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**Agrément Certificate**

**14/5094**

Product Sheet 6

## JABLITE FLOORING SYSTEMS

### JABLITE GARAGE FLOOR SYSTEM

This Agrément Certificate Product Sheet<sup>(1)</sup> relates to the Jablrite Garage Floor System, a range of expanded polystyrene (EPS) panels, and concrete perimeter slip-bricks, stainless steel clips, concrete closure blocks and precast, prestressed concrete beams. The system is for use in conjunction with structural concrete topping reinforced with steel mesh as a suspended ground floor concrete slab, to form domestic integral, annex or outbuilding garages.

(1) Hereinafter referred to as 'Certificate'.

#### CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

#### KEY FACTORS ASSESSED

**Strength and stability** — the system has adequate strength and stiffness to support a suitable structural concrete topping and can sustain and transmit the dead and imposed floor loads associated with domestic garages (see section 6).

**Durability** — the system components, including the EPS, concrete beam and concrete topping reinforced with steel mesh, will have a design life equivalent to that of the building in which they are incorporated (see section 8).



The BBA has awarded this Certificate to the company named above for the system described herein. This system has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Paul Valentine  
Technical Excellence Director

Claire Curtis-Thomas  
Chief Executive

Date of First issue: 23 April 2018

The BBA is a UKAS accredited certification body – Number 113.

The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at [www.bbacerts.co.uk](http://www.bbacerts.co.uk)  
Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

#### British Board of Agrément

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## Regulations

In the opinion of the BBA, the Jablite Garage Floor System, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



### The Building Regulations 2010 (England and Wales) (as amended)

**Requirement:** A1(1)

**Loading**

Comment:

The system can sustain and transmit the dead and imposed floor loads associated with domestic garages to the supporting structure. See sections 6.7 to 6.24 of this Certificate.

**Regulation:** 7

**Materials and workmanship**

Comment:

The system is acceptable. See section 8 and the *Installation* part of this Certificate.



### The Building (Scotland) Regulations 2004 (as amended)

**Regulation:** 8(1)

**Durability, workmanship and fitness of materials**

Comment:

The system can contribute to a construction satisfying this Regulation. See section 8 and the *Installation* part of this Certificate.

**Regulation:** 9

**Building standards in relation to construction**

Standard: 1.1(a)

Structure

Comment:

The system can sustain and transmit the dead and imposed floor loads associated with domestic garages to the supporting structure. See sections 6.7 to 6.24 of this Certificate

Standard: 7.1(a)

Statement of sustainability

Comment:

The system can contribute to satisfying the relevant Requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.



### The Building Regulations (Northern Ireland) 2012 (as amended)

**Regulation:** 23(a)(i)(iii)(b)

**Fitness of materials and workmanship**

Comment:

The system is acceptable. See section 8 and the *Installation* part of this Certificate.

**Regulation:** 30

**Stability**

Comment:

The system can sustain and transmit dead and imposed floor loads to the supporting structure. The system can sustain and transmit dead and imposed floor loads to the ground. See sections 6.7 to 6.24 of this Certificate.

## Construction (Design and Management) Regulations 2015

## Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See sections:

3 *Delivery and site handling* (3.3), 4 *Design Considerations* (4.2, bullet point 2), 6 *Strength and stability* (6.4) and 12 *Procedure* (12.6, 12.7, 12.12, 12.13 and 12.14) of this Certificate.

## Additional Information

### NHBC Standards 2018

In the opinion of the BBA, the Jablite Garage Floor System used with concrete topping<sup>(1)</sup> reinforced with steel mesh, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards 2018* Chapters 5.2 *Suspended ground floors* and 10.1 *Garages*.

### CE marking

The Certificate holder has taken the responsibility of CE marking the EPS Infill Panels in accordance with harmonised European Standard BS EN 15037-4 : 2010.

## Technical Specification

### 1 Description

1.1 The Jablite Garage Floor System consist of a range of expanded polystyrene (EPS) panels (grey and white) and concrete closure blocks, stainless steel clips and structural concrete topping for use in constructing suspended ground floors in integral<sup>(1)(3)</sup>, annex<sup>(2)(3)</sup> and outbuilding<sup>(4)</sup> unheated garages.

