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BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
No 00/3678

RIDGIDRAIN ADVANCED DRAINAGE SYSTEM

PRODUCT SHEET 1 — RIDGIDRAIN PLUS AND RIDGIDRAIN 100 MM TO 600 MM PIPES AND COUPLERS

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Ridgidrain Plus and Ridgidrain 100 mm to 600 mm Pipes and Couplers, perforated or unperforated surface water filter and carrier pipes and couplers.

AGRÉMENT CERTIFICATION INCLUDES:

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

KEY FACTORS ASSESSED

Strength — the pipes and couplers have adequate strength to resist loads associated with installation and service (see section 4).

Performance of joints — the system will remain watertight under normal service conditions (see section 5).

Maintenance — the system may be cleaned using standard techniques (see section 8).

Durability — the system will have a service life in excess of 50 years (see section 9).

The BBA has awarded this Agrément Certificate for Ridgidrain Plus and Ridgidrain 100 mm to 600 mm Pipes and Couplers to Polypipe Civils Ltd as fit for their intended use provided they are installed, used and maintained as set out in this Agrément Certificate.

On behalf of the British Board of Agrément

B C Chamberlain — Head of Approvals — Engineering

G N Cooper — Chief Executive

Date of First issue: 28 February 2000
Date of Fourth issue: 13 June 2008

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

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, Ridgidrain Plus and Ridgidrain100 mm to 600 mm Pipes and Couplers, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:

The Building Regulations 2000 (as amended) (England and Wales)

Requirement:	H3(3)	Rainwater drainage
Comment:		The system will convey the flow of rainwater and minimise the risk of blockages or leakage. See sections 6.1 and 6.2 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The system is acceptable. See section 9 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The use of the system can contribute to a construction satisfying this Regulation. See sections 8.1 to 8.3 and 9 and the *Installation* part of this Certificate.
Regulation:	9	Building standards — construction
Standard:	3.6(a)	Surface water drainage
Comment:		The system will meet the relevant requirements of this Standard, with reference to clauses 3.6.1[(1)(2)] and 3.6.2[(1)(2)]. See sections 6.1 and 6.2 of this Certificate. (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See section 9 and the *Installation* part of this Certificate.
Regulation:	B3(2)	Suitability of certain materials
Comment:		The system is acceptable. See sections 8.1 to 8.3 of this Certificate.
Regulation:	N5	Rain-water drainage
Comment:		The system will meet the relevant requirements of this Regulation. See sections 6.1 and 6.2 of this Certificate.

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

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

See sections: 2 *Delivery and site handling* (2.1) and 10 *General* (10.1).

Non-regulatory Information

NHBC Standards 2007

NHBC accepts the use of Ridgidrain Plus and Ridgidrain 100 mm to 600 mm Pipes and Couplers, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 5.3, Clause 5.3 – D6.

Zurich Building Guarantee Technical Manual 2007

In the opinion of the BBA, Ridgidrain Plus and Ridgidrain 100 mm to 600 mm Pipes and Couplers, when installed and used in accordance with this Certificate, satisfy the requirements of the *Zurich Building Guarantee Technical Manual*, Section 3 *Substructure*, Sub-section *Drainage*.

General

This Certificate relates to Ridgidrain Plus and Ridgidrain 100 mm to 600 mm Pipes and Couplers. The surface water filter and carrier pipes are available perforated or unperforated and in diameters of 100 mm, 150 mm, 225 mm, 300 mm, 375 mm, 400 mm, 450 mm, 500 mm and 600 mm.

1 Description

1.1 Ridgidrain Plus and Ridgidrain 100 mm to 600 mm filter and carrier (perforated and unperforated) pipes and couplers are manufactured by a twin extrusion process. Two pipes are extruded simultaneously, one inside the other, and heat welded together in one continuous process. Ridgidrain in 100 mm to 375 mm diameter is manufactured with a black polyethylene outer layer and a blue polyethylene inner, and in 400 mm to 600 mm diameter, are manufactured in black polypropylene outer layer and a blue polypropylene inner layer as standard. Ridgidrain Plus in 150 mm, 225 mm and 300 mm diameter is manufactured with a black polyethylene outer layer and a blue polyethylene inner layer. Other internal colours are available on request.

