PAS 1188-3:2014

BSI Standards Publication

Flood protection products – Specification

Part 3: Building skirt and wall sealant systems

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Foreword

Publishing information

This PAS was sponsored by the Environment Agency. Its development was facilitated by BSI Standards Limited and it was published under licence from The British Standards Institution. It came into effect on 31 July 2014.

Acknowledgement is given to the following organizations that were involved in the development of this PAS as members of the steering group:

- Association of British Certification Bodies (ABCB)
- AXA Insurance
- Department for Environment, Food & Rural Affairs (Defra)
- Environment Agency
- Flood Protection Association
- HR Wallingford
- Jacobs U.K. Limited
- JBA Consulting
- National Flood Forum
- Royal Institution of Chartered Surveyors (RICS)
- The University of Manchester

Acknowledgement is also given to the members of a wider review panel who were consulted in the development of this PAS.

This PAS is not to be regarded as a British Standard. It will be withdrawn upon publication of its content in, or as, a British Standard.

The PAS process enables a specification to be rapidly developed in order to fulfil an immediate need in industry. A PAS can be considered for further development as a British Standard, or constitute part of the UK input into the development of a European or International Standard.

Supersession

This part of PAS 1188 supersedes PAS 1188-3:2009, which is withdrawn.

Relationship with other publications

PAS 1188, *Flood protection products – Specification*, is issued in four parts:

- *Part 1: Building aperture products;*
- *Part 2: Temporary products;*
- *Part 3: Building skirt and wall sealant systems;*
- *Part 4: Demountable products.*

Guidance is available from *Six steps to flood resilience: Guidance for local authorities and professionals* [1] and *Delivering benefits through evidence: Temporary and demountable flood protection guide* [2]. Other publications on flood resistant and resilient construction are, *Preparing for floods: Interim guidance*

for improving the flood resistance of domestic and small business properties [3] and, *Improving the flood performance of new buildings: Flood resilient construction* [4] and other recent relevant publications (see publications [5] to [8]).

Parallel guidance is available for property owners in, *Six steps to property level flood resilience: Guidance for property owners* [9] and, *SMARTeST Work package 2 – Report D2.3: Guidance for code of practice* [10].

Guidance is also available from the National Flood Forum (www.floodforum.org.uk) and Flood Protection Association (www.thefpa.org.uk) websites.

Attention is drawn to the need to consider the prevention of the ingress of flood water into buildings through building fabric (i.e. walls and floors), horizontal pipes, waste water fittings and floor gullies. Anti-flood devices for buildings are covered in BS EN 13564-1.

Information about this document

This is a full revision of PAS 1188-3:2009, and introduces the following principal changes:

- normative and informative references have been updated;
- subclause **4.2**, designation, has been added;
- subclause **4.8**, marking, has been amended and updated with list items c), d), e) and f) moved to Annex C;
- subclause **B.4.2**, has been amended to allow testing up to 1 200 mm above test facility floor level for the static head leakage test;
- Annex C has been updated to include a deployment guide and user manual;
- some editorial amendments have been undertaken.

Product certification and testing. Users of this PAS are advised to consider the desirability of third-party certification of product conformity with this PAS. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

Assessed capability. Users of this PAS are advised to consider the desirability of quality system assessment and registration against the appropriate standard in the EN ISO 9000 series by an accredited third-party certification body.

Test laboratory accreditation. Users of this PAS are advised to consider the desirability of selecting test laboratories that are accredited to EN ISO/IEC 17065 by a national or international accreditation body.

Use of this document

It has been assumed in the preparation of this PAS that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this PAS are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Requirements in this standard are drafted in accordance with *Rules for the structure and drafting of UK standards*, subclause **J.1.1**, which states, "Requirements should be expressed using wording such as: 'When tested as described in Annex A, the product shall ...'". This means that only those products that are capable of passing the specified test will be deemed to conform to this standard.

Contractual and legal considerations

This publication does not purport to include all necessary considerations and specifications for the production of the relevant products. Users are responsible for their own compliance with all applicable laws, compliance with the industry practice and the correct application of this publication.

Compliance with a PAS cannot confer immunity from legal obligations.

Particular attention is drawn to the following specific regulations and associated documents:

