



NSAI

Agrément

IRISH AGRÉMENT BOARD CERTIFICATE NO. 26/0455

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NUA LGS Building System

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 2024**.



SYSTEM SCOPE:

This Certificate relates to the NUA Manufacturing MMC Ltd.'s Light Gauge Steel (LGS) Building System (hereafter referred to as the NUA LGS Building System), for the design, manufacture and erection of structural cold-formed Light Gauge Steel (LGS) frame buildings.

The NUA LGS Building System is certified for use in buildings with a topmost storey 20m in height for purpose groups 1(c), 2(a) and 5(b) subject to the definitions and specific requirements defined in TGD Volume 1^[59] to Part B of the Building Regulations and the categorisation of consequence classes up to 2b as per I.S. EN 1991-1-7+NA^[72].

The system can also be used in the construction of residential buildings of up to 15m in height in purpose groups 1(a), 1(b) and 1(d) as defined in Technical Guidance Document (TGD) Volume 2^[60] to Part B of the Building Regulations.

The NUA LGS Building System is used for structural walls and floors in buildings up to 6 storeys for the purpose groups, as outlined in previous paragraph, 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, where the full structure is designed, manufactured, supplied and erected by NUA. The system can accommodate a wide range of custom designs.

The NUA LGS System is also assessed as suitable for use in non-loadbearing infill panels in buildings up to 10 storeys for the above purpose groups where the height to the upper floor surface of the top floor is not more than 30m from ground level on the lowest side of the building. The infill panels are used within reinforced concrete, steel frames and traditional construction that possess their own independent lateral stability systems.

Readers are advised to check that this Certificate has not been withdrawn or superseded by a later issue by contacting NSAI Agrément, NSAI, Santry, Dublin 9 or online at www.nsai.ie

Site erection is carried out by approved installers employed by NUA Manufacturing MMC Ltd or specialist sub-contractors under the supervision of NUA Manufacturing.

The system is designed for use in buildings with traditional brick and block outer leaf cladding and traditional roof coverings. The system may also be designed to incorporate NSAI Agrément approved or other external cladding and roofing systems (pitched or flat) as per Section 2.1.2 and 2.1.6 of this Certificate. Other claddings systems may be suitable but have not been considered as part of this certification.

DESIGN:

The NUA LGS System is intended for use where Architect's finalised construction and fire strategy drawings are available and satisfy the applicable Building Regulations. The Building Owner^[56]/Client^[55] and their appointed Architect and Engineering Design Team are responsible for the architectural drawings and compliance of the overall building design with the applicable Building Regulations.

The Nua LGS Building System is designed for use in permanent buildings with traditional brick and block outer leaf cladding or NSAI Agrément certified external wall cladding systems for LGS framed structures as per Section 2.1.1 and 2.1.2 of this Certificate. The compatibility of an NSAI Agrément approved cladding system shall be agreed and confirmed by NUA at design stage to ensure compatibility between both systems and written approval must be sought from the appointed NUA Chartered Structural Engineer on the use of such claddings. Other cladding systems may be suitable but have not been considered as part of this certification.

The NUA LGS System is also designed for use with a wide range of traditional roofing finishes on LGS or timber prefabricated trusses or NSAI Agrément certified roofing systems compatible with LGS frames structures.

The system may also be designed to incorporate other cladding and roofing systems for which fitness for use as a cladding or roofing system for use with an LGS Building System as has been determined through the recognised standardised procedures referred to in paragraphs (a), (b) or (c) of Requirement D3 of the Building Regulations or those in Section 1.1 of TGD D. However, written approval must be sought from the appointed NUA Chartered Structural Engineer on the use of such cladding or roofing systems.

The buildings are assembled using a panelized system, factory made, and site installed. The NUA Chartered Structural Engineer is responsible for the final design of the NUA LGS System.

USE:

The system is certified for the following applications:

1. To provide the structure of a building up to 20m in height to the topmost floor, which can accommodate either a composite concrete profile metal deck, a lattice light gauged steel (LGS) cold formed section or LGS C-section joist floor.
2. The system can also be used for additional storey(s) on an existing building where the resulting top floor is not greater than 20m in height from ground level. The NUA LGS Frame element of the building must be constructed off a concrete floor or non-combustible podium/transfer slab, which has been designed for this purpose.
3. NUA LGS non- loadbearing infill panels may be used in buildings up to 30m in height. The infill panels, where used at this height must be incorporated in a reinforced concrete or steel framed building systems which possess their own independent lateral stability systems.

RESPONSIBILITIES

Prior to the commencement of the contract, the responsibilities are determined and agreed between NUA and the Building Owner/Client, including but not limited to substructure, fire stopping, cavity barriers, roof completion, coordination of design and works. Responsibilities of all parties shall be clearly identified and documented.

MARKETING, DESIGN AND MANUFACTURE:

The product is manufactured, marketed, designed and erected by the certificate holder:

NUA Manufacturing MMC Ltd
Block C, Maynooth Business Campus,
Straffan Road Maynooth,
Co. Kildare, W23 F854.
www.nuamanufacturing.ie
Tel. +353 (01) 9037100

Manufacturing facility is located at:

NUA Manufacturing MMC Ltd
O'Brien Road, Rathnapish,
Carlow, R93 X293.

1.1 ASSESSMENT

In the opinion of the NSAI (National Standards Authority of Ireland) Agrément Board, the NUA LGS Building System if used in accordance with this Certificate shall meet the requirements of the Building Regulations 1997 to 2024, as indicated in Section 1.2 of this Agrément Certificate.

1.2 BUILDING REGULATIONS 1997 to 2024

Buildings incorporating the NUA LGS Building System may be designed to meet the requirements of the following clauses of the Second Schedule of Irish Building Regulations 1997 to 2024:

REQUIREMENTS:

Part D – Materials and Workmanship

D3 – Proper Materials

The NUA LGS Building System consists of 'proper materials' i.e. materials which are fit for their intended use and for the conditions in which they are to be used (see Part 4 of this Certificate).

D1 – Materials and Workmanship

The NUA LGS Building System, used in accordance with this Certificate, can meet the requirements for workmanship.

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.

Part A – Structure

A1 – Loading

The NUA LGS Building System, once appropriately detailed, designed and constructed, has adequate strength and stability to meet the requirements of this Regulation (see Part 3 of this Certificate).

A2 – Ground Movement

The structure shall be designed and constructed, with due regard to the theory and practice of structural engineering, to ensure that movements of the subsoil caused by subsidence, swelling, shrinkage or freezing will not impair the stability of any part of the building structure.

An appropriately designed foundation structure shall 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 – Disproportionate Collapse

The NUA LGS Building System shall be designed, detailed and constructed with sufficient structural

robustness to avoid disproportionate collapse in accordance with Eurocode Design.

Part B – Fire Safety

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

For Dwelling Houses, TGD B Volume 2 Part B6 – B12 are required to be adhered to, while for purpose group 1(c), 2(a), and 5(b), Parts B1 – B5 are required to be adhered to in accordance with TGD B, Volume 1.

The system shall be designed to comply with the project-specific Fire Safety Design Certificate (FSDC), where applicable.

B1 & B6 – Means of Escape in Case of Fire

Building shall be designed and constructed, with the NUA LGS Building System, for adequate means of escape in compliance with Technical Guidance Documents B.

B2 & B7 – Internal Fire Spread (Linings)

The plasterboard lining of walls and ceilings is designated Class B-s1, d0 or higher. It may therefore be used on the internal surfaces of buildings of every purpose group.

B3 & B8 – Internal Fire Spread (Structure)

The NUA LGS building System is designed and constructed so that its stability will be maintained for a reasonable period in the event of fire in compliance with Section B3 and B8 of Technical Guidance Documents to Part B of the Building Regulations.

B4 & B9 – External Fire Spread

External masonry walls (masonry units containing a mass or volume fraction of <1% of homogeneously distributed organic materials) have a Class A1 Reaction to fire 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 as indicated in Section 4.1 of this Certificate.

Note 1: In a building with a topmost floor of more than 15m high, all external wall materials, including insulation material used in drained and/or ventilated cavities in the external wall construction

must be of limited combustibility, minimum A2-s3, d2 rating to I.S. EN 13501-1^[36].

B5 & B10 Access and facilities for the Fire Service

Building shall be designed and constructed with the NUA LGS Building System for adequate access and facilities for the Fire Service in compliance with Technical Guidance Documents to Part B of the Building Regulations. The provision of access and facilities for the fire service is outside the scope of this certificate and is subject to project-specific design.

Part C – Site Preparation and Resistance to Moisture

Groundworks, site preparation and drainage are outside the scope of this certificate. The works must be designed and executed in accordance with Technical Guidance Document to Part C, ensuring appropriate site preparation and drainage. Site assessment for possible ground contamination, groundwater management, ground conditions assessment must be carried out by suitably qualified professionals.

C3 – Dangerous Substances

All ground floor units floor must incorporate a radon sump and pipework for radon gas extraction. Where it is shown that protection from dangerous substances (e.g. radon), is required, an approved gas resistant membrane and gas handling system must be provided under the ground floor. The NUA LGS System permits the incorporation of the appropriate membrane, sump and gas handling system.

C4 – Resistance to Weather and Ground Moisture

The NUA LGS System has adequate damp-proof courses and membranes to resist the passage of moisture from the ground.

Roof and external walls above site Damp Proof Course (DPC) 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 of this Certificate.

Part E – Sound

E1 – Airborne Sound (Walls)

Walls shall be appropriately detailed and constructed to meet the airborne sound level performance outlined in Table 1 of TGD E, provided good workmanship is adhered to onsite. (See Section 4 of this certificate).

Airborne and Impact Sound (Floors)

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

Part F – Ventilation

F1 (a) – Means of Ventilation

Adequate ventilation openings may be provided in internal and external walls and in roofs to meet ventilation requirements. Walls and roofs used in the system may be designed and constructed to prevent any harmful effect from interstitial or inner surface condensation, to comply with the requirements of BS 5250^[1] Management of moisture in buildings. Code of practice for the control of condensation in buildings.

F1 (b) – Limiting the concentration of harmful pollutants in the air within the building

The building system can accommodate adequate and effective means of ventilation to limit the concentration of harmful pollutants in the air within the building. 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 this requirement (see Section 4 of this Certificate).

Part J – Heat Producing Appliances

Design for compliance with TGD J, M&E systems design and regulatory compliance of design and installation of same is outside the scope of this certification. It is the responsibility of the Building Owner/Client to appoint suitably competent, qualified persons to design the building in compliance with TGD J.

J1- Air Supply

It is the responsibility of the Building Owner/Client appointed specialist designer's to ensure the design provides for adequate permanent ventilation for all heat-producing appliances, that combustion air supply meets appliance manufacturer requirements and minimum free area- values to TGD to Part J are achieved.

This building system can facilitate adequate supply of permanent combustible air by means of openings for air ducts, to obviate draughts, within the room in which a heat producing appliance is located, as per Building Owner/Client appointed specialist designer's Building Regulation compliant design.

J2(a)- Discharge of combustion products

It is the responsibility of the Building Owner/Client appointed specialist designer's to ensure a suitable flue or chimney system is designed to safely remove carbon monoxide & other combustion gases in accordance with TGD to Part J.

This building system can facilitate ducts for the adequate discharge of combustion products by means of cast-in extract ducts, as per Building

Owner/Client appointed specialist designer's Building Regulation compliant design.

J3- Protection of Building

Buildings built with this system shall be designed to meet specified separation distances and wall lining insulation requirements of TGD to Part J3 of the Building Regulation. Project-specific design to ensure required separation distances are maintained from combustible materials and suitable fire-stopping where flues pass through the building system walls.

When used in accordance with Section 4 of this Certificate, buildings built with this system may be designed to meet specified separation distances and wall lining insulation requirements of Part J3 to the Building Regulation, in accordance with Building Owner/Client appointed specialist designer's Building Regulation compliant design.

Part L – Conservation of Fuel and Energy

L1, L5, L6 – Conservation of Fuel and Energy

All building elements of the NUA LGS Building System can be readily designed to incorporate the required thickness of insulation to meet and surpass the backstop elemental U-values as set out in the TGDs to Part L of the Building Regulations.

Any building incorporating this building system shall be designed in tandem with this certificate and constructed in accordance with TGD to Part L, ensuring compliance with the energy performance requirements for conservation of fuel and energy. The design must achieve limits on primary energy use, carbon emissions and incorporate the necessary renewable energy provision, along with meeting prescribed building fabric standards,

thermal performance, and building services efficiency. These measures collectively ensure compliance with the energy efficiency requirements set out under Part L.

Thermally bridged junctions have been assessed for both their linear thermal transmittance (i.e. Psi-value (ψ -value)) and their temperature factors (f_{Rsi}) in accordance with the procedures outlined in BRE IP 1/06^[2], BRE report BR 497^[2] and I.S. EN ISO 10211^[3]. As a result, best practice has been observed to limit heat loss due to thermal bridging and minimise the risk of mould growth due to surface condensation.

Part M – Access for People with Disabilities

Design for compliance with Part M on a project-specific basis is outside the scope of this certification. It is the responsibility of the Building Owner/Client to appoint suitably competent, qualified persons to design the building in compliance with TGD M. The system shall be designed to comply with project-specific Access and Use Certificate (AUC).

M1 – Access and Use

Buildings built using this building system shall be designed to meet the access, circulation and facilities requirements of this Regulation (see Section 4 of this Certificate).

M2 – Sanitary Conveniences

Buildings built using this building system shall be designed and constructed using the NUA LGS Building System to meet the requirements for use of the sanitary conveniences by people with a range of abilities who may require assistance.

2.1 PRODUCT DESCRIPTION

This Certificate relates to NUA LGS Building System for the design, manufacture and erection of cold-formed light gauge steel frame buildings. Buildings using this system are erected on site using a factory-made panelised system and site installed with all major custom components being manufactured at the NUA Manufacturing production facility.

Rigid board insulation is fixed on the exterior side of the cold formed steel studs with the insulation serving to encase the cold formed steel sections thus creating a "warm frame" environment for the steel frame. The rigid board insulation and the required DPCs for each panel are installed in the factory in accordance with the production drawings.

NUA Manufacturing produce all cold-formed steel sections using computerised plant and roll forming machinery and then assembles them into panels. The components have all connection holes, service holes and notches punched using the CNC controlled roll formers. The framing software used by NUA Manufacturing transfers this information to the roll formers producing highly accurate components.

Components are connected using self-drilling screws; all load bearing walls are braced to structural design specifications. External steel frames are insulated with air tightness membranes installed and masonry/cladding connection tie provisions incorporated.

The components in the floor are connected either with bolts or self-drilling screws. All floor decking is screwed to the top of the cold formed joists, joints in the floor decking are glued together.

The system may be used in conjunction with hot rolled steel utilising steel beams and columns to transfer loads and create areas of open plan.

All elements are assembled and connected together in NUA's facility creating frames that are then transported to specific sites for installation by trained operatives. Lifting points are designed into the system to load panels onto transport trailers in the manufacturing facility and also for installing into position on site.

The frames will arrive on site fully assembled; external frames are pre-insulated & and internal frames uninsulated.

Each building is specifically designed by NUA Manufacturing design engineers or its consultants, according to actual location and job specific architectural plans and specification.

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

2.1.1 External Walls

The external walls may be load-bearing or non-load bearing (infill panels). The system is assessed as a hybrid warm frame system, where rigid Polyisocyanurate (PIR) or stone mineral wool insulation boards are fitted to the cavity side of the cold formed steel studs and the studs are filled with stone mineral wool for additional acoustic and fire properties. The wall panels are then clad with the required thickness and grade of plasterboard as per Table 4 to achieve the appropriate fire performance rating required for the building. The plasterboards are screw fixed to the cold formed steel stud and track members.

The installation of the AVCL layer is typically done offsite during the manufacturing process while internal insulation between the studs and plasterboard is fitted onsite after services have been fitted. The fitting of the insulation between the LGS studs and the fixing of the plasterboard layers required to meet the fire and acoustic performance are not the responsibility of NUA Manufacturing.

The requirements for the provision of an Air and Vapour Control Layer (AVCL) on external walls are outlined in Section 4.4 of this certificate.

2.1.2 External Cladding and Wall Ties

The external leaf of the NUA LGS Building System is generally of traditional brick/block masonry (masonry units containing a mass or volume fraction of <1% of homogeneously distributed organic materials as per I.S. EN 771-3^[5]) designed and constructed to S.R. 325^[6] and I.S. EN 1996-1-1^[7] Eurocode 6 *Design of Masonry Structures - Part 1-1: General Rules for Reinforced and Unreinforced Masonry Structures (including Irish National Annex)*. The design of the outer-leaf masonry façade, including relieving/support angle spacing and arrangement, is outside the scope of the NUA LGS Building System and is the responsibility of the

Building Owner/Client appointed project façade engineer/designer, who will be design the masonry in line with and I.S. EN 1996-1-1^[7] Eurocode 6 and S.R. 325^[6].

The project Façade Engineer, appointed by the Building Owner/Client, shall design the masonry outer leaf in accordance with I.S. EN 1996-1-1^[7] Eurocode 6 and communicate the necessary reactions and support loading requirements to be accommodated by the NUA LGS Building System to the NUA appointed Chartered Structural Engineer. The NUA Structural Engineer will ensure appropriate provision is made within the primary structure for the masonry support system connections, which shall be fixed only into the concrete composite floor edge. Relieving/support angles will not be connected into the edge of light gauge steel floor cassettes. The structure will be designed to accommodate the applicable vertical, horizontal, torsional, moment, and associated façade support actions generated by the masonry support system.

The masonry outer leaf is tied to the NUA LGS Building System with a stainless-steel slot and channel cavity wall tie system in accordance with I.S. EN 845-1^[8]. The wall tie system used shall be intended to be used in masonry to studded applications, with a design cavity width in accordance with I.S. EN 845-1^[8].

The tie channels are fitted at each cold-formed steel studs at a frequency that can accommodate the requirements for wall tie spacing as outlined in I.S. EN 1996-1-1^[7] Eurocode 6 and as specified by the project-specific Chartered Structural Engineer. As the external masonry or brick outer leaf are installed on site, proprietary wall ties are clipped into the pre-installed vertical channels and the mortar bed joints to provide the required lateral connection between the LGS inner leaf and the masonry outer leaf.

Using this channel system allows for variations within block/brick courses. The frequency and spacing of wall ties will be as specified by the project-specific Chartered Structural Engineer. Around openings, channels are positioned within 150mm of the opening, and line up with the steel studs. The slot in the wall tie bracket enables a wall tie to be adjusted vertically for variations in mortar thickness during construction of the masonry outer leaf. Additional wall ties are provided at 225mm centres around all openings, corners and movement joints, such that there is a tie for each 225mm of perimeter of opening or either side of each movement joint/corner. Stainless steel wall ties are available as standard ASFGD dg`234 ties with drip.

The wall ties have been assessed and meet the performance requirements given in service I.S. EN

845-1^[8] for an asymmetrical cavity wall tie and designed in accordance with I.S. EN 1996-1-1^[7]. Where masonry cladding is being used over 4 storeys' (12m) in height, a Type 1 wall tie in accordance with I.S. EN 845-1^[8] must be used. The wall tie and channel are made from minimum Grade 304 austenitic stainless steel.

The cavity in the external wall must be maintained and kept clear of construction debris to 150 mm below DPC level. Masonry claddings must have adequate weep holes along their base and over openings to allow moisture to exit the cavity.

The system has been assessed with traditional brick and block outer leaf cladding. The system may also be designed to incorporate NSAI Agrément approved cladding systems for which fitness for use as a cladding system with a LGS framed building system has been determined. Other cladding systems may be used where fitness for use as a cladding system with LGS framed building system has been determined through the recognised standardised procedures referred to in paragraphs (a), (b) or (c) of Requirement D3 of the Building Regulations or those in Section 1.1 of TGD D. However, written approval must be sought from the appointed NUA Chartered Structural Engineer on the use of such cladding systems and compatibility with this system, as certified, determined. Refer to Section 2.1.7 for further details on roof cladding.

2.1.3 Load Bearing Walls

The load bearing wall panels are encompassed of vertical 89-150mm deep LGS studs, fixed to horizontal head and bottom channel sections. Horizontal noggins are fitted at the mid-height of all panels where required to provide additional strength and where particularly high vertical loads occur. Studs are normally at 400-600mm centres maximum. Studs are aligned vertically in-line down the height of a building and floor trusses align with the stud centres. Lateral resistance of the wall is provided by flat strap or K bracing.

2.1.4 Non-Load Bearing Walls & Infill Panels

The non-load bearing infill wall panels are made from cold-formed LGS sections minimum 89mm deep, . When internal wall panels provide racking resistance to external walls, diagonal wind bracing members may 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. Non-loadbearing panels are designed to resist lateral loads only.

2.1.5 Internal Walls

The internal load bearing and non-load bearing wall panels are manufactured from cold-formed LGS. When internal wall panels provide racking resistance to external walls, diagonal wind bracing

members may 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. Flat strap steel bracing or K Bracing are used to provide in-plane stability or racking resistance. The bracing is designed to I.S. EN 1993-1-3^[8].

All internal load bearing panels must be sufficiently supported directly under the panels with rising blockwork or equivalent structural support. Plasterboard specifications on the steel panels should be in accordance with Table 4 of this certificate, which shows the plasterboard fire resistance requirements for wall, floor and ceiling elements. The plasterboard and AVCL 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.

2.1.6 Compartment floor

The NUA LGS Building System compartment floor may be designed to provide 60 minutes fire resistance from the underside. There are three forms of compartment floors used with the NUS LGS Building System:

- a) Steel LGS C-joists protected with Plasterboard.
- b) Steel LGS lattice joists protected with Plasterboard.
- c) Steel Concrete Composite Deck.

The Compartment floors as described in Table 4 of this Certificate have a prescribed fire-resistant classification which may be used in the separation of one fire compartment from another.

