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NSAI Agrément

IRISH AGRÉMENT BOARD CERTIFICATE NO. 19/0417
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Glavloc Build System
Systèmes pour constructions

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 2019**.

PRODUCT DESCRIPTION:
This Certificate relates to the Glavloc Build System, for the manufacture and installation of structural timber-based buildings. The Glavloc Build System is a factory manufactured structural building system comprising of patented OSB3 studs, OSB3 racking board, plywood securing wedges and timber head and sole plates.

The Glavloc Build System is Certified to be used in two story single occupancy buildings only for the following purpose groups 1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) and 5 as defined in the Technical Guidance Document B Building Regulations 1997 to 2019. The system is designed for walls and floors in the above purpose groups up to two storeys in height or part of a building not more than 5 metres in height from the external ground level to the top floor level. The structure is designed and supplied by Glavloc Build Systems Ltd and erected by approved installers.

This Certificate complies with the requirements of the Building Regulations 1997 to 2019.

USE:
The system is certified for the following applications:

1. To provide the structure of a building up to 2 storeys in height, which can accommodate either traditional timber joists, engineered joists or metal web joists.
2. The system can also be used as the top storey (Penthouse) of a building not more than 5 m in height from the external ground level to the top floor level. The Glavloc Build System element

must be constructed off a concrete floor or non-combustible podium/transfer slab.

3. The Glavloc Build System non-loadbearing infill panels can be used in building's not more than 10m in height where a fire resistance of 60mins is required. (See Section 1 Part B of this Certificate). The infill panels can be incorporated in concrete or steel framed building systems which possess their own independent lateral stability systems.

DESIGN:

The Glavloc Build System is based on a 600mm centre grid system, where all the standard components are manufactured to suit. Ideally, Glavloc should be consulted at concept design stage of a project, to ensure a building is designed to suit the Glavloc Build System. Where a building has been designed and is ready for construction, Glavloc Build Systems can manufacture specials to suit dimensions which fall outside the 600mm grid system. However, early engagement is preferred to maintain the erection efficiency which can be achieved by the system and mitigate the requirement for any special components.

The Glavloc Build System is intended for use where Architect's finalised construction and fire strategy drawings based on the Glavloc Build System are available and satisfy the Building Regulations 1997 to 2019. The Developer's (Client's) Architect, Engineer and Design Team are responsible for the architectural drawings and compliance of the building design with the Building Regulations.

The Glavloc Build System is designed for use in permanent buildings with brick or block external finishes or with an NSAI Agrément approved external cladding system. The compatibility of an NSAI Agrément approved cladding system shall be agreed and confirmed by Glavloc Build Systems at design stage to ensure compatibility between both systems.

The Glavloc Build System is also designed for use with a wide range of traditional roofing finishes. The system may also be designed to incorporate NSAI Agrément approved alternative roofing systems. However, written approval must be sought from Glavloc Build System's Chartered Structural Engineers on the use of such roofing systems.

The Glavloc Build Systems components are pre-machined off-site, packaged according to a particular building component schedule and delivered to site for assembly. Site assembly must only be carried out by Glavloc Building System approved Contractors. Approved Contractors are trained by Glavloc Build Systems in the assembly of the frame components. Each building is periodically inspected by the Glavloc Build System's project manager and each completed Glavloc Build System is Certified by the Glavloc Build System's Chartered Structural Engineer.

MARKETING, DESIGN AND MAUFACTURE:

The product is manufactured, marketed, designed by:

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Unit C, Collins Buildings,
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1.0 ASSESSMENT

In the opinion of the NSAI Agrément Board, if used in accordance with this Certificate, the Glavloc Build System can meet the requirements of the Building Regulations 1997 to 2019, as indicated in Section 1.2 of this Agrément Certificate.

1.1 Building Regulations 1997 to 2019

REQUIREMENTS:

Part D – Materials and Workmanship

D1 – Materials & Workmanship

The Glavloc Build System, as certified in this Certificate, can meet the requirements for workmanship.

D3 – Proper Materials

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

Part A – Structure

A1 – Loading

The Glavloc Build 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

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

Part B – Fire Safety

Part B Vol 2 – Fire Safety

For purpose groups 1(a), 1(b) and 1(d), the fire safety requirements are laid out in TGD B Fire Safety Volume 2, Dwelling Houses of the Building Regulations 1997 to 2019. For purpose group 1(c), 2(b), 3, 4(a) and 5 the fire safety requirements are laid out in TGD B Fire Safety of the Building Regulations 1997 to 2019.

For the Volume 2 Dwelling Houses, Part B6 – B11 are required to be adhered to, while for purpose groups 1(c), 2(b), 3, 4(a) and 5 Parts B1 – B5 are required to be adhered to.

B1 & B6– Means of Escape in Case of Fire

The Glavloc Build System is designed and constructed so that appropriate provisions for the early warning of fire, and adequate means of escape in the case of fire from the dwelling, can be accommodated. Windows in the ground or higher floors may be used as a means of escape in the case of a fire.

B2/B7 – Internal Fire Spread (Linings)

The plasterboard side of walls and ceilings is designated Class 0 (National Class) or Class B-s3, d2 (European Class). It may therefore be used on the internal surfaces of buildings of every purpose group without restriction.

B3/B8 – Internal Fire Spread (Structure)

The Glavloc Build 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 TGD to Part B of the Building Regulations 1997 to 2019.

B4/B9 – External Fire Spread

External masonry walls shall have a Class 0 surface spread of flame rating and when installed and used in the context of this Certificate will provide adequate resistance to the spread of flame over the external walls and roofs and can satisfy the relevant requirements of this Regulation as indicated in Section 4.1.3 of this Certificate.

B5/B10 Access and Facilities for the Fire Service

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

Part C – Site Preparation and Resistance to Moisture

C3 – Dangerous Substances

Each dwelling ground floor must include a radon sump and provide the facility for radon 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. Glavloc Build Systems permits the incorporation of the appropriate membrane, sump and gas handling system.

C4 – Resistance to Weather and Ground Moisture

The Glavloc Build 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 4.7 of this Certificate.

Part E – Sound

E1 – Airborne Sound (Walls)

Walls can be appropriately detailed and constructed to meet the airborne sound level performance

outlined in Table 1 of TGD E 1997 to 2019 provided good workmanship is adhered to onsite. (see also Section 4.1 of this Certificate).

E2 & E3 – Airborne and Impact Sound (Floors)
Separating floors can be constructed to meet the airborne and impact sound level performance outlined in Table 1 of TGD to Part E of the Building Regulations 1997 to 2019 provided good workmanship is adhered to onsite.

Part F – Ventilation
F1 (a) – Means of Ventilation
The building system can accommodate adequate and effective means of ventilation to limit the moisture content of the air so that it does not contribute to excess condensation and mould growth.

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.

F2 – Condensation in Roofs
The building system can accommodate adequate ventilation to prevent excessive condensation in a roof or roof void above an insulated ceiling.

Part J – Heat Producing Appliances
J3 - Protection of Building
When used in accordance with Section 4.1.4 of this Certificate, specified separation distances from wall lining insulation can meet the Building Regulation requirements.

Part L – Conservation of Fuel and Energy
L1 – Conservation of Fuel and Energy
The Glavloc Build System can be readily designed to incorporate the required thickness of insulation to meet and surpass the backstop elemental U-value as set out in TGD to Part L of the Building Regulations 1997 to 2019.

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 IP 1/06[2], BRE report BR 479[3] and I.S. EN ISO 10211[4]. As a result, best practice has been observed to limit heat loss due to thermal bridging and minimising the risk of mould growth due to surface condensation.

Part M – Access for People with Disabilities
M1 – Access and Use
Buildings can be designed to meet the access, circulation and facilities requirements of this Regulation (see Section 4.6 of this Certificate).

M2 – Sanitary Conveniences
Buildings can be designed to meet the installation requirements for sanitary conveniences for people with disabilities (see Section 4.6.2 of this Certificate).

2.1 PRODUCT DESCRIPTION

This Certificate relates to the design, manufacture and erection of the Glavloc Build System. This building system incorporates a number of CNC (computer numerical control) produced timber/OSB3 and plywood components and a number of EPS (Expanded Polystyrene) components which, when assembled according to specifications form a structural insulated wall panel. The components of the system are factory manufactured and assembled on-site.

The system incorporates rigid EPS70/EPS100 insulation fixed to the outside of the wall panel as well as being fitted between the studs.

The Glavloc Build System can be installed on a wide range of conventional foundation systems (rising blockwork to I.S. 325-1[5], reinforced concrete ground beams etc.) and NSAI approved foundation systems. However, foundations are outside the scope of this Certificate.

2.1.1 External Walls

The Glavloc Build System's external walls are comprised of patented 38mm OSB3 studs, 18mm OSB3 racking board (CE marked to I.S. EN 13986[26]), plywood securing wedges, timber butterfly and stitch connections and timber head and sole plates. All components of the system are formed using a CNC machine to cut the system components to the desired profile and dimensions.

The external walls are assembled by first fixing the timber sole plate to the rising wall/concrete substrate using an appropriate fixing and centre to centre spacing as designed by the Glavloc Build Systems Chartered Structural Engineer. Where the sole plates are required to be joined, such as over long spans and at corners, pre-machined butterfly connectors are hammered into their corresponding holes in the sole plate to form a firm joint (See Figure 1).

The pre-machined OSB3 timber studs are then inserted at 600mm centres into their corresponding pre-machined holes in the timber sole plates. When the studs are erected, the head plate is fitted to the top of the studs in the same manner as the sole plate to complete the frame. The pre-formed corner panels of EPS insulation are then inserted into their locations (See Figure 7). OSB3 racking board with pre-machined slots are then attached to the outside of the studs and secured using the plywood wedges. The EPS insulation panels which fit between the studs are then inserted from the inside, following which the internal sheets of racking boards with pre-machined slots are fitted and secured using the plywood wedges. The vertical joints of the OSB3 racking board on both faces of the wall panel are then completed using the pre-machined stitches which are inserted into their pre machined designated locations.

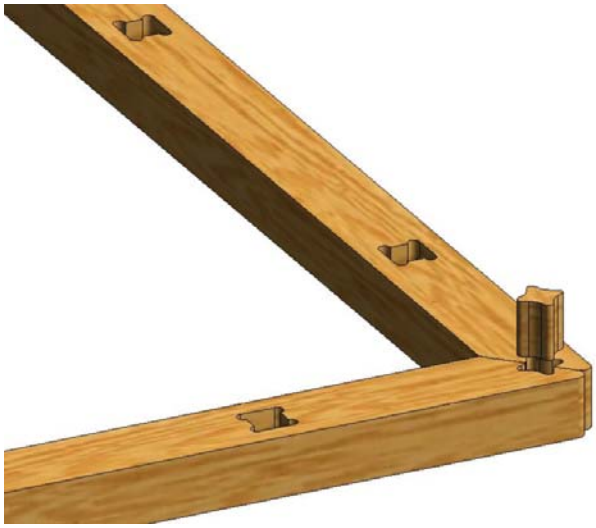


Figure 1 - Sole plate butterfly connector

The OSB3 racking boards are fixed to the head and sole plates through pre-milled holes at maximum 150mm centres which are located at the top and bottom of each sheet.

On the external face of the Glavloc Build System a breathable wall protection membrane is secured with austenitic stainless-steel nails or staples at max 500 mm centres. Upper layers overlap lower layers and horizontal layers are overlap by 150mm. Laps should be taped to enhance the wind tightness of the system.

The external insulation is fixed to the external face of the Glavloc Build System wall panel with standard EPS fixings through to the timber wedges. The EPS is drilled on site to create a plug, to a minimum depth of 17mm which is placed over the head of the EPS fixing once the fixing has been inserted.

The external EPS insulation is pre-machined to allow the EPS insulation to fit over the wedges and is secured to the external face of the OSB3 racking board. The thickness of the wedges is 24mm and the EPS insulation is pre-machined to provide slots to a depth of 17mm. When the EPS insulation is fixed as outlined, it creates a 7mm unventilated residual cavity between the EPS insulation and the breathable membrane on the external face of the Glavloc Build Systems external wall panel.

The blockwork external leaf of the external wall panel is completed as outlined in Section 2.1.2 below.

The internal face of the external wall panel is fitted with timber battens around the perimeter of each wall panel to provide grounds for plasterboard and an airtightness membrane. The timber battens are the same depth as the securing wedges. The internal face of the wall is then complete with a plasterboard and service cavity configuration required for the purpose which the wall is to serve. Section 4.1 of this Certificate outlines the requirements for a fire resistance duration required.

The air tightness membrane can be placed over the timber securing wedges or alternatively it can be placed between plasterboard layers. The location of this layer is project and design specific.

The requirements for the provision of an Air and Vapour Control Layer (AVCL) on the external walls are outlined in Section 4.2 of this certificate.

2.1.2 External Cladding & Wall Ties

The external leaf of the the Glavloc Building System is constructed on site, generally of traditional masonry with sand/cement render to I.S. EN 1996-1-1[6]. It is not recommended to use a lime rendered porous outer leaf for this system.

The masonry outer leaf can be constructed on a traditional strip foundation and rising wall, raft foundation or other foundation system as specified by the Client's Design Engineer, having due regard for the geology and load bearing capacity that exists on a site by site basis.

The masonry outer leaf is tied to the Glavloc Build System with a stainless-steel wall tie channel system (in accordance with I.S. EN 845-1[7]). The wall tie design is intended to be used in masonry to studded applications, with a design cavity width of 40mm minimum. 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 bases and over openings to allow moisture to exit the cavity. The cavity width is defined as the distance between the outer surface of the external EPS insulation and the inner surface of the outer masonry leaf.