- Statutory Rules of Northern Ireland 1991, Technical Booklet L [11];
- Statutory Rules of Northern Ireland 1994, Technical Booklet E [12];
- Statutory Rules of Northern Ireland 1994, Technical Booklet K [13];
- Statutory Rules of Northern Ireland 1994, Technical Booklet N [14];
- Statutory Rules of Northern Ireland 2000, Technical Booklet R [15];
- The Building Regulations (England and Wales) 1991, Approved Document B [16];
- The Building Regulations (England and Wales) 1991, Approved Document F [17];
- The Building Regulations (England and Wales) 1991, Approved Document H [18];
- The Building Regulations (England and Wales) 1991, Approved Document J [19];
- The Building Regulations (England and Wales) 1991, Approved Document M [20];
- The Building Regulations (England and Wales) 2006, Approved Document C [21];
- The Building Standards (Scotland) Regulations 1990, Technical Standard D [22];
- The Building Standards (Scotland) Regulations 1990, Technical Standard E [23];
- The Building Standards (Scotland) Regulations 1990, Technical Standard F [24];
- The Building Standards (Scotland) Regulations 1990, Technical Standard K [25];
- The Building Standards (Scotland) Regulations 1990, Technical Standard M [26];
- The Building Standards (Scotland) Regulations 1990, Technical Standard Q [27];
- The Disability Discrimination Act 1995 [28];
- The Fire Precautions Act 1971 [29];
- The Gas Safety (Installation and Use) Regulations 1998 [30].

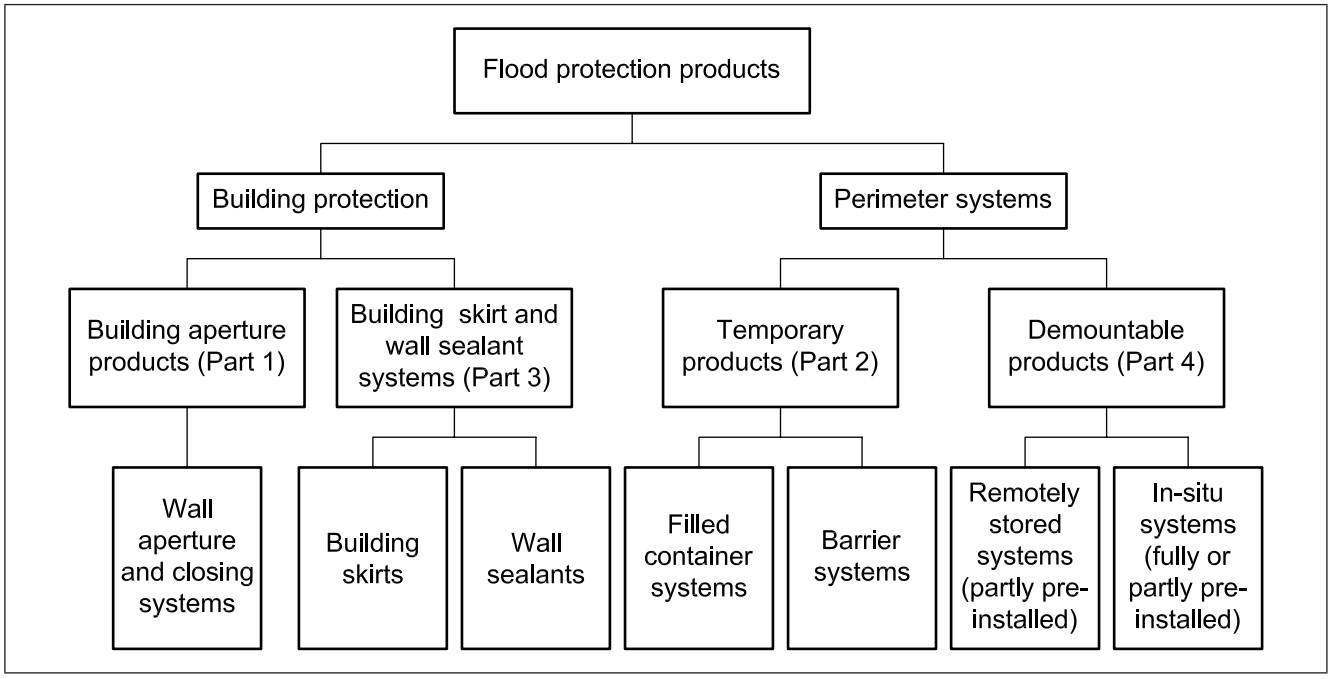
NOTE 1 For rooms containing gas appliances attention is drawn to the Gas Safety (Installation and Use) Regulations 1998 [30] and manufacturers' instructions regarding the free circulation of air both in and out of the building. In such instances special care may be taken with the use of air ventilation bricks.

NOTE 2 It is important that air vent flood protection covers are removed as soon as floodwaters have receded so that sub-floor ventilation is maintained.

0 Introduction

The general classification of flood protection products and relationship between groups of products with each other is shown in Figure 1. Figure 1 also indicates which parts of the PAS 1188 series is relevant for each classification.

Figure 1 **Flood protection products: general classification**



NOTE 1 Attention is also drawn to the need to ensure a safe evacuation of persons in the event of an emergency and to access and egress for persons with impaired movement. This is particularly important for basements where there is a risk that flooding could occur rapidly and to a depth sufficient to be a risk to life. In basement situations consideration may be given to other measures such as water level alarm systems and automatic pumping systems.

