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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

HAPAS Certificate
02/H068
Product Sheet 3

RIDGIDRAIN ADVANCED DRAINAGE SYSTEM

RIDGIDRAIN FITTINGS (150 MM to 600 MM)

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 Assembly Government and the Department for Regional Development, 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 Ridgidrain Fittings (150 mm to 600 mm), polyethylene and polypropylene components for use in conjunction with Ridgidrain pipes to form highways drainage systems for the collection and disposal of surface and subsurface water.

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 fittings have adequate strength to resist loads associated with installation and service (see section 6).

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

Maintenance — the products may be cleaned using standard techniques (see section 9).

Durability — the system will have a service life in excess of 60 years (see section 10).

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 they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of Third issue: 31 March 2017

Originally certificated on 19 May 2003

Brian Chamberlain
Head of Technical Excellence

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.

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Requirements

In the opinion of the BBA, Ridgidrain Fittings (150 mm to 600 mm), when used in accordance with the provisions of this Certificate, will meet or contribute to meeting the following requirements of the *Manual of Contract Documents for Highways Works* (MCHW)[1], Volume 1 series 0500 and Volume 2 series NG 0500.

The general requirements for Thermoplastic Structured Wall Pipes and Fittings are contained in the MCHW, Volume 1 *Specification for Highway Works*, Clause 518.

Further requirements are detailed in the MCHW, Volume 3, Section 1, F series, Drawing Nos F1 and F2.

Additional site requirements may be included on particular contracts.

(1) The MCHW is operated by the Overseeing Organisations: Highways England (HE), Transport Scotland, the Welsh Assembly Government and the Department for Regional Development (Northern Ireland).

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 section: 1 *Description* (1.2) of this Certificate.

Technical Specification

1 Description

1.1 Ridgidrain Fittings (150 mm to 600 mm) comprise a range of fittings manufactured from black polypropylene copolymer outer layer with a blue[1] polypropylene inner layer, or from black polyethylene copolymer outer layer with a blue[1] polyethylene inner layer. The fittings are for use in conjunction with the pipes covered by Product Sheets 1 and 6 of this Certificate.

(1) Other internal colours are available.

1.2 The product range available is:

- injection-moulded components manufactured from polypropylene to nominal dimensions of 150, 225, 300 and 375 mm (see Table 1)
- pipes (nominal dimensions of 150 to 600 mm) manufactured from polyethylene (see Table 2)
- injection-moulded components manufactured from polyethylene to nominal dimensions of 400, 450, 500 and 600 mm (see Table 3).

Table 1 Material properties for injection moulded polypropylene components[1]

Property	Test method reference	Specification
Melt mass-flow rate	BS EN ISO 1133	<7 g/(10 min)$^{-1}$ 2.16 kg at 230°C
Reference density	BS EN ISO 1183	>890 kg·m^{-3}
Thermal stability (OIT)	BS EN 728	> 4 min
Tensile properties	BS EN ISO 527	Sample 1B at 50 mm/min^{-1} >18MPa
Heat reversion	ISO 12091	150°C ±2°C (Pass)

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

Table 2 Material properties for polyethylene pipes[1]

Property	Test method reference	Specification
Melt mass-flow rate	BS EN ISO 1133	<1.0 g/(10 min)$^{-1}$ 2.16 kg at 190°C
Reference density	BS EN ISO 1183	>935 kg·m^{-3}
Thermal stability (OIT)	BS EN 728	> 4 min
Tensile properties	BS EN ISO 527	Sample 1B at 50 mm/min^{-1} >18 MPa
Heat reversion	ISO 12091	110°C±2°C (Pass)

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

Table 3 Material properties for injection moulded polyethylene components[1]

Property	Test method reference	Specification
Melt mass-flow rate	BS EN ISO 1133	< 8 g/(10 min)$^{-1}$ 2.16 kg at 190°C
Reference density	BS EN ISO 1183	>935 kg·m^{-3}
Thermal stability (OIT)	BS EN 728	> 4 min
Tensile properties	BS EN ISO 527	Sample 1B at 50 mm/min^{-1} >18 MPa
Heat reversion	ISO 12091	110°C±2°C (Pass)

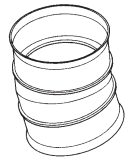
(1) This table is the format of Appendix 5/7 of the MCHW, Volume 2. It is used to satisfy Clause 518.2 of the MCHW, Volume 1.

