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REVISION OF BRE PRODUCT STANDARDS
BRE Product Standards (BPSs) will be revised by issue of revised editions or amendments. Details will be posted on our website at www.BREGlobalListings.com.

Technical or other changes which affect the requirements for the approval or certification of the product or service will result in a new issue. Minor or administrative changes (e.g. corrections of spelling and typographical errors, changes to address and copyright details, the addition of notes for clarification etc.) may be made as amendments.

The issue number will be given in decimal format with the integer part giving the issue number and the fractional part giving the number of amendments (e.g. Issue 3.2 indicates that the document is at Issue 3 with 2 amendments).

Users of BPSs shall ensure that they possess the latest issue and all amendments.
FOREWORD

This BRE Product Standard (BPS) 7014 has been developed to provide a route to certification for modular systems for use in the construction of residential buildings.

There are new Regulations related to fire performance and cladding systems on external walls of buildings with a storey 18m above ground level in England; refer to Section 3.2 (Safety in case of fire) of this BPS.

This Standard sets out performance requirements in a number of technical areas. Some of the requirements are mandatory, such as for fire and structural performance, and are required to demonstrate regulatory compliance. Other performance assessments are voluntary. The requirements have been subject to detailed consultation with the Advanced Manufacturing of Homes Buildings and Infrastructure (AMHBI) project consortium and other stakeholders including:

- The Department of Business Innovation and Skills;
- English Partnerships and the Housing Corporation;
- Association of British Insurers (ABI) and insurers;
- Council of Mortgage Lenders (CML) and lenders;
- Designers;
- Manufacturers;
- Specifiers;
- Building Control (LABC);
- National House-Building Council (NHBC);
- BOPAS Buildoffsite;
- Robust Details Ltd.

Advanced Manufacturing of Homes, Buildings and Infrastructure (AMHBI)

AMHBI is part of the Advanced Manufacturing Supply Chain Initiative (AMSCI) ref 14005. The objective of AMHBI is to help address the capacity gap in housing through development of modular products and advanced manufacturing delivery processes. The preparation of this standard is a constituent part of this project to support customer confidence and adoption of modular and manufactured housing systems and products.
In addition, the AMSCI aims to move towards increased use of digital prototyping, testing and manufacturing quality control processes to support a validated digital model/prototype. For example, if a validated model is in place this could support lower requirement for physical testing, greater confidence in performance.

It is designed to improve the global competitiveness of advanced manufacturing and supply chains. It supports research and development skills training and capital investment to help supply chains achieve World-class standards and encourage major new suppliers.

**AMHBI Consortium and Partners:**

<table>
<thead>
<tr>
<th>Laing O'Rourke PLC</th>
<th>Fulcro Engineering Services Ltd</th>
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</thead>
<tbody>
<tr>
<td>Airedale International Air Conditioning Ltd</td>
<td>Grundfos Pumps Ltd</td>
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<td>Apex Cables Ltd</td>
<td>Hamworthy Heating Ltd</td>
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<tr>
<td>Armstrong Fluid Technology Ltd</td>
<td>Hoare Lea LLP</td>
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<td>ARUP Associates Ltd</td>
<td>Select Plant Hire Ltd</td>
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<tr>
<td>Beckhoff Automation Ltd</td>
<td>SIG Distribution Ltd</td>
</tr>
<tr>
<td>Crown House Technologies Ltd</td>
<td>Thom Lighting Ltd</td>
</tr>
<tr>
<td>Saint Gobain Construction Products (trading as BPB UK Ltd)</td>
<td>University of Cambridge (Centre for Manufacturing)</td>
</tr>
<tr>
<td>Building Research Establishment Limited Crane Ltd</td>
<td>University of Sheffield (Advanced Manufacturing Centre)</td>
</tr>
<tr>
<td>Expanded Ltd</td>
<td>WSP UK Ltd</td>
</tr>
<tr>
<td>Explore Manufacturing Ltd</td>
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</tbody>
</table>

BRE is also grateful for the support of technical sub-committees. These were

Working Group 1: Structural;
Working Group 2: Fire;
Working Group 3: Acoustic;
Working Group 4: Sustainability;
Working Group 5: Health & Wellbeing (including thermal performance);

Background
Residents, owners and the financial sector have long term needs for the performance of residential buildings. New building systems without significant in-service history require rigorous assessment, testing and, ideally, certification. In the past, systemic problems (such as outlined in BR105, BR161, BR130 and BR159) have emerged with some modern innovative building systems. This has resulted in some modern forms of construction becoming unpopular with residents, landlords, owners and attracting additional burden of proof of performance by mortgage lenders and insurers.

The Standard
BPS 7014 requires building systems to meet the requirements of the UK Building Regulations for safety and functionality, and a range of characteristics including buildability, durability, resilience, reparability, whole life performance, adaptability, and for the manufacturer to provide guidance on installation and maintenance. Manufacturers shall also have a factory production control system to ensure on going quality and undergo regular surveillance audits of these systems by the Certification Body.

In addition to meeting the requirements of UK Building Regulations, BPS 7014 makes provision for manufacturers to submit building systems that exceed the requirements of building regulations, so that enhanced performance characteristics may be appropriately assessed and duly recognised.

Additional performance characteristics relate to the adoption of enhanced standards and assessment of module performance in 3D and user health and wellbeing issues, for which assessment methods are provided within the BPS. These are summarised below.

BPS 7014 contains five sections together with an Annex of relevant normative and other references:
- **Section 1** outlines the scope of the Standard and how it deals with normative references.
Section 2 contains the definitions of terms requiring clarification or enhancement for use in the standard. Generally, terms used are in accordance with the BS 6100 series of standards: *Glossary of building and civil engineering terms*.

Section 3 is the main body of the Standard and contains performance requirements and verification criteria for building systems. Each specific performance requirement is considered in respect to UK Building Regulations and the European Construction Products Regulations together with sustainable use of natural resources and the alignment of the BPS with other voluntary performance schemes.

Section 4 considers the requirements and verification criteria for the management system of the manufacturing process, from incoming goods of the supply chain through to installation on site.

Section 5 lists the current UK Regulations, Standards and other guidance documents referenced in the standard.

**GENERAL**

The technical section identifies the requirements to be met for each characteristic of the building system in fulfilment of the relevant regulations and standards given in Section 3 and other stakeholder requirements identified as part of the consultation process.

The manufacturer shall demonstrate compliance with the requirements. This may be through calculation or appropriate testing or, via one of the following, as stated in each section:

- Classification without need for testing (for example, applies to some performance characteristics in fire or where Robust Details® are adopted)
- Classification without further testing declarations (applies to some performance in fire),
- Testing by laboratories accredited by UKAS (or an equivalent accreditation body) for the relevant test.
- Assessment by visual inspection, or by appropriate product and/or process verification.
- Use of CE Marked products covered by Harmonised Standards under European Construction Products Regulations, or other third party approved components
- Any other means referenced within the BPS;
- Mutual recognition of technical submissions made to other recognised schemes, such as BOPAS and SCI.
In all cases the minimum requirement for each category is to meet UK Building Regulations; reference should always be made to the latest version. For each category the BPS also identifies areas where additional functionality can be demonstrated. This is intended to allow the validation of a raised standard in terms of quality of construction, user comfort and satisfaction.

Additional performance standards: For example, Loss Prevention Standards (LPS) are widely recognised and applied in the construction sector around the world. These Standards are complimentary to regulatory compliance and quantify that performance levels for systems, elements and components offer high performance attainment. The third-party certification based on these standards confirm that products and services have met and will continue to meet these complimentary performance standards.

BPS 7014 will also recognise performance of building systems, specifically tested to:

- **LPS 1501**: Fire test and performance requirements for innovative methods of building construction.
- **LPS 1175**: Specification for testing and classifying the burglary resistance of building components, strongpoints and security enclosures.
- **BPS 7014 Method 1**: Three-dimensional structural assessment methodology
- **BPS 7014 Method 2**: Three-dimensional acoustic test methodology

The following non-life safety related performance characteristics are explicitly covered by BPS 7014:

**Sustainability** by voluntary performance declarations such as responsible sourcing and Environmental Product Declaration and comparison against some of BRE Global’s Home Quality Mark requirements.

**Comfort and wellbeing** by performance declarations in relation to energy conservation, overheating and ventilation

**Building Information Modelling (BIM)**, as addressed within BS ISO 12006 and Uniclass 2015.

**Resilience** by review of repairability, Whole Life Performance and adaptability.
BPS 7014 is to be used in association with detailed site and configuration specific design procedures and site installation/quality control supervision. One output from the application of BPS 7014 will require site check lists identifying critical features of the building system requiring appropriate monitoring during installation and construction. Those site check lists are to be used by the constructor and organisations responsible for providing inspection services.

BRE Global Construction Products Certification listing of products and services for construction [www.BREGloballistings.com](http://www.BREGloballistings.com) is based on the following:

i. Satisfactory product performance during initial testing and audit testing by BRE Global Construction Products Certification

ii. Satisfactory product construction

iii. Satisfactory system installation

iv. Satisfactory manufacturing processes, incorporated with a certified Factory Production Control process.

v. Satisfactory product or system service experience

vi. Satisfactory verification by BRE Global Construction Products Certification of the establishment and maintenance of the manufacturer’s or service provider’s quality management systems

This standard shall be used in conjunction with BRE Global Construction Products Certification Scheme Document [SD 212C](http://www.BREGloballistings.com) (weblink).

This Standard will be reviewed regularly and kept up-to-date. Current editions are freely available from the BRE Global Construction Products Certification and Listings web site [www.BREGloballistings.com](http://www.BREGloballistings.com) Comments of a technical or editorial nature on these Standards are always welcomed and should be addressed to the Technical Director, BRE Global Construction Products Certification.

BRE Global Construction Products Certification offers a full range of services for approval and testing. Listed products appear in the Red Book, which may be viewed on our website at [www.redbooklive.com](http://www.redbooklive.com) or obtained in hard copy or CD ROM by contacting us at BRE Global Construction Products Certification, Garston, Herts, WD25 9XX. Tel: +44 (0) 333 321 8811, E-mail: [enquiries@bregroup.com](mailto:enquiries@bregroup.com).

**NOTES**

Compliance with this BPS does not of itself confer immunity from legal obligations. Users of BPSs shall ensure that they possess the latest issue and all amendments.
1 SCOPE

This Standard specifies performance and verification requirements for modular building systems, to be used in UK residential construction, which are manufactured offsite in a factory.

This standard can be applied to modular building systems as described below.

The modular building systems are considered for use in new build residential as well as for application in the refurbishment of existing residential buildings.

The Standard primarily considers a basic modular unit, (and panels) which may or may not include internal, external finishes or building services). The modular unit typically comprises a complete or part dwelling, or bathroom/kitchen unit). It also considers multiple modular units that when brought together create a finished building.

Site specific service installations, structures and features (including foundations) are outside the scope of this Standard, except where certain performance aspects of these features affect the superstructure, e.g. foundation level tolerances.

The BPS does not consider appliances covered by CE marking e.g. sanitation, hot water safety and efficiency, drainage and waste disposal, and heat producing appliances separately as these are covered by CE Marking.

For clarification, the BPS addresses only the modular system aspects of the finished building. The BPS requires the manufacturer to indicate how the modular system connects with the foundation podium and any other forms of conventional construction to form the finished building, and how ground moisture (and methane/radon/soil gas) protection is provided within the construction of the factory manufactured unit or conventional site works.

Services such as Gas, Electric, Drainage etc. located outside the building envelope are not included but consideration shall be made at the design stage to enable services to pass through the building envelope.
Site installed In-situ or beam and block concrete ground floors would generally be considered outside the scope of the BPS, but a factory installed ground floor structure floor within a module would be included.

**Internal services and finishes** are not included in the BPS, but consideration will need to be given to penetrations and fixings within walls, floors and roofs that are provided to accept internal services and finishes. A plantroom shell could be included within the BPS. Services such as heating and drainage pipes, ventilation ducting, cabling for electrics, data handling, services monitoring and security, are not referred to specifically in the BPS. But their integration within the modular building and how they connect between modules will need to be considered, together with fire stopping, repair, maintenance and replacement requirements.

**Facades** are not included in the BPS but for all systems consideration is given to the planned integration and accommodation of the weathertightness layer within the modular building. The chosen façade solution(s) and associated fixings, penetrations and cavity barriers or any parts thereof are to be included.