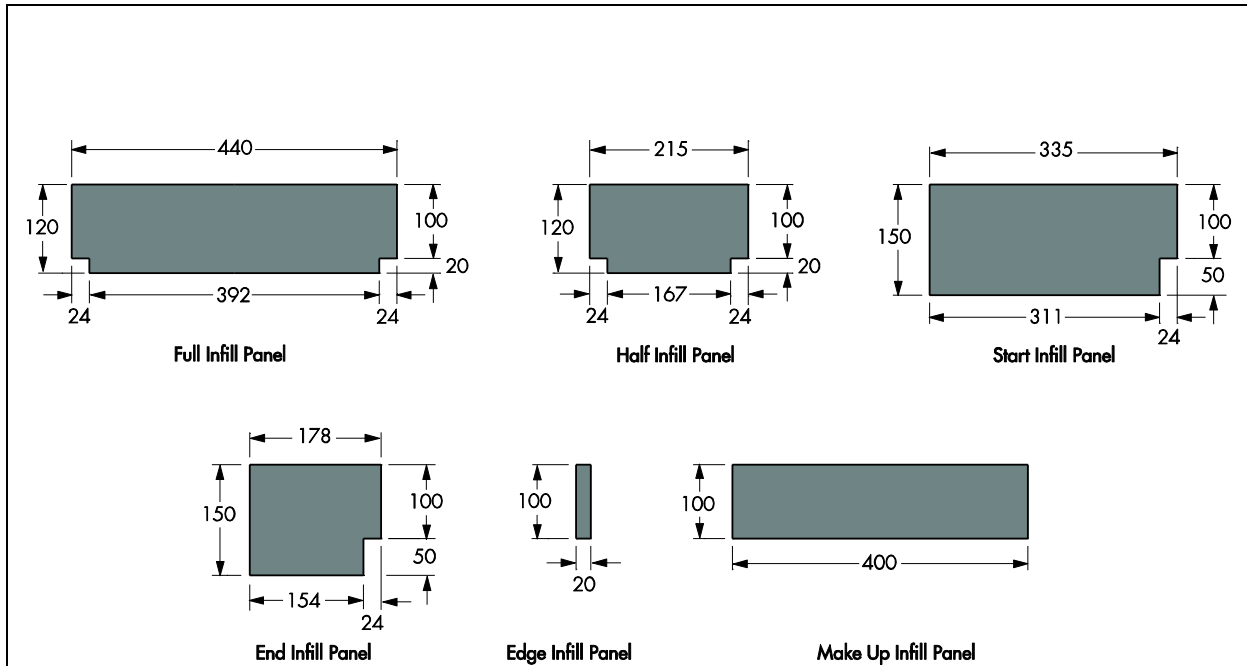
- (1) An unheated integral garage is a space that is built within the walls of the main property and is an element of the building's structure. These garages can allow admission to the house through an integral door.
- (2) An unheated annex garage is a space connected to the dwelling sharing one wall. These garages can also allow admission to the house through an integral door.
- (3) If the integral or annex garage is to be converted to a habitable space in the future, additional thermal insulation to the floor will be required.
- (4) An unheated outbuilding garage is a free standing space, completely separate (detached) from the dwelling. Outbuilding garages must be positioned at an acceptable distance from the dwelling, as required by the local Planning Authority.

1.2 Jablite Garage Floor System EPS Infill Panels are available in Full Infill Panel, Half Infill Panel, Start/End Infill Panels, Edge Infill Panels and Make up Infill Panels and are manufactured from Expanded Polystyrene (EPS) with the nominal characteristics given in Table 1 and Figure 1 of this Certificate.

*Table 1 Characteristic properties and product codes of Jablite Garage Floor System EPS Infill Panels*

Description	Product code	Mechanical resistance according to BS EN 15037-4 : 2010	
JGFS- Full Panel Grey	IN-000006488	Type R1 and Class R1 a	
JGFS - Full Panel White	IN-000006489		
JGFS - Half Panel Grey	IN-000006490		
JGFS - Half Panel White	IN-000006491		
JGFS - Start Panel Grey	IN-000006492		
JGFS - Start Panel White	IN-000006493		
JGFS - End Panel Grey	IN-000006494		
JGFS - End Panel White	IN-000006495		
JGFS - Edge Panel Grey	IN-000006496		-
JGFS - Edge Panel White	IN-000006497		-
JGFS - Make up Panel Grey	IN-000006498	Type R1 and Class R1 a	
JGFS - Make up Panel White	IN-000006499		

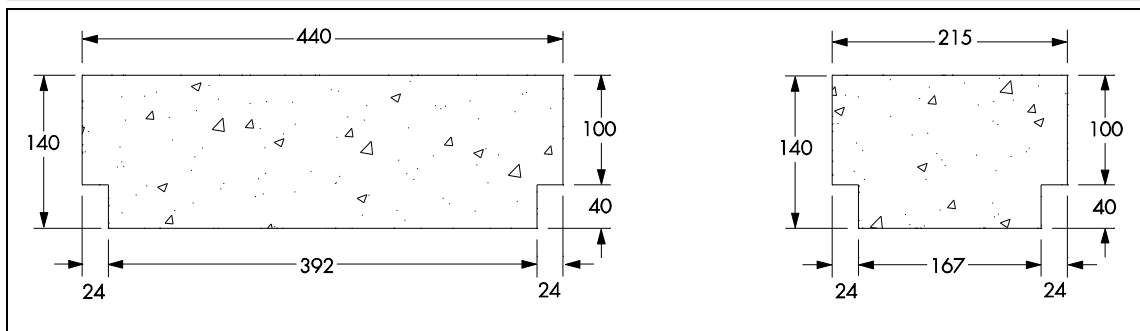
Figure 1 Example Standard EPS panels — dimensions (in mm)



1.3 The Certificate holder's specifications for ancillary items used in conjunction with the Jablite Garage Floor System EPS Infill Panels include the following:

- concrete topping reinforced with steel mesh to the specification given in Table 2. The concrete topping reinforced with steel mesh must be designed in accordance with BS EN 1990 : 2002 and BS EN 1992-1-1 : 2004 and their respective UK National Annexes, with a maximum aggregate size of 20 mm
  - The concrete used in the prestressed beam and concrete topping must comply with BS EN 206: 2013, BS 8500-1: 2015 and BS 8500-2: 2015.
- concrete closure blocks and concrete perimeter slip-bricks — with a compressive strength equal to, or greater than, that of the blocks used to form the inner leaf of the wall. For dimensions of concrete closure blocks see Figure 2.

