NSAI Agrément

IRISH AGRÉMENT BOARD
CERTIFICATE NO. 08/0311
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Extraspace Modular Building System

Systèmes pour constructions

Bausystem

NSAI Agrément (Irish Agrément Board) is designated by Government to carry out European Technical Assessments.

NSAI Agrément Certificates establish proof that the certified products are **'proper materials'** suitable for their intended use under Irish site conditions, and in accordance with the **Building Regulations 1997 to 2023.**

PRODUCT DESCRIPTION:
This Certificate relates to the Extraspace Modular Building System, a modular building system used to construct educational, office, institutional, and other non-residential buildings. Modules consist of structural steel framework, composite roof and end panels and range in size from 6m to 12.2m in length and 2.4m to 4m in width.

This Certificate certifies compliance with the requirements of the Irish Building Regulations 1997 to 2023, hereafter referred to as the Building Regulations.

USE:
The Extraspace Modular Building System is certified for use in the following purpose groups 2(b), 3, 4(a), 5, 6, 7(a), 7(b) and 8 as defined in Technical Guidance Document (TGD) B, 2020 reprint, to Part B of the Building Regulations.

The Extraspace Modular Building System may provide the structure of a building up to four storeys in height but not greater than 15m in height, as measured in accordance with Appendix C of TGD B 2020 reprint.

The Extraspace Modular Building System may also be used in the construction of the top floor of multi-storey buildings provided the system is constructed off a concrete floor or non-combustible podium/transfer slab.

Readers are advised to check that this Certificate has not been withdrawn or superseded by a later issue by contacting NSAI Agrément, NSAI, Santry, Dublin 9 or online at http://www.nsai.ie

DESIGN:
The Extraspace Modular Building System is based on a module consisting of a structural steel framework and composite roof and end wall panels. Modules are used to construct up to four storey buildings, not more than 15m in height, incorporating walls to suit their location in the building. The modules are available in the standard range of sizes without intermediate supports, or can be longer with the addition of intermediate supports.

The system is intended for use where architect's finalised construction and fire strategy drawings are available and satisfy the Irish Building Regulations. The developer's (Client's) Architect Engineer and Design Team is responsible for the architectural drawings and compliance of the building design with the Building Regulations.

The Extraspace Chartered Structural Engineer is responsible for the final structural design for the Modular Building System. The Building System is designed for use in permanent buildings with a brick/block, plastisol-coated galvanised steel sheet, brick slip or render on carrier board with Class O surface spread of flame. The system can be designed to suit a wide range of traditional roofing finishes.

The system may also be designed to incorporate NSAI (National Standards Authority of Ireland) Agrément approved alternative roofing and external wall cladding systems. However, written approval must be sought from Extraspace on the use of such claddings.

Staircases, windows, door sets, fittings, raised access floors, adequacy of mechanical/electrical services, plumbing and ventilation of bathrooms and rooms containing sanitary conveniences are outside the scope of this Certificate.

MARKETING, DESIGN AND MANUFACTURE:
The product is designed, manufactured, marketed and erected by:

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extraspace

1.1 ASSESSMENT

In the opinion of the NSAI (National Standards Authority of Ireland) Agrément Board, the Extraspace Modular Building System if used in accordance with this Certificate meets the requirements of the Irish Building Regulations 1997 to 2023, as indicated in Section 1.2 of this Agrément Certificate.

1.2 BUILDING REGULATIONS

REQUIREMENTS:

Part D – Materials and Workmanship

D1 – Materials & Workmanship

The Extraspace Modular Building System, as certified in this Certificate, meets the requirements for workmanship.

D3 – Proper Materials

The Extraspace Modular Building System, as certified in this Certificate, is comprised of 'proper materials' fit for their intended use.

Part A - Structure

A1 – Loading

The Extraspace Modular Building System once appropriately detailed, designed and constructed has adequate strength and stability to meet the requirements of this Regulation.

A2 – Ground Movement

An appropriately designed ground floor or podium slab can safely sustain the combined dead, imposed and wind loads of the system into the foundation structure without causing undue deflection to any part of the building.

A3 – Disproportional Collapse

The Extraspace Modular Building System will be detailed, designed and installed with high levels of connectivity, so that failure of one structural element will not cause failure of the module as a whole.

Part B – Fire Safety

The fire safety requirements for the purpose groups (2(b), 3, 4(a), 5, 6, 7(a) and 8) to which this certificate relates, are outlined in TGD B 2020 reprint of the Building Regulations.

B1 – Means of Escape in Case of Fire

The Extraspace Modular Building System can accommodate all necessary provisions required to adequately meet the requirements of this regulation (see Part 4 of this Certificate).

B2 – Internal Fire Spread (Linings)

The plasterboard side of walls and ceilings is designated Class 0. It may therefore be used on the internal surfaces of buildings of every purpose group to which this certificate relates.

B3 – Internal Fire Spread (Structure)

The structural elements of the Extraspace Modular Building System have been designed so the system will have its stability maintained for a reasonable period in the event of fire.

B4 – External Fire Spread

External masonry walls have a Class 0 surface spread of flame rating and when installed and used in the context of this Certificate will provide adequate resistance to the spread of flame over the external walls and roofs and can satisfy the relevant requirements of this Regulation.

The Extraspace Modular Building System roof is constructed so that the risk of spread of flame and/or fire penetration from an external fire source is restricted.

B5 – Access and Facilities for Fire Service

The provision of access and facilities for the fire service is outside the scope of this certificate.

Part C – Site Preparation and Resistance to Moisture

C3 – Dangerous Substances

An appropriate gas resistant membrane and gas handling/extraction system must be provided under the ground floor of each building. The Extraspace Modular Building System permits the incorporation of an appropriate membrane, sump and gas handling system. See section 2.1.3.

C4 – Resistance to Weather and Ground Moisture

The Extraspace Modular Building System has adequate damp-proof courses and membranes to resist the passage of moisture from the ground.

The Extraspace Modular Building System is raised up off the ground therefore the floor shall not be damaged by moisture from the ground. Site drainage system are required to be installed under the building to prevent water flowing under the building.

Roof and external walls above site Damp Proof Course (DPC) level or floor level will have adequate weather resistance in all exposures to prevent the passage of moisture from the external atmosphere into the building as specified in Section 4.8 of this Certificate.

Part E – Sound

E1 – Airborne Sound (Walls)

Walls can be appropriately detailed and constructed to meet the airborne sound level performance outlined in Table 1 of TGD E of the Building Regulations, provided good workmanship is adhered to onsite.

E2 & E3 – Airborne and Impact Sound (Floors)

Separating floors can be constructed to meet the airborne and impact sound level performance outlined in Table 1 of TGD E, provided good workmanship is adhered to on site.

Part F – Ventilation

F1(a) – Means of Ventilation

Adequate ventilation openings are provided in internal and external walls and in roofs to meet this requirement. Walls and roofs used in the system can be designed and constructed to prevent any harmful effect from interstitial or inner surface condensation, to comply with the requirements of BS 5250:2021[2] Management of moisture in buildings, *Code of practice for the control of condensation in buildings.*

F1(b) – Means of Ventilation

The ventilation rate is required to be designed to meet the level of air pollutants present in the building. This will be based on the project specific design.

F2 – Condensation in Roofs

Adequate ventilation is provided in roofs to meet the Building Regulation requirements.

Part J – Heat Producing Appliances

J3- Protection of Building

When used in accordance with this Certificate, wall lining insulation and separation distances meet the Building Regulation requirements.

Heating installations vary from project to project and can be readily designed/installed to meet the requirements of this Regulation.

Part L – Conservation of Fuel and Energy

- Dwellings

- Buildings other than Dwellings

L1 – Conservation of Fuel and Energy

All building elements of the Extraspace building system can be readily designed to incorporate the required thickness of insulation to meet a wide range of required elemental U-values. The elemental U-values are calculated using the elemental heat loss method calculations for walls as per TGD to Part L of the Building Regulations.

The system can readily be detailed to accommodate a wide variety of plan forms and users of the system must ensure that Building Regulation requirements (avoidance of cold bridging) that are affected by plan form and internal sub-division of the building are complied with

Thermally bridged junctions have been assessed for both their linear thermal transmittance (i.e. Psi-value (ψ-value) and their temperature factors (fRsi) in accordance with the procedures outlined in IP 1/06 "Assessing the effects of thermal bridging at junctions and around openings"[3] and BRE report BR 479 "Conventions for calculating linear thermal transmittance and temperature factors"[4] and IS EN ISO 10211:2017 Thermal Bridges in Building Construction - Heat Flows and Surface Temperatures – Detailed Calculations[6]. As a result, best practice has been observed to limit heat loss due to thermal bridging and minimising the risk of mould growth due to surface condensation.

