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Agrément Certificate
16/5329
Product Sheet 1

TERRAIN PLEURA DRAINAGE VENTILATION SYSTEMS

TERRAIN P.A.P.A. (POSITIVE AIR PRESSURE ATTENUATOR) DEVICE

This Agrément Certificate Product Sheet⁽¹⁾ relates to the Terrain P.A.P.A.⁽²⁾ (Positive Air Pressure Attenuator) Device, comprising an inflatable isoprene reservoir housed within a PVC-U casing, for use in above-ground drainage systems serving multi-storey buildings, to help reduce the risks associated with positive air pressure transients. The Certificate covers use of the devices in buildings up to 30 storeys.

(1) Hereinafter referred to as 'Certificate'.

(2) P.A.P.A. is a registered trademark.

CERTIFICATION INCLUDES:

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

KEY FACTORS ASSESSED

Drainage system design — the device capacity, opening time and time-to-fill have been established for use in design (see section 6).

Airtightness — the device is airtight and will prevent the release of odours (see section 7).

Effect on water seals — the device can help in maintaining water seals in trapped appliances (see section 8).

Durability — the device will have a life equivalent to that of the drainage system in which it is installed (see section 10).



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

On behalf of the British Board of Agrément

Simon Wroe
Head of Approvals — Engineering

Claire Curtis-Thomas
Chief Executive

Date of First issue: 11 July 2016

The BBA is a UKAS accredited certification body — Number 1113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Regulations

In the opinion of the BBA, the Terrain P.A.P.A. (Positive Air Pressure Attenuator) Device, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



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

Requirement:	H1(1)	Foul water drainage
Comment:		The device can contribute to maintaining the water seals in traps and prevent foul air from entering the building. See sections 7 and 8 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The device is acceptable. See section 10 and the <i>Installation</i> part of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Durability, workmanship and fitness of materials
Comment:		The device satisfies the requirements of this Regulation. See section 10 and the <i>Installation</i> part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	3.7	Wastewater drainage
Comment:		The device can meet the relevant requirements of this Standard, with reference to clause 3.7.8 ⁽¹⁾⁽²⁾ . See sections 7 and 8 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The device can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6 and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
Regulation:	12	Building standards applicable to conversions
Comment:		All comments given for this device under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ . (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).



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

Regulation:	23(a)(i)(iii)(b)(i)	Fitness of materials and workmanship
Comment:		The units are acceptable. See section 10 and the <i>Installation</i> part of this Certificate.
Regulation:	79	Drainage systems
Comment:		The units can contribute to maintaining the water seals in traps. See sections 7 and 8 of this Certificate.

Construction (Design and Management) Regulations 2015

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, Principal Designer/CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: 1 *Description* (1.3) and 3 *Delivery and site handling* (3.1) of this Certificate.

Additional Information

NHBC Standards 2016

NHBC accepts the use of the Terrain P.A.P.A. (Positive Air Pressure Attenuator) Device, provided it is installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 8.1 *Internal services*.