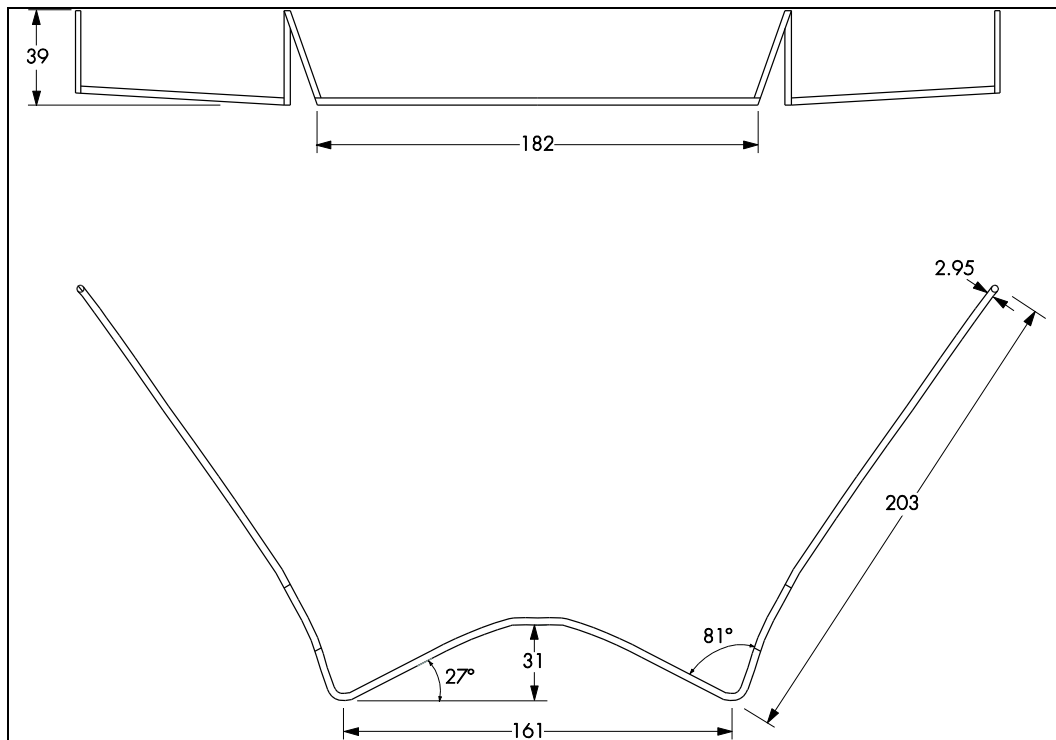
Figure 2 Closure blocks — details (in mm)



- stainless steel edge clips — used to provide an additional support to each EPS End and Start Infill Panel against applied design dead and imposed loads. The specification of the clips is shown below. For further details, see Figure 3 and section 6.8 of this Certificate:

Diameter of the clip	2.95 mm
Grade of stainless steel	302
Tensile / yield strength	1470/1710 N.mm <sup>-2</sup>
Modulus of elasticity	187.7 kN.mm <sup>-2</sup>

Figure 3 Stainless steel edge clips — profiles



1.4 Ancillary items outside the scope of this Certificate include:

- prestressed concrete beams — must be manufactured and CE marked in accordance with BS EN 15037-1: 2008, and designed in accordance with BS EN 1992-1-1 : 2004 and its UK National Annex, BS EN 206 : 2013, BS 8500-1 : 2015 and BS 8500-2 : 2015. See sections 6.16 to 6.24 of this Certificate
- gas barrier membranes<sup>(1)</sup>, if required, with third-party approval.

(1) must be compatible with EPS and hydrocarbon resistant.

## 2 Manufacture

2.1 The EPS Infill Panels are manufactured from expanded polystyrene beads using conventional moulding techniques.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Jablite Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001: 2008 by the BSI (Certificate FM01260).

## 3 Delivery and site handling

3.1 The EPS Infill Panels are supplied on pallets wrapped in polyethene, but are otherwise unprotected. Therefore, reasonable care must be taken during transit and storage to avoid damage.

3.2 The EPS Infill Panels should be stacked on a flat base clear of the ground and protected against prolonged direct sunlight and secured to avoid wind uplift and damage. Care must be taken to avoid contact with organic solvents.

3.3 The EPS Infill Panels must not be exposed to flame or ignition sources.

## Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Jablite Garage Floor System.

### Design Considerations

## 4 Use

4.1 Jablite Garage Floor System EPS Infill Panels are satisfactory for use as part of a suspended ground floor (over a sub-floor void) for domestic garages, where the loads do not exceed those specified in Table 3 of this Certificate.

4.2 A suitably experienced/qualified engineer should perform a site-specific assessment/design/ check to ensure that:

- the Full Infill Panel, Half Infill Panel, Start/End Infill Panels, Edge Infill Panels and Make up Infill Panel, structural concrete topping and concrete beams are in accordance with recommendations in this Certificate and the relevant parts of BS EN 15037-1 : 2008 and BS EN 15037-4 : 2010
- in the absence of a 100 mm upstand, the garage floor has an appropriate fall toward the garage entrance to prevent fuel/hydrocarbons entering any adjoining room; it must also be ensured that the garage floor covering is designed so as not to retain fuel/hydrocarbons
- the exact location and area of garages including all relevant levels, in relation to an agreed reference point and the position of services where applicable, is determined
- the floor area of domestic garage annexes to residential buildings does not exceed 36 m<sup>2</sup>
- the maximum length or width of domestic garages does not exceed 9 m
- the recommendations/limitations of the Local Authority for outbuildings (eg limitation of floor areas, height, distance from the main building) are taken into account
- the detail design for any opening larger than 150 mm × 150 mm for services is provided
- the provision of any services within a garage is in accordance with relevant national Building Regulations and Standards
- the construction detail for the entrance of the garage has been prepared
- the floor is not subjected to loads from construction materials until the concrete topping has reached its design strength
- the natural frequency of the floor is greater than 4.0 Hz. Use of the system where vibration due to rhythmic activity (such as dancing) and external sources (eg building construction or rail traffic) may be encountered is outside the scope of this Certificate.
- where required, lateral restraint is provided at ground floor level in accordance with the requirements of the national Building Regulations, BS EN 8103-1 : 2011 and *NHBC Standards 2018*.

