NSAI Agrément

IRISH AGRÉMENT BOARD
CERTIFICATE NO. 22/0429

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Framespace Solutions LGS Building System

NSAI Agrément (Irish Agrément Board) is designated by Government to issue European Technical Approvals.

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 and subsequent amendments**

SCOPE

This Certificate relates to the Framespace LGS Building System, for the manufacture and erection of structural cold-formed Light Gauge Steel (LGS) Frame Buildings. The Framespace Solutions LGS Building System is certified to be used in the following purpose groups: 1(a), 1(b), 1(c), 1(d), 2(a), 2(b), 3, 4(a) and 5 as defined in Technical Guidance Document B of the Irish Building Regulations 1997 and subsequent amendments.

The system is used for structural walls and floors in the above purpose groups where the height to the upper floor surface of the top floor is not more than 20m from ground level on the lowest side of the building, and where the full structure is designed, manufactured, supplied and erected by Framespace Solutions Limited.

The system may also be used to construct the upper storeys of a concrete or steel framed building where the height of the complete building to the upper floor surface of the top floor is not more than 20m in height. The system can accommodate a wide range of custom designs.

The Framespace Solutions LGS is also approved for use in non-loadbearing infill panels. The infill panels are used within reinforced concrete, steel frames and traditional construction that possess their own independent lateral stability systems.

RESPONSIBILITIES

Prior to the commencement of the contract, the responsibilities are determined and agreed between Framespace Solutions and the main contractor. This must clearly identify the responsibilities of all parties. Responsibilities for foundations design, fire stopping, cavity barriers, roof completion and other elements must be identified.

MANUFACTURE, MARKETING & DESIGN

The product is manufactured, marketed, designed and erected by:

Framespace Solutions Ltd
Aghafad,
Co. Longford,
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T: +353 (0)43 3397991
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Part D – Materials and Workmanship
D3 – Proper Materials
D1 – Materials and Workmanship

The Framespace LGS Building System is comprised of 'proper materials' i.e. materials which are fit for their intended use and for the conditions in which they are to be used.

Note: Nothing in this Certificate is intended to prevent the use of materials of equivalent or superior quality, strength, fire resistance, effectiveness, durability and safety over those described in this Certificate.

Buildings incorporating the Framespace LGS Building System can be designed to meet the requirements of the following clauses of the Building Regulations.

Part A - Structure
A1 – Loading
A2 – Ground Movement

Part B – Fire Safety
For purpose groups 1(a), 1(b), 1(d), 1(c), 2(a), 2(b), 3, 4(a) and 5, the fire safety requirements are laid out in TGD to Part B 2006 of the Building Regulations.

B1 & B6 – Means of Escape in Case of Fire
B2 & B7 – Internal Fire Spread (Linings)
B3 & B8 – Internal Fire Spread (Structure)
B4 & B9 – External Fire Spread

Note: In a building more than 18m high, all external wall cladding, including insulation material used in drained and/or ventilated cavities in the external wall construction should be of limited combustibility A2-s1, d0 rating to IS EN 13501-1[31].

B5 & B10 – Access and Facilities for the Fire Service

Part C – Site Preparation and Resistance to Moisture
C3 – Dangerous Substances
C4 – Resistance to Weather and Ground Moisture

Part E – Sound
E1 – Airborne Sound (Walls)
E2 & E3 – Airborne and Impact Sound (Floors)

Part F – Ventilation
F1 (a) – Means of Ventilation
F1 (b) – Limiting the Concentration of Harmful Pollutants in the Air Within the Building
F2 – Condensation in Roofs

Part J – Heat Producing Appliances
J1 – Air Supply
J3 – Protection of Building

Part L – Conservation of Fuel and Energy
L1 – Conservation of Fuel and Energy

Part M – Access for People with Disabilities
M1 – Access and Use

2.1 PRODUCT DESCRIPTION

This Certificate relates to the Framespace Solutions LGS Building System for the design, manufacture and erection of cold-formed light gauge LGS buildings.

This Certificate contains illustrations to explain the various elements of the Framespace Solutions LGS Building System – these illustrations are not intended to be used as construction drawings. Framespace, in conjunction with the project design team, will produce a set of project specific details for each project. All drawings should be compliant with the relevant codes of practice and relevant standards, along with current Building Regulations.

2.1.1 Foundations and Ground Floor

The construction of the foundations and ground floor slab are outside the scope of this certificate.

An in-situ concrete slab may be used to form the ground floor. Alternatively, a proprietary suspended ground floor may be used, provided it is approved by the Framespace Solutions Structural Engineer for use with the Framespace Solutions LGS Building System to meet the required structural loads criteria (dead load, uplift, etc.).

2.1.2 Compartment Floors

The Framespace Solutions LGS Building System compartment floors can be designed to provide 60mins fire resistance from the underside. There are two forms of compartment floors used with the Framespace Solutions LGS Building System which the build up for each outlined in Table 3:

a) Steel Lattice Truss or C-joists protected with Plasterboard.
b) Steel Concrete Composite Deck.

The compartment floor is non-combustible and is suitable for use in buildings of any purpose group up to the maximum height allowed in this Certificate.

2.1.3 External Walls

The external walls can be load bearing or non-load bearing. Insulation is fitted to the cavity side of the cold formed steel studs. The wall panels are filled with stone mineral wool between the studs for acoustic, thermal and fire. The wall panels are then clad with the required thickness and grade of plasterboard as per Table 3 to achieve the appropriate fire rating required for the building. The plasterboards are screw fixed to the cold formed steel stud and track members.

The requirements for the provision of an Air and Vapour Control Layer (AVCL) on external walls are outlined in Section 4 of this certificate.

2.1.4 Internal Walls

The internal load bearing and non-load bearing wall panels are made from cold-formed LGS. When internal wall panels provide racking resistance to external walls, diagonal wind bracing members can be incorporated into the panel to successfully transfer the horizontal loads safely through the building structure in accordance with structural design requirements. The bracing also serves to keep the frames square during erection.

All internal load bearing panels must be sufficiently supported directly under the panels with rising blockwork or equivalent. Plasterboard specifications on the steel panels should be in accordance with Table 3 of this certificate, which shows the plasterboard fire resistance requirements for wall, floor and ceiling elements. The plasterboard and AVCL (where required) linings are fixed to the walls and ceilings by means of self-drill/self-tap screws; all joints are then taped and filled where required for decoration.

2.1.5 Roof Structure

The roof trusses can be either a traditional timber cut roof, prefabricated roof truss made from timber or steel or a steel prefabricated roof module. The roofing solution chosen for a particular building is both client and project specific and must be assessed and signed off by a nominated Framespace Chartered Structural Engineer.

2.1.6 Internal Linings and Finishes

Linings to walls and ceilings are of plasterboard as specified in Table 3, manufactured to I.S. EN 520[8]. They are attached by means of self-drill/self-tap screws into steel members. In areas prone to high levels of humidity, moisture resistant plasterboard should be used. Joints in plasterboard can be taped and filled in accordance with the plasterboard manufacturer's instructions. Alternatively skim coat plaster can be applied.

2.1.7 Services

Services are outside the scope of this Certificate. Electrical installation should be designed and installed in accordance with I.S. 10101[27]. Heating and plumbing services must be designed and installed by competent professional engineers.

Care shall be taken to avoid dissimilar metals coming into contact to avoid risk of galvanic corrosion. Local earth connection to the steel frame shall be avoided. The structural frame should be earthed in accordance with the current regulations I.S. 10101[27].

Electrical installations and recessed lights may not be accommodated within any of the compartment floor build ups. All electrical installations must be accommodated by creating a separate service void under the compartment floor. All services are installed with reference to Section 3.2.5.7 and 3.4 of TGD to Part B for all purpose groups to which this certificate applies. Figure 2 & 5 show how services are accommodated in the Framespace compartment floors. Penetrations through compartment floors should be minimised. Mechanical ventilation extraction ducts are allowed to pass vertically through the floor but must be appropriately fire sealed where they enter and exit and comply with the recommendations contained within BS 9999[13].

Services can pass through a compartment wall when they are appropriately protected with reference to Section 3.2.5.7 and 3.4 of TGD B 2006 of Building Regulations for all purpose groups to which this Certificate applies. Services passing through compartment walls should be kept to a minimum and avoided where possible.

2.1.8 Foundations and Podium Slab

Foundations are outside the scope of this Certificate. Based on finalised layouts, the Framespace Structural Engineer can carry out a load take down calculation and provide the Client appointed Structural Engineer with accurate line loads which they can accommodate into their foundation design.

The Framespace LGS Building System can be constructed off a concrete podium slab. Responsibility for construction, tolerances and structural details shall be clearly defined before construction begins .

The overall stability of the building is project specific and can be achieved by the LGS system, an independent core, or similar systems designed by others.

2.2 DESIGN AND MANUFACTURE

The Framespace LGS Building System must be designed in accordance I.S. EN 1993-1[7], and manufactured in accordance with I.S. EN 1090-1[11] to EXC2.

2.3 STRUCTURAL PRINCIPLES

2.3.1 LGS Structure

The basis of the typical Framespace Solutions structure is a cold-formed light gauge steel frame, which is assembled into structural panels in the factory and installed on site.

2.3.2 Protective Coatings

The LGS members are all coated with a protective zinc-rich metal coating. The LGS members are manufactured from galvanized coil steel to I.S. EN 10346[10] (min. yield stress 350 N/mm^2) with 275 g/m^2 zinc protection.

In addition to the steel members in the system being protected by zinc rich protective coatings, further protection against corrosion and longer design life is given to the steel by providing the following:

- The bottom channel on all ground floor LGS panels is additionally protected by a DPC.
- The insulation keeps the steel in a "warmframe" environment, which, in conjunction with an internal AVCL (where required) prevents the formation of condensation within the wall structure.
- All fasteners have been assessed and tested for use with the system, to ensure the minimum 50-year design life of the system.

2.3.3 Fasteners and Connection Joints

The design of the Framespace Solutions LGS Building System allows for no welding of joints in the system. The system is assembled using fasteners such as screws. Only self-drilling Tek screws are used for the structural connectivity of the system on site. On-site structural connections such as panel to panel connections, OSB boarding to floor joist, floor joist to panel, composite deck to panel and wind bracing are fastened using approved Tek screws.

All fasteners used in the LGS system are adequately protected against corrosion i.e. galvanising/zinc coating and made from a suitable metal to ensure the design life of the system is maintained. Framespace Solutions provide a full specification of all fasteners, where they are to be used and how they are to be installed during the construction of the system. Only system fasteners approved or supplied by Framespace Solutions may be used with the system. It is important to ensure that protective coatings on fasteners are not removed, i.e. to assist the fitting of a connection, as this would severely compromise the corrosion performance of the fastener.
Framespace Solutions specify corrosion protection of fasteners with consideration to the environment in which they are to be used, with additional coatings applied on site where required.

2.3.4 Racking

The composite action of the steel studs and bracing combine, as per the design, to provide the required stiffness to meet the stability requirements of the panellised system.

2.3.5 Holding Down

To provide resistance to uplift, the bottom channel of the external panels is fixed to the ground floor slab, podium slab or rising wall with approved fixings. The type of fixing used to hold down the panels of the system will be dependent on what substrate the fixing is being fixed to. These fixings are designed by the Framespace Solutions Structural Engineer and are installed in accordance with the Code of Practice for the Design and Installation of Anchors in accordance with section 60 of the Safety, Health and Welfare at Work Act 2005. The positions of the fixings are project specific and are determined by the Framespace Solutions Chartered Structural Engineer. The plasterboard is site applied allowing access for the fixings to be installed on site.

2.4 COMPARTMENTATION

2.4.1 Separating Wall

Separating walls (party walls) are typically constructed using a staggered stud wall system. This system comprises of 100mm LGS studs at 300mm centres which are staggered to each side of a 150mm wide head and floor channel.

The second and more traditional LGS Party wall option is two independent cold formed steel framed leaves with a recommended minimum cavity of 50mm between both frames.

In both systems, the frames are boarded (on site or in the factory) with the appropriate level of boarding required to provide the acoustic and fire properties, as illustrated in Table 3. The LGS studs are filled with the appropriate mineral wool insulation from ground floor to the underside of the roof structure to provide the required fire and acoustic properties.

