is provided by the internal lining specification. The i-SIP system provides various options to achieve an improved acoustic performance over and above the current requirements of the Building Regulations. UKAS accredited tests have been completed on adjoining SIPs structures, providing either 54dB Rw + Ctr or 53dB Rw + Ctr depending on the panel build-up of the separating wall. Alternatively, timber frame separating walls can be provided to Robust Details standards.

Heat loss from a house built using traditional methods. SIPs offers improved thermal performance through an airtight structure.

Acoustic performance provided by internal lining fitted off-site during manufacture, or on-site following assembly of SIPs structure.
MANUFACTURE

i-SIP Assembly

I-S Manufacturing, sister company of Innovaré Systems and dedicated SIPs production facility is responsible for the manufacturing of i-SIP panels and related building system components.

i-SIP panel construction

Based in a 33,000 sq ft facility in Coventry, the unique I-S Manufacturing production process utilises lean manufacturing principles to maximise production line efficiency and minimise waste. i-SIP panels are manufactured in a bespoke, large format up to 6 x 2.7 metres.

The I-S Manufacturing production line is capable of producing a 6 metre long i-SIP panel every 12 minutes. Detailed manufacturing drawings and CNC information are provided by Innovaré direct to the I-S Manufacturing production line from the scheme design software. Each i-SIP panel is manufactured in the sequence required by the on-site build programme – ensuring the first panel needed on-site is the final panel to be manufactured.

The following matrix demonstrates the range of i-SIP panel thicknesses and subsequent U-values.

<table>
<thead>
<tr>
<th>Panel Core</th>
<th>Insulation thickness</th>
<th>Overall panel thickness</th>
<th>U-value W/m²K</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS</td>
<td>114</td>
<td>136</td>
<td>0.27</td>
</tr>
<tr>
<td>EPS-Low lambda</td>
<td>114</td>
<td>136</td>
<td>0.24</td>
</tr>
<tr>
<td>EPS</td>
<td>140</td>
<td>162</td>
<td>0.23</td>
</tr>
<tr>
<td>EPS-Low lambda</td>
<td>140</td>
<td>162</td>
<td>0.20</td>
</tr>
<tr>
<td>EPS</td>
<td>184</td>
<td>206</td>
<td>0.18</td>
</tr>
<tr>
<td>EPS-Low lambda</td>
<td>184</td>
<td>206</td>
<td>0.16</td>
</tr>
<tr>
<td>EPS</td>
<td>235</td>
<td>257</td>
<td>0.15</td>
</tr>
<tr>
<td>EPS-Low lambda</td>
<td>235</td>
<td>257</td>
<td>0.13</td>
</tr>
<tr>
<td>EPS</td>
<td>285</td>
<td>307</td>
<td>0.13</td>
</tr>
<tr>
<td>EPS-Low lambda</td>
<td>285</td>
<td>307</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Quality Assurance

Ongoing testing and quality assurance is undertaken to guarantee the performance of the i-SIP building system. The i-SIP structural insulated panel is subject to third party accreditations and is approved by the BBA, which annually inspects Innovaré’s internal quality testing for;

• Goods inwards
• In process
• Goods out

Standard i-SIP components

The i-SIP building system is supplied with a standard range of components.

• External wall panels consisting of two types of EPS insulated core to be BS EN 13163 sandwiched between 11mm OSB type 3 to BS EN 300 2006 and a breather membrane to the external face
• 111mm thick party wall i-SIP panels, constructed of a minimum of 11mm OSB with 89mm thick EPS core, additional 50mm sound quilt built into the cavity and factory-fitted, moisture resistant plasterboard
• Timber frame party wall option using 89mm stud timber frame
• Standard trusses, panelised roof system or flat roof system using insulated roof cassette
• Internal load-bearing and non load-bearing partitions
• Engineered timber beams where necessary
• Sole plates
• Nails, fixings and other ancillary items
• Supply and fix screed rails

For details of optional extras then please contact Innovaré Systems directly on 0845 674 0020.
The key to a successful i-SIP build programme

SIPs are designed to provide maximum efficiency on-site and reduce the overall project build time in comparison to traditional build methods through speed of build. The supply of the i-SIP building system is carefully scheduled to ensure these efficiencies generate maximum benefit and value for the client.