**Table 1 – List of system-types covered by this Standard**

<table>
<thead>
<tr>
<th>Floor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Floor</td>
<td>A floor located directly above (or in contact with) the ground – may include rising damp or soil gas protection, and thermal insulation.</td>
</tr>
<tr>
<td>Intermediate Floor</td>
<td>A floor that separates an upper and lower living space and may be a separating structural element between dwellings. In volumetric systems the separating structural element might consist of module ceiling and module floor component.</td>
</tr>
<tr>
<td>Floor over an open space</td>
<td>A floor located above an open area such as an under-croft, car park, alleyway or similar.</td>
</tr>
<tr>
<td>Wall</td>
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<tr>
<td>---</td>
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</tr>
<tr>
<td>Load Bearing Wall</td>
<td>An internal or external wall loadbearing walls. This may include a party wall.</td>
</tr>
<tr>
<td>Infill Wall</td>
<td>Wall that is built into the primary structural components of a building and can provide support for the cladding system. Infill walls are considered to be non-load bearing, but they resist transportation, lifting and wind loads, and also support their own weight and that of a cladding. This may include a party wall.</td>
</tr>
<tr>
<td>Facade</td>
<td>An external load bearing or non-load bearing cladding or walling system that provides weathertightness or rain-screening</td>
</tr>
</tbody>
</table>

| Roof | | |
|---|---|
| Flat Roof | Structure and covering to a flat roof and its connection to the module. |
| Pitched Roof | Structure and covering to a sloping roof and its connection to the module |

| Unit | | |
|---|---|
| Panel | Two-dimensional elements produced in factory or on site used to form a three-dimensional (volumetric) module |
| Volumetric Module | A module or a part-module featuring three interconnecting elements i.e. junction between two walls and a floor, or the junction between a roof and two walls. |
| Multiple Modules | Any assembly of connected volumetric modules. Modules manufactured in the same location, combined to form a functional part of a building (i.e. flat, room, corridor, staircase) and assessed in factory (offsite). Internal and/or external finishes are either fitted in factory or on site. |

Note. Roofs can double as access areas.
This Figure shows examples of some of the Elements from Table 1 above

This is not exhaustive – for example infill walls and load bearing walls may be internal and not part of the external envelope.

The Standard primarily aims to consider a basic modular unit, (which may or may not include internal or external finishes). The modular unit typically comprises a complete or part dwelling, or bathroom/kitchen unit). It also considers multiple modular units.

The Standard requires compliance with the relevant requirements of the UK Building Regulations and the Basic Works Requirements of the Construction Products Regulations 305-2011 (CPR) [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011R0305&from=EN]

- Mechanical resistance and stability
- Safety in case of Fire
- Hygiene, health and environment
- Safety and accessibility in use
- Protection against noise
- Energy economy and heat retention

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- Sustainable use of natural resources

**Normative References**

This Standard incorporates provisions from other publications. These references are cited at the appropriate places in the text and are listed in Section 5. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this Standard only when incorporated into it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

Requirements included for supply chain, off-site and on-site activities are:

- Design Life and service life planning
- Practicability of installation and buildability
- Practicability of repair and adaptability
- Unique identification of building systems
- Durability, materials and workmanship
- Factory production control
- Handling, lifting, transportation and storage
- Checklist for on-site construction
- Building information modelling (BIM)

**BPS overview matrix (Draft only, finalised after consultation period)**

The table below overviews all the requirements covered in this BPS and includes the reference as to where in the standard these are covered. Mandatory performance declarations are marked in blue. Additional performance declarations are marked in green. N/A denotes not applicable.
### Overview Matrix – summary of applicable requirements relative to category

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>FLOOR</th>
<th>WALL</th>
<th>ROOF</th>
<th>MODULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>Ground floor</td>
<td>Inter-</td>
<td>Over open space</td>
<td>Load-bearing</td>
</tr>
<tr>
<td>3.1 Mechanical resistance and stability</td>
<td></td>
<td></td>
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<tr>
<td>Loads – static</td>
<td>3.1.1</td>
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<tr>
<td>Deflection</td>
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<tr>
<td>Vibration in use</td>
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<tr>
<td>Racking resistance</td>
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<tr>
<td>Disproportionate collapse</td>
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<tr>
<td>3.2 Safety in case of fire</td>
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</tr>
<tr>
<td>Resistance to fire</td>
<td></td>
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<tr>
<td>Cavity barriers and penetrations</td>
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</tr>
<tr>
<td>Reaction to fire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External fire spread on walls and roofs</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Fire test on whole module</td>
<td>N/A</td>
<td></td>
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<tr>
<td>3.3 Hygiene, health and environment</td>
<td></td>
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<tr>
<td>Weathertightness and airtightness</td>
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<tr>
<td>Vapour permeability and moisture resistance</td>
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<tr>
<td>Soil gases</td>
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<tr>
<td>Ventilation</td>
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<tr>
<td>Overheating</td>
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<tr>
<td>Dangerous substances</td>
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<tr>
<td>Electric lighting</td>
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<tr>
<td>3.4 Safety in use</td>
<td>3.4.1</td>
<td>3.4.1</td>
<td>3.4.1</td>
<td>3.4.1</td>
</tr>
</tbody>
</table>
### CATEGORY

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Floor</th>
<th>Wall</th>
<th>Roof</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ground floor</td>
<td>Intermediate</td>
<td>Over open space</td>
<td>Load-bearing</td>
</tr>
<tr>
<td>3.5 Protection against noise</td>
<td>3.5.1</td>
<td>3.5.1</td>
<td>3.5.1</td>
<td>3.5.1</td>
</tr>
<tr>
<td>3.6 Energy economy and heat retention</td>
<td>3.6.1</td>
<td>3.6.1</td>
<td>3.6.1</td>
<td>3.6.1</td>
</tr>
<tr>
<td>3.7 Security</td>
<td>3.7.1</td>
<td>3.7.1</td>
<td>3.7.1</td>
<td>3.7.1</td>
</tr>
<tr>
<td></td>
<td>Service life planning</td>
<td>3.8.2</td>
<td>3.8.2</td>
<td>3.8.2</td>
</tr>
<tr>
<td>3.9 Durability resilience, materials and workmanship</td>
<td>3.9.1</td>
<td>3.9.1</td>
<td>3.9.1</td>
<td>3.9.1</td>
</tr>
<tr>
<td>3.10 Sustainable use of natural resources</td>
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<tr>
<td>Environmental impact</td>
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<tr>
<td>Life cycle costing</td>
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<tr>
<td>Responsible sourcing</td>
<td></td>
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</tr>
</tbody>
</table>

### 4.0 Quality Management Requirements

| 4.1 Practicability of installation | All categories |
| 4.2 Practicability of repair, replacement and adaptability | All categories |
| 4.3 Identification of building systems | All categories |
| 4.4 Factory Production Control | All categories |
| 4.5 Handling and storage | All categories |
| 4.6 Site assembly | All categories |
| 4.7 Home information | All categories |
| 4.8 Building Information Modelling | All categories |
2 DEFINITIONS
The definition of terms used in this Standard is generally that given in the British Standard BS 6100 series: *Glossary of building and civil engineering terms*. Where the meaning of any term requires clarification or modification for use within this document then a definition is given in this section.

2.1 Applicant
The manufacturer or supplier of the building system seeking certification.

2.2 Assessment
An assessment is an opinion from a trained assessor of the likely performance of an element or component if it were subjected to a standard test. It shall only be used:

- where a modification is made to a construction which has already been tested;
- to interpolate results of a series of tests to evaluate a range of variables in a construction design or product; or
- where for reasons of size, or configuration, it is not possible to subject a construction to a test.

2.3 Cavity stop/barrier
A construction other than a smoke curtain, provided to close a concealed space against the penetration of smoke or flame, or provided to restrict the movement of smoke or flame within such a space.

2.4 Certification Body
BRE Global Construction Products Certification or its Licensees. This could also be operators of other industry certification schemes such as BOPAS.

2.5 Compartment
A building or part of a building, comprising one or more rooms, spaces or storeys, constructed to prevent the spread of fire to, or from, another part of the same building or an adjoining building.

2.6 Compartment wall or floor
A fire-resisting wall, or floor, that is used in the separation of one compartment or dwelling from another to meet the specific requirements of the Building Regulations/Standards.

2.7 Component
A product manufactured as a distinct unit to serve a specific function or functions e.g., door, window, or frame connectors.
2.8 Design climatic conditions
Outdoor and indoor conditions (such as snow and wind loading, air temperature, relative humidity etc) as stated in the UK Building Regulations and/ or other standards such as CIBSE Guide A: Environmental Design to be used for building design.

2.9 Dwelling
Building as defined by the Classification of Purpose Group given in Table D1, Appendix D of Building Regulations (England and Wales), Approved Document B – Fire Safety: Volume 1 Dwelling houses (2006 incorporating 2010 and 2013 amendments) – Residential (dwellings) Groups 1(a), 1(b), and 1(c).

2.10 Durability
The ability of a building system, component or element to perform its intended function over a period of time.

2.11 Element
A major functional part of a building e.g. roof, floor, wall which may be manufactured from components. Elements may be supplied factory-assembled or for assembly on site with internal and external finishes and/or envelope components such as thermal insulation, cladding, roof covering, internal lining, internal partitions, windows and doors, and stairs.

2.12 Façade
An external load bearing or non-load bearing cladding or walling system that provides weathertightness or rain-screening.

2.13 Fitness for Purpose
The ability of a building system, component or element to perform its function in its intended application.

2.14 Flat
A separate and self-contained premises constructed or adapted for use for residential purposes and forming part of a building from some other part of which is divided horizontally and/or vertically.

2.15 Flooding
The entry of water into a building or part of a building that results in, potential or actual damage to the contents and/or structure. For this standard, levels of water temporarily up to 10cm below a damp-proof course or membrane are not classified as a flood, but levels above this are.
2.16 Health and Safety File
The Construction Design and Management Regulations require a Health and Safety File to be prepared and handed over to the Client. Its purpose is to ensure that, at the end of the project, the client has information that anyone carrying out subsequent construction work on the building will need to know about in order to be able to plan and carry out the work safely and without risks to health. The file is a record of all information for the client, which informs those persons who might be responsible for the building in the future of the risks that have to be managed during maintenance, repair, renovation and demolition. Typical contents include; as built drawings, operational manuals for any equipment, mechanical and electrical service drawings, details of emergency provisions, details of hazardous substances / materials which could give rise to risk of injury, maintenance schedules, etc.

2.17 Installation Manual
Documentation provided by the relevant building system supplier showing clearly to a trained competent installer how it shall be installed to fulfil its function.

2.18 Internal floor
Any floor that is not a separating floor.

2.19 Internal partitions
Internal vertical construction which can be load bearing or non-load bearing.

2.20 Internal wall
Any wall that does not have a separating function.

2.21 Joint
The junction between two materials, components and elements, or parts of a building.

2.22 Load bearing element
Component bearing the weight that is carried by a structure, can include structural framing, walling, flooring or roof elements.

2.23 Modular Building System
Volumetric: Three-dimensional units produced in a factory, that may or may not be at a substantial level of internal completion, before being transported to site and stacked onto prepared foundations to form buildings
Panelised: Two dimensional units produced in a factory used to form three-dimensional units in a factory or on site.

2.24 Modular Building System
A building system comprising a combination of modular elements and/or components
connected on site to form a building that:

- is not wholly covered under current recognised standards or codes for residential buildings, and/or
- may have a limited track record of service in residential buildings in the UK
- for the purposes of this standard, has a vertical load bearing component

2.25 Overheating
This describes when temperature conditions in a building reach a level that may cause occupants to feel uncomfortable or heat stressed.

2.26 Repairability
The ability of a component or element to be repaired (unplanned replacement) following damage or failure or, replaced (planned replacement), considering the accessibility, ease and duration of the repair process.

2.27 Robustness
Ability of a system to resist damage resulting from accidental or natural events.

2.28 Rooms for residential purposes
A room, or a suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep and includes a room in a hostel, an hotel, a boarding house, a hall of residence or a residential home, but does not include a room in a hospital, or other similar establishment, used for patient accommodation.

2.29 Separating floor
Floor that separates flats or rooms for residential purposes, and separates dwellings from communal areas, commercial premises or other spaces such as plant rooms etc.

2.30 Separating wall
Wall that separates adjoining dwelling-houses, flats or rooms for residential purposes, and separates dwellings from communal areas, commercial premises or other spaces such as plant rooms etc.

2.31 Site Assembly Checklist
This is issued in conjunction with a set of clear instructions (provided by the manufacturer) which details the assembly and installation of the system as appropriate. The checklist details the installation check criteria for critical parts of the assembly and critical aspects of its relationship with other parts of the construction. The checklist includes specifications, tolerances and order of construction of integrated conventional construction and any other appropriate information needed to ensure that on site construction of each module meets
the standards certified under BPS 7014.

2.32 **Unit**
A unit is formed of elements and components, either panellised or volumetric.

2.33 **User Manual**
A document provided by the Manufacturer to enable the end user to run their building effectively. It shall describe the building system, including thermal performance characteristics, and the ‘Dos and Don’ts’ that need to be understood before any maintenance, or adaptation, of the system is undertaken. The User Manual shall form part of the buildings Health and Safety File.

2.34 **Ventilation**
The intentional provision of fresh air into a room/building.