Technical Specification

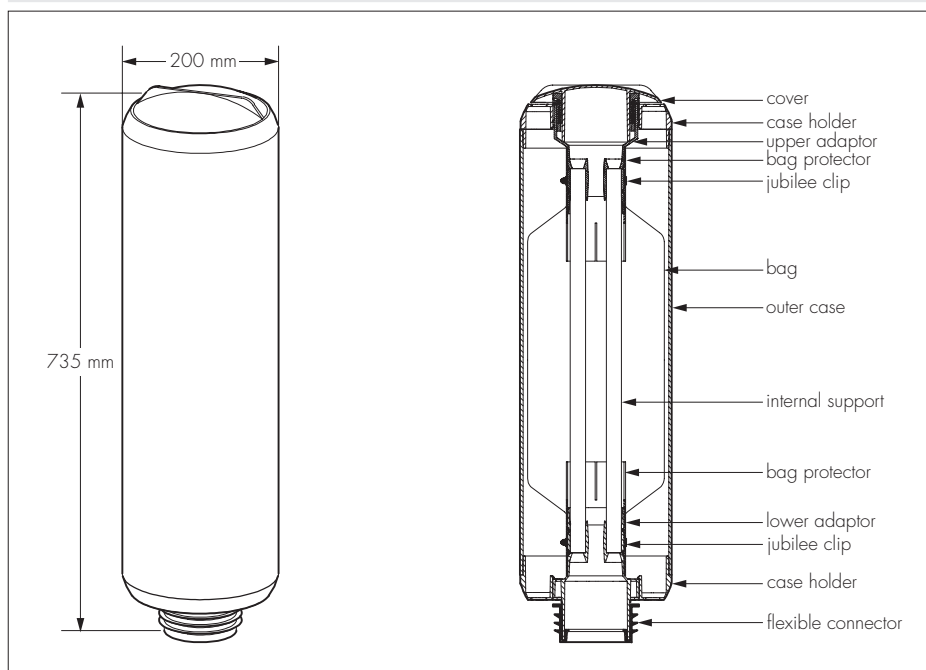
1 Description

1.1 The Terrain P.A.P.A. (Positive Air Pressure Attenuator) Device comprises an expandable isoprene reservoir enclosed in a protective unplasticised polyvinyl chloride (PVC-U) casing, with an acrylonitrile-butadiene-styrene (ABS) inlet spigot to allow different-sized synthetic rubber connectors to be fitted, for push-fit connection to 110 mm or 75 mm outside diameter (OD) drainage pipes.

1.2 A PVC-U screw cap at the top of each device gives access to a threaded adaptor where, if required, a second device can be fixed. The connection is achieved using a second threaded ABS adaptor, which is solvent-welded to the inlet spigot of the second device. The two devices are then connected by screwing together.

1.3 Each device has a nominal external diameter of 200 mm and a nominal overall length of 735 mm (including spigot) and weighs approximately 3.5 kg.

Figure 1 Terrain P.A.P.A. (Positive Air Pressure Attenuator) Device



2 Manufacture

2.1 The device's internal components are assembled and inserted into the outer protective casing. Upper and lower covers are then placed in position and secured with rivets.

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

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

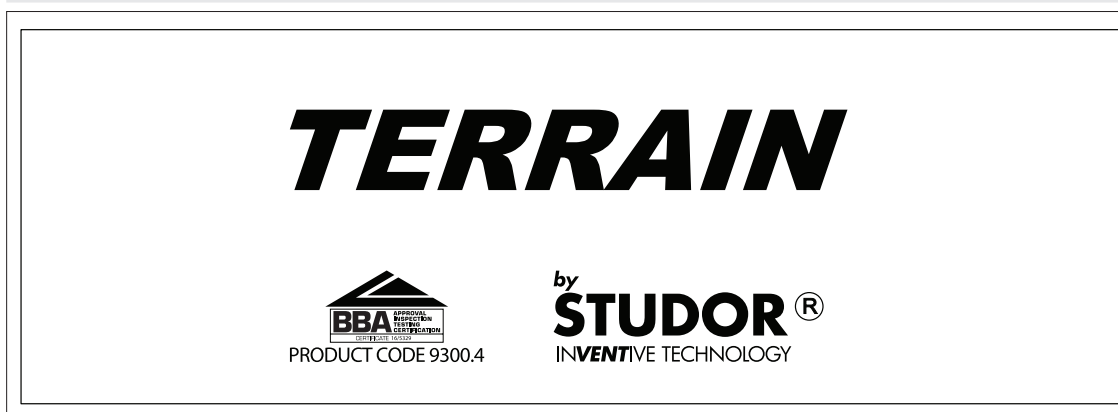
2.3 The management system of the manufacturer has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by BSI (Certificate FM582230).

3 Delivery and site handling

3.1 The devices are individually packaged in cardboard boxes. Larger orders are delivered on pallets of up to 20 boxes, which are loaded and shrink-wrapped on each pallet.

