HAPAS

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HAPAS Certificate
18/H283
Product Sheet 1

WEHOLITE PIPES, FITTINGS AND FABRICATIONS (SYSTEMS)

WEHOLITE PIPES FROM 1000 MM TO 3500 MM INTERNAL DIAMETER AND FITTINGS

This HAPAS Certificate Product Sheet(1) is issued by the British Board of Agrément (BBA), supported by Highways England (HE) (acting on behalf of the Overseeing Organisations of the Department for Transport; Transport Scotland; the Welsh Government and the Department for Infrastructure, Northern Ireland), the Association of Directors of Environment, Economy, Planning and Transport (ADEPT), the Local Government Technical Advisers Group and industry bodies. HAPAS Certificates are normally each subject to a review every three years.
(1) Hereinafter referred to as 'Certificate'.

This Certificate relates to Weholite Pipes, comprising 1000 mm to 3500 mm internal diameter, structured wall, polyethylene pipes, and Fittings, for use as a highway carrier drainage system. The Weholite Fittings are made from the Weholite Pipes, and are jointed on site by fusion welding.

CERTIFICATION INCLUDES:

- factors relating to compliance with HAPAS requirements
- factors relating to compliance with Regulations 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 products have adequate strength to resist the loads associated with installation and service (see section 6).

Performance of joints — the products will remain watertight under normal service conditions (see section 7).

Flow characteristics — the products will have flow characteristics equivalent to thermoplastic pipes (see section 8).

Maintenance — the products may be cleaned using standard techniques (see section 10).

Durability — the products will have a service life in excess of 100 years (see section 11).

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

On behalf of the British Board of Agrément

Date of First issue: 26 September 2018

Paul Valentine
Technical Excellence Director

Claire Curtis-Thomas
Chief Executive

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.
Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

Requirements

In the opinion of the BBA, Weholite Pipes from 1000 mm to 3500 mm internal diameter and Fittings, when used in accordance with the provision of this Certificate, will meet or contribute to meeting the requirements of Highways England for the design and construction of surface water drainage.

Highways England is of the view that certain highway schemes may derive benefit from the hydraulic and structural performance of large diameter thermoplastic wall pipes and attenuation structures. These large pipes are typically greater than 900 mm diameter and are classed as structures. As such they will require technical approval, in compliance with BD2 *Technical approval of highway structures*.

Such products are not currently covered by Highways England's existing specification requirements and their use requires approval via a departure from standard. Specification clauses are currently under review and Generic Approval in Principle forms will be developed in due course.

Regulations

Construction (Design and Management) Regulations 2015
Construction (Design and Management) Regulations (Northern Ireland) 2016

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

See sections: 1 *Description* (1.2), 3 *Delivery and site handling* (3.5), 5 *Practicability of Installation,* 13 *General* and 14 *Procedure* of this Certificate.

Technical Specification

1 Description

1.1 Structured wall plain ended Weholite Pipes, in 18 nominal sizes from 1000 to 3500 mm in stiffness classes from 2 $kN \cdot m^{-2}$ and 4 $kN \cdot m^{-2}$, are manufactured from black, high density polyethylene (HDPE) to the material specification given in Table 1. Weholite Fittings are made from Weholite Pipes and have the same material specification as the pipes.

Table 1 Materials properties/specification(1)

Property	Test method reference	Specification
Tensile properties	BS EN ISO 527	≥ 22 MPa (50 $mm \cdot min^{-1}$)
Oxygen induction time	BS EN 728	≥ 20 min (200°C)
Melt flow rate	BS EN ISO 1133-1	≤ 1.6g/10 min (5 kg at 190°C)
Density	BS EN ISO 1183-3	≥ 956 $kg \cdot m^{-3}$

(1) This Table is in the format of Appendix 5/7 of the MCHW, Volume 2. It is used to satisfy Clause 518.2 of the MCHW, Volume 1.

1.2 The pipes are of structured-wall construction, with smooth inner and outer surfaces, made from a spirally wound extruded hollow box profile forming pipe with a minimum internal wall thickness of 5 mm, as per relevant parts of BS EN 13476 : 2007 and to the dimensions shown in Figure 1 and Table 2 of this Certificate. The pipes are available in 18 nominal internal diameters.