The construction of C-joist/truss compartment floors must be such that the achievement of the required fire resistance performance relies primarily on the integrity of the linings of such constructions. The integrity of linings of compartment floors should not be breached to allow for the installation of services (e.g. pipes, wires, flues, including manufacturing flues), except where necessary to allow services pass through these compartment floors. Where services pass through compartment floors, they should be adequately fire stopped in accordance with the respective TGD to Part B of the Building Regulations to which the relevant purpose class relates. A composite metal deck floor provides its own fire resistance which is based on the concrete cover to the steel reinforcement, in accordance with I.S. EN 1992-1-1^[10].

Services may be accommodated within a service cavity created external to the un-breached linings of the fire-resistant compartment floor on the underside of the ceiling below.

For additional acoustic performance, resilient bars may be added where specified and are fixed to the underside of the floor trusses/C-joist in order to maintain the fire integrity of the floor in accordance with fire performance details outlined in Table 4.

2.1.7 Roof Structure

The roof trusses may be either a traditional timber cut roof or prefabricated roof truss made from timber or steel. The site fitted roof trusses are attached to timber wall plates, which are bolted on site to the head LGS track of the load bearing NUA LGS wall panel. The roof trusses can also be fixed down directly with a thermal break onto the top wall track of the load bearing NUA LGS wall panel. Roofs may be clad with concrete or clay interlocking tiles or slates. The imposed load on the roof is project-specific and is accounted for in the design of the steel frame structure.

The system may also be designed to incorporate NSAI Agrément approved or other roofing systems (pitched or flat) whose fitness for use as a roofing system has been determined through the recognised standardised procedures referred to in paragraphs (a), (b) or (c) of Requirement D3 of the Building Regulations or those in Section 1.1 of TGD D.

The roofing solution chosen for a particular building is both Building Owner/Client and project-specific and must be assessed and signed off by the NUA Chartered Structural Engineer on a project-by-project basis.

2.1.8 Chimney Construction

The NUA LGS Building System may be designed to incorporate both traditional block/brick chimney construction or an NSAI Agrément approved prefabricated chimney system in accordance with its NSAI Certificate and the applicable Building Regulations.

2.1.9 Internal Linings and Finishes

Linings to walls and ceilings are of plasterboard of Type A or Type F as specified in Table 4, manufactured to I.S. EN 520^[10]. 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 may be taped and filled in accordance with the plasterboard manufacturers' instructions for direct decoration. Alternatively, skim coat plaster may be applied over the plasterboard.

Any wall mounted fitting to the wall other than lightweight items, e.g. framed pictures, must be fixed to proprietary grounds, using appropriately sized fixings for the LGS gauge. To accommodate larger wall mounted fittings such as kitchen units, timber grounds or proprietary grounds may be provided between LGS studs.

Surface linings of walls and ceilings must comply with Section 2 of Technical Guidance Documents to Part B. The plasterboard slabs used on the internal wall finishes must meet or exceed Class B-s1,d0 rating.

2.1.10 Services

Building mechanical, electrical and telecommunication services are outside the scope of this Certificate.

Services can pass through a compartment wall when they are appropriately protected with reference to Section 3 of TGDs to Part B 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. A service void may be created on the un-breached linings of the fire-resistant compartment and separating walls to allow for services.

Service penetrations in walls and floors must be suitably sealed for moisture exclusion, thermal, sound, and fire performances, as appropriate.

Electrical installation should be designed, installed, inspected and tested in accordance with I.S. 10101^[12]. Heating and plumbing services shall 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. Where hot water pipework is enclosed in the inner leaf of the wall, contact between copper pipes and the steel frame must be avoided by the use of rubber or plastic grommets around the service-hole lips. 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^[12].

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 of TGDs to Part B of the Building Regulations for all purpose groups to which this certificate applies. 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 TGDs to Part B and recommendations contained within BS 9999^[12].

All swaged, unswaged or site drilled service holes incorporating electrical services wiring must be lined with a polyethylene grommet or sleeve to avoid the occurrence of damage to plastic pipes or cable sheathing.

2.2 GENERAL BUILDING STRUCTURE

2.2.1 Foundations

Foundations are outside the scope of this Certificate. Responsibility for the design and construction of suitable foundations should be agreed before construction commences.

The NUA Chartered Structural Engineer will carry out a site-specific load take down and provide the Building Owner/Client's appointed Engineer with accurate line and/or point loads for which their selected foundation solution must be designed for. The design of the substructure is the responsibility of the Building Owner/Client's appointed Engineer. The Building Owner/Client's appointed Engineer will be a suitably qualified Chartered Engineer, and the design will be in accordance with the relevant codes and standards, i.e. Foundation's shall be designed in accordance with I.S. EN 1997-1^[19] Eurocode 7 Geotechnical Design – Part 1: General Rules.

NUA LGS Building System may be used with a variety of foundation types, depending on the ground conditions encountered on site. A site investigation should be carried out by an appropriately qualified and experienced engineer to determine the maximum bearing pressure the soil can carry. Once this is established a suitable foundation type may be selected. A tolerance of $\pm 5\text{mm}$ in 10 meter lengths is specified for concrete slab level and $\pm 5\text{mm}$ in 5 meter run horizontal dimensions. Where variations in slab level occur, such variations are catered for using galvanised steel spacers or thermally broken shims located directly below the studs as required (maximum deviation 10mm). However, the use of such shims should be kept to a minimum and approved by NUA's Chartered structural engineer in all instances. The remaining gaps below the steel framed panel sole plate are filled using structural grade non-shrink grout.

Note: The construction of the foundations and ground floor slab are the responsibility of the main contractor and should be constructed in accordance with the Building Owner/Client's engineering specifications and design and current building regulations. Due to the low tolerances of the steel frame manufacture, the foundation and ground floor slab must be constructed accurately, i.e. correct dimensions, square and level so that the steel frame system may be assembled and erected properly within the specified tolerances.

2.2.2 Ground Floor

The ground floor slab is outside the scope of this Certificate. Responsibility for the design and construction of a suitable ground floor slab should be agreed before construction commences.

An in-situ concrete slab may be used to form the ground floor. Below the concrete slab, insulation is provided to meet the requirements of TGDs to Part

L of the Building Regulations, including the avoidance of cold bridging. An NSAI or equally approved radon resistant membrane is installed in accordance with Clause 8 of I.S. EN 1996-1-1^[7] Eurocode 6 and BS 8102^[14] *Code of Practice for protection of below ground structures against water from the ground*, to protect the floor and bottom channels of the steel studs from rising damp. Alternatively, a proprietary suspended ground floor may be used, provided it is approved by the NUA Chartered Structural Engineer for use with the NUA LGS Building System to meet the required structural loads criteria (dead load, uplift, etc.). The structural design of the ground floor should be in accordance with Part 3 of this Certificate.

The ground floor slab must be constructed to a tolerance of $\pm 5\text{mm}$ in a 10-meter length for line and $\pm 5\text{mm}$ in a 5-meter run on level.

2.2.3 Concrete Podium Slab (Transfer Slab)

Where the NUA LGS Building System is constructed off a concrete podium slab, a tolerance of $\pm 5\text{mm}$ over 5m is required on the podium slab line and level. Procedures for variations in slab level are as described in Section 2.2.1 of this certificate. The construction of the podium slab is the responsibility of the Main Contractor, and the design is the responsibility of the Building Owner/Client's appointed Engineer, who will require line loads from the NUA Chartered Structural Engineer.

2.2.4 Balconies

Cantilevered balconies are outside the scope of the NUA LGS Building System. Specialist balcony designers are employed on each project, as required, where cantilever balcony loads are required to be accommodated by the system.

The balcony design, including the cantilever members, balcony structure, guarding, finishes, drainage product selection and balcony durability design are by others. NUA's Chartered Structural Engineer shall design the LGS building system to make allowance for the balcony reactions advised by the balcony designer. (Note: an exemplar design for balcony reactions for a specific proprietary balcony support system connected to a 300mm RC composite slab edge was reviewed as part of the certificate assessment. Other balcony connections to RC composite slab designs may be acceptable but have not been considered as part of this certification. Careful design and coordination are imperative on a project specific basis.)

Where balconies are proposed, the balcony designer shall provide all relevant design actions to NUA, including factored and unfactored vertical loads, horizontal loads, moments, torsion (where applicable), dynamic effects and temporary/construction stage loads.

Balcony reactions may only be transferred back into the building through a suitably designed reinforced composite concrete floor edge. The composite slab edge, local reinforcement zones, edge trims and supporting structure shall be designed on a project-specific basis to accommodate the balcony reactions advised by the balcony designer.

Cantilevered balconies shall not be connected directly to:

- light gauge steel floor cassettes
- lattice joists/trusses
- or cold formed steel floor members. Where light steel floor cassettes are used, these elements are not to be relied upon for support of cantilever balcony loads.

NUA shall be responsible for the project-specific detailing immediately surrounding the balcony connection/interface to ensure continuity of:

- cavity barriers and fire stopping
- insulation and thermal continuity
- AVCL interfaces
- weatherproofing interfaces to the NUA system; and
- local coordination of the external wall buildup.

Where the composite metal deck or slab edge is exposed externally, such as at balcony interfaces, suitable thermal insulation and weather protection measures shall be incorporated to limit thermal bridging and maintain compliance with the project thermal strategy.

2.3 DESIGN AND MANUFACTURE

2.3.1 Design Process

Before a NUA LGS System can be manufactured, a Chartered Structural Engineer shall complete the structural design including the specification of all members. The Building Owner/Client's appointed design team's architectural drawings are received by NUA and converted into a 3D structural computer aided design model (CAD). The NUA Chartered Structural Engineer checks and signs off all drawings to ensure structural compliance before any drawing are transferred to production. Once the drawings have been cleared for production, they are run through CAM software which converts the CAD/CAE and CNC files into an optimised machine ready format for use with the roll-forming equipment.

2.3.2 Roll-Form Production

The roll-formers use computer aided manufacturing (CAM) techniques to process the data, which has been transferred from the design BIM model to the roll former. The steel coil is formed into the required C-Section profiles, with the position of cut-outs, punch-holes etc. being accurately located within a tolerance of $\pm 2\text{mm}$ per 10m length. Individual members are automatically labelled by the roll formers inkjet printing system

and grouped into bundles as they come off the roll-forming equipment, corresponding to their subsequent handling in the assembly process. Assembly of the components can commence in the factory directly after the have been roll-formed or the components may be transferred in flat pack form for assembly elsewhere by NUA approved assemblers.

Elements	Tolerance
Length	±1mm in 10m lengths
Opening position	±2mm
Size of openings	±2mm
Frame squareness	±2mm

Table 1: Manufacturing Tolerances

2.3.3 Wall Panel Assembly

The steel frame panels are composed of galvanised mild steel manufactured from galvanised coil as described in Section 2.4.2. All profiles are designed in accordance with I.S. EN 1993-1-3^[8] Eurocode 3 (including Irish National Annex). Section properties comply with I.S. EN 10162^[15]. The wall panels have vertical, C-channel studs at maximum 600mm centres, which are fixed to top and bottom horizontal channels using rivets/screws. The zinc-coated rivets/screws are precisely located in pre-punched holes in the studs, which match holes in the top and bottom channel. The pre-punched holes in the studs are dimpled which allows the flat-topped rivets/screws to be flush with the metal surface.

Where rivets are used in the assembly of panels in the factory, i.e. stud to track connections, it is important to note that these rivet fasteners have not been considered in the structural performance of the panels. It is structurally acknowledged that the rivets will contribute to the structural performance of the panel with increased stiffness, but this has not been considered in the structural design calculations of the panel. Where structural elements are added to the wall panels such as wind bracing, wall tie brackets and lintel plates, these must only be fixed with approved Tek screws as these are structural connections and shall be designed and installed in accordance with the NUA Chartered Structural Engineer's design drawings.

2.3.4 Floor Assembly

Floors may be assembled onsite with loose joists or assembled in the factory as part of a floor cassette. The use of floor cassettes is project-specific, with cassettes often being used for mid-rise multi-storey buildings.

The components of the floors are connected using self-tapping screws. Specified floor decking is screwed to the top of the floor. The floors are either supported on vertical wall panels, hung on Z

hangers or supported by C-channels at the end of the joists or trusses. The solution adopted is chosen by NUA's appointed Chartered Structural Engineer.

2.3.5 Quality Control Production

Quality control carried out during manufacture includes visual inspection of steel coiled raw material, calibration of roll forming equipment daily, cross checking of all in-house production drawings, and checks on production dimensions (length, width, and steel thickness) and on the dimensions and squareness of finished panels.

Each panel is labelled with a QC sticker confirming it has passed final inspection. NUA Manufacturing operates a full in-house quality control system, which outlines procedures on material specification, quality control in production, purchasing of raw materials, design and assembly.

2.4 STRUCTURAL PRINCIPLES

2.4.1 Steel Frame Structure

The basis of the typical NUA LGS System structure is a cold-formed light gauge steel frame, which is assembled into units in the factory and installed on site. The design, manufacture, assembly and erection of the system is based on the combined services of CAD (Computer Aided Design), CAE (Computer Aided Engineering) which are converted by CAM (Computer Aided Manufacturing) software, which feeds the required code into the proprietary roll-formers and produces the drawing and schedule documentation required to manufacture and install accurately.

The panels are fabricated from suitably coated steel coil as described in Section 2.4.2. The frequency and size of the structural elements will depend on the individual panel and truss (roof) design. The individual elements manufactured are then assembled by trained personnel to produce the required LGS Panel with fixings as specified by the NUA Chartered Structural Engineer.

The wall panels, where required by design, will have ancillary elements assembled into them such as strap, noggin or 'K' bracing, lintel trusses over openings and insulation on the external walls which are described in this Certificate.

The NUA LGA Building System utilises prefabricated steel or timber roof trusses which are either designed and manufactured by NUA or from outside sources. The fixings used will be specified by NUA's Chartered Structural Engineer.

The grades of steel and dimensions of sections used are selected and specified by the NUA Chartered Structural Design Engineer in accordance with design requirements. Table 2 shows typical section sizes utilised for both load bearing walls and non-load bearing walls for the cold formed steel elements of their system.

Section properties are calculated using design core thickness of steel (excluding coatings) in accordance with I.S. EN 1993-1-1^[15], I.S. EN 1993-1-3^[8] and I.S. EN 1993-1-5^[16]. The grades of steel and dimensions of sections used are selected and specified by a NUA Manufacturing Chartered Structural Design Engineer or its consultants in accordance with design requirements.

2.4.2 Protective Coatings

The steel frame members are manufactured from galvanized coil steel to I.S. EN 10346^[18], (minimum yield stress 350 N/mm²) with 275 g/m² zinc protection to I.S. EN 10346^[18].

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

- The bottom channel on all ground floor steel frame panels is additionally protected by a DPC.
- Studs shall be located a minimum of 150mm above ground level.
- The insulation keeps the steel in a “warm frame” environment, which, in conjunction with the AVCL, prevents the formation of condensation within the wall structure, when properly installed, subject to workmanship.
- The metal and timber in the roof trusses are kept free from prolonged moisture build up, by means of free air circulation in the roof space, using ventilation methods in accordance with Part F2 of TGD to Part F of the Building Regulations.
- Where steel is cut on site or where the coating of the steel becomes damaged, it is protected by the application of a zinc rich paint.
- Fasteners have been assessed and tested for use with the system, to achieve the minimum 60-year design life of the system.

2.4.3 Fasteners and Connection Joints

The design of the NUA LGS Building System allows for no welding of joints in the system. The system is assembled using fasteners rivets or self-tapping 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 steel frame 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.

NUA 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 NUA 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.

NUA 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. Where a building is located within one kilometre of the coastline and has a steel roof structure (pitched or flat), all fasteners at the eaves shall be coated with a zinc rich paint to protect against coastal spray or fasteners with suitable salt-spray resistance must be used.

2.4.4 Load Bearing Walls Structural Principles

The perimeter walls may be the primary load bearing elements of the structure and are therefore designed to bear on the walls of the panels below; i.e. permanent and variable imposed loads are transferred by load bearing external wall panels and if required load bearing internal wall partitions where necessary.

The load bearing wall panels are comprised of vertical studs, fixed to horizontal head and bottom channel sections. Horizontal noggins are fitted to panels where required to provide additional strength. Under highly concentrated loads, studs can take multiple forms including, but not limited to, back-to-back formations and box formations, amongst others. The formation for a project is decided by NUA Chartered Structural Engineer's particular design.

Where windows are present a cold formed lintel or hot rolled, section is provided to allow the load to transfer to the vertical wall studs. The design loads from each level are transferred through the primary load bearing elements into the substructures / foundations. Perimeter steel Z or C sections may be used to support floor joists/trusses and can also be designed to act as a lintel over openings.

HRS (Hot Rolled Steel) structural members may also be incorporated into the design of the wall panels as required to achieve more complex structural designs. Any HRS structural members used as part of the NUA LGS Building System must be fabricated in accordance with I.S. EN 1090-1^[18] and in accordance with execution class specified in the project-specific design, to minimum Execution Class 2 (EXC 2). Weld records to be maintained in accordance with the I.S. EN 1090-1^[18] certification requirements.

2.4.5 Racking

Resistance to horizontal loading (racking) is provided by the horizontal diaphragm action of the approved floor sheeting and roof in conjunction

with the metal diagonal cross-bracing or K bracing members on specific external inner leaf and internal walls. All flat strap, cross bracing or K bracing is pre-assembled in the factory and has the dual function of ensuring squareness of factory produced panels in addition to providing lateral stability for the overall structure.

Foundations and lateral stability such as concrete cores are outside the scope of this certification. All structural criteria and load transfer to lateral stability system will be determined by the NUA chartered engineer and communicated to the Building Owner/Client's appointed Structural Engineer.

2.4.6 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 NUA's Chartered Structural Engineer to I.S. EN 1992-4^[20] 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*^[21]. The positions of the fixings are project-specific and are determined by the NUA Chartered Structural Engineer and pre-drilled into the bottom channel member during assembly to accommodate fixings on site. The plasterboard is site applied allowing access for the fixings to be installed through the sole plate on site.

2.5 COMPARTMENTATION

2.5.1 Separating Wall (Party Wall)

Separating walls (party walls) are constructed using a minimum of two independent cold formed steel framed leaves with a recommended minimum cavity of 50mm between both frames. The individual frames are boarded (on site or in the factory) with the appropriate level of boarding required to provide the acoustic and fire properties, as outlined in Table 4. The LGS studs are filled with the appropriate stone mineral wool insulation from ground floor to the underside of the roof structure (pitched or flat) to provide the required fire and acoustic properties.

Where the party wall abuts an external wall, the stone mineral wool insulation within the cavity of the party wall extends through the inner leaf of the external wall and to the inner face of the external masonry leaf and abuts the external masonry leaf and forms the fire stop in the external 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 NUA construction details.

Services shall not be placed in the cavity or penetrate the wall linings of separating walls. Where services are required, an additional cavity shall be provided so that the integrity of the fire lining is maintained. Services on a party wall may be accommodated by either surface mounting on the party wall or by creating a service cavity to the party wall with timber battens or metal top hat sections and plasterboard. All battens used with the NUA LGS Building System are treated in accordance with BS 8417^[22].

An apartment, a house in a terrace and a semi-detached house are treated as separate buildings and therefore must be separated by a separating wall (party wall), as shown in the TGDs to Part B of the Building Regulations. Design must comply with the requirements of Section 3.5 of TGD B Volume 2 of Building Regulations for purpose class 1(a), 1(b) & 1(d) and Section 3.4 of TGD B, Volume 1 for all other purpose groups.

2.5.2 Single Frame Compartment Walls

A compartment wall within the NUA LGS Building System may be constructed of a single steel frame wall. This wall may be used in situations where a building is sub-divided into different compartments, but 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. The single frame compartment wall shall be designed and specified to meet the acoustic, fire and structural requirements required by the wall within the building to meet the requirements of TGD to Part B Volume 2 of the Building Regulations for purpose groups 1(a), 1(b) and 1(d), and of TGD to Part B Volume 1 of the Building Regulations for all other purpose groups to which this Certificate applies.

No services are allowed to run vertically or horizontally within the compartment wall. Where services are required at a compartment wall, they may be accommodated by battening out the wall with timber battens or with resilient bar similar to accommodating services in a party wall. Services however can pass through a compartment wall, but they must be appropriately protected in accordance with Section 3.5.4.1 of TGD Vol. 2, 2017, of Part B of the Building Regulations for purpose class 1(a), 1(b) & 1(d) and in accordance with Section 3.5.15 and 3.7 of TGD Vol. 1, 2024, of Part B of the Building Regulations for all other purpose classes to which this certificate applies. Services passing through compartment walls should be kept to a minimum and avoided where possible with all necessary fire stopping at penetration to maintain the fire integrity of the wall.

2.5.3 Compartment Floors

The NUA LGS Building System compartment floor may be designed to provide 60-minute fire resistance from the underside. There are three forms of compartment floors used with the NUA LGS Building System:

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

2.5.3.1 Compartment Floor -Steel Lattice Truss or C-Joists Protected with Plasterboard

The structure of a compartment floor used with the NUA LGS Building System consists of cold formed steel lattice trusses or C -Joists.

The construction of compartment floors must be such that the achievement of the required fire resistance performance relies primarily on the integrity of the linings of such constructions. The integrity of linings of compartment floors should not be breached to allow for the installation of services (e.g. pipes, wires, flues, including manufactured flues), except where necessary to allow services pass through these compartment floors. Where services pass through compartment floors, they should be installed in accordance with Section 3.5.15 and Section 3.7 of TGD to Part B Vol 1 of the Building Regulations, and Section 3.5.4.1 and Section 3.7 of TGD to Part B Vol 2 of the Building Regulations.

Services may be surfaced mounted or accommodated in service ducts or within service cavities created externally to the un-breached linings of the fire-resistant compartment floor.

The compartment floor construction can comply with Part E of the Building Regulations through the appropriate use of gypsum boarding and stone mineral wool insulation between the steel lattice trusses or steel C-joists, while maintaining the fire performance of the compartment floor. Further improvements to acoustic reductions may be achieved by using resilient bars between the ceiling and the plasterboard where appropriate and without compromising the fire performance of the floor.

Where a steel lattice truss type floor is supplied as a non-compartment floor, services may be catered for through the lattice diagonals, but these services must be fire sealed.