1.2 The products tested and covered by this Certificate are manufactured from material with the specification given in Table 1 for polyethylene and Table 2 for polypropylene.

Table 1 Material properties/specification (polyethylene)

Property	Test method reference	Specification
Tensile properties	EN 638, BS EN ISO 527-2	Sample 1B at 50 mm min^{-1} ⩾ 18 MPa
Oxygen induction time	EN 728	⩾ 4 min
Melt flow rate	ISO 1133	⩽ 0.75 g $(10\ min)^{-1}$ 2.16 kg at 190°C
Density	ISO 1183	⩾ 935 kgm^{-3}
Heat reversion	ISO 12091	110°C ± 2°C (pass)
Effects of heating (injection moulded fittings only)	EN 763	N/A

Table 2 Material properties/specification (polypropylene)

Property	Test method reference	Specification
Tensile properties	EN 638, BS EN ISO 527-2	Sample 1B at 50 mm min^{-1} ⩾ 21 MPa
Oxygen induction time	EN 728	⩾ 4 min
Melt flow rate	ISO 1133	⩽1.8 g $(10\ min)^{-1}$ 2.16 kg at 230°C
Density	ISO 1183	⩾ 890 kgm^{-3}
Heat reversion	ISO 12091	150°C ± 2°C (pass)
Effects of heating (injection moulded fittings only)	EN 763	150°C ± 2°C (pass)

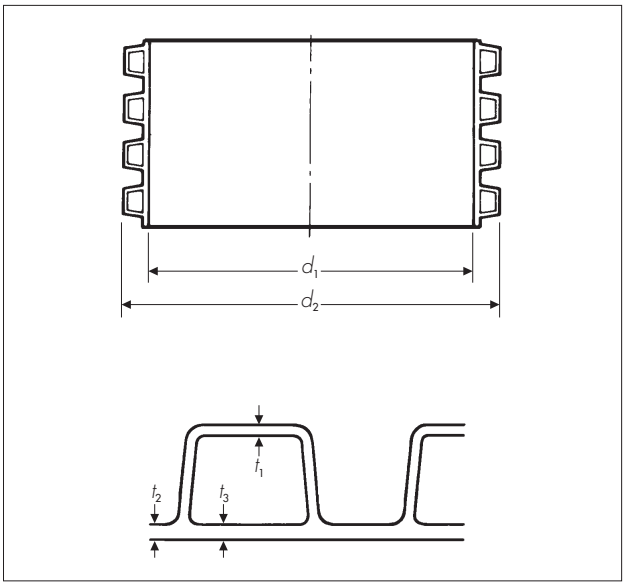
1.3 The outer wall is corrugated and the inner wall is smooth finished. Details and dimensions are given in Table 3 and Figure 1.

Table 3 Pipe dimensions

Nom(1) internal pipe diameter, d_1 (mm)	Min(2) internal pipe diameter (mm)	Nom(1) external pipe diameter, d_2 (mm)	t_1 min (mm)	t_2 min (mm)	t_3 min (mm)	Nom(1) length (m)	Nom(1) weight (kgm^{-1})
100	98	118.75	0.8	1.5	0.7	6	0.8
150	145	176.35	0.7	1.0	0.8	6	1.35
225	220	266.50	1.3	2.4	1.0	6	3.0
300	294	353.75	1.4	2.8	1.0	6	5.0
375	372	435.50	1.6	2.9	1.5	6	6.7
400	395	458.00	1.7	3.0	1.5	6	7.3
450	445	512.25	1.7	3.0	1.5	6	9.4
500	496	569.50	1.8	3.2	1.6	6	11.0
600	588	674.50	1.8	3.3	1.7	6	14.0

(1) Nom = nominal.
(2) Min = minimum.