The wall tie system consists of two main elements, firstly, a channel, which is screw fixed through the external EPS into the Glavloc wall system and which is installed after the Glavloc system has been erected but before the external masonry leaf has been constructed. The second element is a wall tie tab which the mason inserts into the channel to match the level of the course work as he progresses. The wall tie tab is able to move vertically within the wall tie channel to allow for variations in the level of the masonry course. The wall tie tab also incorporates a drip detail which uses gravity to prevent water droplets that may make their way through the exterior masonry leave from further progression into the internal leaf of the system. The water droplets drop down the cavity onto the DPM/DPC layer and out through the weep holes at the base of the external leaf.

Additional wall ties are provided at 225mm centres around openings or either side of each movement joints, such that there is a tie for each 225mm of perimeter of opening and on either side of each movement joint/corner.

The wall ties have been assessed and meet the performance requirements given in I.S. EN 845[7] for a Type 6 wall tie and designed in accordance with I.S. EN 1996-1-1[6]. The design of the ties and their centres is the responsibility of the project Chartered Structural Engineer and outside of Glavloc Building Systems design responsibility. The wall tie and channel are made from minimum Grade 304 austenitic stainless steel.

2.1.3 Internal Walls

Internal walls within the Glavloc Build System can be both load bearing and non-load bearing in function. Internal walls are constructed in a similar manner to the External Walls (Section 2.1.1) without the requirement for insulation and airtightness membranes.

The plasterboard requirement on internal load bearing walls is outlined in section 4.1.2 of this Certificate.

The internal load-bearing walls that are required for lateral wind bracing are a bespoke design to cater for the wind load.

The Glavloc Build System can incorporate a traditional timber stud partition system within its design if required. The performance (fire and acoustic) of these traditional timber stud partition systems is obtained from plasterboard manufacturing data, which is outlined in Table 4 and Table 5 of this Certificate.

Glavloc Build Systems have completed acoustic testing on their internal non-load bearing wall system, therefore specific acoustic performance requirements can be achieved with the construction system.

2.1.4 Roof Structure

The roof structure can be either a traditional timber cut roof or prefabricated roof trusses made from timber from an approved manufacturer. The site fitted roof trusses/timber rafters can be fixed to the head plate of the Glavloc Build System wall panel which acts as a traditional wall plate, this is

illustrated in Figure 9. The EPS 300 insulation panel provides a thermal break between the roof trusses/timber rafters and the wall panel.

Roofs may be clad with concrete or clay interlocking tiles or slates or most other NSAI approved roof cladding systems. The imposed load on the roof is project specific and is accounted for in the design of the Glavloc Build System.

2.1.5 Chimney Construction

The Glavloc Build System can incorporate a traditional block/brick chimney construction. The chimney must comply with the requirements set out in TGD to Part A of the Building Regulations 1997 to 2019.

2.1.6 Internal Linings and Finishes

Typical linings to walls and ceilings are gypsum plasterboards as outlined in section 4.1.2 of this Certificate. All plasterboard is manufactured to I.S. EN 520[8]. The gypsum boards are fixed to the securing wedges and timber battens by self-drill/self-tap screws. In areas prone to high levels of humidity, moisture resistant plasterboard should be used. Joints in plasterboard wall linings are taped and filled in accordance with the plasterboard manufacturers' instructions for direct decoration. Joints in ceilings are similarly treated.

2.2 GENERAL BUILDING STRUCTURE

2.2.1 Foundations

The Glavloc Build System can be installed on a wide range of conventional foundations such as strip foundations with rising walls, with either floating or suspended ground floor slabs, timber suspended floors, raft foundation systems or other Agrément Certified foundation systems.

The foundation system is outside the scope of this Certification. Prior to selecting an appropriate foundation system, a site investigation should be carried out by an appropriately qualified and experienced Engineer to determine the maximum bearing pressure of the soil at formation level.

Due to the tight tolerance and complexity of the Glavloc Build System, foundations must be constructed accurately, i.e. correct dimensions, square and level so that the system can be assembled and erected properly within the specified tolerance of ±5mm over 10m. Where variations in slab level occur, such variations are catered for using structural packers located directly below the sole plate as required. However, the use of such packers should be kept to a minimum.

2.2.2 Ground Floor

The Glavloc Build System can be incorporated into a wide range of conventional ground floor construction types such as floating concrete ground floors, suspended timber and suspended concrete ground floors as well as other NSAI Agrément Certified Systems.

The ground floor design is outside the scope of this Certification. Specifiers need to ensure that the selected ground floor has adequate structural strength to support the line loads applied down through the Glavloc Build System.

Designers will need to ensure that the ground floor contains enough insulation to achieve the specified elemental U-value as specified in the project specific brief. The effects of thermal bridging at the ground floor perimeter junction must be assessed as described in Section 4.2.1.

The installation of the DPM/radon barriers and radon sumps is not the responsibility of the Certification holder and is therefore outside the scope of this Certificate. The installation of the DPC layer is the responsibility the site installers and must be installed beneath every ground floor sole plate prior to the fixing of the timber sole plate to the concrete substrate.

2.2.3 Concrete Podium Slab (Transfer Slab)

Where the Glavloc Build System is constructed off a concrete podium slab, a tolerance of ±5mm is required on the podium slab line and level. Procedures for variations in slab are described in Section 2.2. The design of the podium slab is the responsibility of the Client's Engineer, who will require line loads from the Glavloc Build System's Structural Engineer. Glavloc Build Systems Structural Certification applies from transfer slab level upwards.

2.2.4 Intermediate Floor (Non-Compartment Floor)

The Glavloc Build System enables the use of different flooring systems between storeys including traditional solid timber joists, timber I-joists and metal web joists.

The intermediate floors which are joist based are delivered and assembled on site. Floor joists are supported on the vertical walls through the use of traditional joist hangers or alternatively supported on top of the lower story head plate with the floor supporting the construction of the upper storey wall.

2.3 DESIGN AND MANUFACTURE

2.3.1 Design Process

A Chartered Structural Engineer must complete the structural design of every building before the Glavloc Build System can be assembled.

The Clients architectural drawings are received by Glavloc Build Systems and the layouts are reconfigured to suit the Glavloc Build Systems 600mm building module. The reconfigured

drawings are issued to Glavloc's Structural Engineer for detailed structural design.

The final drawings produced are issued to the Clients Architect/Engineer for final review and sign off, for production.

When sign off is received from the Clients Architect/Engineer, a building component schedule is developed for production/selection.

Once the order is packaged and labelled correctly, it is dispatched to the site at a time agreed with the appointed Contractor for the Project.

2.3.2 Wall Component Production

The Glavloc Build System wall panel components are manufactured at the Glavloc Build System's manufacturing facility. This facility is a quality-controlled factory environment, which allows a higher level of accuracy on individual components to be achieved. The accuracy of component production achieved in the factory ensures that site assembly is both efficient and timely.

2.3.3 Quality Control Production

Quality control carried out during manufacture includes visual inspection and cross checking of all in-house production drawings and checks on production dimensions (length, width and timber thickness). In addition to this Glavloc Build System operate a full in-house quality control system, which outlines procedures on material specification, quality control in production, purchasing of materials, design and assembly.

The manufacturing equipment uses Computer Aided Manufacturing (CAM) techniques to process the data, which has been transferred from the design office to the CNC manufacturing equipment. The materials are then processed into the required profiles along with the position of cut-outs; slots etc.

Each component type has an identifying code which are run in batches. The building components can then be sourced from product on the floor which facilitates the dispatch of the components of a building to site in a relatively short time frame.

2.4 STRUCTURAL PRINCIPLES

2.4.1 Timber Composite Structure

The basis of the structure is:

- timber sole plates
- OSB3 studs
- timber head plates
- OSB3 racking board
- plywood securing wedges
- plywood stitches

Ancillary to the structural components listed above, is EPS insulation. EPS insulation is fixed to the outer face of the panel, with specifically cut EPS insulation sheets also fitted between the OSB3 studs.

The frequency of vertical studs is based on a 600mm centres system. The individual elements are all manufactured for stock in the factory and then dispatched to be assembled onsite in accordance with the requirements specified by the Structural Engineer.

The Glavloc Build System's component list is outlined in Table 1 of this Certificate. The Glavloc Build Systems Chartered Structural Engineer will design each building using these components as standard. In situations where anomalies occur and the Glavloc Build System standard components require additional support, the Chartered Structural Engineer will complete a bespoke design with traditional timber elements or steel elements as required. Examples of situations where anomalies could arise would be where wide openings occur in wall panels or where difficult glazing elements are required to be incorporated into the system.

2.4.2 Fasteners and Connection Joints

Glavloc Build Systems 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 Glavloc Build Systems may be used with the system.

Apart from the technology used to assemble the walls, the system will require fasteners for timber battens, plasterboard, restraining straps, cavity barriers, breather membranes, roof trusses etc. These fasteners are adequately protected against corrosion where they are required to do so. It is important to ensure that where a fixing has a protective coating it is not removed as this would severely compromise the corrosion performance of the fastener.

2.4.3 Load Bearing Walls - Structural Principles

The external and internal walls of the Glavloc Build System provide load-bearing capacity to the construction system.

Glavloc Build Systems have completed an extensive range of structural testing on their wall systems to ensure the design is within the limits of the structural design codes.

Vertical dead and imposed loads are transferred by load bearing (external or internal) wall panels to the foundations on which the system is constructed. Loads are transferred down the OSB3 vertical studs, fixed to timber head plate and sole plate. The OSB3 racking boards provide additional strength and resistance against racking.

Roof loads are transferred down through the wall plate and/or head plate to the studs and into the foundation through the sole plate. Where windows or doors are present, a timber lintel is provided to allow the load to transfer to cripple studs and down to the sole plate of the wall panel in which the window is located.

2.4.4 Racking

Resistance to horizontal loading (racking) is provided by the horizontal diaphragm action of the approved floor sheeting and roof, in conjunction with the composite action of the OSB3 studs, timber head and sole plates, plywood wedges and OSB3 sheeting combined as per the design to provide the required stiffness to meet the global stability requirements of the system.

2.4.5 Holding Down

To provide resistance to uplift, the sole plates of the wall panels which run the perimeter of the building are secured using anchor straps where masonry rising walls are used in conjunction with rising blockwork, or bolt anchors where reinforced concrete slabs are provided. The specific type of anchor (strap or bolt) to be used, and the fixing positions are determined by the Glavloc Build Systems Chartered Structural Engineer.

2.4.6 Resistance to Moisture

In the unlikely event that external moisture, in the form of wind driven rain, should penetrate the external masonry outer leaf and migrate across the cavity and external EPS layer, moisture penetration will be repelled by the breathable moisture resistant membrane fitted to the external OSB3 racking board.

The Glavloc Build System incorporates stepped DPC's overall opes and at the ground floor external wall junctions. As a result, moisture which enters the cavity is deflected back out of the building as it travels down the cavity.

The ventilation methods of free air circulation and proprietary cross flow rafter ventilation in the roof space together with the use of a breathable roof membrane and AVCL ensures the timber roof trusses are kept free from prolonged moisture build up. This ventilation method is in accordance with Part F2 of TGD to Part F of the Building Regulations 1997 to 2019.

The bottom sole plate of the ground floor wall panel is protected by a DPC layer as well as a DPM or Radon barrier layer under the concrete slab to prevent residual moisture and rising damp from penetrating.

The machined 38mm OSB3 studs have a water-based Nano technology protective coating applied to the machined faces which protect against water penetration as well as bacteria and algae growth. The unmachined surfaces of the OSB3 studs come with a factory applied coating thus application to this surface is not required.

2.5 COMPARTMENTATION

2.5.1 Separating Wall (Party Wall)

TGD to part B 2006 and TGD to Part B Volume 2 2017 of the Building Regulations 1997 to 2019 requires separating walls to have a 60 minutes fire resistance for all purpose groups.

Separating walls (party walls) are constructed using two independent wall frames back to back. 150mm wide OSB3 strips are placed on the OSB3 studs and secured using the securing wedges. The back to back frame is placed in a way that there exists a 68mm cavity between the 150mm wide strips of OSB3 on the inner face of each leaf of the wall (facing cavity). This equates to a 20mm gap separating the securing wedges in the cavity. There is no connection between the two individual frames of the construction.

The room face of both frames is sheeted with 18mm OSB3 racking board following the installation of the stone mineral wool insulation from ground floor to the underside of the roof structure to provide the required fire and acoustic properties.

The Glavloc Build System can provide its separating wall in constructions associated with domestic applications (purpose group 1(a), 1(b) & 1(d)) up to two storeys in height as outlined in Section 3.5.4.3 of TGD to Part B Volume 2 2017 of the Building Regulations 1997 to 2019.

Services cannot be accommodated in any capacity in a separating wall. If services are required to be installed, a service cavity must be provided outside the unbreeched lining of the separating wall (See figure 3).

2.5.2 Compartment Wall

The Glavloc Build System can provide compartment wall with the same configuration as the Separating Wall (See Table 5) or it can provide a wall as a single frame compartment wall.

The Glavloc Build Systems single frame wall panel is assembled from 90mm OBS3 studs at 600mm centres, between which 90mm EPS insulation is fitted. An 18mm OSB3 racking boards is fitted to each face of the OSB3 studs which are secured using the plywood securing wedges. Timber battens are fixed to the OSB3 racking board around the perimeter following which the first layer of plasterboard is fitted. Timber battens are then fixed over the first layer of gypsum plasterboard to create the service void. A second layer of gypsum plasterboard is then fixed to the timber battens to complete the single frame compartment wall.