2.5.3.2 Compartment Floor Steel Concrete Composite Deck

The floor is constructed of a composite profiled metal deck which is fixed to the head track of the supporting load bearing walls. The steel concrete composite deck adopts the use of steel decking as both permanent shutter for concrete and as a structural element forming composite action

between steel and concrete. Steel reinforcement is installed on top of the deck, and the required concrete thickness is then poured as required by the design.

The fire resistance of the composite deck is provided from the underside of the deck. The composite deck can provide up to 60 minutes' load bearing fire resistance from a combination of the bars within the trough of the decking and adequate concrete cover to the reinforcement steel bars in question.

The additional layers of plasterboard will provide additional fire protection but is not considered in the fire resistance performance. The composite deck compartment floor is suitable for use in all-purpose groups to which this Certificate relates.

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 3.7 of the TGDs to Part B of the Building Regulations for all other purpose groups to which this certificate relates.

An additional layer of resilient material is added to the top of the composite slab to meet the requirements outlined in Section 4.4 of TGD to Part E of the Building Regulations (see Section 4.4.2.1 of TGD to Part E for definition of resilient material). The underside of the deck is fitted with the ceiling type required by the specific project.

2.5.4 Forming Holes in Profiled Decks

When holes or opes to accommodate service penetrations are required, these may be incorporated in the composite concrete slab design prior to pouring the structural concrete. When additional opes are required, the size and exact set-out must be signed-off by the Structural Engineer who designed the concrete slab.

2.5.5 Exposure of Metal Decks

Steel concrete composite decks are intended for internal use within the building envelope. Where design requires the metal deck to be exposed to the external environment, such as in a balcony situation, the metal deck needs to be thermally insulated to provide the required U-value and to limit thermal bridging. In addition, it should be suitably weather protected in accordance with the project-specific design.

2.5.6 Cavity Barriers and Fire Stops

To meet the requirements of TGD to Part B Volume 2 of the Building Regulations and TGD to Part B Volume 1 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 steel frame 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 leaf/cladding to form the cavity barrier.
- 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.
- Eaves boxes shall be provided at the junctions of separating wall with external walls to reduce the risk of fire passing across these junctions.
- Cavity barriers are required around all openings in external walls such as doors, windows, vents, extractor fans, meter cupboards, etc.
- The integrity of compartment/separating walls within roof voids that are continuous with the compartment walls between flats or continuous with a separating wall between dwellings is essential to prevent fire spread. These walls must be fire stopped at the wall/roof junction to afford a minimum 60 minutes fire resistance. The method of fire stopping should be in accordance with guidance given in Diagram 10 of TGD to Part B Volume 2 of the Building Regulations for purpose groups 1(a), 1(b) and 1(d) and Diagram 50 of TGD to Part B Volume 1 of the Building Regulations for all other purpose groups for which this Certificate applies.

The NUA LGS Building System can incorporate both horizontal and vertical cavity barriers and fire stops to comply with the fire strategy drawings supplied by the Building Owner/Client's appointed fire consultant specialist. NUA are responsible for ensuring all fire stopping/cavity closers are installed in accordance with the approved construction drawings. The NUA site manager shall inspect and record all cavity closers/fire stopping at each floor level in the quality control file for that site. The site manager will inspect all cavity barriers and fire stops prior to the closing up of the cavities and ceilings.

2.5.7 Fire Stopping Service Penetrations

If an element, intended to provide fire separation (i.e. it has a requirement for fire resistance in terms of insulation and integrity), is to be effective, then every joint or imperfection of fit, or opening to allow services to pass through the element should be adequately protected by sealing of fire-stopping

so that the fire resistance of the element is not impaired.

The method of fire stopping should be in accordance with guidance given in Section 3.7 of TGD Vol. 2 to Part B of the Building Regulations for purpose groups 1(a), 1(b) and 1(d), and Diagram 50 and Section 3.7 of TGD Vol. 1 to Part B of the Building Regulations for all other purpose groups for which this Certificate applies.

If it essential that both the designer and the specialist contractor are fully conversant with the fire protection requirements for pipe, cable and service penetrations. It is the responsibility of the main contractor to complete the fire stopping of the service penetrations. The fire stopping is recorded in the NUA quality control file for that site – the fire stopping must be installed correctly before NUA will issue the certificate for the building.

2.5.8 Firefighting shafts

The design and construction of separating construction around firefighting shafts is outside the scope of this building system, and this certificate, and is the responsibility of the Building Owner/Client's appointed design engineer and main contractor respectively.

2.6 DELIVERY, STORAGE AND SITE HANDLING

2.6.1 Delivery of Panels

NUA LGS Building System panels are delivered to site on flat bed trailers. Panels are vertically or horizontally bundled together with certified lifting brackets located close to the four corners. Each bundle contains panels located in a similar location on site. This enables the placement of bundles close to their installation location on site, minimising lifting time. Bundles are typically densely packed onto flatbed trailers and clearly labelled/marked for identification against erection drawings on site.

All off-loading and erection should be in accordance with the NUA Manufacturing Method Statement and erection procedures.

All lifting shall be carried out by competent personnel in accordance with the NUA LGS Building System Erection Manual and site-specific safety statement. Care is needed to avoid scratching the surface of any zinc coated steel frame 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. Smaller internal panels may be manually manoeuvred into position

The use of protective gloves when handling the LGS panels is necessary, as steel members formed from cut or sheared sheet can have sharp edges and care should be taken when handled, to avoid injury.

The zinc coated steel frames members must be kept out of contact with dry cement and lime.

2.6.2 Storage of Panels

To minimise any risk of damage or deterioration of the NUA LGS Building Systems' elements on site the following precautions shall be followed:

- Panels which are stored on site should be kept off the wet ground, using steel studs or timber skids.
- While in storage, packs of panels should be covered to protect them from the rain, using a plastic tarpaulin or similar waterproof membrane.
- Where panels do get wet, the bottom track of the panel should be inspected for moisture entrapment. If water exists, a hole between studs should be drilled in the corner of the track.
- NUA LGS Building Systems' products should not be stored near lime, dry cement, plaster, mortar or salt.
- Where NUA LGS Building System has supplied boarding to site, be it orientated strand board, cement board, insulation boards, these products should be protected from exposure to rain/moisture.
- Flooring and other ancillary items such as insulation and cavity barriers must also be kept dry and stored on a firm level base.

2.6.3 Traceability

The NUA 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 the panel is completed and passed quality control in the factory, the label is attached to it stating typically:

- Manufacturer name and address
- Project name and reference number
- Reference number of the panel in the project
- Quality approved
- Total weight
- CE marking

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

2.6.4 Typical Material List Supplied to Site

With each customised delivery to site, a comprehensive bill of materials (BOM) is supplied. This bill of materials provides a detailed list of all components delivered to site to complete the installation of the steel frame 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 (BOM). This pre-marking system provides the advantage of both speed and accuracy during assembly and erection on site.

2.7 INSTALLATION

2.7.1 General

Installation is carried out in accordance with the requirements of this Certificate and all relevant codes of building practice, regulatory Health & Safety requirements and the manufacturer's instructions contained in the NUA LGS Building System Erectors Manual, a copy of which must be available on each site. Site erection must only be carried out by a NUA approved installer or a specialist sub-contractor under the periodic supervision of NUA and in accordance with the NUA LGS Building System Erectors Manual. In any scenario, NUA is responsible for site inspections and sign off steel frame, as erected, in accordance with Building Regulations.

Installers are approved once they have undergone training on NUA LGS Building System on-site installation and demonstrate an understanding of 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 shall have a signed record of training.

All off-loading and erection should be in accordance with the NUA Method Statement and erection procedures for each site. All structural connections to the foundation must be installed in accordance with the structural design details, independently checked by qualified members of the installation team and formally recorded on the NUA site quality control records.

2.7.2 Tolerances

Prior to installation of the wall panels, the tolerances are checked at the base of the wall frame by the main contractor and communicated to NUA for approval. The required tolerances are detailed in the NUA LGS Building Systems' Erectors Manual. If required tolerances are not achieved, no works will commence until remedial actions have been complete to the satisfaction of the NUA site manager and chartered structural engineer.

2.7.3 Panels Fixing

Permanent anchorage of the panel may commence as soon as the connecting subassembly surrounding the panel are set (hot rolled steel/floor etc.). Anchorage of the panel should follow the specification stated within the detailed drawings provided. Any grouting of shimming shall be carried out prior to fixing of panels (refer to NUA LGS Building Systems' Erectors Manual). Anchorage of

the panel is typically required at the following locations:

- At panel ends
- At intersections of internal panels
- Either side of door openings jamb studs
- At specified centres along the panel (maximum 1200mm c/c)
- At ends of all diagonally bracing

2.7.4 Floors fixing

Fixing Lipped C-section joists and light gauge steel lattice trusses

Intermediate floors may be formed using either a lattice steel truss or a steel C-joist. The trusses are typically supplied to site as individual elements, which are then placed between supporting wall frames using the z-hangers attached to the top of the panels. Steel C-Joists are commonly supplied to site in cassettes which may be placed between frames according to the plan drawings. Once the structural elements are in place, they must be immediately fixed in place according to the NUA LGS Building Systems' drawings and details. Once fixed in place OSB shall be fixed in place as shown on project's drawings. LGS steel lattice joists must be properly braced, as per NUA Chartered Engineer's Design, before loading.

Where trusses are supporting load bearing walls overhead, web stiffeners are fitted per design for structural stiffness to support the loads tracking from above. Floors are not allowed to run through the party wall (separating wall).

Steel concrete composite floor deck

Compartment floors may be constructed using a steel concrete composite floor deck. Metal decking should be delivered to site in bundles strapped together according to their location and size. These bundles should be positioned in place next to their position on plan for ease of access. The steel sheets shall be slid into place on the Z-hangers or atop the LGS steel frame. First steel sheet shall be fixed in place before placing further sheets to avoid unwanted movement. Sheets shall be fixed as shown on project's drawings.

Temporary propping may be required for sheets typically in excess of 3.5m in length. All propping locations are indicated on Nua LGS Building Systems' drawings. Propping shall remain in place during construction for a specified time by the NUA Chartered Structural Engineer.

Reinforcement shall be installed as per NUA LGS Building Systems' drawings and specification. Once reinforcement is installed the concrete pour may commence. All materials and components specified will be supplied by NUA or approved contractor.

2.7.5 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 NUA Manufacturing Ltd. Plasterboard, in addition to all cavity barriers and fire stops on all walls and floors must be fully checked on site and signed off in accordance with project-specific details by the appropriate personnel. All plasterboard that provides fire resistance to load bearing and non-load bearing elements of the structure must conform to the requirements of Type F to I.S. EN 520^[10] and must be installed in accordance with the specification given in Table 4. If alternative boarding is proposed, then an independent fire test report or fire test assessment, from an Accredited Laboratory, must be provided and assessed by a competent Fire Engineer in accordance with I.S. EN 15725^[49] and I.S. CEN 15117^[50]. Typically, all NUA LGS System panels are delivered to site un-boarded.

2.7.6 Infill Panels Installation

Infill panels installation shall be in accordance with Nua LGS Building Systems' Erectors Manual and Section 2.7 of this Certificate. Infill panels shall be installed on supporting structure with minimum bearing width and fixings as stated on Nua LGS Building Systems' drawings. Typical fixings are as below:

- Base track to supporting structure
- Vertical connection to vertical elements (columns etc.)
- Deflection head to structure over
- Deflection head to infill panel
- Two panels connection

Fixings and centres are to project-specific design but typically are required at stud centres and should not exceed 600mm. Additional fixings are required at track ends and split points and likely required at jamb stud locations.

Fixings manufacturer specifications should be followed as to minimum embedment depth and edge distances. When fixing to a ground floor slab, a DPC layer shall be positioned underneath the base track.

The minimum edge distance for a screw fixing into light steel sections should be three times the fixing diameter and not less than 10mm. The fixing centres for any compound section, such as back-to-back studs or built-up jamb studs should follow the fixing specification shown on NUA LGS Building Systems' drawings.

Deflection head shall be installed at the top of the infill panel to take account of deflection of the structure overhead. Deflection criteria shall be identified by Building Owner/Client's Structural Engineer.

2.7.7 Site Supervision

The approved installation contractors are subject to periodic inspections by the NUA Site Manager/Quality Supervisor. Typically, the NUA site manager will agree a schedule of hold points and inspections with the erection contractor. The Quality Supervisor of the erection crew is responsible for the quality and workmanship carried out by the erection crew. The erection supervisor reports directly to the NUA Site Manager/Quality Supervisor to ensure all work follows the requirements of the design drawings and the requirements of NUA Structural certification for the building.

NUA employ a Site Manager/Quality Supervisor who works very closely with the erection supervisor and the main contractor to conduct periodic site inspections. Panels are installed on a suitable concrete base. All fixings and brackets between panels are visually inspected and recorded on the assembly quality control sheet for structural connections.

Each building has its own quality control file which is kept on site by the NUA Site Manager/Quality Supervisor. The Site Manager/Quality Supervisor also inspects benchmark fire stopping and cavity closing on each site with interim inspections through the works. Records of the fire stopping are recorded by NUA.

Any defects noted are recorded, photographed where possible and notified in writing to the erection supervisor. The site manager must inspect and approve the remediation before work can proceed.

The approved NUA LGS Building System erection contractors are subject to periodic supervision by the NUA Site Manager/Quality Supervisor. The following checklist is provided to offer guidance to Building Owners/Clients who intend to carry out their own additional site supervision. This non-exhaustive list of items is of a general nature and are in addition to all other building requirements.

- All components delivered to site comply with the Bill of Materials.
- Components are not damaged and are properly pre-marked for erection.
- The substructure is set out accurately and level within the tolerance specified by NUA before the wall panels are positioned.
- The wall panel should not be erected unless any inaccuracies in the floor slab have been corrected.
- The ground floor layout is properly marked out.
- Site applied DPC and DPM are correctly installed in accordance with BS 8102^[14].
- DPC course is laid under all ground floor panels, as a good practice measure between

steel and concrete slab, both internal and external walls.

- Panels are in line and plumb and in accordance with the NUA panel layout.
- Rooms are checked for squareness.
- All insulated wall panels are free from damage after erection.
- All horizontal and vertical joints are correctly detailed.
- All bottom tracks are free of construction debris.
- Joints in floor decking occur on the centre line of the joists and all T&G joints run perpendicular to the floor C-joists. Decking sheet joints must be staggered.
- If floor decking has potential to be exposed to weather for prolonged periods due to construction sequence, then it will be protected with a weatherproof cover until building is weather tight.
- Floor decking is screwed at the correct centres.
- All bracing is properly tensioned.
- Check requirements of web stiffeners when floor joists are continuous over internal load bearing support walls against Engineers drawings.
- Cavity barriers and fire stops are installed as specified and in accordance with the Building Regulations.
- Roof trusses are installed plumb and per layout.
- Roof bracing installed where required.
- Where galvanised steel section is cut or where any damage occurs to the steel frame a coat of zinc rich paint or galvanised spray is applied to exposed surfaces.
- All fasteners supplied are approved by NUA Manufacturing Ltd.
- No modification i.e. cutting of the steelwork is allowed without prior written permission by a NUA Chartered Structural Engineer.
- Always maintain the recommended minimum 50mm between the two leaves of the party wall.
- Radon membrane/DPC/DPM are correctly installed by Main Contractor prior to placing the modules.

2.7.8 Main Contractor Responsibilities

The Main Contractor is responsible for the construction of the foundations, ground floor slab or podium slab within tolerance specified by NUA. Once the floor slab is within the tolerance range, erection of the NUA LGS Building System can commence. If the slab level is outside the specified tolerances the remedial works (grinding etc.) will be the responsibility of the Main Contractor.

The Main Contractor is also responsible for the installation of all façade claddings, roof claddings and the installation of fire stopping and cavity barriers where it is impractical for NUA to install

prior to these claddings being applied. All other fire stopping, and cavity barriers are the responsibility of NUA.

The Main Contractor on site is responsible for providing scaffolding and site-specific fall arrest to wall plate level and all access necessary for the safe erection of the structure. NUA provides the main contractor with project specific building details on the construction of their steel frame system.

Component Type	Grade of Steel	Typical Section Dimensions (mm)			
		Depth ² (h)	Width ² (b)	Lip (c)	Thickness ¹ (t)
Wall Stud	S350, S390, S450, S550	89	45	10	0.8 – 1.6
		100	45	10	0.8 – 1.6
Wall track/Noggin	S350, S390, S450, S550	89	45	10	0.8 – 1.6
		100	45-50	10	0.8 – 1.6
Floor Joist	S350, S390, S450, S550	200-300	45-100	10	1.2 – 2.5
Floor Track End Bearer	S350, S390, S450, S550	100	45-50	10	1.5 – 2.0

¹ The range of thickness of cold formed section available = 0.8, 1.0, 1.2, 1.5, 1.6, 2.0 mm.
² Range of Depth (h) and Width (b) available to allow for uniform cross section of structural zone.

Table 2: Typical Sized of Elements in the Steel Frame System

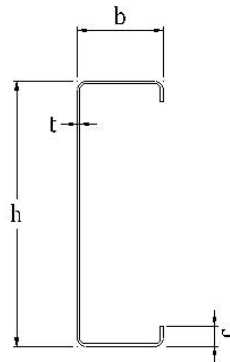
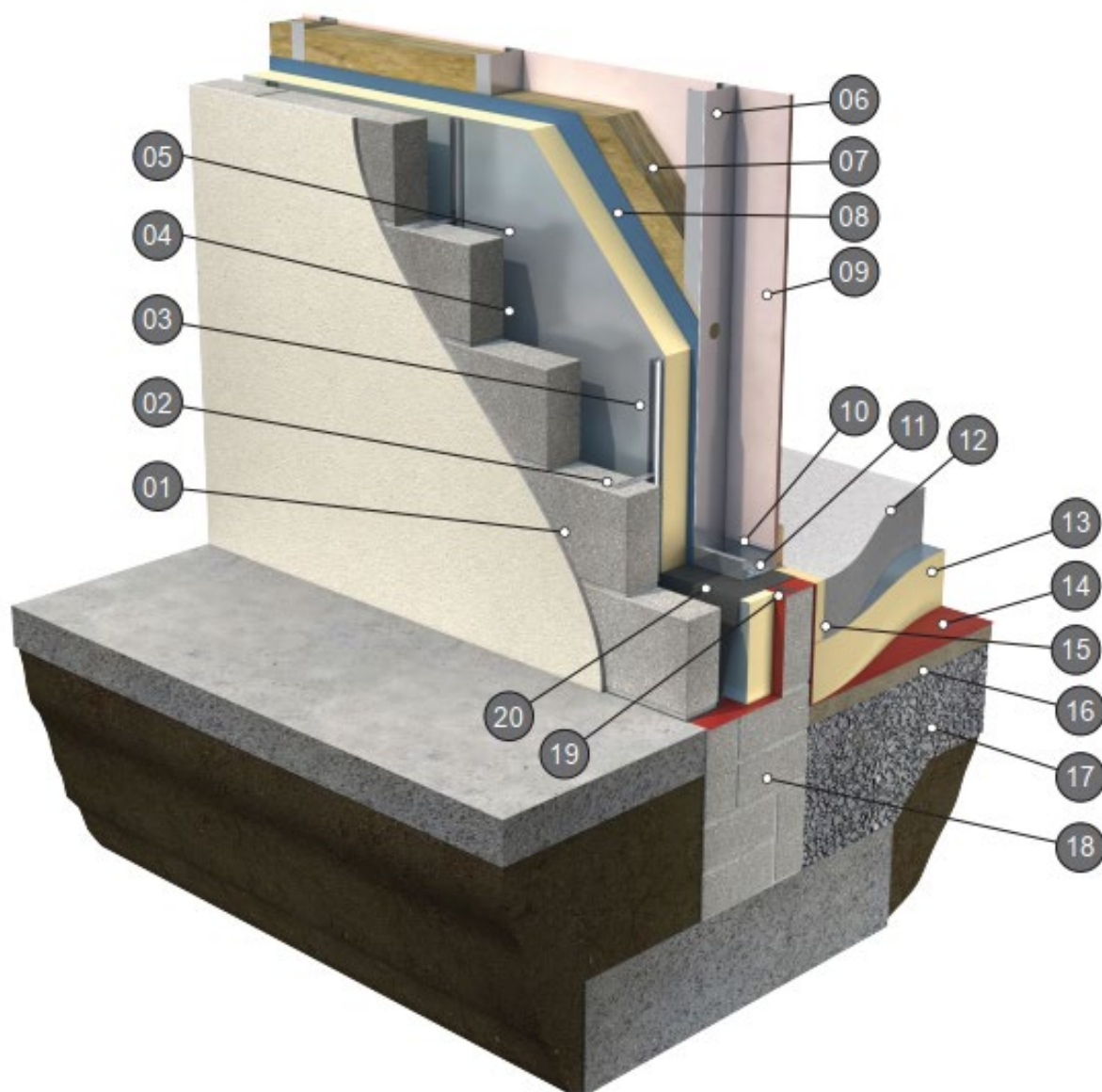


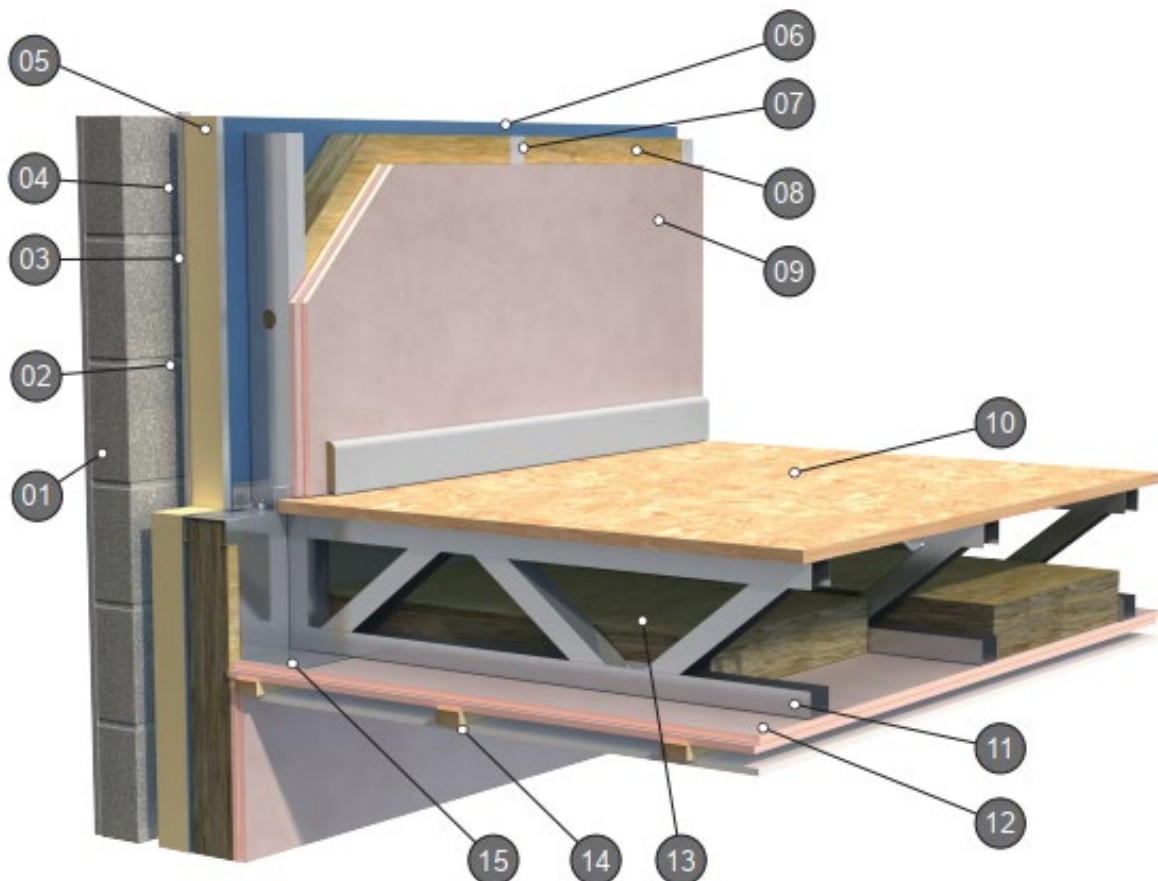
Figure 1 – LGS Channel profile

Note: This Certificate contains illustrations to explain the various elements of the NUA LGS Building System such as intermediate floors, external walls, separating wall etc. These illustrations are not intended to be construction drawings. NUA, in conjunction with the design team on a project, will produce a set of project-specific details on a project-by-project basis. All drawings should be in compliance with relevant codes of practice and relevant standards along with current Building Regulations.