Figure 1 Details of pipe

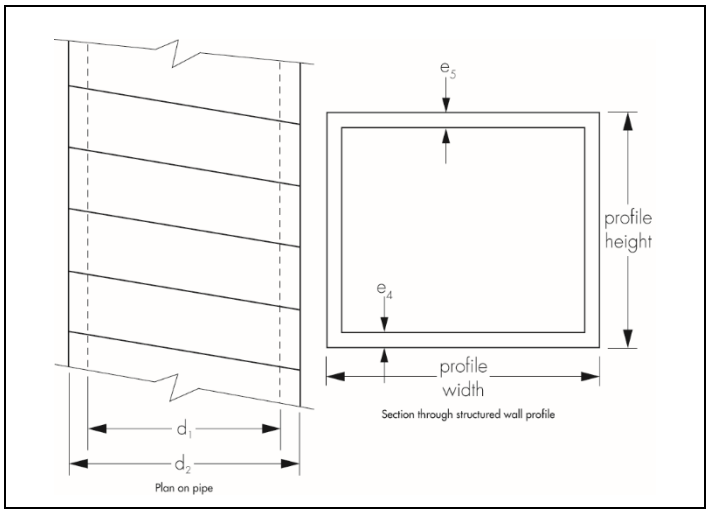


Table 2 Pipe dimensions

Nominal Internal pipe Diameter d_1 (mm)	Nominal External pipe Diameter d_2 (mm)	Minimum Mass per unit length (kg per m length)
Stiffness Class 2 kN·m^{-2}		
1000	1088	41
1050	1138	45
1200	1288	58
1350	1468	80
1400	1518	85
1500	1618	88
1600	1718	98
1650	1768	103
1800	1934	122
2000	2168	156
2100	2268	180
2200	2368	205
2400	2582	225
2500	2720	245
2600	2820	275
2800	3024	320
3000	3224	340
3500	3794	500
Stiffness Class 4 kN·m^{-2}		
1000	1096	54
1050	1178	57
1200	1328	70
1350	1484	120
1400	1554	125
1500	1654	130
1600	1754	150
1650	1832	155
1800	1982	165
2000	2220	195
2100	2320	240
2200	2420	260
2400	2670	295
2500	2770	310
2600	2870	320
2800	3070	425
3000	3294	515
3500	3874	650

Note: Weholite Pipes are also available in other stiffness classes from 6 to 12 kN·m^{-2} depending on the pipe diameter, however those are outside the scope of this Certificate.

1.3 Weholite Pipes from 1000 mm to 3500 mm internal diameter are supplied in any length from 1 to 30 m in one piece. The pipes and fittings are designed to be joined by fusion welding on site (see section 14).

1.4 Box profile dimensions, Profile Height (PrH) x Profile Width (PrW), can range from 44 x 55 mm to 187 x 234 mm and vary by diameter.

2 Manufacture

2.1 The pipes are manufactured from black HDPE, formed by spirally, winding a preformed extruded hollow box profile around a heated steel mandrel with adjacent sections welded together. The welded pipe is then reheated and trimmed to form a flat external surface.

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 Asset International Ltd has been assessed and registered as meeting the requirements of ISO 9001 : 2015 by BSI (Certificate FM12306).

3 Delivery and site handling

3.1 Weholite Pipes from 1000 mm to 3500 mm internal diameter and Fittings should be handled, transported and stored with care at all times, and in accordance the Certificate holder's instructions.

3.2 A label bearing the BBA logo incorporating the number of this Certificate is attached to each pipe length or to each pack of pipes.

3.3 The products can be left outside as they contain a minimum of 2% carbon black. When long-term storage is envisaged, the pipes and fittings can be protected.

3.4 All pipes are delivered pre-slung with certified nylon lifting straps. These are positioned so that there should be no need for climbing onto the vehicle trailer. The Certificates for the nylon slings will be in the possession of the driver.

3.5 The pipes should be stored on even surfaces. Timbers supplied with each delivery can be used to prevent rolling or movement during storage. The pipes are generally delivered as loose lengths and should not be stacked more than 4 m high.

3.6 Care should be taken not to drop pipes on their ends.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Weholite Pipes from 1000 mm to 3500 mm internal diameter and Fittings.

Design Considerations

4 Use

4.1 Weholite Pipes from 1000 mm to 3500 mm internal diameter and Fittings, when designed and installed in accordance with the recommendations given in this Certificate, are suitable for use in highways as carrier pipes for surface and sub-surface water.

4.2 Weholite Pipe characteristics are specified by the manufacturer (see section 6) and these should be verified with a type approval Certificate. Site-specific structural calculations, in accordance with BS EN 1295-1 : 1997 and BS 9295 : 2010, should be checked by a Chartered Engineer, to validate the structural performance of a proposed installation.