Part M – Access for People with Disabilities

M1 – Access and Use

Buildings can be designed to meet the access, circulation and facilities requirements of this Regulation.

M2 – Sanitary Conveniences

Buildings can be designed to meet the installation requirements for sanitary conveniences for people with disabilities.

2.1 PRODUCT DESCRIPTION

2.1.1 General

The Extraspace Modular Building System is based on a module consisting of a structural steel framework and composite roof and end wall panels. Modules are used to construct up to four storey buildings incorporating walls to suit their location in the building. The modules are available in the standard range of sizes without intermediate support, given in Table 1, or can be longer with the addition of intermediate supports.

	Value/Units
Width	2.4m to 4m
Length	6m to 12.2m

Table 1 - Product Range

2.1.2 Structural Frame

The modular galvanised steel frame consists of cold-rolled structural steel and hollow box section columns/stanchions located at the four corners of the module. The sections are bolted to cold-formed galvanised steel perimeter beams at floor and roof level. Cold-formed steel floor and roof joists span each module and are welded to the beams at roof and floor level. These connections are subject to adequate protection measures to ensure no adverse effect on the structure due to the welding. At the top of each column there is an integral lifting point, designed to accept a lifting eyebolt, thus enabling the module to be crane handled.

Resistance to horizontal loading (racking) is provided by means of diaphragm action of the floor and roof in conjunction with the steel frame. Horizontal loads are transferred to ground by means of timber racking walls or vertical cross bracing using steel flat bars. Site specific assessments are undertaken on a project by project basis and racking bracing is provided as required.

Holding down bolts are provided where the engineer's assessment indicates that actual net uplift forces will be applied to the foundation. These conditions can occur where units are used in highly exposed locations such as along the coastline – site specific assessments are required in these instances.

2.1.3 Floors

Floors comprise 18mm thick structural timber floor decking, designed in accordance with I.S. EN 1995-1-1:2005+NA:2010+A1:2013 *Eurocode 5: Design of timber structures. Part 1-1: General. Common rules and rules for buildings including National Annex 2013 plus Amendment NA+A1*[36], on vapour check layer and fixed to galvanised folded steel structural floor joists.

The joists, typically 180mm deep LGS sections, span the width of a module between the main 305mm deep (LGS) module perimeter 'C' beams. Thermal insulation at ground floor level is provided by a combination of Earthwool insulation between joists and a continuous (un-bridged) layer of polyisocyanurate (PIR) insulation to the top of the 180mm deep LGS floor joists. The underside of the module is then clad with a steel mesh under-drawing with 60-70% open area.

Under all ground floors, an NSAI or equally approved radon resistant membrane/DPM is installed in accordance with Clause 8 of I.S. EN 1996-1-1:2005[37] Eurocode 6 and BS 8102:2022[12] Code of practice for protection of below ground structures against water from the ground, to protect the channels of the steel studs from rising damp.

Typically, a radon barrier is installed over the solum level and over the top of any foundation pad or pier. The sub-floor is always fully vented and there is an overflow pipe connected to the storm water network to ensure excessive water does not collect in the sub-floor. The radon sump is connected to a vent on the footpath outside the building to enable the owner/occupier to extract the radon gas if necessary through the use of an extractor fan.

Section 2.15 of TGD C to the Building Regulations advises that a single radon sump is likely to have influence over an area of at least 250m^2, however, manufactures data and installation guidance should be followed when deciding on location and number of radon sumps to be installed in a building.

2.1.4 External Walls

In general, the external wall of the modules consists of mild steel square hollow section (SHS) incorporating timber studs infill panels with vapour control layer (VCL) and plasterboard internal lining and OSB racking board and moisture barrier external lining. In general studs are at 600mm centres except for brick/block clad buildings where the studs are at 400mm centres to provide additional grounds for wall ties.

A wide range of external wall claddings from plastisol coated steel sheet, Architectural panels, timber cladding, brick cladding and Acrylic rendered finish supported on carrier boards are available.

Thermal insulation is provided by providing approved mineral wool insulation between the timber studs. Additional insulated drylining can be provided when superior or lower U-values are required to meet Part L of the Building Regulations.

2.1.5 External Roof/Ceiling Panel

The roof is comprised of an 80mm thick NSAI Agrément certified Kingspan KS1000 RW roof panels: composite panels with a trapezoidal profiled outer surface made from plastisol-coated 0.5mm hot-dipped zinc coated steel to I.S. EN 10346:2015 *Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions*[20]. The insulation core is a polyisocyanurate (PIR) material and the thickness of the core can vary to achieve a range of U-values as required to comply with Part L of the Building Regulations. The Kingspan KS1000 RW panels have an external and internal Class 0 fire rating when tested in accordance with the requirements of BS 476: Part 6: 2009 and Part 7:1997.

The roof is bolted to, and supported by, fixings which are fixed to every fourth roof joist to create a fall of 100mm along the length of the module. Additional mineral wool insulation is added between the roof joists for improved thermal performance.

The Kingspan KS1000 RW roof panel has been designed in accordance with the requirements of I.S. EN 14509:2013[21], *Self-supporting double skin metal faced insulating panels - Factory made products - Specifications* and can support a range of roof loads as required.

2.1.6 Protection of Steelwork Against Corrosion

The side beams and joists are produced from galvanised steel sheet. Roof beams more than 9.6m long are to I.S. EN 10025-1:2004 *Hot rolled products of structural steels - Part 1: General technical delivery conditions*[22]. All other roof/floor beams and joists are to I.S. EN 10346:2015[20], *Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions*. Posts are to I.S. EN 10219-1:2006 *Cold formed welded structural hollow sections of non-alloy and fine grain steels – Part 1: Technical delivery conditions*[23]. The external skin of the building is protected by the chosen external finish, either cladding steel with 200 micron high-performance plastisol coating on a Galvatite hot-dip zinc coated substrate to I.S. EN 10346:2015[20], masonry brick cladding or selected finish on carrier board.

Where site alterations are required, the surrounding surface area will be cleaned of all paint prior to alterations.

In the case of welding, the slag will be removed, cleaned and checked by site manager before proceeding. Once approved, the weld and surrounding area will receive a coat of cold zinc and a top coat of the specified paint.

In the case of oxy acetylene cutting, the surrounding materials should be covered with an appropriate protective layer. Once cutting has finished, the steel is allowed to cool down naturally. All molten steel is to be removed and once approval is given by the site manager, a coat of cold zinc is applied, and a top coat of the specified paint is then applied.

2.1.7 Finishes

The external face of the wall panels can accommodate a range of finishes from plastisol coating with a leather grain finish available in a wide range of colours, brick cladding, timber cladding, render onto a render carrier board, Trespa rain screen cladding and a range of Architectural wall panels.

Factory applied external finishes will require site applied wall trims and fasciae at the junction between two modules. Site applied wall finishes, such as render carrier board or brickwork, shall be adequately fixed back to the primary modular structure in accordance with the certificate holder's instructions. The external face of the roof panel is available in a variety of coatings and colours to suit particular conditions.

Fascia's and wall trims, to match factory applied wall finishes, are fitted to the external corners, the roof perimeter, the lower perimeter of all modules, the upper perimeter of modules and the horizontal junction between modules in multi storey buildings. Fascias and wall trims are fitted after site assembly of the modules is completed.

2.2 MANUFACTURE

System components are brought in to agreed specifications, carrying the appropriate CE mark when covered by a harmonised European Standard (hEN) or in accordance with European Standards or Agrément Certificates.

Quality checks are made on the sub-assemblies such as wall and roof panels and the steel frame, and on the final assembly of the modules. Each module is accompanied by its own unique quality control check sheet, a copy of which accompanies the module from the factory to site. Quality control carried out during manufacture includes checks on dimensions; squareness, welding and bolt hold alignment for site assembly.