Component Type External Wall	Type of Material	Typical Section Dimensions		
		Depth (a)	Width (b)	Height/Length (t)
Wall Head/Sole Plate	Timber	62mm	90mm	Variable up to 3.6m
OSB (1) Wall Stud	OSB3(1)	38mm	174mm	Up to 3m
Face Sheet	OSB3(1)	18mm	600mm/ 1200mm	Up to 3m
Head & Cill Face Sheet	OSB3(1)	18mm	600mm/ 1200mm	Up to 3m
Wedges	Birch Ply	24mm	102mm	300mm
Stitches	Birch Ply	18mm	72mm	N/A
Butterfly Connector	Timber	62mm		N/A
Note (1) Oriented Strand Board				

Table 1 - Standard Component Dimensions in Glavloc Building System

No services can run vertically or horizontally within the compartment wall and where services are required in a compartment wall, they can be accommodated by the standard service cavity provided on all Glavloc Build System walls. Services can pass horizontally through a compartment wall, but they must be appropriately protected in accordance with Section 3.5.4.1 of TGD B 2017 Volume 2 of Building Regulations 1997 to 2019 for purpose class 1(a), 1(b) & 1(d) and in accordance with Section 3.2.5.7 and 3.4 of TGD B 2006 of Building Regulations 1997 to 2019 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.

2.5.3 Cavity Barriers and Fire Stops

To meet the requirements of TGD to Part B of the Building Regulations 1997 to 2019, the correct specification and placement of cavity barriers and fire stops shall be detailed and shown on a schedule for a project. Typically, cavity barriers and fire stops should be provided in construction of timber 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.
- A cavity barrier shall cover the full length of the separating/compartment wall and shall tightly abut the rear of the vertical fire stops at the ends of the separating/compartment wall and the non-combustible board at the top of the separating/compartment wall.
- A cavity barrier shall cover the full ceiling depth as well as the upper wall panel sole plate and lower wall panel head.
- Eaves boxes shall be provided at the junctions of separating wall and compartment walls with external walls to reduce the risk of fire passing across these junctions.
- At the top of any external cavity wall including any gable wall, as can be seen in Table 3.2 of TGD to Part B 2006 of Building Regulations 1997 to 2019.
- Cavity barriers are required around all openings in external walls such as doors, windows, vents, extractor fans, meter cupboards etc.

2.6 DELIVERY, STORAGE AND SITE HANDLING

Once the components are machined and inspected, they are packaged in their respective component bundles i.e. OSB3 racking board pallet, OSB3 stud pallet, butterfly components and stitch components in separate labelled heavy-duty bags.

Once project list is received by the floor, the components are selected, packaged, wrapped, labelled and prepared for dispatch to site.

During the construction phase, every effort must be made to limit the systems' exposure to rain and moisture.

2.6.1 Typical Material List Supplied to Site

With each customised delivery of a Glavloc Build System to site, a comprehensive bill of materials is supplied. This bill of materials gives a detailed list of all components delivered to site.

2.6.2 Approved Installer Contractor Responsibilities

The Glavloc Build Systems approved Installers are required to assemble the building system in accordance with the Assembly Instructions and training provided by Glavloc Build Systems. The Approved Installers are required to install the fire stopping elements within the Glavloc Build System These details will be inspected by Glavloc Build Systems Project Manager.

2.6.3 Main Contractor Responsibilities

Prior to the commencement of the contract, the responsibilities are determined and agreed between Glavloc Build Systems and the main contractor. Glavloc Build Systems provides the main Contractor with project specific building details on the construction of their building system. The Main Contractor is responsible for the proper construction of the foundations, ground floor slab or podium slab within the tolerances specified by

Glavloc Build System as described in Section 2.2 of this Certificate.

If the floor is outside the specified tolerances when Glavloc Build Systems approved installers arrive on site to commence the system installation, the remedial works (grinding etc.) will be the responsibility of the Main Contractor.

The Main Contractor is also responsible for the construction of all wall claddings, roof claddings and the installation of fire stopping and cavity barriers prior to these claddings being applied. All other fire stopping, and cavity barriers are the responsibility of Glavloc Build Systems.

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.

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 Glavloc Build Systems Assembly Manual, a copy of which is issued to each site. Site assembly must only be carried out by approved Assemblers trained by Glavloc Build System's and in accordance with the Glavloc Build System Assembly Manual.

Assemblers are approved once they have undergone on-site training, understand the fundamental structural principals of the system, fire stopping requirements, tolerances, importance of weathering, storage and handling of the components and all other relevant information. Only trained approved assemblers should assemble the system and they should have signed records of training available for inspection if requested.

All off-loading and assembly should be in accordance with the Glavloc Build System's method statement and assembly procedures. Care must be taken to avoid any damage to the system components during transportation and assembly.

A Glavloc Build System's Chartered Structural Engineer must assess the adequacy of the design of the proposed superstructure of the building system for compatibility with the Glavloc Build System.

All structural connections to the foundation must be installed in accordance with the structural design details provided by the Glavloc Build System Chartered Structural Engineer. They then need to be checked by the supervisor of the installation team and formally recorded on the Glavloc Build Systems site quality control records.

Before the sole plate is installed a 300mm wide layer of DPC is placed on the slab perimeter over which the sole plate will sit. Anchor bolts fix the timber sole plate to the concrete ground floor slab or the masonry rising wall. A stainless-steel anchor strap ties down the Glavloc wall panel to the external block wall in some situations depending on the foundation system being used.

These fixings are designed by the Glavloc Build System's Chartered Structural Engineer. The positions of the fixings are project specific and are determined by the Glavloc Build System's Chartered Structural Engineer. Once the sole plate is fixed, the wall panel is assembled in accordance with Section 2.1.1 of this Certificate.

Once the load bearing structure has been erected, work can start on the external masonry leaf or NSAI Approved cladding system, interior plaster board, electrical work, plumbing and second fix carpentry.

2.7.2 Site Supervision

The approved assemblers are subject to ongoing supervision by the Glavloc Build System's Project Manager who will agree a schedule of inspections with the Assembly Contractor. The supervisor of the Assembly crew is responsible for the quality and productivity of work carried out by the erection crew. The assembly supervisor ensures that works are carried out in line with Health & Safety requirements as per the site-specific Method Statement & Risk Assessment.

The assembly supervisor reports directly to the Glavloc Build Systems Project manager to ensure all work follows the requirements of the design drawings and the requirements of the Glavloc Build Systems Structural Certification for the building.

The Project Manager is responsible for ensuring all concrete slabs are within the Engineer's specified tolerances before delivery and assembly on site. No assembly will begin until the Glavloc Build System's project manager approves the concrete slab to which the system is being assembled.

The Glavloc Build Systems Project Manager also inspects fire stopping and cavity closing of all-party walls and service shafts and then records this information on the fire stopping check sheets which are recorded for each floor of each building. Any defects noted are recorded, photographed where possible and notified in writing to the Assembly Supervisor. The Glavloc Build Systems Project Manager will inspect and approve the remediation before work can proceed.

The approved system Assemblers are subject to ongoing supervision by the Glavloc Build Systems Project Manager. The following checklist is provided

to offer guidance to clients who intend to carry out their own additional site supervision.

The items listed, are of a general nature which 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 Glavloc Build Systems before installation begins.
- The ground floor layout is properly marked out.
- DPC and DPM are correctly installed in accordance with BS 8102[9] and BS 8215[10].
- DPC course is laid under all ground floor sole plates, as a good practice measure between timber and concrete, both internally and externally.
- All ground floor, first floor and roof panels are correctly anchored into position in accordance with the assembly drawings.
- All insulated external wall panels are free from damage after assembly.
- All horizontal and vertical joints are correctly detailed.
- All joints in the airtight barrier are taped and all service penetrations are fully sealed following service installation.
- Cavity barriers and fire stops are installed and signed off by Glavloc Build Systems project manager as specified and in accordance with the Building Regulations 1997 to 2019.
- Roof trusses are installed plumb and per layout.
- Roof bracing is installed where required.
- All fasteners used are supplied or approved by a Glavloc Build Systems Chartered Structural Engineer.
- No modifications are permitted without prior written permission by a Glavloc Build Systems Chartered Structural Engineer.
- Minimum 20mm cavity between the securing wedged of the two leaves of the party wall has been maintained.

2.7.3 Infill Panel Installation

Glavloc Build System can be utilised as non-load bearing infill panels in locations which suit the components which make up the construction system. The Glavloc Build System Construction System can be installed as internal non-load bearing infill panels in a building which contains its own lateral stability system.

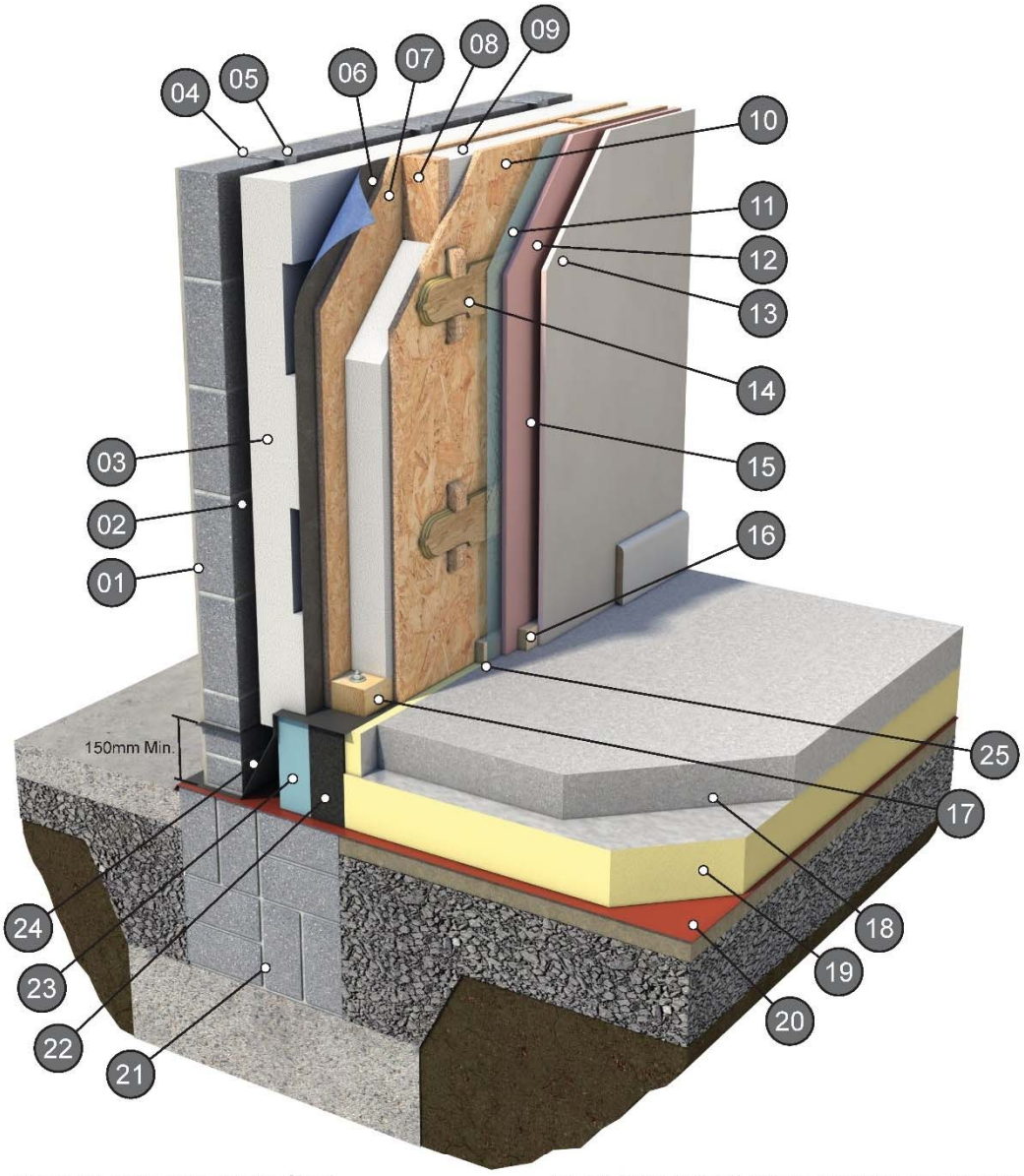
The Glavloc Build infill panels are installed on a clean structural slab which has a level tolerance of ±5mm. Glavloc Build System approved installers install the panels.

For infill panels the timber sole plate of the Glavloc Build System infill panel is secured to the slab with suitable fixings at the specified locations identified on the Glavloc Build drawings.

Glavloc Build infill panels are designed to resist lateral loads only to the required deflection limit depending on internal pressures of the building.