2.35 **Weathertightness**
Performance in respect of air permeability, watertightness and wind resistance.
3 REQUIREMENTS

This section identifies the requirements to be met for each characteristic of the building system in fulfilment of the relevant regulations and standards given in Section 3 and other stakeholder requirements.

The manufacturer shall demonstrate compliance with the requirements. This may be through calculation or appropriate testing or, via one of the following, as stated in each section:

- Classification without need for testing (for example, applies to some performance characteristics in fire or where Robust Details® are adopted).
- Classification without further testing declarations (applies with some performance in fire characteristics).
- Assessment by laboratories accredited by UKAS (or an equivalent accreditation body) for the relevant test.
- Assessment by visual inspection.
- Use of CE Marked products covered by Harmonised Standards under European Construction Products Regulations, or other third party approved components
- Any other means referenced within the BPS;
3.1 MECHANICAL RESISTANCE AND STABILITY

3.1.1 Requirements

3.1.1.1 The relevant Building Regulations are summarised below

### Building Regulation Requirements covered by this section

The Building Regulations (England) 2010 (Amended 2013)
- Approved Document A: Structure
- Approved Document C: Site preparation and resistance to contaminants and moisture
- Regulation 7 – Materials & Workmanship

The Building Regulations (Wales) 2010
- Approved Document A: Structure
- Approved Document C: Site preparation and resistance to contaminants and moisture
- Regulation 7 – Materials & Workmanship (Amended 2013)

Scottish Building Standards 2017
- Technical Handbook: Domestic Buildings
  - Section 0 Regulation 8 materials and workmanship.
  - Section 1 Structure
  - Section 3 Environment

The Building Regulations (Northern Ireland) 2012
- Part B Materials & Workmanship
- Part C - Site preparation and resistance to contaminants and moisture
- Part D Structure

3.1.1.2 The structural safety, serviceability, robustness and durability of a structure shall be ensured by using appropriate and current codes, standards and other references for structural design and construction.
3.1.1.3 BPS 7014 is intended to be used in conjunction with these standards for the design of modular buildings.

3.1.1.4 The design shall

a) identify hazards to which the structure is likely to be subjected, assessment of the risks and select relevant critical situations that can reasonably be foreseen.

b) determine dead load, imposed and accidental loads using current Codes of Practice (see Section 5), including BS EN 1991-1-1, BS 1991-1-3, BS EN 1991-1-5 and BS EN 1991-1-7.

c) determine wind loads using BS EN 1991-1-4 taking appropriate account of location-related effects. Wind loads may be calculated either for specific locations or based on a stipulated maximum value which may then limit the locations where the building can be sited in the UK.

d) Confirm the façade solution(s) to be used in conjunction with the system and any key components such as fixings.

e) determine loads during execution using BS EN 1991-1-6 and temporary loading cases (during transport and construction) shall be considered explicitly in the design.

3.1.2 Verification by Calculation

3.1.2.1 The design of systems shall be carried out in accordance with relevant material and structural standards. Where this is not possible owing to the absence of appropriate standards, then the design shall be carried out by a qualified structural engineer based on sound engineering principles supported by appropriate technical data.

3.1.3 Verification by Testing

3.1.3.1 Where testing is used to demonstrate compliance of systems, elements and components it shall be done in accordance with the appropriate section of relevant material, product, test and structural design standards (or closest aligned standard) and/or BS EN 1990 shall be used. Manufacturers may also use testing (including full module testing) to verify performance.

3.1.3.2 The manufacturer shall determine the performance of loadbearing walls for
a) Vertical loadbearing resistance (including eccentric loading where relevant)
b) Racking resistance
c) Horizontal loadbearing resistance
d) Soft and hard body impact resistance

3.1.3.3 The manufacturer shall determine the performance of loadbearing floors for specified maximum spans, including
   a) Resistance to uniformly distributed vertical load
   b) Resistance to concentrated vertical load
   c) Resistance to horizontal shear action (diaphragm)
   d) Soft and hard body impact resistance
   e) Natural frequency
   f) Modal Mass
   g) Damping
   h) Response factor

3.1.3.4 The manufacturer shall determine the performance of roofs for specified maximum spans, including
   a) Resistance to uniformly distributed vertical load
   b) Resistance to concentrated vertical load
   c) Soft and hard body impact resistance

3.1.3.5 The manufacturer should demonstrate the building system has adequate levels of robustness and shall demonstrate the building will not suffer collapse to an extent disproportionate to the cause.
3.2 SAFETY IN CASE OF FIRE

3.2.1 Requirements

3.2.1.1 The Building Regulations as summarised below

<table>
<thead>
<tr>
<th>Regulations</th>
<th>folder 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Building Regulations (England &amp; Wales) 2010</td>
<td></td>
</tr>
<tr>
<td>• Approved Document B1, B2, and B3 (as appropriate)</td>
<td></td>
</tr>
<tr>
<td>• Regulation 7 – Materials &amp; Workmanship</td>
<td></td>
</tr>
<tr>
<td>The Building Regulations (Wales) 2010</td>
<td></td>
</tr>
<tr>
<td>• Approved Document B Fire Safety Volume 1 Dwelling</td>
<td></td>
</tr>
<tr>
<td>• Regulation 7 – Materials &amp; Workmanship</td>
<td></td>
</tr>
<tr>
<td>Scottish Building Standards 2017</td>
<td></td>
</tr>
<tr>
<td>• Technical Handbook: Domestic</td>
<td></td>
</tr>
<tr>
<td>• Section 0 Regulation 8 materials and workmanship.</td>
<td></td>
</tr>
<tr>
<td>• Section 2 : Fire</td>
<td></td>
</tr>
<tr>
<td>The Building Regulations (Northern Ireland) 2012</td>
<td></td>
</tr>
<tr>
<td>• Part B Materials &amp; Workmanship</td>
<td></td>
</tr>
<tr>
<td>• Part E Fire Safety</td>
<td></td>
</tr>
</tbody>
</table>

There are new Regulations related to fire performance and cladding systems on external walls of buildings with a storey 18m above ground level in England.

The relevant buildings to which the new Regulations apply are those with a storey at least 18m above ground level and which contain:
• One or more dwellings or
• An institution or
• A room for residential purposes (excluding any room in a hostel, hotel or boarding house)

This specifically includes buildings with a storey at least 18m above ground floor level as follows;
• Residential blocks of flats
• Student accommodation
• Care homes
• Sheltered housing
• Hospitals
• Dormitories in boarding schools

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In all these cases, all materials forming a part or element of an external wall or attachment must now achieve a class A2-s1, d0 or A1 in accordance with BS EN 13501-1:2007+A1:2009 for use 18m above ground level.

This means that some of the systems within these certificates that previously complied with the building regulations and the guidance in Approved Document (AD) B through classification in accordance with BR 135 are no longer permitted for use on buildings of the above types, with a storey at least 18m above ground level. The certificates should be read alongside The Building (Amendment) Regulations 2018 (SI 2018 No. 1230) which is available in full through the following link:

3.2.2 Verification by Calculation
3.2.2.1 This may be used where permitted.

3.2.3 Verification by Testing/Assessment
3.2.3.1 Fire resistance

3.2.3.1.1 Where compartmentation, which separates buildings or occupancies, has openings such as doors or pipe penetrations, the manufacturer shall design the fire resistance of the separating element in accordance with either:
- Results of testing in accordance with the European fire resistance classification through BS EN 13501-2 employing the relevant EN test methods, or by testing to BS 476 Parts 20-24, or, if appropriate,
- Assessment based on BS 476: Parts 4 and 11 and/or 6 and 7.

3.2.3.1.2 Where a compartment wall or a compartment floor meets another compartment wall, or an external wall, the manufacturer shall design that junction to maintain the fire resistance of the compartmentation in order to allow the maximum period of fire resistance required by an element to be achieved.

3.2.3.1.3 The minimum fire resistance for compartment walls, floors and roofs shall be as required to meet Building Regulations in respect to its use and shall be expressed in terms of Loadbearing Capacity (R), Integrity (E) and Insulation (I).

3.2.3.1.4 Cavity barriers/fire stopping shall be fitted at all junctions between individual dwellings, communal areas, and the exterior envelope. For larger buildings comprising a number of dwellings, the requirements for the placing of cavity barriers and fire stopping shall follow the guidance given in Approved Document B3 (England & Wales), the Technical Handbooks 2.4 (Scotland) and the Technical Booklet E (N.I)
3.2.3.2 Reaction to fire
3.2.3.1.1 The manufacturer shall design the Reaction to Fire performance in accordance with either:
   - European fire test methods to derive a classification in accordance with BS EN 13501-1 or results of test methods to BS 476: Parts 4 and 11 and/or BS 476: Parts 6 and 7, or if appropriate,
   - Assessment based on BS 476: Parts 4 and 11 and/or Parts 6 and 7.

3.2.3.3 External fire spread on walls and roofs
3.2.3.3.1 The manufacturer shall design the external fire spread performance in accordance with either:
   - Results of tests in accordance with BS EN 13501 Part 5 for roofing or BS 476: Part 3 or, if appropriate,
   - Assessment for roofing based on BS 476: Part 3 only.

3.2.3.3.2 Any building with a storey at least 18m above ground level and which contains:
   - one or more dwellings; or an institution; or a room for residential purposes (excluding any room in a hostel, hotel or a boarding house).

   This includes residential blocks of flats, student accommodations, care homes, sheltered housing, hospitals and dormitories in boarding schools with a storey above 18 m in height.

   All materials which become part of an external wall or specified attachment shall achieve European Class A2-s1, d0 or Class A1 except for components exempted in Regulation 7(3).

3.2.3.4 Fire test on whole module(s)
3.2.3.4.1 When tested in accordance with LPS 1501 the module shall achieve a classification of MMC2 as defined in LPS 1501.
3.3 HYGIENE HEALTH AND ENVIRONMENT

3.3.1 Requirements

3.3.1.1 The Building Regulations are summarised below

The Building Regulations (England) 2010
- Approved Document C, C1 and C2
- Approved Document D Toxic Substances
- Approved Document F. F1 Ventilation
- Approved Document L1A Conservation of fuel and power
- Regulation 7 – Materials & Workmanship

The Building Regulations (Wales) 2010
- Approved Document C,
- Approved Document D Toxic Substances
- Approved Document F. F1 Ventilation
- Approved Document L1A Conservation of fuel and power
- Regulation 7 – Materials & Workmanship

Scottish Building Standards 2017
- Technical Handbook: Domestic
  - Section 0 Regulation 8, materials and workmanship.
  - Section 3 Environment
  - Section 6 Energy

The Building Regulations (Northern Ireland) 2012
- Technical Booklet B Materials & Workmanship
- Technical Booklet C preparation of site and resistance to moisture
- Technical Booklet K Ventilation

3.3.2 Weathertightness and airtightness

3.3.2.1 Verification by Desk Study and Site Visit

3.3.2.1.1 The external envelope shall be weathertight, and the manufacturer shall submit construction details to demonstrate this. The manufacturer shall place emphasis on the full external envelope, including joints between prefabricated components in the external facade and connections between that facade and its supporting structure.
3.3.2.2 Verification by Testing
3.3.2.2.1 The external envelope shall be weathertight, and evidence as demonstrated by testing, for example to CWCT Technical Note TN 41, shall be provided by the manufacturer. The manufacturer shall consider testing of a whole wall or module complete with doors and windows as testing of individual components does not address the joints between components within a whole system.

3.3.2.2.2 Airtightness testing to satisfy building regulations is carried out on whole dwellings in accordance with ATTMA requirements TS L1. This can be at shell and core stage or on completion and shall address the joints between individual components such as windows and doors.

3.3.3 Vapour permeability and moisture resistance
3.3.3.1 Verification by Desk Study and Site Visit
3.3.3.1.1 The manufacturer shall determine the risk of interstitial condensation for each element (as required) in accordance with BS EN ISO 13788 and BS 5250.

3.3.3.1.2 The water-tightness of any basement construction and its elements shall be designed to comply with BS 8102 and the Approved Document for basements in dwellings.

3.3.3.2 Verification by Testing
3.3.3.2.1 The manufacturer shall demonstrate vapour permeability and moisture resistance through results of testing carried out to BS EN 12086 or other relevant standards.

3.3.4 Protection against soil gases
3.3.4.1 Verification by Desk Study
The manufacturer shall demonstrate how the dwelling is to be protected from the risk from soil gases in accordance with BS 8485 and BRE Report BR 211, in cases of sites where such a risk is identified.
3.3.5 Ventilation

3.3.5.1 Verification by Desk Study

The manufacturer shall provide all relevant information regarding the module's ventilation systems, which will go into the user manual (see section 4.7 of BPS 7014). Note that ventilation is considered at the whole dwelling level.

Information must be provided for the intended user for the ventilation system installed, including:

- The commissioning certificate
- User instructions for the system and controls
- A user-friendly description and explanation of the system (including the location of components)
- Details of routine maintenance
- Method of cleaning ductwork (where required)
- Guidance for the use of summer bypass and boost settings (where installed)
- Contact details for the manufacturer and installer
- Details of the installed system, including part numbers
- Details of any maintenance and service agreements

The manufacturer shall provide an assessment to demonstrate purge ventilation capability and impact on the noise environment.

