



Polypipe Civils Ltd

Union Works
Bishop Meadow Road
Loughborough
Leicestershire LE11 5RE
Tel: 01509 615100 Fax: 01509 265945

**Agrément
Certificate
No 00/3678**
Third issue*

Designated by Government
to issue
European Technical
Approvals

RIDGIDRAIN ADVANCED DRAINAGE SYSTEM

Systèmes de canalisations d'évacuation
Abflußleitungen

Product




• THIS CERTIFICATE RELATES TO THE RIDGIDRAIN ADVANCED DRAINAGE SYSTEM, COMPRISING POLYETHYLENE AND POLYPROPYLENE TWIN WALL PIPES AND COUPLERS.

• This Certificate covers the use of the pipe as a filter or carrier pipe for surface water only.

These Front Sheets must be read in conjunction with the accompanying Detail Sheets which provide information to specific systems.

Regulations — Detail Sheet 1

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

 The Secretary of State has agreed with the British Board of Agrément the requirements of the Building Regulations to which surface water pipe can contribute in achieving compliance. In the opinion of the BBA, the Ridgidrain Advanced Drainage System, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: H3(3)

Rainwater drainage

Comment:

The system will convey the flow of rainwater and minimise the risk of blockages or leakage. See the tinted areas in the *Flow characteristics* section of the accompanying Detail Sheets.

Requirement: Regulation 7

Materials and workmanship

Comment:

The system is acceptable. See the tinted area in the *Durability* section of the accompanying Detail Sheets.

Electronic Copy

2 The Building Standards (Scotland) Regulations 1990 (as amended)



In the opinion of the BBA, the Ridgidrain Advanced Drainage System, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Technical Standards as listed below.

Regulation:	10	Fitness of materials and workmanship
Standard:	B2.1	Selection and use of materials, fittings, and components and workmanship
Comment:		The system is acceptable. See the tinted area in the <i>Durability</i> section of the accompanying Detail Sheets.
Regulation:	24	Drainage and sanitary facilities
Standard:	M2.1	Drainage system
Comment:		The system will meet the relevant requirements of this Standard. See the tinted areas in the <i>Flow characteristics</i> section of the accompanying Detail Sheets.

3 The Building Regulations (Northern Ireland) 2000



In the opinion of the BBA, the Ridgidrain Advanced Drainage System, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See the tinted area in the <i>Durability</i> section of the accompanying Detail Sheets.
Regulation:	N5	Rain-water drainage
Comment:		The system will meet the relevant requirements of this Regulation. See the tinted areas in the <i>Flow characteristics</i> section of the accompanying Detail Sheets.

4 Construction (Design and Management) Regulations 1994 (as amended) Construction (Design and Management) Regulations (Northern Ireland) 1995 (as amended)

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See sections: 2 *Delivery and site handling* (2.1) and 10 *General* (10.1) of the accompanying Detail Sheets.

Conditions of Certification

5 Conditions

5.1 This Certificate:

- (a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) is valid only within the UK;
- (d) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (e) is copyright of the BBA;
- (f) is subject to English law.

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

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

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine; and

(c) are reviewed by the BBA as and when it considers appropriate.

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

- (a) the presence or absence of any patent, intellectual property or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the actual works in which the product is installed, used and maintained, including the nature, design, methods and workmanship of such works.

5.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do 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 or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future 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 installation and use of this product.



In the opinion of the British Board of Agrément, the Ridgidrain Advanced Drainage System is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 00/3678 is accordingly awarded to Polypipe Civils Ltd.

On behalf of the British Board of Agrément

Date of Third issue: 2nd December 2004

Chief Executive

**Original Certificate issued on 28th February 2000. This amended version issued to include new Conditions of Certification.*

Electronic Copy

British Board of Agrément

P O Box No 195, Bucknalls Lane
Garston, Watford, Herts WD25 9BA
Fax: 01923 665301

©2004

e-mail: mail@bba.star.co.uk
website: www.bbacerts.co.uk



For technical or additional information,
contact the Certificate holder (see
front page).
For information about the Agrément
Certificate, including validity and
scope, tel: Hotline 01923 665400,
or check the BBA website.