1.3 Details and dimensions of the fittings product range are given in Figure 1.

Figure 1 Ridgidrain ADS fittings

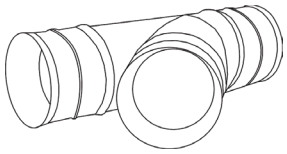
Bends (fabricated) (polypropylene/polyethylene)

11.25°, 22.5°, 45° and 90°



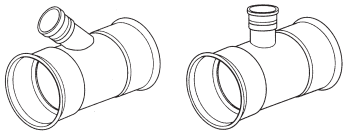
Nominal size (mm)	
Polypropylene	Polyethylene
225	400
300	450
375	500
	600

Equal junctions (fabricated) 45° and 90°



Nominal size (mm)	
Polypropylene	Polyethylene
225	400
300	450
375	500
	600

Unequal junctions (fabricated) 45° and 90°



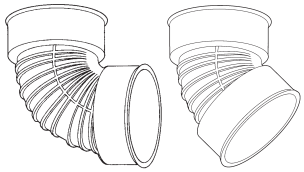
Nominal size (mm)	
Polypropylene	Polyethylene
225 x 100[1]	400 x 150
300 x 100[1]	400 x 225
300 x 225	400 x 300
375 x 100[1]	400 x 375
375 x 150	450 x 150
375 x 225	450 x 225
375 x 300	450 x 300
	450 x 375
	450 x 400
	500 x 150
	500 x 225
	500 x 300
	500 x 375
	500 x 400
	500 x 450
	600 x 150
	600 x 225
	600 x 300
	600 x 375
	600 x 400
	600 x 450
	600 x 500

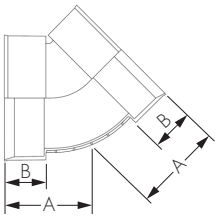
(1) Only suitable for access for inspection and maintenance.

Figure 1 Ridgidrain ADS fittings (continued)

Injection-moulded fittings (polypropylene)

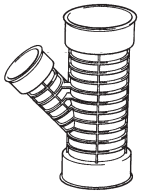
Bends





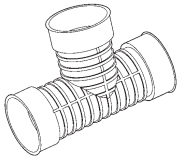
Angle	Nominal size (mm)
15°	150
30°	150
45°	150
87.5°	150

Unequal junction 45°



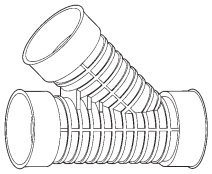
Nominal size (mm)
225 x 150
300 x 150

Equal junction 90°



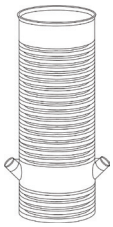
Nominal size (mm)
150 x 150

Equal junction 45°



Nominal size (mm)
150 x 150

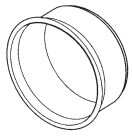
Special long fittings, single or double 45° branch (polyethylene)



Nominal size (mm)	Length (m)	Branch size	
		unequal	equal
400	3 or 6	150[1]	400[2]
450	3 or 6	150[1]	450[2]
500	3 or 6	150[1]	500[2]
600	3 or 6	150[1]	600[2]

(1) Single and double unequal branches.
(2) Single 45° branch for equal double branch not covered by this Certificate.

End caps (polypropylene)



Nominal size (mm)
150
225
300

Sealing rings (rubber)

Nominal size (mm)
150
225
300
375
400
450
500
600

1.4 Rubber ring seals to BS EN 681-1: 1996 are available for each size of pipe for connection to the fittings.

2 Manufacture

2.1 The polyethylene and polypropylene fittings are manufactured by either fabrication or injection moulding. Component parts used in the fabricated fittings are twin-wall extruded pipes, injection-moulded coupling and sheet material. During fabrication these are cut and welded to produce the relevant size configurations.