Figure 1 Ridgidrain and Ridgidrain Plus pipe



1.4 Black polypropylene couplers are available for each size of pipe. Details and dimensions are given in Table 4 and Figure 2.

1.5 Ridgidrain pipe 100 mm to 375 mm diameter is supplied with plain ends and separate injection moulded couplers. Ridgidrain Plus pipe is supplied with one plain end and one integrally moulded socket. Pipe 400 mm to 600 mm diameter is supplied with either an integrally welded socket or a separate coupler. The integral socket end is designed to connect with the plain pipe end and is the same as half the coupler. Details and dimensions are given in Table 5 and Figure 3.

1.6 Elastomeric seals manufactured to BS EN 681-1 : 1996 can be ordered from the Certificate holder for each coupler. Details are given in Table 4 and Figure 4.

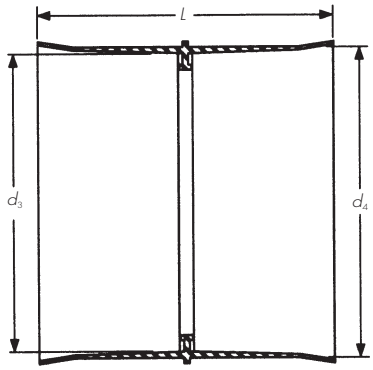
Table 4 Coupler dimensions

Nominal internal pipe diameter (mm)	Internal, diameter d_3 (min) (mm)	Nominal external, diameter d_4 (mm)	Nominal length (l) (mm)	Nominal seal height (h) (mm)
100	119	127	195	10
150	176	182	183	16.3
225	265	275	260	24
300	353	365	280	31
375	433	447	333	33
400	461	479	400	32
450	517	529	438	35
500	574	583	489	38
600	678	688	560	44

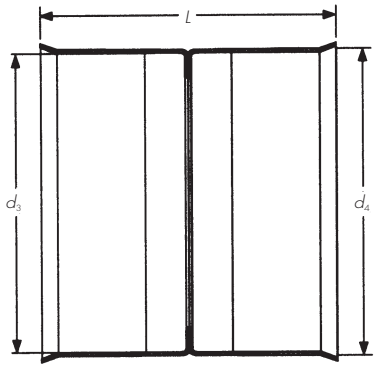
Table 5 Integral socket dimensions

Nominal internal pipe diameter, d_1 (mm)	Nominal socket diameter, d_3 (mm)	Nominal socket depth, L_1 (mm)	Nominal seal height (h) (mm)
150	179	95	16.3
225	269	145	24
300	358	185	31
400	461	196	32
450	517	215	35
500	574	240	38
600	678	275	44

Figure 2 Couplers

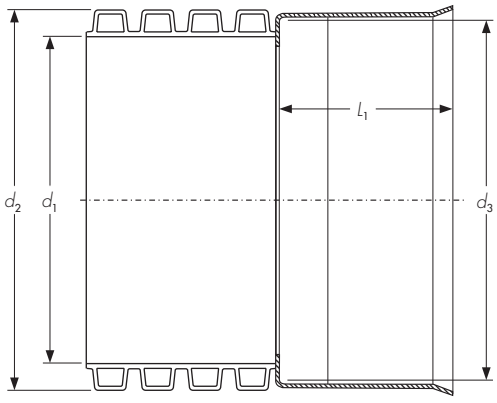


coupler for 100 mm, 150 mm, 225 mm, 300 mm and 375 mm pipe



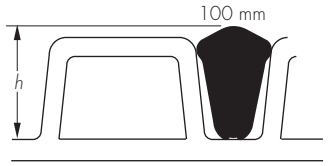
coupler for 400 mm, 450 mm, 500 mm and 600 mm pipe