- | | | |
|---|--|---|
| 01. Masonry outer leaf with exterior render system. | 09. 12.5mm Type F Plasterboard to provide REI 30 External wall in accordance with table 4 fire performance requirements. | 15. PIR Perimeter strip. |
| 02. Stainless Steel wall tie. | 10. Bottom track. | 16. Sand blinding. |
| 03. Stainless Steel wall tie channel. | 11. Anchor bolt. | 17. Hardcore. |
| 04. Cavity. | 12. Concrete Floor. | 18. Foundation detail to specification. |
| 05. PIR Insulation. | 13. Floor Insulation. | 19. Butyl Sealant Tape. |
| 06. LGS metal stud. | 14. Selected DPM or Radon Membrane. | 20. Stepped DPC, min. 150mm above ground level. |
| 07. Stone mineral wool insulation. | | |
| 08. Selected AVCL. | | |

Figure 2- Ground floor external wall junction



01. Masonry outer leaf with exterior render system.

02. Stainless Steel wall tie.

03. Stainless Steel wall tie channel.

04. Cavity.

05. PIR Insulation.

06. Selected AVCL.

07. LGS metal stud.

08. Stone mineral wool insulation.

09. 2 layers 15mm Type F Plasterboard to provide REI 60 External wall in accordance with table 4 fire performance requirements.

10. OSB3 or equivalent floor decking.

11. LGS Lattice Joist.

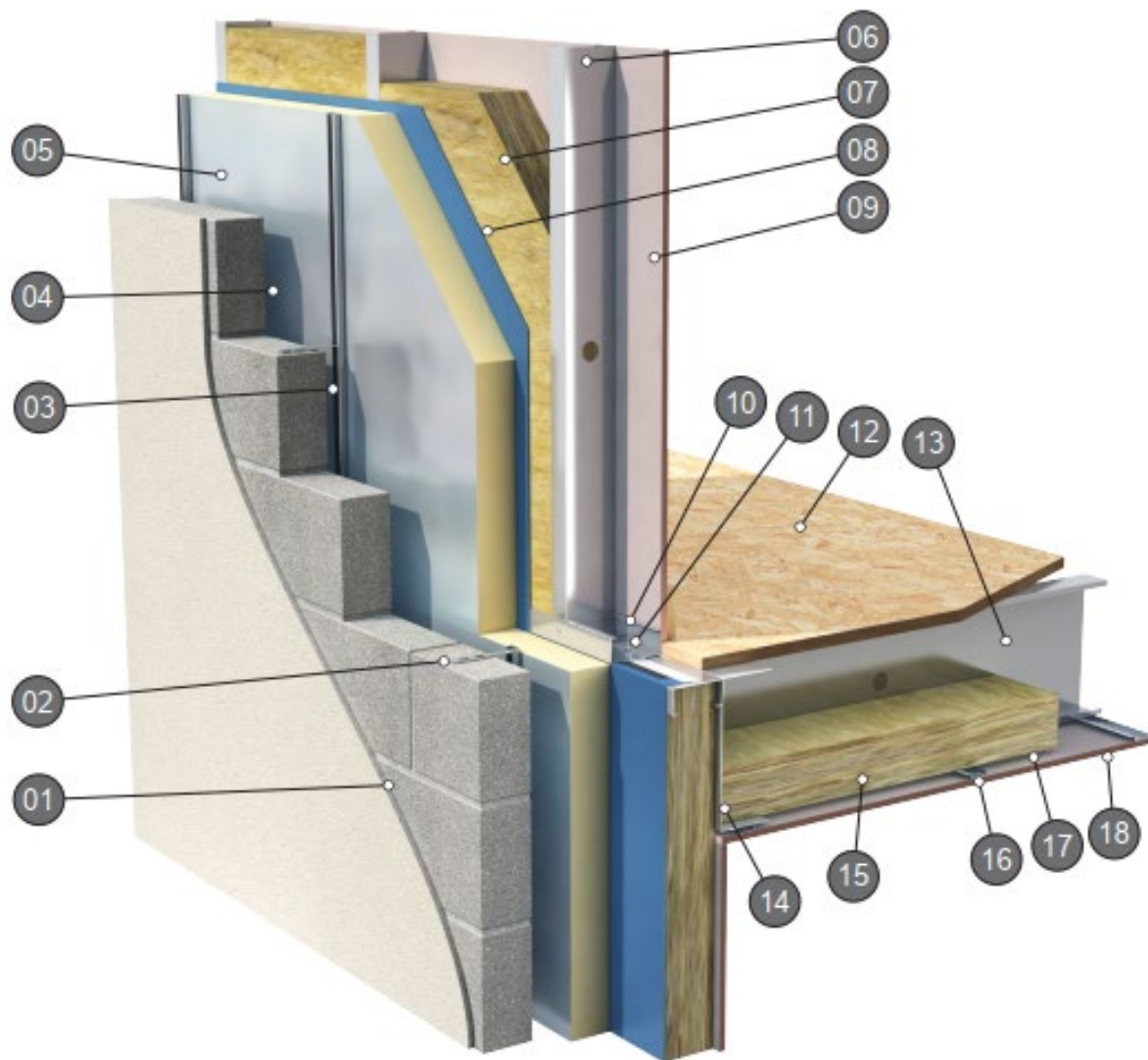
12. 2 layers 15mm Type F Plasterboard to provide REI 60 in accordance with Table 4 fire performance requirements.

13. Stone mineral wool insulation.

14. 12.5mm Type A Plasterboard fixed to battens

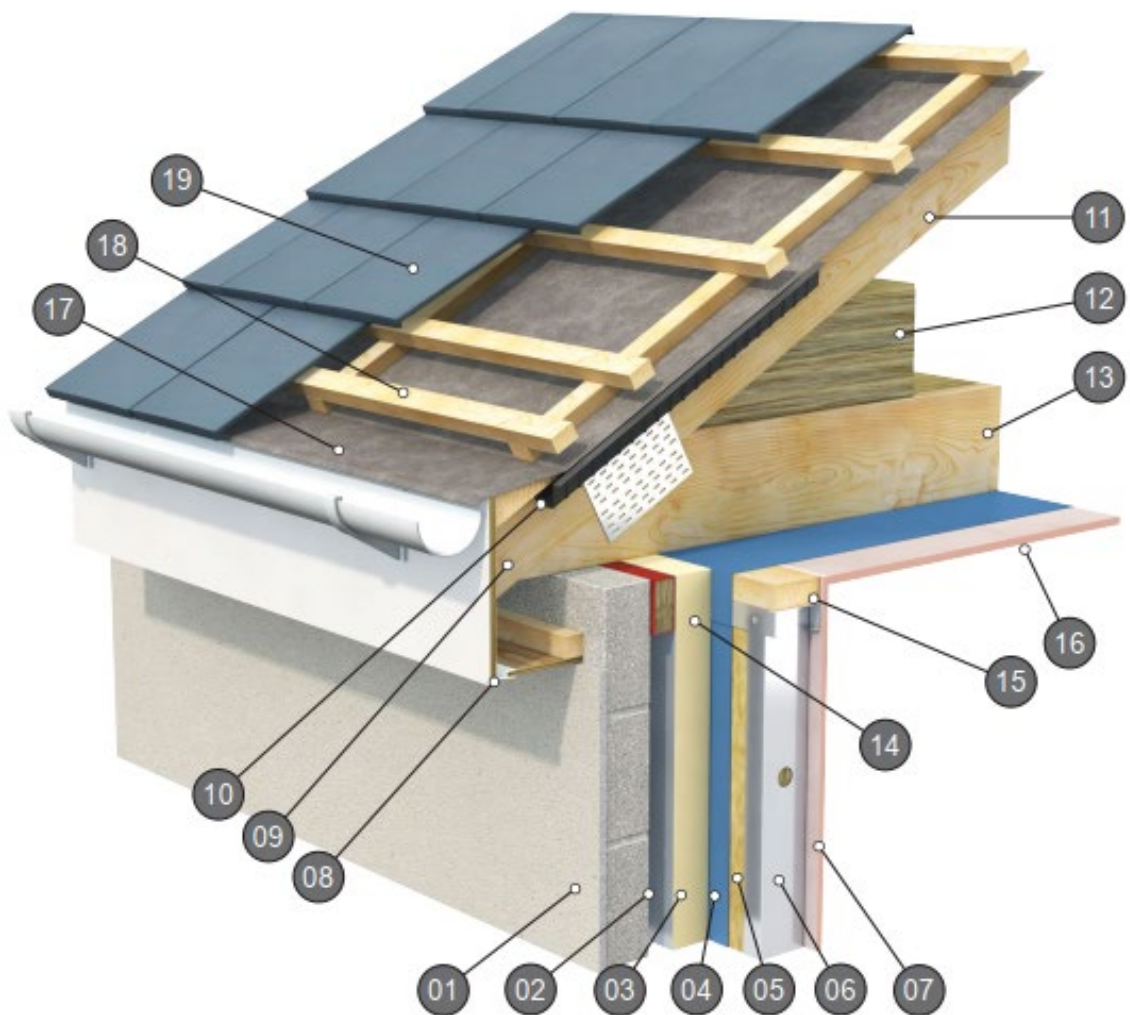
15. Z Hanger.

Figure 3 - Lattice floor to exterior wall detail



- | | | |
|---|--|--|
| 01. Masonry outer leaf with exterior render system. | 09. 12.5mm Type F Plasterboard to provide REI 30 External wall in accordance with table 4 fire performance requirements. | 16. Resilient bar. |
| 02. Stainless Steel wall tie. | 10. Bottom track. | 17. Service cavity. |
| 03. Stainless Steel wall tie channel. | 11. Screw fixing | 18. 12.5mm Type F Plasterboard to provide REI 30mins in accordance with Table 4 fire performance requirements. |
| 04. Cavity. | 12. OSB3 or equivalent floor decking. | |
| 05. PIR Insulation. | 13. LGS Floor Joist. | |
| 06. LGS metal stud. | 14. C-Channel. | |
| 07. Stone mineral wool insulation. | 15. Stone mineral wool insulation. | |
| 08. Selected AVCL. | | |

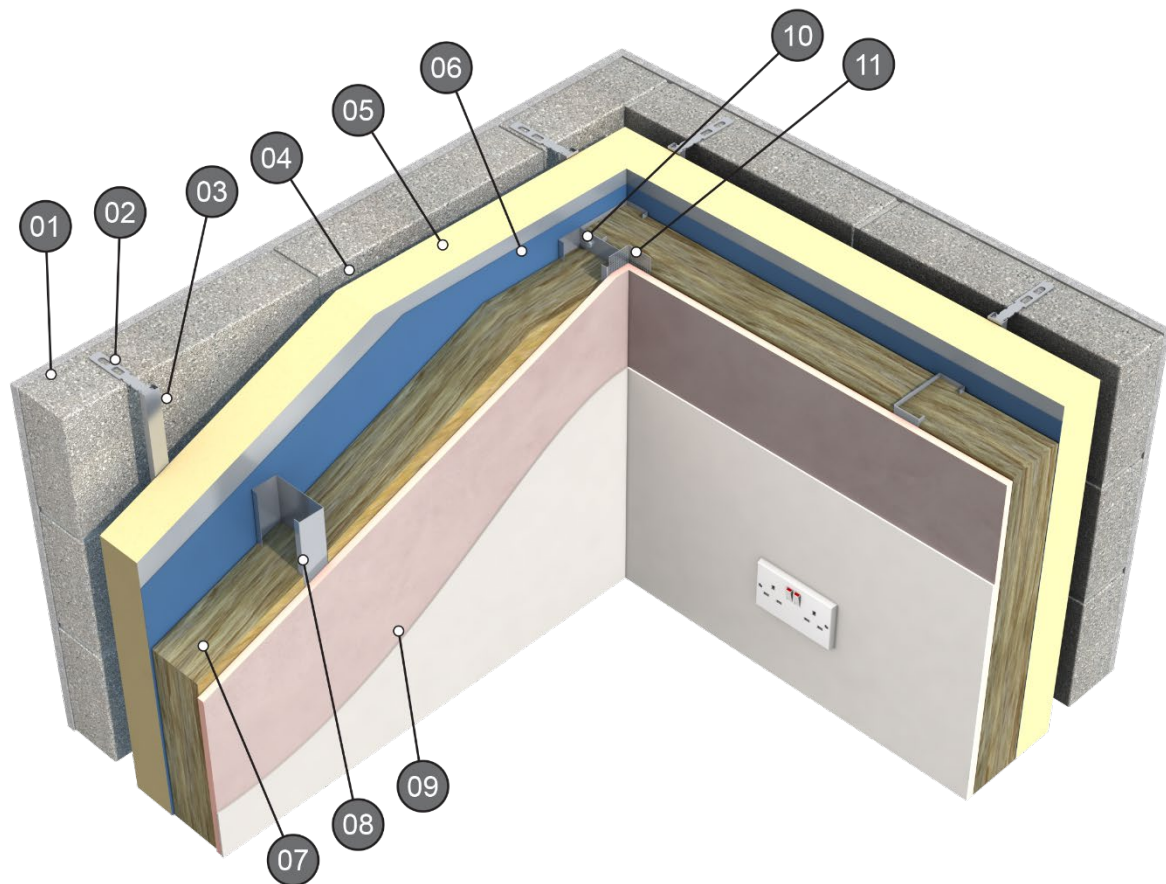
Figure 4 – LGS C-Section floor to exterior wall detail



- | | | |
|--|---|--|
| 01. Masonry outer leaf with exterior render system. | 08. Fascia & Soffit with propriety soffit vent. | 14. Cavity Closer. |
| 02. Cavity. | 09. Rafter. | 15. Treated Wall Plate. |
| 03. PIR Insulation with breather membrane | 10. Propriety rafter ventilator. | 16. 12.5mm Type F Plasterboard with skim finish. |
| 04. Selected AVCL. | 11. Pre-fabricated roof truss | 17. Selected roofing felt. |
| 05. Stone mineral wool insulation. | 12. Stone mineral wool insulation. | 18. Batten. |
| 06. LGS metal stud. | 13. Cieling joist. | 19. Roof tile or slate. |
| 07. 12.5mm Type F Plasterboard to provide REI 30 External wall in accordance with table 4 fire performance requirements. | | |

Firestopping at junction of eaves with separating wall in compliance with Diagram 10(a), TGD B, Volume 2

Figure 5 - Typical Eaves detail - Insulated at ceiling



01. Masonry outer leaf with exterior render system.

02. Stainless Steel wall tie.

03. Stainless Steel wall tie channel.

04. Cavity.

05. PIR Insulation..

06. Selected AVCL.

07. Stone mineral wool insulation.

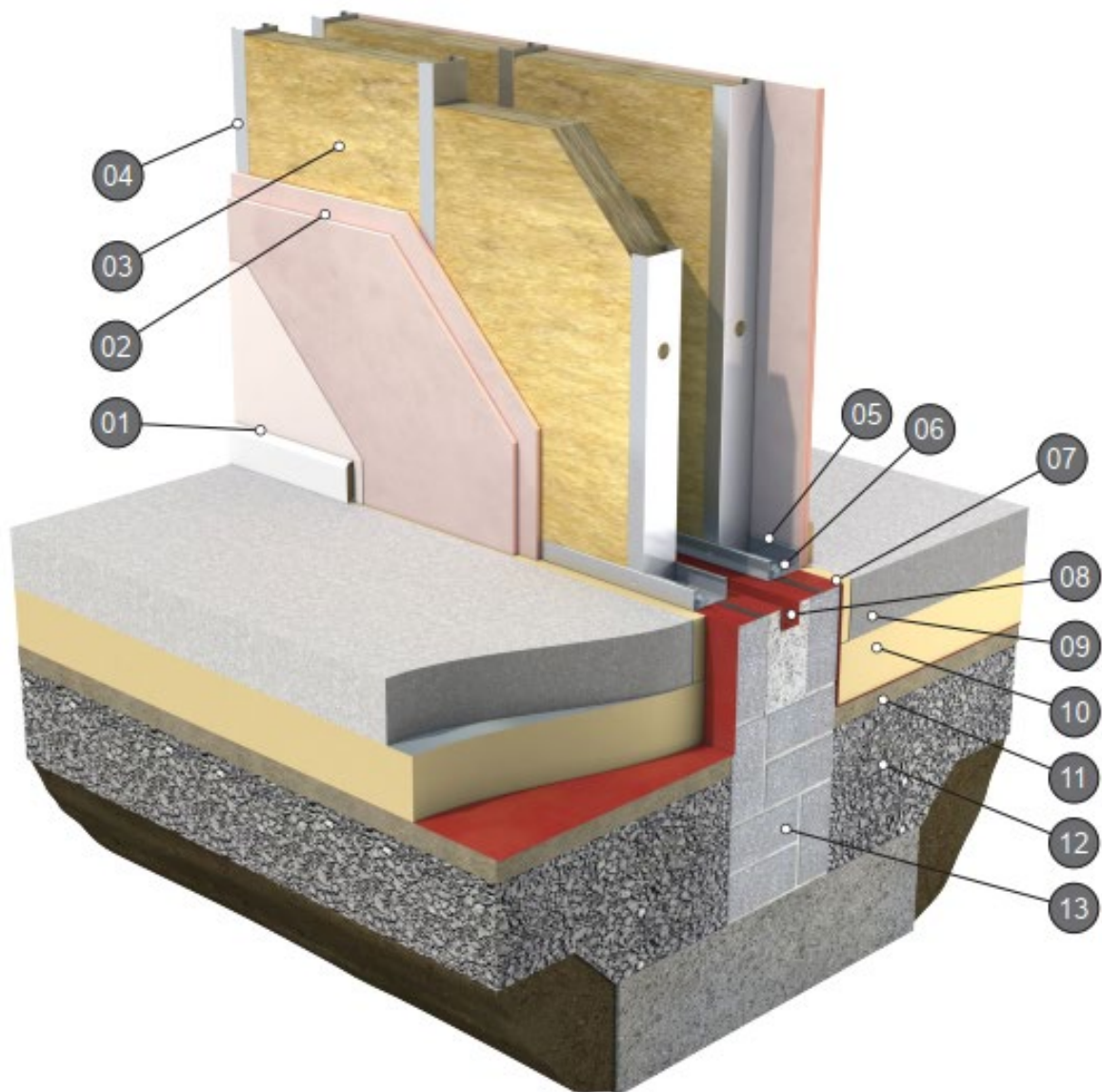
08. LGS metal stud.

09. 12.5mm Type F Plasterboard to provide REI 30 External wall in accordance with table 4 fire performance requirements.