NOTE 2 Other risks also need to be considered including gas safety, particularly if bottled gas is being used for temporary heating and cooking, and adequate ventilation of exhaust fumes from equipment such as generators and pumps. Boilers with low level vents are not to be used during flooding if the vent has been covered.

NOTE 3 Maintaining the structural integrity of the building to which the product may be applied to should also be considered in the design of the product designated maximum water depth and its deployment to the building. Attention is drawn to the Construction Design and Management Regulations 2007 *[31] and parts relevant to the roles and responsibilities of designers.*

1 Scope

This PAS specifies requirements for the design, testing, factory production control, installation and user documentation, and marking for different types and configurations of building skirt system and wall sealant system intended for the temporary sealing of the above or below ground external faces of buildings and properties, in the event of flood water rising up to a level between 600 mm and 1 200 mm above ground level.

This PAS is intended for use in the UK or locations with similar exposures, i.e. where there is a temperate climate.

This PAS specifies the method of testing and any allowable leakage rate for above or below ground components.

The range of building sizes covered is governed by the system constraints, but theoretically the system could be installed to provide protection to any size of building.

NOTE 1 The hydrostatic pressures exerted by floodwater can cause sudden or long-term structural damage and undermine the foundations of a building, unless the building is specifically designed to withstand such stresses. The actual water level that can be safely retained by the external walls depends upon the construction, age and condition of the walls. It is advisable that a suitably qualified building surveyor, architect or structural engineer inspects the external walls, before any building skirt or wall sealant system is installed.

NOTE 2 Flood protection products adjacent to or around buildings are not normally intended to prevent water more than 600 mm to 1 200 mm above the level of the ground surrounding the property from entering the building.

NOTE 3 The PAS leakage test given in Annex B represents conditions that can be experienced during a flood. This includes testing the flood protection product under static water levels, random waves up to 0.1 m high and currents up to 1.0 m/s.

NOTE 4 This PAS does not cover testing with contaminated or saline water; however, product manufacturers are required to provide information about the performance of their products in these conditions (see Annex C).

NOTE 5 Flood protection product that conform to this PAS might not be suitable for all situations. Further guidance is set out in Delivering benefits through evidence: Temporary and demountable flood protection guide *[2],* Six steps to property level flood resilience: Guidance for property owners *[9] and guidance can also be obtained from the Flood Protection Association or from the National Flood Forum or Scottish Flood Forum or other qualified professional advisers.*

NOTE 6 Extreme loading conditions such as those resulting from turbulent water or static water head (above designated maximum water depth) or debris impact are not covered by testing in this PAS. If required in these locations, the flood protection product and system are specifically designed and/or tested to withstand such stresses.

NOTE 7 The installation of flood protection products described in this PAS are, with the exception of some products such as sealants which provide passive protection, not intended to provide permanent flood protection. In general these flood protection products are installed or activated in the event of an imminent flood and removed or deactivated as soon as danger from flooding is over.

This PAS does not cover groundwater protection systems.

This PAS is not applicable to flood protection products designed solely for installation across building apertures. These are covered by PAS 1188-1.

This PAS is not applicable to temporary or demountable flood protection products which are designed to be installed away from and not attached to buildings, including flood protection products intended for installation across driveway entrances and gateways at property boundaries. These are covered by PAS 1188-2 and PAS 1188-4.

This PAS does not cover test flood resilience products designed to allow flooding but covers those that enable more rapid recovery from flooding.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 124, *Gully tops and manhole tops for vehicular and pedestrian areas – Design requirements, type testing, marking, quality control*

3 Terms and definitions

For the purposes of this PAS the following terms and definitions apply.

NOTE For information on building skirt system components and wall sealant systems see Annex A.

3.1 building aperture
opening in the structure of a building which allows access and egress and/or ventilation to the building

3.2 building skirt system
combination of materials and components curtaining a building used to limit or restrict the flow of water entering the building at or above ground level

3.3 designated maximum water depth (DMWD)
depth above the base on or above which the flood protection product is installed and for which the flood protection product is intended to physically retain water

NOTE 1 The DMWD is the water depth at which the flood protection is tested (see Annex B).

NOTE 2 For building skirts, the DMWD is restricted to a minimum of 600 mm and a maximum of 1 200 mm for testing purposes.

3.4 factory production control
permanent, internal control of production exercised either by the manufacturer or by their representative on the responsibility of the manufacturer

NOTE 1 Factory production control comprises operational techniques and all measures necessary to regulate and maintain the conformity of the product to the requirements of this specification.

NOTE 2 Requirements for factory production control are specified in Annex D.

3.5 flood protection product
material or equipment used to limit or restrict the flow of water, which when installed, forms part or all of the flood protection system

3.6 flood protection system
system that aims to reduce the risks of flooding to people and property

NOTE 1 A flood protection system includes all the constituent parts of the flood protection product and the operational environment, such as barriers, joints, foundations, end connections, interaction with the subsoil, and all operational activities required during installation, including flood risk plans.