5 Practicability of installation

The products should only be installed by contractors who have been trained and approved by the Certificate holder, in accordance with the Certificate holder's Installation Manual.

6 Strength

6.1 The pipes have the nominal ring stiffness shown in Table 2, for use in calculations to BS EN 1295-1 : 1997 and BS 9295 : 2010. Example calculations illustrating the variables contributing to the design of large diameter pipes to BS EN 1295-1 : 1997 and BS 9295 : 2010 are shown in Table 3. The loading is in accordance with BS EN 1991-2 : 2003.

Table 3 Example Calculation

Cover (depth above pipe crown) H (m)		1.2
Pipe internal diameter D1 (m)		3
Pipe external diameter D2 (m)		3.224
Trench width B_d (m)		4.2
Pipe Stiffness short term ($kN \cdot m^{-2}$)		2
Pipe Stiffness long term ($kN \cdot m^{-2}$)		0.5
Unit weight of soil ϒ ($kN \cdot m^{-3}$)		19.6
Native soil Class (BS EN 1295-1 : 1997: Table NA.1)		Clayey Silty sand - Dense
Spangler modulus for Native soil modulus E'3 ($MN \cdot m^{-2}$) (BS EN 1295-1 : 1997: Table NA.1)		6
Pipe Embedment properties	Embedment Class (BS EN 1295-1 : 1997: Table NA.8)	S1
	Compaction (BS EN 1295-1 : 1997: Table NA.6)	90% compaction
	Deflection coefficient Kx (BS EN 1295-1 : 1997: Table NA.6)	0.083
	Modulus of soil reaction E'2 ($MN \cdot m^2$) (BS EN 1295-1 : 1997: Table NA.6)	10
	Deflection lag factor D_L (BS EN 1295-1 : 1997: Table NA.6)	1
Overall Modulus of soil reaction	Overall modulus E' ($kN \cdot m^{-2}$) (BS EN 1295-1 : 1997: Equation 16)	6462
	Adjust factor C_L (BS EN 1295-1 : 1997: Equation 17)	0.646
Loading	Dead load Pe ($kN \cdot m^{-2}$) (BS EN 1295-1 : 1997: Equation 20)	23.52
	Surcharge	LM1/LM2(1)
	Live load Ps ($kN \cdot m^{-2}$)	62.24
	Total load P ($kN \cdot m^{-2}$)	85.76
Pcrs critical short ($kN \cdot m^{-2}$) (BS EN 1295-1 : 1997: Equation 21a)		269.42
Pcrl critical long ($kN \cdot m^{-2}$) (BS EN 1295-1 : 1997: Equation 21a)		170.51
Pcra Short term critical pressure in air (H<1.5m) ($kN \cdot m^{-2}$) (BS EN 1295-1 : 1997: Equation 22a)		48
Ovalisation (%) (BS EN 1295-1 : 1997: Equation 23)		1.92
Factor of safety against buckling	Soil support (BS EN 1295-1 : 1997: Equation 21)	2.71
	Without Soil support (BS EN 1295-1 : 1997: Equation 22)	2.04

(1) The values have been determined from the critical pressures from Load Model 1 (LM1) and Load Model 2 (LM2) - General Verification, dispersal of wheel loads is in accordance with the dispersion angles given in BS EN 1991-2 : 2003.

6.2 The pipes have adequate resistance to the impact loads to which they may be subjected during installation and in service.

7 Performance of joints

When correctly made, the welded joints remain watertight and comply with the requirements as specified in the standard BS EN 1610 : 2015 and the manufacturer's instructions (see section 14 of this Certificate).

8 Flow characteristics

8.1 The pipes will have the normal flow characteristics associated with thermoplastic pipes.

8.2 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 0.03 mm is applicable, but for normal design purposes, a value of 0.6 mm should be adopted.

9 Resistance to chemicals

The Weholite Pipes from 1000 mm to 3500 mm internal diameter and Fittings will be unaffected by the types and quantities of chemicals likely to be found in surface water.

10 Maintenance

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

10.2 Tests indicate that the pipes have adequate resistance to water cleansing using pressure jetting equipment (see section 13.1). It is recommended that low pressure, high volume systems are used in accordance with the Certificate holder's guidelines.

10.3 The products must at all times be left clean and free from silt and obstruction, and must be cleaned and maintained in accordance with manufacturer's recommendations. Where site-specific issues impose constraints on cleaning and maintenance practices the manufacturer must be consulted to determine the solution. The manufacturer's advice must then be followed.