10. Screw fixing.

11. Perimeter angle or corner stud.

Figure 6 - External Corner Detail



01. Skim plaster finish & skirting board.

02. 2 No. layers of 12.5mm Type F Plasterboard to provide REI 60min Separating wall in accordance with Table 4 fire performance requirements

03. Stone mineral wool insulation.

04. LGS metal stud.

05. Bottom track.

06. Anchor bolt.

07. Selected DPM or Radon membrane.

08. Cast-In drainage slot.

09. Concrete floor.

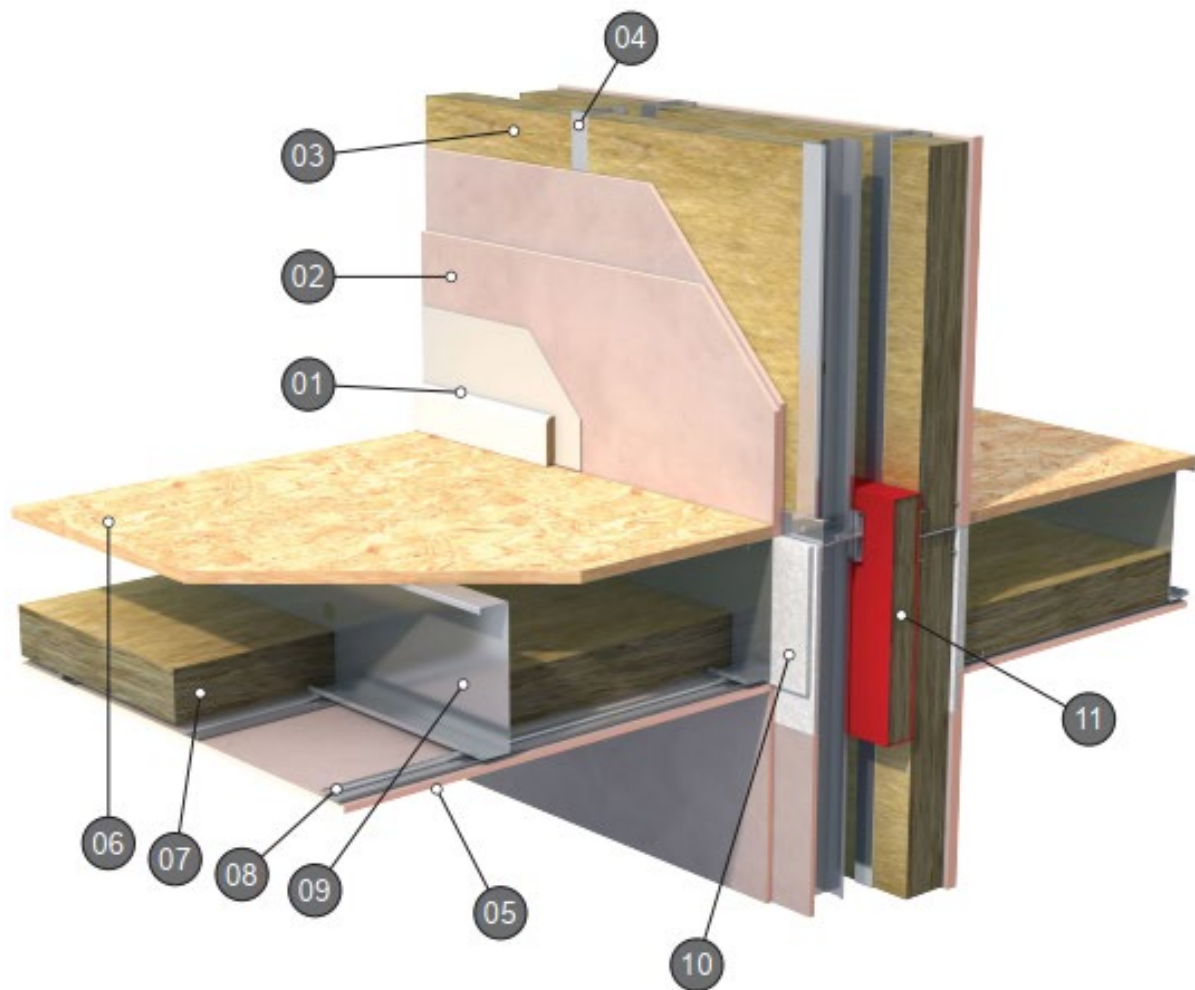
10. Floor Insulation.

11. Sand Blinding.

12. Hardcore.

13. Foundation detail to specification.

Figure 7 – Separating Wall to Foundation Detail



01. Selected finish & skirting board.

02. 2 No. layers of 12.5mm Type F Plasterboard to provide REI 60min Separating wall in accordance with Table 4 fire performance requirements

03. Stone mineral wool insulation.

04. LGS metal stud.

05. 12.5mm Type F Plasterboard to provide REI 30mins in accordance with Table 4 fire performance requirements.

06. OSB3 or equivalent floor decking.

07. Stone mineral wool insulation.

08. Resilient bar.

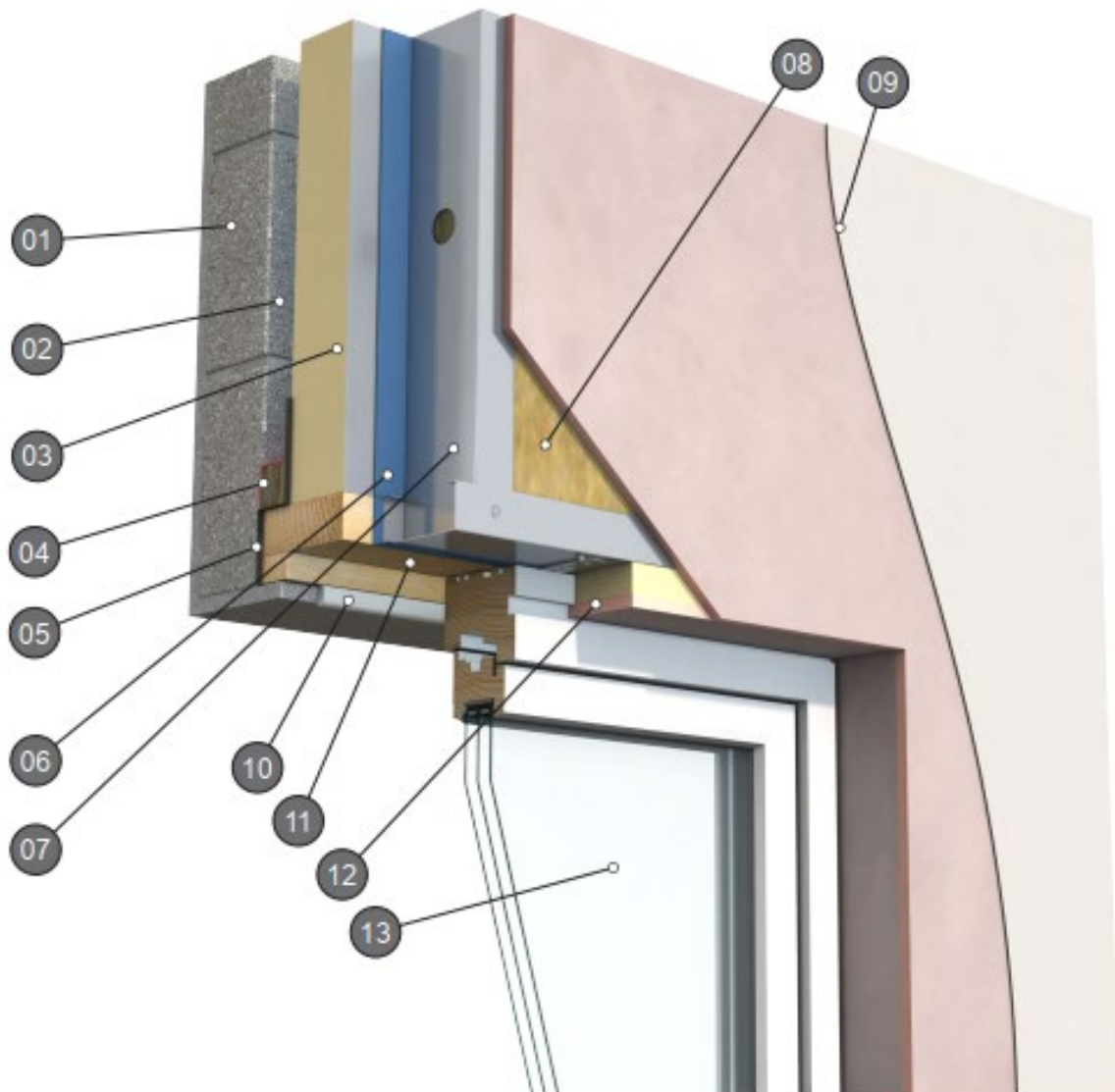
09. LGS floor joist

10. 2no. layers of selected 12.5mm weatherboard infill with appropriate fire resistance in accordance with Table 4 fire performance

11. Proprietary fire stops as required (Compressed mineral wool in cavity extending 300mm below ceiling and 300mm above F.F.L. at separating floors)

Note: all services penetrations in intermediate floor must be fully fire stopped to maintain R 30 REI 15 fire protection.

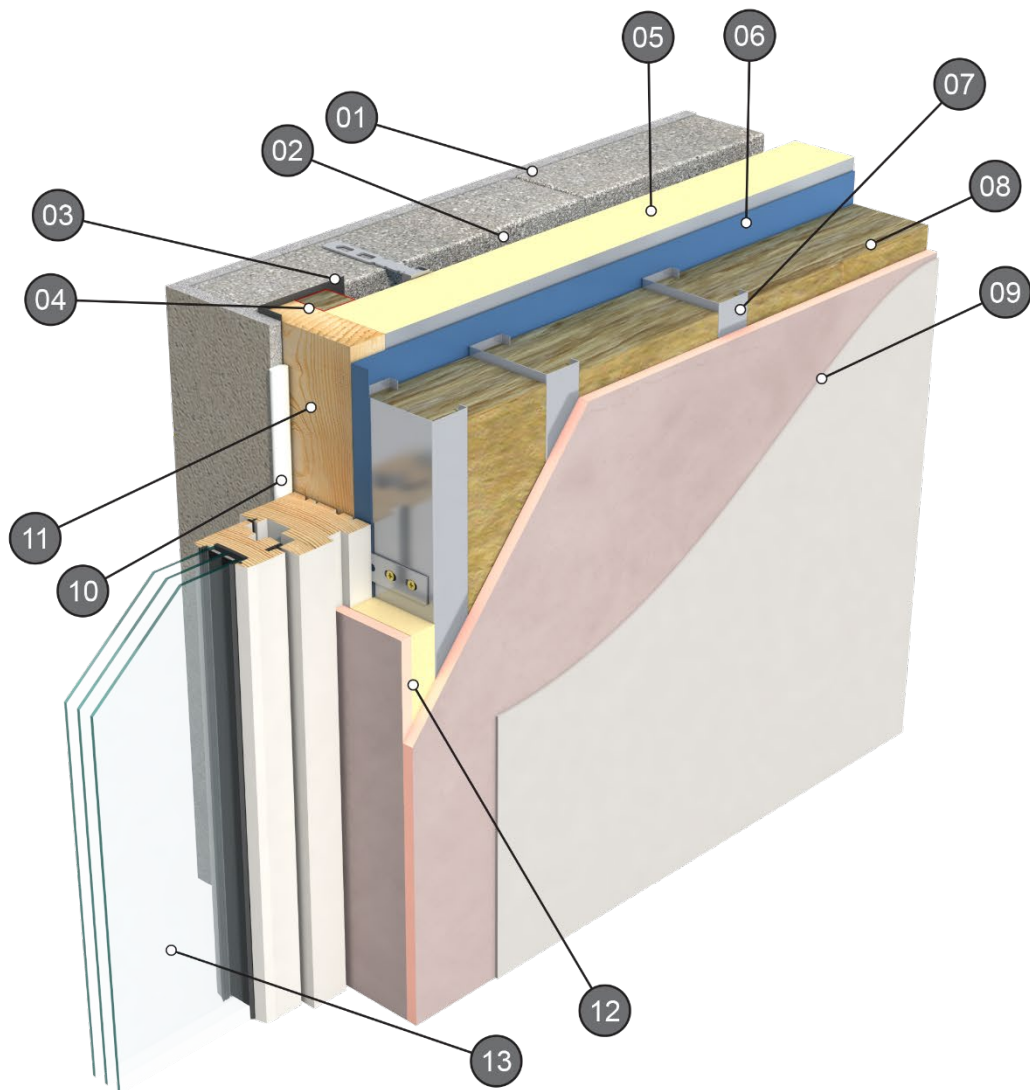
Figure 8 - Separating Wall to Intermediate Floor Detail



- 01. Masonry outer leaf with exterior render system.
- 02. Cavity.
- 03. PIR Insulation.
- 04. Cavity Closer to specification.
- 05. DPC.
- 06. Selected AVCL returned along the LGS head rail and taped to the window frame.
- 07. LGS metal stud.
- 08. Stone mineral wool insulation.

- 09. 1 no layer of 12.5mm Type F Plasterboard to provide REI 30 External Wall in accordance with table 4 fire performance requirements.
- 10. Selected Sealant.
- 11. Treated timber batten.
- 12. Insulation backed plasterboard.
- 13. Selected window.

Figure 9 - Window head Detail



01. Masonry outer leaf with exterior render system.

02. Cavity.

03. DPC

04. Cavity Closer to specification.

05. PIR Insulation.

06. Selected AVCL returned along the LGS jamb rail and taped to the window frame.

07. LGS metal stud.

08. Stone mineral wool insulation.

09. 1 no layer of 12.5mm Type F Plasterboard to provide REI 30 External Wall in accordance with table 4 fire performance requirements.

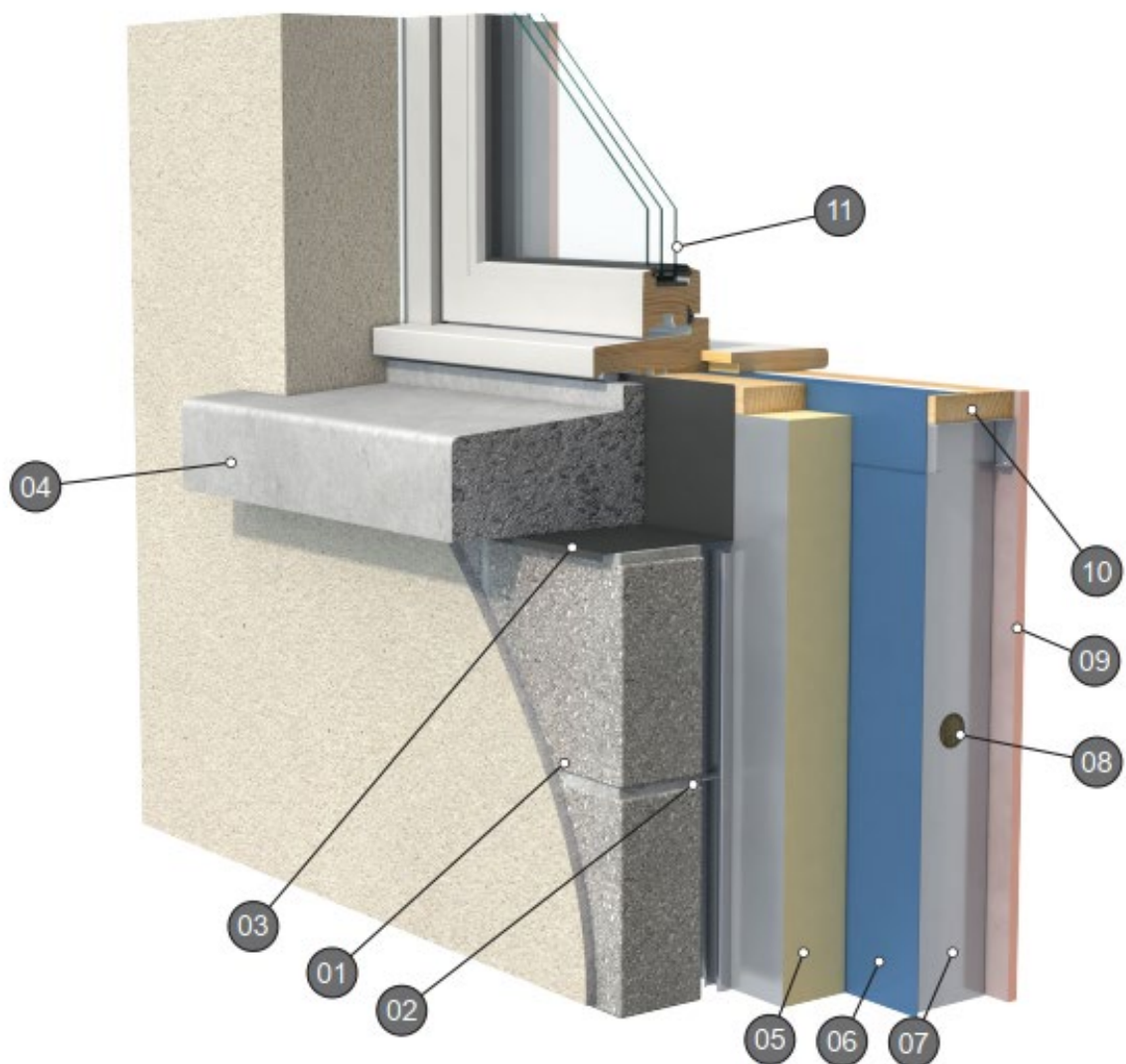
10. Selected Sealant.

11. Treated timber batten.

12. Insulation backed plasterboard.

13. Selected window.

Figure 10 - Window reveal detail



01. Masonry outer leaf with exterior render system.

02. Stainless Steel wall tie channel & wall tie.

03. DPC.

04. Selected sill.

05. PIR Insulation with breather membrane

06. Selected AVCL.

07. LGS metal stud.

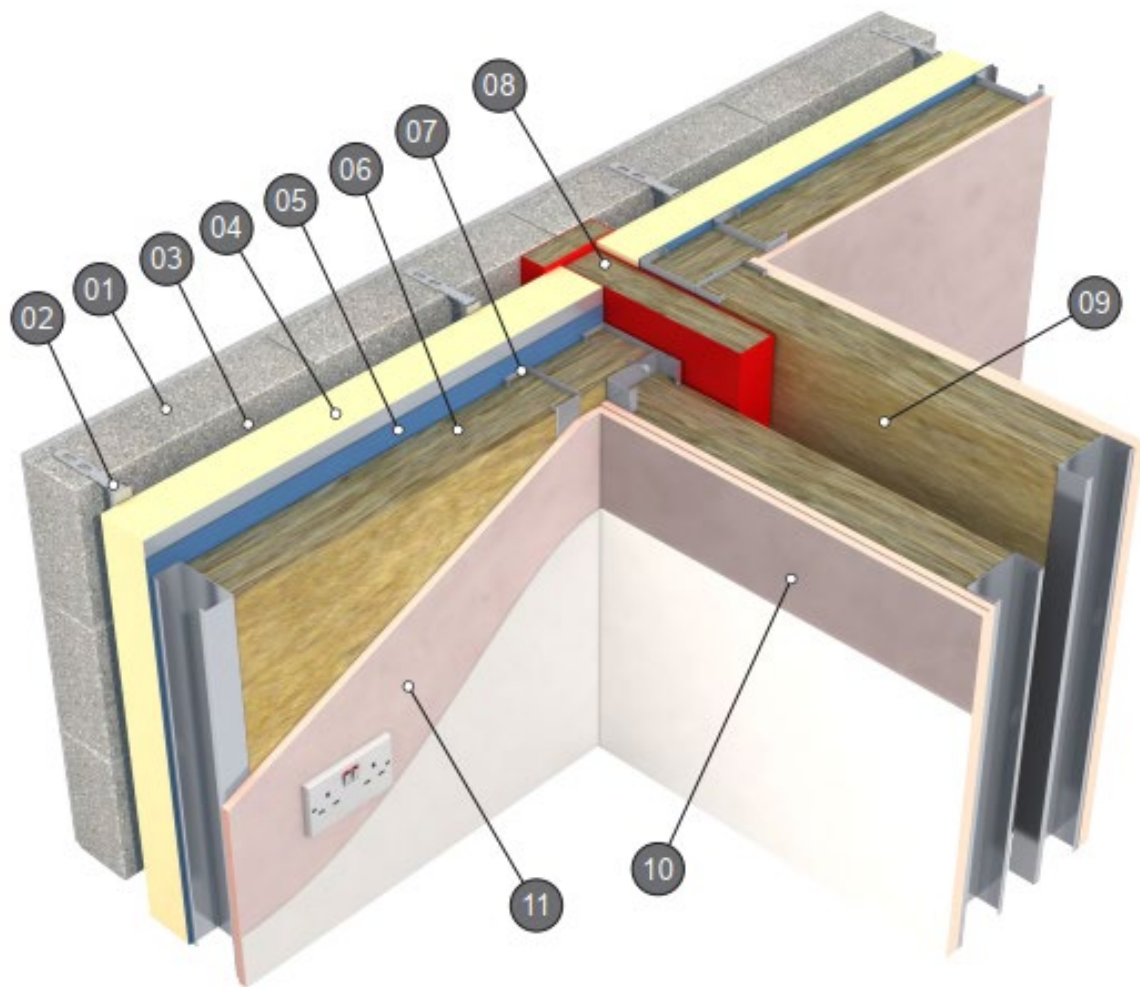
08. Stone mineral wool insulation.

09. 1 no layer of 12.5mm Type F Plasterboard to provide REI 30 External Wall in accordance with table 4 fire performance requirements.