NOTE 2 Flooding can be from any source.

NOTE 3 Groundwater flooding can occur for long periods possibly extending to weeks or months.

3.7 leakage
water passing through the building skirt system, wall sealant system or any associated seal

3.8 overtopping
water passing over the flood protection product, driven by wave action when the static water level is below the top of the flood protection product

*NOTE Overtopping contributes to the leakage in the wave leakage test (see **B.6.3**).*

3.9 wall sealant system
material which is applied to above or below ground walls to limit or restrict the flow of water entering the building at, above or below ground level

4 Requirements

4.1 Design

4.1.1 General

4.1.1.1 Building skirt systems shall incorporate a membrane capable of temporary deployment prior to imminent flooding and concealed storage when not deployed. The membrane shall be reusable.

4.1.1.2 Where constructed or deployed in more than one section, building skirt systems shall include a water resistant seal between sections.

4.1.1.3 Building skirt systems shall be capable of accommodating internal and external corners without loss of integrity.

4.1.2 Frames

Where provided, frames for skirts shall be designed to prevent the ingress of matter likely to impede the proper functioning of the system when deployed or during storage.

4.1.3 Supports

4.1.3.1 Building skirt systems shall be provided with a means to support the skirt at the DMWD.

4.1.3.2 Where deployed across glazed panels and building apertures other than air-bricks, building skirt systems that rely on the building fabric for their support shall be provided with temporary support panels and/or framing of sufficient strength to accommodate the applied loading.

4.1.4 Accommodation of services

Building skirt systems shall be capable of accommodating surface mounted or projecting building services, such as drain pipes and meter boxes.

4.1.5 Seals

4.1.5.1 Where pneumatic seals are incorporated, there shall be a means of ensuring that the initial air pressure on deployment does not exceed the manufacturer's specified level.

4.1.5.2 A seal shall be provided between all permanently fixed components of the building skirt system and the fabric of the building.

4.1.6 Skirt storage

4.1.6.1 Storage for skirts shall be designed to prevent the ingress of water and matter likely to impede the proper functioning of the system and to aid easy cleaning and demounting of the system for future use.

NOTE Manufacturers should provide advice on rolling, packing or storage as improper handling could reduce the life or performance of the skirt.

4.1.6.2 Where installed in footways, pedestrian areas or car parking areas, covers fitted to skirt storage units shall meet the loading requirements of BS EN 124 Class B 125. Where installed across vehicle access, skirt storage units shall be fitted with a frame and cover conforming to BS EN 124 Class D 400.

4.2 Designation

4.2.1 Building skirt and wall sealant systems shall be designated as one of the following:

a) "building skirt system"; or

b) "wall sealant system".

4.2.2 Single use products shall be designated as "non-reusable".

4.3 Designated maximum water depth (DMWD)

The DMWD for building skirt and wall sealant systems shall be a minimum of 600 mm and a maximum of 1 200 mm.

4.4 Installation and removal of a reusable flood protection product

Non-permanent components of building skirt systems shall be capable of being installed and removed in accordance with the manufacturer's guidance.

4.5 Leakage

When tested in accordance with Annex B, the recorded rate of leakage for any of the tests on each designated flood protection product shall not exceed 1 L/h/m base length of the flood protection product.

4.6 Deployment guide and user manual

A deployment guide and user manual shall be provided with every product and shall, as a minimum, contain the information listed in Annex C.

4.7 Factory production control

A factory production control system shall be operated in accordance with Annex D.

4.8 Marking

Building skirt and wall sealant systems shall be permanently marked with the following information:

a) the number and date of this PAS, i.e. PAS 1188-3:2014 [1)];

b) the name or trademark of the manufacturer or their appointed agent, where applicable;

c) symbols or instructions relating to the proper installation;

NOTE These may include for example, arrows depicting right way up.

d) for components of the flood protection product, the date of manufacturing and unique batch number of the component;

NOTE Marking on sealing components or products should be placed on the container.

[1)] Marking PAS 1188-3:2014 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

e) where authorized and applicable, the product conformity mark of a third party certification body; and

f) website reference for a downloadable copy of the deployment guide and user manual and address from which a hard copy can be obtained.

Annex A (informative) Building skirt and wall sealant system components

NOTE *See also* Six steps to flood resilience: Guidance for local authorities and professionals *[1].*

A.1 General – skirt systems

Building skirt systems are designed for the temporary sealing of the above ground external faces of buildings and properties. Systems generally comprise fabricated membrane sections, e.g. plastic or butyl rubber sheets that are flexible and connected to form a continuous, watertight seal, deployed from permanent skirt storage units fixed at the base of the building. Often, where the skirt storage unit is below ground, substantial ground work can be required.

A.2 Skirts

Individual sections of the skirt are connected with each other by various methods, such as zip fasteners or couplings, to form a continuous, waterproof membrane.