4.3 At least a 150 mm deep void must be provided between the underside of the floor and the underlying ground surface.

4.4 In locations where clay heave is anticipated, a greater void depth may be required to accommodate the possible expansion of the ground below the garage floor. In such cases where the risk of clay heave has been confirmed by geotechnical investigations, a total void of up to 300 mm (see *NHBC Standards 2018*) may be required as follows:

- high volume change potential (300 mm total void)
- medium volume change potential (250 mm total void)
- low volume change potential (200 mm total void).

4.5 On sites which may be subject to emissions of ground gases or volatile organic compounds (VOC's), a suitably experienced and qualified person must assess the compatibility of the insulation with any potential emissions.

4.6 Electrical cables in contact with the EPS must be enclosed in a suitable conduit. The Certificate holder should be consulted for further advice.

4.7 Movement joints should be provided between homes and attached garages where there is a change of foundation type or depth.

4.8 The void beneath a garage floor is considered as unventilated where:

- the floor has adequate durability
- the ground beneath is well drained
- there is unlikely to be a build-up of soil gases.

## 5 Practicability of installation

The system is designed to be installed by a competent general builder or contractor, experienced with this type of product.

## 6 Strength and stability

### General

6.1 A suitably experienced/qualified engineer must ensure that the concrete beams are suitable for the domestic garage application (see section 4.2 of this Certificate).

### EPS products

6.2 The EPS panels provide a permanent formwork to the structural concrete topping reinforced with steel mesh. They make no further contribution to the long-term structural performance of the floor once the steel reinforced structural concrete topping has been placed and has obtained its full design strength.

6.3 Subject to compliance with the design and installation requirements of this Certificate, the Jablite Garage Floor System EPS Infill Panels have adequate strength to carry the normal temporary loads expected during the construction phase of the floor system including the weight of the structural concrete topping when poured.

6.4 Jablite Garage Floor System EPS Infill Panels may be cut to accommodate varying beam lengths. Cut panels must be at least 300 mm long and should be positioned at the floor edges. The width of the End Panels is 178 mm.

6.5 Jablite Garage Floor System EPS Infill Panels are designed to have a normal bearing of 18 mm, with a 3 mm allowance for misalignment and manufacturing tolerances in the straightness of the beam, with a minimum bearing width of 15 mm.

6.6 The Make up Infill Panels (see section 12.7) should not be used at widths greater than 400 mm.



6.7 Spacers for supporting steel mesh reinforcement should be located along the beams or on spreader plates over the Jablite Garage Floor System. This will reduce the risk of accidental penetration of the EPS during the construction phase and the resulting misalignment of the reinforcement within the structural concrete topping depth. The spacer dimensions must not be less than 50 by 50 mm; and a minimum of four spacers per m<sup>2</sup> are required.

### Stainless steel edge clips



6.8 The stainless steel edge clips have adequate strength to provide additional support to the Jablite Garage Floor System EPS Start and End Infill Panels against the applied design dead and imposed loads on the floor at SLS (Serviceability Limit State) and ULS (Ultimate Limit State) conditions (see section 1.3 of this Certificate). Three clips are used per full length of Start and End Infill Panels, and one clip is used per minimum cut length of Start and End Infill Panels.

## Structural concrete toppings



6.9 The concrete topping thickness and steel reinforcement specification must be as shown in Table 2 for loadings defined in Table 3 of this Certificate. The concrete topping above the Start and End panels must be designed as a cantilevered slab. The 335 mm panel must be placed at the end of the wall of the garage, positioned so as to be in a location inaccessible by vehicles. (See Figure 6 of this Certificate).

6.10 The structural concrete topping should be in accordance with BS 8500-1 : 2015, BS 8500-2 : 2015 and BS EN 206 : 2013, manufactured in plants covered by the QSRMC scheme (Quality Scheme for Ready Mixed Concrete) and laid by personnel with the appropriate skills and experience.

6.11 The structural concrete topping shown in Table 2, in conjunction with the EPS panels and the prestressed concrete beams (as defined in section 1.4 of this Certificate), is suitable for use in buildings with the characteristic loads defined in Table 3, when the concrete topping is designed to BS EN 1992-1-1 : 2004 and its UK National Annex with respect to steel mesh reinforcement, thickness and strength class.

**Table 2 Specification of structural concrete topping <sup>(1)(2)(3)</sup>. The minimum depth of concrete topping above the services is 75 mm**

### Reinforcement

One layer of A142 mesh to BS 4483: 2005 with a characteristic yield strength ( $f_{yk}$ ) of 500 N·mm<sup>-2</sup>. Steel reinforcement is placed at mid height of the concrete slab (nominal cover to steel reinforcement is 31.5 mm).

- (1) The strength class of concrete is C28/35 with maximum 20 mm aggregate.
- (2) For spot samples taken from initial discharge, the slump should be Class S2 (30 mm to 110 mm).
- (3) The aggregate for concrete must comply with BS EN 12620 : 2013.

6.12 Permitted characteristic loadings for structural concrete topping reinforced with steel mesh are shown in Table 3 of this Certificate.

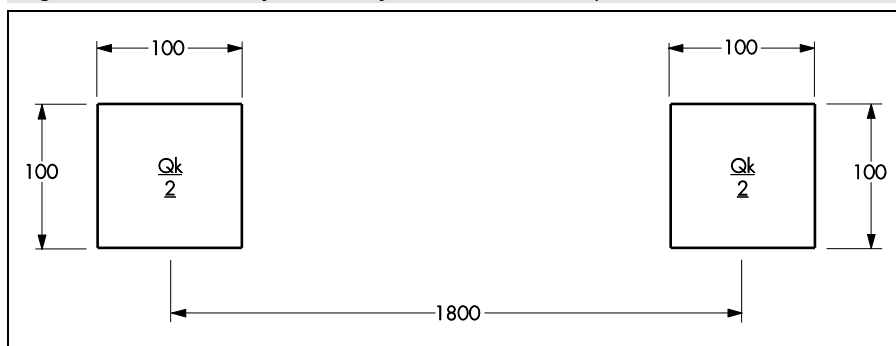
**Table 3 Maximum characteristic imposed loads for structural concrete toppings reinforced with steel mesh A142**

Description	Maximum characteristic loads
Imposed uniformly distributed load (UDL) (kN·m <sup>-2</sup> )	2.5 <sup>(1)</sup>
Imposed concentrated load (kN)	20 <sup>(1)</sup>

- (1) Imposed concentrated load must not be combined with the UDL, imposed load or other variable actions.