3.2 The device description/trade mark, license number, country of manufacture, BBA logo and this Certificate number are printed on the outer casing of each device (see Figure 2).

Figure 2 Labelling



3.3 The devices should be stored under cover and in dry conditions. Pallets containing the devices should be stored on level ground and must not be stacked on top of each other.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Terrain P.A.P.A. (Positive Air Pressure Attenuator) Device.

Design Considerations

4 General

4.1 The Terrain P.A.P.A. (Positive Air Pressure Attenuator) Device is satisfactory for use in above-ground gravity drainage systems serving multi-storey buildings. This Certificate covers use of the devices in buildings up to 30 storeys. The advice of the Certificate holder should be sought for use of the devices in taller buildings, which are outside the scope of this Certificate.

4.2 The device is used to help manage and reduce the effects of positive air pressure transients, which can lead to temporary or permanent loss of the water seal in sanitary devices. Expansion of the isoprene reservoir within the device, when subjected to a positive air pressure, helps to absorb and dissipate the pressure transient.

4.3 Positive pressure transients can be generated at various points throughout a building drainage system and for a variety of reasons. Likely locations include the base of the discharge stack, offsets and branch connections, where turbulent flow conditions can lead to water curtains which temporarily block the through-flow of air down the discharge stack. Temporary blockages, surcharging and other operational factors within the building drainage system can also result in positive pressure transients.

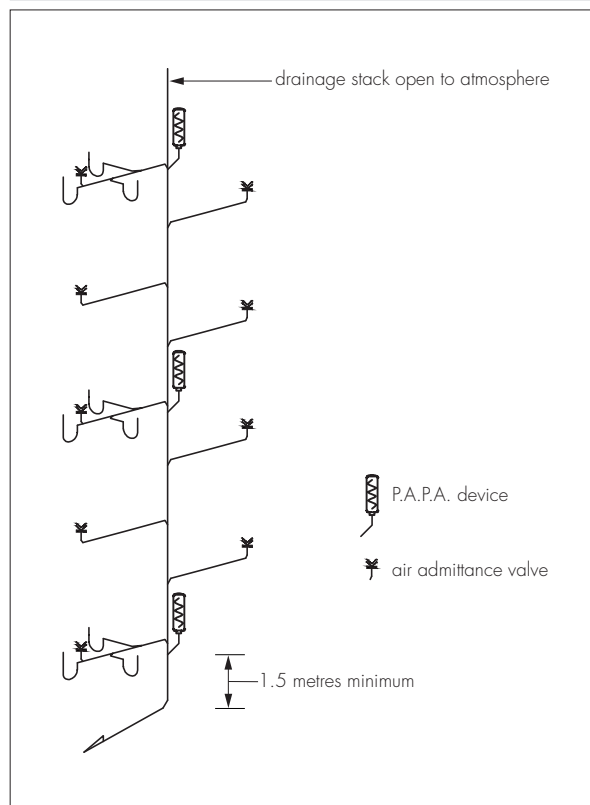
4.4 Terrain P.A.P.A. (Positive Air Pressure Attenuator) Devices should be installed as close as possible to and above the source of the pressure transient, ensuring always that the device is located at least 1.5 metres above the base of the discharge stack, or as close as possible to and below the first branch above the base of the stack (see Figure 3).

4.5 In multi-storey buildings with long discharge stack runs, the devices should be distributed strategically at locations along the discharge stack (see section 6 of this Certificate).

4.6 This Certificate covers use of the devices in drainage systems which vent freely to the atmosphere (Figure 3).

4.7 Closed drainage systems are outside the scope of the Certificate. Where it is intended to use the devices in closed drainage systems, ie those that do not include permanent open ventilation to atmosphere, the Certificate holder's advice should be sought.

Figure 3 Typical system layout



5 Practicability of installation

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

6 Drainage system design

6.1 The design of above-ground building drainage systems incorporating the devices must be carried out by a suitably experienced and qualified individual.