A.3 Seals

Building skirt systems are designed to be watertight and effective seals and are an integral part of the system. The systems require seals between adjacent skirt sections, between individual skirt sections and the skirt storage unit or ground, and between guide frames, skirt storage units and the building itself. Adjacent skirt membrane sections are normally sealed with waterproof zip fastener arrangements, pneumatic seals or waterproof sealant. Individual skirt sections are sealed to the skirt storage unit or ground by various means, e.g. flexible sealant and/or mechanical methods.

A.4 Ancillary components

Some building skirt systems include ancillary components as an integral part of the system, such as sump pumps between the skirt and building, non-return valves to drainage installations, sealant around service ducts, by-passes to rainwater down pipes and floor slab pressure relief systems. These ancillary components are not covered by this PAS.

A.5 Deployment

In advance of a flood, the flexible skirt sections are raised, e.g. lifted or unrolled, from the skirt storage unit, and either attached to the building with fasteners or fixed between guides which are permanently attached to the building. Some systems rely on rising floodwater to lift and unfold the membrane sections. The skirt membrane is replaced in the storage units after the flood has receded.

A.6 Wall sealant systems

Wall sealant systems are permanently applied non-reusable systems.

NOTE *Re-application might be required after a period specified by the manufacturer.*

Annex B (normative) Method of test for leakage

B.1 General

B.1.1 The deployment guide and user manual (see Annex C) shall be assessed for usability prior to testing. Where the content of the deployment guide and/or user manual is unclear or the instructions cannot be physically implemented, the deployment guide and/or user manual shall be updated for clarity.

NOTE The deployment guide and user manual should be checked to ensure that they are logical and that there are no ambiguities or contradictions in the text for installing, operating, removing, cleaning, drying and storing the test specimen.

B.1.2 As part of the test, the test specimen shall be handled in accordance with the deployment guide and user manual for the following:

a) before the leakage test:
   1) preparation;
   2) deployment.

b) after the leakage test:
   1) removal;
   2) cleaning and drying.

*NOTE 1 Leakage is defined in this specification (see **3.7**).*

NOTE 2 During testing there is a risk of components of the test specimen bowing or failing due to high water pressure. Particular attention is drawn to the potential risk to persons standing behind the test specimen. The manufacturer may recommend that panels are deployed to provide added protection. Testing should be stopped immediately if there is any uncertainty regarding the safety of persons.

B.2 Principle

A test specimen of the building skirt or wall sealant system is installed in a test facility simulating static water, waves and currents, and the leakage rate is measured. The tests are carried out with non-saline, non-contaminated water.

B.3 Test conditions

Carry out all tests at a water temperature of (15 ±14) °C.

B.4 Apparatus

B.4.1 *Test facility*, capable of accommodating the test specimen (see **B.5**) and creating the DMWD.

B.4.2 *Test facility*, to create the following static water depths:

a) up to 1 200 mm above laboratory floor level for the static head leakage test (see **B.6.2**);

b) up to 300 mm below the DMWD for the wave leakage test (see **B.6.3**);

c) up to 100 mm below the DMWD for the current leakage test (see **B.6.4**).

NOTE Products may be tested up to any water depth within the values stated above in mm.

B.4.3 *Equipment capable of generating currents of 1.0 m/s parallel to, and random waves of height (100 ±10) mm and mean wave period of 1.03 s perpendicular to, the face of the building aperture product.*

B.4.4 *Equipment designed to measure static water levels, water surface elevations (from which wave height is calculated) and current velocities*, to an accuracy of 1 mm, 1 mm and 0.01 m/s respectively.

B.4.5 *Equipment to measure leakage rate over the time periods*, specified in **B.6**, to a tolerance of ±5% of the maximum allowable rate of leakage (see **4.5**).

B.5 Test specimen

B.5.1 For building skirt systems the test specimen shall be a length of building skirt system incorporating standard sections, an internal corner and an external corner, and at least one intermediate joint.

B.5.2 For wall sealant systems the test specimen shall be a 3 m length of wall to which the wall sealant is to be applied in accordance with the manufacturer's instructions. The manufacturer shall state the types of wall and wall thicknesses to which the wall sealant product is to be applied and test specimens shall be prepared for each wall type and wall thickness.

B.6 Test procedure

B.6.1 General

B.6.1.1 Carry out the tests set out in **B.6.1.2**, **B.6.1.3** and **B.6.1.4** on a test specimen in order to obtain the leakage rate. Reuse the same test specimen each time.

B.6.1.2 Install test specimen and carry out:

- a static head leakage test in accordance with **B.6.2.1** to **B.6.2.5;**
- a wave leakage test in accordance with **B.6.3**; and
- a current leakage test in accordance with **B.6.4**.

B.6.1.3 Remove the test specimen, reinstall the test specimen and then carry out:

- a static head leakage test in accordance with **B.6.2.1** to **B.6.2.5**;
- a wave leakage test in accordance with **B.6.3**; and
- a current leakage test in accordance with **B.6.4**.