6.13 The load model is a single axle with a load  $Q_k$  applied on a square plate as shown in Figure 4, below . The imposed concentrated load must be applied over a square plate of dimensions not less than 100 mm by 100 mm.

**Figure 4 Dimensions of axle load for concentrated imposed load**





6.14 The maximum length of the cantilevered slab from the top face of the top flange of the concrete beam must not exceed 183 mm ( $178 \text{ mm} + 5^{(3)} \text{ mm} = 183 \text{ mm}$ ) and 340 mm ( $335 \text{ mm} + 5^{(3)} \text{ mm} = 340 \text{ mm}$ ). For 178 mm and 335 mm, see Figure 1 of this Certificate.

6.15 The maximum distance of the concentrated load applied on the cantilever from the top face of the concrete beam must not exceed 270 mm ( $335^{(1)} - 20^{(2)} + 5^{(3)} - 50^{(4)} = 270$ ).

- (1) Length of EPS End Panel.
- (2) Width of EPS insulation strip.
- (3) Assumed upper taper of the concrete beam.
- (4) Half of width of a 100 mm square plate (imposed concentrated load for garage buildings is assumed to be applied over a square plate not less than 100 mm by 100 mm).

## Prestressed concrete beam

6.16 The Full Infill Panel, Half Infill Panel, Start/End Infill Panels, Edge Infill Panels and Make up Infill Panels are for use with self-bearing prestressed concrete beams, normal weight concrete, which provide the final strength of the floor system independently of any other constituent part of the floor system.

6.17 The prestressed concrete beams must be designed in accordance with BS EN 1992-1-1 : 2004 (Eurocode 2) and its UK National Annex, by a suitably experienced/qualified engineer to ensure that the beams are adequate to resist the applied loading. The orientation of the concrete beams must be perpendicular to the garage entrance (See Figure 6 of this Certificate).

6.18 The proposed prestressed concrete beams must be CE marked and manufactured and designed in accordance with the requirements of BS EN 15037-1 : 2008.

6.19 The serviceability deflection limit of the proposed concrete beam must be in accordance with BS EN 1992-1-1 : 2004, as summarised in Table 4 of this Certificate.

*Table 4 Deflection limitation of prestressed concrete beams*

Description	Limit for deflection
Camber at transfer (upward deflection) of pre-stressed force under the self-weight of the concrete beam	span/250
Deflection at application of finishes – downward from the level of the bearings	span/250
Deflection for long-term quasi permanent loading ( $M_{QP}$ ) <sup>(1)</sup> after losses in pre-stress force and creep measured from below the level of the bearings. $E_{cm,eff}^{(2,3)}$ should be used, to account for the effect of creep in the concrete	span/250
Movement after application of finishes – increase in deflection due to pre-stress loss and creep	span/500

- (1)  $M_{QP}$  is the moment under the quasi-permanent load combination (refer to equation 6.16a of BS EN 1990 : 2002).
- (2) Effective modulus of elasticity of concrete obtained from equation  $E_{cm} / (1 + \Psi)$ , where  $\Psi$  is the long-term creep coefficient of the concrete beam and assumed to be equal to 2.
- (3) For limestone and sandstone aggregates the value of  $E_{cm}$  should be reduced by 10% and 30% respectively.

6.20 The maximum effective span of the concrete beam (assumed to be a simply supported and self-bearing beam) must be calculated using the equations from BS EN 1990 : 2002 (6.10 and 6.14a, or the less favourable equations, 6.10a, 6.10b and 6.14a). The lowest effective span obtained from these equations will be considered to be the maximum effective span of the concrete beam.

6.21 A suitably experienced/qualified engineer must ensure that the following criteria are met for the concrete beams under the specified loading conditions:

- (a) The concrete beam should have a natural frequency greater than 4 Hz when loaded with full dead load plus 0.1 x imposed load (UDL).
- (b) The natural frequency in Hz of a simply supported concrete beam under UDL loading is determined from equation  $f = 18/\Delta^{0.5}$ , where  $\Delta$  is the deflection of the concrete beam in mm for imposed UDL, as defined in item (a) above and UDL dead loads.

6.22 Where two or more concrete beams are placed side by side, eg beneath load-bearing walls, the spaces between the beam webs should be in-filled with concrete with a minimum strength class of C25/30 to give unity of action.

6.23 The minimum bearing width to support the concrete beam is 90 mm in accordance with BS EN 8103-1 : 2011.

6.24 The concrete beam is self-bearing and no account should be made for possible composite action between the beams and the Jablite Garage Floor System EPS Infill Panels or the structural concrete topping.

## 7 Maintenance

The system components are installed within the floor structure and, therefore, do not require maintenance.

## 8 Durability



8.1 When the system components are protected in service from organic solvents and substances liable to cause deterioration, they will be effective as insulation for the life of the building in which they are installed.

8.2 The exposure condition beneath a suspended ground floor over a ventilated void and soil is class XC3 in accordance with BS EN 1992-1-1 : 2004. The concrete beam must have adequate durability for this exposure condition.