2.2 The rubber ring seals are manufactured to BS EN 681-1 : 1996.

2.3 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.

2.4 The management system of Polypipe Civils Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 by BSI (Certificate Q06225).

3 Delivery and site handling

3.1 Each fitting carries a label bearing the BBA logo incorporating the number of this Certificate, and the angle of the bends and junctions.

3.2 Fittings with 300 mm nominal diameter and above must be handled with care.

3.3 When long-term storage is envisaged, fittings must be protected from direct sunlight.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Ridgidrain Fittings (150 mm to 600 mm).

Design Considerations

4 General

Ridgidrain Fittings (150 mm to 600 mm), when used in conjunction with the pipes subject of Product Sheets 1 and 6 of this Certificate and installed in accordance with the recommendations given in this Certificate, are satisfactory for use in highways for the collection and disposal of surface and sub-surface water.

5 Practicability of installation

The fittings are designed to be installed by a competent contractor experienced with these types of products in highways works.

6 Strength

The fittings have adequate strength to resist loads associated with installation and with subsequent use in the situations described in this Certificate.

7 Performance of joints

The joints constructed from connectors with rubber seals remain watertight when subjected to deflection and distortion, and comply with the MCHW, Volume 1, Clauses 504.3 and 518.7.

8 Flow characteristics

When used with suitable pipes, the fittings will increase the hydraulic resistance of the system. Loss coefficients (K values) may be taken as:

- 11° bends 0.2
- 22.5° and 45° bends 0.5
- 45° branch connections 1.0.

9 Maintenance

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

9.2 Drains incorporating the fittings can be rodded using conventional drain rods.

9.3 In common with other standard plastics drainage systems, toothed root cutters and rods with metal ferrules, as used with some mechanical cleaning systems, could damage the fittings and should not be used.

9.4 Drains incorporating the fittings have adequate resistance to water cleansing by pressure-jetting equipment (see section 12). It is recommended that low-pressure, high-volume systems are used in accordance with the MCHW, Volume 1, Clause 520.

10 Durability

In the opinion of the BBA, when used in the context of this Certificate, the fittings can be expected to have a service life equivalent to that of other plastic fittings listed in Table 5/1 of the MCHW, Volume 1.

11 Reuse and recyclability

The fittings are manufactured from polyethylene and polypropylene, which can be recycled.

Installation

12 General

Drains utilising the Ridgidrain Fittings (150 mm to 600 mm) must be installed in accordance with the MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

13 Procedure

13.1 For typical laying, trench and backfilling specification details, reference should be made to Figure 2 and the MCHW, Volume 3, Drawing Nos F1 (Type T and S) and F2 (Type G, H and I).