Figure 3 Integral sockets

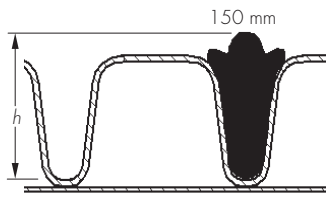


socket for 150 mm, 225 mm, 300 mm, 400 mm, 450 mm, 500 mm and 600 mm pipe

Figure 4 Seals



similar seals of sizes 375 mm, 400 mm, 450 mm, 500 mm and 600 mm are available



similar seals of sizes 225 mm and 300 mm are available

1.7 Pipes can be supplied either perforated or unperforated. Perforated pipe is available with the slots in the dwell between corrugations equally spaced around the circumference and offset[1] symmetrically for alternate dwells along the pipe length (see Tables 6 and 7 and Figure 5). Alternatively, the slots are located on one half only of the pipe and thus the permeable area is approximately halved.

(1) Pipe sizes 300 mm and 375 mm do not have the offset for alternate dwells.

Table 6 Perforated pipe details — fully perforated

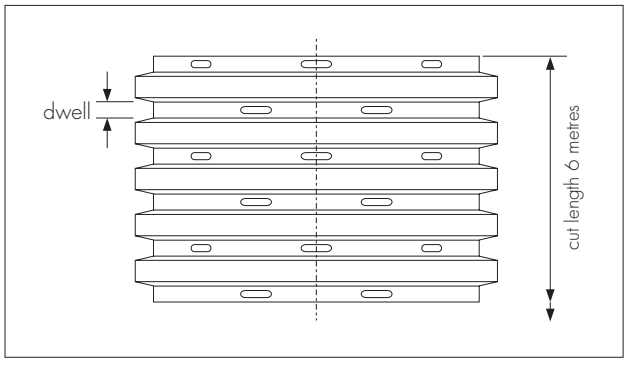
Nominal internal pipe diameter (mm)	No of slots per dwell	No of rows of slots	No of dwells per metre	Slot length (range) (mm)	Slot width (range) (mm)	Permeable area (minimum) (mm^2m^{-1})
100	4	8	60	15–25	1.5–2.0	5400
150	3	6	45	15–25	1.5–3.0	3040
225	3	6	30	15–35	1.5–3.0	2025
300	6	6	25	15–35	1.5–3.0	3375
375	10	10	20	20–45	1.5–3.6	6000
400	2	4	20	70–90	3.0–4.0	8400
450	2	4	26	70–90	3.0–4.0	10 920
500	2	4	22	70–90	3.0–4.0	9240
600	2	4	19	80–100	3.0–4.0	9120

Table 7 Perforated pipe details — half perforated

Nominal internal pipe diameter (mm)	No of slots per dwell	No of rows of slots	No of dwells per metre	Slot length (range) (mm)	Slot width (range) (mm)	Permeable area (minimum) (mm^2m^{-1})
100	2	3	60	15–25	1.5–2.0	2700
150	2/1[1]	3	45	15–25	1.5–3.0	1520
225	2/1[1]	3	30	15–35	1.5–3.0	1015
300	3	3	25	15–35	1.5–3.0	1685
375	5	5	20	20–45	1.5–3.6	3000
400	1	2	20	70–90	3.0–4.0	4200
450	1	2	26	70–90	3.0–4.0	5460
500	1	2	22	70–90	3.0–4.0	4620
600	1	2	19	70–90	3.0–4.0	4560

(1) Two slots or one slot in alternating dwells.

Figure 5 Details of perforations



1.8 Continuous quality control is exercised during manufacture. Checks include:

Pipes

- dimensional accuracy
- impact resistance
- short-term stiffness.

Couplers

- dimensional accuracy
- impact resistance.

1.9 A label bearing the BBA identification mark incorporating the number of this Certificate is attached to each pipe length and coupler or to each pack of pipes.