6.2 Design of the above-ground drainage systems within multi-storey buildings should be carried out in accordance with the principles set out BS EN 12056-1 : 2000 and BS EN 12056-2 : 2000 and their UK National Annexes. These Standards recognise that ventilating pipework sizes will need to be increased to ensure pressure transients are managed effectively where pipe runs are long or include many bends.

6.3 The BBA is satisfied on the basis of output from computerised mathematical modelling (see Section 6.4) that, for buildings served by one of the four standard building drainage system configurations described in Table 1, the effects of positive pressure transients can normally be adequately managed and mitigated by the inclusion of Terrain P.A.P.A. (Positive Air Pressure Attenuator) Devices in accordance with the guidance given in Table 2 and Figure 4.

6.4 For other drainage system layouts⁽¹⁾ and in situations where complex operational constraints exist⁽¹⁾, the design and performance of the building drainage system should be verified using a suitable computerised mathematical modelling software package, capable of assessing:

- airflow and pressure fluctuations resulting from sanitary appliances discharging to the drainage system and other external influences
- the effects of positive pressure transients on the continued integrity of the sanitary appliance water seals.

(1) Such building drainage systems are outside the scope of the Certificate.

Table 1 Standard building drainage configurations

Drainage system configuration	Description
1	A building drainage system designed in accordance with BS EN 12056-2 : 2000 to serve a multi-storey building (up to 10 storeys) comprising flats, apartments, hotel accommodation and/or offices by means of a single, straight, vertical DN 100 mm discharge stack, open to atmosphere at the top and connected to the below-ground drainage system via a single, industry-standard long radius bend. Incoming connections are 50 mm and 100 mm diameter and occur at every floor, giving an even distribution of flow over the length of stack. The system has active ventilation, using air admittance valves (AAVs) meeting the requirements of BS EN 12380 : 2002.
2	A building drainage system designed in accordance with BS EN 12056-2 : 2000 to serve a multi-storey building (of between 10 and 20 storeys) comprising flats, apartments, hotel accommodation and/or offices by means of a single, straight, vertical DN 100 mm discharge stack, open to atmosphere at the top and connected to the below-ground drainage system via a single, industry-standard long radius bend. Incoming connections are 50 mm and 100 mm diameter and occur at every floor, giving an even distribution of flow over the length of stack. The system has active ventilation, using air admittance valves (AAVs) meeting the requirements of BS EN 12380 : 2002.
3	A building drainage system designed in accordance with BS EN 12056-2 : 2000 to serve a multi-storey building (of between 10 and 20 storeys) comprising flats, apartments, hotel accommodation and/or offices by means of a single, straight, vertical DN 150 mm discharge stack, open to atmosphere at the top and connected to the below-ground drainage system via a single, industry standard long radius bend. Incoming connections are 50 mm and 100 mm diameter and occur at every floor, giving an even distribution of flow over the length of stack. The system has active ventilation, using air admittance valves (AAVs) meeting the requirements of BS EN 12380 : 2002.
4	A building drainage system designed in accordance with BS EN 12056-2 : 2000 to serve a multi-storey building (between 20 and 30 storeys) comprising flats, apartments, hotel accommodation and/or offices by means of a single, straight, vertical DN 150 mm discharge stack, open to atmosphere at the top and connected to the below-ground drainage system via a single, industry standard long radius bend. Incoming connections are 50 mm and 100 mm diameter and occur at every floor, giving an even distribution of flow over the length of stack. The system has active ventilation, using air admittance valves (AAVs) meeting the requirements of BS EN 12380 : 2002.