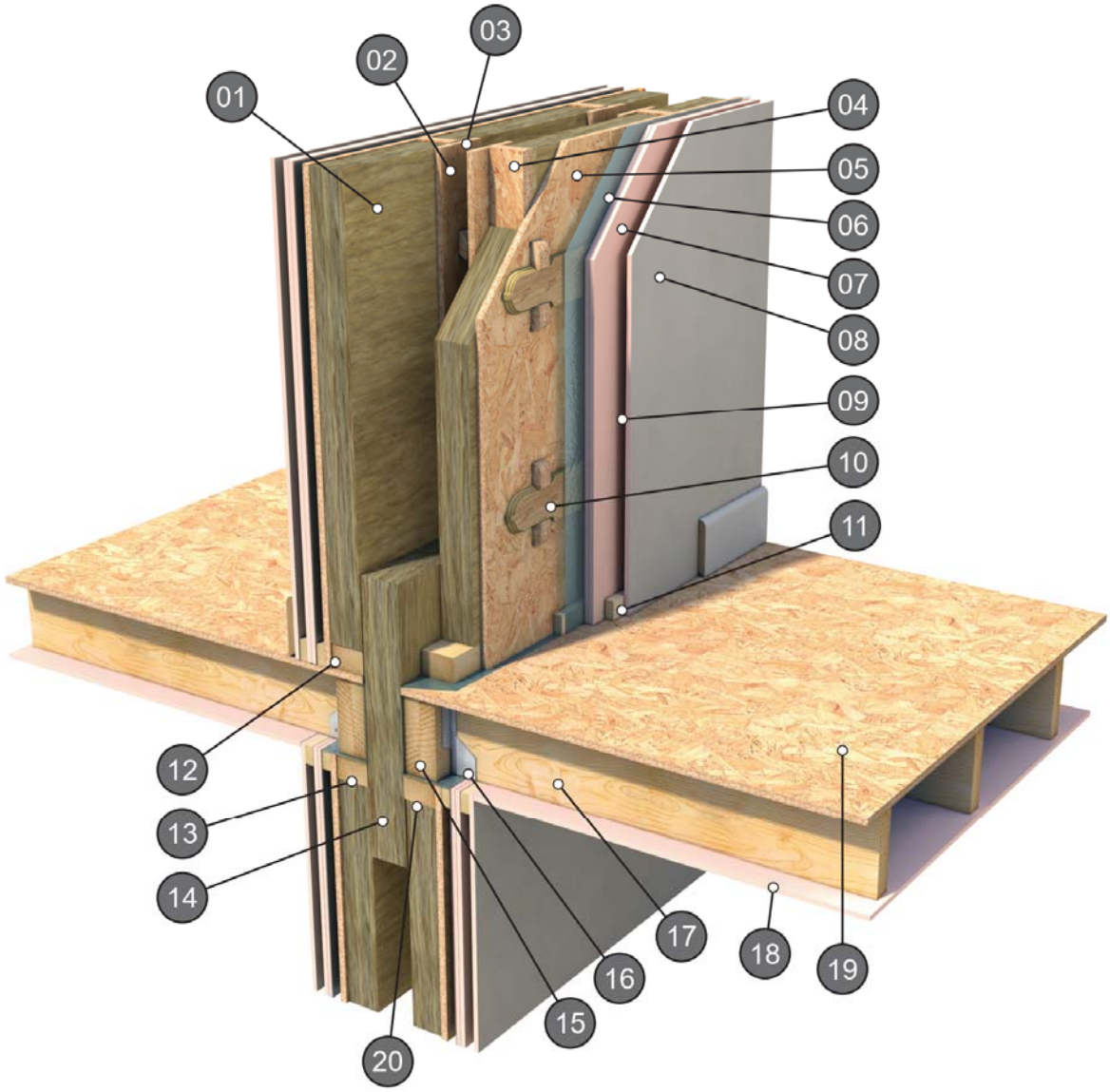
It is critical that no permanent or variable loading from the superstructure is transferred into the infill sections. Infill panels can be designed and detailed to transfer horizontal loads, satisfactorily into the primary structure, while incorporating a soft top joint which will allow vertical deflection of the primary structure to occur but will not transfer vertical load into the panel.

All vertical and horizontal cavity closing/fire stopping is carried out in accordance with the project specific fire strategy drawings.



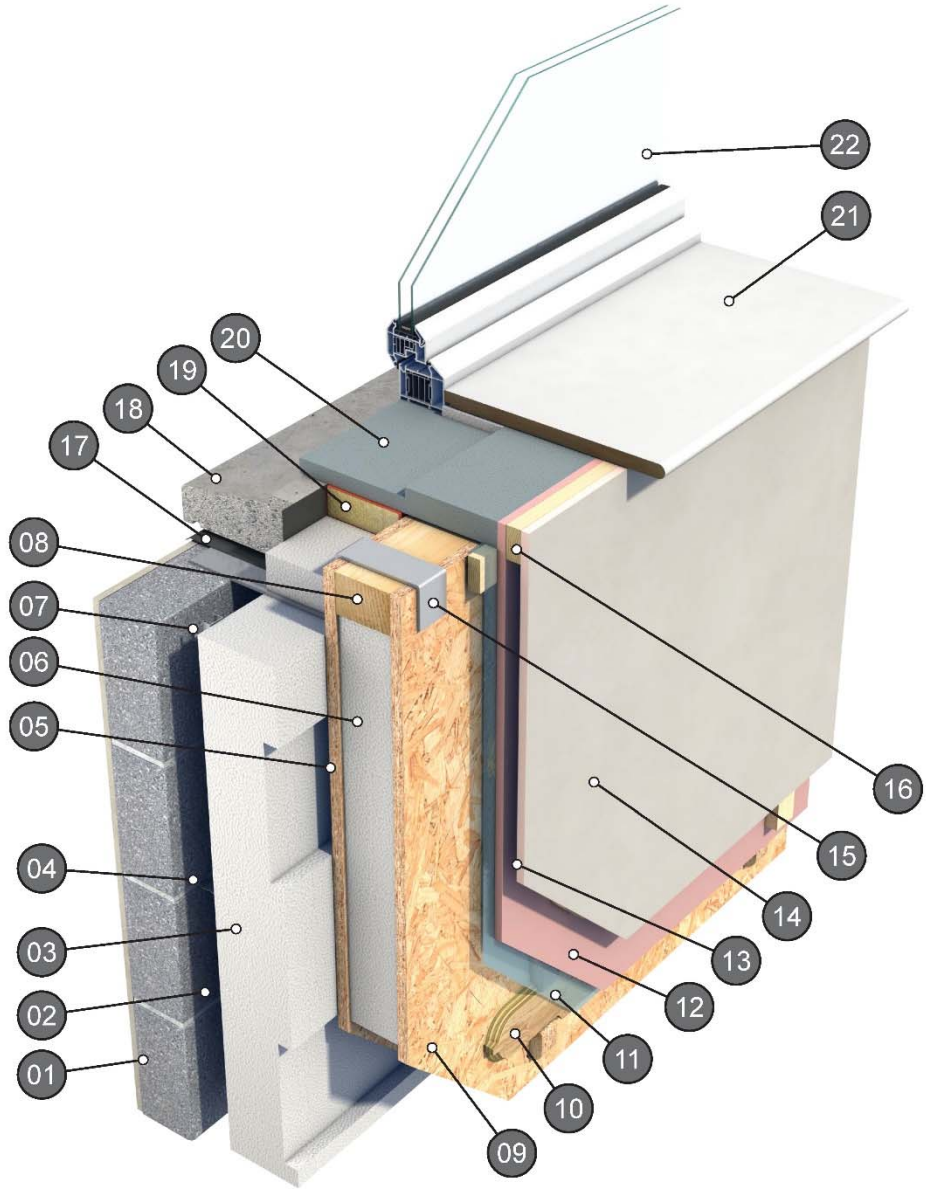
01. Block on edge with render finish.
02. Min. 40mm cavity.
03. EPS70/100 rigid board (Min. depth 125mm)
04. S.S. Wall Tie.
05. S.S. Wall Tie channel fix through insulation to OSB3 frame.
06. 7mm cavity incorporating breather membrane between OSB board & EPS70 insulation.
07. 18mm OSB3 racking board.
08. 90mm x 38mm OSB3 studs @600mm C/C's.
09. 90mm EPS70 insulation.
10. 18mm OSB3 racking board.
11. AVCL barrier (to be fixed to timber wedges or over first layer of plasterboard.
12. 15mm Type F plasterboard to specification.
13. 12.5mm Type A plasterboard to specification.
14. Plywood securing wedge.
15. Min. 24mm service cavity.
16. 24mm x 50mm timber battens to wall perimeter.
17. 90mm x 62mm treated timber sole plate with mechanical anchor bolt to engineers specification.
18. Concrete floor slab to specification.
19. Floor insulation to specification.
20. DPM to lap with DPC under frame.
21. Rising Block Wall To Structural Engineers Specification
22. 215x100mm thermal course to specification.
23. EPS insulation to specification.
24. DPC
25. 24mm x 50mm timber battens

Figure 2: Wall to Foundation Junction



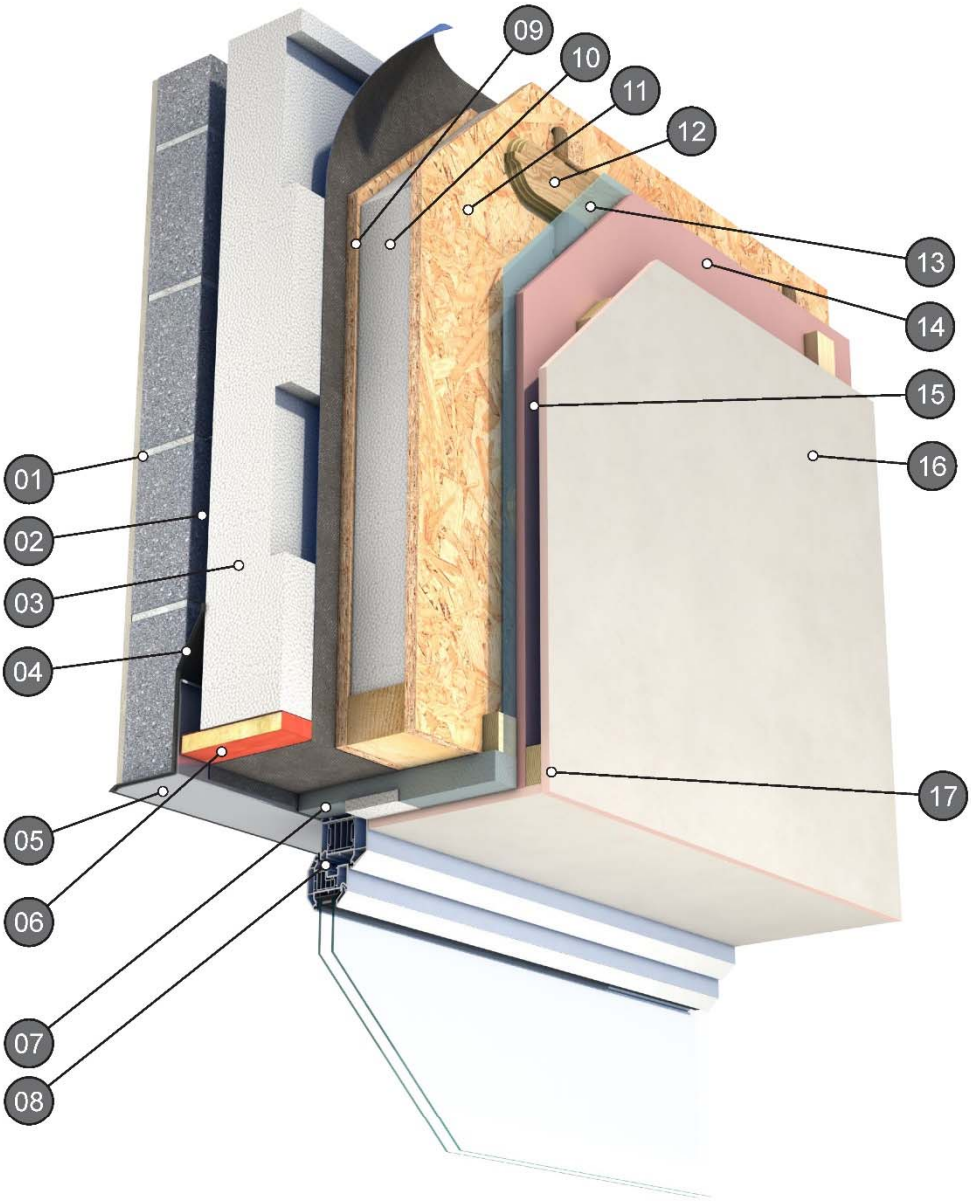
01. Stone Mineral Wool insulation as per specification.
02. 150mm OSB3 Strip.
03. 68mm cavity between OSB strips, 20mm between plywood wedges.
04. 90mm x 38mm OSB3 studs @600mm C/C's.
05. 18mm OSB3 racking board..
06. AVCL barrier (to be fixed to timber wedges or over first layer of plasterboard.
07. 2 No. 15mm Type F plasterboard to specification.
08. 12.5mm Type A plasterboard to specification.
09. Min. 24mm service cavity.
10. Plywood securing wedge.
11. 24mm x 50mm timber battens to wall perimeter.
12. 90mm x 62mm Treated Timber Sole plate with notches for OSB3 studs.
13. 90mm x 62mm treated timber head plate with notches for OSB3 studs.
14. Stone Mineral Wool insulation as per specification.
15. Timber ring beam to specification.
16. Floor joist hanger to specification.
17. Solid timber floor joist to specification.
18. 12.5mm Type F or 15mm Type A plasterboard to specification.
19. 18mm OSB3 deck board.
20. 90mm x 62mm Treated Timber Head plate with notches for OSB3 studs.