B.6.1.4 Remove the test specimen, reinstall the test specimen and then carry out a static head leakage test in accordance with **B.6.2.6**.

NOTE 1 The deployment guide and user manual provided by the manufacturer should be followed regarding deployment and demounting of the building skirt and sealant system. Particular attention should be paid to guidance on whether the building skirt should be allowed to dry out before being redeployed.

NOTE 2 For the repeat tests it is not necessary to remove and refit any building skirt and sealant system components designed to remain permanently fixed.

B.6.2 Static head leakage test

B.6.2.1 Install the test specimen in the test facility in accordance with the deployment guide and user manual. Deploy the building skirt to the level specified in, and in accordance with, the deployment guide and user manual.

B.6.2.2 For each of the static head leakage tests in **B.6.2.3** to **B.6.2.6**, measure any horizontal movement of the test specimen by noting the position of the product before and after the tests. Take photographs of the test specimen before and after the test and record any test specimen deformation.

B.6.2.3 Fill the test facility to one-third of the DMWD to a tolerance of ±5 mm. Measure the total leakage over a period of 1 h and record the result. Maintain the depth of water to within ±10 mm for the duration of the test.

B.6.2.4 Following **B.6.2.3**, fill the test facility to two-thirds of the DMWD to a tolerance of ±5 mm. Measure the total leakage over a period of 1 h and record the result. Maintain the depth of water to within ±10 mm for the duration of the test.

B.6.2.5 Following **B.6.2.4**, fill the test facility to ±5 mm of the DMWD. Measure the total leakages over the first and last hour of an 18 h period and record both values. Maintain the depth of water to within ±10 mm for the duration of the test.

B.6.2.6 Carry out the tests described in **B.6.2.3** and **B.6.2.4**, then fill the test facility to ±5 mm of the DMWD. Measure the total leakages over the first and last hour of a 48 h period and record both values. Maintain the depth of water to within ±10 mm for the duration of the test.

NOTE The intermediate depth tests at one-third and two-thirds of the DMWD are to be carried out at appropriate points in the filling of the basin, rather than when the basin is being drained.

B.6.3 Wave leakage test

B.6.3.1 Install the test specimen in the test facility in accordance with the deployment guide and user manual. Deploy the building skirt to the level specified in, and in accordance with, the user documentation.

B.6.3.2 Fill the test facility to ±5 mm of the wave testing depth in accordance with Table B.1 and apply random waves with a JONSWAP spectrum with significant wave height of (100 ±10) mm and mean wave period of 1.03 s, perpendicular to the face of the building apertures.

NOTE For further information on the JONSWAP spectrum see BS 6349-1.

B.6.3.3 Prevent water from overtopping the building skirt, e.g. by sealing a temporary barrier to the top edge of the skirt. Measure the total leakage over a period of 0.5 h and record the result.

B.6.3.4 Ensure that the static water depth in the basin before and after the wave test is maintained to within ±10 mm. Take photographs of the test specimen before and after the test and record any test specimen deformation.

B.6.4 Current leakage test

B.6.4.1 Install the test specimen in the test facility in accordance with the deployment guide and user manual. Deploy the building skirt to the level specified in, and in accordance with, the user documentation.

B.6.4.2 Fill the test facility to ±5 mm of the wave testing depth in accordance with Table B.1 and apply a flow of water parallel to the face of the building skirt to achieve a mean velocity of (1.0 ±0.1) m/s on the vertical centreline of the building skirt, at mid-depth above the laboratory floor level, 150 mm from the external face of the structure. Measure the total leakage over a period of 1 h and record the result. Ensure that the static water depth in the basin before and after the wave test is maintained to within ±10 mm. Take photographs of the test specimen before and after the test and record any test specimen deformation.

Table B.1 **Wave and current testing depths**
Dimensions in mm

DMWD	Wave testing depth	Current testing depth
> 900	DMWD – 300	DMWD – 100
801 to 900	600	800
701 to 800	550	700
601 to 700	500	600
600	450	500

Annex C (normative)

Deployment guide and user manual

C.1 A deployment guide shall be printed on water resistant paper and, as a minimum, include the following:

a) a statement that the product is designed for the temporary mitigation of flood risk and should be seen as part of a suite of measures to reduce the risk of flood water;

b) procedures for ensuring safe and effective installation of, operation and removal of the flood protection product including health and safety advice and full installation instructions for the whole system (including speed of deployment, the mass of individual components, specialist lifting requirements if applicable and the maximum inflation pressure where pneumatic seals are used), operation, access/egress (in all stages of the flood) and removal procedures;

NOTE 1 A manufacturer may provide a website address to an online demonstration video or provide a copy of the video.