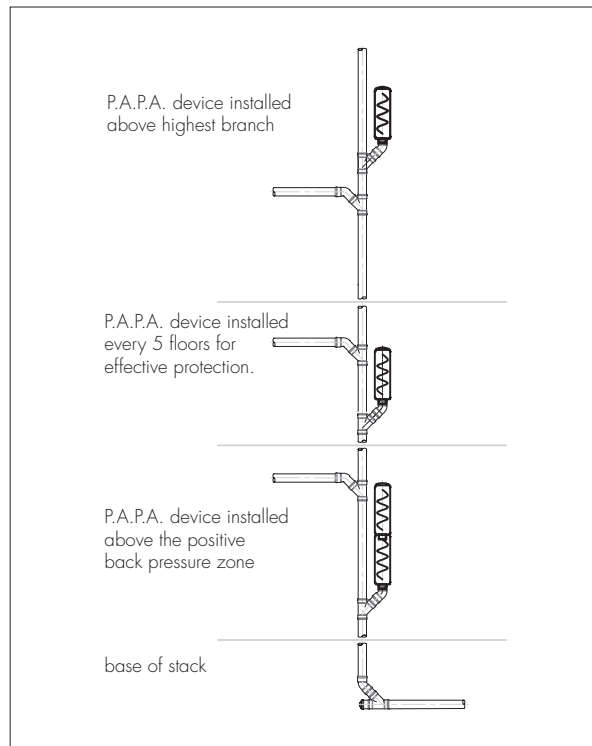
Note: The drainage system configurations in Table 1 have been verified with respect to the effects of positive pressure transients at the peak flow permitted by BS EN 12056-2 : 2000 for the stack size given.

Table 2 Recommended P.A.P.A. device locations

Building height (number of floors)	Recommended device locations (per discharge stack)
Up to 8	Devices generally only required for remedial purposes in buildings up to 8 storeys high
8 to 30 storeys	Two devices at the base of the discharge stack ⁽¹⁾ , plus one device every 5th floor and one device above the highest inlet branch

(1) Device to be located a minimum of 1.5 metres above the base of the discharge stack, or as close as possible to and below the first branch above the base of the stack.

Figure 4 Typical system layout



6.5 The device performance characteristics given in Table 3 may be used for the computer simulations.

Table 3 Device performance characteristics

Characteristic	Value
Time to open	10 milliseconds
Time to fill	125 milliseconds
Reservoir capacity	4 litres

7 Airtightness



7.1 The device will remain airtight under all internal pressure conditions normally encountered in a gravity building drainage system.

7.2 The synthetic rubber connector supplied with the device will provide an airtight seal when used with 110 mm and 75 mm diameter pipes meeting the requirements of BS EN 1329-1 : 2014, BS EN 1451-1 : 2000, BS EN 1455-1 : 2000, BS EN 1519-1 : 2000, BS EN 1565-1 : 2000 and BS EN 1566-1 : 2000.

8 Effect on water seals



The expansion of the isoprene reservoir, when subjected to positive air pressure, helps to relieve the positive air pressures on the rest of the drainage system, and therefore contributes to maintaining the effectiveness of seals.

9 Maintenance

9.1 The devices do not normally require maintenance. However, they should be installed in accessible locations, to allow for periodic inspection and replacement, if required. In the event of accidental damage or vandalism, or if there is evidence of breakdown of the device reservoir or seals (eg manifested by odour problems), the device must be renewed.

9.2 The devices can be removed from the drainage system. Should a device be removed, the connector must be renewed before reinstallation.

10 Durability



The devices are manufactured from materials conventionally used in drainage systems. When used in accordance with this Certificate, the device can be expected to have a service life equivalent to that of the drainage system in which it is installed.