Where the attic space is habitable the mineral wool insulation must go up to the underside of the roof for acoustic purposes. Where the party wall abuts an external wall, the mineral wool insulation within the cavity of the party wall extends through the inner leaf of the external wall and abuts the external leaf of the system and forms the fire stop in the wall. This detail seals air gaps and minimises flanking sound transmission.

The head of the party wall must also be fire stopped and cavity closed as specified by the Framespace Solutions construction details. Where services are required in a party wall, they can be accommodated by creating a service cavity to the party wall with timber battens or metal top hat sections and plasterboard.

All battens used with the Framespace Solutions LGS building system are treated in accordance with BS 8417[12]. Design must comply with the requirements of Section 3.5 of TGD B 2017 Volume 2 of Building Regulations for all purpose classes to which this certificate applies.

2.4.2 Single Frame Compartment Walls

A compartment wall within the Framespace Solutions building system can be constructed of a single frame wall and must be designed and specified to meet the acoustic, fire and structural requirements of the Building Regulations.

This compartment wall must not be used where a wall is common to two or more buildings (separating wall) or where a compartment wall is used to separate dwellings from each other within a building.

2.4.3 Cavity Barriers and Fire Stops

To meet the requirements of TGD to Part B Volume 2 of the Building Regulations, the correct specification and placement of cavity barriers and fire stops shall be detailed and shown on a schedule for the project. Typically, cavity barriers and fire stops should be provided in the construction of LGS walls as follows:

- Separating walls shall have a vertical cavity barrier sealing the cavity at the wall ends, running from DPC level to the underside of the fire stopping at the top of the wall.
- At a separating wall junction with the external wall, the vertical cavity barrier runs out to the inner face of the external cladding to form the cavity barrier (see Figure 4).
- Horizontal cavity barriers shall be placed at the perimeter of all compartment floors. The cavity barrier should be appropriate for the external cladding that is intended to cavity close in the event of a fire and smoke entering the cavity.
- A cavity barrier shall cover the full floor depth as well as the upper wall panel rail and lower wall panel head plate.
- Cavity barriers are required around all openings in external walls such as doors, windows, vents, extractor fans, meter cupboards, etc.

Figures 2, 3, 4 and 8 show typical details on the proper installation of cavity barriers and fire stops in the Framespace Solutions LGS Building System.

The Framespace Solutions site install manager will inspect all cavity barriers and fire stops prior to the closing up of the cavities and ceilings and this is recorded in the quality control file for that site. The fire stopping must be installed correctly before Framespace Solutions will issue the certificate for the building.

2.5 DELIVERY, STORAGE AND SITE HANDLING

2.5.1 Delivery of Panels

Frame panels are transported vertically on stillages to site. Where lifting points are required, they are located, designed and certified by the Framespace Structural Engineer, taking into account the unit weight and dimensions and the distance of lift required. They will conform to the requirements of the Safety, Health and Welfare at Work Act 2005 and the Safety, Health and Welfare at Work (Construction) Regulations 2013.

All off-loading and erection shall be in accordance with the Framespace Solutions Method Statement and erection procedures. Erection tools should be of suitable quality to avoid surface contamination. Smaller panels may be manually manoeuvred into position.

All lifting shall be carried out by competent personnel in accordance with the Framespace Solutions Erection Manual and site-specific safety statement. Care is needed to avoid scratching the surface of any exposed LGS members. Frames must be stored on a dry, clean, level base with a suitable packing to prevent damage and must not be dropped or allowed to rest on projecting objects.

Flooring and other ancillary items such as insulation and cavity barrier must also be kept dry and stored on a firm level base.

2.5.2 Traceability

The Framespace Solutions CAM software assists the tailor made custom designed roll formers in arranging production groups and complex punching operations. The software also directs dynamic inkjet printing for parts identification and positioning ensuring all pieces are identified for accurate and fast assembly.

Each assembly drawing contains the unique identification number for each steel member. This allows for ease of assembly by the assemblers.

When each wall panel is complete and within the required dimensional tolerances, it is labelled with a "Quality Passed" sticker when it has been checked according to the building drawing and stacked according to the off-loading plan for the building.

2.5.3 Typical Material List Supplied to Site

With each customised delivery to site, a comprehensive bill of materials is supplied. This bill of materials gives a detailed list of all components delivered to site to complete the installation of the LGS building.

All panels are individually numbered using the pre-marking system during production to correspond with the erection drawings supplied with the bill of materials. This pre-marking system facilitates speed and accuracy during assembly and erection on site.

2.6 INSTALLATION

2.6.1 General

Site installation must only be carried out by Framespace approved installers in accordance with the Framespace Installation Manual.

Installers are approved once they have undergone on-site training, and understand the fundamental structural principals of the system, fire stopping requirements, tolerances, importance of weathering, storage and handling of the LGS panels and all other relevant information. Installers must have installed panels under the guidance of a qualified installer and shall have a signed record of training.

2.6.2 Site Supervision

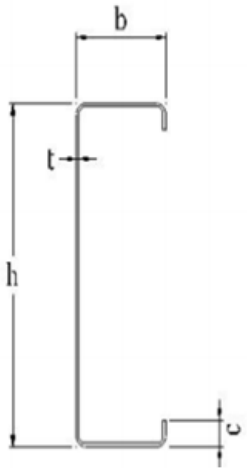
Each project will have a specific site inspection plan to comply with the BCAR requirements. Framespace Solutions site manager will take responsibility for carrying out inspections in accordance with the site inspection plan and maintaining appropriate records

2.6.3 Plasterboard Installation

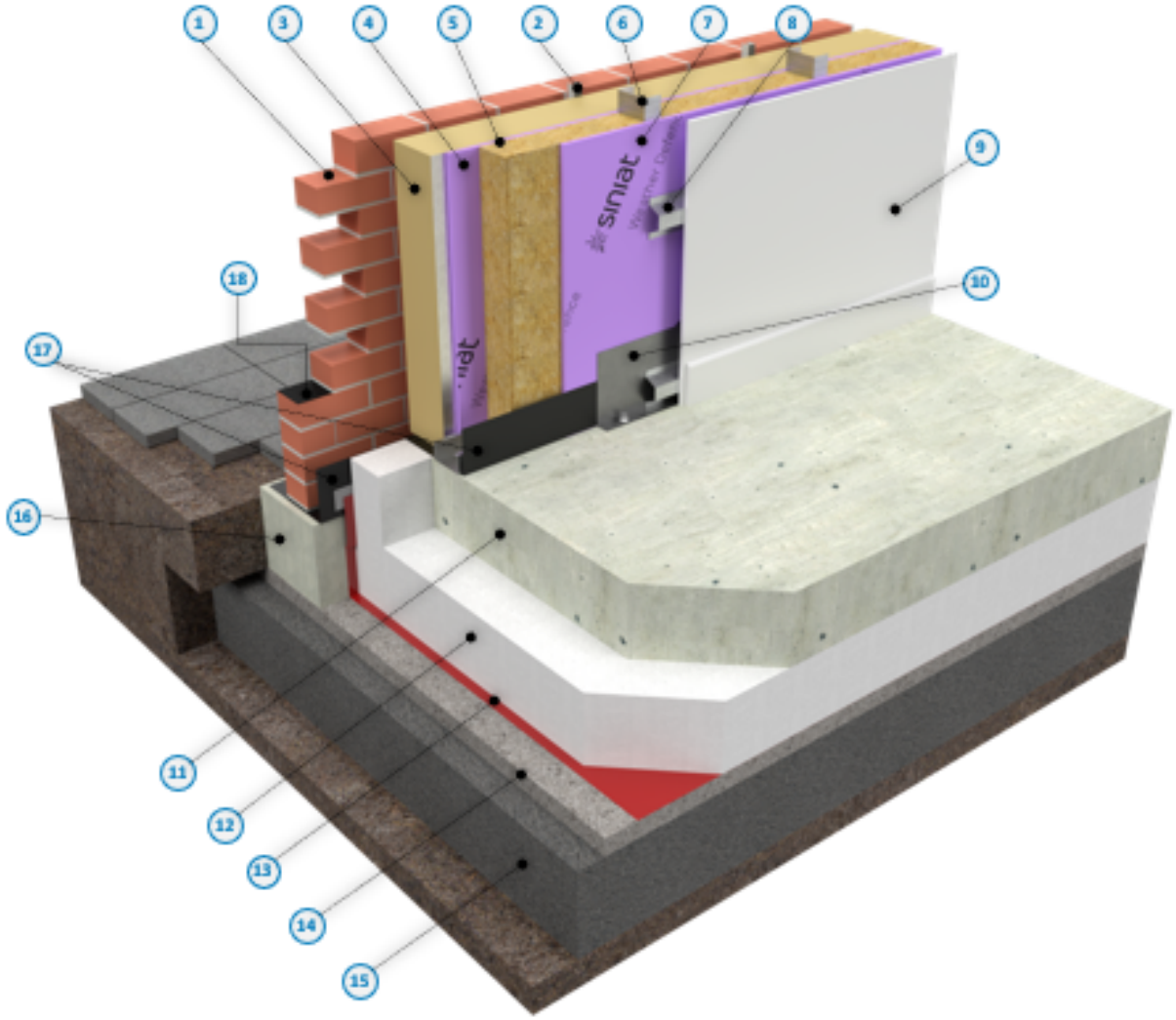
The proper application of plasterboard to the steel frame members is critical for both fire and sound performance. Attention shall be given to proper and practical detailing on the part of the designer and a high standard of workmanship on behalf of Framespace. Plasterboard, in addition to all cavity barriers and fire stops on all structural walls and floors and separating walls, must be fully checked on site and signed off in accordance with project specific details by the appropriate personnel, as detailed in section 2.5.3 of this certificate. All boarding that provides fire resistance must conform to the specification given in Table 3.

If alternative boarding is proposed, then an independent fire test report, from an Accredited Laboratory, must be provided and assessed by a competent Fire Engineer.

Table 1: LGS Profiles and properties					
Framespace Solutions – LGS Frame Profile					
Component Type	**Grade of steel**	**Typical Section Details (mm)**			
		Depth (h)	**Width (b)**	**Lip (c)**	**Thickness (t)**
Wall Stud	S390, S450, S550	75	51	10	1.0 - 2.0
Wall Stud /Roof Truss	S390, S450, S550	100	51	15	1.0 - 2.0
Wall Stud/Roof Truss /Floor Joist	S390, S450, S550	150	51	15	1.0 - 2.0
Floor Joist	S390, S450, S550	200	51	15	1.0 - 2.0
Floor Joist	S390, S450, S550	250	51	15	1.0 - 2.0