3.3.5.2 Verification by Testing

The manufacturer shall test the system in accordance with Approved Document (AD) F to demonstrate that the ventilation rates are in accordance with the requirements of AD F and/or corresponding Regulations for Scotland, Wales and Northern Ireland.

Additionally, the manufacturer may wish to demonstrate compliance with the table below (this is considered as beyond the minimum requirement in AD F).
### Ventilation rates

<table>
<thead>
<tr>
<th>Number of bedrooms</th>
<th>Assumed maximum occupancy</th>
<th>Minimum ventilation rate (l/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>4+</td>
<td>8 + 2 additional occupants per additional bedroom</td>
<td>37 + 8L/s per additional bedroom</td>
</tr>
</tbody>
</table>

#### 3.3.6 Overheating

**3.3.6.1 Verification by Desk Study**

The manufacturer of a fully fitted out module shall provide a generic assessment of the risk of the overheating and how the risk is to be minimised. Guidance is provided by the Home Quality Mark (HQM) Temperature Tool and CIBSE TM59.

Aspects to consider (not exhaustive) include:
- Solar shading and shutters
- Cooling and ventilation strategies
- Heat-reflective finishes
- Orientation
- Window design
- Occupant guidance

#### 3.3.7 Dangerous substances (within or released from construction materials)

**3.3.7.1 Verification by Desk Study**

The manufacturer shall minimise detrimental impacts on health arising from indoor air pollutants emitted from the building at the time of habitation by using materials that do not contain or release dangerous substances.

For information, Annex I to the Dangerous Substances Directive 67/548/EEC contains a list of some 8000 dangerous substances for which classification and labelling have been agreed at Community level.
3.3.7.2 Verification by Testing

When tested in accordance with BS EN ISO 16000-6 or BS EN ISO 16017-2 the airborne Total Volatile Organic Compounds (TVOC) from all sources (where the TVOC concentration in indoor air is measured post construction, but pre-occupancy) shall not exceed 0.3mg/m³ (300μg/m³), averaged over 8 hours.

When tested in accordance with the Table below the emissions from building product types shall not exceed the emissions limits listed in the Table below.

Emission limits (maximum)

<table>
<thead>
<tr>
<th>Building Product type</th>
<th>Emission limits</th>
<th>Total Volatile organic compounds (TVOCs)</th>
<th>Category 1A and 1B carcinogens*</th>
<th>Testing requirement</th>
<th>Additional requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior paints and varnishes</td>
<td>0.06 mg/m³</td>
<td>1.0 mg/m³</td>
<td>0.001 mg/m³</td>
<td>BS EN 16402 or BS EN ISO 16000-9 or PD CEN 16516 or CDPH Standard Method v11</td>
<td>Paints used in wet areas (e.g. bathrooms, kitchens, utility rooms) should protect against mould growth</td>
</tr>
<tr>
<td>Wood-based products</td>
<td>0.06 mg/m³ (Non MDF) 0.08 mg/m³ (MDF)</td>
<td>1.0 mg/m³</td>
<td>0.001 mg/m³</td>
<td>BS EN ISO 16000-9 or PD CEN 16516 or CDPH Standard Method v11 or BSEN 717-1 formaldehyde emissions only</td>
<td>N/A</td>
</tr>
<tr>
<td>Flooring materials</td>
<td>0.06 mg/m³</td>
<td>1.0 mg/m³</td>
<td>0.001 mg/m³</td>
<td>BS EN ISO 16000-9 or PD CEN 16516 or CDPH Standard Method v11</td>
<td>N/A</td>
</tr>
<tr>
<td>Ceiling, wall and insulation materials</td>
<td>0.06 mg/m³</td>
<td>1.0 mg/m³</td>
<td>0.001 mg/m³</td>
<td>BS EN ISO 16000-9 or PD CEN 16516 or CDPH Standard Method v11</td>
<td>N/A</td>
</tr>
<tr>
<td>Interior adhesives</td>
<td>0.06 mg/m³</td>
<td>1.0 mg/m³</td>
<td>0.001 mg/m³</td>
<td>BS EN 13999 (pts 1-4)</td>
<td>N/A</td>
</tr>
</tbody>
</table>
3.3.8 Electric lighting

3.3.8.1 Verification by Desk Study

Electric lighting (luminaires and switches) shall be CE marked which indicates compliance with safety standards and electromagnetic compatibility. The lighting installation must comply with the IET Wiring Regulations (currently BS 7671:2018).

Where possible, dimming of internal lighting, rather than just switching, should be provided to give residents a wider range of lighting choices and to generally provide energy savings compared to switching alone.

| and sealants | or BS EN ISO 16000-9 or PD CEN 16516 or CDPH Standard Method v11 |

*Emissions testing to the methods referenced in column 5 of the table normally provides an Emissions Rate per area of the material (in, for example, units µg/m²/hr). Because the actual concentration of an emitted compound in room air in the modular building will depend on several factors (surface area of the emitting material; volume of room; air change rate of room) the emissions rate can be converted to a theoretical concentration once the dimensions of the space, area of product to be used and ventilation strategy are known.
3.4 SAFETY IN USE

3.4.1 Requirements
3.4.1.1 The Building Regulations are summarised below

<table>
<thead>
<tr>
<th>The Building Regulations (England) 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation 7 – Materials &amp; Workmanship</td>
</tr>
<tr>
<td>Approved Document M Access to and use of buildings: Volume 1 Dwellings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The Building Regulations (Wales) 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation 7 – Materials &amp; Workmanship</td>
</tr>
<tr>
<td>Approved Document M Access to and use of buildings: Volume 1 Dwellings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scottish Building Standards 2017 Technical Handbook: Domestic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 0: Regulation 8 materials and workmanship.</td>
</tr>
<tr>
<td>Section 4: Safety</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The Building Regulations (Northern Ireland) 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Booklet B Materials &amp; Workmanship</td>
</tr>
<tr>
<td>Technical Booklet R - Access and use of buildings</td>
</tr>
</tbody>
</table>

3.4.2 Verification by Calculation/Inspection
3.4.2.1 The manufacturer shall determine the design loads appropriate to occupancy and use from BS EN 1991-1-1. The design of elements and components shall either be in accordance with the relevant material and performance standards e.g. BS 6180 for barriers, BS 585 and/or BS 5395 for stairs, or based on established product performance for that use. For the latter, the manufacturer shall supply relevant product data.

3.4.2.2 Where appropriate, the manufacturer shall design appropriate provision for reasonable access for wheelchair users and ambulant disabled people to and from the building and for their movement within the building in accordance with BS 8300 and Approved Document M Category 2 provision.

3.4.3 Verification by Testing
3.4.3.1 Where established product performance is not available then the manufacturer shall provide test data appropriate to the function of the elements or components in use.

3.4.3.2 Communal areas inside multi-residential buildings are required to use emergency lighting. Relevant emergency lighting recommendations are given in: BS 5266-1, BS EN 1838, BS EN 50172 and CIBSE LG12.
3.5 PROTECTION AGAINST NOISE

3.5.1 Requirements

3.5.1.1 The relevant Building Regulations are summarised below

### Building Regulation Requirements covered by this section

The Building Regulations (England) 2010
- Schedule 1, Part E

The Building Regulations (Wales) 2010
- Schedule 1, Part E

The Building Regulations (Scotland) 2004
- Schedule 5, Section 5

The Building Regulations (Northern Ireland) 2012
- Part G

3.5.1.2 Several noise related requirements from the different National Building Regulations apply to systems covered by this BPS. The following table references the relevant noise related Building Regulation requirement for the different UK countries and identifies which elements or potential systems are therefore addressed by this BPS:

<table>
<thead>
<tr>
<th>England</th>
<th>Wales</th>
<th>Scotland</th>
<th>Northern Ireland</th>
<th>System Type</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>E1</td>
<td>Standard 5.1</td>
<td>Regulation 49</td>
<td>Intermediate Floors; Floor over an open space; Load bearing wall; Infill Wall;</td>
<td>Where they form separating walls and/or floors</td>
</tr>
</tbody>
</table>
3.5.2 Verification by calculation - Separating walls and/or floors

3.5.2.1 Not applicable

3.5.3 Verification by testing – Separating walls and/or floors

3.5.3.1 The developer/manufacturer is required to demonstrate compliance for Building Control Purposes on a site-by-site basis through on-site performance testing between completed, or near completed, pairs of dwellings or rooms for residential purposes in accordance with the relevant National Requirements.

3.5.3.2 Airborne sound insulation performance for separating walls and separating floors shall be presented in the following single figure ratings:

\[ D_{nT,w} \text{ (dB)} \] and

\[ D_{nT,w}+C_{tr} \text{ (dB)} \]

3.5.3.3 Airborne sound insulation performance for separating walls and separating floors shall be presented in one-third octave bands between 100 Hz and 3150 Hz in:

\[ D_{nT} \text{ (dB)} \]

3.5.3.4 Impact sound insulation performance for separating walls and separating floors shall be presented in the following single figure ratings:

\[ L'_{nT,w} \text{ (dB)} \]

3.5.3.5 Impact sound insulation performance for separating floors shall be presented in one-third octave bands between 100 Hz and 3150 Hz in:

\[ L'_{nT} \text{ (dB)} \]
3.5.3.6 Comparison of measured performance shall be presented against relevant, National performance targets.

3.5.3.7 Alternatively, the system shall be approved for use in the Robust Details® Handbook and the plots registered and built in accordance with the Robust Details scheme requirements. In which case on-site performance testing is not required.

3.5.3.8 Where on-site test evidence is available from a previous development is available, this should be submitted as evidence to meet the requirements of this BPS. While this evidence will not be sufficient to discharge obligations under the relevant National Regulations, it will help to quantify potential performance of the system to inform decision makers over the potential suitability of the system.

3.5.3.9 Where a system has not been tested on-site and is not approved for use in the Robust Details Handbook, then testing and reporting in accordance with Annex A.1 is required to meet the requirements of this BPS. While this evidence will not be sufficient to discharge obligations under the relevant National Regulations, it will help to quantify potential performance of the system to inform decision makers over the potential suitability of the system.

3.5.3.10 Where system tests are conducted in accordance with Annex A.1, the three-dimensional testing shall be conducted if the modular building system comprises multiple elements. Where the system only comprises a single element, the two-dimensional testing shall be undertaken.

3.5.4 Verification by calculation - Internal walls and/or floors

3.5.4.1 Not applicable

3.5.5 Verification by testing – Internal walls and/or floors

3.5.5.1 The developer/manufacturer is required to demonstrate compliance for Building Control purposes on a site-by-site basis through submission of the results from laboratory testing in accordance with the relevant National Requirements.

3.5.5.2 Performance of internal walls and floors is established through two-dimensional testing in an acoustic laboratory, in accordance with BS EN ISO 10140-1 and BS EN ISO 10140-2. See Annex A.1 for additional information.

3.5.5.3 Airborne sound insulation performance for internal walls and internal floors shall be presented in in the following single figure rating: $R_w$ (dB)

3.5.5.4 Airborne sound insulation performance for internal walls and internal floors
shall be presented in one-third octave bands between 100 Hz and 3150 Hz in: 

\[ R \text{ (dB)} \]

3.5.5.5 Comparison of measured performance shall be presented against relevant, National performance targets.

3.5.5.6 The tested specimen representative of the internal wall or floor should not include any penetrations, electrical sockets, electrical switches or deflection head details.

3.5.6 Verification by calculation - corridors, hallways, stairwells and entrance halls that give access to flats and rooms for residential purposes

3.5.6.1 The developer/manufacturer is required to demonstrate compliance for Building Control Purposes on a site-by-site basis through calculation in accordance with the relevant National Requirements.

3.5.6.2 Calculations shall be conducted in accordance with Method A or Method B as described in the relevant National Guidance (see Approved Document E for England and Wales, Technical Booklet G for Northern Ireland).

3.5.6.3 Existing, published data may be used for ascribing absorptive performance to surfaces for the purposes of the calculations. Where data is not available for specific surfaces, materials or treatment then sound absorption testing shall be undertaken in accordance with BS EN ISO 20354 by a UKAS accredited testing laboratory with the results rated in accordance with BS EN ISO 11654.

3.5.6.4 The report format shall include:

- a) a description of the enclosed space (entrance hall, corridor, stairwell, etc.);
- b) the approach used to satisfy the requirements, Method A or B
  i. with Method A, state the absorber class and the area to be covered; or
  ii. with Method B, state the total absorption area of additional absorptive material used to satisfy the requirement; and
- c) Plans indicating the assignment of the absorptive material in the enclosed space.
- d) Sound absorption data used in the calculation, including test reports (or relevant extracts) demonstrating performance.

3.5.6.5 Depending on the system design, it may be that Method B demonstrates that additional absorbent materials are not required to satisfy the requirements.
beyond the developed system.