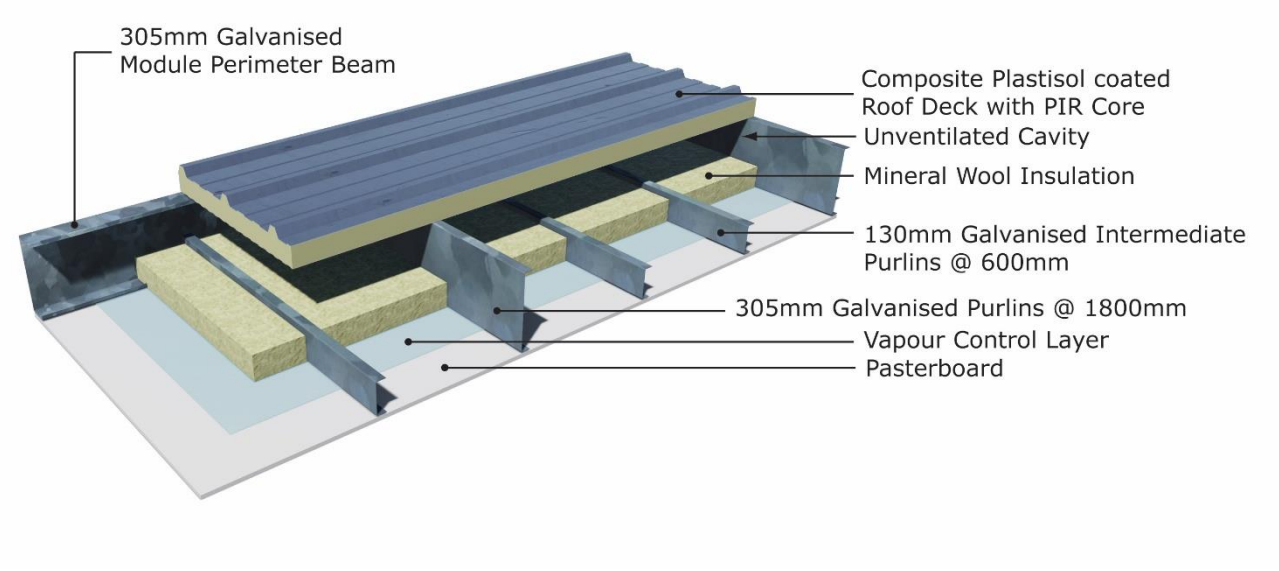

Figure 1 - Roof Type 1

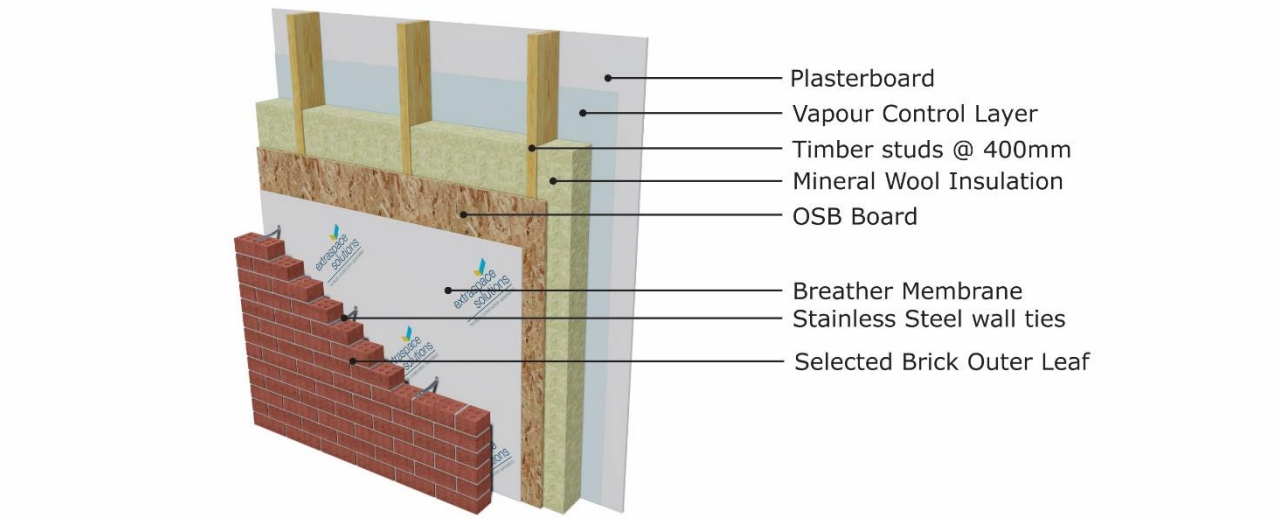

Figure 2 - Typical Brick clad wall

2.3 DELIVERY, STORAGE AND MARKING

The modules are transported to site on a flat-bed lorry or trailer long enough to fully support the module. The open sides of the modules are weatherproofed during transit using polythene sheet.

The modules are unloaded by crane and are normally positioned on the day of delivery; thus, site storage is not required.

2.4 INSTALLATION

2.4.1 General

Buildings must be erected with due regard to any boundary and must be sited in accordance with the provisions of B4 of the Building Regulations. Due regard must be taken of all 'unprotected areas'.

Erection is carried out by Extraspace. The arrangements for erection have been assessed and found to be satisfactory.

2.4.2 Preparation

Extraspace, or a client appointed ground works contractor, can provide suitable foundations and underground services which must be installed and checked before the modules are delivered to site. Items to be checked include:

- Setting out and level of foundations.
- Setting out of service connections.

Ground works and associated preparation is outside the scope of this certificate.

2.4.3 Procedure

The modules are placed by crane by Extraspace on prepared foundations using purpose-designed