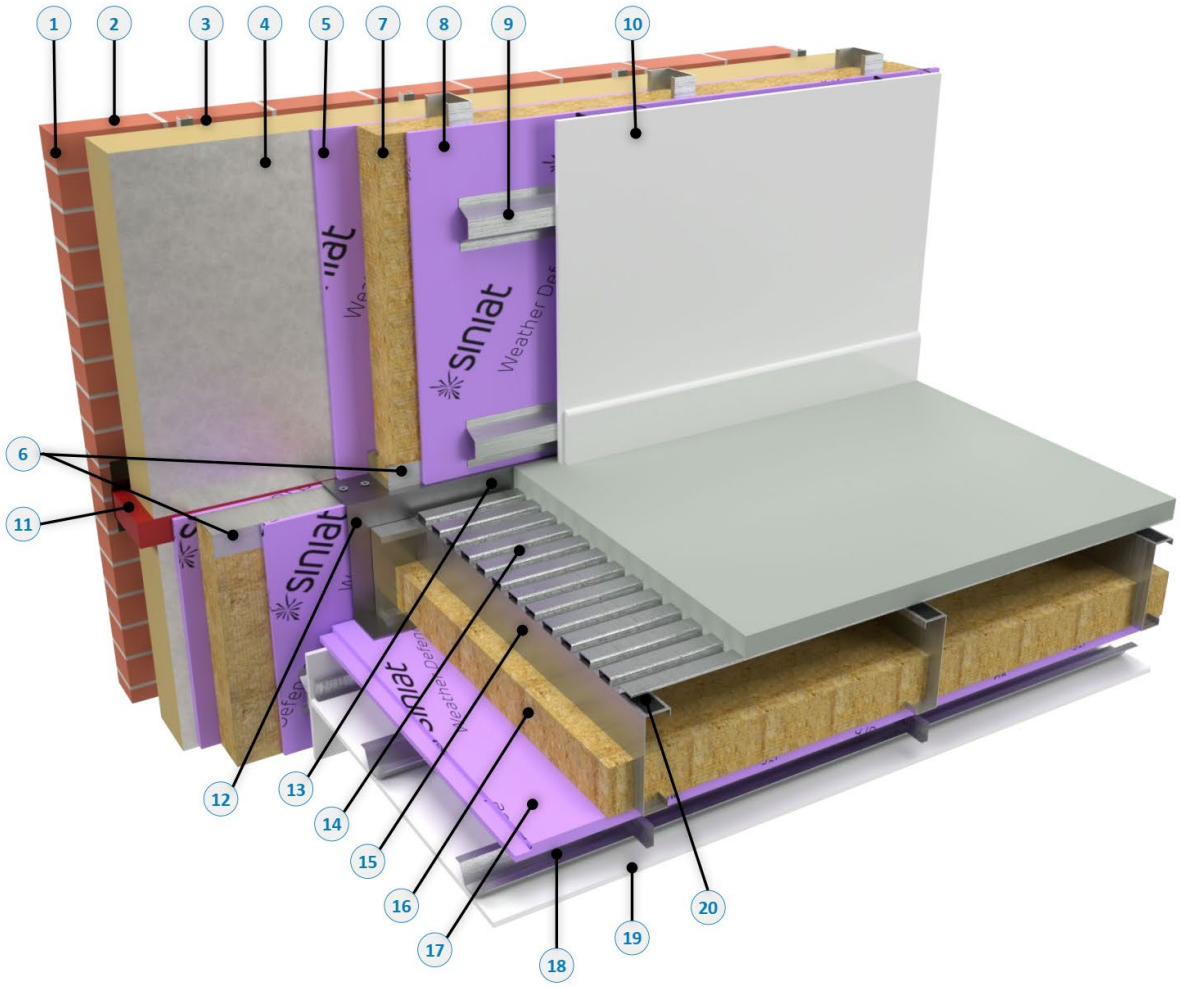


Note: 60min fire resistance build-ups are shown in the following details for illustrative purposes only.



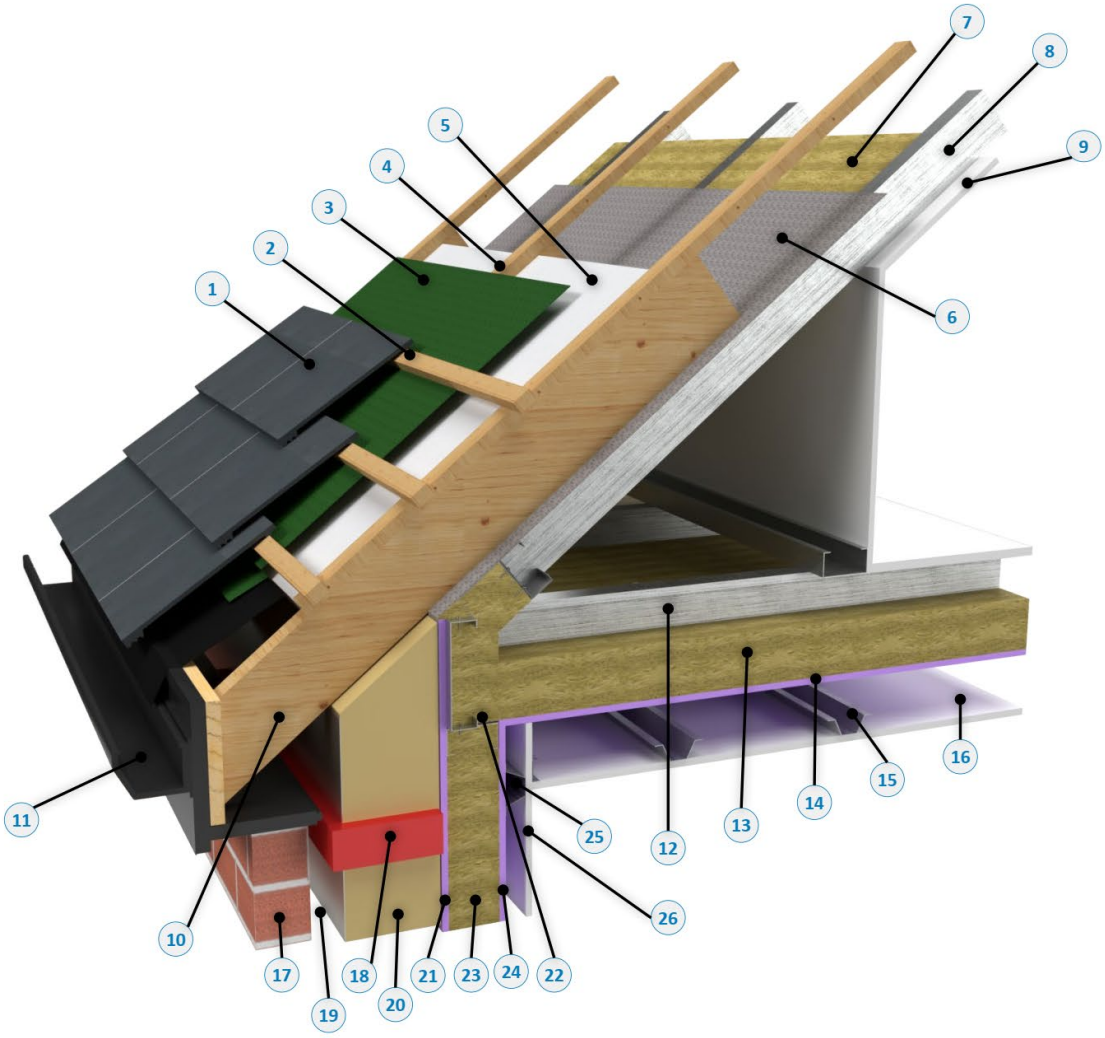
1. 102mm Brick outer leaf
2. 14mm S.S Wall tie & channel fixed through insulation to LGS frame
3. 150mm PIR Insulation
4. 12.5mm Siniat Weather Defence Board
5. 100mm Stone wool density=22kg/m3
6. 100mm LGS metal studs @600c/c
7. 12.5mm Siniat Weather Defence Board
8. 40mm Service Cavity Horizontal top hats @ 450 c/c
9. 12.5mm Standard Plasterboard
10. 2mm Light Gauge "L" Wall anchor & bracket to engineers' specification
11. 200mm Thick reinforced concrete slab to engineers' specification
12. 200mm Thick EPS Insulation (EPS300 or as specified by Structural Engineer)
13. DPM/Radon Barrier if required
14. 50 mm Blinding
15. 250mm Min. Structural T.1 granular material wrapped in 2000G polythene
16. Ring beam for outer brickwork
17. Radon rated stepped DPC
18. Strip of DPC in brickwork min. 150mm above ground

Figure 1: External Wall to Insulated foundation detail



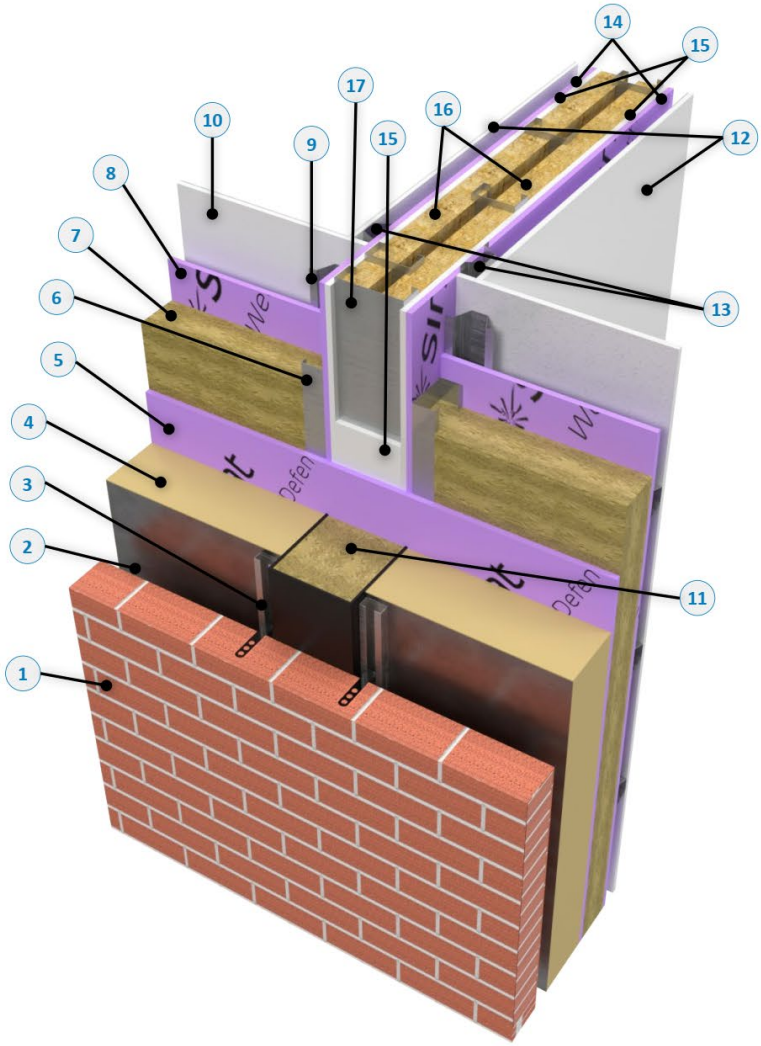
1. 102mm Brick outer leaf
2. 14mm S.S Wall tie & channel fixed through insulation to LGS frame
3. 50mm Cavity
4. 150mm PIR Insulation
5. 12.5mm Siniat Weather Defence Board
6. 100mm LGS metal studs @600c/c
7. 100mm Stone wool density = 22kg/m3
8. 12.5mm Siniat Weather Defence Board
9. 40mm Service Cavity Horizontal top hats
10. 12.5mm Standard Plasterboard
11. Cavity Fire Barrier with stepped and sealed DPC
12. 2mm Light Gauge “Z“ joist hanger
13. 10mm Poly joint - Foam expansion joint 30kg/m3 between screed and wall
14. 60mm Self levelling concrete screed on Lewis deck dovetailed metal decking
15. LGS Floor joist to engineers' specification
16. 100mm Stone wool density=22kg/m3
17. Double 12.5mm Siniat Weather Defence Board
18. Service cavity formed with MF Ceiling
19. 12.5mm Standard Plasterboard Ceiling
20. GTEC Resilient Tape