Polypipe Civils Ltd

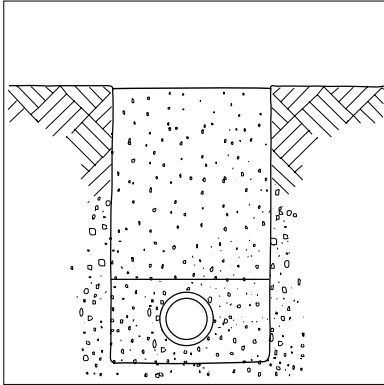
**RIDGIDRAIN ADS — SURFACE WATER
FILTER AND CARRIER (PERFORATED AND
UNPERFORATED) PIPES AND COUPLERS**

Certificate No 00/3678

DETAIL SHEET 2

*Third issue**

Product



• THIS DETAIL SHEET RELATES TO THE RIDGIDRAIN ADS — SURFACE WATER FILTER AND CARRIER (PERFORATED AND UNPERFORATED) PIPES AND COUPLERS.

• The pipes and couplers covered by this Detail Sheet are in diameters of 100 mm, 150 mm, 225 mm, 300 mm, 375 mm, 400 mm, 450 mm, 500 mm and 600 mm.

This Detail Sheet must be read in conjunction with the Front Sheets which give the product's position regarding the Building Regulations and Conditions of Certification, respectively.

Technical Specification

1 Description

1.1 Ridgidrain ADS — Surface Water 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 400 mm to 600 mm diameter, are manufactured in black polypropylene outer layer and a blue polypropylene inner layer as standard. 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, ISO 527	Sample 1B at 50 mm min ⁻¹ ≥ 18 MPa
Oxygen induction time	EN 728	≥ 4 min
Melt flow rate	ISO 1133, ISO 4440	≤ 1.0 g (10 min) ⁻¹ 2.16 kg at 190°C
Density	ISO 1183, ISO 4451	≥ 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, ISO 527	Sample 1B at 50 mm min ⁻¹ ≥ 21 MPa
Oxygen induction time	EN 728	≥ 4 min
Melt flow rate	ISO 1133, ISO 4440	≤ 1.8 g (10 min) ⁻¹ 2.16 kg at 230°C
Density	ISO 1183, ISO 4451	≥ 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)

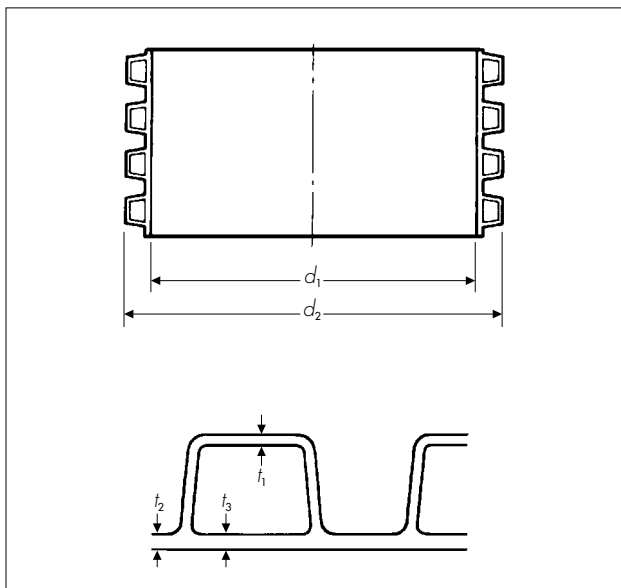
1.3 The outer wall is corrugated and the inner wall is smooth finished. Details and dimensions are given in Table 3 and Figure 1.