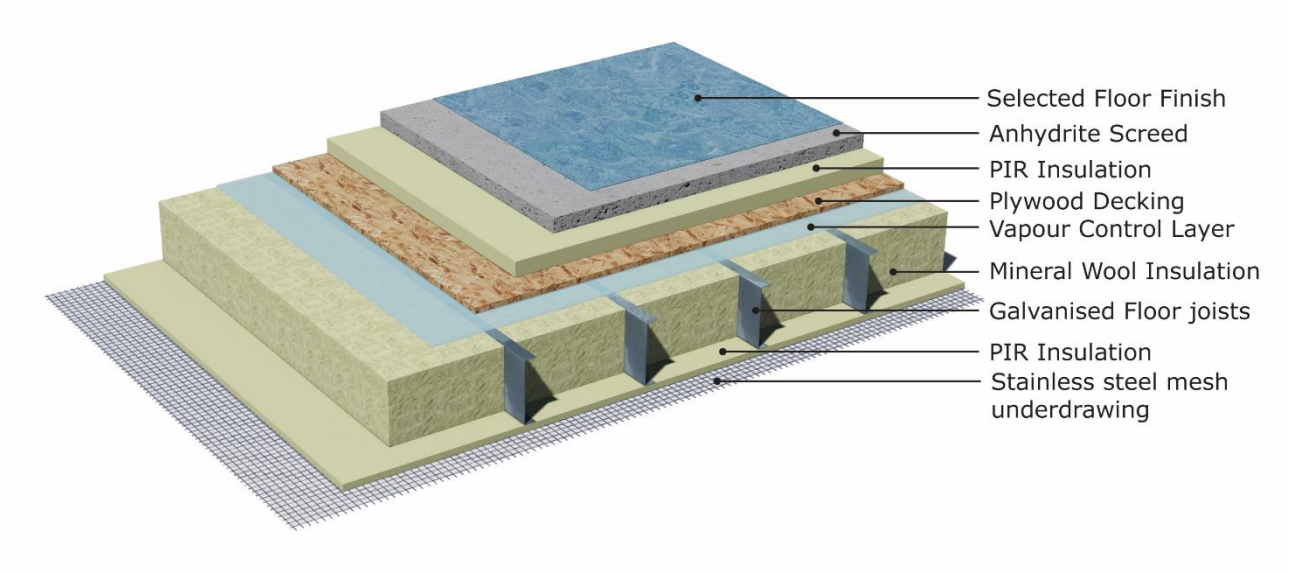

Figure 3 - Typical Ground Floor

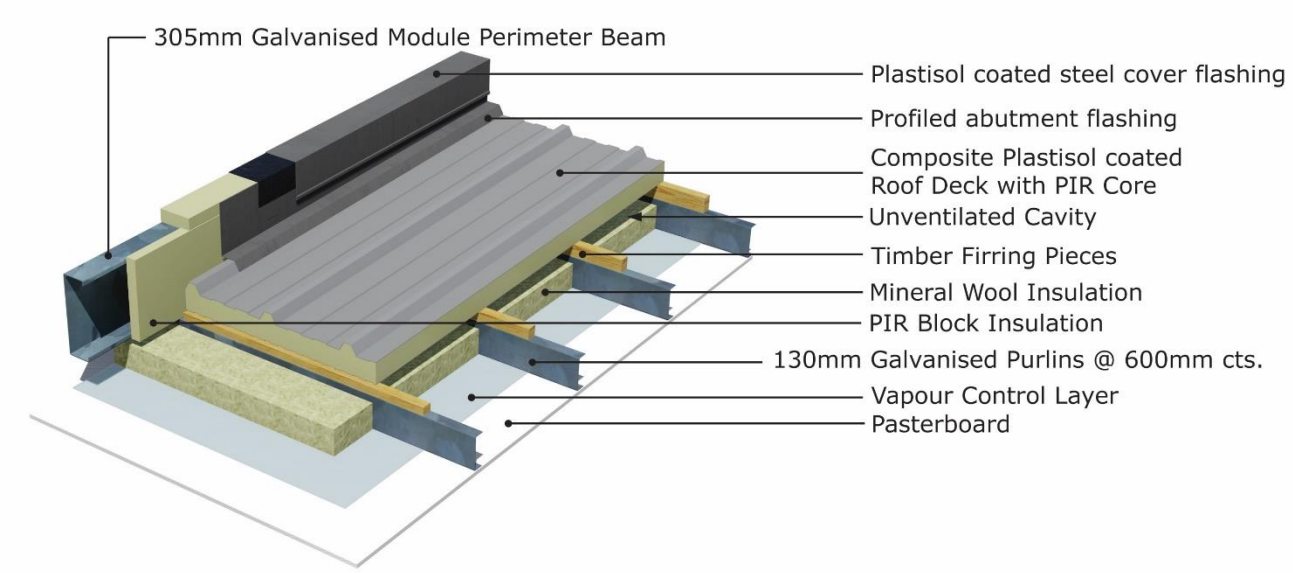

Figure 4 - Roof Type 2

lifting points incorporated in the steel frame. Steel alignment shoes are used between modules to assist in alignment. Access to the site is required for the crane and this requirement will be agreed with the client.

Temporary weatherproofing at joints between modules and the open ends of incomplete buildings is provided by Extraspace to suit the construction sequence.
Building modules can be stacked up to four storeys high. The modules are bolted together at the four steel column points and along the longitudinal beams, both horizontally and vertically. The completion of external and internal cladding and trims is carried out on site. Service connections are made, and internal subdivisions and finishes completed at joints between modules.

2.4.4 Supervision

The following checklist is provided to offer guidance to clients who intend to carry out their own additional site supervision. The items listed are of a general nature and are in addition to all other building requirements.

- Before each ground floor module is positioned, check the location of dpc's and the positioning of sealing strip between adjacent modules, if required.
- The type of anchor used to hold down the the system will be dependent on the project and what substrate the anchor is being fixed to. Anchors must be installed in accordance with the *Code of Practice for the Design and Installation of Anchors*[57] *in accordance with Section 60 of the Safety, Health and Welfare at Work Act 2005.*

- During positioning, check that no damage is caused to the steelwork protective systems.
- After each ground floor module is positioned, check the fixings between modules.
- Before each first-floor module is positioned, check the positions of sealing strip between adjacent modules, if required.
- After each first-floor module is positioned, check the fixings between modules.
- Completion of roof weatherproofing at junction between modules.
- Satisfactory extension of finishing over joints between modules.
- Fixing of casings to columns to ensure continuity of fire protective systems.
- Satisfactory fixing of ground floor skirt panels to provide ventilation.

Erection will be supervised by suitably qualified Extraspace personnel who will sign-off on completion of all installations. This sign-off will verify that all quality checks have been completed and the installation has been carried out in accordance with this Certificate and the Building Regulations.

Part Three / Design Data 3

3.1 STRENGTH AND STABILITY

3.1.1 Certificate of Structural Compliance

The Extraspace Modular Building System is intended for use where Architect's drawings are available and satisfy the Building Regulations. The Architectural and Engineering design team are responsible for ensuring that architectural drawings and overall building design comply with the Building Regulations. Extraspace, using an experienced Chartered Structural Engineer, are responsible for the structural design of the Extraspace Modular Building System.

Building Control (Amendment) Regulations (S.I. 9) of 2014 (BCAR) came into force on 1st March 2014. The Extraspace Modular Building System certification will typically be supplied as a sub-contractor role under BCAR projects which will require Extraspace to furnish the relevant ancillary certification per project. The appointed person within Extraspace will liaise with the Assigned Certifier (AC)/Employer's Representative (ER) and the Design Certifier where applicable, furnishing the relevant Commencement Notice data, within the timeframe requested, along with an inspection notification framework summary and completion ancillary certificate as and when required.

It is imperative that all design team members are clear in relation to the elements of the project for which Extraspace are responsible and what the ancillary certificates relate to.

Buildings constructed using the Extraspace Modular Building System shall be certified by a competent, Chartered Structural Engineer as being in accordance with Part A of the Building Regulations.

3.1.2 Superstructure Design

The structural assessment of the Extraspace Modular Building System shall be site specific and project specific. A Structural Design Engineer suitably qualified in this type of structure shall undertake the structural engineering of every building element designed by Extraspace. In accordance with IS EN 1990:2002, Eurocode – Basis of Structural Design[25], A DSL2 (Design Supervision Level) should be employed to check the design in line with good practice.

This structural design certificate should cover the adequacy of all the cold formed and hot rolled elements within the structure in question. It should also address the dimensions and thickness of each element and member making up the steel module superstructure, and assess the suitability of the interface between the superstructure and the external cladding.

The structural certificate of compliance must also confirm that there is sufficient uplift resistance and that there is adequate racking and load bearing capacity to either side of any opening to ensure the stability of the modules. Buildings designed and constructed in accordance with this certificate will have adequate strength and stability as per the building codes and standards.

3.1.3 Substructure Design

The design of the building's substructure is outside the scope of this certificate. The design of the substructure is the responsibility of the Client's Engineer. The Engineer will need to be a suitably qualified Chartered Engineer and the design will need to be in accordance with the relevant codes and standards, i.e. foundations must be designed in accordance with IS EN 1997-1:2004+A1:2013 *Eurocode 7 Geotechnical Design – Part 1: General Rules*[38].

Extraspace's Engineer will be responsible for undertaking a load take down for the structure and providing this information to the Client's Engineer for use in the design of the substructure.
The Extraspace Engineer will also need to provide the Client's Engineer with the permissible deflection of the ground floor slab under the Extraspace module line loads and podium slab level loading.

3.1.4 Design Loads

The design of a typical building has been examined by NSAI Agrément and demonstrates compliance with the following Codes of Practice. In general, the frame and roof structure are designed in accordance with:

- IS EN 1993-1-1+NA:2007 and timber roof trusses to IS EN 1995-1-1:2005 Eurocode 5 Design of Timber Structures Part 1-1. General – Common rules and rules for Buildings[32].
- IS EN 1991-1-1:2002+NA:2013 Eurocode 1: Actions on Structures Part 1-1: *General actions – Densities, self-weight, imposed loads for buildings[26].*
- IS EN 1991-1-4:2005+NA:2013 Eurocode 1. *Actions on Structures Part 1-4. General actions. Wind actions[27].*
- IS EN 1991-1-3:2003+NA:2020 Eurocode 1. *Actions on Structures Part 1-3. General actions. Snow loads[28].*

Design snow and wind loads should be based on Diagram 1 and 14 of TGD to Part A of the Building Regulations.

Non-load bearing partitions and walls are designed in conformance with the criteria set out in BS 5234-1:1992 *Partitions (including matching linings, Code of practice for design and installation)*[39] and IS EN 10143:2006 *Continuously Hot Coated Steel Sheet and Strip - Tolerances on dimensions and shape[40]*. Typical design loads, in the absence of client specified, project specific loads, are:

- Imposed load on floor of 1.5kN/m^2 plus an allowance of 0.32kN/m2 for internal partitions.
- Roof imposed loads of 0.60kN/m^2 with an allowance of 0.25kN/m^2 distributed load over a loft space with access, along with a concentrated load (point load) 0.9kN (i.e. water tank).
- Wind loads based on IS EN 1991-1-4:2005[27].
- Snow loads to be assess based on IS EN 1991-1-3:2003+NA:2020[28].