Figure 2: External Wall to 60min Separating floor



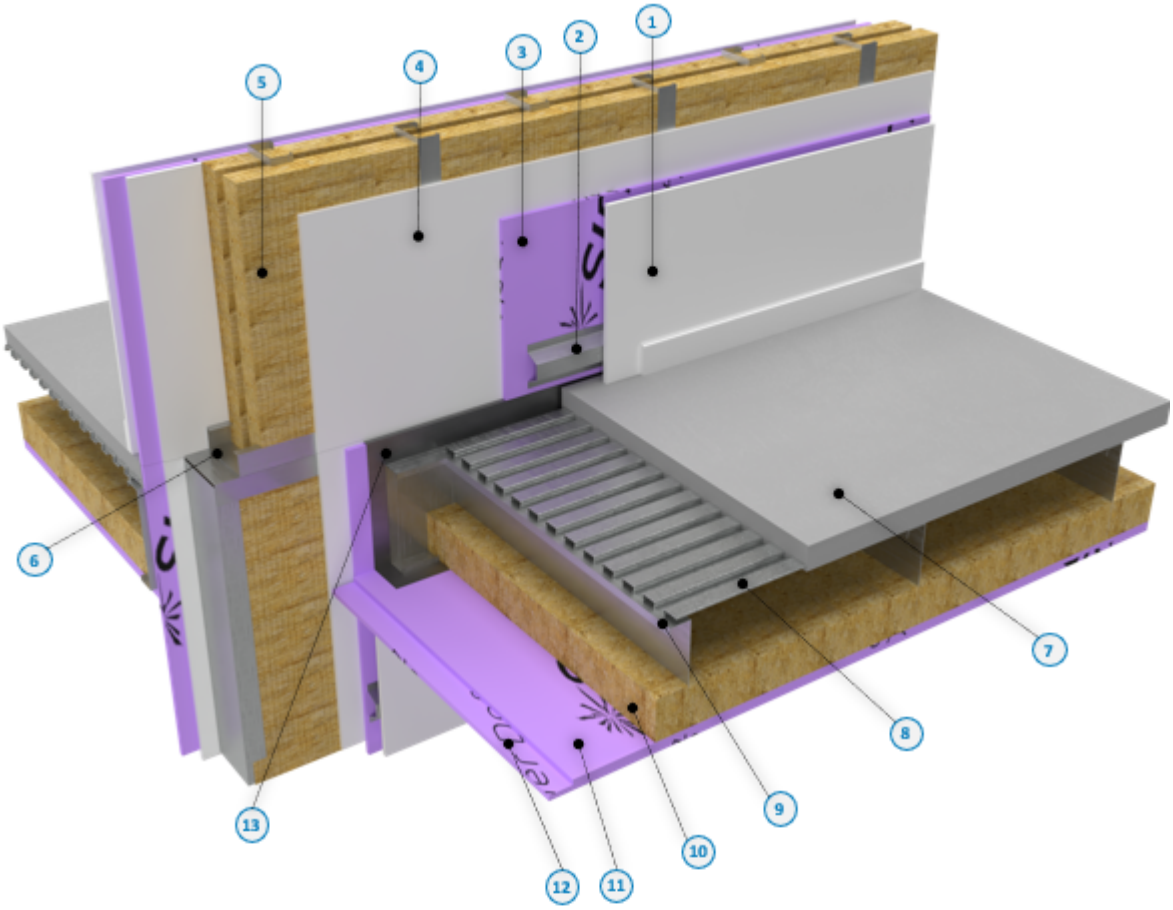
1. Tiles/Slates as selected
2. 25x50mm treated battens
3. Breather Sarking Felt
4. 32x38mm counter battens
5. 150mm EPS Insulation
6. Airtightness Membrane
7. 100mm Loft Roll Insulation
8. 100mm LGS Frame
9. 12.5mm Standard Plasterboard
10. 150 x 50mm Timber Sprockets
11. UPVC Gutter system to selection on treated timber facia and soffit
12. LGS Floor joist to engineer specification
13. 100mm Stone wool density=22kg/m3
14. 12.5mm Siniat Weather Defence Board
15. Service cavity formed with MF Ceiling
16. 12.5mm Standard Plasterboard Ceiling
17. 102mm Brick outer leaf
18. Fire Cavity Barrier
19. 50mm Cavity
20. 150mm PIR Insulation
21. 12.5mm Siniat Weather Defence Board
22. 100mm LGS metal studs @600c/c
23. 100mm Stone wool density=22kg/m3
24. 12.5mm Siniat Weather Defence Board
25. 40mm Service Cavity Horizontal top hats
26. 12.5mm Standard Plasterboard

Figure 3: Eaves Detail



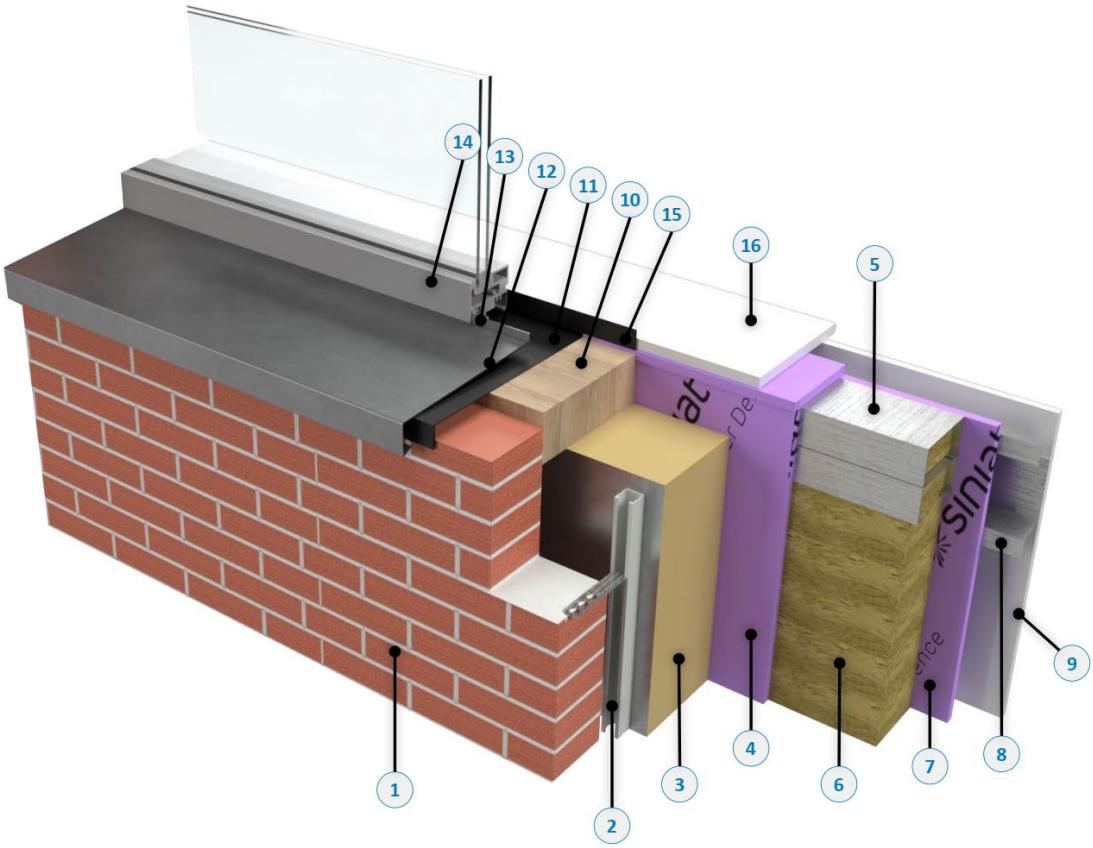
1. 102mm Brick outer leaf
2. 50mm Cavity
3. 14mm S.S Wall tie & channel fixed through insulation to LGS frame
4. 150mm PIR Insulation
5. 12.5mm Siniat Weather Defence Board
6. 100mm LGS metal studs @600c/c
7. 100mm Stone wool density=22kg/m3
8. 12.5mm Siniat Weather Defence Board
9. 40mm Service Cavity Horizontal top hats
10. 12.5mm Standard Plasterboard
11. Fire Barrier with sealed DPC
12. 12.5mm Standard Plasterboard
13. 40mm Service Cavity Horizontal top hats
14. 12.5mm Siniat Weather Defence Board
15. 12.5mm Type F Plasterboard
16. Staggered 2x60mm RWA Mineral Wool Density: 45kg/m3
17. 150mm LGS Frame with Staggered 100mm LGS Studs

Figure 4: External wall to Separating wall junction



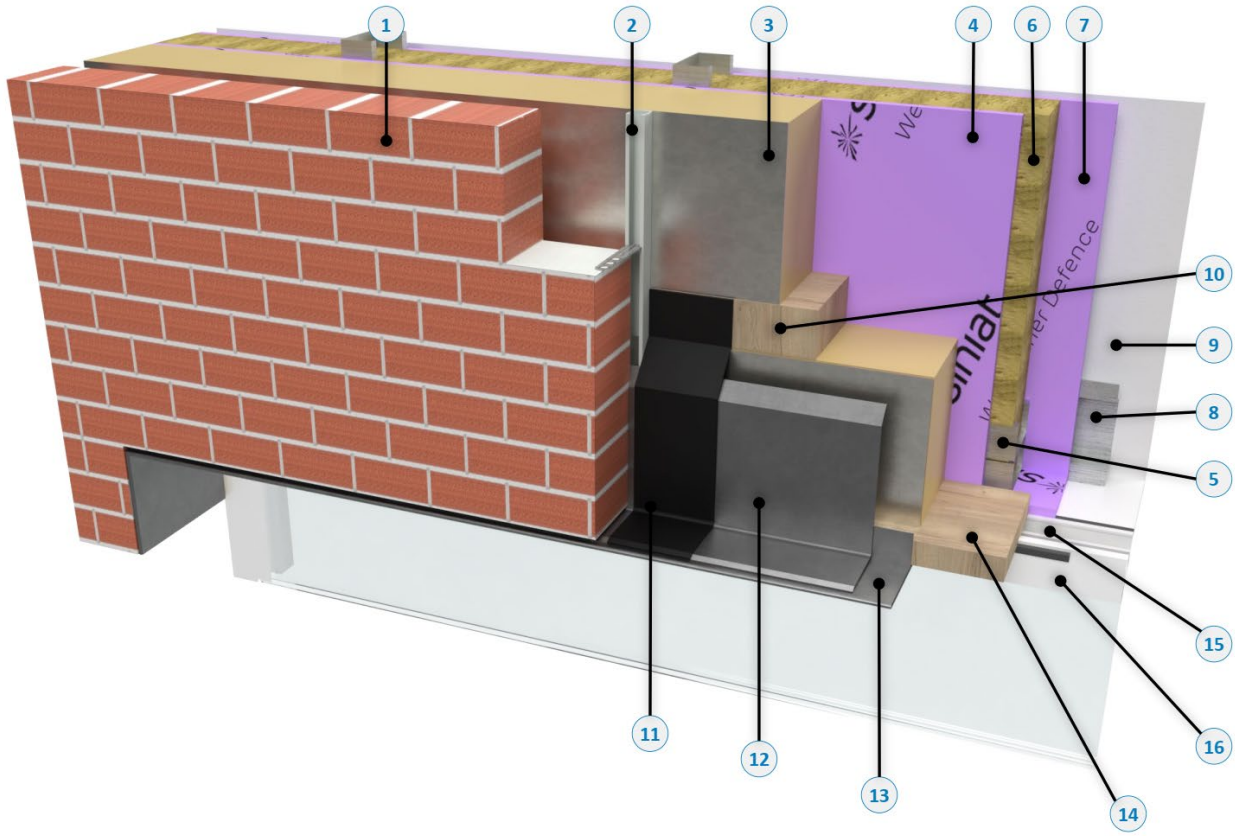
1. 12.5mm Standard Plasterboard
2. 40mm Service Cavity Horizontal top hats
3. 12.5mm Siniat Weather Defence Board
4. 12.5mm Type F Plasterboard
5. Staggered 2x60mm RWA Mineral Wool Density: 45kg/m3
6. 150mm LGS Frame with Staggered 100mm LGS Studs
7. 60mm Self levelling concrete screed.
8. Lewis deck dovetailed metal decking
9. LGS Floor joist to engineer specification
10. 100mm Stone wool density=22kg/m3
11. 12.5mm Siniat Weather Defence Board
12. 12.5mm Siniat Weather Defence Board
13. 2mm Light Gauge "Z" joist hanger