NOTE 2 The instructions and guidance should be clear and understandable. This could be achieved with the use of pictorial diagrams and symbols.

c) advice on installation by a suitably qualified installer;

d) manufacturer's specified skirt deployment or wall sealant application height;

e) instructions on use of temporary panels and/or frames across glazed building apertures;

f) advice on the suitability of products for use by different user groups;

NOTE For example, some products might not be suitable for use by older people; products only suitable for installation by adults and any hazards to children stated.

g) the time in minutes required to undertake full deployment of the flood protection product;

NOTE For multiple units forming a contiguous length of defence, this is the time in minutes to deploy each unit.

h) advice on cleaning, drying and storage procedures (including rolling and packing procedures);

i) whether the product is designated to be "reusable" or "non-reusable" (see **4.2**);

j) possible failure mechanisms and advice on safety precautions to be taken whilst using the flood protection product;

k) product supplier or manufacturer's website address and contact details/ helpline number (if applicable);

l) a statement advising that further important information relevant to use of the product is provided in the user manual.

C.2 A user manual shall be provided with the flood protection product and, as a minimum, include the following:

a) a statement on the need for a flood protection risk assessment to be carried out by a suitably qualified building surveyor, architect, structural engineer, civil engineer or those deemed competent prior to installation of the product to ensure the relevant routes for water entry have been identified and that the structural integrity of the building is not compromised by the flood protection product;

NOTE 1 The manual should include website addresses of the Environment Agency and other sources of advice, including the National Flood Forum and Scottish Flood Forum.

NOTE 2 Appropriate professional qualifications might include, for example, being a corporate member of the Chartered Institution of Water and Environmental Management, the Institution of Civil Engineers, Royal Institution of Chartered Surveyors, or similar professional body.

b) a statement of the flood protection product's use including appropriate installation locations, and the types of flooding to which the flood protection product is applicable and the need for advance flood warning (see **3.6)**;

NOTE The suitability of the product to protect against raised flood levels over long periods should be considered by the manufacturer and appropriate guidance given.

c) the relevant designation of the flood protection product;

NOTE For example, Building skirt system product – Sealant system product.

d) the designated maximum water depth (DMWD) in metres to which the flood protection product has been tested;

e) the leakage rate in L/h/m base length of the flood protection product;

f) a list of finishes suitable for the flood protection product;

NOTE For example, brick, timber, concrete, gloss paint over timber, render and other types of finishes.

g) maintenance procedures and the maximum number of uses and interval between services, whichever is reached first;

h) long-term durability and design life of the flood protection product and components;

NOTE For example, the period in years after which the flood protection product should be replaced, including advice on storage and inspection prior to reuse of components, such as gaskets.

i) if relevant to the product the designation of "manual" or "automatic", where manual refers to the need for human intervention for its operation, and automatic refers to non-passive self-closing systems designed to operate without human intervention;

NOTE For example, the opening and closing of an automatic product can be triggered by water level or flow.

j) advice on the need for, frequency and procedure for visual testing of flood protection products;

k) advice on the suitability of a flood protection product for different types of buildings;

NOTE For example, domestic properties, commercial premises, schools, other public buildings and other categories of buildings.

l) advice on disposal of life expired, contaminated or failed flood protection products and components;

m) appropriateness for locations with contaminated or saline water, indicating in particular, if at risk from pollutants such as hydrocarbons and solvents;

n) details on previous field trials and whether or not the flood protection product has been independently verified;

o) quick reference troubleshooting guide;

p) a website address to a downloadable copy of the deployment guide and user manual and a postal address from which a hard copy can be obtained.

NOTE Offer, if relevant, an installation demonstration of the protection product on site, at the discretion of the manufacturer.

C.3 The following statement shall be presented clearly on accompanying literature:

> *This product has been tested against the standard set of tests as defined in PAS 1188-3:2014 which represent typical conditions that might be experienced during a flood in the UK. This includes testing the product for leakage under static water levels [state the DMWD] above ground level, waves up to 0.1 m high, and parallel currents up to 1.0 m/s. The testing undertaken under this PAS excludes all other components of the flood protection system.*
>
> *Conformance of the product to PAS 1188-3:2014 does not mean it is suitable for all buildings or locations. If the user is in any uncertainty as to the suitability of a product they should seek professional guidance.*

NOTE The instructions and guidance should be clear and understandable. This could be achieved by the use of pictorial diagrams and symbols.

Annex D (normative) Requirements for factory production control

D.1 Organization

D.1.1 General

Factory production control shall be operated in accordance with a documented system given in a quality manual.

D.1.2 Responsibility and authority

The responsibility, authority and the interrelationships between all personnel who manage, perform, or verify work affecting quality shall be defined.

NOTE This applies particularly to personnel who need the organizational freedom and authority to:

a) initiate action to prevent the occurrence of product nonconformity;

b) identify and record any product quality problems.

D.1.3 Management representative for factory production control

At every place of production, a representative, with the detailed knowledge of the flood protection products being manufactured and production experience, shall be appointed by the manufacturer and given responsibility for managing and supervising factory production control procedures and for ensuring that the requirements of this annex are implemented and maintained.