11 Durability

In the opinion of the BBA, when used in the context of this Certificate, the material from which the products are manufactured will not significantly deteriorate and the anticipated life will be in excess of 100 years.

12 Reuse and recyclability

The products are manufactured from polyethylene and can be recycled.

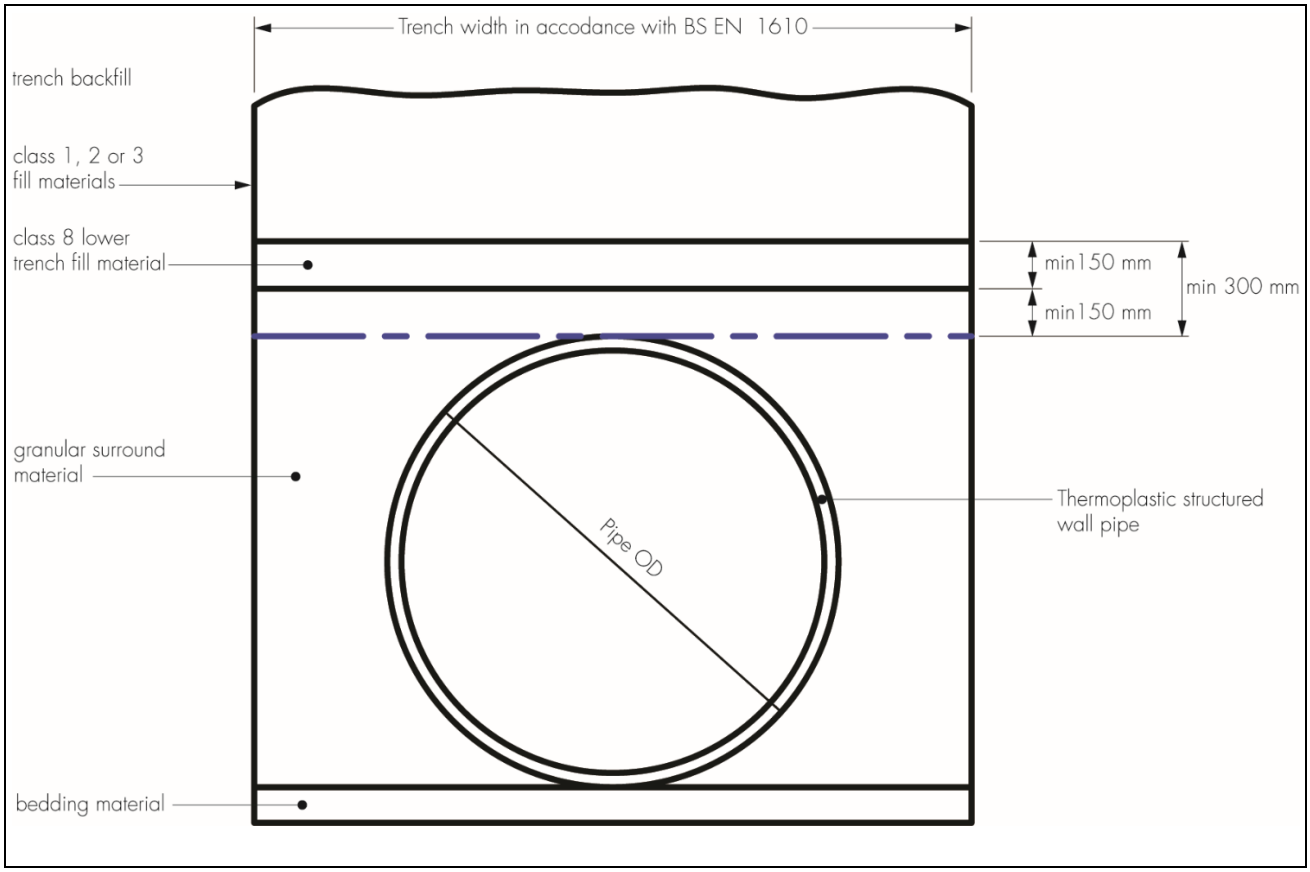
Installation

13 General

13.1 The products must be installed in accordance with the Certificate holder's Installation Guidelines (February 2018 — Issue 3) and HE requirements.

13.2 For typical laying, trench and backfilling specification details, reference should be made to the details, as shown in Figure 2.

Figure 2 Trench and bedding details



13.3 The pipes are installed using traditional drain-laying methods. They can be handled and installed readily in the lengths supplied.