Figure 5: Separating Floor to Separating wall Detail



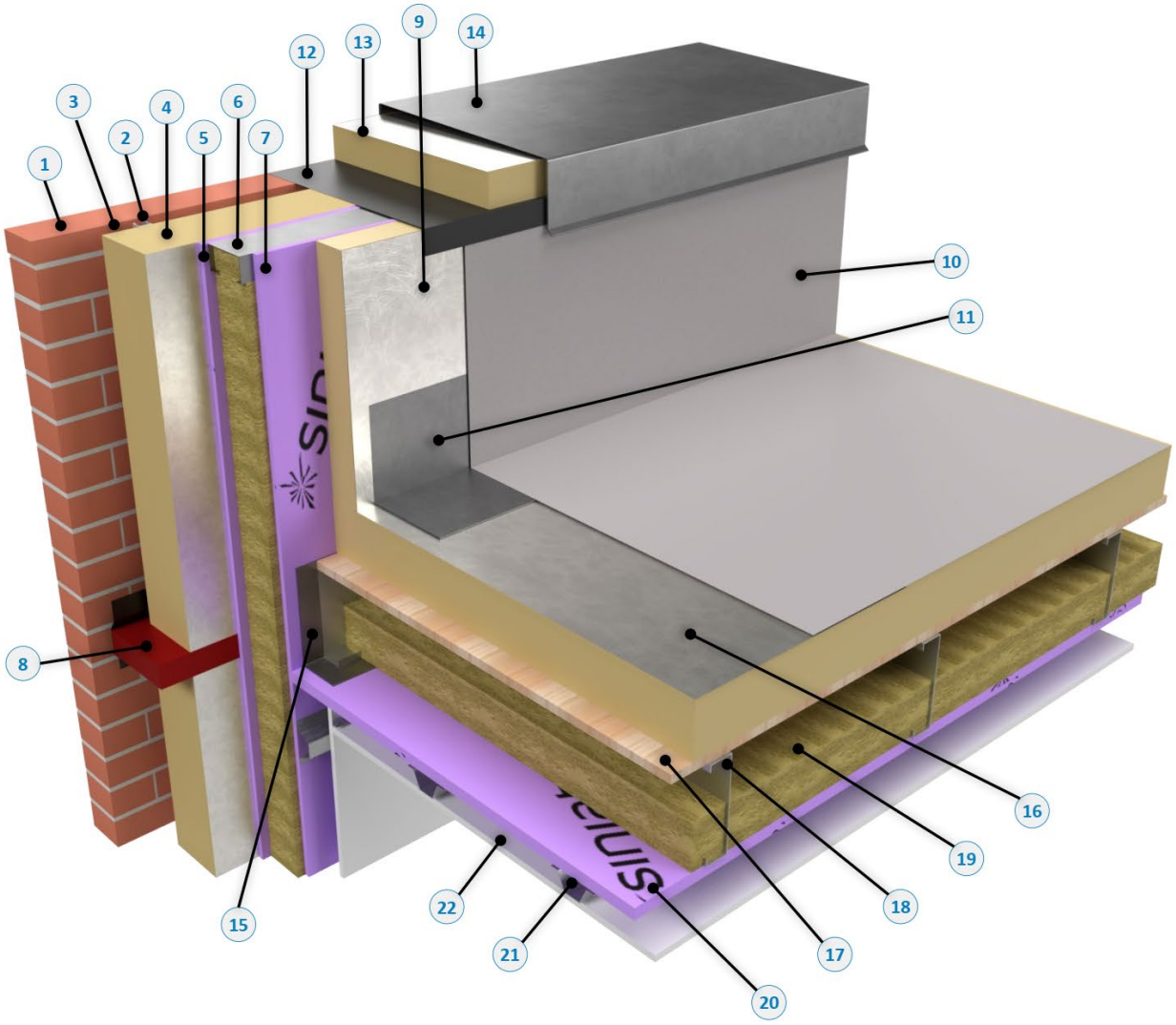
1. 102mm Brick outer leaf
2. 14mm S.S Wall tie & channel fixed through insulation to LGS frame
3. 150mm PIR Insulation
4. 12.5mm Siniat Weather Defence Board
5. 100mm LGS metal studs @600c/c
6. 100mm Stone wool density=22kg/m3
7. 12.5mm Siniat Weather Defence Board
8. 40mm Service Cavity Horizontal top hats
9. 12.5mm Standard Plasterboard
10. Treated timber batten (30mins. fire-rated cavity closer)
11. DPC
12. PPC flashing with stop ends
13. Full mastic bead
14. Window frame to selection cramps fixed outside window frame to inside LGS stud seal with VC mastic
15. Air tightness tape
16. MDF window board, bullnose

Figure 6: Window Sill Detail



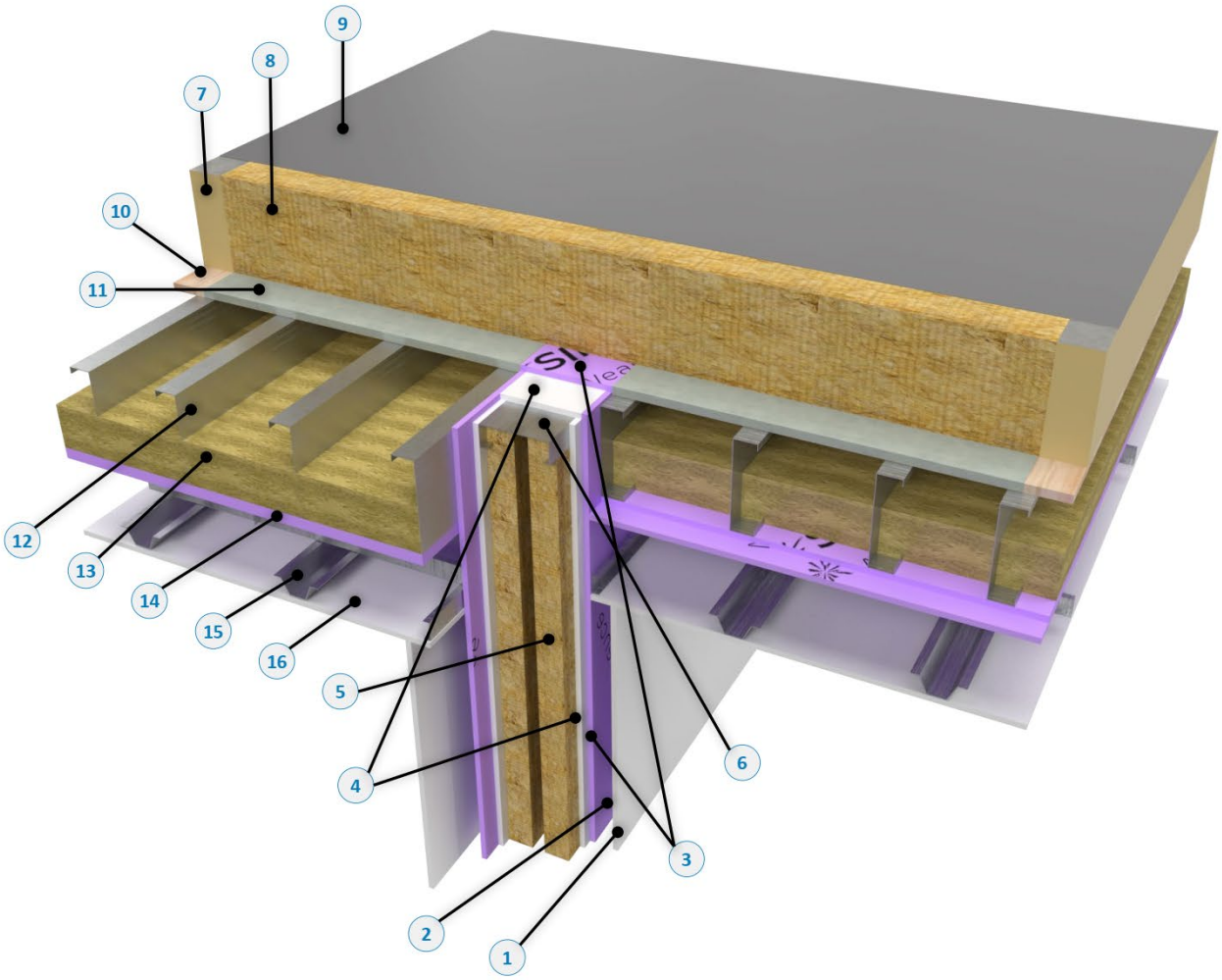
1. 102mm Brick outer leaf
2. 14mm S.S Wall tie & channel fixed through insulation to LGS frame
3. 150mm PIR Insulation
4. 12.5mm Siniat Weather Defence Board
5. 100mm LGS metal studs @600c/c
6. 100mm Stone wool density=22kg/m3
7. 12.5mm Siniat Weather Defence Board
8. 40mm Service Cavity Horizontal top hats
9. 12.5mm Standard Plasterboard
10. Treated timber batten
11. DPC
12. Single leaf lintel
13. PPC-finished soffit plate clipped to front edge of lintel and adhered to cavity closer soffit, to manufacturer's details
14. Treated timber batten (30mins. fire-rated cavity closer)
15. Full mastic bead
16. Window frame to selection cramps fixed outside window frame to inside LGS stud seal with VC mastic

Figure 7: Window Head Detail



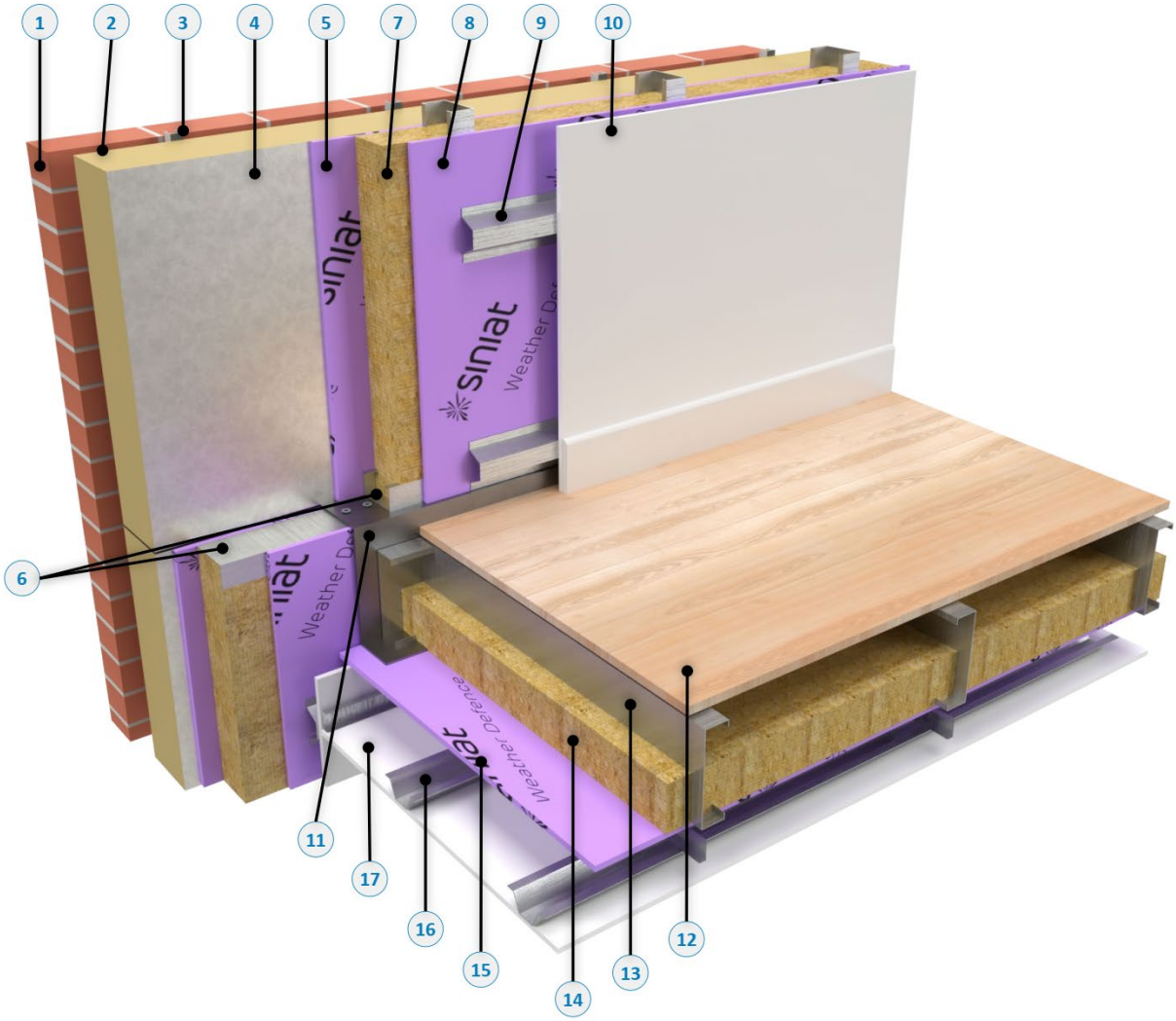
1. 102mm Brick outer leaf
2. 14mm S.S Wall tie & channel fixed through insulation to LGS frame
3. 50mm Cavity
4. 150mm PIR Insulation
5. 12.5mm Siniat Weather Defence Board
6. 100mm LGS metal studs @600c/c with 100mm Stone wool density=22kg/m3
7. 12.5mm Siniat Weather Defence Board
8. Cavity Fire Barrier with sealed DPC
9. 75mm PIR Insulation
10. DPC Membrane and/or finish board
11. 3mm 200x200mm Galvanized "L" retaining angle
12. DPC Membrane
13. PIR tapered to match capping flashing
14. 2mm Flashing Butt-straps with full mastic bed at every cap joint
15. 2mm Light Gauge “L“ joist hanger
16. 120mm Tapered PIR Insulation
17. 18mm Plywood
18. LGS Floor joist to engineer specification
19. 100mm Stone wool density=22kg/m3
20. Double 12.5mm Siniat Weather Defence
21. Service cavity formed with MF Ceiling
22. 12.5mm Standard Plasterboard Ceiling