D.2 Quality control

The manufacturer's documentation and procedures shall define the production and process control used during the manufacturing of the product. The manufacturer shall provide the following details in a quality manual:

a) the quality aims and the organizational structure, responsibilities and authority of the management with regard to product conformity;

b) the procedures for specifying and verifying the raw materials and other constituent materials;

c) the manufacturer's production control and other techniques, processes and systematic actions that shall be used;

d) the inspections and tests to be carried out before, during and after manufacture, together with their frequency (see **D.3**) and possible retest procedures (see **D.4**);

e) the procedures for handling, storage, packaging, marking and labelling the product;

f) the procedures for all personnel to receive training in the activities affecting quality (see **D.7**).

D.3 Inspection and training

D.3.1 General

All necessary facilities, equipment and personnel shall be available to carry out the inspections and tests. The manufacturer, or the manufacturer's representative, may employ, under contract, a subcontractor who has the facilities, equipment and personnel to carry out the inspection and tests on its behalf. The manufacturer shall be responsible for control, calibration, and maintenance of testing, measuring, and inspection equipment, whether owned by or on loan to the manufacturer or a subcontractor.

Inspection and testing shall be performed by competent personnel qualified for such tasks on the basis of documented, appropriate education, training and/or experience.

Equipment shall be used in a manner which ensures that any measurement uncertainty is not greater than the required measurement capability.

D.3.2 Production test equipment

Tests to demonstrate conformity of the finished product to the relevant product standard shall be performed using equipment in accordance with the test methods referred to in the relevant product standard.

The production test equipment shall be calibrated and/or checked against equipment traceable to relevant internationally or nationally recognized reference test standards. Where no such reference exists, the basis used for internal checks and calibration shall be documented. Test equipment shall be checked and/or calibrated in accordance with the manufacturer's documented procedures. The calibration records shall be maintained for a period of 10 years.

The manufacturer shall ensure that handling, preservation, and storage of test equipment is such that its accuracy and fitness for use is maintained.

When production is intermittent, the manufacturer shall ensure that test equipment which could be affected by the interruption is suitably checked and/or calibrated before use.

The calibration of all test equipment shall be repeated if any repair or failure which could upset the calibration of the test equipment occurs.

D.3.3 Inspection and testing of raw materials and other constituent materials

The manufacturer shall check that raw materials and other constituent materials conform to the requirements specified. In determining the checks required, consideration shall be given to the control exercised by the supplier and the documented evidence of conformity.

The manufacturer shall ensure that incoming raw materials and other constituent materials are used or processed only after they have been verified as conforming to the specified requirements. Where incoming material is released for urgent production purposes prior to verification it shall be identified and recorded in order to permit immediate recall in the event of nonconformity.

D.3.4 Inspection and testing during manufacture

In order to manufacture products that conform to the product standard, the manufacturer shall control their process and perform in-process inspection and tests as described in the quality manual.

D.3.5 Finished product inspection and testing

The manufacturer shall regularly inspect and, where appropriate, test the finished products.

D.3.6 Inspection and test status

The inspection and test status of the products shall be identified by means which indicate the conformity or nonconformity of the product with regard to inspections and tests performed (e.g. passed, failed or due to be reclassified).

D.3.7 Inspection and test records

The results of the finished products' inspection and testing shall be recorded. The record shall include the product identification, the date and time of manufacture, and for each product the test methods, the test results, the required limits, the inspection result and the identification of the person carrying out the inspection.

Where products do not meet the requirements of the product standard, records shall include the remedial measures taken.

The manufacturer's log shall be kept for at least 10 years.

D.4 Actions in the case of nonconforming products

Where a nonconforming product is identified, the manufacturer shall immediately take the steps necessary to identify the cause and rectify the deficiency. Products that do not conform to the requirements of the product standard shall be marked accordingly. When the deficiency has been identified and rectified, the test or inspection in question shall be repeated without delay in accordance with the quality manual, to provide evidence that the defects have been overcome. In the event that products are dispatched before the result of the inspection is available, prompt notification shall be given to the customer to prevent any consequential damage and a record shall be maintained of such notification.

D.5 Handling, storage, packaging, and marking of products

In accordance with the quality manual (see **D.2**) the manufacturer shall:

a) provide methods of handling that prevent damage or deterioration;

b) provide suitable storage areas or stock rooms to prevent damage to or deterioration of the product;

c) control the packaging, storage and the marking processes.

D.6 Traceability of products

Delivered individual products or product batches shall be identifiable and traceable with regard to their production origin.

D.7 Training of personnel

The manufacturer shall establish and maintain procedures for the identification of training needs and shall provide for the training of all personnel in activities affecting quality.

Personnel performing specific assigned tasks shall be competent and qualified on the basis of appropriate education, training and/or experience, as required.

Records of training shall be kept up-to-date.

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