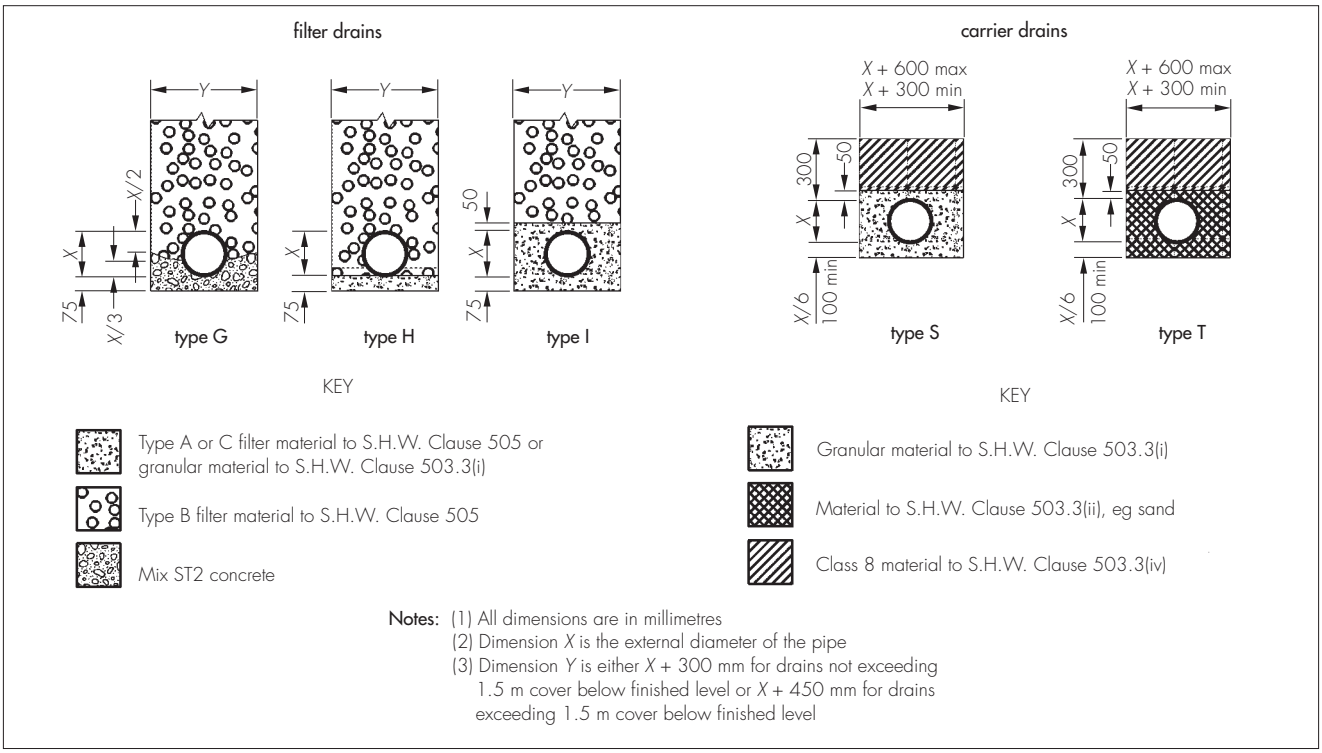
13.2 Pipes are cut using conventional hand tools, and should be cut square between the corrugations.

13.3 For a watertight joint, the pipe ends and coupler are cleaned and a rubber seal fitted externally between the first and the second corrugations in the pipe. The seal and the 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.

13.4 The perforated and unperforated pipes and couplers must be protected against damage from site construction traffic.

13.5 Care should be taken during backfill to maintain the line and level of the pipeline. If necessary, the pipe should be restrained to prevent uplift.

Figure 2 Installation details (MCHW, Volume 3, Section 1, F series Drawing Nos F1 and F2)



Notes: (1) All dimensions are in millimetres
(2) Dimension *X* is the external diameter of the pipe
(3) Dimension *Y* is either *X* + 300 mm for drains not exceeding 1.5 m cover below finished level or *X* + 450 mm for drains exceeding 1.5 m cover below finished level

14 Tests

Tests were conducted and the results assessed to determine:

- dimensional accuracy
- rodding resistance
- resistance to an applied torque of 900 $N \cdot m^{-1}$, or the torque at which the pipe and/or connector is damaged, whichever occurs first; the test carried out with one end of the fitting fully restrained and the connector and pipe fitted to the other
- impact resistance (drop) test
- ring stiffness
- strength of flexibility of fabricated fittings
- watertightness of fabricated fittings
- leaktightness of joints.

15 Investigations

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

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

BS EN ISO 527-1 : 2012 *Plastics — Determination of tensile properties — General principles*

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 1183-1 : 2012 *Plastics — Methods for determining the density and relative density of non-cellular plastics — Immersion method, liquid pyknometer method and titration method*

BS EN ISO 9001 : 2015 *Quality management systems — Requirements*

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

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*
Manual of Contract Documents for Highway Works, Volume 3 *Highway Construction Details*

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.

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