Figure 8: Parapet roof Detail



1. 12.5mm Standard Plasterboard
2. 40mm Service Cavity Horizontal top hats
3. 12.5mm Siniat Weather Defence Board
4. 12.5mm Type F Plasterboard
5. Staggered 2x60mm RWA Mineral Wool Density: 45kg/m3
6. 150mm LGS Frame with Staggered 100mm LGS Studs
7. 120mm Tapered PIR Insulation
8. 120mm Tapered Stone wool density=22kg/m3 insulation 1500 mm from each side of the Party Wall
9. DPC Roof membrane
10. 18mm Plywood
11. 12mm Cement Board 1500 mm from each side of the Party Wall
12. LGS Floor joist to engineer specification
13. 100mm Stone wool density=22kg/m3
14. Double 12.5mm Siniat Weather Defence Board
15. Service cavity formed with MF Ceiling
16. 12.5mm Standard Plasterboard Ceiling

Figure 9: Separating wall flat roof Detail



1. 102mm Brick outer leaf
2. 14mm S.S Wall tie & channel fixed through insulation to LGS frame
3. 50mm Cavity
4. 150mm PIR Insulation
5. 12.5mm Siniat Weather Defence Board
6. 100mm LGS metal studs @600c/c
7. 100mm Stone wool density = 22kg/m3
8. 12.5mm Siniat Weather Defence Board
9. 40mm Service Cavity Horizontal top hats
10. 12.5mm Standard Plasterboard
11. 2mm Light Gauge “Z“ joist hanger
12. 18mm plywood
13. LGS Floor joist to engineer specification
14. 100mm Stone wool density=22kg/m3
15. 12.5mm Siniat Weather Defence Board
16. Service cavity formed with MF Ceiling
17. 12.5mm Standard Plasterboard Ceiling

Figure 10: Intermediate floor Detail

3.1 STRENGTH AND STABILITY

3.1.1 General

The Architectural and Engineering design team are responsible for ensuring that architectural drawings and overall building design comply with the Building Regulations. Framespace Solutions, using an experienced Chartered Structural Engineer, are responsible for the structural design of the Framespace Solutions LGS Building System.

3.1.2 Certificate of Structural Compliance

Framespace are responsible for the design, manufacture, supply, installation and certification of the system.

3.1.3 Superstructure Design

The design must be in accordance with I.S. EN 1990[14] and IS EN 1993-1[7].

3.1.4 Substructure Design

The design of the building's substructure is outside the scope of this certificate.

3.1.5 Design

The design of a typical building has been examined by the NSAI Agrément and demonstrates compliance with the following Codes of Practice. In general, the wall panels, floor trusses and roof truss are designed in accordance with I.S. EN 1993-1-1[7] and timber roof trusses to I.S. EN 1995-1-1[32].

Design wind and snow loads should be based on Diagrams 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[18] and I.S. EN 10143[19]. During the design process, loads are determined by Framespace Solutions depending on the intended use of the building and client requirement, using IS EN 1991-1 suite and designed with reference to

- Dead and imposed load to IS EN 1991-1-1[15]
- Snow load to IS EN 1991-1-3[17]
- Wind loads based on I.S. EN 1991-1-4[16]

Greater loads can be accommodated by request.

3.1.6 Structural Testing

Where it is required, structural testing can be used to verify the relevant aspects of the structure where the design falls outside the scope of I.S. EN 1993-1-1[7].

3.2 FIRE

3.2.1 General

Buildings using the Framespace Solutions LGS Building System must be designed to comply with the relevant requirements of TGD to Part B of the Building Regulations.

The building details of the system incorporate suitable cavity barriers and fire stops to satisfy the requirements of Section 3.3 of TGD B 2006 of the Building Regulations. Additional guidance is contained in BS 9991[22] & BS 9999[13].

Table 3 lists the fire resistance tests for non-loadbearing and loadbearing elements, in accordance with I.S. EN 1364-1[33], I.S. EN 1365-1[20] and I.S. EN 1365-2[21]. All fire testing has been carried out with service penetrations in the walls.

All tiles or slates used in the roof in conjunction with the system shall be designated AA/Broof per Table A5 of TGD to Part B 2006. Other NSAI Agrément approved roof coverings may also be used with the system under the guidance of the Framespace Solutions nominated Chartered Engineer.

Table 2 illustrates the surface spread of flame characteristics for typical materials used in the Framespace Solutions LGS Building System. A more comprehensive list of material and product fire performance ratings can be found in Table A6 of TGD B 2006 of the Building Regulations.
The Framespace Solutions LGS Building System must be designed with the required boarding specification to meet the minimum requirements of Table A1 and Table A2 of TGD B 2006 of the Building Regulations for all purpose groups to which this certificate applies, and any other building specific structural fire performance requirements.

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. Fire doors should be appropriately rated to match the rating of the compartment wall where they are to be installed.

A wide variety of fire safety measures that should be considered and incorporated to a greater of lesser extent, as appropriate to the circumstances, include:

- The adequacy of the means to prevent fires occurring,
- Early warning by automatic fire detection and alarm systems,
- The means of escape provided,
- Provision of smoke control systems,
- Control of the rate of growth of a fire,
- The adequacy of the structure to resist the effects of a fire,
- The degree of fire containment,
- Fire separation between buildings or parts of buildings,
- The standard of active measures for fire extinguishment or control,
- Facilities to assist the fire service,
- The degree of fire safety management including the likely standard of maintenance of the fire safety systems,
- Consideration of the availability of any continuing control under other legislation that could ensure continued maintenance of such systems.

Table 2: Surface Spread of Flame		
Material	**National Rating**	**Euroclass**
Brickwork/Blockwork	Class 0	A1
Weather Resistant Boarding	Class 0	A2 – s1, d0
Timber Boarding	Class 3	D – s3, d2
Internal Fire Rated Plasterboard before decoration	Class 0	A2 – s1, d0
Slates/Tiles	AA	BRoof(t4)

3.2.2 Fire Resistance of Steel/Concrete Composite Deck

The fire resistance of the composite deck is provided from the underside of the deck as detailed in Table 3 of this Certificate. The composite deck can provide up to 120 minutes load bearing fire resistance from a combination of the reinforcement steel bars within the trough of the decking and adequate concrete cover to the reinforcement steel bars.

All electrical and ventilation services are installed to the underside of the deck. The fire stopping of holes in the composite deck floor slab to accommodate pipes passing through a compartment floor (unless the pipe is in a protected shaft) should comply with Section 3.4 of the TGD to Part B 2006 of the Building Regulations for all purpose groups to which this Certificate relates.

3.3 VENTILATION

The Framespace Solutions LGS Building System can accommodate ventilation solutions, designed by a M&E engineer competent in the design of multiple occupancy buildings, that meet the requirements of TGD to Part F of the Building Regulations. These should be verified using an NSAI registered ventilation validator.

3.4 AIRTIGHTNESS

Airtightness testing is a mandatory requirement of TGD to Part L of the Building Regulations. Testing must be carried out as specified in I.S. EN ISO 9972[23] with additional guidance given in the NSAI's "Certified Air Tightness Tester Scheme Master Document" and clause 1.5.4 of TGD to Part L of the Building Regulations.

3.5 ACCESS FOR PEOPLE WITH DISABILITIES

Building designs can accommodate minimum dimensions for doors/corridors/rooms and circulation spaces to provide access for people with disabilities as indicated in Diagrams 5 – 12 of TGD to Part M of the Building Regulations.

3.6 WEATHERTIGHTNESS AND DAMP PROOFING

The system has adequate DPCs and DPMs to resist the passage of moisture. Roof coverings will provide adequate weather resistance when completed in accordance with this Certificate and the manufacturer's instructions.

Buildings constructed using the Framespace solutions building System can readily accommodate adequate rainwater gutters and down pipes.

3.6.1 External Cladding

All cladding connections to the LGS system are agreed between the cladding contractor, façade engineer and Framespace Structural Engineer to ensure that LGS system structure is designed to support cladding loads.

Where the external facade is constructed of a masonry/brick outer leaf it must incorporate a minimum 40mm clear cavity, to minimise the risk of water reaching the cavity face of the inner leaf.

The external leaf of the Framespace Solutions LGS Building System can be constructed of traditional brick/block to I.S. 325-1[5] and I.S. EN 1996-1-1[6], or NSAI Agrément approved external cladding system. Where such cladding systems are used, it is important the maximum storey height and all other relevant requirements in their NSAI Agrément certificate are complied with.

Joints, in the insulation lining to the system substrate, are weatherproofed and any penetrations are sealed. Secondary membranes must be provided over window and door heads to protect vulnerable interfaces.

Good building practice such as secondary membrane and weep-holes are essential to ensure that moisture within a cavity is deflected to the outside of the building.

3.7 ELECTRICAL AND PLUMBING SERVICES

Electrical and plumbing services are outside the scope of this Certificate.

3.8 WINDOWS AND DOORS

Windows and doors are outside the scope of this Certificate. However, Figures 6 and 7 give indicative details of how they can be installed to limit heat loss and moisture penetration.

Other considerations for the design of windows and doors include:

- Escape in the event of fire,
- Safety and security,
- Thermal performance.

Note: NSAI's Window Energy Performance (WEP) Scheme gives full details of the energy performance aspects of window systems.

3.9 THERMAL PERFORMANCE

The panels are designed as hybrid warm frame system where the LGS sections are located on the warm frame side of the insulation. Some building elements, namely the roof, ground floor, windows and doors may be site and project specific. Therefore, the U-value of these elements must be calculated before overall compliance with Part L of the Building Regulations can be determined. The Framespace Solutions LGS building system can be provided for a wide range of required elemental u-values.

TGD Part L of the Building Regulations directs users to Digest 465 "U-values for light steel construction" published by BRE. A more precise result is obtained by using a numerical method which conforms to I.S. EN ISO 10211[4].

3.9.1 Limiting Thermal Bridging

The linear thermal transmittance ψ-value (Psi-value) 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.

The Dwelling Energy Assessment Procedure (DEAP) used to produce the Building Energy Rating (BER) for a dwelling takes account of the total effects of thermal bridging through the input of the "y" value, which is a multiplier applied to the total exposed area of the building.

Where limited provisions are made to eliminate any risk of surface condensation or mould growth, the default "y" value of 0.15 should be taken. When all building junctions are demonstrated to be equivalent to or better than the corresponding Acceptable Construction Details (ACD), then the "y" value can be taken as 0.08.

Alternatively, the transmission heat loss coefficient due to thermal bridging (HTB) can be calculated out by summing up the ψ-values for each junction and multiplying by the linear length of each junction. The "y" value is calculated by dividing HTB by the exposed surface area.

ψ-values for other junctions outside the scope of this certificate should be assessed in accordance with the BRE IP 1/06[2] and BRE Report BR 497[3] in accordance with Appendix D of TGD to Part L of the Building Regulations.

3.9.2 Internal Surface Condensation

As part of the assessment carried out to determine the 'Ψ' values, internal surface temperatures (fRsi) are also checked. When internal surface temperatures (fRsi) are greater than 0.75, best practice will have been adopted to safeguard against the risk of surface condensation occurring under normal occupancy and humidity class levels.