3.5.6.6 Where additional sound absorptive material(s) which are not part of the system need to be incorporated to satisfy the requirements, they shall be clearly identified in terms of manufacturer and system/product identification.

3.5.7 Verification by testing – corridors, hallways, stairwells and entrance halls that give access to flats and rooms for residential purposes

3.5.7.1 Not applicable

3.5.8 Additional performance declaration (non-Building Regulations) (APD)

3.5.8.1 Several noise related issues are covered by this BPS which are not currently addressed by UK Building Regulations. These issues are detailed below with system types and evidence requirements:

<table>
<thead>
<tr>
<th>Description</th>
<th>System Types</th>
<th>Performance to be declared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Envelope</td>
<td>Infill wall (where used as an external wall)</td>
<td>Airborne sound insulation</td>
</tr>
<tr>
<td></td>
<td>Façade</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flat roof</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pitched roof</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Three-dimensional module (where forming aspects of the building envelope)</td>
<td></td>
</tr>
<tr>
<td>Building Envelope</td>
<td>Flat roof (where forming an amenity area/roof terrace)</td>
<td>Impact sound insulation</td>
</tr>
<tr>
<td>Building Envelope</td>
<td>Flat roof</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pitched roof</td>
<td></td>
</tr>
<tr>
<td>Integrated mechanical ventilation systems</td>
<td>Three-dimensional systems (if part of the product supplied)</td>
<td>Noise levels resulting from mechanical ventilation within:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Living rooms,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Bedrooms,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Kitchens, and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Bathrooms</td>
</tr>
</tbody>
</table>
3.5.9 Verification by calculation – Building envelope, airborne sound insulation

3.5.9.1 The airborne sound insulation performance of the intended external wall assembly and roof constructions (from weather face to internally finished inner leaf) may be calculated based on measured or published performance data of individual components/elements in accordance with BS EN ISO 12354-3. The calculations should include all direct and flanking transmission paths, including (but not limited to):

a) Unglazed areas of external wall,
b) Glazed areas of external wall,
c) Windows,
d) Trickle vents (if included)
e) Passive ventilators, and
f) Inlets for mechanical systems

3.5.9.2 For three-dimensional modules, only the elements forming external building envelopes need to be considered for this aspect. If no areas of building envelope are formed from the module, this aspect is not applicable.

3.5.9.3 It is anticipated that several models may be developed for each system type for different configurations of critical elements such as windows in external walls. Each result is only valid for the configuration calculated. The reported output must accurately reflect what variations of elements have been considered for any given output.

3.5.9.4 Where insufficient data exists on specific elements to facilitate the calculation, such as a new wall/window design, then these can be tested in isolation following the guidance given in BS EN ISO 10140-1.

3.5.9.5 Airborne sound insulation performance for the building envelope shall be presented in in the following single figure rating:

- $R'_{w}$ (dB),
- $R'_{w} + C_{tr}$ (dB),
- $R_w$ (dB),
- $R_w + C_{tr}$ (dB)
3.5.9.6 Airborne sound insulation performance for the building envelope shall be presented in one-third octave bands between 100 Hz and 3150 Hz in:

- $R'(\text{dB})$, or
- $R(\text{dB})$

3.5.10 Verification by testing – Building envelope, airborne sound insulation

3.5.10.1 The airborne sound insulation characteristics of building envelope sub-assemblies (such as windows or wall sections) or elements (such as vents or inlets) may be tested following the two-dimensional testing guidance in BS EN ISO 10140-1. The test specimen should be from internal face to external, weather facing side. The test results only apply to the configuration tested.

3.5.10.2 Under certain circumstances, it may be appropriate/desirable to test on-site or in the factory fully assembled parts of, or the entire, building envelope. Guidance is provided in Annex A.2 for three-dimensional testing. The three-dimensional test is only valid for the configuration tested, which may be appropriate for single design solution.

3.5.10.3 Airborne sound insulation performance for the building envelope, the sub-assemblies or elements shall be presented in the following single figure rating:

- $R'_w (\text{dB})$,  
- $R'_w + C_w (\text{dB})$,  
- or  
- $R_w (\text{dB})$,  
- $R_w + C_r (\text{dB})$,  
- or  
- $D_{\text{ne,w}}$  

as appropriate for the element or combination of elements tested.

3.5.10.4 Airborne sound insulation performance for the building envelope, the sub-assemblies or elements shall be presented in one-third octave bands between 100 Hz and 3150 Hz in:

- $R'(\text{dB})$, or
- $R(\text{dB})$, or
as appropriate for the element or combination of elements tested

3.5.11 Verification by calculation – Building envelope, impact sound insulation

Not applicable

3.5.12 Verification by testing – Building envelope, impact sound insulation

3.5.12.1 The impact sound insulation characteristics of flat roofs shall be tested where they are accessible/intended for use as an outdoor amenity area such as a roof terrace following the two-dimensional testing guidance in Annex A.1. The test specimen should be from external weather facing side to internal ceiling face. The test results only apply to the configuration tested.

3.5.12.2 Under certain circumstances, it may be appropriate/desirable to test on-site or in the factory fully assembled parts of, or the entire, building envelope. Guidance is provided in Annex A.2 for three-dimensional testing. The three-dimensional test is only valid for the configuration tested, which may be appropriate for single design solution.

3.5.12.3 For two-dimensional tests, impact sound insulation performance for flat roofs shall be presented in in the following single figure rating:

\[ L_{nw} \] (dB)

3.5.12.4 For two-dimensional tests, impact sound insulation performance for flat roofs shall be presented in one-third octave bands between 100 Hz and 3150 Hz in:

\[ L_n \] (dB)

3.5.12.5 For three-dimensional tests, impact sound insulation performance for flat roofs shall be presented in in the following single figure rating:

\[ L_{nT, w} \] (dB)

3.5.12.6 For three-dimensional tests, impact sound insulation performance for flat roofs shall be presented in one-third octave bands between 100 Hz and 3150 Hz in:

\[ L_{nT} \] (dB)

3.5.13 Verification by calculation – Building envelope, rain noise

The impact noise from rain falling on the flat or pitched roof shall be assessed based on data obtained for the roof in accordance with BS EN ISO 10140-1 Annex K subject to “heavy” rain excitation.
The results from the assessment shall be presented in terms of a dB(A) value, due to the rain noise excitation taking account of the complete structure from weather face to room finish for each room type.

The calculations shall be based on representative furnishing levels for units when occupied.

Where the system only represents two-dimensional elements e.g. simply the roof and not enclosing walls to form rooms, the calculations shall be based on assumed geometry representative of typical spaces for each room type.

3.5.14 Verification by testing – Building envelope, rain noise

Not applicable.

3.5.15 Verification by calculation – Integrated mechanical ventilation systems

The noise from integrated mechanical ventilation systems shall be based on sound power data obtained for the ventilation system in accordance with the relevant part of BS EN 13141.

The assessment should be undertaken in accordance with a published calculation method such as that presented in CIBSE Guide B4:2016 – Noise and vibration control for building services systems. The results shall be presented in terms of a dB(A) value taking account of structure borne noise contributions, if appropriate.

The calculations shall be based on representative furnishing levels for units when occupied.

Where the system does not form completed rooms, the calculations shall be based on assumed geometry representative of typical spaces for each room type.

3.5.16 Verification by testing – Integrated mechanical ventilation systems

The noise due to the ventilation system should be undertaken within enclosed rooms, representative of the completed dwellings. Testing should be undertaken in accordance with an appropriate, published method such as those presented in ANC Guidelines – Noise Measurements in Buildings, Part 1: Noise from Building Services.

The results shall be presented in terms of a dB(A) value and be based on representative furnishing levels for units when occupied.
3.6 ENERGY ECONOMY AND HEAT RETENTION

3.6.1 Requirements

3.6.1.1 The Building Regulations are summarised below

<table>
<thead>
<tr>
<th>The Building Regulations (England) 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Approved Document L1A Conservation of fuel and power in new dwellings</td>
</tr>
<tr>
<td>- Regulation 7 – Materials &amp; Workmanship</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The Building Regulations (Wales) 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Approved Document L1A Conservation of fuel and power in new dwellings</td>
</tr>
<tr>
<td>- Regulation 7 – Materials &amp; Workmanship</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scottish Building Standards 2017 Technical Handbook: Domestic</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Section 0 Regulation 8 materials and workmanship.</td>
</tr>
<tr>
<td>- Section 6: Energy, 6.2 Building insulation envelope</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The Building Regulations (Northern Ireland) 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Technical Booklet B Materials &amp; Workmanship</td>
</tr>
<tr>
<td>- Technical Booklet F1 Conservation of fuel and power</td>
</tr>
</tbody>
</table>

3.6.2 Verification by Calculation

3.6.2.1 The manufacturer shall demonstrate compliance of the thermal performance of buildings, in accordance with the procedures given in the version of the Building Regulations and Standards currently in force in the appropriate UK administration. For example, Approved Document L1A of the Building Regulations (England and Wales) states that compliance can be demonstrated by meeting the five criteria given in it, which involves the use of approved calculation tools (current versions of the Standard Assessment Procedure (SAP) or the Simplified Building Energy Model (SBEM)) to predict the Dwellings Emission Rate (DER) for comparison with the Target Emission Rate (TER).

3.6.2.2 SBEM shall be used if part of the modular construction is for a heated common area in an apartment block.

3.6.2.3 Where appropriate, the manufacturer shall submit element U-value calculations in accordance with the following:

- Walls and roofs: BS EN ISO 6946
- Ground floors: BS EN ISO 13370
Windows and doors: BS EN ISO 10077-1 or BS EN ISO 10077-2
Basements: BS EN 13370 or the BCA/NHBC Approved Document
Light steel-frame construction: Digest 465, BRE 2002
Components outside the scope of the above: BS EN ISO 10211

3.6.2.4 The manufacturer shall submit evidence to show that the connections between elements of the building system comply with the regulatory requirements. This can be via utilisation of published Robust Construction Details given in 'Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings', or for other connections, via appropriate numerical modelling using data appropriate to the connection configuration.

3.6.3 Verification by Testing
3.6.3.1 Where a manufacturer chooses to demonstrate compliance by test evidence that evidence shall be in accordance with the following:

BS EN 12664, BS EN 12667 or BS EN 12939 for thermal conductivity
BS EN ISO 8990 for thermal transmittance
BS EN ISO 12567-1 for thermal transmittance of windows and doors
3.7 SECURITY

3.7.1 Requirements

3.7.1.1 The Building Regulations are summarised below

<table>
<thead>
<tr>
<th>Building Regulation Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Building Regulations (England) 2010</td>
</tr>
<tr>
<td>• Approved Document Q Security - Dwellings</td>
</tr>
<tr>
<td>• Regulation 7 – Materials &amp; Workmanship</td>
</tr>
</tbody>
</table>

3.7.2 Verification by Calculation

3.7.2.1 Not applicable.

3.7.3 Verification by Testing/Assessment

3.7.3.1 Physical security

The manufacturer shall consider how accessible the attack-side of each feature (e.g. wall element or component) is, the types of attack likely on each feature (i.e. whether covered by LPS 1175 or LPS 2081), and the delay each feature must deliver to mitigate the threat identified (i.e. the security rating to be achieved in accordance with the relevant standard).

The manufacturer shall then demonstrate compliance with the relevant minimum Security Rating identified by the threat, with PAS 24 (for relevant attributes of the system, e.g. doors and windows and that those products are installed in accordance with manufacturers’ instructions) and/or LPS 2081 Security Rating B.

3.7.3.2 Consideration must be given to the compatibility of approved components within the wall/module to ensure the security rating of the installed component is maintained.

3.7.3.3 Additionally the manufacturer may wish to demonstrate compliance of the system, panels and elements with LPS 1175 Security Rating 2 or higher (this clause is considered as beyond the minimum requirement in AD Q).
3.8 DESIGN CHANGE AND SERVICE LIFE PLANNING

3.8.1 Design life planning

3.8.1.1 Verification by Desk Study

The manufacturer shall demonstrate how they have considered potential changes and adaptations that might reasonably be expected to be introduced during the life of the building, if appropriate to the design of the system. This shall include the identification of structure/components that have been readied for future adaptation e.g. strengthened structure, fixing points provided, cabling installed, etc.

3.8.2 Service life planning

3.8.2.1 Verification by Desk Study

The manufacturer shall demonstrate how they have considered the design life of module components, and their maintenance, servicing and replacement requirements. The manufacturer should consider CIBSE TM31 Building log Book Kit.