Greater loads can be accommodated by request

3.1.5 Steel/Concrete Composite Deck Design

Extraspace's Structural Engineer is responsible for the structural design of all profiled steel composite concrete decks. The Extraspace Engineer is also responsible for design of the propping of this deck and the design of the procedure to remove the propping. A method statement for the propping of the slab must be agreed between the Clients Engineer and Extraspace's structural engineer and needs to be strictly adhered too on site.

The profiled steel deck and all accessories such as slab edge trim, restraint strap and closures etc. are installed by Extraspace trained erectors. All propping and reinforcement is done to Extraspace's propping and deck reinforcement plans. The execution of the propping and reinforcement plan is the responsibility of the main contractor or Extraspace installers if included in their scope of works.

The Extraspace Structural Engineer and Extraspace Site Manager inspect the installation of all decks prior to pouring of concrete to ensure the supporting structure, including temporary props, all reinforcement, screw fixings, shutters and straps are installed correctly. Steel reinforcement bars and mesh should be placed into position using concrete cover spacers, wheels and tying as required.

The concrete mix must be specified in accordance with project specific design to IS EN 1992-1-1:2005 *Eurocode 2: Design of Concrete Structures Part 1-1: General Rules and Rules for Buildings[30]* and should be supplied and manufactured in accordance with IS EN 206:2013+A2:2021[16] and National Annex 2015 – *Concrete – Specification, Performance, Production and Conformity*. The concrete must be supplied and laid in accordance with IS EN 1992-1-1:2004+A1:2014[30] and NA:AC2:2020 to Eurocode 2: *Design of Concrete Structures – Part 1-1: General Rules and Rules for Buildings.* The concrete should be dispensed across the decking to avoid 'heaping' and the surface levelled in accordance with the decking manufacturer's recommendations.

The results of concrete cube compressive test must be supplied to the Extraspace's Structural Engineer to ensure that the actual concrete strength attained, achieve the strengths required.

Concrete run-off and spillage should be minimised and build-up of debris in base tracks should be avoided. In cold weather, the concrete should be protected from the effects of frost and rain until adequately cured. Props are not to be removed until concrete has reached required strength, curing period and approval is given by Extraspace Structural Engineer to remove props.

3.1.6 Wind Load

Extraspace designed buildings will have adequate resistance to wind load in areas as outlined in Figure 1 (a) Map of Wind Speeds (v) in m/s of TGD to Part A of the Building Regulations.

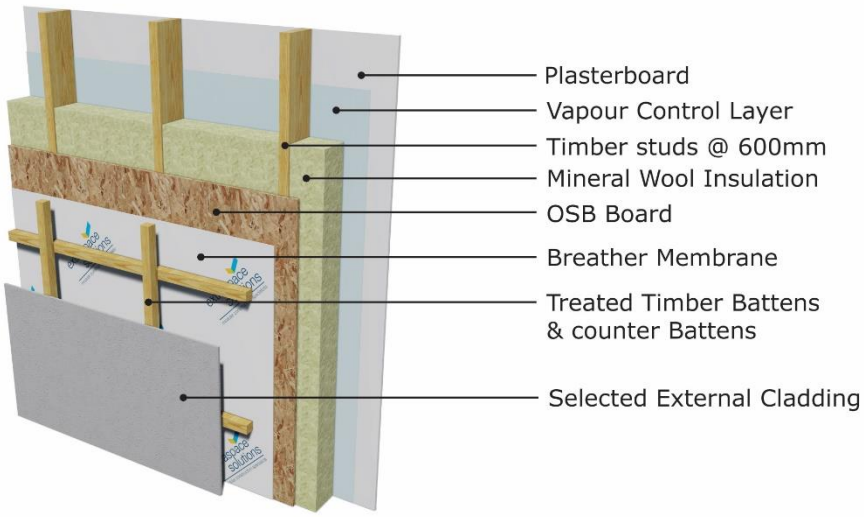

Figure 5 - Typical External Wall (other than Brick)

For very exposed sites on hills above the general level of the surrounding terrain, the system can be specifically designed to meet the requirements as defined in IS EN 1991-1-4:2005+NA:2013[27]. The system can be designed to be used in all suitable locations in Ireland.

3.2 STRUCTURAL FIRE SAFETY

The fire safety of the purpose groups to which this certificate relates is dictated by TGD B 2020 reprint of the Building Regulations.

Any dampers, ductwork, and sealing of gaps formed by services that pass through the compartment walls and floors will require suitable tested systems which have included appropriate fire resistance testing for the required time duration. Details around penetrations and openings such as doors and windows shall avoid any excessive heat ingress into the wall cavities.

All materials such as cavity barriers and fire stops, used in the construction must comply with IS EN 13501- 1:2018[1] Fire Classification of Construction Products and Building Elements Part 1: Classification using Data from Reaction to Fire Tests. They shall be detailed as described in Section 2.5.3 (of this Certificate) and as specified in the Extraspace fire stopping details in line with the supporting documents to the Building Regulations.

Any compartment or separating wall providing fire compartmentation shall be carried up through any roof space and brought up to the underside of the roof cladding to provide adequate fire stopping. **No services can pass through a separating wall.** Services are permitted within all internal and external loadbearing and non-loadbearing walls of the Extraspace Modular Building System provided the wall is not a compartment wall and services are not provided within 200mm of each other back to back. All services are installed in a factory-controlled environment and are fully quality checked before transport to site.

3.3 IMPACT RESISTANCE

The interaction of components is such that, if subjected to exceptional impacts causing local failure, the overall stability of the structure will not be dangerously impaired

4.1 BEHAVIOUR IN RELATION TO FIRE

4.1.1 Fire Resistance

A fire strategy review should be undertaken for all buildings prior to design/construction as necessary, to establish the relevant regulations and requirements relating to fire safety which need to be met during the design and construction phases of any project. Buildings must be sited in accordance with the provisions of TGD Part B Section B4 of the building Regulations with respect to space separation and unprotected areas.

Assessment of test results show that buildings constructed using the Extraspace Modular Building System can meet the Building Regulation requirements in relation to fire resistance as shown in Table 2. The tests have demonstrated the ability of the Extraspace Modular Building System to withstand severe fire exposure for the period more than that required for compliance with the Building Regulations in terms of fire performance. Tests have been conducted to meet fire test requirements of I.S. EN 1364-1:2015[42], I.S. EN 1365-1:2012[43], I.S. EN 1365-2:2014[44] and BS 476 Part 20/22. The test required is dependent upon the purpose group of the building being designed and constructed.

Services shall not be placed in the cavity of a compartment wall. Where services are required to penetrate a compartment wall, all such penetrations shall be kept to a minimum and shall be fire stopped. Where services (e.g. light switches and sockets) are placed on a compartment wall, a service cavity shall be provided so that the integrity of the fire lining is maintained. Accommodation of services in compartment walls/floors and separating walls must be in accordance with Section 3.2.5.7 and 3.4 of TGD B 2020 reprint of the Building Regulations for all purpose group to which this certificate applies.

The system can be designed to accommodate sub-divided fire resisting construction in accordance with a Fire Safety Certificate where it is necessary to inhibit the spread of fire within the building.

The building details of the system incorporate suitable cavity barriers and fire stops, in accordance with IS EN 13501-1:2018[1], to satisfy the requirements of Section 3.3 for the different purpose groups to which this certificate applies.

The fire resisting elements of the construction that are specified in Table 5 of this Certificate provide 30 and 60 minutes fire resistance from either side, for a range of specifications.

Adequate provision must be made for escape in case of fire.

4.1.2 Plasterboard Installation

The proper application of plasterboard to the steel frame members is critical for both fire and sound performance. Attention shall to be given to proper and practical detailing on the part of the designer and a high standard of workmanship on behalf of Extraspace. Plasterboard, in addition to all cavity barriers and fire stops on all structural and separating walls, must be fully checked on site and signed off by the Main Contractor in accordance with project specific details. All plasterboard that provides fire resistance must conform to the requirements of Type F to I.S. EN 520:2004+A1:2009[18] and must be installed in accordance with the specification given in Table 2. If alternative boarding is proposed, then an independent fire test report from an Accredited Laboratory needs to be provided and assessed by a competent Fire Engineer.

4.1.3 Fire Protection of Corner Posts

The required fire resistance to the corner posts is based on the section factor which describes the heating rate of a member. The shape of the member governs the time taken for it to reach its failure or limiting temperature and varies according to the relative dimensions of the sections. The section factor is referred to as A/V ratio if determined in accordance with I.S. EN 1993-1-2 while is it is referred to as the Hp/A ratio according to BS 5950-8. Both references may be relevant dependent upon the origin of the plasterboard manufacturer. The fire protection of the structural corner posts in the Extraspace system is to be in compliance with fire boarding manufacturer's specifications.