Figure 3: Separating Wall to Intermediate Floor Junction



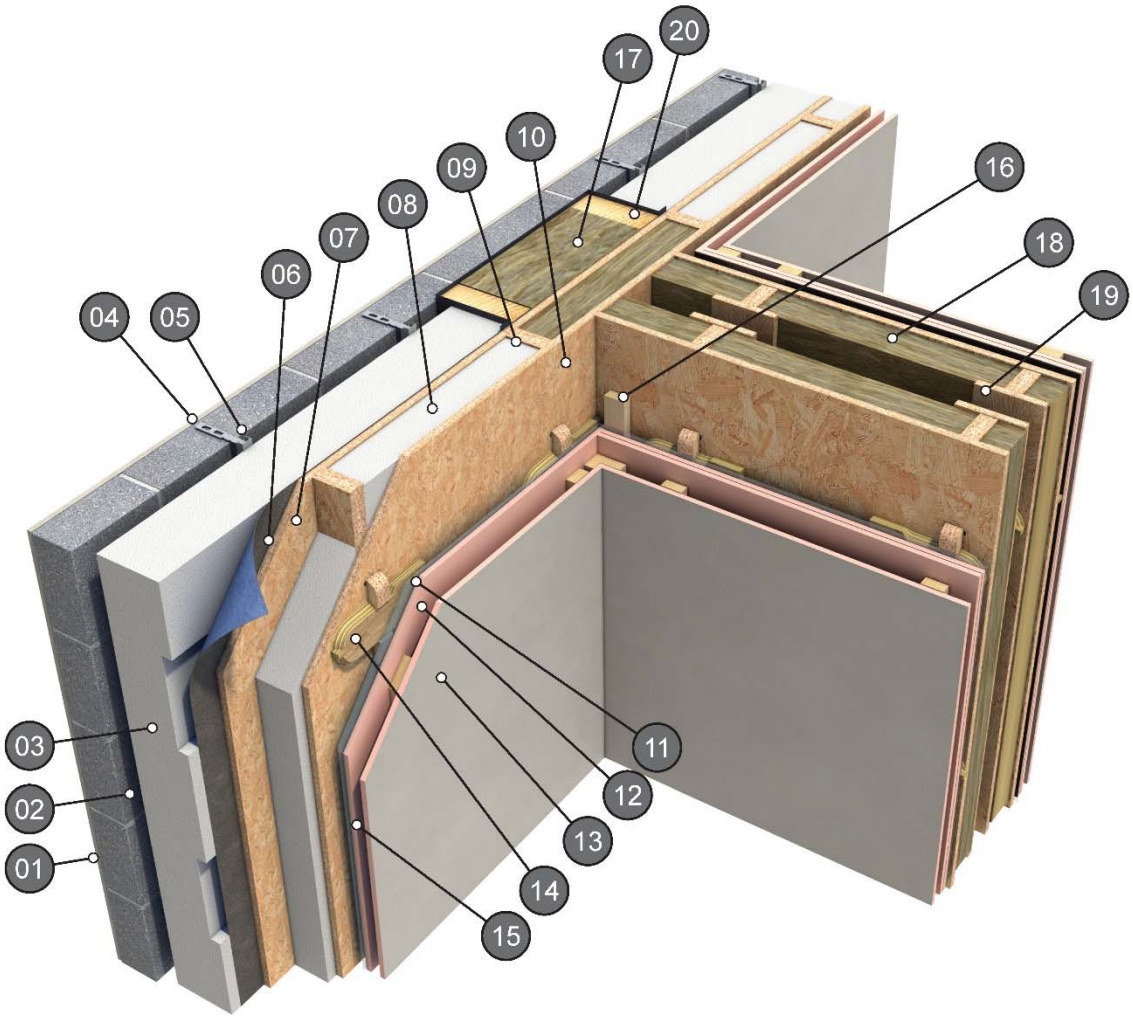
01. Block on edge with render finish.
02. Min. 40mm cavity.
03. EPS70/100 rigid board. (Min. depth 125mm)
04. S.S. Wall Tie.
05. 18mm OSB3 racking board (7mm cavity incorporating breather membrane between OSB board & EPS70 insulation).
06. 90mm EPS70 insulation.
07. S.S. Wall Tie channel fix through insulation to OSB3 frame.
08. 90mm x 62mm treated timber plate with notches for OSB3 studs
09. 18mm OSB3 racking board.
10. Plywood securing wedge.
11. AVCL barrier (to be fixed to timber wedges or over first layer of plasterboard.
12. 15mm Type F plasterboard to specification.
13. Min. 24mm service cavity.
14. 12.5mm Type A plasterboard to specification.
15. 5mm steel bracket cut into insulation.
16. 24mm x 50mm timber battens to wall perimeter.
17. DPC wrapped around window cill.
18. Precast concrete cill.
19. Cavity closer to specification.
20. EPS window surround.
21. Window board to specification.
22. Window/Door to specification including any plates or brackets required for fixing purposes.

Figure 4: Window Cill Detail



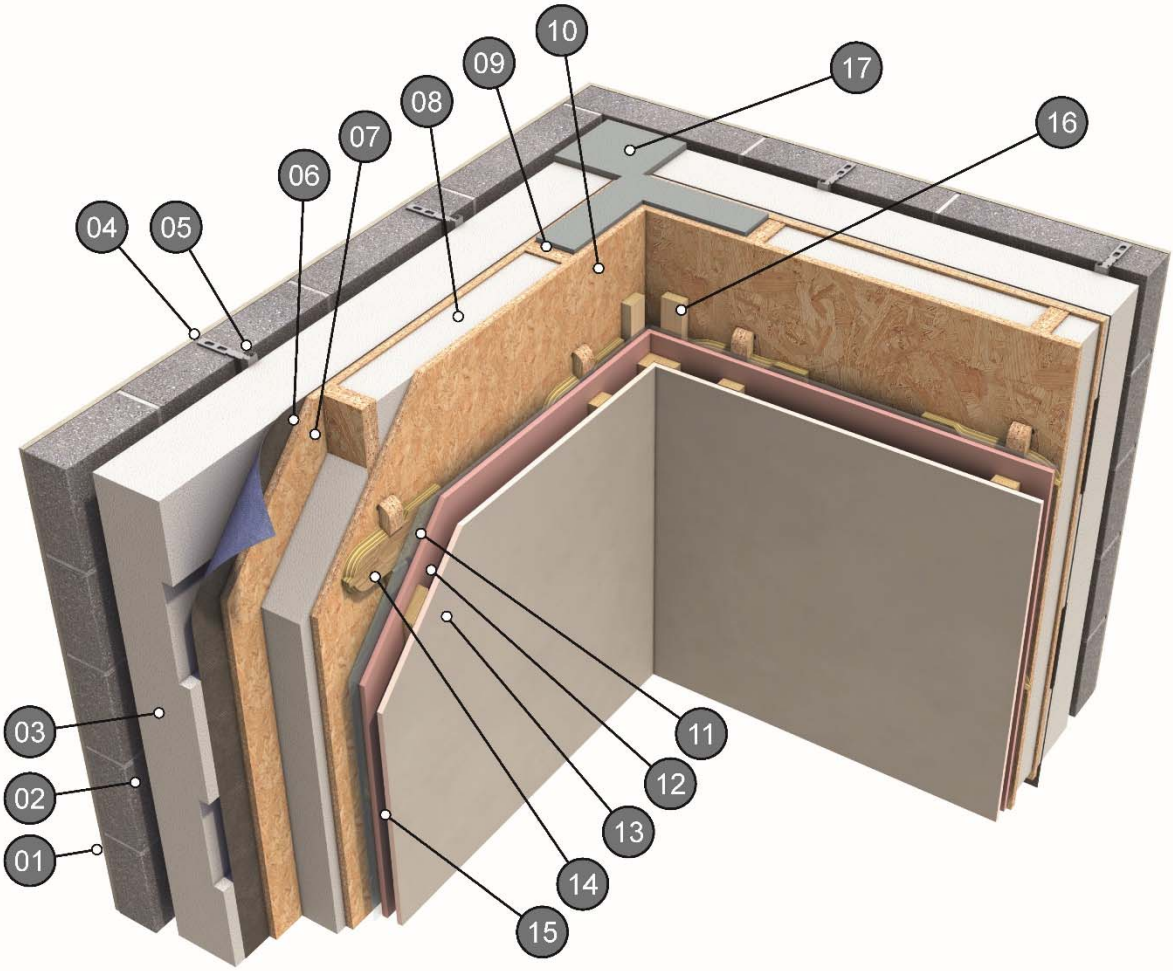
01. Block on edge with render finish.
02. Min. 40mm cavity.
03. EPS70/100 rigid board. (Min. depth 125mm)
04. DPC
05. Galvanised Steel Lintel or as approved.
06. Cavity closer to specification.
07. EPS window surround.
08. Window/Door to specification including any plates or brackets required for fixing purposes.
09. 18mm OSB3 racking board (7mm cavity incorporating breather membrane between OSB board & EPS70 insulation).
10. 90mm EPS70 insulation.
11. 18mm OSB3 racking board.
12. Plywood securing wedge.
13. AVCL barrier (to be fixed to timber wedges or over first layer of plasterboard.
14. 15mm Type F plasterboard to specification.
15. Min. 24mm service cavity.
16. 12.5mm Type A plasterboard to specification.
17. 24mm x 50mm timber battens to wall perimeter.

Figure 5: Window Head Detail



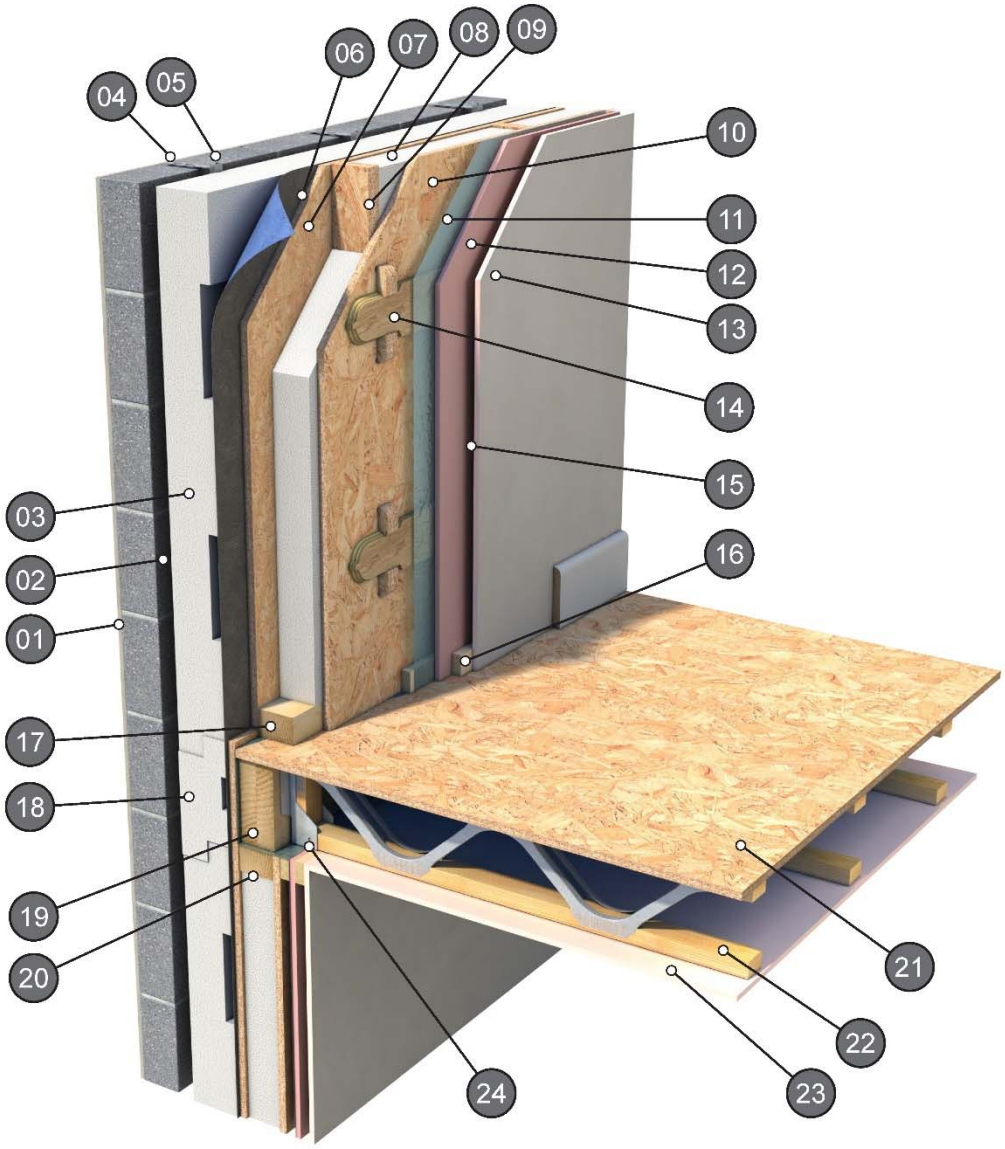
01. Block on edge with render finish.
02. Min. 40mm cavity.
03. EPS70/100 rigid board. (Min. depth 125mm)
04. S.S. Wall Tie.
05. S.S. Wall Tie channel fix through insulation to OSB3 frame.
06. 7mm cavity incorporating breather membrane between OSB board & EPS70 insulation.
07. 18mm OSB3 racking board.
08. 90mm EPS70 insulation.
09. 90mm x 38mm OSB3 studs @600mm C/C's.
10. 18mm OSB3 racking board.
11. AVCL barrier (to be fixed to timber wedges or over first layer of plasterboard.
12. 15mm Type F plasterboard to specification.
13. 12.5mm Type A plasterboard to specification.
14. Plywood securing wedge.
15. Min. 24mm service cavity.
16. 24mm x 50mm timber battens @600mm C/C's vertically & to wall perimeter.
17. Cavity closer to specification.
18. Stone mineral wool insulation as per specification.
19. 150mm OSB3 Strip.
20. Treated timber cavity closer.