11 Reuse and recyclability

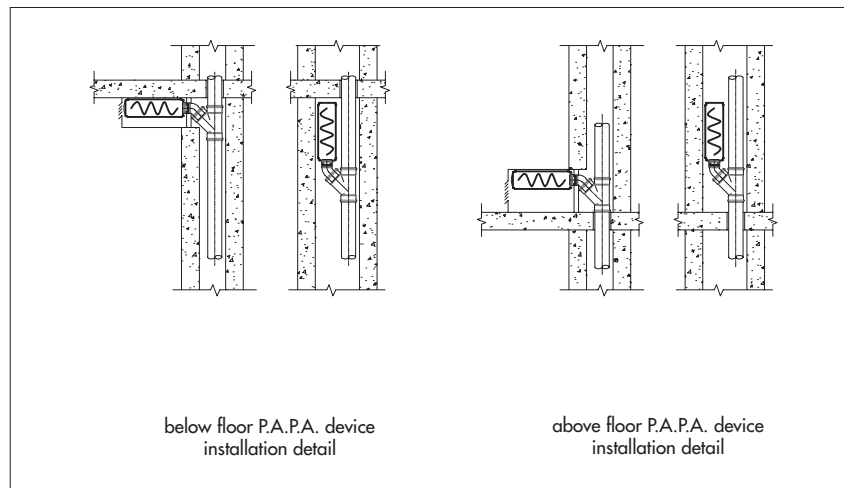
The units are manufactured from materials which can be readily recycled.

12 General

12.1 Installation of the Terrain P.A.P.A. (Positive Air Pressure Attenuator) Device must be carried out in accordance with the Certificate holder's instructions.

12.2 The devices can be installed either horizontally or vertically (see Figure 5).

Figure 5 Typical installation details



13 Procedure

13.1 The devices are supplied with a synthetic rubber connector enabling push-fitting into a 110 mm diameter (OD) pipe or over a 75 mm (OD) diameter pipe.

13.2 The devices should be adequately supported.

13.3 The devices must only be installed after the drainage system has been subjected to any necessary pressure tests.

Technical Investigations

14 Tests

14.1 Tests, conducted in accordance with American Society of Sanitary Engineering Standard ASSE 1030-2013, have been carried out on the devices to establish:

- reservoir filling time
- reservoir response time
- reservoir capacity
- endurance — pressure cycling following conditioning at a temperature of 65°C
- endurance — pressure cycling following conditioning at a temperature of -40°C
- airtightness under positive pressure.

14.2 The contribution that the devices can make in helping to mitigate positive pressure transients in drainage systems was witnessed in a 'full scale' laboratory test rig.

15 Investigations

15.1 The results of computer modelling simulations for a number of standard building drainage configurations incorporating the devices were assessed.

15.2 The manufacturing process was evaluated, including the methods adopted for quality control, and details were obtained of the quality and compositions of materials used.

Bibliography

- BS EN 1329-1 : 2014 *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure — Unplasticized poly(vinyl chloride) (PVC-U) Specifications for pipes, fittings and the system*
- BS EN 1451-1 : 2000 *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure — Polypropylene (PP) Specifications for pipes, fittings and the system*
- BS EN 1455-1 : 2000 *Plastics piping systems for soil and waste (low and high temperature) within the building structure — Acrylonitrile-butadiene-styrene (ABS) Specifications for pipes, fittings and the system*
- BS EN 1519-1 : 2000 *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure — Polyethylene (PE) Specifications for pipes, fittings and the system*
- BS EN 1565-1 : 2000 *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure — Styrene copolymer blends (SAN + PVC) Specifications for pipes, fittings and the system*
- BS EN 1566-1 : 2000 *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure — Chlorinated poly(vinyl chloride) (PVC-C) Specification for pipes, fittings and the system*
- BS EN 12056-1 : 2000 *Gravity drainage systems inside buildings — General and performance requirements*
- BS EN 12056-2 : 2000 *Gravity drainage systems inside buildings — Sanitary pipework, layout and calculation*
- BS EN ISO 9001 : 2008 *Quality management systems — Requirements*
- BS EN 12380 : 2002 *Air admittance valves for drainage systems — Requirements, test methods and evaluation of conformity*
- ASSE 1030-2013 *Performance requirements for positive pressure reduction devices for sanitary drainage systems*

16 Conditions

16.1 This Certificate:

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

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

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

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

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

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

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

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