3.10 INTERSTITIAL CONDENSATION

3.10.1 Condensation in Walls

The joints of the externally fixed Weather Defence sheathing board are filled and taped with air tightness tape to ensure air tightness and to prevent moisture ingress. Similarly, the joints on the internally fixed Weather Defence board are also filled and taped with air tightness tape .

3.10.2 Condensation in Roofs

Roof ventilation should be provided in accordance with TGD Part F of the Building Regulations and the recommendations of BS 5250[1].
In the case of cold flat roofs, a cross-ventilated void, not less than 50mm deep, between the slab or deck and insulation should be provided in conjunction with the AVCL being provided on the warm side of the insulation. Ventilation openings should be provided to every roof void along two opposite sides of the roof and should be equivalent in area to a continuous opening of not less than 25mm at each side. It should also be noted that the dimensions of the cross-ventilated void and the ventilation depends on the size of the roof.

In the case of warm flat roofs, the risk of surface condensation is dependent on the nature of the supporting structure. With all flat roofs, there is a risk of interstitial condensation forming between the thermal insulation and the waterproof covering. To avoid this risk, an AVCL should be provided immediately above the supporting structure.

In the case of inverted flat roofs, it is essential that the thermal insulation used resists water absorption and is sufficiently load bearing to support the protective finish of ballast, paving or soil.

3.11 SOUND

3.11.1 Compartment Floor Steel Concrete Composite Deck

The composite deck can meet either the requirements of a Type 1 floor concrete base with a soft covering or a Type 2 Floor concrete base with a floating floor as described in Part E of the Building Regulations.

In both floor types the resistance to airborne sound depends mainly on the mass of the concrete base, plasterboard ceiling and good flanking detailing.

In a Type 1 floor the soft covering reduces the impact sound at source. The impact sound reduction is achieved with the use of a suitable approved layer of soft floor covering. The covering is not intended to be the final finished floor but is intended to act as a resilient layer beneath different floor finishes such as vinyl, carpet, timber flooring, tiles etc.

In the Type 2 floor with a concrete base and a floating layer, the floating layer reduces the transmission of impact sound to the base and to the surrounding construction

3.11.2 LGS Joist Separating Floor (LGS Joists)

As per TGD Part E, all building, post completion must be subjected to acoustic testing. In all cases, where applicable, the values achieved for buildings incorporating the Framespace LGS joist separating floors design must meet TGD Part E requirements (i.e. impact ≤58db , airborne ≥53db). See Table 9 for results achieved when tested.

3.12 MAINTENANCE

Maintenance will be required at a level comparable with that for buildings of traditional construction. The elimination of wet trades in the construction of the inner leaf of external walls reduces drying time and can reduce the incidence of superficial cracking early in the life of the building.

As the plasterboard is screwed into the steel structure, there is much less likelihood of nail popping in plasterwork, which results in less maintenance of plasterwork, than that of a traditionally constructed building.

Repainting should be carried out in accordance with the relevant recommendations of BS 6150[26]. Timber boarding, fascia, soffits etc. where used, should be treated with an appropriate paint system or translucent stain and should be maintained by periodic re-coating using a paint or stain suitable for external applications, applied in accordance with the manufacturer's instructions.

It shall be the responsibility of the building owner to monitor the condition of the building and commission maintenance and repairs as required. It is envisaged these will be carried out by the building owner in accordance with BS 8210[28].

4.1 BEHAVIOUR IN FIRE

4.1.1 Fire Resistance

Assessment of test results shows that buildings constructed using the Framespace Solutions Building System can meet the Building Regulation requirements in relation to fire resistance as shown in Table 3.

4.2 THERMAL PROPERTIES

Assessment of U-value calculations shows that the Framespace Solutions Building System meets and can exceed the maximum back-stop elemental U-value requirements of Table 1 of TGD to Part L of the Building Regulations. Table 4 – 5 of this certificate gives the various elemental wall U-values in W/m^2K with a traditional 100mm masonry cladding and a 50mm ventilated cavity.

4.2.1 Limiting Thermal Bridging

Table 8 of this certificate gives ψ-values for a range of Building System junctions. A full listing of ψ-value calculations, along with the building details on which calculations are based, are contained within the certificate holder's technical data sheets for ψ-values.

U-values and Ψ-values are to be calculated by an NSAI approved thermal modeller – a register of these can be found at https://www.nsai.ie/certification/agrement-certification/thermal-modellers-scheme/.

4.2.2 Internal Surface Condensation

Table 8 of this Certificate gives internal surface temperature factors (fRsi) for a range of building junctions.

The junctions of the Framespace Solutions Building System has been assessed to comply with the requirements of Section D.2 of Appendix D of TGD to Part L of the Building Regulations.

4.3 INTERSTITIAL CONDENSATION

4.3.1 Condensation in Walls

Calculations to BS 5250[1] have been carried out for all possible wall build ups as covered by this certificate. They predict no interstitial condensation within the external wall and pass the risk criteria in I.S. EN ISO 13788[24].

4.4 SOUND

4.4.1 Separating Walls

The acoustic performance of the separating wall specified in Section 2.5.1 has been assessed by both laboratory testing and comparison with Robust Standard Details for Separating Wall - Steel Frame E-WS-1 and SCI Publication P 372 Acoustic Detailing for Steel Construction and through adopting best practice at salient junctions to minimise the effects of airborne, impact and flanking sound. In respect of a separating wall, an examination was also carried out of the key junctions in the external walls to ensure compliance with the requirements of Part E of the Building Regulations.

The separating wall in the Framespace Solutions Building System has been assessed and when constructed in accordance with this certificate can meet the requirements of TGD to Part E of the Building Regulations.

4.4.2 Compartment Floors

The mass per unit area of the Framespace Solutions, coverings and ceilings meet the specification for a Type 2 separating floor and can meet the specifications for a Type 1 separating floor when complying with the guidelines in Section 4 of TGD to Part E of the Building Regulations. See Section 3.11.1.

See also 3.11.2 regarding Lewis deck composite floor with composite deck.

4.4.3 Acoustic Testing

Successful laboratory and on-site acoustic tests were carried out on the Framespace Solutions Building System. The testing included sound insulation tests on separating walls between four pairs of rooms in accordance with I.S. EN ISO 16283-1[29] and impact sound insulation to I.S. EN ISO 16283-2[30].

The Framespace Solutions wall details have been assessed and when constructed in accordance with this certificate, can meet the minimum sound level performance outlined in TGD to Part E of the Building Regulations.

4.5 DURABILITY

The LGS structure and wall cladding has been assessed as capable of achieving a minimum design life of 60 years. The steel structure is constructed from steel members having a minimum 275g/m^2 Zinc galvanised coating which will provide adequate protection to the steel members. In addition to this, the steel is kept in a "warmframe" environment, which should prolong the life of the steel.
The DPC and the galvanising will provide adequate protection to ensure that the bottom channel has a life equal to that of the other frame members.

The insulations are durable materials and will remain effective as an insulant for the life of the building. The roof, internal wall and ceiling linings and the outer leaf of the external wall are all constructed from conventional durable materials.

4.6 TESTS AND ASSESSMENTS WERE CARRIED OUT TO DETERMINE THE FOLLOWING

- Structural strength and stability (racking resistance, load bearing capacity),
- Behaviour in relation to fire,
- System specific load bearing fire testing to I.S. EN 1365-1[20],
- Laboratory and on-site acoustic performance,
- Thermal insulation performance calculations,
- Desktop study on corrosion of fasteners in normal conditions with a view to a minimum 50-year design life,
- Compatibility with other materials,
- Risk of condensation both surface and interstitial,
- 3D thermal modelling of junction details in accordance with BRE IP 1/06[2].

4.7 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.

Table 3: Fire Protection Requirements for Loadbearing Wall, Floor and Ceiling Elements				
Type	**Element:**	**Test Standard**	**Results**	**Purpose Class**
External Load Bearing Walls - Inside to Outside				
1	• Test conducted on 3000mm high x 3000m wide x 125mm thick panel with total vertical load of 39kN • 6 No. LGS C-Studs (100x51x1.2mm) with noggins at mid height • 1No. layer 12.5mm Siniat GTEC Fireboard Board to the fire side face using 38mm long drywall screws at 300mm centres. • 25mm Top hat section creating service cavity • 1No. layer 12.5mm Siniat Weather Defence Board to the fire side face using 38mm long drywall screws at 300mm centres. • 100mm stone mineral wool (22kg/m3 density) fitted between studs • 1No. layer 12.5mm Siniat Weather Defence Board fixed to the non-fire side face as per the fire side face • 80mm PIR insulation fixed to LGS frame with steel wall tie channel at 600mm centres • 2 No. Double Sockets were fitted on the fire side	I.S. EN 1365-1[20]	60 mins from inside	1(a), 1(b), 1(c), 1(d), 2(a), 2(b), 3, 4(a) and 5
2	• Test conducted on 3000mm high x 3000m wide x 125mm thick panel with total vertical load of 96kN • 6 No. LGS C-Studs (100x51x1.2mm) with noggins at mid height • 1No. layer 12.5mm Siniat GTEC Fireboard Board to the fire side face using 38mm long drywall screws at 300mm centres. • 25mm Top hat section creating service cavity • 1No. layer 12.5mm Siniat Weather Defence Board to the fire side face using 38mm long drywall screws at 300mm centres. • 100mm stone mineral wool (22kg/m3 density) fitted between studs • 80mm PIR insulation fixed to LGS frame with steel wall tie channel at 600mm centres • 2 No. Double Sockets were fitted on the fire side	I.S. EN 1365-1[20]	60 mins from inside	1(a), 1(b), 1(c), 1(d), 2(a), 2(b), 3, 4(a) and 5
Internal Load Bearing Walls				
3	• Test conducted on a 3000 mm x 3000 mm x 100 mm (w x h x th) test panel. • 6 No. LGS C-Studs (75x51x1.2mm) with noggins at mid height • Fire side: One layers of SINIAT GTEC Fire Board 12.5 mm thick using 25mm long drywall screws at 300mm centres. • Non-fire side: One layer of SINIAT GTEC Fire Board 12.5 mm thick using 25mm long drywall screws at 300mm centres. • 50mm stone mineral wool (8-10kg/m3 density) fitted between studs • (2 No. Double Sockets fitted on the fire side)	I.S. EN 1365-1[20]	30 mins from inside	1(a), 1(b), 1(c), 1(d), 2(a), 2(b), 3, 4(a) and 5

4	• Test conducted on a 3000 mm x 3000 mm x 125 mm (w x h x th) test panel. • 6 No. LGS C-Studs (75x51x1.2mm) with noggins at mid height • Fire side: Two layers of SINIAT GTEC Fire Board 12.5 mm thick using 45mm long drywall screws at 300mm centres. • Non-fire side: Two layers of SINIAT GTEC Fire Board 12.5 mm thick using 45mm long drywall screws at 300mm centres. • 50mm stone mineral wool (8-10kg/m3 density) fitted between studs (2 No. Double Sockets were fitted on the fire side)	I.S. EN 1365-1[20]	60 mins from inside	1(a), 1(b), 1(c), 1(d), 2(a), 2(b), 3, 4(a) and 5
Separating Walls				
5	**Staggered Stud Wall** • Test conducted on 3000mm high x 3000m wide x 210mm thick panel with total vertical load of 77kN FLS over 11 studs • 1No. layers of 12.5mm Siniat Gtec Fireboard plasterboard fixed to LGS C-Studs (100x51x1.2mm) at 300centres. • 1No. layers of 12.5mm Siniat Weather Defence Board fixed to at 300centres. • 2No. layers 60mm RW45 stone mineral wool (45kg/m3 density) fitted between studs • 1No. layers of 12.5mm Siniat Gtec Fireboard plasterboard fixed to LGS C-Studs (100x51x1.2mm) at 300centres. • 1No. layers of 12.5mm Siniat Weather Defence Board fixed to at 300centres.	I.S. EN 1365-1[20]	60 mins from either side	1(a), 1(b), 1(c), 1(d), 2(a), 2(b), 3, 4(a) and 5
Non-Load Bearing Walls				
6**	**Internal Non-Load Bearing Partition Wall** Panel dimensions and build up as per No.3: LGS C-Studs (75x51x1.2mm) with 1No. layers of 12.5mm Siniat Gtec Fireboard fixed each face of the LGS C-studs with 50mm stone mineral wool insulation between the studs.	I.S. EN 1365-1[20]	30 mins from exposed side	1(a), 1(b), 1(c), 1(d), 2(a), 2(b), 3, 4(a) and 5
7**	**Internal Non-Load Bearing Partition Wall** Panel dimensions and build up as per No.4: LGS C-Studs (75x51x1.2mm) with 2No. layers of 12.5mm Siniat Gtec Fireboard fixed each face of the LGS C-studs with 50mm stone mineral wool insulation between the studs.	I.S. EN 1365-1[20]	60 mins from exposed side	1(a), 1(b), 1(c), 1(d), 2(a), 2(b), 3, 4(a) and 5
Intermediate floor				
8	**Floor supporting a Uniformly Distributed Load of 1.0kN/m2** • Test conducted on 4308mm long x 3000mm wide x 230.5mm thick floor with a uniformly distributed load of 1.00kN/m2 • Exposed side: 1No. layers of 12.5mm Siniat Weather Defence Board fixed on fire side face using GTEC Wet Area Self Drilling 4042968 coated steel Screws 3.5x38mm at 220mm max centres • 6 No. LGS floor C-Joists 200mm deep at 600mm nominal centres	I.S. EN 1365-2[21]	30 mins from below ceiling level	***