Figure 6: Separating Wall to External Wall Junction



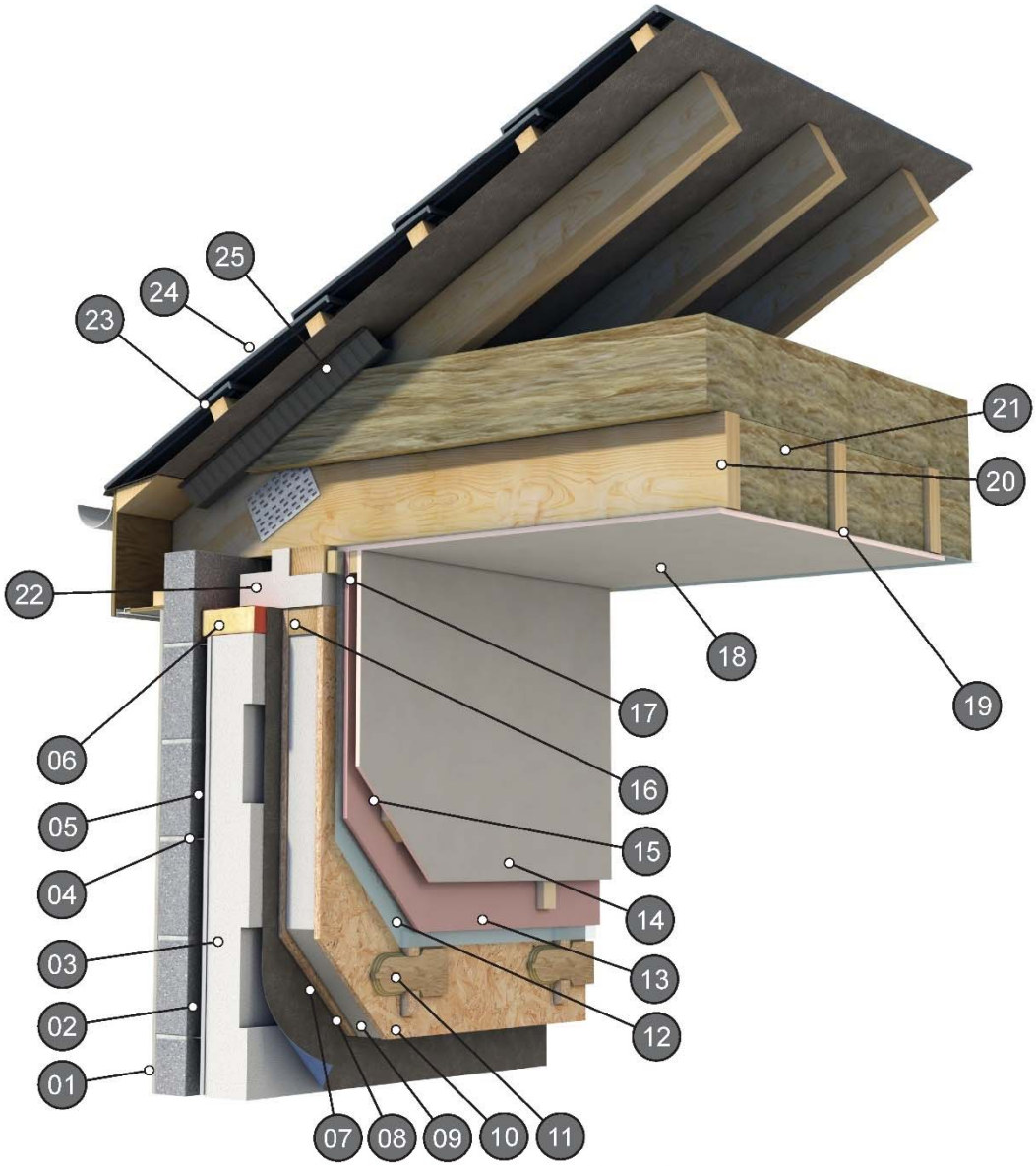
01. Block on edge with render finish.
02. Min. 40mm cavity.
03. EPS70/100 rigid board. (Min. depth 125mm)
04. S.S. Wall Tie.
05. S.S. Wall Tie channel fix through insulation to OSB3 frame.
06. 7mm cavity incorporating breather membrane between OSB board & EPS70 insulation.
07. 18mm OSB3 racking board.
08. 90mm EPS70 insulation.
09. 90mm x 38mm OSB3 studs @600mm C/C's.
10. 18mm OSB3 racking board.
11. AVCL barrier (to be fixed to timber wedges or over first layer of plasterboard.
12. 15mm Type F plasterboard to specification.
13. 12.5mm Type A plasterboard to specification.
14. Plywood securing wedge.
15. Min. 24mm service cavity.
16. 24mm x 50mm timber battens @600mm C/C's vertically & to wall perimeter.
17. Corner insulation profile to specification.

Figure 7: External Corner Detail



01. Block on edge with render finish.
02. Min. 40mm cavity.
03. EPS70/100 rigid board. (Min. depth 125mm)
04. S.S. Wall Tie.
05. S.S. Wall Tie channel fix through insulation to OSB3 frame.
06. 7mm cavity incorporating breather membrane between OSB board & EPS70 insulation.
07. 18mm OSB3 racking board.
08. 90mm EPS70 insulation.
09. 90mm x 38mm OSB3 studs @600mm C/C's.
10. 18mm OSB3 racking board.
11. AVCL barrier (to be fixed to timber wedges or over first layer of plasterboard.
12. 15mm Type F plasterboard to specification.
13. 12.5mm Type A plasterboard to specification.
14. Plywood securing wedge.
15. Min. 24mm service cavity.
16. 24mm x 50mm timber battens to wall perimeter.
17. 90mm x 62mm treated timber sole plate with notches for OSB3 studs.
18. EPS70 infill component.
19. Timber ring beam 44x204mm C24.
20. 90mm x 62mm treated timber head plate with notches for OSB3 studs.
21. 18mm OSB3 deck board.
22. Metal Web floor joist (floor system must be tested in accordance with EN 1365-2).
23. 12.5mm Type F or 15mm Type A plasterboard to specification.
24. Floor joist hanger to specification.

Figure 8: Wall to Intermediate Floor Junction



01. Block on edge with cement render finish.
02. Min. 40mm cavity.
03. EPS70/100 rigid board (Min. depth 125mm).
04. S.S. Wall Tie.
05. S.S. Wall Tie channel fix through insulation to OSB3 frame.
06. Cavity closer to spefification.
07. 7mm cavity incorporating breather membrane between OSB board & EPS70 insulation.
08. 18mm OSB3 racking board.
09. 90mm EPS70 insulation.
10. 18mm OSB3 racking board.
11. Plywood securing wedge.
12. AVCL barrier (to be fixed to timber wedges or over first layer of plasterboard.
13. 15mm Type F plasterboard to specification.
14. 12.5mm Type A plasterboard to specification.
15. Min. 24mm service cavity.
16. 90mm x 62mm Treated Timber Head plate with notches for OSB3 studs.
17. 24mm x 50mm timber battens to wall perimeter.
18. 12.5mm Type F or 15mm Type A plasterboard to specification.
19. AVCL barrier
20. Prefabricated roof truss by others (Roof truss fire specification should be in accordance with manufacturers test data).
21. Insulation between and above joists to meet project U-Values.
22. Optional EPS300 Eaves profile to specification.
23. Horizontal timber battens.
24. Selected roof finish.
25. Proprietary cross flow rafter ventilator.

Figure 9: Wall to Cold Roof Junction

3.1 STRENGTH AND STABILITY

3.1.1 Certificate and Structural Compliance

The Glavloc Build System is intended for use where Architect's drawings are available and satisfy the Building Regulations 1997 to 2019. The Architectural and Engineering design team are responsible for ensuring that architectural drawings and overall building design comply with the Building Regulations. Glavloc Build Systems, using a Chartered Structural Engineer, are responsible for the structural design of the Glavloc Build System.

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

It is imperative that all Design Team members are clear in relation to the elements of the project for which Glavloc Build Systems are responsible and what the ancillary Certificates relates to.

Buildings constructed using the Glavloc Build System shall be Certified by a Chartered Structural Engineer as being in accordance with Part A of the Building Regulations 1997 to 2019.

3.1.2 Superstructure Design

The Glavloc Build System can be designed to comply with the requirements of TGD to Part A of the Building Regulations 1997 to 2019 regarding the design to avoid disproportionate collapse.

The structural assessment of the Glavloc Build System shall be site specific and project specific. A Structural Design Engineer suitably qualified in this type of structure shall undertake the structural engineering of every building designed by Glavloc Build Systems. In accordance with I.S. EN 1990[13], a DSL1 (Design Supervision Level) should be employed to check the design in line with good practice.

This Structural Design Certificate provided by Chartered design Engineer should cover the adequacy of all relevant components within the structure in question taking into account the dimensions and thickness of each element. The Structural Design Certificate of compliance must also confirm that there is sufficient uplift resistance, that there is adequate racking and adequate load bearing capacity to either side of any opening to ensure the stability of the system. 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 Substructure Design

The design of the building's substructure is outside the scope of this Certificate. The design of the substructure is the responsibility of the Client's Engineer. The Engineer will need to be a suitably qualified Chartered Engineer and the design will need to be in accordance with the relevant codes and standards, i.e. foundations must be designed in accordance with I.S. EN 1997[14]. The Glavloc Build System's Engineer will be responsible for undertaking a load take down for the structure and providing this information to the Client's Engineer for use in the design of the substructure. The Glavloc Build System's Engineer will also need to provide the Client's Engineer with the permissible deflection of the ground floor slab under the Glavloc Build System's line loads and podium slab level loading.

3.1.4 Design Loads

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

- I.S. EN 12369-1[16]
- I.S. EN 1995-1-1[15] Eurocode 5
- SR 70[17]
- I.S. EN 1991-1-1[18][19] Eurocode 1
- I.S. EN 1991-1-4[19] Eurocode 1
- I.S. EN 1991-1-3[20] Eurocode 1

Design snow and wind loads should be based on Diagram 1 and 14 of TGD to Part A of the Building Regulations 1997 to 2019.

Non-load bearing partitions and walls are designed in conformance with the criteria set out in BS 5234-1:1992. Holding down straps should comply with I.S. EN 10143:2006. Typical design loads, in the absence of client specified, project specific loads, are:

- Imposed load on floor of 1.5kN/m^2 plus an allowance of 0.5kN/m^2 for internal partitions.
- Roof imposed loads of 0.60kN/m^2 with an allowance of 0.25kN/m^2 distributed load over a loft space with access, along with a

concentrated load (point load) of 0.9kN i.e. water tank.

- Wind loads based on I.S. EN 1991-1-4[19].

Greater loads can be accommodated by request.

3.1.5 Structural Testing

Glavloc Build Systems have undertaken extensive structural testing on the construction system. The results of the structural testing completed has been used to verify the relevant aspects of the structure where the design falls within the scope of I.S. EN 1995-1-2[15].

3.1.6 Wind Load

Buildings designed in accordance with the Glavloc Build System Design Manual will have adequate resistance to wind loads and can be used in all locations in Ireland.

For very exposed sites on hills above the general level of the surrounding terrain, the system can be specifically designed to meet the requirements as defined in I.S. EN 1991-1-4[19].

3.2 STRUCTURAL FIRE SAFETY

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

All materials such as cavity barriers and fire stops, used in the construction, comply with I.S. EN 13501-1[21]. They shall be detailed as described in Section 2 (of this Certificate) and as specified in the Glavloc Build System fire stopping details in line with the supporting documents to the Building Regulations 1997 to 2019.

Any compartment or separating wall providing fire compartmentation shall be carried up through any roof space and brought up to the underside of the roof cladding to provide adequate fire stopping.

No services can pass through a separating wall**.** Services are permitted within the provided service cavity on designated internal and external loadbearing and non-loadbearing walls of the Glavloc Build System provided the wall is not a separating wall.

All fire testing on the Glavloc Build System walls has been carried out with services penetrations in the wall to accurately test the system.

3.2.1 Structural Fire Safety Purpose Groups (Volume 2)

The buildings in purpose group 1(a), 1(b), 1(c) and 1(d), are covered under TGD B Fire Safety Dwelling Houses Volume 2 of the Building Regulations 1997 to 2019. Under this revision 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[22] , I.S. EN 1365-1[23] *and* I.S. EN 1365-2[24].

3.2.2 Structural Fire Safety Purpose Group 2006

The fire resistance performances of elements of the Glavloc Build System's loadbearing structures are given in Table 4, Table 5 and Table 6 as a combination of I.S. EN 1364-1[22] and I.S. EN 1365-2[24]. Table 4, Table 5 and Table 6 contain fire resistance tests to 30 and 60 minutes.

3.3 IMPACT RESISTANCE

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

4.1 BEHAVIOUR IN RELATION TO FIRE

4.1.1 Fire Resistance

Fire tests and assessment of the test results show that buildings constructed using the Glavloc Build System can meet the Building Regulation requirements in relation to fire resistance as shown in Table 4, Table 5 and Table 6 of this certificate. The tests have demonstrated the ability of the Glavloc Build System to withstand severe fire exposure for more than that required for compliance with the Building Regulations in terms of fire performance. Tests have been conducted on behalf of Glavloc Build Systems to meet fire test requirements of I.S. EN 1365-1[23]. The test required is dependent upon the purpose group and height of the building being designed and constructed.

The Glavloc Build System must be designed with the required boarding specification:

(a) to meet the minimum requirements of Table A1 of TGD to Part B 2017 Volume 2 of the Building Regulations 1997 to 2019 for purpose group 1(a), 1(b) & 1(d);

(b) to meet the minimum requirements of Table A1 and Table A2 of TGD to Part B 2006 of the Building Regulations 1997 to 2019 for all other purpose groups to which this Certificate applies;

and to meet any other building specific structural fire performance requirements.

Table 4, Table 5 and Table 6 of this Certificate provides a table of tested fire results 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.

The Glavloc Build System provides two leaves in a separating wall with a minimum of 20mm clear cavity between the two securing wedges, implying a 68mm cavity is present between the two 150mm wide OSB3 strips. Where services are required, they are to be installed within the service cavity provided, ensuring that the integrity of the fire lining is maintained.

Services shall not be placed in the cavity of a compartment wall. Where services are required to penetrate a compartment wall, all such penetrations shall be kept to a minimum and shall be fire stopped. Where services (e.g. light switches and sockets) are placed on a compartment wall, a service cavity shall be provided so that the integrity of the fire lining is maintained.

Accommodation of services in compartment walls/floors and separating walls must be in accordance with Section 3.5.4.1 of TGD to Part B 2017 Volume 2 of Building Regulations 1997 to 2019 for purpose group 1(a), 1(b) & 1(d) and in accordance with Section 3.2.5.7 and 3.4 of TGD to Part B 2006 of the Building Regulations 1997 to 2019 for all other purpose group to which this certificate applies.

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

The building details of the system incorporate suitable cavity barriers and fire stops, in accordance with I.S. EN 13501-1[21], to satisfy the requirements of Section 3.6 of TGD to Part B 2017 Volume 2 of the Building Regulations 1997 to 2019 and Section 3.3 of TGD to Part B 2006.