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	149	178.20	0.7	1.0	0.8	6	1.30
225	221	267.00	0.7	1.3	0.8	6	3.20
300	294	355.30	0.9	1.5	0.8	6	4.90
375	372	435.50	1.6	2.9	1.5	6	6.70
400	395	457.50	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 pipe



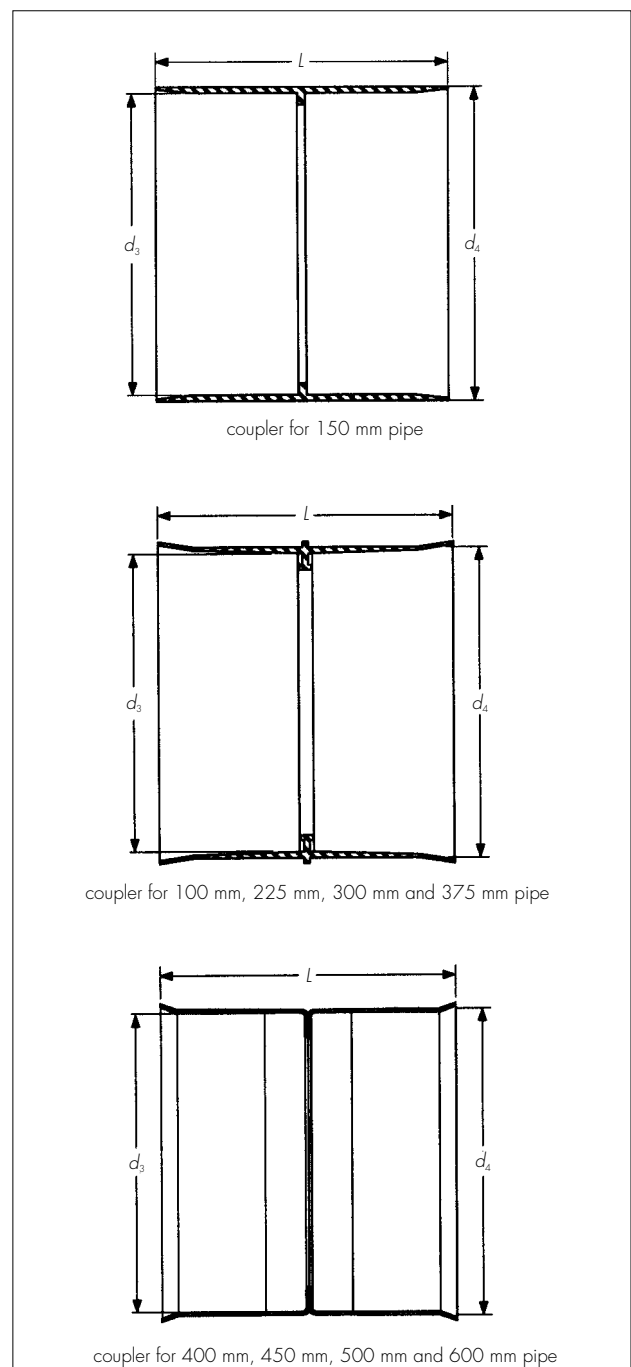
1.4 Black polypropylene couplers are available for each size of pipe. Details and dimensions are given in Table 4 and Figure 2.

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	177	186(184) ⁽¹⁾	183	15
225	265	275	260	22
300	353	365	280	27
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

(1) Tapered along coupler length.