2 Delivery and site handling

2.1 Handling, storage and transportation should be in accordance with BS 5955-6 : 1980.

2.2 Black polypropylene and polyethylene pipes have good resistance to UV degradation but it is recommended they be protected from direct sunlight. If protection cannot be provided, consideration must be given to the effects of prolonged exposure to direct sunlight:

- up to 3 months — negligible UV degradation but possible extreme surface temperatures of up to 80°C may cause some localised distortion

- 3 to 12 months — may have a significant effect on the impact resistance and physical properties
- over 12 months — damage will occur unless protection is provided.

2.3 The manufacturer has the option of adding chemicals to provide enhanced UV stability on request.

2.4 Pipe of diameters up to 400 mm are generally delivered in prepacked bundles and should be retained in their packaging until installation. Larger pipe is generally delivered as loose lengths and should not be stacked more than 4 m high. Care should be taken not to drop the pipe or couplers on their ends, particularly during cold weather conditions.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Ridgidrain Plus and Ridgidrain 100 mm to 600 mm Pipes and Couplers.

Design Considerations

3 General

3.1 Ridgidrain Plus and Ridgidrain 100 mm to 600 mm Pipes and Couplers (perforated or unperforated), when installed in accordance with the recommendations given in this Certificate, are suitable for the collection and disposal of surface and sub-surface water.

3.2 This Certificate does not cover use of the pipe for domestic sewage, combined sewerage systems or untreated trade effluent.

4 Strength

4.1 The product has adequate strength to resist loads associated with installation and with subsequent use in the situations defined in sections 3.1 and 3.2.

4.2 For installation purposes the pipe may be assumed to have a standard dimension ratio (SDR) equivalent of not greater than 41.

4.3 Pipes are of Stiffness Class SN8 in accordance with BS EN ISO 9969 : 1995.

5 Performance of joints

The joints are satisfactory and will remain watertight under normal service conditions of pipe deformation, side or vertical displacement, pipeline deflection and thermal movement.

6 Flow characteristics

6.1 The pipe will have the normal flow characteristics associated with PVC-U pipes.

6.2 Full-bore velocities are available from the *Tables for the Hydraulic Design of Pipes, Sewers and Channels*, Volume 2, 8th Edition by H R Wallingford and D I H Barr. The values are based on the Colebrook-White equation. An appropriate value of roughness coefficient should be selected when designing the drainage system. For new pipes, a value of 0.006 mm is applicable, but for designs, a value of 0.6 mm is generally used.

7 Resistance of chemicals

The pipes will be unaffected by those types and quantities of chemicals likely to be found in surface water drainage pipes.

8 Maintenance

8.1 Access to the system for cleaning should be provided by conventional methods.

8.2 The system can be rodded easily using flexible drain rods. In common with other standard plastic drainage systems, toothed root cutters and rods with metal ferrules, as used with some mechanical cleaning systems, could damage the pipe and couplers and should not be used.

8.3 From tests it is indicated that pipes have adequate resistance to cleaning by water pressure jetting equipment (see section 13.1). However, it is recommended that low pressure, high volume systems are used in accordance with MCHW, Volume 1, clause 520.

9 Durability

In the opinion of the BBA, no significant deterioration of the system will take place when the product is installed in accordance with section 10, and installations will have a life in excess of 50 years.

Installation

10 General

10.1 Installation of Ridgidrain Plus and Ridgidrain 100 mm to 600 mm Pipes and Couplers must be in accordance with the recommendations of BS EN 752-2 : 1997, BS EN 752-3 : 1997, BS EN 752-4 : 1998 and BS 5955-6 : 1980, where appropriate.