10. Treated timber batten.

11. Selected window.

Figure 11 - Window Sill detail



01. Masonry outer leaf with exterior render system.

02. Stainless Steel wall tie channel & wall tie.

03. Cavity.

04. PIR Insulation.

05. Selected AVCL as required.

06. Stone mineral wool insulation.

07. LGS metal stud.

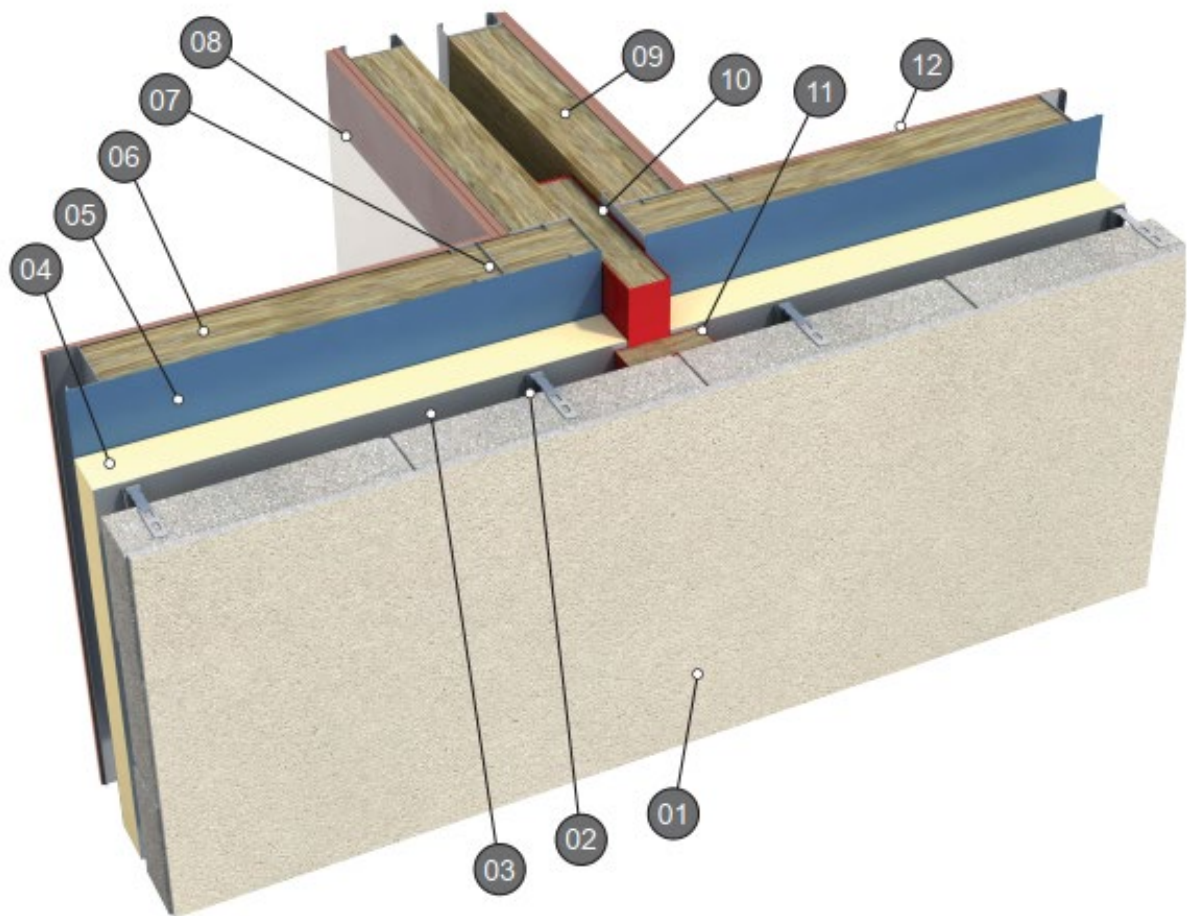
08. Selected firestop at perimeter wall junction.

09. Stone mineral wool insulation.

10. 2 No. layers of 12.5mm Type F Plasterboard to provide REI 60min Separating wall in accordance with Table 4 fire performance requirements

11. 1 No layer of 12.5mm Type F Plasterboard to provide REI 30 External wall in accordance with table 4 fire performance

Figure 12 - Separating wall to exterior wall detail (Interior view)



01. Masonry outer leaf with exterior render system.

02. Stainless Steel wall tie channel & wall tie.

03. Cavity.

04. PIR Insulation with breather membrane

05. Selected AVCL.

06. Stone mineral wool insulation.

07. LGS metal stud.

08. 2 No. layers of 12.5mm Type F Plasterboard to provide REI 60min Separating wall in accordance with Table 4 fire performance requirements

09. Stone mineral wool insulation.

10. Selected firestop at perimeter wall junction.

11. Vertical firestop.

12. 1 no layers of 12.5mm Type F Plasterboard to provide REI 30 External wall in accordance with table 4 fire performance requirements.

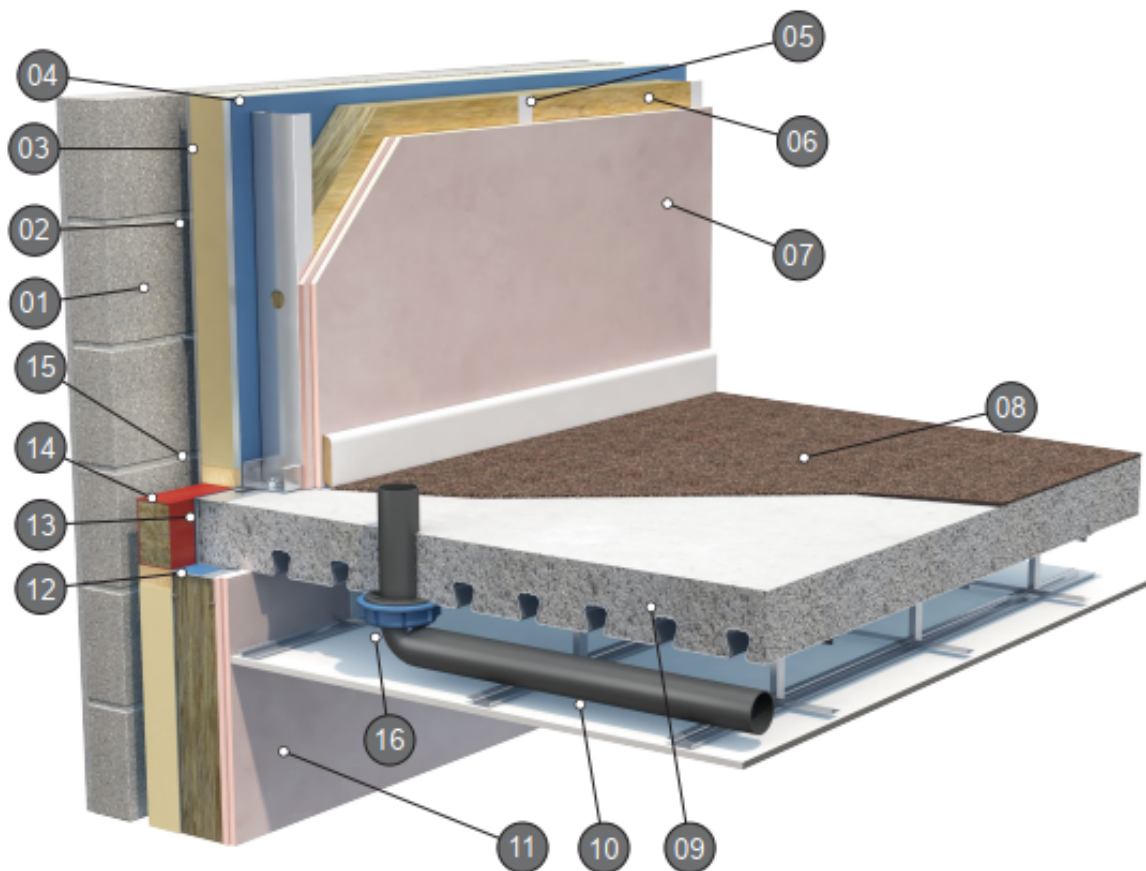
Figure 13- Separating wall to exterior wall detail (exterior view)



- 01.** 22mm OSB3 decking boards.
- 02.** Stone mineral wool insulation.
- 03.** LGS C-Section floor joists.
- 04.** Resilient Bars.
- 05.** 12.5mm Type F Plasterboard to provide REI 30min in accordance with Table 4 fire performance requirements

Note: All services penetrations in intermediate floor must be fully fire stopped to maintain R 30 REI 15 fire protection.

Figure 14 – 30-minute REI Intermediate Floor detail



01. Masonry outer leaf or other NSAI approved cladding system

02. Cavity.

03. PIR Insulation.

04. Selected AVCL.

05. LGS metal stud.

06. Stone mineral wool insulation.

07. 2No. layers 12.5mm Type F Plasterboard to provide REI 60 External wall in accordance with table 4 fire performance requirements.

08. Appropriate resilient soft covering.

09. Concrete poured into metal deck.

10. Suspended ceiling to specification.

11. 2No. layers 12.5mm Type F Plasterboard to provide REI 60 in accordance with Table 4 fire performance requirements.

12. Isolation strip between deck and LGS wall.

13. Composite Deck edge trim.

14 Proprietary open state cavity barrier to specification, fixed as per manufacturers' requirements

15. DPC lapped over cavity closer.

16. Vertical services through compartment floor to have proprietary fire collar in accordance with TGD part B.

Figure 15 – Compartment floor steel composite deck

3.1 STRENGTH AND STABILITY

3.1.1 General

The NUA LGS Building System is intended for use where the Building Owner/Client's appointed Design Team/Architect's drawings are available and satisfy the applicable Building Regulations. The Building Owner/Client and their appointed Architectural and Engineering design team are responsible for the architectural drawings and overall building design to comply with the Building Regulations. NUA, using an experienced Chartered Structural Engineer, are responsible for the structural design and detailing of the NUA LGS Building System.

Under the Building Control (Amendment) Regulations (S.I. 9) of 2014 (BCAR), the NUA LGS Building System certification will typically be supplied as a sub-contractor role under BCAR projects which will require NUA to furnish the relevant ancillary certification per project. The appointed person within NUA will liaise with the Assigned Certifier (AC)/Employers 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 what elements of the project NUA are responsible for and what the ancillary certificate relates to.

3.1.2 Certificate of Structural Compliance

NUA Manufacturing Ltd. are responsible for the design, manufacture, supply, installation, and certification of the system. Buildings constructed using the NUA LGS Building System shall be certified by a competent, Chartered Engineer as being in accordance with Part A of the Building Regulations.

The structural design certificate should cover the adequacy of all the cold formed elements with masonry or other approved cladding system and hot rolled elements within the structure in question which NUA supply. It should also address the dimensions and thickness of each element and member making up the superstructure. 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 walls. Dwellings designed and constructed in accordance with this Certificate will

have adequate strength and stability as per the building codes and standards.

3.1.3 Superstructure Design

The system design must be in accordance with I.S. EN 1990^[23], I.S. EN 1993-1^[23] and the requirement of Part A to Building Regulations. The system shall be designed to comply with the requirements of Part A of the Building Regulations regarding the Design to Avoid Disproportionate Collapse.

The structural assessment of the NUA LGS Building System shall be site and project-specific and a Chartered Structural Design Engineer suitably experienced in this type of structure shall undertake the structural engineering of every building element designed by NUA Manufacturing. In accordance with I.S. EN 1990^[23], a DSL2 (Design Supervision Level) should be employed to check the design in line with good practice.

3.1.4 Substructure Design

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

The design of the substructure is to be the responsibility of the Building Owner/Client's appointed Engineer. The Engineer will need a suitably qualified Chartered Structural Engineer, and the design will be in accordance with the relevant codes and standards, i.e. foundation's shall be designed in accordance with I.S. EN 1997-1^[19].

The NUA Chartered Structural Engineer will be responsible for undertaking a load take down for the structure and providing this information to the Building Owner/Client's appointed Engineer for use in the design of the substructure. The NUA Chartered Structural Engineer will also provide the Building Owner/Client's appointed Engineer with the permissible deflection of the ground floor slab under the LGS frame line loads and podium slab level loading.

3.1.5 Infill Panels Design

Non-load bearing partitions and walls are designed in conformance with the criteria set out in I.S. EN 1993-1^[23], BS 5234-1^[26] and I.S. EN 10143^[27].

3.1.6 Design Loads

During the design process, loads are determined by NUA depending on the intended use of the building and Building Owner/Client's requirements, using I.S. EN 1991-1 suite and designed with reference to:

- Dead and imposed load to I.S. EN 1991-1-1^[27]

- Snow load to I.S. EN 1991-1-3^[29]
- Wind loads based on I.S. EN 1991-1-4^[30]

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^[26] and I.S. EN 10143^[27]. Typical design loads, in the absence of Building Owner/Client specified, project-specific loads, are:

- Imposed load on floor of 1.5kN/m² plus an allowance of 0.5kN/m² for internal partitions.
- Roof imposed loads of 0.60kN/m² with an allowance of 0.25kN/m² distributed load over a loft space with access, along with a concentrated load (point load) of 0.9kN i.e. water tank.
- Wind loads based on I.S. EN 1991-1-4^[30]
- Snow loads to be assessed based on I.S. EN 1991-1-3^[29]

Greater loads may be achieved by project-specific structural design, on request.

3.1.7 Steel Concrete Composite Deck Design

NUA Chartered Structural Engineer is responsible for the structural design of all profiled steel composite concrete decks. The NUA Chartered Structural Engineer is also responsible for design of the propping of this deck and the design of the procedure to remove the propping. A safe system of work for the propping of the slab must be agreed between the Building Owner/Client's appointed Engineer and NUA's Chartered Structural Engineer and needs to be strictly adhered to on site.

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

The NUA Chartered Structural Engineer and NUA 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. The metal deck is designed to bear onto the top of the head track and must have a minimum end bearing suitable to the profile being used before it is fixed. Steel reinforcement bars and mesh should be placed into position using plastic spacers, wheels and tying as required.

The concrete mix must be specified in accordance with project-specific design to I.S. EN 1992-1-2^[29] and should be supplied and manufactured in

accordance with I.S. EN 206^[32]. The concrete must be supplied and laid in accordance with I.S. EN 1992-1-2^[29] Eurocode 2. 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 tests must be supplied to the NUA Chartered 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 the NUA Chartered Structural Engineer to remove props.

3.1.8 Wind Load

Buildings designed in accordance with the NUA LGS Building System Design Manual 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. For very exposed sites on hills above the general level of the surrounding terrain, the system may be specifically designed to meet the requirements as defined in I.S. EN 1991-1-4^[30]. The system may be designed to be used in all locations in Ireland.

3.2 FIRE

3.2.1 General

Buildings using the NUS LGS Building System shall be designed to comply with the relevant requirements of TGDs 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 of TGDs to Part B of the Building Regulations. Additional guidance is contained in BS 9991^[33] & BS 9999^[13].

The NUA LGS Building System shall be designed with the required boarding specification to meet the minimum resistant to fire requirements of Table A1 of TGD to Part B, Vol. 2 and Tables 31 and 32 of TGD to Part B, Vol. 1 of the Building Regulations and the minimum reaction to fire requirements of Table 13 of TGD to Part B Vol. 1 and Section 2.4 of TGD to Part B Vol. 2 of the Building Regulations for all purpose groups to which this certificate applies, and any other building specific structural fire performance requirements.

All roof coverings (pitched or flat) in conjunction with the system shall be designated B_{ROOF} (t4) per TGDs to Part B of the Building Regulations. Roof coverings other than traditional slate and concrete tiles, such as NSAI Agrément approved roof

coverings (pitched or flat), may also be used with the system under the guidance of the NUA nominated Chartered Engineer.

3.2.2 Fire Resistance of Compartment Walls

Table 4 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^[34] and I.S. EN 1365-2^[35]. All fire testing has been carried out with service penetrations in the walls, where appropriate.

Any compartment 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.

Separating walls should be continuous, should run the full height of the building in a continuous vertical plane and should be constructed of materials having a reaction-to-fire classification Class A2 - s3,d2, or better, as per Section 3 of the TGDs to Part B.

3.2.3 Fire Resistance of Compartment Floor (Steel/Concrete Composite Deck)

The fire resistance of the composite deck is provided from the underside of the deck as detailed in Table 4 of this Certificate. The composite deck can provide up to 60 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 of TGDs to Part B of the Building Regulations for all purpose groups to which this certificate relates.

3.2.4 Structural fire safety

Any dampers, ductwork, and sealing of gaps formed by services that pass through the compartment walls and floors will involve 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 comply with I.S. EN 13501-1^[37]. They shall be detailed as described in Section 2.5.6 (of this Certificate) and as specified in the NUA fire stopping details in line with the supporting documents to the Building Regulations.

3.2.5 Structural Fire Safety Purpose Groups (Vol 2)

The buildings in purpose class 1(a), 1(b) & 1(d) are covered under TGD B Fire Safety Dwelling Houses Volume 2 of the Building Regulations. Buildings designed in accordance with the Eurocodes require the structural fire resistance performance specified, to be achieved in accordance with European test methods. The European tests required to be used are I.S. EN 1364-1^[33], I.S. EN 1365-1^[34], I.S. EN 1365-2^[35].

The load-bearing and non-loadbearing elements of the above purpose classes have a fire resistance performance in accordance with the required European test method. Table 4 outlines a combination of 30-minute, 60-minute and 90-minute fire resistance tests.

3.2.6 Structural Fire Safety Purpose Groups (Vol 1)

The fire resistance performances of elements of non-loadbearing and loadbearing structure are given in Table 4 as a combination of I.S. EN 1365-1^[33] and I.S. EN 1365:2^[35]. Table 4 contains fire resistance tests to 30, 60 and 90 minutes.

3.3 AIRTIGHTNESS

Airtightness testing is a mandatory requirement of TGDs to Part L of the Building Regulations. Testing must be carried out as specified in I.S. EN ISO 9972^[38] with additional guidance given in the NSAI's "Certified Air Tightness Tester Scheme Master Document^[54]" and TGDs to Part L of the Building Regulations.

The airtight tape must be installed as per NUA LGS Building System Erector's Manual and system detailing between external wall and party wall panels and the foundations, external to external wall junctions, external wall to party wall junctions and at roof junction.

3.4 WEATHERTIGHTNESS AND DAMP PROOFING

The system has adequate DPCs and DPMs to resist the passage of moisture.

Suitable precautions must be undertaken when preparing the site for the installation of the system so that water cannot flow or pond under the substructure. Unless a peripheral drainage system is to be used, the finished ground level adjacent to the building must be maintained at a minimum of 150mm below the DPC, which must not be bridged. Thresholds shall be detailed to allow level access (as required), while protecting the steel frame from weather and ground moisture. Weep holes and cavity vents should be avoided in immediate threshold areas and should be placed on either side of the threshold.

In accordance with good practice a drainage channel is provided on the ground floor where there is a separating wall. The drainage channels reduce the risk of accidental flooding in one dwelling causing water damage to the neighbouring dwelling.

3.4.1 External Cladding

Where the external façade 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 NUA LGS Building System may be constructed of traditional brick/block to S.R. 325^[6] and I.S. EN 1996-1-1^[7], or NSAI Agrément approved external cladding system certified for use with LGS framed buildings and where the compatibility of the systems has been assessed by the NUA engineer.

Non-traditional facades, certified by NSAI Agrément, may be used within the parameters set out in the scope of their certificate. Other cladding systems, for which fitness for use as a cladding system with a LGS framed building system in Irish climatic conditions, has been determined through the recognised standardised procedures referred to in paragraphs (a), (b) or (c) of Requirement D3 of the Building Regulations or those in Section 1.1 of TGD D, may be suitable for use with this system. However, compatibility of the system with the system as described in this certificate must be determined and written approval must be sought from the appointed NUA Chartered Structural Engineer on the use of such cladding systems. These cladding systems are outside the scope of this assessment.

The masonry outer leaf is tied to the NUA LGS Building System with a stainless-steel slot and channel cavity wall tie system in accordance with I.S. EN 845-1^[8] Specification for ancillary components for masonry Part 1: Wall Ties, Tension Straps, Hangers and Brackets. The tie is intended to be used in masonry to stud applications, with a design cavity width of 40mm in accordance with TGD C. The cavity width is defined as the distance between the outer surface of the rigid board insulation and the inner surface of the masonry leaf. The wall tie system comprises of two parts; the channel incorporates a slot and is factory fitted through the rigid board insulation with the required depth of tek screw directly into the flange of the cold formed studs. The tie channels are fitted to cold-formed steel studs at a frequency that can accommodate the requirements for wall tie spacing as outlined in I.S. EN 1996-1-1^[7] Eurocode 6.

Good building practice such as stepped DPC and weepholes are essential to ensure that moisture within the cavity is deflected to the outside of the building.

3.4.2 Roof Cladding

Roof coverings (pitched or flat) will provide adequate weather resistance when completed in accordance with this Certificate and the manufacturer's instructions.

Buildings constructed using the NUS LGS Building System can readily accommodate adequate rainwater gutters and down pipes.

3.4.3 Windows and Doors

Windows and doors are outside the scope of this Certificate. However, Figures 9, 10 and 11 give indicative details of how they May 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 provides full details of the energy performance aspects of window systems.

Window and door openings complete with sills, their DPC trays and vertical and horizontal DPC's at window jamb and head are incorporated into the panels during the manufacturing process at the factory.

The windows and doors are made to order by the window manufacturer using the dimensions provided by NUA design office and supplied and fitted on site. Once fitted, windows are made weathertight externally using a sealant between the frame and the concrete panel while internally the continuity of the AVCL is maintained using proprietary sealed tape to connect AVCL to the window frame.

Where a window is required to provide an alternative means of escape in a dwelling house or apartment, it must provide an unobstructed opening of at least 0.33m² with a minimum width and height of 450mm. The opening section should be capable of remaining in an open position, which provides the minimum clear area. The window should be positioned as required by BS 9991^[32] and in accordance with Part B1 of TGDs to Part B of the Building Regulations. Any restrictor fitted on the window, must be easy to operate.

3.5 THERMAL PERFORMANCE

The panels were assessed as a hybrid warm frame system where the insulation is included both outside of the steel structure and in between the steel components and as a warm-frame system where the full insulation is external to the LGS frame. The NUA LGS Building System may provide for a wide range of required elemental U-values.

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 shall be determined.

TGDs to Part L of the Building Regulations directs users to Digest 465^[38] "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].

3.5.1 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 as well as used Acceptable Construction Details to meet the requirements of Building Regulations.

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 shall be taken as 0.08.

Alternatively, the transmission heat loss coefficient due to thermal bridging (HTB) may 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.

3.5.2 Internal Surface Condensation

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

3.6 INTERSTITIAL CONDENSATION

3.6.1 Condensation in Walls

Air and vapour control layer is provided on the warm side of the external wall PIR insulation for

protection against interstitial condensation in the external wall build-up.

3.6.2 Condensation in Roofs

In both cold (insulation at ceiling level) and warm (insulation along the slope/covering) roofs, it is recommended that an AVCL is provided on the warm side of the insulation to limit the migration of moisture laden air from the dwelling, entering the roof structure through diffusion. The AVCL can double as the airtight barrier.

Roof ventilation should be provided in accordance with TGD Part F of the Building Regulations and the recommendations of BS 5250^[1], for pitched or flat roofs, as appropriate.

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 requirement depend 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.

3.7 SOUND

3.7.1 Separating Walls (Party Wall)

The specification for the separating wall achieves airborne sound insulation through the following:

- Structural isolation is achieved by leaving a recommended minimum 50mm cavity between the two steel frames.
- Stone mineral wool of minimum 22kg/m³ density is placed between the studs in each frame. These wool batts are continuous from ground floor to the underside of the fire stopping under the roofing finish (pitched or flat) and provide the required acoustic properties.
- Mass is achieved using dense wall linings. Each steel frame when boarded with two layers of plasterboard provides the minimum total mass per unit area of 22Kg/m² per face. All joints between the outer layer of plasterboard are staggered, taped and filled (where required for

decoration) in accordance with manufacturers specifications.