8.3 The concrete topping reinforced with steel mesh will have adequate durability for exposure class XC1.

8.4 The stainless steel clips are durable and will not be impaired by contact with conventional mortar admixtures or cavity insulation materials.

## 9 Reuse and recyclability

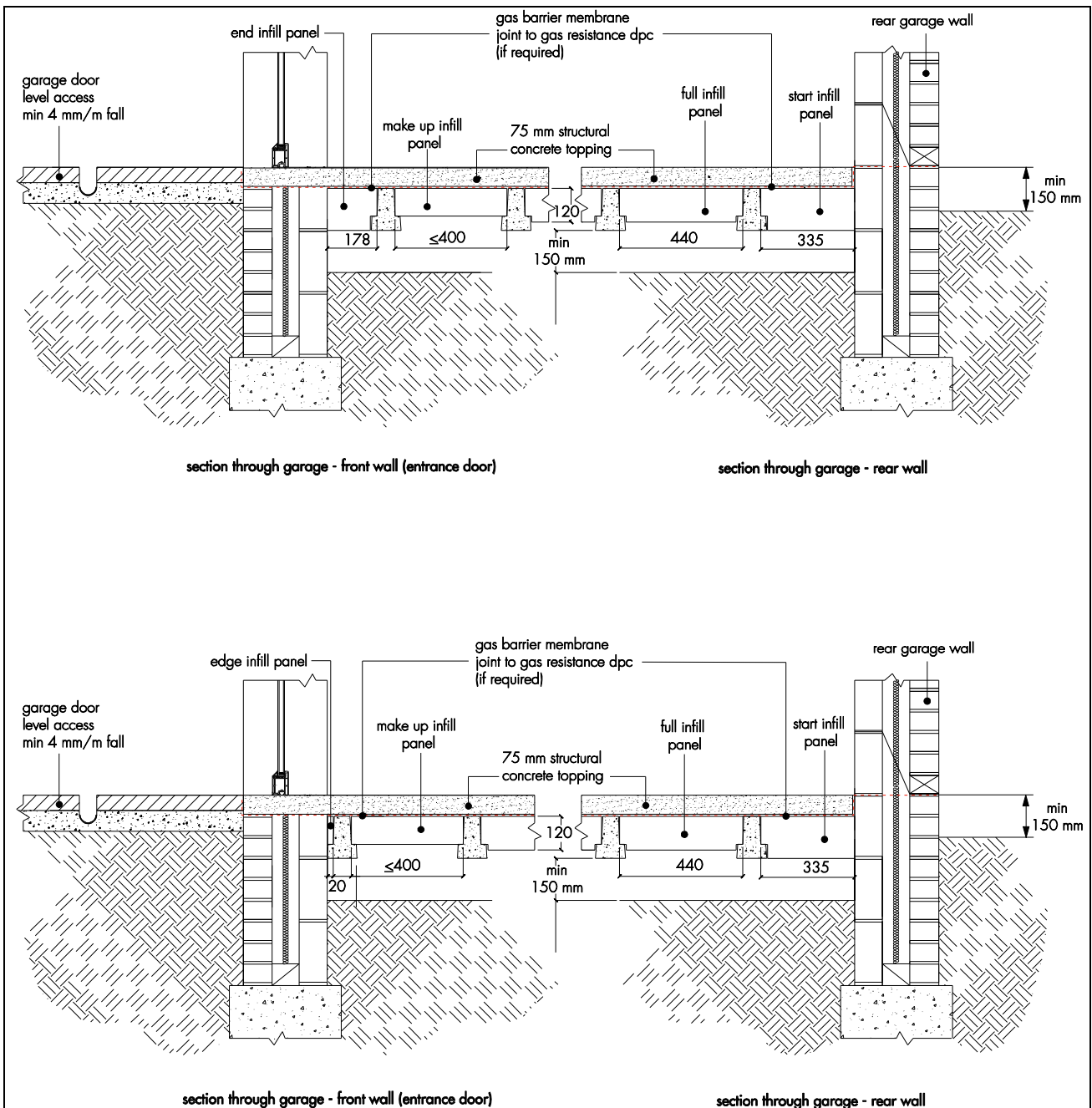
EPS material can be recycled if free from debris and contamination. The concrete and reinforcement steel and stainless steel clips can also be recycled.

## Installation

## 10 General

Details of typical precast concrete beams and Jablite Garage Floor System EPS Infill Panels assemblies are shown in Figure 5.

Figure 5 Example beam and EPS block assemblies



## 11 Site preparation

11.1 Where clay soil of low-, medium- or high-volume change potential exists, the final minimum void depth should be increased appropriately to prevent problems associated with heave (see section 4.4). The sub-floor void should have good natural drainage or land drains should be provided to prevent standing water within the sub-floor void when this is below external ground level.

11.2 The ground beneath the floor must be free of topsoil and vegetation. Oversite concrete or other surface seal is not required, but material added to bring the solum to an even surface must be hard and dry.

11.3 Damp-proofing and ventilation arrangements must be in accordance with normal good practice, for example, by the provision of damp-proof sleeves to ventilators and adequate drainage of the sub-floor.

11.4 A continuous damp proof course (dpc) should be laid along the supporting wall below the beam and block bearings in accordance with BS 8102 : 2009.

11.5 The beams are laid in the positions shown on the floor plan. Each beam is tightly placed against the closure blocks. Further installation details are given in section 12 of this Certificate.

## 12 Procedure

12.1 Normal precautions for handling EPS materials should be taken to avoid damaging the products during offloading, storage, handling and installation. Any damaged products must be replaced before pouring the concrete.

12.2 A damp-proof course (dpc) is laid on top of the bearing and end walls.

12.3 The precast concrete beams are positioned at approximate locations and centres shown on Jablite Ltd's approved drawing (see Figure 6).