The manufacturer shall demonstrate that they have considered the requirements in ISO Standard ISO 15686.
3.9 DURABILITY, RESILIENCE, MATERIALS AND WORKMANSHIP

3.9.1 Requirements

3.9.1.1 The Building Regulations are summarised below

<table>
<thead>
<tr>
<th>Building Regulation Requirements</th>
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</tr>
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<td>The Building Regulations (Northern Ireland) 2014</td>
</tr>
<tr>
<td>- Technical Booklet B Materials &amp; Workmanship</td>
</tr>
</tbody>
</table>

3.9.1.2 Those regulations require systems and materials to be of a suitable nature and quality in relation to their purposes and conditions of use. In this Standard the following requirements are adopted:

- The life expectancy of the structural system and inaccessible elements or components shall not be less than 60 years.
- Individual elements or components with shorter life expectancies shall be clearly identified in the installation and/or user manual(s) and their life expectancies stated. In addition, appropriate maintenance, refurbishment and/or replacement schedules for such elements or components shall be supplied.
- The durability, resilience and repairability of building systems shall be assessed against a benchmark residential building constructed using an established method of building.

3.9.2 Verification by Desk Study

3.9.2.1 The manufacturer shall provide sufficient information so that durability can be established by desk study.

3.9.2.2 The manufacturer shall consider the resilience of their system and provide their methodology for repairing the resulting damage, see also section 4.2.
3.9.3 Verification by Testing
3.9.3.1 Flood resilience of doors and frames shall be tested in accordance with, and meet the requirements of, the leakage test requirements of PAS 1188-1.

3.10 SUSTAINABLE USE OF NATURAL RESOURCES
3.10.1 Environmental impact of materials
3.10.1.1 Verification by Assessment
The manufacturer can demonstrate it has taken measures to lower the environmental impact of materials of the finished dwelling by:

1. Procuring products with independently verified environmental product declarations (EPD) in accordance with ISO 14025 and either ISO 21930 or EN 15804. Only two EPDs per compliance group (as defined by Uniclass 2015 code) will be accounted for. A minimum number of two EPD’s will be required from the offsite system manufacture to comply with this standard.

2. Providing information to demonstrate or calculate the environmental impact of the building in terms of BRE 2014 Ecopoint/m² and demonstrate improvement against the benchmark as defined by HQM. This can be done in either of the following ways:
   - Provide the assessor with the required information so that they can carry out the assessment. Information required includes: element location and system profile classification, quantity of the unit of measurement and general dwelling information (e.g. GIA, number of bedrooms, communal areas, etc.)
   - OR carry out the assessment using an IMPACT compliant tool (see [http://www.impactwba.com/](http://www.impactwba.com/) for a list of IMPACT compliant tools)

Should the innovative offsite system manufacturer not wish to follow the HQM route, it will still need to comply with the requirements above. With regards to calculating the environmental impact of the building, the manufacturer will either use an IMPACT or an EN 15978 compliant tool.
3.10.2 Life Cycle Costing (LCC) of Construction Products

3.10.2.1 Verification by Assessment

Life Cycle Costing (LCC) analysis is carried out to PD156865 by a suitably qualified cost consultant commencing at the end of Stage 2/RIBA Stage 2. Whilst a full Life Cycle Costing analysis cannot be performed on less than a whole completed building in situ the manufacturer can provide all the information required to perform an LCC for relevant sections so that the building could be fully assessed once installed.

3.10.3 Responsible sourcing of materials/products

3.10.3.1 Verification by Assessment

Legally harvested and traded timber products can be considered as responsibly sourced if all timber and timber-based products used in the building meet the definition of ‘legally harvested and legally traded timber’. Guidance is provided in the UK Government’s Timber Procurement Policy (TPP).

The manufacturer can demonstrate responsible sourcing of construction products assessment by following the guidance and principals in BS 8900-1 Managing sustainable development of organizations and/or ISO 20400 Sustainable procurement.

Similarly, the manufacturer should demonstrate compliance with the responsible sourcing certification scheme for BES 6001 Responsible sourcing framework Standard.

Additionally, the manufacturer should demonstrate compliance with BES 6002 Ethical Sourcing Standard.
4 QUALITY MANAGEMENT REQUIREMENTS

This section considers all of the actions necessary to manage the quality of the building system throughout its life.

- Practicability of installation (buildability)
- Practicability of repair, replacement and adaptability
- Identification of building systems
- Factory production control
- Handling and storage
- Site Assembly
- Home information
- Building information modelling/management (BIM)
- Information to be supplied by the applicant

4.1 PRACTICABILITY OF INSTALLATION (Buildability)

4.1.1 Requirements

4.1.1.1 Verification by Assessment

4.1.1.1.1 The manufacturer shall provide a set of clear instructions detailing site installation details and assembly procedures, handling and storage instructions, and operator training requirements.

4.1.1.1.2 The assembly and installation of the system shall be in accordance with the manufacturer's instructions using an appropriately trained or qualified workforce. The manufacturer shall provide a checklist detailing the critical assembly and installation checks for the system, as required, for inspection of on-site construction and quality control by Building Control and/or other appropriate organisations.

4.1.1.1.3 The installation instructions shall include specifications for the tolerances of ancillary constructions to be provided by others, e.g. foundation levels, so as not to impair the construction of the building.

4.1.1.1.4 The manufacturer shall provide installation instructions that include specifications for the tolerances of the intermediate stages of the modular building's construction. This shall include maximum permissible deviations that are specific to the manufacturer's system, such as deviation from level and twist about the building's vertical stack axis.
4.1.1.1.5 The building shall be made weathertight as soon as practicably possible during assembly and installation in order to protect elements and components that may be damaged by water.

4.1.1.1.6 The manufacturer shall allow the Certification Body to witness assembly and installation at a minimum of one site in order to assess the buildability of the system and to confirm that the methods being used are in accordance with the procedures. This shall include site organisational structure, competency and training of those performing the installation to ensure a satisfactory and repeatable installation.

4.1.1.1.7 The manufacturer shall ensure that modules cannot sustain long term damage during transportation to site, or during assembly and installation that could go undetected.

4.2 PRACTICABILITY OF REPAIR, REPLACEMENT AND ADAPTABILITY

4.2.1 Requirements

4.2.1.1 Verification by Assessment

4.2.1.1.1 The manufacturer shall provide repair and adaptability procedures for the building system as appropriate. This shall include for replacement of components.

4.2.1.1.2 The procedures for repair shall consider the requirements resulting from the schedule of specified threats given in Clause 3.9, as applicable to the type of development. The procedures for the adaptation/change of use of building systems should consider the following scenarios, as applicable:

- Insertion of a 2m x 2m opening for a new patio door.
- Fixing of heavy items to internal walls, ceilings and stairs – e.g. stair lift, or ceiling hoist for disabled.
- Fixing of heavy items to external walls.
- Adding a conservatory/porch to an external wall.
- Removal of internal load bearing walls.
- Accessibility for modifications to plumbing and electrics services.
- Cutting or drilling holes through elements or components to accommodate modifications to service requirements.

4.2.1.1.3 The manufacturer shall provide the recommended approach to damage assessment and repair, taking into account the availability of replacement parts and the degree of inter-connection between different elements in the system. The approach shall also indicate whether repair requires particular levels of competency, e.g. carried out by competent DIY, general tradesperson or specialist contractors.
4.2.1.1.4 The Developer/Builder shall supply a ‘User/Owner Guide’ that will be given to the Building Owner, which identifies clearly ‘Dos and Don’ts’ that need to be understood before any maintenance, modification or adaptation of the system is undertaken.

4.2.1.1.5 The User Guide shall indicate the competency required to achieve particular types of modifications or adaptations (see clause 4.2.1.1.2). It shall also include key information relating to the construction, e.g. wall and floor drawings, positions of services etc., and be capable of being updated to record work done throughout the life of the building.

4.2.1.1.6 Whilst this Standard does not consider sanitation, hot water safety and efficiency, drainage and waste disposal, and heat producing appliances separately as they are covered by CE Marking, consideration shall be given to accessing these services for repair or replacement. The Manufacturer can provide a report to demonstrate this.

4.3 IDENTIFICATION OF BUILDING SYSTEMS

To prevent inadvertent damage from works or to enable repair and maintenance to be carried out effectively, future occupants of residential buildings, and any professionals/contractors engaged by them, shall have ready access to information about the design and construction of that building (see clause 4.7). Each system supplied shall have a data sheet provided to the owner. The data provided shall meet the following requirements.

4.3.1 Requirements

4.3.1.1 Verification by Assessment

4.3.1.1.1 The building system shall be unambiguously identifiable by an overt marking device.

4.3.1.1.2 The identification system shall incorporate at least one form of overt marking device placed in a suitable location on the building, e.g. in an external service/meter box, so as to be readily accessible by the occupier, professionals and contractors, yet be secure from accidental or deliberate damage.

4.3.1.1.3 The manufacturer of a module or system shall provide at least one overt marking device on each module or system which records the following information:

1. A unique identification code for each building system delivered and batch reference.
2. The name and contact details (e.g. web site or phone number) of the system manufacturer and postcode of manufacturing facility.
3. The name and contact details of developer.
4. A code to identify the Building Control Body used.
5. A code to identify which UK Building Regulations compliance applies to, i.e. England, Scotland, Wales, Northern Ireland, or a combination of countries.
6. The year of manufacture and year of installation (if different).
7. The name/reference for the system.
8. The Certificate number and issuing authority.

4.3.1.4 The manufacturer may have a documented process for demonstrating tracking of components and modules. This might feature ‘Tag and Track’ or the use of Quick Response Codes (QRC) or maintain an as-built condition record. A Tag and track system using radio frequency identification (RFID) tags/QRC barcodes can allow real-time monitoring of components and elements from the supply chain, through the manufacturing process, transportation to site and storage, site construction and the operations and maintenance of the completed building. Once installed the tagged components will remain for the life-cycle of the building, providing accurate information to those that need it.

4.3.1.2 Verification by Testing

4.3.1.2.1 Overt marking devices shall withstand a test for resistance to removal or damage in accordance with manual intervention testing specified in LPS 1225, or similar.

4.4 FACTORY PRODUCTION CONTROL

Some of the purposes of control of the manufacturing are to produce product which meets design intent, and which complies with the design specification and the requirements of this Standard.

4.4.1 Requirements

4.4.1.1 Verification by Assessment

4.4.1.1.1 The manufacturer’s Factory Production Control procedures shall be in accordance with BRE Global Construction Products Certification document PN 111 ‘Factory Production Control’ requirements.

4.4.1.2 The manufacturer shall have a Production Control Plan available at the start of the Certification Body’s assessment. The plan shall list the raw materials used, show the means of verification of their quality, the type and frequency of in-process and final testing of the product and the associated performance (pass/fail) requirements.
4.4.1.1.3 The manufacturer shall establish key performance indicators for its supply chain.

4.4.1.1.4 The manufacturer may have a “Design Authority” to clarify accountability for owning design intent, the method of manufacture, verification, change and non-conformance. The Design Authority controls how design specification is approved, released and changed. The Design Authority controls, or can delegate, the method of manufacture/verification and assessment/permit of non-conformance.

4.4.1.1.5 Where manual on-site processes have been automated, the manufacturer shall demonstrate that potential failure modes, for example due to input material or process, have been identified and mitigated to an ALARP (as low as reasonably practicable) level.

4.5 HANDLING AND STORAGE (Factory and Site)

4.5.1 Requirements

4.5.1.1 Verification by Assessment

4.5.1.1.1 Handling (lifting and transporting) and storage activities shall not cause damage and/or ingress of moisture, nor impair the intended performance of building systems when subsequently erected to form the building. Guidance shall be provided for handling and lifting activities. This shall include factory activity and site installation requirements.

4.5.1.1.2 Guidance shall be provided for the storage of modules, part modules or components at the factory and include intermediate in-transit storage which might be of many months duration. This shall include provision for weatherproofing where modules or systems are stored before installation.

4.5.1.1.3 No elements damaged during handling and storage shall be used in construction of a building unless specifically authorised by a competent engineer.

4.5.1.1.4 The manufacturer shall demonstrate that no part of the system is adversely affected from handling, transporting and lifting or from the support conditions in storage. The manufacturer shall have a documented procedure for demonstrating transportation, handling and lifting.

4.5.1.2 Verification by Testing

Testing, if required to demonstrate any of the above requirements, shall be determined by the Certification Body.
4.6 SITE ASSEMBLY
The manufacturer shall demonstrate the following requirements. Additionally, these requirements apply where a manufacturer uses an installer who is not part of the manufacturer.

4.6.1 Requirements
4.6.1.1 Verification by Assessment
4.6.1.1.1 The manufacturer shall provide full detailed site installation/assembly instructions including any diagrams for use by the site installer.
4.6.1.1.2 The manufacturer shall identify relevant competency and/or training requirements for installers.
4.6.1.1.3 The manufacturer shall provide risk assessments for the installation and construction process inspection.
4.6.1.1.4 The manufacturer shall identify requirements for checking workmanship of the installation, which could involve providing a site quality check list.
4.6.1.1.5 The manufacturer/developer (as appropriate) shall consider how they ensure that the installation is completed to a satisfactory standard.
4.6.1.1.6 The manufacturer shall identify any specialist installation equipment and tools that are needed.