The party walls between terraced housing or between semi-detached dwellings is treated as a separating wall and must be constructed to comply with the requirements outlined in TGD to Part B 2017 Volume 2 and TGD to Part B 2006 of the Building Regulations 1997 to 2019.

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 0.33m^2 with a minimum width and height of 450mm. The opening section should be capable of remaining in the position which provides this minimum clear area. The window should be positioned as required by BS 9991[25] and BS 9999[12], and in accordance with Part B1 of TGD B 2006 and Part B6 of TGD to Part B Volume 2 of the Building Regulations 1997 to 2019. Any restrictor fitted, must be easy to operate.

The fire resisting elements of the construction that are specified in Table 4, Table 5 and Table 6 of this Certificate provide 30 and 60min fire resistance from either side for a range of specifications.

4.1.2 Plasterboard Installation

The proper application of plasterboard to the systems wall panels is critical for both fire and acoustic 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 the Contractor. Plasterboard, in addition to all cavity barriers and fire stops on all structural and separating walls, must be fully checked on site and signed off by the Main Contractor in accordance with project specific details. All plasterboard that provides fire resistance to load bearing and non-load bearing elements of the

structure must conform to the requirements of I.S. EN 520[8] and must be installed in accordance with the specification given in Table 4, Table 5 and Table 6 of this Certificate .

4.1.3 Surface Spread of Flame

An external cladding of brick/block has a designated Class 0 National Rating surface spread of flame as shown in Table 2. For a more comprehensive list of material and product fire performance ratings, reference should be made to Table A5 of TGD to Part B 2017 Volume 2 and Table A6 of TGD to Part B 2006 of the Building Regulations 1997 to 2019. The Classes are defined in accordance with BS 476-7[27].

Material	Fire Rating (National Class)	Fire Rating (European Class)
Brickwork/ Blockwork	Class 0	Class B-s3, d2
Timber Boarding	Class 3	Class D-s2, d2
Internal Plasterboard before decoration	Class 0	Class B-s3, d2
Slates/Tiles	AA	Class $B_{Roof(t4)}$

Table 2 - Surface spread of Flame

4.1.4 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 TGD to Part J of the Building Regulations 1997 to 2019. 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 1997 to 2019.

Combustible material in proximity to a constructional hearth must be protected by 250mmm of solid concrete or as detailed in Diagram 8 of TGD to Part J of the Building Regulations 1997 to 2019. Heat producing appliances will generally be installed on site with appropriate opening designed in the first-floor level and at ceiling level to attic.

4.1.5 Roof Designation

All tiles or slates used in the roof in conjunction with the Glavloc Build System shall be designated AA in accordance with TGD to Part B of the Building Regulations 1997 to 2019 (reference Table A4 of TGD B 2017 Volume 2 and reference Table A5 of TGD B 2006 depending upon which purpose group applies). Other NSAI Agrément approved roof coverings may also be used with the system under the guidance of a Glavloc Build Systems appointed Chartered Engineer.

4.2 THERMAL INSULATION

The Glavloc Build System is insulated with EPS70/EPS100 insulation on the exterior of the wall system. EPS70/EPS100 is also fitted between the OSB3 studs, for additional thermal performance. The thermal conductivities for a range of typically used EPS insulations are giving in Table 3. 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 TGG to Part L of the Building Regulations 1997 to 2019 can be determined. The Glavloc Build System can be designed to provide specific elemental u-values as required on a project specific basis.

Insulation Type	Thermal Conductivity W/m.K
EPS 70 White	0.037
EPS 70 Silver	0.031
EPS 100 White	0.036
EPS 100 Silver	0.031

Table 3 - Typical insulation

Table 7 of this Certificate gives a range of wall elemental U-values in W/m^2K for various thickness and types of insulation.

With the appropriate amount of insulation fitted to the system, the Glavloc Build System meets and can exceed the maximum back-stop elemental U-value requirements of TGD to Part L of the Building Regulations 1997 to 2019.

4.2.1 Limiting Thermal Bridging

The linear thermal transmittance ψ-value (Psi-value) describes the additional heat loss associated with junctions and around openings. The Certificate holder has carried out ψ-value calculations for a range of thermally bridged junctions in accordance with IP 1/06[2], BRE report BR 479[3] and I.S. EN ISO 10211[4].

Table 9 of this Certificate gives ψ-values for a range of Glavloc Build System's junctions and their corresponding flanking elemental U-value. Each junction has a Standard Detail (SD) reference number which relates to the Glavloc standard installation details. The published ψ-value in Table 9 remain valid for the stated target flanking elemental U-value. When flanking elemental U-values deviate by an aggregated 20%[1] from the target U-values, the ψ-values no longer remain valid and guidance must be sought from the Certificate holder. A full listing of ψ-value

[1] See footnote 3 of TGD to Part L, Table D4.

calculations, along with the building details on which calculations are based, are contained within the Certificate holder's technical manual.

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 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 can be taken as 0.08.

Alternatively, the transmission heat loss coefficient due to thermal bridging (H_{TB}) can be calculated out by summing up the ψ-values for each junction and multiplying by the linear length of each junction. The Y-value is calculated by dividing H_{TB} by the exposed surface area. The ψ-values published in Table 9 of this certificate can be used in a Y-value calculation subject to flanking elemental U-value being within acceptable range/tolerance.

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 and the conventions outlined in BRE Report BR 497.

4.2.2 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 are greater than 15°C, best practice will have been adopted to safeguard against the risk of surface condensation occurring under normal occupancy and humidity class levels.

Table 9 of this Certificate gives internal surface temperature factors (f_{Rsi}) for a range of building junctions and their corresponding flanking elemental U-value.

The Glavloc Build System has been assessed and when detailed in accordance with this Certificate, these thermally bridged junctions comply with the requirements of Section D.2 of Appendix D of TGD to Part L of the Building Regulations 1997 to 2019.

4.3 VENTILATION

4.3.1 Un-designed Air Infiltration

Air permeability can be measured by means of a pressure test and this is now a mandatory requirement under TGD to Part L of the Building Regulations 1997 to 2019 to show compliance with the backstop air permeability index of 5 $m^3/(h.m^2)$ at a pressure of 50Pa across the building envelope. When inputting values into DEAP, the measured air permeability index at a pressure differential of 50Pa across the building envelope is divided by 20 to determine an air permeability value which is more representative of the actual pressure differential across the building envelope under normal conditions.

The procedure for testing is specified in I.S. EN ISO 9972[28] 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 1997 to 2019. 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.

TGD to Part L of the Building Regulations 1997 to 2019 requires 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.

The Glavloc Build System can provide adequate levels of airtightness through the provision of a designed airtightness line using an AVCL and compatible sealants and tapes.

4.3.2 Designed Ventilation

TGD to Part F of the Building Regulations 1997 to 2019 prescribes ventilation requirements to meet the needs of the occupants within the building. This can 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, 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 $m^3/(h.m^2)$ and lower than 5 $m^3/(h.m^2)$, natural ventilation can be considered as one acceptable ventilation solution for a dwelling. When the air permeability is lower than 3 $m^3/(h.m^2)$ natural ventilation is no longer acceptable and some form of mechanical ventilation system must be considered.

All ventilation systems will need to 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.

4.4 INTERSTITIAL CONDENSATION

4.4.1 Condensation in Walls

Calculations to BS 5250[1] have been carried out for all external wall build-ups covered by this certificate and predict no risk of interstitial condensation within the external wall. As a result the external walls have passed the risk criteria set out in I.S. EN ISO 13788[29].

It is a requirement to provide an Air and Vapour Control Layer (AVCL) behind the plasterboard to protect against interstitial condensation. To remain effective, the continuity of the AVCL layer is imperative to eliminate any risk of interstitial condensation. Continuity can be achieved through the correct application of sealants and tapes. In the Glavloc Build System an AVCL is provided on all external walls in either one of the following locations:

- between the plasterboard and the OSB3 racking board
- between the layers of plasterboard (where more than one layer is required).

4.4.2 Condensation in Roof

In both cold (insulation at ceiling level) and warm (insulation along the slope) 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 an airtight barrier.

Roof ventilation should be provided in accordance with TGD to Part F of the Building Regulations 1997 to 2019 and the recommendations of BS 5250[1]. 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 eave trays may be provided to maintain ventilation at the eaves.

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 provided on the warm side of the insulation. Ventilation openings should be provided to every roof void along two opposite sides of the roof and should be equivalent in area to a continuous opening of not less than 25mm at each side. It should also be noted that the dimensions of the cross-ventilated void and the ventilation depends on the size of the roof.

In the case of warm flat roofs, the risk of the 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.

Type	Element:	Test Standard	Results	Purpose Class
External Load Bearing Walls				
1	1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 1No. 12.5mm Type A Standard Plasterboard, 24mm G-Loc Zero Securing Pin, 18mm OSB3 Racking Board, 90x38mm G-Loc Zero Studs @ 600mm C/C, 90mm EPS70 Insulation, 18mm OSB3 Racking Board, 24mm G-Loc Zero Securing Pin, 125mm (minimum) EPS70 Insulation.	IS EN 1365-1[23]	30 mins from exposed side	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
2	1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 1No. 15mm Type F Plasterboard, 24mm G-Loc Zero Securing Pin, 18mm OSB3 Racking Board, 90x38mm G-Loc Zero Studs @ 600mm C/C, 90mm Polystyrene KORE SD IPS70 Insulation, 18mm OSB3 Racking Board, 24mm G-Loc Zero Securing Pin, 125mm (minimum) EPS70 Insulation.	IS EN 1365-1: 2012	60 mins from exposed side	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
Internal Load Bearing Walls				
3	1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 1No. 12.5mm Type A Standard Plasterboard, 24mm G-Loc Zero Securing Pin, 18mm OSB3 Racking Board, 90x38mm G-Loc Zero Studs @ 600mm C/C, 90mm EPS70 Insulation, 18mm OSB3 Racking Board, 24mm G-Loc Zero Securing Pin, 1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 1No. 12.5mm Type A Standard Plasterboard.	IS EN 1365-1[23]	30 mins from either side	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
4	1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 1No. 12.5mm Type A Standard Plasterboard, 24mm G-Loc Zero Securing Pin, 18mm OSB3 Racking Board, 90x38mm G-Loc Zero Studs @ 600mm C/C, 90mm EPS70 Insulation, 18mm OSB3 Racking Board, 24mm G-Loc Zero Securing Pin, 1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 1No. 12.5mm Type A Standard Plasterboard.	IS EN 1365-1[23]	60 mins from either side	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
See Notes on Table 6				

Table 4 - Fire Protection Requirements for building elements

Type	Element:	Test Standard	Results	Purpose Class
Separating/Compartment Walls				
5	**Twin Frame Wall** 1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 2No. 15mm Type F Plasterboards, 24mm G-Loc Zero Securing Pin, 18mm OSB3 Racking Board, 90x38mm G-Loc Zero Studs @ 600mm C/C, 100mm Stone Mineral Wool (density = 45kg/m^3) insulation between the studs, 18mm OSB3 Racking Board, 24mm G-Loc Zero Securing Pin, 20mm Cavity, 24mm G-Loc Zero Securing Pin, 18mm OSB3 Racking Board, 90x38mm G-Loc Zero Studs @ 600mm C/C, 100mm Stone Mineral Wool (density = 45kg/m^3) insulation between the studs, 18mm OSB3 Racking Board, 24mm G-Loc Zero Securing Pin, 2No. 15mm Type F Plasterboards, 50x24mm Timber Battens (Service Cavity), 1No. 12.5mm Type A Standard Plasterboard.	IS EN 1365-1[23]	60 mins from either side	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
Non-Load Bearing Walls				
6	1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 1No. 12.5mm Type A Standard Plasterboard, 24mm G-Loc Zero Securing Pin, 18mm OSB3 Racking Board, 90x38mm G-Loc Zero Studs @ 600mm C/C, 90mm EPS70 Insulation, 18mm OSB3 Racking Board, 24mm G-Loc Zero Securing Pin, 1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 1No. 12.5mm Type A Standard Plasterboard.	IS EN 1365-[23]	30 mins from either side	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
7	1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 1No. 12.5mm Type A Standard Plasterboard, 24mm G-Loc Zero Securing Pin, 18mm OSB3 Racking Board, 90x38mm G-Loc Zero Studs @ 600mm C/C, 90mm EPS70 Insulation, 18mm OSB3 Racking Board, 24mm G-Loc Zero Securing Pin, 1No. 12.5mm Type A Standard Plasterboard, 50x24mm Timber Battens (Service Cavity), 1No. 12.5mm Type A Standard Plasterboard.	IS EN 1365-1[23]	60 mins from either side	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
8	1No. 15mm GTEC Fire Board, 50mm x 100mm Timber Studs at 600mm Centres, 1No. 15mm GTEC Fire Board.	EN 1364-1[22]	30 mins from either side	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
9	2No. 12.5mm Gyproc FireLine Boards, 75mm x 38mm Timber Studs at 600mm centres, 25mm Isover Acoustic Roll Insulation between the studs, 2No 12.5mm Gyproc FireLine Boards.	EN 1364-1[22]	60 mins from either side	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
Intermediate Floors – Solid Timber Joists				
10	18mm Tongue & Grooved Chipboard, 47mm x 200mm Joists At 400mm Centres Without Noggins, 1No. 15mm GTEC Standard Board.	IS EN 1365-2[24]	30 minutes	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
See Notes on Table 6				

Table 5 - Fire Protection Requirements for building elements (Cont.)