12.4 The first beam should be positioned tightly against the wall. The gap between the first beam and the wall should be infilled with the Edge Infill Panel. (See Figure 6 for layouts of concrete beams for single and double garages.) For staggered beam installation, the universal Start Infill Panel should be used in the adjacent bay. The stainless steel clips are used to assist the supporting of the Start and End Infill Panels. The clips should be installed horizontally and in the plane of the mortar joint across a cavity.

12.5 The remaining beams must be accurately positioned in line with the Jablite Ltd's approved layout drawing using the spacer/closure blocks. The spacer/closure blocks are bedded in mortar.

12.6 The Jablite Garage Floor System Infill Panels can be cut with a handsaw where required. Offcuts greater than 300 mm may be used elsewhere in the floor zone.

12.7 Make up Infill Panels can be used to fill the gaps in non-standard beam spacings. These are cut to suit on site as per the approved drawing. Make up Infill Panels (between the beams) should not be more than 400 mm wide.

12.8 End Infill Panels are installed using stainless steel clips to complete the infill installation. Where required Edge Infill Panels are used where beams are positioned against the wall face.

12.9 A gas membrane should be installed where required between the insulation and the concrete topping.

12.10 If gas carcassing pipes are specified, these can be secured to the uppermost layer of insulation material. If a gas membrane is not required, this can be achieved using standard pipe clips secured directly to the insulation. Where a membrane is required pipes should be taped securely in position. Care must be taken not to puncture the gas membrane.

12.11 Steel mesh spacers should be positioned over spreader plates, minimum four per m<sup>2</sup> and minimum 50 mm by 50 mm. These should be installed to position the A142 steel mesh at the correct level, centrally within the concrete topping. See Figure 6 and Table 2 of this Certificate for position and cover to steel mesh A142.

12.12 The Jablite Garage Floor System Infill Panels are cut as appropriate to accommodate service penetrations, eg soil vent pipes, and the resulting gaps filled with polyurethane expanding foam or other insulation to minimise local cold bridging and air infiltration.

12.13 Should any other cutting be required, the advice of the Certificate holder should be sought.

12.14 Although they can withstand light foot traffic (see section 6.2), care should still be taken not to walk unnecessarily over the installed EPS panels. If a temporary working platform is required, the panels should be covered with a suitably rigid board. To avoid damage to the panels, the structural concrete topping should be laid as soon as possible after the panels have been installed.

12.15 When using a concrete pump, truck or skip, concrete must not be discharged onto the Garage Blocks from heights greater than 500 mm and concrete heaps must not be formed over 300 mm high.

12.16 When wheelbarrows are used, planks must be placed to spread the wheel load to the precast concrete beams. Spot boards must be used when tipping and shovelling.

12.17 The structural concrete topping is placed and compacted. Provision should be made for a suitable concrete finish to be achieved, preferably by operatives not standing on the panels or boards.

12.18 Throughout the installation process, due consideration must be given to relevant health and safety regulations and the Certificate holder's product information sheets.

12.19 To prevent concrete ingress where a gas membrane is not placed above the Garage Blocks, the procedure described below should be followed:

- any gaps between Jablite Garage Floor System Infill Panels or around service openings, visible prior to installing the concrete, must be either taped or filled with grout or polyurethane expanding foam