10.2 Pipe and couplers must be protected against damage from site construction traffic.

10.3 Completed systems should be tested in accordance with BS EN 1610 : 1998 to ensure they are functioning correctly.

11 Procedure

11.1 The pipe can be cut easily using conventional hand tools, and should be cut square and centrally between the ribs.

11.2 For a watertight joint, the pipe ends and coupler should be cleaned and a rubber seal fitted externally between the first and second corrugation in the pipe. The seal and inside of the coupler should be lubricated and the pipe pushed fully home to the central register either by hand, or using a lever if necessary.

11.3 Care should be taken during backfill to maintain the line and level of the pipelines. If necessary, the pipe should be restricted to prevent uplift.

Technical Investigations

12 Tests

Tests were carried out to determine:

- impact strength at 0°C and 23°C to BS EN 1411 : 1996 with a d25 striker of 1.0 kg mass
- creep ratio to BS EN ISO 9967 : 1995
- resistance to longitudinal bending to MCHW, Volumes 1 and 2, Clause 518.11
- ring stiffness to BS EN ISO 9969 : 1995
- leaktightness of joints to BS EN 1277 : 2003 when subjected to diameter distortion and angular deflection from 0.5 bar to –0.3 bar
- insertion force (ease of jointing)
- resistance to rodding.

13 Investigations

13.1 An examination was made of data relating to:

- chemical resistance
- material properties
- flow capacity
- resistance to rodding and jetting
- practicability of installation
- resistance to cyclic loading.

13.2 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

Bibliography

BS 5955-6 : 1980 *Plastics pipework (thermoplastics materials) — Code of practice for the installation of unplasticized PVC pipework for gravity drains and sewers*

BS EN 681-1 : 1996 *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Vulcanized rubber*

BS EN 752-2 : 1997 *Drain and sewer systems outside buildings — Performance requirements*
BS EN 752-3 : 1997 *Drain and sewer systems outside buildings — Planning*
BS EN 752-4 : 1998 *Drain and sewer systems outside buildings — Hydraulic design and environmental considerations*

BS EN 1277 : 2003 *Plastics piping systems — Thermoplastics piping systems for buried non-pressure applications — Test methods for leaktightness of elastomeric sealing ring type joints*

BS EN 1411 : 1996 *Plastics piping and ducting systems — Thermoplastics pipes — Determination of resistance to external blows by the staircase method*

BS EN 1610 : 1998 *Construction and testing of drains and sewers*

BS EN ISO 527-2 : 1996 *Plastics — Determination of tensile properties — Test conditions for moulding and extrusion plastics*

BS EN ISO 9967 : 1995 *Thermoplastics pipes — Determination of creep ratio*

BS EN ISO 9969 : 1995 *Thermoplastics pipes — Determination of ring stiffness*

EN 638 : 1994 *Plastics piping and ducting systems — Thermoplastics pipes — Determination of tensile properties*

EN 728 : 1997 *Plastics piping and ducting systems — Polyolefin pipes and fittings — Determination of oxidation induction time*

EN 763 : 1994 *Plastics piping and ducting systems — Injection moulded thermoplastics fittings — Test method for visually assessing effects of heating*

ISO 1133 : 1997 *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*

ISO 1183 : 1970 *Methods for determining the density and relative density (specific gravity) of plastics excluding cellular plastics*

ISO 12091 : 1995 *Structural wall thermoplastics pipes — Oven test*

Manual of Contract Documents for Highway Works, Volume 1 *Specification for Highway Works*, August 1998 (as amended)

Manual of Contract Documents for Highway Works, Volume 2 *Notes for Guidance on the Specification for Highway Works*, August 1998 (as amended)

Conditions of Certification

14 Conditions

14.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- 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.

14.2 References in this Certificate to any Act of Parliament, Statutory Instrument, Directive or Regulation of the European Union, British, European or International Standard, Code of Practice, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

14.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant 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.

14.4 In granting this Certificate, the BBA is not responsible for:

- 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
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

14.5 Any information relating to the manufacture, supply, installation, use and maintenance 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 and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date 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. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product/system.

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