On-site requirements
Detailed drawings and structural calculations, supported by BBA Certificate number 08/S040 are provided to allow the applicant to obtain necessary Building Regulation approval. It is the responsibility of the main contractor to provide suitable access and positioning for delivery vehicles, along with the supplied 35 tonne crane and suitable hard standing for offload and storage. Substructure or foundation slabs should be in-line and level to a tolerance within +/- 5mm. Achieving these tolerances is the responsibility of the main contractor and failing to meet these requirements will necessitate further packing / bedding to a maximum of +/- 10mm locally which will need approval from a Structural Engineer.

Foundation specification
- Lengths of wall should be within +/-5mm
- Diagonals should be equal.
- Acceptable deviation is +/-5mm
- Areas must be square with right-angle corners (unless designed otherwise)
- Bays must be aligned along elevations with correct party wall spacing and cavity / offset relationships.
- Levels to be +/-5mm across block
- Maximum of 20mm across whole block (consisting of a series of bays as above) for permitted packing.
- Wall or slab supporting Innovaré setting out rails or plates are levelled to a maximum of 20mm by Innovaré
- Dry-packing, to fully infill and support the underside of screedrails / plates, by main contractor.
- DPC to width of screedrails /plates, can be installed by Innovaré, with main contractor supplied materials, beneath screed rails during this operation.

The benefits of off-site construction are clear when all parties – architect, main contractor and building system provider clearly understand the requirements and processes for delivering the project to the client. The following shows a typical process example for the i-SIP building system.
**i-SIP erection method and requirements**

**Erection guide**

The appropriate site conditions are vital for the successful erection and assembly of the i-SIP building system. A number of considerations and provisions should be made by the client/main contractor ready for the erection team to commence on-site. The on-site erection team is coordinated by an Innovaré Systems Project Manager who will remain responsible for the management of the scheme, up to the point of handover of the structure to the client/main contractor.

**On-site health and safety**

In accordance with Innovaré Systems’ policy, all work is undertaken in the safest practicable manner, consistent with good on-site practice. It is the duty of the management to do everything necessary to prevent injury and ill health and it is equally the duty of each employee to exercise personal responsibility for their own safety and that of others. A Health and Safety plan relevant to the scheme as issued by the main contractor, is to be supplied to Innovaré in order for a specific plan to be drawn up to cover appropriate activity and works. In addition, welfare facilities such as mess room, canteen, drying room, WCs and trained first aider and first aid kit would be expected on-site. Innovaré is accredited by CHAS and has a 100% CSCS card requirement.

**Scaffolding requirements**

The following lists the general arrangement details and requirements for on-site scaffolding for the erection of the i-SIP building system.

- Scaffolding is required prior to i-SIP erection
- Scaffold design is the responsibility of the main contractor/client to current regulations
- Where required, main contractor/client to provide internal scaffold or aluminium tower
- Base of the scaffold should be 525mm from the face of the i-SIP panel or edge of the slab, leaving a 75mm gap for the ‘plumbing’ of the panel
- Subject to scaffolding design, installation of ties may be required on completion of ground floor panels and 1st floor cassettes
- Once tied, 2nd lift is fully boarded for installation of trusses/fascia/soffit
- Provide gable end lifts, step/staggers and any other scaffold requirements as per building design

**For structures over three stories, consider the following**

- Ties may be required on completion of 2nd floor panels and floor cassettes
- Once tied, 3rd lift is fully boarded for installation of trusses/fascia/soffit
- Gable end lifts and any other scaffold requirements as per building design
i-SIP sustainability

Production
Innovaré’s operations and I-S Manufacturing production facility have been developed under a clear sustainability mandate to guarantee the environmental performance of the i-SIP structural building system. Each area of the Innovaré and I-S Manufacturing business is geared up to significantly reduce any waste material in the production process and produce zero waste on-site.

Optimisation-saws within the manufacturing process utilise 90% of timber, with the remaining off-cuts supplied to local schools and community groups for art and craft-based projects. Surplus expanded polystyrene insulation off-cuts are returned to the supplier for recycling whilst the manufacturing sequence minimises OSB waste.

Materials
We use only PEFC certified timbers and all components within the i-SIP building system are classified ‘A’ rated by the BRE Green Guide, with a Global Warming Potential (GWP) and Ozone Depletion Potential (ODP) of zero.