4.7 HOME INFORMATION
4.7.1 Requirements
4.7.1.1 Verification by Assessment
4.7.1.1.1 The manufacturer shall make available a Health and Safety File to comply with the Construction Design and Management (CDM) Regulations, which require a Health and Safety File to be prepared and handed over to the Client. The file is a record of all information for the client/end user, which tells those persons who might be responsible for the structure in the future of the risks that have to be managed during maintenance, repair, renovation and demolition. Typical contents include; as built drawings, operational manuals for any equipment, mechanical and electrical service drawings, details of emergency provisions, details of hazardous substances/materials which could give rise to risk of injury, maintenance schedules, etc.
4.7.1.1.2 In addition to satisfying the CDM regulations the manufacturer shall provide a User Manual to enable the end user to run their building effectively. It shall describe the building system, including thermal performance characteristics, and the ‘Dos and Don’ts’
that need to be understood before any maintenance, or adaptation, of the system is undertaken, and allows for work carried out to be recorded. The User Manual should form part of the Health and Safety File for the building.

4.7.1.1.3 The Dwelling Management Guide and Logbook shall include a list of examples of additions or adaptations identifying any installation constraints. Constraints may range from excluding works altogether, to limiting works to areas of the building which incorporate suitably reinforced construction. Examples of additions might include PV panels, wind turbines, washing lines, basketball hoops, awnings, aerials, examples of adaptations might include balconies, patio doors etc.

4.8 BUILDING INFORMATION MODELLING (BIM)

4.8.1 Requirements

4.8.1.1 Verification by Assessment

4.8.1.1.1 Whilst non-mandatory it is considered Construction Industry best practice to utilise Building Information Modelling (BIM) in co-ordinating construction projects. Internationally, BIM is addressed in BS ISO 12006–2 and BS ISO 12006-4. For the UK national implementation of ISO 12006 see Uniclass 2015. The manufacturer should achieve Level 2 of Uniclass 2015 for the components and system.

4.8.1.1.2 Whilst non-mandatory it is suggested that the information considered as part of BIM should be carried through to an AIM (Asset Information Model) for user/owner/maintainer etc. to use and update through the life of the building.
5 RELEVANT UK REGULATIONS, STANDARDS, AND PUBLICATIONS

The construction system will be evaluated to determine it satisfying the relevant requirements of the building regulations current at the time of the assessment. The relevant regulations at the date of publication of this standard are listed for completeness. Evaluation will normally be carried out against regulations marked * in the list below. BRE Global Construction Products Certification reserve the right to include other regulations in the list if appropriate and will notify the manufacturer accordingly.

5.1 Regulations
a) The Building Regulations (England (and Wales)) 2010: Requirements
   https://www.gov.uk/government/collections/approved-documents
   http://www.gov.scot/Topics/Built-Environment/Building/Building-standards
c) The Building Regulations (Wales) 2010: Requirements
   http://gov.wales/topics/planning/buildingregs/approved-documents
d) The Building Regulations (Northern Ireland) 2014*
   http://www.buildingcontrol-ni.com/regulations
e) The Health and Safety at Work etc Act 1974*
f) Construction (Design and Management) Regulations 2015
g) Technical housing standards – nationally described space standard 2015

5.2 Component Product Standards and EC Harmonised Standards

Components used in the construction of the building system shall comply with relevant International, European or National standards.

Where available EC Harmonised Standards shall be used. These can be found at:

5.3 Standards referred to in the BPS

ISO, EN and British Standards can be found at: http://shop.bsigroup.com/
BS 476-3  Fire tests on building materials and structures. Classification and method of test for external fire exposure to roofs
BS 476-4  Fire tests on building materials and structures. Non-combustibility test for materials
BS 476-6  Fire tests on building materials and structures. Method of test for fire propagation for products
BS 476-7  Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products
BS 476-11  Fire tests on building materials and structures. Method for assessing the heat emission from building materials
BS 476-20  Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles)
BS 476-21  Fire tests on building materials and structures. Methods for determination of the fire resistance of load bearing elements of construction
BS 476-22  Fire tests on building materials and structures. Methods for determination of the fire resistance of non-load bearing elements of construction
BS 476-23  Fire tests on building materials and structures. Methods for determination of the contribution of components to the fire resistance of the structure
BS 476-24  Fire tests on building materials and structures. Methods for determination of the fire resistance of ventilation ducts
BS 585–2  Wood Stairs. Specification for performance requirements for domestic stairs constructed of wood-based materials
BS 5250  Code Stairs. Specification for performance requirements for domestic stairs constructed of wood-based materials
BS 5266-1  Emergency lighting. Code of practice for the emergency escape lighting of premises
BS 5268-2  Structural use of timber. Code of practice for permissible stress design, materials and workmanship
BS 5395-1  Stairs. Code of practice for the design of stairs with straight flights and winders
BS 5446-2  Fire detection and fire alarm devices for dwellings. Specification for heat alarms
BS 5534  Slating and tiling for pitched roofs and vertical cladding — Code of practice
BS 5839-1  Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises
BS 5839-6  Fire detection and fire alarm systems for buildings. Code of practice for the design, installation and maintenance of fire detection and fire alarm systems in dwellings
BS 5900  Powered home –lifts with partially enclosed carriers and no liftway enclosures. Specification
BS 5925  Code of practice for ventilation principles and designing for natural ventilation
BS 6100  Series of standards: *Glossary of building and civil engineering terms.*
BS 6180  Barriers in and about buildings. Code of practice
BS 6750  Specification for modular coordination in building
BS 7543  Guide to durability of buildings and building elements, products and components
BS 8000 1-16 series of standards: Workmanship on building sites
BS 8102 Code of Practice for protection of structures against water from the ground
BS 8103-1 Structural design of low-rise buildings. Code of practice for stability, site investigation, foundations, precast concrete floors and ground floor slabs for housing
BS 8103-2 Structural design of low-rise buildings. Code of practice for masonry walls for housing
BS 8103-3 Structural design of low-rise buildings. Code of practice for timber floors and roofs for housing
BS 8104 Code of Practice for assessing exposure of walls to wind-driven rain
BS 8206-2 Lighting for buildings. Code of Practice for daylighting
BS 8214 Code of practice for fire door assemblies with non-metallic leaves
BS 8233 Guidance on sound insulation and noise reduction for buildings
BS 8297 Code of practice for Design and installation of non-loadbearing precast concrete cladding
BS 8298-1 Code of practice for the design and installation of natural stone cladding and lining. General
BS 8298-2 Code of practice for the design and installation of natural stone cladding and lining. Traditional handset external cladding
BS 8298-3 Code of practice for the design and installation of natural stone cladding and lining. Stone-faced pre-cast concrete cladding systems
BS 8298-4 Code of practice for the design and installation of natural stone cladding and lining. Rainscreen and stone on metal frame cladding systems
BS 8300 Design of buildings and their approaches to meet the needs of disabled people
BS 8414-1 Fire performance of external cladding systems Part 1: Test Method for non-load bearing external cladding systems applied to the face of the building.
BS 8414-2 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame
BS 8485 Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
BS 8500-1 Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier
BS 8500-215 Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete
BS 8541-1 Library objects for architecture, engineering and construction. Identification and classification. Code of practice
BS 8541-2 Library objects for architecture, engineering and construction. Recommended 2D symbols of building elements for use in building information modelling
BS 8541-3 Library objects for architecture, engineering and construction. Shape and measurement
BS 8541-4 Library objects for architecture, engineering and construction. Attributes for specification and assessment
BS 8541-5 Library objects for architecture, engineering and construction. Assemblies. Code of practice
| BS 8541-6 | Library objects for architecture, engineering and construction. Product and facility declarations. Code of practice |
| BS 8900-1 | Managing sustainable development of organizations - Guide |
| BS 9251 | Fire sprinkler systems for domestic and residential occupancies. Code of practice |
| BS EN 81-70 | Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Accessibility to lifts for persons including persons with disability. |
| BS EN 197-1 | Cement. Composition, specifications and conformity criteria for common cements |
| BS EN 197-2 | Cement. Conformity evaluation |
| BS EN 717-1 | Wood-based panels. Determination of formaldehyde release. Formaldehyde emission by the chamber method |
| BS EN 771-1 | Specification for masonry units. Clay masonry units |
| BS EN 771-2 | Specification for masonry units. Calcium silicate masonry units |
| BS EN 771-3 | Specification for masonry units. Aggregate concrete masonry units (dense and lightweight aggregates) |
| BS EN 771-4 | Specification for masonry units. Autoclaved aerated concrete masonry units |
| BS EN 771-5 | Specification for masonry units. Manufactured stone masonry units |
| BS EN 771-6 | Specification for masonry units. Natural stone masonry units |
| BS EN 845-1 | Specification for ancillary components for masonry. Wall ties, tension straps, hangers and brackets |
| BS EN 845-2 | Specification for ancillary components for masonry. Lintels |
| BS EN 845-3 | Specification for ancillary components for masonry. Bed joint reinforcement of steel meshwork |
| BS EN 998-2 | Specification for mortar for masonry. Masonry mortar |
| BS EN 1027 | Windows and doors. Watertightness. Test method |
| BS EN 1090-2 | Execution of steel structures and aluminium structures. Technical requirements for steel structures |
| BS EN 1090-3 | Execution of steel structures and aluminium structures. Technical requirements for aluminium structures |
| BS EN 1195 | Timber structures. Test methods. Performance of structural floor decking |
| BS EN 1303 | Building hardware. Cylinders for locks. Requirements and test methods |
| BS EN 1364-1 | Fire resistance tests for non-loadbearing elements. Walls |
| BS EN 1364-2 | Fire resistance tests for non-loadbearing elements. Ceilings |
| BS EN 1365-1 | Fire resistance tests for loadbearing elements. Walls |
| BS EN 1365-2 | Fire resistance tests for loadbearing elements. Floors and roofs |
| BS EN 1365-3 | Fire resistance tests for loadbearing elements. Beams |
| BS EN 1365-4 | Fire resistance tests for loadbearing elements. Columns |
| BS EN 1366-1 | Fire resistance tests for service installations. Ventilation ducts |
| BS EN 1366-2 | Fire resistance tests for service installations. Fire dampers |
| BS EN 1366-3 | Fire resistance tests for service installations. Penetration seals |
| BS EN 1366-4 | Fire resistance tests for service installations. Linear joint seals View details |
| BS EN 1366-5 | Fire resistance tests for service installations. Service ducts and shafts |
BS EN 1366-6  Fire resistance tests for service installations. Raised access and hollow core floors
BS EN 1634-1  Fire resistance and smoke control tests for door, shutter and, openable window assemblies and elements of building hardware. Fire resistance tests for doors, shutters and openable windows
BS EN 1634-2  Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware. Fire resistance characterisation test for elements of building hardware
BS EN 1634-3  Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware. Smoke control test for door and shutter assemblies
BS EN 1838  Lighting applications. Emergency lighting.
BS EN 1990  UK National Annex for Eurocode. Basis of structural design
BS EN 1991-1-7  Eurocode 1. Actions on structures. General actions. Accidental actions
BS EN 1993-1-10  Eurocode 3. Design of steel structures material toughness and through thickness properties
BS EN 1993-1-5  Eurocode 3. Design of steel structures plated structural elements
BS EN 1993-1-7  Eurocode 3. Design of steel structures. Plated structures subject to out of plane loading
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BS EN ISO 10140-5 Acoustics. Laboratory measurement of sound insulation of building elements. Requirements for test facilities and equipment
BS EN ISO 10211 Thermal performance of buildings. Heat transfer via the ground. Calculation methods
BS EN ISO 11654 Acoustics. Sound absorbers for use in buildings. Rating of sound absorption
BS EN ISO 11925-2 Reaction to fire tests. Ignitability of products subjected to direct impingement of flame. Single-flame source test
BS EN ISO 12354-3 Building acoustics. Estimation of acoustic performance of buildings from the performance of elements. Airborne sound insulation against outdoor sound
BS EN ISO 12567-1 Thermal performance of windows and doors. Determination of thermal transmittance by hot box method. Complete windows and doors
BS EN ISO 13370 Thermal performance of buildings. Heat transfer via the ground. Calculation methods
BS EN ISO 13788 Hygrothermal performance of building components and building elements: Internal surface temperature to avoid critical surface humidity and interstitial condensation. Calculation methods
BS EN ISO 14001 Environmental management systems. Requirements with guidance for use
BS EN ISO 14025 Environmental labels and declarations. Type III environmental declarations. Principles and procedures.
BS EN ISO 16000-2 Indoor air -- Part 2: Sampling strategy for formaldehyde
BS EN ISO 16000-3 Indoor air -- Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air -- Active sampling method
BS EN ISO 16000-5 Indoor air. Sampling strategy for volatile organic compounds (VOCs)
BS EN ISO 16000-6 Indoor air. Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS or MS-FID
BS EN ISO 16000-9:2006 Indoor air. Determination of the emission of volatile organic compounds from building products and furnishing. Emission test chamber method
BS EN ISO 16017-2 Indoor, ambient and workplace air. Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography. Diffusive sampling
BS EN ISO 16283-1 Acoustics. Field measurement of sound insulation in buildings and of building elements. Airborne sound insulation
BS EN ISO 20354 Acoustics. Measurement of sound absorption in a reverberation room
BS ISO 12006-3 Building construction. Organization of information about construction works. Framework for object-oriented information
BS ISO 15686-1 Buildings and constructed assets - service life planning - Part 1: General principles and framework