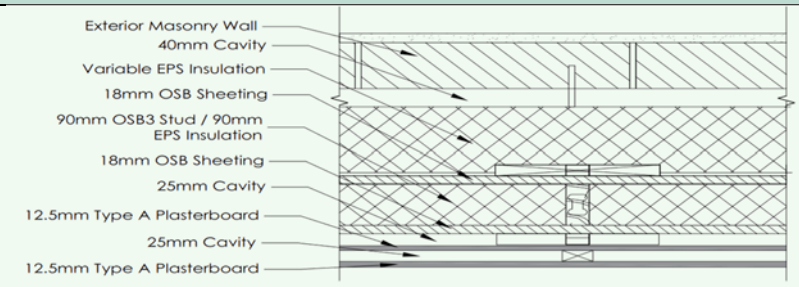
Type	Element:	Test Standard	Results	Purpose Class
Intermediate Floors – Solid Timber Joists (Continued)				
11	22mm Tongue & Grooved Chipboard, 47mm x 200mm Joists At 600mm Centres with Noggins, 1No. 15mm GTEC Standard Board (Fixed with 63mm GTEC High Thread Screws).	IS EN 1365-2[24]	60 minutes	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
Intermediate Floors – Manufactured Joists				
12	30min Steico I-Joist intermediate floor:22mm Chipboard, 200mm I- joist at 600mm Centres, 15mm Type A Standard Plasterboard	IS EN 1365-2[24]	30 minutes	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5
13	60min Steico I-Joist intermediate floor 22mm Chipboard, 200mm I-joist at 600mm Centres, Resilient Bar at 450mm Centres, 2No. x 15mm Type F Plasterboard	IS EN 1365-2[24]	60 minutes	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 55
14	30min Metal Web Joists -18mm OSB T&G OSB3 (Joists glued using D4 Adhesive to joints and fixed with 4.2mm x 45mm screws at 200mm centres), 219mm metal web joist at 600mm Centres, 47x72mm strongback fixed to each joist, 15mm Type A Plasterboard fixed with 3.5x55mm Drywall Screws at 150mm centres.	IS EN 1365-2[24]	30 minutes	1(a), 1(b), 1(c), 1(d), 2(b), 3, 4(a) & 5

Notes:

- Type F plasterboard refers to the particular type of plasterboard tested in the respective fire tests and the details are available directly from Glavloc Build Systems.
- 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 Glavloc Build Systems.
- All Wall Fire Tests were completed without the joints being taped and jointed.
- Non-load bearing wall fire resistance data is provided from the Load Bearing Test Data and can be utilised under the Field of Direct Application whereby the load can be decreased on the specimen.
- Metal Web and Timber I-Joist constructions must be supported by an EN 1365-2[24] Test Report.

Table 6 - Fire Protection Requirements for building elements (Cont.)

External walls U-value for variable EPS thickness



Wall thickness	EPS variable thickness:	Calculated U-value[1] (W/m^2K)
488mm	120mm	0.174
493mm	125mm	0.171
498mm	130mm	0.168
503mm	135mm	0.165
508mm	140mm	0.162
513mm	145mm	0.16
518mm	150mm	0.157
523mm	155mm	0.155

[1] Calculations are based of EPS 70 White only (0.037 W/m.K).
[2] When superior project specific U-value are required, these can be achieved by increasing insulation thickness or introducing superior EPS insulations as described in Table 3 of this certificate. In such incidences a project specific U-value calculation should be requested form the certificate holder.

Table 7 - Typical External Wall U-values

Ground Floor slab U-value for varying P/A ratio											
P/A Ratio	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60
U-value[2]	0.111	0.129	0.14	0.149	0.156	0.161	0.165	0.169	0.172	0.174	0.176
[2] Floor U-values based on 150mm RC Slab on 95mm PIR insulation (λ=0.022) on soil (λ=2.0). P/A Ratio = Exposed perimeter of the floor to total ground-floor area ratio.											

Table 8 - Typical Ground Floor U-Values

Target linear thermal transmittance (ψ) for different types of junctions.			
ACD Ref:	**Junction Description**	**Temperature Factor f_{Rsi} (Min = 0.75)**	**Glavloc Ψ-value (W/m.K)**
4.02	GL_SD_03 GF Junction (3-D TM)	0.891	0.104
4.02	GL_SD_04C GF Junction (2-D TM)	0.91	0.073
4.04.1	GL_SD_12 Corner	0.91	0.043
4.04.2	GL_SD_13 Inverted corner	0.97	-0.072
4.05	GL_SD_06B Timber Intermediate Floor within a dwelling	0.96	0.011
4.05a	GL_SD_06B Timber Separating Floor between dwellings[1]	0.96	0.046
4.06	GL_SD_26 Separating Wall – Plan[1]	0.94	0.065
4.07	GL_SD_24 Separating Wall – Section[1]	0.90	0.117
4.10	GL_SD_11D Warm Eaves	0.91	0.037
4.13.1	GL_SD_11C Eaves (Pitched Ceiling)	0.94	0.025
4.15	GL_SD_45 Ventilated Roof – Attic Floor Level	0.90	0.040
4.19	GL_SD_11E Parapet	0.90	0.035
4.20	GL_SD_14 Ope Head	0.93	0.010
4.21	GL_SD_16 Jamb	0.96	0.002
4.22	GL_SD_15 Cill	0.92	0.093
4.23.1	GL_SD_04 Separating Wall through Ground Floor - Rising Wall (3-D TM)[1]	N/A	0.088
4.23.1	GL_SD_04E Separating Wall through Ground Floor - Insulated Foundation (3-D TM)	N/A	0.026
4.23.2	GL_SD_04D Partition Wall Through Ground Floor (3-D TM)	N/A	0.006
[1]Psi value is for the whole junction. Half the value should be applied to each dwelling on either side of the junction. Flanking element U-values for walls, roof and floor thermal models above were based on, U_W = 0.14 W/m^{2}k, U_F = 0.09 W/m^{2}k, U_R = Varies Modelled junction ψ-values above can be used in y-value calculations.			

Table 9 - Typical Ψ-value (W/m.K)

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

4.5 SOUND

4.5.1 Party Wall

The acoustic performance of the Glavloc Build System has been assessed by Laboratory testing and through adopting best practice at salient junctions to minimise the effects of airborne, impact and flanking sound in regard to party walls (separating wall). An examination was also carried out of the key junctions in the external walls to ensure compliance with the requirements of TGD to 2Part E of the Building Regulations 1997 to 2019.

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

- Structural isolation is achieved by leaving a minimum 20mm gap (68mm cavity between the 150mm OSB3 strips) between the securing wedges of the wall frames.
- Stone mineral wool of minimum 45kg/m^3 density is placed between the studs in each frame. These wool batts are continuous from ground floor to the upper floor ceiling level and provide the required acoustic properties.
- Mass is achieved by using dense wall linings. Each wall panel consists of OSB3 studs

connected to timber head and sole plates with an 18mm OSB3 racking board on the room face of each wall frame, and a 150mm wide strip of OSB3 board in the cavity face of each wall frame. The wall panels are fitted with 100mm stone mineral wool (45kg/m^3) between the studs. The wall panels are boarded with 2No. layers of 15mm Type F plasterboard, following which timber battens are aligned vertically on the wall and a 12.5mm layer of Type A plasterboard if fixed to complete each face of the wall panels. Only joints on the decorated layer of plasterboard are required to be taped and filled.

- 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 floor and the party wall, an additional 700mm section of stone mineral wool fiber insulation is provided.
- The floor void is fully filled with stone mineral wool. This is done both sides of the twin frame party wall. This mineral wool layer will also help to minimise flanking and direct sound transmission.

The separating wall (party wall) in the Glavloc Build 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 1997 to 2019.

Any onsite acoustic tests are to be carried out on separating walls between four pairs of rooms in accordance with I.S. EN ISO 16283-1[30] and impact sound insulation to I.S. EN ISO 16283-2[31].

4.5.2 Compartment Floors

The Compartment Floors covered in Section 2.5.3 of this Certificate can meet the acoustic requirements as described in Section 4 of TGD to Part E of the Building Regulations 1997 to 2019. The resistance to airborne sound depends mainly on the combined mass of the materials, plasterboard ceilings and good flanking detailing.

4.6 ACCESS FOR PEOPLE WITH DISABILITIES

4.6.1 Access and Use

Building designs can accommodate minimum dimensions for doors/corridors/rooms and circulation spaces to provide access for people with disabilities as indicated in Diagrams 5 – 12 of TGD to Part M of the Building Regulations 1997 to 2019.

4.6.2 Sanitary Conveniences

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

4.7 WEATHERTIGHTNESS AND DAMP PROOFING

Thresholds shall be detailed to allow level access (as required), while protecting the timber wall panels 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 the system incorporates a drainage channel on the ground floor of all modules where there is a separating wall. This drainage channels reduces the risk of accidental flooding in one dwelling causing water damage to the neighbouring dwelling.

4.7.1 Floor Damp Proofing

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

4.7.2 Roof Cladding

Roof coverings will provide adequate weather resistance in all situations covered by Section 3 of this Certificate, when completed in accordance with this Certificate and the manufacturer's instructions.

4.7.3 External Cladding

The external cladding detail used on the Glavloc Building System consists of a masonry/brick outer leaf incorporating a 40mm minimum clear cavity or another NSAI approved cladding system.

When constructed with a masonry/brick outer leaf, care must be taken to ensure there is well filled perpends and mortar free cavity ties, to minimise the risk of water reaching the cavity face of the inner leaf.

Penetrations in the insulating lining to the inner leaf are sealed. Wind-driven rain, which may cross the cavity under adverse conditions, will be effectively prevented from penetrating the inner leaf.

Stepped DPC's must be provided over window and door heads to deflect moisture that enters the cavity from entering the dwelling/building. Good building practice such as stepped DPC and weep-holes are essential to ensure that moisture within a cavity is deflected to the outside of the building.

4.7.4 Windows and Doors

This Certificate does not cover the installation or performance of windows and doors. However, 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.

Windowsills and external thresholds must either be impervious, run the full width of the cavity and be suitably jointed to a horizontal, continuous cavity tray or DPC which is preferably flexible, or a cavity

tray must be provided under the opening provision. Good attention to detail must be given to ensuring that, when installing the horizontal cavity tray or DPC below an external window board, provision for any condensation that may occur on the window is deflected into the cavity and away from the timber frame. To prevent Thermal bridging, the Glavloc Building System typically incorporates profiled EPS surround for all window and door openings, which are installed onsite before the doors, windows and windowsills are installed. The windows and doors are made to order by the window manufacturer using the dimensions provided by the Glavloc Build Systems design office.

4.7.5 Rainwater Goods

Buildings constructed using the Glavloc Build System can readily accommodate adequate rainwater gutters and down pipes.

4.8 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 building system or the services.

- At the design stage, it is useful if the positions and sizes of services can be established in advance to prevent any issues onsite. A considerable amount of services is generally required in bathroom, hot press and utility areas.
- Where plastic coated electrical wiring is in contact with insulation, then the cables must be enclosed in a suitable conduit, e.g. PVC as outlined in I.S. 10101[34].
- Under no circumstances should electrical cables be placed within compartment floors, walls and/or party walls. The Glavloc Build System walls provide a service cavity as standard to distribute electrical services on these fire rated build-ups.
- All electrical and plumbing services on the external walls must be accommodated in the specially built service cavity.
- The enclosure of cold-water pipework within the external wall should be avoided as condensation on the pipe work could lead to wetting of the timber frame. 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.
- Additional slots, notches or holes should not be cut through any building component without the approval of the Glavloc Build Systems Chartered Structural Engineer responsible for the overall design of the structure.

4.9 DURABILITY

The timber-based structure and wall brick/block external cladding has been assessed as capable of achieving a minimum design life of 60 years. The DPC layer ensures that the bottom plate of the wall system has a life equal to that of the other building system members.

The insulation used is made from 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.

Buildings constructed using the Glavloc Build System will, when constructed in accordance with Glavloc Build Systems Assembly Instructions and the requirements of this Certificate along with all relevant codes of practice will have design life of at least 60 years in accordance with BS 7543[32].

4.10 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 (with the exception of finishing the plasterboard) 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 timber 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 using slab nails.

Repainting should be carried out in accordance with the relevant recommendations of BS 6150[33]. 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.

4.11 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 Glavloc Building System:

- Structural strength and stability (racking resistance, load bearing capacity).
- Behaviour in relation to fire.
- System specific loadbearing fire testing to EN 1365-1[23] and EN 1365-2[24].
- Acoustic performance, resistance to airborne and impact sound transmission.
- Thermal insulation performance.
- 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.
- Pre-completion airtightness testing.
- 3D thermal modelling of junction details in accordance with BRE IP 1/06[2].

4.11.1 Other Investigations
Existing data was examined to assess:
- Adequacy of the Glavloc Build System Assembly Instructions.
- Adequacy of Weather tightness of building constructed using the system.
- Durability of the system.
- Requirements for maintenance.

4.11.2 Production Audits
Production audits were carried out at the Glavloc Build Systems factory to examine the process of design and manufacturing to assess the adequacy of the methods adopted for quality control.

4.11.3 Site Erection Visits
Buildings under construction were visited to assess the practicability of construction (assembly) and the adequacy of Glavloc Build System site supervision arrangements.

Part Five / Conditions of Certification 5

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

a) the specification of the product is unchanged.

b) the Building Regulations 1997 to 2019 and any other regulation or standard applicable to the product/process, its use or installation remains unchanged.

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

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

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

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

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

5.3 In granting Certification, the NSAI makes no representation as to;
a) the absence or presence of patent rights subsisting in the product/process; or
b) the legal right of the Certificate holder to market, install or maintain the product/process; or
c) whether individual products have been manufactured or installed by the Certificate holder in accordance with the descriptions and specifications set out in this Certificate

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

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

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

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

NSAI Agrément

This Certificate No. **19/0417** is accordingly granted by the NSAI to **Glavloc Build System Ltd.** on behalf of NSAI Agrément.

Date of Issue: **7th February 2020**

Signed

Seán Balfe
Director of NSAI Agrément

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

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