Figure 2 Couplers

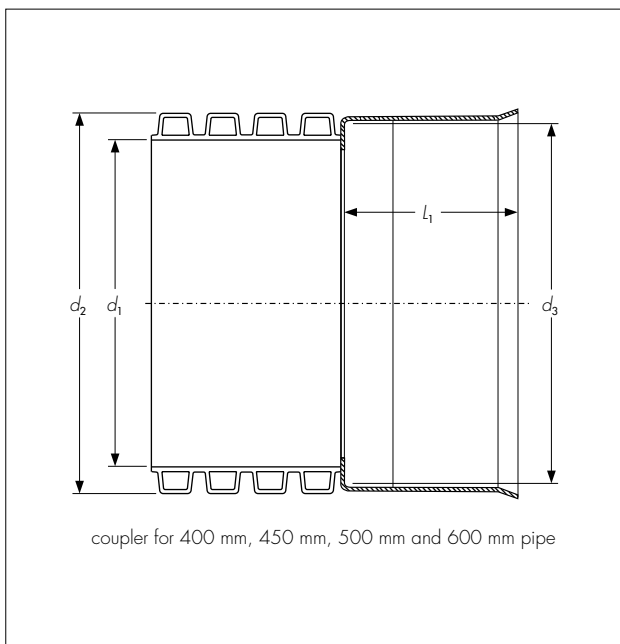


1.5 Pipe 100 mm to 375 mm diameter is supplied with a separate injection moulded coupler. Pipe 400 mm to 600 mm diameter is supplied with either an integrally welded socket or a separate coupler. The integral socket end is designed to connect with the plain pipe end and is the same as half the coupler.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

Table 5 Integral socket dimensions

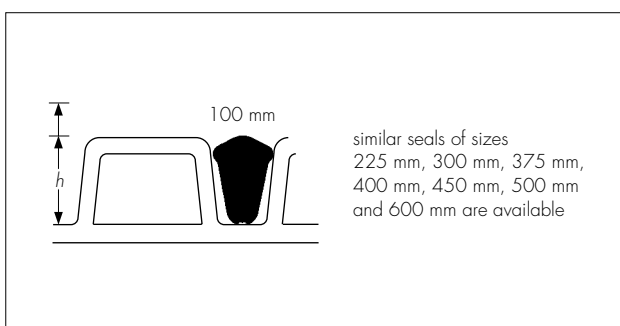
Nominal internal pipe diameter, d_1 (mm)	Nominal socket diameter, d_3 (mm)	Nominal socket depth, L_1 (mm)	Nominal seal height (h) (mm)
400	461	196	32
450	517	215	35
500	574	240	38
600	678	275	44

Figure 3 Welded integral socket and couplers



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.

Figure 4 Seals



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 dwells per metre	Slot length (range) (mm)	Slot width (range) (mm)	Permeable area (minimum) (mm^2m^{-1})
100	4	60	15–25	1.5–2.0	5400
100 (H) ⁽¹⁾	3	80	10–20	1.0–2.0	2400
150	4	51	10–25	1.5–2.5	3060
150 (H) ⁽¹⁾	3	52	20–52	1.0–2.0	3120
225	4	41	15–30	1.5–2.7	3690
225 (H) ⁽¹⁾	3	40	25–60	1.0–2.0	3000
300	10	29	15–35	1.5–3.4	6525
300 (H) ⁽¹⁾	6	32	25–71	1.0–2.0	4800
375	10	20	20–45	1.5–3.6	6000
400	2	20	70–90	3.0–4.0	8400
450	2	26	70–90	3.0–4.0	10920
500	2	22	70–90	3.0–4.0	9240
600	2	19	80–100	3.0–4.0	9120

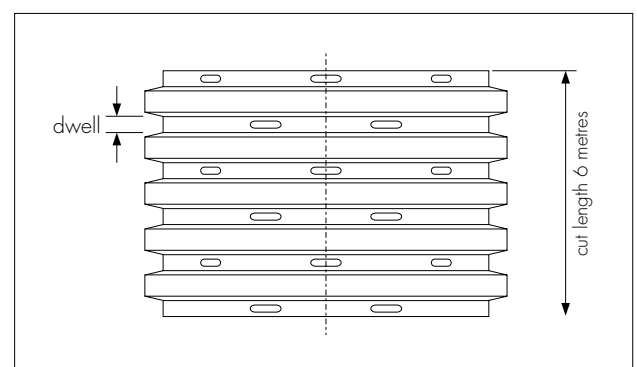
- (1) (H) = Produced at Horncastle site.