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BS ISO 15686-2 Buildings and constructed assets - service life planning - Part 2: Service life prediction procedures
BS ISO 15686-3 Buildings and constructed assets - service life planning - Part 3: Performance audits and reviews
BS OHSAS 18001 Occupational health and safety management systems. Requirements
DD 252 Components for residential sprinkler systems. Specification and test methods for residential sprinklers
DD CEN/TS 1187 Test methods for external fire exposure to roofs
PD 6687-1 Background paper to the National Annexes to BS EN 1992-1 and BS EN 1992-3
PD 6688-1-1 Recommendations for the design of structures to BS EN 1991-1-1
PD 6688-1-2 Background paper to the UK National Annex to BS EN 1991-1-2
PD 6688-1-4 Background information to the National Annex to BS EN 1991-1-4 and additional guidance
PD 6688-1-7 Recommendations for the design of structures to BS EN 1991-1-7
PD 6693-1 Recommendations for the design of timber structures to Eurocode 5: Design of timber structures. General. Common rules and rules for buildings
PD 6695-1-10 Recommendations for the design of structures to BS EN 1993-1-10
PD 6695-1-9 Recommendations for the design of structures to BS EN 1993-1-9
PD 6697 Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2
PD 6698 Recommendations for the design of structures for earthquake resistance to BS EN 1998
PD 6702-1 Structural use of aluminium. Recommendations for the design of aluminium structures to BS EN 1999
PD 6705-3 Structural use of steel and aluminium. Recommendations for the execution of aluminium structures to BS EN 1090-3
prEN 15193-1 Energy performance of buildings, Module M9, Energy requirements for lighting Part 1: Specifications
ISO 20400 Sustainable procurement
ISO 21930 Sustainability in buildings and civil engineering works. Core rules for environmental product declarations of construction products and services.

5.4 Other publications


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BCA Technical Guidance Note 20: Ensuring adequate ventilation to naturally-ventilated dwellings with high levels of as-built air permeability
BES 6001 Responsible sourcing of construction products
BES 6002 Ethical labour sourcing
BRE BR209 Site layout planning for daylight and sunlight: a guide to good practice
BRE BR211 Radon: Guidance on protective measures for new buildings
BRE BR364 Solar shading of buildings
BRE DG498 Selecting lighting controls
BRE Digest 464 Part 2 VOC emissions from building products - Control, evaluation, and labelling schemes
BRE IP 4-14 People-friendly lighting controls
CIBSE AM11 Building Energy and Environmental Modelling
CIBSE LG09 Lighting Guide 9: Lighting for Communal Residential Buildings
CIBSE LG12 Lighting Guide 12: Emergency Lighting
CIBSE TM21 Minimising Pollution at Air Intakes
CIBSE TM52 Limits of Thermal Comfort: Avoiding Overheating
CIBSE TM59 Design methodology for the assessment of overheating risk in homes
CIBSE TM60 Good practice in the design of homes
Construction (Design and Management) Regulations
ETAG 023 Guideline for European Technical Approval of Prefabricated Building Units
GD021 BRE Guidance Document (Acoustics)
ILP GN01 Guidance Notes for the Reduction of Obtrusive Light
LPS 1175 Specification for testing and classifying the burglary resistance of building components, strongpoints and security enclosures
LPS 1225 Requirements for the LPCB Approval and Listing of Asset Marking Systems.
LPS 1270 Specification for testing and classifying the burglary resistance of security glazing and glazing films
LPS 1501 LPCB Fire Standard for Innovative Construction Methods
LPS 2081 Requirements and testing procedures for the LPCB approval and listing of building components, strongpoints, security enclosures and free-standing barriers offering resistance to intruders attempting to use stealth to gain entry.
NHBC 6.4/10 Technical Guidance: Recessed light fittings in ceilings to intermediate floors in houses
NHBC 8.1/17 Technical Guidance: Wiring to wall lights
PAS 24 (untitled refers to testing and assessing security performance of doorsets and windows)
PAS 1188-1 Flood protection products — Specification, Part 1: Building aperture products
PN 111 Generic Factory Production Control Requirements, BRE Global Construction Products Certification Ltd
UK Police Service - Secured by Design interpretive document for BS EN 1627, BS EN 1628, BS EN 1629, and BS EN 1630.

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UKSRG

Uniclass 2015
Unified classification for UK construction sectors
ANNEX A.1 Separating Walls/Floors and Internal Walls/Floors: Test Methods

A.1.1 Test Method: Two-dimensional tests
A.1.1.1 For two-dimensional systems/elements, testing shall be undertaken within an acoustic laboratory. The testing shall be undertaken in accordance with the BS EN ISO 10140 series of test Standards, within a laboratory that is UKAS accredited for the testing.

A.1.1.2 For wall elements, the test specimen shall be at least 2.3m in height with an overall area of 8-12m². The actual specimen dimensions shall generally be dictated by typical wall panel/module size and may consist of multiple panels/modules.

A.1.1.3 For floor elements, the test specimen shall be at least 2.3m along the shortest dimension with an overall area of 10-20m². The actual specimen dimensions shall generally be dictated by typical wall panel/module size and may consist of multiple panels/modules.

A.1.1.4 The sample tested shall be representative of the actual system and fabricated within the factory and subsequently installed within the laboratory. The test sample shall not be delivered as a kit form and assembled at the laboratory unless this is the same process as expected when the system/element goes to site or unless the test sample can replicate the completed system/element including fixing type and manner.

A.1.1.5 If required for installation purposes, the test sample may be supplied as sub-assemblies/modules/panels provided that the final sample replicates that of the actual system/element when installed on-site. Where this cannot be achieved, any differences between the sample and actual system must be clearly identified in the test report/evidence submission.

A.1.1.6 If the test specimen does not fully fill the test opening within the laboratory, then the remainder shall be infilled with a high-performance construction to avoid flanking sound transmission limiting the tested performance.

A.1.1.7 Care should be taken to reduce sound transmission at the interface between the test specimen and the acoustic laboratory/infill construction.

A.1.1.8 For the two-dimensional test, the perimeter junction need not replicate expected site installation though care should be taken to avoid adverse levels of sound transmission.
A.1.2 Test Method: Three-dimensional test
A.1.2.1 For three-dimensional testing the tests shall be conducted in accordance with BS EN ISO 140-4:1998 and BS EN ISO 140-7:1998 (floors only) by a testing organisation (or individual) that is either:
   a. UKAS accredited to undertake testing to BS EN ISO 140-4 & 7:1998 (Tests to these standards are accepted for the purposes of this BPS, since they are explicitly referenced in UK Building Regulations although these standards have been superseded by BS EN ISO 16283-1&-2. Tests to the relevant parts of BS EN ISO 16283 will be accepted as well.); or
   b. A member of the ANC pre-completion registration scheme;

A.1.2.2 The test specimen shall comprise three-dimensional module(s) as required to form at least a pair of rooms/spaces of at least 30m³ in each case. The test specimen may be located within the factory, at a bespoke testing facility or on-site.

A.1.2.3 Where the three-dimensional modules come together to form a separating wall then they shall be placed/connected horizontally (See Diagram A below).

A.1.2.4 Where the three-dimensional modules come together to form a separating floor then they shall be placed/connected vertically (See Diagram B below).

A.1.2.5 Where the three-dimensional modules come together to form a separating wall and separating floor then the two modules can be re-configured between testing or a third module included, typically at lower level but upper level is also acceptable (See Diagram C below).

1 Where three-dimensional modules do not form a complete enclosure then temporary works shall be used to close off missing elements/constructions. Care should be taken to ensure that any temporary work performs at least as well as the adjoining structures will in practice. Details of temporary works shall be provided within the test report/submission.
A.1.2.6 In the case of doorways or other openings, temporarily to allow access for testing or as intended for the final system, it is recommended that they be situated as far from those located in the adjoining system (wall or floor) as reasonably practicable to avoid undue transmission.

A.1.2.7 All doors and windows intended as part of the three-dimensional module shall be present and operable for the testing. If openings are part of the module but doors/windows are not, then the opening shall be over boarded (or similar temporary works) as necessary to prevent undue adverse sound transmission. Details of any works not part of the module required to facilitate the test shall be reported accordingly.

A.1.2.8 All wall, floor and ceiling finishes shall be present, but need not be decorated, as expected in the finished building. Where finishes do not form part of the three-
A.1.2.9 Carpets shall not be present for impact tests, where the system tested is acting as separating floor.

ANNEX A.2 Building Envelope APD Test Methods

A.2.1 Additional performance declarations (APD) (non-Building Regulations)
A.2.1.1 For APD, the most practical test for the system shall be used. Two-dimensional tests will generally be more straightforward, however three-dimensional testing may be more appropriate depending on the situation.

A.2.2 APD two-dimensional tests
A.2.2.1 Where constructional elements, such as infill wall, have already been tested in a two-dimensional test then the test results can be used for Additional Performance Declaration (APD).

A.2.2.2 Where the system has not already been tested then the testing described in Annex A.1 shall be followed.

A.2.2.3 Ideally, multiple elements shall be combined to form complete parts of the building envelope from the weather facing side to the internal face and all elements between. This approach will reduce the total number of tests undertaken and provide the most information. Care must be taken to test different variants representative of the different permutations of the building envelope. For example, in respect of an external wall, all different façade configurations shall be tested as appropriate for the system. Reliance must not be placed on pervious test data where different, even similar, components have been tested.

A.2.3 APD three-dimensional tests
A.2.3.1 For three-dimensional testing the airborne sound insulation tests shall be conducted in accordance with either BS EN ISO 16283-1 or BS EN ISO 16283-3:2016. The test specimen should be representative of a part of the completed building envelope to include doors and windows as required to represent the final product. For flat roof elements only, additionally, impact sound insulation performance shall be measured in accordance with BS EN ISO 16283-2.

A.2.3.2 The test specimen shall comprise three-dimensional module(s) as required to form an enclosed volume of at least 30m³ with an envelope area of at least
10m$^2$. The test specimen may be located within the factory, at a bespoke testing facility or on-site.

A.2.3.3 When located within the factory or bespoke testing facility, an open-ended test chamber shall be formed/abutted to the test specimen (horizontally for wall systems and vertically for roof systems) such that a pair of enclosed spaces/rooms are formed. It may be convenient to have the opening of the test chamber to be smaller than the representative area of external wall, to reduce the potential for leakage/indirect sound transmission. The test chamber need not be the same size/dimensions the enclosed space of the test specimen, but it shall have an enclosed volume of at least 30m$^3$ and preferably 50m$^3$. Specialist, acoustic design input would usually be required for developing the test chamber to ensure representative and repeatable test results can be achieved.

Diagrams of test arrangement for three-dimensional tests for APD of the building envelope

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2 Where three-dimensional modules do not form a complete enclosure then temporary works shall be used to close off missing elements. Care should be taken to ensure that any temporary work performs at least as well as the adjoining structures will in practice. Details of temporary works shall be provided within the test report/submission.
A.2.3.4 Where the test specimen is located outside, then the Global loudspeaker method described in BS EN ISO 16283-3:2016 shall be used. If this is not practical, then the Global road traffic noise method shall be used.

A.2.3.5 All doors and windows intended as part of the three-dimensional module shall be present and operable for the testing. If openings are part of the module but do not form part of the building envelope, then the opening shall be over boarded (or similar temporary works) as necessary to prevent undue adverse sound transmission. Details of any works not part of the module required to facilitate the test shall be reported accordingly.

A.2.3.6 All wall, floor and ceiling finishes shall be present, but need not be decorated, as expected in the finished building. Where finishes do not form part of the three-dimensional module then, if considered to affect acoustic performance, they should be introduced in a representative manner.
### AMENDMENTS ISSUED SINCE PUBLICATION

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**NOTE:**

The standard will be up-issued for every change formally incorporated into this amendment list. The up-issuing will work as follows. Technical or other changes which affect the requirements for testing, assessment, certification or approval of the product or service will result in a new issue. Minor or administrative changes (e.g. corrections of spelling and typographical errors, changes to address and copyright details, the addition of notes for clarification etc.) may be made as amendments. The issue number shall be given in decimal format with the integer part giving the issue number and the fractional part giving the number of amendments e.g. Issue 3.2 indicates that the document is at Issue 3 with 2 amendments.

**USERS OF BRE PRODUCT STANDARDS SHALL ENSURE THAT THEY POSSESS THE LATEST ISSUE AND ALL AMENDMENTS.**