Material	National Rating
Brickwork/Blockwork	Class 0
Timber Boarding	Class 3
Internal Plasterboard before decoration	Class 0
Slates/Tiles	AA

Table 2 - Surface Spread of Flame Characteristics

4.1.4 Surface Spread of Flame

An external cladding of brick/block has a designated Class 0 National Rating surface spread of flame as shown in Table 4. Other external claddings may also be used on the Extraspace Modular Building System, such as Plastisol Coated Steel, Fibre Cement Weatherboard, Trespa and prefabricated mineral wool boards provided they meet the spread of flame criteria with regards to the height of a particular building. For a more comprehensive list of material and product fire performance ratings, reference should be made to Table A6 of TGD B 2020 reprint of the Building Regulations. The Classes are defined in accordance with BS 476-7:1997 *Fire tests on building materials and structures. Method for classification of the surface spread of flame of products.*

4.1.5 Protection of Building

Combustible material, e.g. insulation, should be separated from the flue of a masonry chimney by at least 200mm, or at least 40mm from the outer surface of the chimney. Details are given in Section 2 and Diagrams 5 to 7 of TGD to Part J of the Building Regulations. The separation from a heating appliance to combustible wall insulation material should be as per Clause 2.5.6 and Diagram 6 of TGD to Part J of the Building Regulations. For chimneys, covered by I.S. EN 1859:2009+A1:2013 *Chimneys – Metal chimneys – Test methods*[45], separation between this product and the external surface of the chimney is determined in accordance with Clause 2.5.7 to 2.5.8 and in accordance with Diagram 7 of Part J of the Building Regulations.

Combustible material in proximity to a constructional hearth must be protected by 250mmm of solid concrete or as detailed in Diagram 8 of TGD to Part J of the Building Regulations. Heat producing appliances will generally be installed on site with appropriate opening designed in the module at first floor level and at ceiling level to attic.

4.1.6 Roof Designation

All tiles or slates used in the roof in conjunction with the system shall be designated AA in accordance with TGD to Part B of the Building Regulations (reference Table A5 of TGD B 2020 reprint depending upon which purpose group applies). Other NSAI Agrément approved roof coverings may also be used with the system under the guidance of an Extraspace appointed Chartered Engineer.

4.2 THERMAL INSULATION

The Extraspace Modular Building System can be readily designed to achieve a wide range of specified elemental U-value as required.

The minimum provided elemental U-value for a range of building elements is shown Table 5. TGD Part L, *Conservation of Fuel and Energy – Buildings other than dwellings* (2022) requires the achievement elemental U-values as described in Table 5.

Component	Extraspace U-Value (W/m^2K)	TGD Part L U-Value (W/m^2K)
Ground floor	0.21	0.21
External wall	0.21	0.21
Roof – Flat	0.20	0.20

Table 3 - U-value of Building Elements

The level of insulation at junctions between elements and around openings in walls will adequately limit the risk of excessive additional heat loss and local condensation problems. If a client requires superior elemental U-value than the values listed in Table 3, then this can be easily achieved by the provision of addition insulation. In general, the certificate holder can provide U-value calculations for building elements which comply with the general guidance of Report BR 443 *Conventions for U-value Calculations* (2019)[5].

Ground Floor U-Value for Varying P/A Ratio	
P/A Ratio	U-Value (W/m^2K)
0.25	0.21
0.22	0.21
0.20	0.20
0.175	0.193
0.15	0.185
0.1	0.163

Table 4 - Typical Ground Floor U-values

Table 4 gives the various elemental floor U-values in W/m^2K for a standard floor build up using, 180mm LGS floor joists, OSB3 board and 40mm PIR insulation (λ=0.022w/mK) above the joists. The calculations are based on a range of perimeter to area (P/A) ratios for the typical floor. The system can meet and exceed the maximum backstop elemental U-value requirements of Table 1 of TGD to Part L of the Building Regulations.

Calculations for elemental thermal transmittance (U-value) for walls and roofs are carried out in accordance with I.S. EN ISO 6946:2007&LC:2021[48] *Building components and building elements – Thermal resistance and thermal transmittance – Calculation method*. This standard provides a simplified method for calculating U-value for building components consisting of homogeneous and inhomogeneous layers. A more precise result is obtained by using a numerical method conforming to I.S. EN ISO

Type	Element	Test Standard	Result
External Non-Load Bearing Walls			
1	**External Non-Load Bearing Wall** Timber Studs 147-194mm deep @ 400 / 600mm ctrs. 15mm GTEC Megadeco board internally to the face exposed to the fire. Vapour Control layer, 140mm – 180mm Mineral Wool Insulation between studs. 11mm OSB board externally and Breather membrane. This build up will also include a selected external cladding finish.	BS 476: Part 20/22: 1987	60mins from Exposed side. (Inside to Out)
2	Timber Studs 147-194mm deep @ 400 / 600mm ctrs. 15mm GTEC Megadeco board internally to the face exposed to the fire. 140mm – 180mm Mineral Wool Insulation between studs. 0.7mm Plastsisol coated steel facing, bonded to 12mm Multipro XS board externally.	BS 476: Part 20/22: 1987	60mins from either side.
Internal Non-Load Bearing Walls			
3	Steel C- Studs 70mm deep with single layer of 15mm GTEC Megadeco board each side. No Insulation. Max Height 3.8m	BS476-22	60mins from either side
4	Steel C- Studs 70mm deep @ 600mm ctrs with one layer of 12.5mm GTEC Fire Board and one layer of 12.5mm GTEC Megadeco Board each side of stud. 25mm 16kg/m² glass mineral wool insulation between studs. Max Height 5.8m	BS476-22	120mins from either side
5	Steel C- Studs 90mm deep @ 600mm ctrs with single layer of 15mm GTEC Megadeco board each side. No Insulation. Max Height 4.6m	BS476-22	60mins from either side
6	Steel C- Studs 90mm deep @ 600mm ctrs with one layer of 12.5mm GTEC Megadeco board and one layer of 12.5mm GTEC dB Board each side of stud. 25mm 16kg/m² glass mineral wool insulation between studs. Max Height 5.8m	BS476-22	90mins from either side
7	Steel C- Studs 146mm deep @ 600mm deep with single layer of 15mm GTEC Megadeco board each side. No Insulation. Max Height 8.8m	BS476-22	60mins from either side
8	Twin Steel GTEC C Studs 50mm deep @ 600mm ctrs strapped using GTEC V Brace @ 1500mm vertical ctrs. One layer of 15mm GTEC dB Board and one layer of 15mm GTEC Megadeco board each side of stud. 25mm 16kg/m² glass mineral wool insulation between studs. Max Height 8.8m	BS476-22	120mins from either side
Loaded Joisted Floors			
9	**Intermediate (Compartment) Floor - Supporting an imposed load of 1.5 kN/m² (1) with Ceiling Protection** 18mm T&G Plywood Decking on 200x50x2 galvanised steel joists @ 400mm ctrs. Spanning between main floor beams - 305x89x3 galvanised steel cold formed C sections. 200mm Earthwool Insulation between joists. Floor beams bolted to roof beams of module below. Roof Beams 305x89x3 galvanised steel cold formed C sections with 150x50x2 galvanised steel purlins @ 600mm ctrs. Single skin profiled sacrificial transport layer. 15mm GTEC Megadeco board fixed to GTEC MF track to underside of steel roof purlins.	BS EN 1365-2:2000	60 mins from below ceiling level.
(1) Typical load requirements for different purpose groups varies			

Table 5 - Fire Rating

10211:2017[6], *Thermal bridges in building construction - Heat flows and surface temperatures - Detailed calculations*.

U-values of heat transfer to the ground are carried out using methods specified in I.S. EN ISO 13370:2017[7], *Thermal performance of buildings – Heat transfer via the ground – Calculation methods.*

Psi-values (ψ-value) and internal surface temperature factors at all building interfaces have been thermally modelled using the numerical method conforming to I.S. EN ISO 10211:2017[6].

The thermal conductivity or lambda value (λ-value) for all building materials used in U-value calculations must be taken from manufactures Declaration of Performance (DoP) when those materials are CE marked and covered by a harmonized European Standard. It is a requirement to only use the declared $\lambda_{90/90}$ value for all insulations. In the absence of a manufactures declared $\lambda_{90/90}$ for less thermally critically components such as timber or concrete screeds, the thermal conductivity of commonly used building materials can be taken from I.S. EN ISO 10456:2007, *Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values*[8].