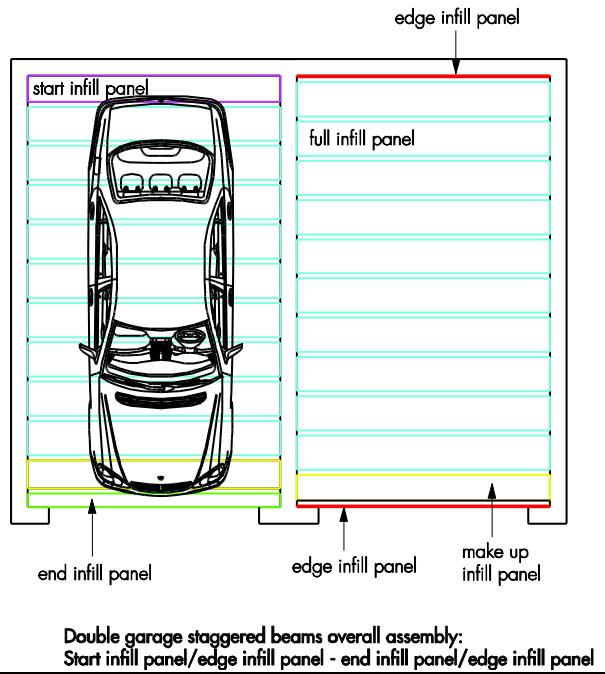
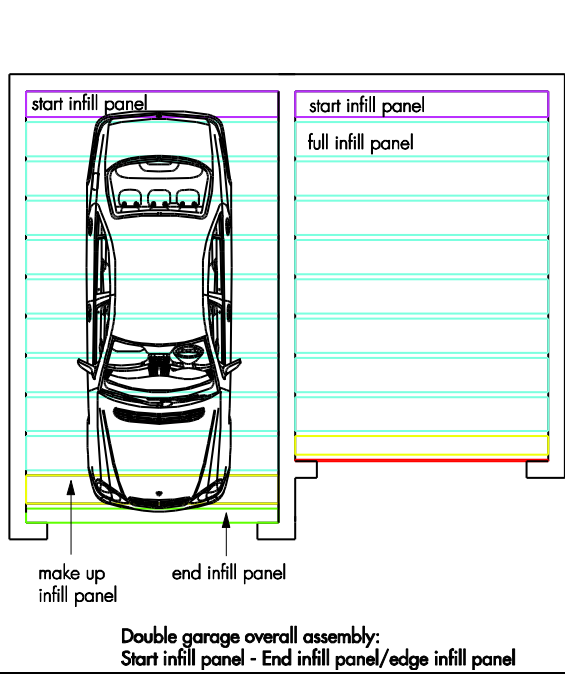
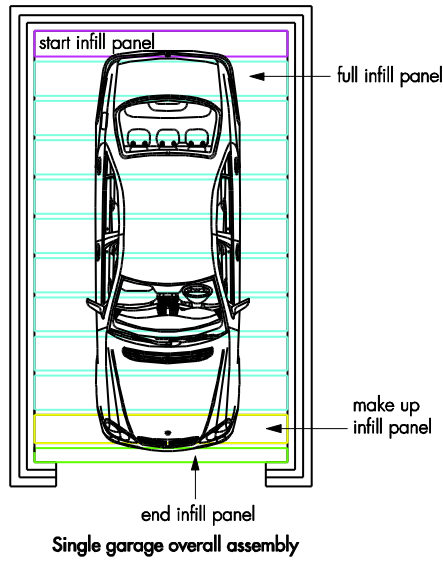
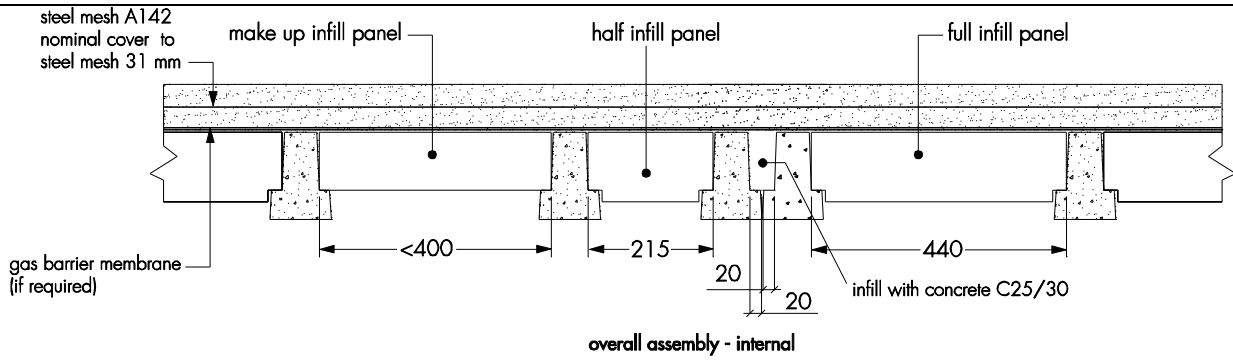
12.20 The following good practice should be taken into account throughout the concrete installation process:

- cube compressive strength and slump tests for concrete topping
- limitation of slump for standard concrete and slump flow for self-compacting concrete
- concrete topping not to be poured below 5°C
- the maximum temperature at which the concrete should be placed is 30°C and decreasing
- concrete should not be poured during rainfall

To prevent shrinkage cracks:

- joints should be incorporated into the slab where appropriate. Inclusion of joints must not compromise structural performance of the concrete topping
- an aspect ratio greater than 2:1 should be avoided
- avoid the use of high shrinkage potential aggregate
- the w/c ratio should not be increased beyond the limits specified in BS 8500-1 : 2015, BS 8500-2 : 2015 and BS EN 206 : 2013.

Figure 6 Overall assembly, single, double garage and double garage with staggered beam



### 13 Tests

13.1 Tests were conducted on the system and the results assessed to determine:

- the load bearing capacity and the number of clips against the applied loads on EPS Start and End Infill Panels
- resistance to construction loads of the EPS panels
- dimensional accuracy.

### 14 Investigations

14.1 Evaluation and calculations were made of existing data to assess:

- adequacy of concrete topping reinforced with steel mesh in terms of thickness, strength class of concrete and diameter of steel reinforcement in accordance with BS EN 1992-1-1 : 2004 and BS EN 15037-1 : 2008
- the durability, practicability of installation and detailing techniques of the system were assessed.

14.2 The manufacturing processes for the EPS products were evaluated including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

## Bibliography

BS 4483 : 2005 *Steel fabric for the reinforcement of concrete — Specification*

BS 8102 : 2009 *Code of practice for protection of below ground structures against water from the ground*

BS 8103-1 : 2011 *Structural design of low-rise buildings ground structures against water from investigation, foundations, precast concrete floors and ground floor slabs for housing*

BS 8500-1 : 2015 *Concrete — Complementary British Standard to BS EN 206-1 — Method of specifying and guidance for the specifier*

BS 8500-2 : 2015 *Concrete — Complementary British Standard to BS EN 206-1 — Specification for constituent materials and concrete*

BS EN 206 : 2013 *Concrete — Specification, performance, production and conformity*

BS EN 1990 : 2002 + A1 : 2005 *Eurocode : Basis of structural design*

NA to BS EN 1990 : 2002 + A1 : 2005 *UK National Annex to Eurocode : Basis of structural design*

BS EN 1992-1-1 : 2004 *Design of concrete structures — General rules and rules for buildings*

NA to BS EN 1992-1-1 : 2004 *UK National Annex to Eurocode 2 : Design of concrete structures — General rules and rules for buildings*

BS EN 12620 : 2013 — *Aggregates for concrete*

BS EN 15037-1 : 2008 *Precast concrete products — Beam-and-block floor systems — Beams*

BS EN 15037-4 : 2010 *Precast concrete products — Beam-and-block floor systems — Expanded polystyrene blocks*

BS EN ISO 9001 : 2008 *Quality management systems — Requirements*

### 15 Conditions

#### 15.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page – no other company, firm, organisation or person may hold claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document – it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

15.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

15.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

15.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

15.5 In issuing this Certificate the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

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- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

15.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.