- Reduction of flanking sound is achieved by sealing between the end of the separating wall frames and the outer cladding leaf.
- At the junction of the compartment floor and the party wall, an additional 500mm section of stone mineral wool insulation is provided within the cavity between the two steel frames to minimise flanking and direct sound transmission.

The separating wall (party wall) in the NUA LGS 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.

3.7.2 Compartment Floor Steel Concrete Composite Deck

The composite deck can meet either the requirements of a Type FT-1 floor concrete base with a soft covering or a Type FT-2 Floor concrete base with a floating floor as described in section 4 of TGD to Part E of the Building Regulations.

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

In a Type FT-1 floor the soft covering reduces the impact sound at source. The mass per unit area of the floor, coverings and ceilings meet the specification for a Type FT-1 separating floor. 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 FT-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.

All buildings, post completion, must be subjected to acoustic testing to demonstrate compliance to TGD to Part E of the Building Regulations with testing by a person certified by an independent third party. In all applicable cases, the values achieved for buildings incorporating the NUA separating floors design must meet the requirements set out in TGD to Part E.

3.7.3 LGS Joist Separating Floor (LGS Joists)

A lightweight floating floor consists of a floating layer and resilient layer. A floating floor uses a resilient layer to isolate the walking surface from the base, and this isolation contributes to both airborne and impact sound insulation. The joist and steel concrete composite deck compartment

floor systems have been assessed with both an approved batten system and an acoustic flooring grade stone mineral wool product.

3.8 ELECTRICAL AND PLUMBING SERVICES

Electrical and plumbing services are outside the scope of this Certificate. However, in designing and installing these services it is essential that the following procedures are followed, and precautions are taken to minimise the risk of long-term damage to the steel frame or the services.

- At the design stage, it is useful if the positions and sizes of services may be established in advance, as special holes may be cut in the factory to help with the rapid and economic installation of services.
- In general, 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 the National Rules of Electrical Installations I.S. 10101^[11]
- All service holes in the steel frame members must be fitted with rubber or plastic grommets to avoid damage to services. To ease the installation of services, particularly electrical cables, these purpose-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 the National Rules of Electrical Installations I.S. 10101^[12]
- Under no circumstances should electrical cables be placed within compartment floors, compartment walls and/or separating walls. Walls must be battened out to provide a false service zone in which to distribute electrical services on these fire rated build-ups.
- The enclosure of cold-water pipe work 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.
- 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.

3.9 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.

Adequate provision should be made in the initial design phase for access and maintenance over the life of the system. The system shall be inspected and maintained in accordance with the Certificate holder's instructions. Below is a non-exhaustive list of maintenance inspections and works which should be undertaken regularly:

- Regular examination (at least annually) of the sealant around openings such as window frames, door frames and ventilation apertures for cracking, peeling or loss of adhesion. Sealant must be removed and replaced if there are signs of deterioration or damage. Regular maintenance ensures long-lasting seals, enhanced protection, and avoids premature failure. The joints in windows and doors may require resealing at approximately 10-year intervals. Proper care and reapplication should be part of routine maintenance.
- Proper care and reapplication should be part of routine maintenance.
- Visual inspection of the render for signs of cracking, and repair where necessary in line with I.S. EN 13914^[53] recommendations.
- Visual inspection to ensure all flashings, capping and sills are performing correctly to shed water from the façade.
- Visual inspection to ensure all downpipes and gutters are watertight and not leaking causing excessive localised water on the façade.
- Any visible streaking on the façade must be thoroughly investigated and resolved.
- Necessary repairs should be carried out immediately and must be in accordance with the Certificate holder's instructions to prevent deterioration or damage, and to protect the integrity of the system.

Repainting should be carried out in accordance with the relevant recommendations of BS 6150^[40]. 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. Care should

be taken to ensure that any synthetic finish coat used is compatible with the original system and that the water vapour transmission or fire characteristics are not adversely affected.

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^[41].

4.1 STRENGTH AND STABILITY

The design of a typical building has been examined by the NSAI Agrément and demonstrates compliance with compliance with the TGD to Part A of the Building Regulations 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 Eurocode 3^[24]
- I.S. EN 1991-1-1 Eurocode 1^[28]
- I.S. EN 1991-1-4 Eurocode 1^[30]
- I.S. EN 1991-1-3 Eurocode 1^[29]
- I.S. EN 1992-4 Eurocode 2^[21]
- timber roof trusses to I.S. EN 1995-1-1^[41] Eurocode 5.

The system has been assessed for use in buildings of categorisation of consequence classes up to 2b as per I.S. EN 1991-1-7+NA^[72].

4.2 BEHAVIOUR IN RELATION TO FIRE

4.2.1 Fire Resistance

Fire tests and assessment of test results show that buildings constructed using the NUA LGS Building System can meet the Building Regulation requirements in relation to fire resistance as shown in Table 4. The tests have demonstrated the ability of the system to withstand severe fire exposure for the period required for compliance with the Building Regulations in terms of fire performance. Tests have been conducted by NUA to meet fire test requirements I.S. EN 1364-1^[33], I.S. EN 1365-1^[34] and I.S. EN 1365-2^[35]. The fire resistance required is dependent upon the purpose class of the building being designed and constructed.

The NUA LGS Building System shall be designed with the required boarding specification to meet the minimum requirements of Table A1 of TGD B Volume 2 of the Building Regulations for purpose class 1(a), 1(b) & 1(d), Table 31 and 32 of TGD B Volume 1 and to meet the minimum criteria of any other building specific structural fire performance requirements. Table 4 of this Certificate provides summaries of test specimens fire resistance performances which provide a variety of boarding specifications and their associated fire resistance performance that will have its stability maintained for the minimum required period in the event of fire.

Accommodation of Services in Compartment Walls/Floors and Separating Walls must be in accordance with Section 3.5.4.1 of TGD B Volume 2 of Building Regulations for purpose group 1(a), 1(b) & 1(d) and in accordance with Sections 3.5.15 and 3.7 of TGD B Volume 1 of Building Regulations for all other purpose groups.

The system may 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 I.S. EN 13501-1^[37], to satisfy the requirements of section 3 of the TGDs to Part B of the Building Regulations.

The fire resisting elements of the construction that are specified in Table 4 of this Certificate provide for 30-minutes, 60-minute and 90-minutes fire resistance, for a range of specifications.

4.2.2 Surface Spread of Flame

The masonry outer leaf has a designated Class A1 fire rating as shown in Table 3, while the undecorated internal plasterboard lining to wall and ceilings provides a fire rating of Class A2-s3, d2.

Material	Fire Rating - European Class
Brickwork/Blockwork	A1
Internal Plasterboard before decoration	A2-s3, d2
Slates/Tiles	Class B Roof(t4)

Table 3: Fire rating characteristics

4.2.3 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 2 – 6 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^[52], 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 250mm of solid concrete or as detailed in Diagram 8 of TGD to Part J of the Building Regulations.

4.2.4 Roof Designation

All tiles or slates used in the roof in conjunction with the NUA LGS Building System are designated AA in accordance with TGD to Part B of the Building Regulations (see Table 35 of TGD Part B Volume 1 and Table A4 of TGD to Part B Volume 2 for notional

designations of roof coverings). Other NSAI Agrément approved roof coverings (pitched or flat) may also be used with the system under the guidance of the NUA Chartered Structural Engineer. Other roof covering systems (pitched or flat), for which fitness for use as a roofing system with a LGS framed building system in Irish climatic conditions, has been determined through the recognised standardised procedures referred to in paragraphs (a), (b) or (c) of Requirement D3 of the Building Regulations or those in Section 1.1 of TGD D, may also be suitable. However, compatibility of the system with the system as described in this certificate must be determined and written approval must be sought from the appointed NUA Chartered Structural Engineer on the use of such pitched or flat roofing systems.

4.2.5 Cavity Barriers

Cavity barriers are covered in clause 2.5.6 of this certificate.

4.3 THERMAL PROPERTIES

The NUA LGS Building system 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 shall be determined.

Assessment of U-value calculations shows that the NUA LGS Building System meets and can exceed the maximum back-stop elemental U-value requirements of TGDs to Part L of the Building Regulations. The NUA LGS Building System may provide for a wide range of required elemental U-values.

Table 5 of this certificate provides a range of external wall elemental U-values for the NUA LGS Building System. Table 6 provides a sample U-value calculation for an external wall taking account of the approached outlined in BRE Digest 465^[38].

Both Table 5 and Table 7 allow for a light gauge steel (LSG) section 1.2mm gauge at 600mm centres. Table 7 provides an overview of the effects on the elemental U-value of increasing the gauge of the LSG and changing the spacing (c/c) of same.

TGD Part L of the Building Regulations directs users to BRE Digest 465^[38] published by BRE of light steel-framed constructions. A more precise result is obtained by using a numerical method which conforms to I.S. EN ISO 10211^[3].

U-values for roofs should be calculated to I.S. EN ISO 6946^[51] U-value for ground floor slab should be calculated to I.S. EN ISO 13370^[40].

4.3.1 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.

Table 8 of this certificate provides ψ -value for a range of NUA LGS Building System junctions and their corresponding flanking elemental U-values. When flanking elemental U-values deviate by an aggregated 20% from the target U-values given in Table 8, the ψ -values no longer remain valid, and guidance must be sought from the Certificate holder. A full listing of ψ -value calculations, along with the building details on which calculations are based, are contained within the Certificate holder's System manual.

Bridged junctions were thermally modelled in accordance with BRE IP 1/06^[1] and BRE Report BR 497^[2] by NSAI Certified Thermal Modellers.

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 must be entered into DEAP. When all building junctions are demonstrated to be equivalent to or better than the corresponding Acceptable Construction Details (ACD), then the Y-value shall be taken as 0.08.

Alternatively, the transmission heat loss coefficient due to thermal bridging (H_{TB}) may 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 H_{TB} by the exposed surface area.

ψ -values for other junctions outside the scope of this Certificate should be assessed by an NSAI registered Thermal Modeller or equivalent competent person in accordance with the BRE IP1/06^[2] and the conventions outlined in BRE Report BR 497^[3].

NSAI approved thermal modeller register may be found at <https://www.nsai.ie/certification/agreement-certification/thermal-modellers-scheme/>.

4.3.2 Internal Surface condensation

As part of the assessment carried out to determine the ψ -values, internal surface temperatures factors (f_{Rsi}) are checked. When internal surface temperatures are greater than 15°C, best practice

has been adopted to safeguard against the risk of surface condensation occurring under normal occupancy and humidity class levels.

Table 8 of this certificate provides internal surface temperature factors (f_{Rsi}) for a range of building junctions and their corresponding flanking elemental U-value.

The NUA LGS Building System has been assessed and when detailed in accordance with this certificate, these thermally bridged junctions comply with the requirements of the TGDs to Part L of the Building Regulations.

4.4 INTERSTITIAL CONDENSATION

4.4.1 Condensation in Walls

Calculations to BS 5250^[1] have been carried out for all external wall build ups as covered by this certificate. The results pass the risk criteria in I.S. EN ISO 13788^[43] and no risk of degradation of building materials or deterioration of thermal performance as a consequence of the calculated maximum amount of moisture. Project-specific condensation risk analysis outside of the parameters calculated may require additional condensation risk analysis considering the location of the building, the building occupancy and purpose class.

The AVCL is applied in between the PIR and the external side of the LGS framework which protects against interstitial condensation. The AVCL is applied during the manufacturing process at the factory.

4.4.2 Condensation in Roof

Although roof trusses are outside the scope of this certificate, the detailing at eaves and separating wall junction with roof has been assessed and is considered adequate. It is recommended that in both cold (insulation at ceiling level) and warm (insulation along the slope) pitched or flat roofs, an AVCL is provided on the warm side of the insulation to limit the migration of moisture laden air from the dwelling, entering the roof structure through diffusion.

Roof ventilation should be carried out in accordance with TGD Part F of the Building Regulations and the recommendations of BS 5250^[1], for pitched or flat roofs, as appropriate. It is important to ensure that the ventilation is not obstructed by roof insulation at eaves level. When roof insulation is packed into the eaves space, proprietary eaves tray may be provided to maintain ventilation at the eaves. Refer also to section 3.6 of this Certificate.

4.5 VENTILATION

4.5.1 Un-designed Air Infiltration

The NUA LGS Building System shall be designed to provide the required project-specific airtightness requirement and may be achieved in practice due

to its offsite production process; hybrid construction build up, and the quality of product produced in a factory-controlled environment. The system incorporates an AVCL on all external walls and ceiling lines which is designed to maximize airtightness performance. To avoid excessive heat losses due to un-designed air infiltration and to maintain continuity on the building component relied upon to perform the air sealing function of the building, it is necessary to install peripheral seals around windows, doors, services, floors, roof and all building junctions which penetrate the envelope of the building.

TGD to Part L of the Building Regulations requires an air permeability pressure tests to be carried out on all dwellings by an independent third party such as a National Standards Authority of Ireland (NSAI) certified tester or an Irish National Accreditation Board (INAB) accredited tester or equivalent.

Air permeability results for dwellings constructed using the NUA LGS Building System were assessed and show compliance with the backstop air permeability index at a pressure differential of 50Pa across the building envelope of $5 \text{ m}^3/(\text{h.m}^2)$, as per TGDs to Part L of the Building regulations.

The procedure for testing is specified in I.S. EN ISO 9972^[38] 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. As outlined in Clause 1.5.4.1 of TGD to Part L, two sets of measurements should be made when testing a dwelling namely a pressurisation and depressurisation test.

4.5.2 Designed Ventilation

TGD to Part F of the Building Regulations prescribes ventilation requirements to meet the needs of occupants within the building. This may be achieved by limiting moisture content of the air within the building so that it does not contribute to condensation and mould growth and to limit the concentration of harmful pollutants in the air within the dwelling.

In addition to ventilation requirements within the dwelling living space, TGD to Part F makes provisions for ventilation requirements in roofs and roof voids above the insulation line. These provisions will allow for the removal of moisture laden air or condensation which may enter the roof structure from the dwelling either through diffusion or exfiltration.

Where the air permeability is greater than $3 \text{ m}^3/(\text{h.m}^2)$ and lower than $5 \text{ m}^3/(\text{h.m}^2)$, natural ventilation may be considered as one acceptable ventilation solution for a dwelling. When the air permeability is lower than $3 \text{ m}^3/(\text{h.m}^2)$ natural ventilation is no longer acceptable, and some form

of mechanical ventilation system must be considered.

All ventilation systems will be installed, balanced and commissioned by competent installers and validated by a competent person to ensure that they achieve the design flow rates. The validation should be carried out by a person certified by an independent third party to carry out this work, e.g. National Standards Authority of Ireland (NSAI) certified or equivalent.

When continuous mechanical ventilation systems are being considered, low air permeability values will be required for the energy efficient operation of the mechanical systems.

For all ventilation systems, provision for a 10mm gap under internal doors to facilitate transfer of air and cross ventilation between rooms must be provided.

4.6 SOUND

4.6.1 Separating Walls (Party Wall)

The acoustic performance of the separating walls of the NUA LGS building system have been assessed by both on-site testing and comparison with Robust Standard Details for Separating Wall - Steel Frame E-WS-1 and SCI P372^[45] and through adopting best practice at salient junctions to minimise the effects of airborne, impact and flanking sound.

In respect of party walls (separating wall) an examination was also carried out on site of the key junctions in the external walls to ensure compliance with the requirements of Part E of the Building Regulations.

When constructed in accordance with this certificate the NUA LGS Building System Separating walls shall meet the requirements of TGD to Part E of the Building Regulations.

4.6.2 Separating/Compartment Floor

The acoustic performance of the compartment floor specified in Section 2.5.3 has been assessed by both on site testing and comparison with Robust Standard Details for Separating Floor-Metal Joist E-FS-3 and SCI P372^[45]. Best practice has been adopted at salient junctions to minimise the effects of airborne, impact and flanking sound. In respect of compartment floor (separating floor) an examination was also carried out of the key junctions with the external walls to ensure compliance with the requirements of Part E of the Building Regulations.

4.6.3 On Site Testing

The NUA LGS Building System separating wall and floor 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. All sound insulation testing was

carried out in accordance with I.S. EN ISO 16283-1^[46] and I.S. EN ISO 16283-2^[47].

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 NUA LGS joist separating floors design must meet TGD Part E requirements (i.e. impact $\leq 58\text{db}$, airborne $\geq 53\text{db}$). See Table 9 for results achieved when tested.

4.7 WEATHERTIGHTNESS AND DAMP PROOFING

The system has adequate DPCs and DPMs to resist the passage of moisture.

4.7.1 External Cladding

The external wall incorporates a drained cavity. Wind-driven rain, which may reach the cavity under adverse conditions, will be effectively prevented from penetrating the inner leaf.

4.7.2 Windows and Doors

The detailing at window and door openings has been assessed and is considered adequate to ensure that water penetration will not occur at these locations assuming conventional window frame profiles and sealing arrangements are used.

4.8 DURABILITY

The steel frame structure, when used with an appropriate external 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/m² Zinc galvanised coating which will provide adequate protection to the steel members. In addition to this, the steel is kept in a "warm frame" environment, which should prolong the life of the steel. The external cladding system must be appropriately detailed, executed and maintained to adequately protect the LGS frame components for their lifespan.

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 bottom LGS track will be a minimum of 150mm above finished ground level.

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.

It is important to note that the durability of the render system is entirely dependent on the correct installation of the product in accordance with its NSAI Agrément Certificate and/or the manufacturer's instructions, I.S. EN 13914-1^[53] and ongoing care and maintenance as per the manufacturer's instructions. Critical details include

rendering at window sills, raised features, junctions with eaves and verges, and the use of suitably designed overhangs and flashings. Reference should be made to I.S. EN 13914-1^[53] for general advice on design, in particular on the use of angle, stop and movement joint beads. Render shall meet durability and exposure conditions as per S.R. 325^[6]. Any damage to the surface finish shall be repaired immediately and regular maintenance shall be undertaken as outlined in render manufacturer's specification.

Buildings constructed using the NUA LGS Building System will, when constructed in accordance with NUA LGS Building System Erectors Manual and the requirements of this Certificate along with all relevant codes of practice will have a minimum design life of at least 60 years in accordance with BS 7543^[46].

4.9 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 NUA LGS Building System:

- Structural strength and stability (racking resistance, load bearing capacity).
- Behaviour in relation to fire.
- System specific loadbearing fire testing to I.S. EN 1365-1^[34] and I.S. EN 1365-2^[35].
- On-site acoustic performance, resistance to airborne and impact sound transmission.

- Thermal insulation performance calculations.
- Corrosion of fasteners in normal conditions with a view to a minimum 60-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].
- Pre-completion airtightness testing.
- 3D thermal modelling of junction details in accordance with BRE IP 1/06^[2] and BRE Report BR 497^[3].

4.9.1 Other Investigations

Existing data was examined to assess:

- Adequacy of weather tightness of building constructed using the system.
- Durability of the system.
- Requirements for maintenance.
- product properties in relation to fire, toxicity, environmental impact and the effect on mechanical strength/stability and durability.

4.9.2 Production Audits

Production audits were carried out at the factory in Carlow town to examine the process of structural design, steel frame fabrication, assembly and to assess the adequacy of the methods adopted for quality control.

4.9.3 Site Erection Visits

Buildings under construction were visited to assess the practicability of construction (erection) and the adequacy of NUA site supervision arrangements.