8 Cont.	• 100mm Rockwool Rollbatt (22kg/m3 density) between the joists • 1No. layer of 18mm Plywood fixed to LGS joists 5.5 x 55mm screws at 300mm centres			
Compartment floors: Loaded Floor Truss				
9*	**Floor supporting a Uniformly Distributed Load of 2.06kN/m2** • Test conducted on 4175mm long x 3000mm wide x 280mm thick floor with a uniformly distributed load of 2.06kN/m2 • Exposed side: 2No. layers of 12.5mm Siniat Weather Defence Board fixed on fire side face using GTEC Wet Area Self Drilling 4042968 coated steel Screws 3.9x48mm at 300mm max centres • 6 No. LGS floor C-Joists 200mm deep at 600mm nominal centres • 100mm Rockwool Rollbatt (22kg/m3 density) between the joists • LEWIS decking, Omega profiled metal sheet, Gauge: 0.5 mm • 60mm Concrete screed	I.S. EN 1365-2[21]	60 mins from below ceiling level	***
Compartment floors: Loaded Floors Composite Metal Deck				
10	**Loaded Floor supporting Imposed Load of 2.0kN/m²** 140mm normal weight concrete with 0.9mm Tata Comflor 51. Concrete reinforced with A393 Mesh with a minimum 20mm cover to the top of the reinforcing mesh – 4500mm span.	Eurocode Design	30 mins from below deck	***
11	**Loaded Floor supporting Imposed Load of 2.0kN/m²** 160mm normal weight concrete with 1.2mm Tata Comflor 60. Concrete reinforced with A393 Mesh with a minimum 20mm cover to the top of the reinforcing mesh – 3420mm span.	Eurocode Design	60 mins from below deck	***

Notes:

- The above build-ups are summaries of those tested to the referenced standards – they should not be taken as an exhaustive list. For full details of test reports, the Certificate holder should be contacted.
- Type F plasterboard refers to the particular type of plasterboard tested in the respective fire tests and the details are available directly from Framespace Solutions Ltd.
- Stone mineral wool refers to the particular type and density of stone mineral wool used in a particular fire test and the details are available directly from Framespace Solutions Ltd.
- All wall tests were completed without the joints being taped and jointed.
- Joints are staggered on successive layers of plasterboard.
- For alternative approaches to fire safety requirements, refer to 0.2 of TGD B 2006 of the Building Regulations.
- In situations where there is no fire requirement for non-loadbearing walls, alternative non-loadbearing wall boarding specifications can be used once they have been agreed and signed off on by Framespace Solutions Ltd where the boarding supplier has provided supporting fire test data.

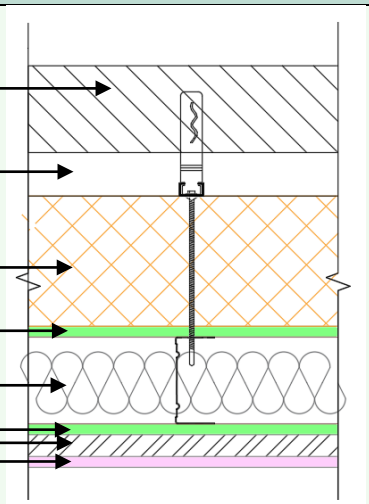
* These constructions are based on tested build-ups where the exposed fire side face remains the same as that tested but on the unexposed non-fire side face an identical construction is mirrored after a 50mm cavity. This means that the number of plasterboard panels remains the same on the fire side face, while the number of studs (and inter-stud insulation) is increased.

** Non-load bearing wall fire resistance data is provided from the load bearing data and can be utilised under the Field of Direct Application whereby the load can be decreased on the specimen.

***Design to be dictated by project specific loading requirements on a case by case basis to meet the requirements of SCI P424.

Table 4: External walls U-value for variable PIR thickness

Wall build-up:
Layer 8: Brick/masonry cladding
Layer 7: 50mm cavity
Layer 6: Variable PIR layer [2][3] (see below)
Layer 5: 12.5mm Siniat Weather Board [1]
Layer 4: LGS/MW insulation
Layer 3: 12.5mm Siniat Weather Board
Layer 2: Service Cavity
Layer 1: 12.5mm Plasterboard



Wall thickness	PIR variable thickness:	Calculated U-value (W/m²K)
405mm	75mm	0.18
410mm	80mm	0.17
420mm	90mm	0.16
430mm	100mm	0.15
440mm	110mm	0.14
460mm	130mm	0.13
470mm	140mm	0.12
480mm	150mm	0.115

Calculation complies with BRE Digest 465 *U-values for light steel-frame construction.*
[1] Corrections have been made for 1.2mm LGS studs @ 600mm c/c bridging layer 4.
[2] A level 1 correction for air voids has been applied to layer 6 (IS EN ISO 6946 Table D.1)
[3] Correction for mechanical fasteners have been applied to layer 6 equating to 6 No. 5.5mm Ø Stainless steel fixing to connect brick tie channel to LGS section.

Note: All U-value calculations illustrated in the above U-value tables should be taken as examples of performance that can be achieved. It is strongly recommended that U-value calculations are produced on a project specific basis by a competent person as U-value calculations may increase or decrease depending on a wide range of parameters such as number of fixings per square meter, size of fixing, emissivity of PIR surface facing into cavity etc. therefore U-values should be recalculated if the build-ups differ from those described in Tables 4, 5, 6 and 7.

Table 5: Sample U-value Calculation for 150mm PIR						
Layer	**Description**	**% Bridged**	Thickness [mm]	Thermal conductivity **λ** [W/m K]	Thermal resistance **R** [W/m²K]	
	Rsi				0.13	
1	Firecheck Plasterboard		12.5	0.25	0.05	
2	40mm Service Cavity		40		0.18	
3	Siniat Weather Board		12.5	0.25	0.05	
4	Steel Stud	0.002	100	50	0.002	
	Mineral Wool	0.998	100	0.04	2.5	
5	Siniat Weather Board		12.5	0.25	0.05	
6	Variable PIR Insulation		**150**	0.022	6.818	
7	Cavity		50		0.18	
8	Brickwork Outer Leaf		102.5	0.77	0.133	
	Rse				0.04	
				Ru Total =	10.125	
				RL Total =	8.346	
	From BRE Digest 465			P = 0.739, $R_T = pR_{max} + (1-p)R_{min}$ =	9.660681	
				Correction term, ΔU =	0.0117	
				Corrected U-Value (2DP) =	**0.115**	W/m²K
Correction as described in **Error! Reference source not found.**apply						

Table 6: Effect on U-value for variations in LGS thickness and centres						
Effect on 0.12 W/m²K (140mm PIR) U-value for variations in LGS thickness and centres						
Centres of studs	**LGS Thickness (Gauge)**					
	0.8mm	1.0mm	1.2mm	1.5mm	2.0mm	2.5mm
300mm	0.12	0.121	0.121	0.122	0.123	0.123
400mm	0.117	0.118	0.118	0.119	0.119	0.120
600mm	0.114	0.115	0.115	0.116	0.116	0.117

Table 7: Typical Ground Floor U-Values											
Ground Floor slab U-value for varying P/A ratio											
P/A Ratio	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60
U-value	0.098	0.111	0.121	0.128	0.133	0.137	0.14	0.142	0.145	0.146	0.148
Floor U-values based on 200mm RC Slab on 200mm EPS 100 insulation (λ=0.036) on soil (λ=2.0). P/A Ratio = Exposed perimeter of the floor to total ground-floor area ratio.											

Table 8: Typical ψ-Value W/mK					
Target linear thermal transmittance (ψ) for different types of junctions.					
ACD Ref:	**Junction Description**	**Temperature Factor f_{Rsi} (Min = 0.75)**	**Framespace Ψ-value (W/m.K)**		**TGD L Default Ψ-value (shown for indicative purposes only)**
5.02	Ground Floor - Insulation below slab	0.92	0.025	<	0.106
5.03	Intermediate Floor (1)	0.96	0.005	<	0.055
5.04	Separating Wall edge (plan) (1)	0.95	0.021	<	0.057
5.05	Separating Wall top (section) (1)	0.97	0.182	>	0.095
5.07/5.08	Eaves Detail (PIR above rafter) (2)	0.92	0.119	>	0.026
5.15	Gable end detail (PIR at rafter) (2)	0.92	0.036	>	0.034
5.19	Ope - Lintel - Timber Cavity Closer (2)	0.89	0.056	>	0.016
5.20	Ope - Jambs - Timber Cavity Closer (2)	0.84	0.088	>	0.019
5.21	Ope - Sill (2)	0.91	0.049	>	0.021
5.22.1	Steel Frame Separating Wall through ground floor (base) (1)	0.78	0.034	<	0.132
5.23.1	Corner Detail (2)	0.9	0.042	>	0.029
5.23.2	Inverted Corner Detail	0.96	-0.063	<	-0.043

(1) Value of ψ is applied to each dwelling.
(2) Some ψ-values do not meet the default ψ-values; however, all junctions pass f_{Rsi} assessments.
(3) Flanking element U-values for walls, roof and floor thermal models above were based on U_W = 0.11 W/m²k, U_F = 0.13 W/m²k, U_R = 0.12 W/m²k.
Modelled junction ψ-values are based on typical Framespace details above can be used in y-value calculations, if relevant detail is applicable.

Table 9: Acoustic results *				
Separating construction	**Airborne sound insulation DnT,w dB**		**Impact sound insulation L'nT,w dB**	
	Performance Target	**Result**	**Performance Target**	**Result**
Walls (Construction as per Item No.5, Table 3 with service cavity)	≥53dB DnT,w	62	N/A	N/A
Floors (Construction as per Item No.9, Table 3 with service cavity)	≥53dB DnT,w	59	≤58dB L'nT,w	56

* The results above were obtained from on-site project specific testing, Results may vary based on project specific conditions but must always meet or exceed TGD Part E performance requirements.

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 latest revision 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 IAB 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.

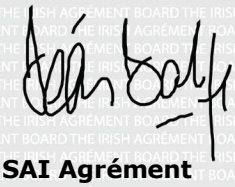
5.7 Where reference is made in this Certificate to any Act of the Oireachtas, Regulation made thereunder, Statutory Instrument, Code of Practice, National Standards, manufacturer's instructions, or similar publication, it shall be construed as reference to such publication in the form in which it is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

NSAI Agrément

This Certificate No. **22/0429** is accordingly granted by the NSAI to **Framespace Solutions Ltd** on behalf of NSAI Agrément.

Date of Issue: **11th January 2022**

Signed



Seán Balfe
Director of NSAI Agrément

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

NSAI Agrément

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