4.3 CONDENSATION

The buildings are not suitable for use where the internal relative humidity is expected to exceed 70% for any significant length of time since condensation may occur. Assuming normal internal conditions of temperature and humidity, and appropriate ventilation, it is considered that the amount and duration of any condensation will be insufficient to significantly affect the structural or thermal properties of the building.

Equipment producing large quantities of water vapour, for example flue-less heaters, must not be used.

Adequate underfloor ventilation is provided to ensure that any condensation on the steelwork or insulation is effectively dispersed

4.4 Interstitial Condensation

A vapour control layer is required on the warm side of the insulation (in both walls and roofs) to eliminate the risk of interstitial condensation, unless an assessment to BS 5250:2021[2] indicates that it is not necessary for a particular construction.

When building elements do not follow the principles of BS 5250:2021[2], a robust hygrothermal assessment to either I.S. EN 15026:2007 *Hygrothermal performance of building components and building elements - Assessment of moisture transfer by numerical simulation* or I.S. EN ISO 13788:2012 *Hygrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation - Calculation methods*[47] must be considered.

Care should be taken to provide adequate ventilation, particularly in rooms expected to experience high relative humidity. In order to safe guard against moisture in the form of water vapour entering into the external elements of the building it is essential to ensure the integrity and continuity of the vapour control layer (VCL). All joints in the VCL must be adequately taped and sealed. Service penetrations which pass through the VCL must be sealed.

4.5 Internal Surface condensation.

To safe guard against the risk of internal surface condensation, which can result in dampness and mould growth, the Extraspace Modular Building Systems' elements and the interface between building elements has been assessed and found to have sufficient thermal resistance to eliminate the risk of surface condensation occurring under normal low occupancy levels associated with humidity class 3 (as defined in BS 5250:2021[2]).

As discussed in Section 4.6 of this certificate, thermally bridged sections of the envelope such as window jambs, sills and lintels, will experience a lower level of thermal performance due to thermal bridging.

When bridged junctions meet the requirements of the Acceptable Construction Details (ACD), the coldest internal surface temperature will surpass the minimum internal surface temperature of 15°C. As a result, and in the presence of appropriate ventilation, best practice will have been adopted in order to limit the risk of internal surface condensation.

4.6 LIMITING THERMAL BRIDGING

The linear thermal transmittance ψ (Psi) describes the heat loss associated with junctions and around openings. The certificate holder has carried out ψ-value calculations for a range of thermally bridged junctions. A full listing of ψ-value calculations, along with the building details on with calculations are based, are contained within the certificate holder's Technical manual.

Ψ-values for building junctions were assessed in accordance with the guidance given in BRE IP 1/06 "*Assessing the effects of thermal bridging at junctions and around openings*". Thermal modelling, which complies with methods described in I.S. EN ISO 10211:2017[6] and using the conventions described in BRE Report BR 497 "*Conventions for calculating linear thermal transmittance and temperature factors*"[4] were carried out to limit the heat loss due to thermal bridging and to safe guard against the risk of surface condensation as described in appendix D of TGD to Part L of the Building Regulations.

For building junctions not covered by the certificate holder's Technical Manual, designers should refer to the Acceptable Construction Details (ACD's) for guidance on best practice on limiting the heat loss due to thermal bridging.

4.7 VENTILATION

The Extraspace Modular Building Systems when constructed in accordance with the Certificate holder's supervision can achieve low levels of un-

designed air permeability through the building envelope. The certificate holder can provide a range of ancillary products, such as sealing tapes, mastic beads, draught seals and airtight membranes, which will contribute to superior levels of airtightness as required.

All services penetrations which pass through the building envelope must be adequately sealed to lower the air permeability index for the building.

While the airtightness strategy for the building is incorporated into the initial design, the actual air permeability index ($m^3/hr.m^2$) and/or air leakage rate (air changes per hour) can only be determined by carrying out a pressure test of the completed building. The procedure for testing is specified in I.S. EN ISO 9972:2015 - *Thermal performance of buildings - Determination of air permeability of buildings - Fan pressurization method*[46].

Air permeability pressure testing is now a mandatory requirement under TGD to Part L of the Building Regulations to show compliance with the backstop air permeability index of 5 $m^3/(hr.m^2)$ at a pressure of 50Pa across the building envelope as per Section 1.3.4.3 of TGD L to the Building Regulations.

When inputting values into NEAP, the measured air permeability index at a pressure differential of 50Pa across the building envelope is divided by 20 to determine an air permeability value which is more representative of the actual pressure differential across the building envelope under normal conditions.

As indicated in Section 1.5.4.2 of TGD L to the Building Regulations, an air pressure testing should be carried out on all buildings.

Adequate basic ventilation and purge ventilation must be provided to meet the requirements of Table 3 of TGD Part F of the Building Regulations, for buildings other than dwellings. This is essential in controlling levels of harmful pollutants, such as carbon monoxide, and is an important factor in reducing the incidence of surface condensation by lowering the internal relative humidity within the building.

4.8 WEATHERTIGHTNESS AND DAMP PROOFING

The steel supporting columns raise the building clear of the ground, giving it an inherent resistance to ground moisture. A damp proof course is provided where the galvanised steel structure contacts the foundations and Section 2.1.3 of this Certificate details the requirements and installation of radon membranes in the Extraspace Modular Building System.

The ground beneath the building should, as a minimum, be effectively cleared of turf and other vegetable matter at least to a depth sufficient to prevent later growth.

In preparing the site for erection of the building, adequate drainage must be provided, or other precautions taken, to prevent water flowing beneath the building or ponding against the perimeter steelwork. Flowerbeds should not be positioned so that loose soil can become banked against the building perimeter.

The roof and external wall surface will provide adequate weather resistance. The final weathertightness of the building is dependent upon effective positioning and sealing of the roof cover strips, the sealing of the horizontal joint between stacked modules and the vertical joints between adjacent modules.

Each building is provided with suitable rainwater gutters and downpipes.

The performance of windows and doors is outside the scope of this Certificate, however the perimeter joints between windows and doors and the wall panels are detailed in such a way that is adequate to ensure that water penetration will not occur at these positions, with the use of carefully detailed DPC's and EPDM's at these junctions.

4.9 ELECTRICAL AND PLUMBING SERVICES

Electrical and plumbing services are outside the scope of this Certificate. However, in designing and installing these services, precautions must be taken to avoid the possible risk of long-term damage to the structure or the services by, for example, the ingress of water, water vapour or condensate from cold water service pipes.

No services can be installed which will affect the integrity of any compartment walls/floors and separating walls. Linings should not be breached to allow for the installation of services except where necessary to allow services pass through these compartment walls or floors. All details will be in accordance with Section 3.2.5.7 of TGD B 2020 reprint to the Building Regulations.

4.10 Design Stage

At the design stage, it is useful if the positions and sizes of services can be established in advance, as special holes may be fabricated in the factory to help with the rapid and economic installation of services. A considerable amount of services is generally required in bathroom, hot press and utility areas.

4.11 Earthing of Frame

The steel frame at each floor level must be connected directly onto the main earthing terminal in the main fuse box and all earth connections in

the circuit wired back to this point. This measure is necessary to control the flow of electric current to earth without the risk of corrosion of critical structural components.

However, the earthing system must be installed in accordance with I.S. 10101: 2020 + A1:2024[51] National Rules for Electrical Installations

4.12 Service Routes

All unswaged service holes in the steel members in the modules must be fitted with rubber or plastic grommets to avoid damage to services. To ease the installation of services, particularly electrical cables, these purposes made rubber or polyethylene grommets form the inner face of the openings. The service holes may alternatively be formed by swaging which is fully rounded to offer a non-sharpened surface to the services. Where plastic coated electrical wiring is in contact with insulation, then the cables must be enclosed in a suitable conduit, e.g. PVC as outlined in I.S. 10101: 2020 + A1:2024[51].

Under no circumstances should electrical cables be placed within compartment floors, walls and/or party walls. Walls must be battened out to provide a false service zone in which to distribute electrical services on these fire rated build-ups.
Additional slots, notches or holes should not be cut through any steel member without the approval of the Chartered Structural Engineer responsible for the overall design of the structure.