The i-SIP dry structure can be specified in a range of formats that will deliver various U-values (see matrix on page 14), the lowest being 0.11W/m²K and the highest at 0.35W/m²K – still somewhat lower than the standard required by Part L of the Building Regulations. A low air permeability performance of 2m³/m²/hr can be achieved with some additional taping of joints etc, enhancing the efficiency of sustainable technology such as heat recovery ventilation systems.

Transportation
Where possible all vehicles leave the factory with full loads of bespoke panels, reducing the number of vehicle movements on-site - a particular advantage to urban construction schemes where disruption to the local community needs to be kept to a minimum.

See over for details of this Code for Sustainable Homes Level 5 project

FAQs

1. How long do you calculate it would take to erect all your components on a standard house type, assuming the slabs & infrastructure has been provided?
   On a continuous build programme we would estimate approximately 3 houses per week. (95m² floor area each).

2. What approvals do i-SIP by Innovaré have?
   Full BBA approval for the whole house, not just the panels. i-SIP panels have been rigorously tested for concentric, eccentric, bending and racking strength in addition to fire and sound testing. At all points the i-SIP system has exceeded those standards required by Building Regulations.

   By achieving BBA approval, the system is recognised by the NHBC. i-SIP is also system approved by Lantac.

3. Would you do the load calculations and therefore advise on the foundation/piling requirements?
   As part of the design and engineering of the Innovaré system we would confirm the structural loadings to the foundation designer.

4. What drawing detail do you have as standard Building Regulations approved plans that could reduce the working drawing detail?
   We provide a full set of details to the architect for use in drawing up final details. In some cases the architect will hand to us the entire design of the structure so we adopt and include our standard details before handing back. This choice is entirely that of the architect.

5. Does i-SIP comply with CSH and Breeam standards?
   There is no compliance guidelines for these requirements. We are able to assist in product selection to maximise the number of points achievable, potentially reducing costly micro renewable technologies through a high performance building structure.

   All the standard details are those approved by the BBA and Lantac.
The Company

Innovaré Systems was established in 2004 by leading South East based contractor Osborne to become supply chain integrators for SIPs building systems. Working closely with architects, developers and main contractors, Innovaré has completed many sustainable building projects in the social and private housing, education, leisure and commercial sectors, some of which are highlighted on the opposite page.

Osborne invested £2 million in the launch of I-S Manufacturing in 2008, enabling Innovaré Systems to strengthen its market position and offer customers a complete, single chain of custody for the design, engineering, manufacture, supply and erection of their i-SIP building system.

Outside of this primary objective, Innovaré aims to challenge the UK construction industry to think differently about the building systems it procures and take advantage of the modern methods of construction and off-site approach offered by i-SIP system build.

In 2009, Innovaré became a founding member of the UK SIPS Association, a trade organisation set-up by the leading SIPS manufacturers and suppliers to promote industry best practice, share experiences and knowledge and encourage the construction industry to embrace new building technologies and methods.

i-SIP project gallery

**Gallon Close**
- **Client:** Family Mosaic Housing Association
- **Architect:** BPTW Architects
- **Main contractor:** Osborne
- **Project brief:** High-performance building envelope and thermally efficient structure for seven new homes in South London.

**Stepping Hill Hospital**
- **Client:** Stockport NHS Foundation Trust
- **Architect:** Taylor Young Architects
- **Main contractor:** W. Carefoot & Sons Ltd.
- **Project brief:** Large format infill i-SIP panels for new hospital development.

**Davison School**
- **Client:** West Sussex County Council
- **Main contractor:** Joynt Construction
- **Project brief:** Six classrooms, a staffroom and toilet block for new school building with high thermal performance, delivered within a tight build programme.

**Downsview Residential Development**
- **Client:** Hyde Housing
- **Architect:** Architects Plus
- **Main contractor:** Denne Construction Ltd.
- **Project brief:** Light weight top floor apartment on top of concrete frame building, reducing overall foundation requirements.

**Hindleap Warren Accommodation Centre**
- **Client:** Ashdown Forest
- **Architect:** RDJW Architects
- **Main contractor:** Farrrise Construction
- **Project brief:** Large format i-SIP panels to provide exceptional U-value for new accommodation centre with the benefits of speed of build.

**Steep Private Housing Scheme**
- **Client:** Bricks & Mortar Property Development
- **Architect:** Richard Ashby Associates
- **Main contractor:** n/a
- **Project brief:** Thermally efficient structure for new development of executive homes, with i-SIP building system integrating with thatched roof as part of planning requirements.