Type	Element summary description:	Test Standard	Classification	Purpose Group**
External Load Bearing Walls				
1	Fire Test conducted on 3000mm x 3000mm x 265mm (w x h x th) panel with total vertical load of 84kN 6 No. LGS C-Studs (100x45x1.2mm) with noggins at mid-height 100mm glass mineral wool (10kg/m³ density) fitted between studs - Fire side: Single layer of Gyproc Fireline Type F 15 mm thick fixed using 25mm long drywall screws at 300mm centres, taped and jointed finish. - Non-fire side: an AVCL layer, 100mm thick PIR panel and an external breather membrane layer fixed to the vertical studs by stainless steel wall tie channel and spaced at 600mm centres, and 135mm long screws. (2 No. Double Sockets were fitted on the fire side)	I.S. EN 1365-1 ⁺	REI 30mins from inside	1(a) 1(b) 1(c) ** 1(d) 2(a)** 5(b)**
2	Fire Assessment on 3000mm x 3000mm x 114mm (w x h x th) panel with total vertical load of 72KN 6 No. LGS C-studs (89x45x1.2mm) with noggins at mid height 100mm stone mineral wool (22kg/m³ density) fitted between studs - Fire side: 1no. layer of 12.5mm Knauf Fire Panel Type F/Gyproc Fireline plasterboard fixed to LGS frame with 25mm dry wall screws at 200mm centres at perimeter and 300mm centres at intermediate stud locations. - Non-fire side: 70mm thick PIR panel fixed to LGS studs. (2 No. Double Sockets fitted on the fire side)	I.S. EN 1365-1 ⁺	REI 30mins from inside	1(a) 1(b) 1(c) ** 1(d) 2(a)** 5(b)**
3	Fire test conducted on 3000mm x 3000mm x 184.5mm (w x h x th) panel with total vertical load of 60kN 6 No. LGS C-Studs (89x45x1.2mm) with noggins at mid-height 100mm stone mineral wool (45kg/m³ density) fitted between studs - Fire side: 2no. layers of Gyproc Fireline Type F 12.5mm thick using 35mm and 55mm long drywall screws at 200mm centres at board perimeter and 300mm centres at intermediate studs, taped and jointed finish. - Non-fire side: 75mm thick PIR panel with joints foil taped, fixed to the vertical studs by stainless steel wall tie channel and spaced at 600mm centres, and 105mm long screws. (2 No. Double Sockets were fitted on the fire side)	I.S. EN 1365-1 ⁺	REI 60mins from inside	1(a) 1(b) 1(c) ** 1(d) 2(a)** 5(b)**
4	Fire test conducted on 3000mm x 3000mm x 250mm (w x h x th) panel with total vertical load of 84kN - Fire side: a 12mm Aquapanel External cement board fixed to 38 x 50mm treated timber battens at 600mm centres using Aquapanel rustproof screws at 200mm centres in field of board and 150mm centres at edges - Breathable membrane fitted to external side of 100mm PIR with AVCL membrane to inner side 6 No. LGS C-Studs (100x45x1.2mm) with noggins at mid-height 100mm stone mineral wool (22kg/m³ density) fitted between studs	I.S. EN 1365-1 ⁺	REI 60mins from outside	1(a) 1(b) 1(c) ** 1(d) 2(a)** 5(b)**

Type	Element summary description:	Test Standard	Classification	Purpose Group**
	- Non-fire side: 2no. layers of Siniat Fireboard Type F 12.5mm Plasterboard fixed using 3.5 x 25/38mm (Ø x L) screws at 300mm centres, tape and jointed. (2 No. Double Sockets were fitted on the non-fire side)			
5 ¹	Assessment of Fire test conducted on 3000mm x 3000mm x 300mm (w x h x th) panel with total vertical load of 60kN - Fire side: 2no. layers of Gyproc Fireline Type F 12.5mm Plasterboard fixed using 3.5 x 25/35/45mm ((Ø x L) screws at 300mm centres - No. LGS C-Studs (100x45x1.2mm) with noggins at mid-height 100mm stone mineral wool (22kg/m³ density) fitted between studs - Non-fire side: a 12mm A2 cement bonded particle sheathing board fixed to LGS frame using 4.8 x 45mm ((Ø x L) screws at 600mm centres 150mm External stone mineral wool (density 120 kg/m³) fitted over sheathing board with breather membrane to fire side, held in position with 1.2mm stainless steel wall tie channel spaced at 600mm centres. (2 No. Double Sockets were fitted on the fire side)	I.S. EN 1365-1 ⁺	REI 60mins from inside	1(a) 1(b) 1(c) ** 1(d) 2(a)** 5(b)**
6 ¹	Fire test conducted on 3000mm x 3000mm x 172mm (w x h x th) panel with total vertical load of 96kN 6 No. LGS C-Studs (100x50x1.2mm) with noggins at mid-height 100mm stone mineral wool (22kg/m³ density) fitted between studs - Fire side: a 12mm B-s1,d0 cement bonded particle sheathing board fixed to LGS frame using 4.8 x 45mm ((Ø x L) screws at 600mm centres, 150mm External stone mineral wool (density 120 kg/m³) fitted over sheathing board with breather membrane to fire side, held in position with LGS sections fixed at 600mm centres. - Non-fire side: 2no. layers of Gyproc Fireline Type F 12.5mm Plasterboard fixed using 3.5 x 25/38mm ((Ø x L) screws at 300mm centres (2 No. Double Sockets were fitted on the non-fire side)	I.S. EN 1365-1 ⁺	REI 120mins from outside	1(a) 1(b) 1(c) 1(d) 2(a) 5(b)
7 ¹	Fire test conducted on 3000mm x 3000mm x 300mm (w x h x th) panel with total vertical load of 96kN - Fire side: 3no. layers of Gyproc Fireline Type F 12.5mm Plasterboard fixed using 3.5 x 25/35/45mm ((Ø x L) screws at 300mm centres 6 No. LGS C-Studs (100x45x1.2mm) with noggins at mid-height 100mm stone mineral wool (22kg/m³ density) fitted between studs - Non-fire side: a 12mm A2 cement bonded particle sheathing board fixed to LGS frame using 4.8 x 45mm ((Ø x L) screws at 600mm centres, 150mm External stone mineral wool (density 120 kg/m³) fitted over sheathing board with breather membrane to fire side, held in position with LGS sections fixed horizontally at 600mm centres. (2 No. Double Sockets were fitted on the fire side)	I.S. EN 1365-1 ⁺	REI 120mins from inside	1(a) 1(b) 1(c) 1(d) 2(a) 5(b)

Type	Element summary description:	Test Standard	Classification	Purpose Group**
Internal Load Bearing Walls¹				
8	Fire Test conducted on 3000mm x 3000mm x 114mm (w x h x th) panel with total vertical load of 72KN 6 No. LGS C-studs (89x45x1.2mm) with noggins at mid height 100mm stone mineral wool (22kg/m³ density) fitted between studs - Fire side: 1no. layer of 12.5mm Knauf Fire Panel Type F plasterboard fixed to LGS frame with 25mm dry wall screws at 200mm centres at perimeter and 300mm centres at intermediate stud locations. - Non-fire side: 1no. layer of 12.5mm Knauf Fire Panel Type F plasterboard fixed to LGS frame with 25mm dry wall screws at 200mm centres at perimeter and 300mm centres at intermediate stud locations. (2 No. Double Sockets fitted on the fire side)	I.S. EN 1365-1 ⁺	REI 30mins from exposed side	1(a), 1(b), 1(c) 1(d), 2(a), 5(b)
9	Fire Test conducted on 3000mm x 3000mm x 139mm (w x h x th) panel with total vertical load of 84KN 6 No. LGS C-studs (89x45x1.2mm) with noggins at mid height 100mm stone mineral wool (22kg/m³ density) between studs - Fire side: 2no. layers of 12.5mm Knauf Fire Panel Type F plasterboard fixed to LGS frame with 35/55mm dry wall screws at 200mm centres at perimeter and 300mm centres at intermediate studs. - Non-fire side: 2no. layers of 12.5mm Knauf Fire Panel Type F plasterboard fixed to LGS frame with 35/55mm dry wall screws at 200mm centres at perimeter and 300mm centres at intermediate studs. (2 No. Double Sockets fitted on the fire side)	I.S. EN 1365-1 ⁺	REI 60mins from exposed side	1(a), 1(b), 1(c) 1(d), 2(a), 5(b)
10	Fire assessment on 3000mm x 3000mm x 139mm (w x h x th) panel with total vertical load of 84KN 6 No. LGS C-studs (89x45x1.2mm) with noggins at mid height 100mm stone mineral wool (22kg/m³ density) between studs - Fire side: 3no. layers of 12.5mm Knauf Fire Panel Type F plasterboard fixed to LGS frame at 200mm centres at perimeter and 300mm centres at intermediate stud locations. - Non-fire side: 3no. layers of 12.5mm Knauf Fire Panel Type F plasterboard fixed to LGS frame at 200mm centres at perimeter and 300mm centres at intermediate stud locations. (2 No. Double Sockets fitted on the fire side)	I.S. EN 1365-1 ⁺	REI 90mins from exposed side	1(a), 1(b), 1(c) 1(d), 2(a), 5(b)
Separating Walls¹				
11	Twin-frame Separating Wall - Fire Assessment on 3000mm x 3000mm panel with total vertical load of 84kN 6 No. LGS C-Studs (89x45x1.2mm) at 600mm centres with noggins at mid height 100mm stone mineral wool (22kg/m³ density) between studs	I.S. EN 1365-1 ⁺	REI 60 mins from either side	1(a) 1(b) 1(c) ** 1(d) 2(a)** 5(b)**

Type	Element summary description:	Test Standard	Classification	Purpose Group**
	2No. layers of 12.5mm Knauf Fire Panel Type F Plasterboards 12.5 mm thick fixed with 35 and 55mm screws to LGS frame at 200mm centres at perimeter and 300mm centres at intermediate stud locations. 50mm Cavity 6 No. LGS C-Studs (89x45x1.2mm) at 600mm centres with noggins at mid height 100mm stone mineral wool (22kg/m³ density) between studs 2No. layers of 12.5mm Knauf Fire Panel Type F Plasterboards fixed with 35 and 55mm screws to LGS frame at 200mm centres at perimeter and 300mm centres at intermediate stud locations. - Optional: service cavity may be created with the addition of a 25mm timber batten and internal lining of 12.5 Type A plasterboard			
12	Twin-frame Separating Wall - Fire Assessment on 3000mm x 3000mm panel with total vertical load of 84kN 6 No. LGS C-Studs (89x45x1.2mm) at 600mm centres with noggins at mid height 100mm stone mineral wool (22kg/m³ density) fitted between studs 3No. layers of 12.5mm Knauf Fire Panel Type F Plasterboards 12.5 mm thick fixed to LGS frame at 200mm centres at perimeter and 300mm centres at intermediate stud locations. 50mm Cavity 6 No. LGS C-Studs (89x45x1.2mm) at 600mm centres with noggins at mid height 100mm stone mineral wool (22kg/m³ density) fitted between studs 3No. layers of 12.5mm Knauf Fire Panel Type F Plasterboards fixed to LGS frame at 200mm centres at perimeter and 300mm centres at intermediate stud locations. - Optional: service cavity may be created with the addition of a 25mm timber batten and internal lining of 12.5 Type A plasterboard	I.S. EN 1365-1 ⁺	REI 90 mins from either side	1(a) 1(b) 1(c) 1(d) 2(a) 5(b)
Internal Non-Load Bearing Walls¹				
13	Fire Assessment on Test Specimen described at 6 above: 6 No. LGS C-studs (89x45x1.2mm) at 600mm centres (no noggins) 100mm stone mineral wool (22kg/m³ density) fitted between studs - Fire side: 1no. layer of 12.5mm Knauf Fire Panel or Gyproc Fireline Type F plasterboard fixed to LGS frame with 25mm dry wall screws - Non-fire side: 1no. layer of 12.5mm Knauf Fire Panel or Gyproc Fireline Type F plasterboard fixed to LGS frame with 25mm dry wall screws	I.S. EN 1365-1	EI 30mins from exposed side	1(a), 1(b), 1(c) 1(d), 2(a), 5(b)
14	Fire Assessment on Test Specimen described at 7 above: 6 No. LGS C-studs (89x45x1.2mm) at 600mm centres (no noggins)	I.S. EN 1365-1	EI 60mins from exposed side	1(a), 1(b), 1(c) 1(d), 2(a), 5(b)

Type	Element summary description:	Test Standard	Classification	Purpose Group**
	100mm stone mineral wool (22kg/m³ density) fitted between studs - Fire side: 2no. layers of 12.5mm Knauf Fire Panel or Gyproc Fireline Type F plasterboard fixed to LGS frame with 35/55mm dry wall screws - Non-fire side: 2no. layers of 12.5mm Knauf Fire Panel or Gyproc Fireline Type F plasterboard fixed to LGS frame with 35/55mm dry wall screws			
Intermediate floor: LGS C-section Joist				
15	Floor supporting a Uniformly Distributed Load of 1.65kN/m² - Test conducted on 4948mm long x 3060mm wide x 300.5mm thick floor - Exposed side: 1no. 12.5mm Gyproc Fireline Type F plasterboard fixed to 16mm Gyproc resilient bar at 400mm centres - Frame: 6 No. C-section Steel joists 250 x 60 x 2mm (depth x flange x gauge) at 600mm nominal centres, cavity partially filled with 100mm stone mineral wool (density 22kg/m³) - Non-fire side: 1No. layer of 22mm OSB3 with glued T&G joints fixed to LGS joists with 55 mm screws.	I.S. EN 1365-2 ⁺	30 mins from below ceiling level	1(a), 1(b), 1(c) **, 1(d), 5(b)**
16	Floor supporting a Uniformly Distributed Load of 5kN/m² - Test conducted on 4208mm long x 2960mm wide x 285mm thick floor - Exposed side: 1no. 12.5mm Gyproc Fireline Type F plasterboard fixed using 3.5 x 25 mm (Ø x L) screws at 230mm centres across field of board and 150mm centres at perimeter ends of boards. Tape and jointed finish. - Frame: 9 No. 250 x 65 x 2mm LGS C-joists framing joists (depth x flange x gauge) at 400mm nominal centres - Non-fire side: 1No. layer of 18mm OSB3 fixed to LGS joists with 41 mm screws at 300mm centres. OSB3 adhered to top flange of C-joists with sealant.	I.S. EN 1365-2 ⁺	REI 30 mins from below ceiling level	1(a), 1(b), 1(d)
Compartment floors: LGS Lattice Truss (top floor ≤11m) ¹				
17	Floor supporting a Uniformly Distributed Load of 1.5kN/m² - Test conducted on 4300mm long x 3000mm wide x 339.5mm thick floor - Exposed side: 1no. 12.5mm Gyproc Standard Type A plasterboard fixed to 50 x 25mm timber battens at 400mm centres, below 2No. layers of 15mm Gyproc Fireline Type Plasterboard fixed using 3.5 x 35/55 mm (Ø x L) screws at 300mm centres (4No. light fitting cut-outs in Type A layer facing fire) - Frame: 6 No. 250mm deep LGS lattice truss of lipped C-section framing joists 62 x 50 x 1.2mm (depth x flange x gauge) at 600mm nominal centres, cavity partially filled with 100mm stone mineral wool (density 22kg/m³) - Non-fire side: 1No. layer of 22mm OSB3 fixed to LGS joists with 55 mm screws at 300mm centres.	I.S. EN 1365-2 ⁺	60 mins from below ceiling level	1(a), 1(b), 1(c), 1(d), 5(b)

Type	Element summary description:	Test Standard	Classification	Purpose Group**
Compartment floors: Composite Metal Deck***				
18	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 30mm cover below the upper surface - 4500mm span.	Eurocode Design	30 mins from below deck	1(a), 1(b), 1(c) **, 1(d), 2(a)**, 5(b)**
19	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 30mm cover below the upper surface - 3420mm span.	Eurocode Design	60 mins from below deck	1(a), 1(b), 1(c), 1(d), 2(a), 5(b)

Notes:

The above build-ups are summaries of those tested to the referenced standards and assessed as part of the Agrément certification process – they should not be taken as an exhaustive list. For full details of test reports and assessments, the Certificate holder should be contacted.

Fire performance of elements to be determined on a project-specific basis and in accordance with TGDs to Part B for purpose group, building height and layout.

For alternative approaches to fire safety requirements, refer to TGDs to Part B of the Building Regulations.

In situations where there is no fire requirement for non-loadbearing walls, alternative non-loadbearing wall boarding specifications may be used once they have been agreed and signed off on by Nua Manufacturing Ltd. provided the boarding supplier has provided supporting fire test data.

In situations where the element continues to have a fire and/or load bearing performance requirement, any change to the build-up or materials of the tests specimen require that the specimen fire performance is verified by fire testing to relevant EN standard or by technical assessment by a suitably qualified competent professional in accordance with I.S. EN 15725^[49] and I.S. CEN/TS 15117^[49].

Type F plasterboard refers to the particular type of plasterboard tested in the respective fire tests and the details are available directly from Nua Manufacturing.

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 NUA Manufacturing Ltd.

All wall tests were completed without the joints being taped and jointed unless specified in the Element summary description above.

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

**Design to be dictated by project-specific loading and height requirements on a case-by-case basis to meet the requirements of Parts A and B of the Building Regulations.

*** It is assumed that the composite decks are adequately supported by a suitable fire-resisting structure. Supporting structure must be fully protected to underside of composite deck including any concealed cavities. For load/span conditions deck manufacturers guidance must be strictly followed. The floors described in this table are typical of those used with the system, however, other loads/spans may be accommodated subject to design by Chartered Structural Engineer in compliance with Eurocodes and in accordance with deck manufacturers guidance.

¹ All materials to have a fire classification to EN 13501-1^[37] of Class A2-s3, d2 where used in buildings:

- of purpose groups 1c, 2a, 2b or 5 where the topmost storey is above 15m, as per Table 19 of TGD B Vol.1 for external walls
- compartment walls for purpose group 2(a)
- in any purpose group where the topmost storey is above 11m for compartment floors and walls

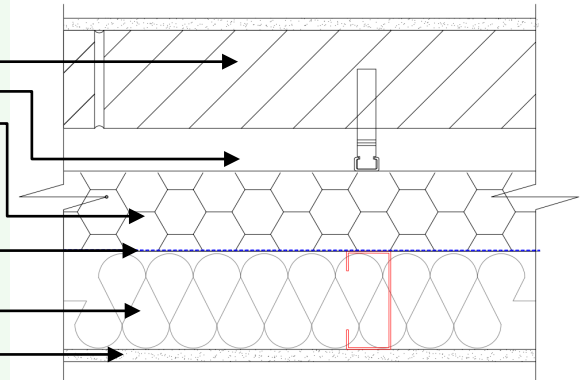
⁺ BS and I.S. versions of EN standard have been confirmed as currently equivalent, at time of issue of this certificate, through i2i Platform.

Table 4: Fire Protection Requirements for Loadbearing Wall, Floor and Ceiling Elements

External walls U-value for variable PIR (0.022 W/m.K) thickness

Wall build-up:

- Layer 1: Brick/Block Masonry Cladding
- Layer 2: 40mm drained cavity
- Layer 3: Variable Low E PIR layer ⁽²⁾⁽³⁾ (see below)
- Layer 4: AVCL
- Layer 5: LGS/MW insulation ⁽¹⁾
- Layer 6: 12.5mm Plasterboard



Wall thickness	PIR variable thickness:	Calculated U-value (W/m²K)
345mm	80mm	0.18
355mm	90mm	0.17
365mm	100mm	0.16
375mm	110mm	0.15
385mm	120mm	0.14
395mm	130mm	0.13

Calculation complies with BRE Digest 465^[38] U-values for light steel-frame construction

⁽¹⁾ Corrections have been made for 1.2mm LGS studs @ 600mm c/c bridging layer 5.

⁽²⁾ A level 1 correction for air voids has been applied to layer 3 (I.S. EN ISO 6946^[51] Table D.1)

⁽³⁾ Correction for mechanical fasteners have been applied to layer 3 equating to 6 No. 5.5mm Ø Stainless steel fixing to connect brick tie channel to LGS section.

Table 5: Typical External Wall U-Values

Sample U-value Calculation for 80mm PIR

Layer	Description	% Bridged	Thickness [mm]	Thermal conductivity λ [W/m.K]	Thermal resistance R [W/m²K]
	R_{se}				0.040
1	Sand Cement render		12	1.0	0.012
2	Concrete Block 1800Kg/m³		100	1.21	0.083
3	Unventilated Cavity		40	0.219	0.180
4	PIR Insulation		80	0.022	3.636
5	AVCL				-
6	Steel Stud (@ 600mm c/c)	0.002	100	50	0.002
	Stone Mineral Wool	0.998	100	0.04	2.500
7	Type F Plasterboard		12.5	0.25	0.050
	R_{si}				0.130
					R_u Total = 6.623
					R_L Total = 4.846
From BRE Digest 465 ^[38] $P = 0.665$, $R_T = pR_{max} + (1 - p)R_{min}$					6.028
$nf = 4\text{No./m}^2$, $A_f = 28.3\text{mm}^2$, $\lambda_{fixing} = 17\text{ W/m.K}$					Correction term, $\Delta U = 0.0116$
					Corrected U-Value = 0.177 W/m²K
					Corrected U-Value (2DP) = 0.18 W/m²K

Table 6: Sample U-value calculation for 80mm PIR

Effect on 0.16 W/m ² K (100mm 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	0.167	0.168	0.169	0.17	0.172	0.172
400mm	0.161	0.163	0.163	0.165	0.166	0.167
600mm	0.156	0.157	0.158	0.159	0.16	0.161

Table 7: Effect on U-value for variations in LGS thickness and centres

Target linear thermal transmittance (ψ) for different types of junctions.					
ACD Ref:	Junction Description	Temperature Factor f_{Rsi} (Min = 0.75)	NUA Ψ -value (W/m.K)		TGD L Default Ψ -value (shown for indicative purposes only)
5.01	Ground Floor - Insulation below slab	0.84	0.121	<	0.141
5.03	Intermediate Floor	0.92	0.112	>	0.021
5.03	Intermediate floor with Masonry Bracket	0.88	0.214	>	0.021
5.04	Separating Wall (plan) ⁽¹⁾	0.91	0.080	<	0.103
5.07/5.08	Eaves Detail - Unventilated/Ventilated Attic	0.87	0.070	>	0.030
5.15	Gable end detail	0.78	0.096	>	0.049
5.19	Ope - Lintel	0.90	0.034	>	0.006
5.20	Ope - Jamb	0.89	0.046	>	0.023
5.21	Ope - Sill	0.90	0.058	>	0.012
5.23.1	Corner Detail	0.84	0.052	<	0.075

⁽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 $U_w = 0.171$ W/m²K, $U_f = 0.126$ W/m²K, $U_r = 0.097$ W/m²K

Modelled junction ψ -values are based on typical NUA details above and may be used in γ -value calculations, if relevant detail is applicable.

Refer to Table D5 of the current Steelframe Acceptable Construction Details 2021, Technical Guidance Document L, for additional calculated ψ values as relevant to details.

Table 8: Typical ψ -Value W/mK

Please note: All U-value and Ψ -value calculations illustrated in the above Table 5 to Table 8 should be taken as examples of performance that may 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 metre, size of fixing, thickness of PIR etc, therefore U-values or Ψ -value should be recalculated if the build-ups differ from those described in Table 5 to Table 8.

Acoustic results *				
Separating construction	Airborne sound insulation $D_{nT,w}$ dB		Impact sound insulation $L'_{nT,w}$ dB	
	Performance Target	Result	Performance Target	Result
Walls (compartment wall as per Table 4, item 10)	≥ 53 dB $D_{nT,w}$	55-70	N/A	N/A
Floors (Compartment floor as per Table 4, item 18)	≥ 53 dB $D_{nT,w}$ dB	59-73	≤ 58 dB $L'_{nT,w}$ dB	41-51

* 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.

Table 9 : Acoustic filed test results for Separating Elements

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 or building system is unchanged.
- (b) the Building Regulations and any other regulation or standard applicable to the product/building system/ including processes for its manufacture, installation or use, remain unchanged.
- (c) the product/building system 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^[51], 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. **26/0455** is accordingly granted by the NSAI to **NUA Manufacturing MMC Ltd.** on behalf of NSAI Agrément.

Date of Issue: **17th September 2026** (Original Certificate)

Signed

Kevin D. Mullaney
Digitally signed by
Kevin D. Mullaney
Date: 2026.09.22
08:34:44 -04'00'

Kevin D. Mullaney
Director of Certification, NSAI

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. www.nsai.ie

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