4.13 Water Pipework

The enclosure of cold water pipework within the external wall should be avoided as condensation on the pipe work could lead to wetting of the steel frame with a consequent risk of corrosion. If enclosure is unavoidable, the cold-water pipework must be insulated with tubular plastic insulation, which must be accurately cut at junctions and at changes of direction and held firmly in place with adhesive tape. Where hot water pipework is enclosed in the inner leaf of the wall, contact between copper pipes and the galvanised frame must be avoided using rubber or plastic grommets.

4.14 DURABILITY

The main structural steel framework has been assessed as capable of achieving a minimum design life of up to 60 years in accordance with BS 7543:2015 *Guide to durability of buildings and building elements, products and components*[52]. Other elements can achieve a design life of 25 years depending on the materials, construction and degree of maintenance.

Particular care is required in arrangement for damp proof courses, integrity of vapour control layers and weathertightness of the building envelope.

Foot traffic over the roof should be restricted to the purpose of maintenance and suitable precautions taken to avoid the risk of damaging the plastisol coating.

The plastisol coating and galvanising will be effective for the building's envisaged life. The ceiling covering will remain effective for this period. If a suspended ceiling is used, the mineral fibre tiles will be effective during the building's envisaged life, but may require occasional painting. Care must be taken to ensure that any paint coating maintains the Class 0 surface spread of flame of the tiles.

The sealants used in the construction of the modules in the factory and to seal between modules on site are concealed and are not subject to excessive movement. They should not normally require replacement during the building's envisaged life.

4.15 MAINTENANCE

External plastisol cladding requires an occasion washing down with water containing a mild detergent. In some areas, after approximately 10 years of service, it may be necessary to restore the visual appearance of the building by painting, using a paint recommended by Extraspace.

Other external wall claddings systems such as architectural panels, timber cladding, brick cladding and acrylic rendered finish supported on carrier boards are subject to preventative maintenance as recommended by the Certificate holder.

The exposed columns should be repainted in accordance with the relevant section of Parts 1 to 8 of I.S. EN ISO 12944[54] and I.S. EN ISO 14713-1:2017[55].

In the event of impact or other damage to an external wall, a replacement plastisol-coated steel panel can be fitted over the original panel by Extraspace. If necessary, damage to the wall can be made good before fitting the replacement panel. This will restore the appearance and ensure that the weathertightness and insulation are unaffected.

Trims or skirt panels can be readily replaced if necessary.

4.16 TESTS AND ASSESSMENTS WERE CARRIED OUT TO DETERMINE THE FOLLOWING

The following is a summary of the tests and assessments which have been carried out on the Extraspace Modular Building System:

- Structural strength and stability.
- Behaviour in relation to fire.
- Impact resistance of floor and wall panels.
- Resistance to sound transmission[56].
- Load capacity of roof and floor.
- Durability.
- Maintenance requirements.

4.17 OTHER INVESTIGATIONS

(i) Existing data on product properties in relation to fire, toxicity, environmental impact and the effect on mechanical strength/stability and durability were assessed.

(ii) The manufacturing process was examined including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

(iii) Site visits were conducted to assess the practicability of installation and the history of performance in use of the product.

(iv) Computer simulations data was examined and verified to determine the effectiveness of the insulation arrangements and the risk of condensation.

(v) The Declaration of performance for components covered by harmonized European Standards was reviewed.

5.1 National Standards Authority of Ireland ("NSAI") following consultation with NSAI Agrément has assessed the performance and method of installation of the product/process and the quality of the materials used in its manufacture and certifies the product/process to be fit for the use for which it is certified provided that it is manufactured, installed, used and maintained in accordance with the descriptions and specifications set out in this Certificate and in accordance with the manufacturer's instructions and usual trade practice. This Certificate shall remain valid for five years from date of issue or revision date so long as:

(a) the specification of the product is unchanged.

(b) the Building Regulations and any other regulation or standard applicable to the product/process, its use or installation remains unchanged.

(c) the product continues to be assessed for the quality of its manufacture and marking by NSAI.

(d) no new information becomes available which in the opinion of the NSAI, would preclude the granting of the Certificate.

(e) the product or process continues to be manufactured, installed, used and maintained in accordance with the description, specifications and safety recommendations set out in this certificate.

(f) the registration and/or surveillance fees due to NSAI Agrément are paid.

5.2 The NSAI Agrément mark and certification number may only be used on or in relation to product/processes in respect of which a valid Certificate exists. If the Certificate becomes invalid the Certificate holder must not use the NSAI Agrément mark and certification number and must remove them from the products already marked.

5.3 In granting Certification, the NSAI makes no representation as to;

(a) the absence or presence of patent rights subsisting in the product/process; or

(b) the legal right of the Certificate holder to market, install or maintain the product/process; or

(c) whether individual products have been manufactured or installed by the Certificate holder in accordance with the descriptions and specifications set out in this Certificate.

5.4 This Certificate does not comprise installation instructions and does not replace the manufacturer's directions or any professional or trade advice relating to use and installation which may be appropriate.

5.5 Any recommendations contained in this Certificate relating to the safe use of the certified product/process are preconditions to the validity of the Certificate. However, the NSAI does not certify that the manufacture or installation of the certified product or process in accordance with the descriptions and specifications set out in this Certificate will satisfy the requirements of the Safety, Health and Welfare at Work Act 2005, or of any other current or future common law duty of care owed by the manufacturer or by the Certificate holder.

5.6 The NSAI is not responsible to any person or body for loss or damage including personal injury arising as a direct or indirect result of the use of this product or process.

5.7 Where reference is made in this Certificate to any Act of the Oireachtas, Regulation made thereunder, Statutory Instrument, Code of Practice, National Standards, manufacturer's instructions, or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this Certification.

NSAI Agrément

This Certificate No. **08/0311** is accordingly granted by the NSAI to **Tiergaul Limited** on behalf of NSAI Agrément.

Date of Issue: **April 2008** (Original Certificate)

Signed

Martin Searson
Head of MMC Certification

Readers may check that the status of this Certificate has not changed by contacting NSAI Agrément, NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland.
Telephone: (01) 807 3800. Fax: (01) 807 3842. www.nsai.ie

Revisions:

- **January 2018:** Revision in accordance with requirements of Building Regulations. Revised to include four stories. Revised to include a range of external wall claddings.
- **7th November 2023:** References to Building Regulations updated.
- **23rd April 2025:** Company details updated. '2020 reprint' added to TGD B references. Height reduced to 15m, per Appendix C, TGD B 2020 reprint.

Bibliography:

[1] I.S. EN 13501-1:2018 *Fire Classification of Construction Products and Building Elements Part 1: Classification Using Data from Reaction to Fire Tests*.
[2] BS 5250:2021 Management of moisture in buildings. *Code of practice for the control of condensation in buildings.*
[3] IP 1/06:2006 *Assessing the effects of thermal bridging at junctions and around openings.*
[4] BRE report BR 479:2016 *Conventions for calculating linear thermal transmittance and temperature factors.*
[5] BRE report BR 443:2019 *Conventions for U-value Calculations*.
[6] I.S. EN ISO 10211:2017 *Thermal Bridges in Building Construction - Heat Flows and Surface Temperatures – Detailed Calculations.*
[7] I.S. EN ISO 13370:2017 *Thermal performance of buildings – Heat transfer via the ground – Calculation methods.*
[8] I.S. EN ISO 10456:2007 *Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values.*
[9] BRE Digest 465:2002 *U-values for light steel frame construction.*
[10] I.S. EN 1090-1:2009+A1:2011 *Execution of Steel Structures and Aluminium Structures Part 1: Requirements for Conformity Assessment of Structural Components.*
[11] I.S. EN 1090-2:2008+A1:2011 *Execution of Steel Structures and Aluminium Structures Part 2: Technical requirements for steel structures.*
[12] BS 8102:2022 *Code of practice for protection of below ground structures against water from the ground.*
[13] BS 9991:2015 *Fire Safety in The Design, Management and Use of Residential Buildings -" Code of Practice.*
[14] BS 9999:2017 *Fire Safety in the Design, Management and Use of Buildings - Code of practice.*
[15] S.R. 325:2013+A2:2018/AC:2019 *Recommendations for the design of masonry structures in Ireland to Eurocode 6.*
[16] I.S. EN 206:2013+A2:2021 Concrete – *Specification, Performance, Production and Conformity including National Annex;2015+AC2:2017*
[17] I.S. EN 845-1:2013+A1:2016 *Specification for ancillary components for masonry Part 1: Wall Ties, Tension Straps, Hangers and Brackets.*
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