13.4 The pipes and fittings must be protected from damage from site construction traffic.

14 Procedure

14.1 After the pipes and fittings have been installed and backfilled by the contractors using Asset International Ltd installation guidelines, fusion jointing operations can commence by Asset International Ltd. It is normal practice for Asset International Ltd to provide a site-specific method statement and risk assessment (RAMS) in line with the contractor's requirements to comply with Health and Safety Regulations.

14.2 The joints between pipes are fusion welded by operatives employed by Asset International Ltd and trained in accordance with the Certificate holder's documented procedures.

14.3 Step ends are cut into the pipe using a 110V reciprocating saw, following the spiral of the pipe, and using a planer/grinder to produce a clean finish.

14.4 The inside surface of the pipes must be clean and dry, and the area around joints clear, so that extrusion welding operations can take place.

14.5 Grind out chamfer on each side of joint to remove oxide layer.

14.6 Switch on extrusion welding gun and check temperature settings.

14.7 Purge out old extrudite. The extrusion process consists of inserting a 4 mm thick HDPE rod into the side of the welding gun, which is heated to 200 to 250°C. Molten rod is emitted at the nozzle, no hazardous fumes are emitted.

14.8 Weld around the inner circumference of the pipe with the extrusion welding gun. Continue with one or several passes until complete.

14.9 A record will be taken of operating temperatures and joint location, and a final inspection carried out once the work is completed.

14.10 All necessary documentation, of completed works, as required by the contract/client, must be provided to the Certificate holder in a timely manner in line with the CDM Regulations.

Technical Investigation

15 Tests

15.1 The following tests were carried out to determine the characteristics of the pipes and the pipe material:

- pipe stiffness to BS EN ISO 9969 : 2016
- ring flexibility to BS EN ISO 13968 : 2008
- tensile strength of seam to BS EN 13262 : 2017
- tensile properties to BS EN ISO 527-1 : 1996 and BS EN ISO 527-2 : 1996
- oxygen induction to BS EN 728 : 1997
- melt flow rate to BS EN ISO 1133-1 : 2011
- density to BS EN ISO 1183-3 : 1999.

15.2 Tests were carried out to establish the dimensional accuracy of the pipes.

16 Investigations

16.1 An examination was made of data in relation to the effect of the production tolerances on the performance of the products.

16.2 An evaluation of existing data was made to assess material properties, UV resistance, resistance to damage from cleansing operations and durability.

16.3 Test data relating to flow characteristics were examined.

16.4 Calculations were carried out in order to assess the design process of Asset International Ltd.

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

Bibliography

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

BS 9295 : 2010 *Guide to the structural design of buried pipelines*

BS EN 1295-1 : 1997 *Structural design of buried pipelines under various conditions of loading — General requirements*

BS EN 1610 : 2015 *Construction and testing of drains and sewers*

BS EN 1991-2 : 2003 *Eurocode 1 — Actions on structures — Traffic loads on bridges*

BS EN 13262 : 2017 *Thermoplastics piping systems for non-pressure underground drainage and sewerage — Thermoplastics spirally-formed structured-wall pipes — Determination of the tensile strength of a seam*

BS EN 13476-1 : 2007 *Plastics piping systems for non-pressure underground drainage and sewerage. Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE). General requirements and performance characteristics*
BS EN 13476-2 : 2007 *Plastics piping systems for non-pressure underground drainage and sewerage. Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE). Specifications for pipes and fittings with smooth internal and external surface and the system, Type A*

BS EN ISO 527-1 : 1996 *Plastics — Determination of tensile properties — General principles*
BS EN ISO 527-2 : 1996 *Plastics — Determination of tensile properties — Test conditions for moulding and extrusion plastics*

BS EN ISO 1133-1 : 2011 *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics — Standard method*

BS EN ISO 1183-3 : 1999 *Plastics — Methods for determining the density and relative density of non-cellular plastics*

BS EN ISO 9969 : 2016 *Thermoplastic pipes — Determination of ring stiffness*

BS EN ISO 13968 : 2008 *Plastics piping and ducting systems — Thermoplastics pipes — Determination of ring flexibility*

ISO 9001 : 2015 *Quality management systems — Requirements*

Manual of Contract Documents for Highway Works, Volume 1 *Specification for Highway Works*
Manual of Contract Documents for Highway Works, Volume 2 *Notes for Guidance on the Specification for Highway Works*

17 Conditions

17.1 This Certificate:

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

17.2 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.

17.3 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.

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

17.5 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.

17.6 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.

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