Table 7 Perforated pipe details — half perforated

Nominal internal pipe diameter (mm)	No of slots per dwell	No of dwells per metre	Slot length (range) (mm)	Slot width (range) (mm)	Permeable area (minimum) (mm^2m^{-1})
100	2	60	15–25	1.5–2.0	2700
100 (H) ⁽¹⁾	2	80	10–20	1.0–2.0	1200
150	2	51	10–25	1.5–2.5	1530
150 (H) ⁽¹⁾	2	52	20–52	1.0–2.0	1560
225	2	41	15–30	1.5–2.7	1845
225 (H) ⁽¹⁾	2	40	25–60	1.0–2.0	1500
300	5	29	15–35	1.5–3.4	3262
300 (H) ⁽¹⁾	4	32	25–71	1.0–2.0	2400
375	5	20	20–45	1.5–3.6	3000
400	1	20	70–90	3.0–4.0	4200
450	1	26	70–90	3.0–4.0	5460
500	1	22	70–90	3.0–4.0	4620
600	1	19	70–90	3.0–4.0	4560

- (1) (H) = Produced at Horncastle site.

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.

Design Data

3 General

3.1 Ridgidrain ADS — Surface Water Filter and Carrier (Perforated and Unperforated) Pipes and Couplers have been assessed for use underground for the conveyance of 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.

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 *Table for the Hydraulic Design of Pipes, Sewers and Channels*, Volume 2, 7th 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.

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.

10 General

10.1 Installation of Ridgidrain ADS — Surface Water Filter and Carrier (Perforated and Unperforated) 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.

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.

The following is a summary of the technical investigations carried out on Ridgidrain ADS — Surface Water Filter and Carrier (Perforated and Unperforated) Pipes and Couplers.

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 : 1996 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
- flow capacity
- practicability of installation
- material properties
- resistance to rodding and jetting
- 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 : 1996 *Methods of testing plastics — Thermoplastics pipes, fittings and valves — 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 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 527 *Plastics — Determination of tensile properties*

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

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

ISO 4440 : 1994 *Thermoplastics pipes and fittings*

ISO 4451 : 1980 *Polyethylene (PE) pipes and fittings — Determination of reference density of uncoloured and black polyethylenes*

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)



On behalf of the British Board of Agrément

Date of Third issue: 2nd December 2004

A handwritten signature in black ink, appearing to read 'P. C. Newson'.

Chief Executive

*Original Detail Sheet issued on 28th February 2000. This amended version issued to include new test data.

British Board of Agrément

P O Box No 195, Bucknalls Lane
Garston, Watford, Herts WD25 9BA
Fax: 01923 665301

©2004

e-mail: mail@bba.star.co.uk
website: www.bbacerts.co.uk



For technical or additional information,
contact the Certificate holder (see
front page).
For information about the Agrément
Certificate, including validity and
scope, tel: Hotline 01923 665400,
or check the BBA website.



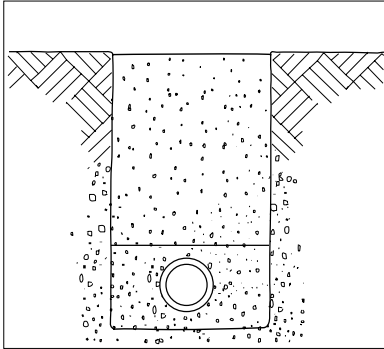
Polypipe Civils Ltd

Certificate No 00/3678

**RIDGIDRAIN ADS — 750 mm AND 900 mm
PIPES AND COUPLERS**

DETAIL SHEET 3
Third issue*

Product



• THIS DETAIL SHEET RELATES TO RIDGIDRAIN ADS — 750 mm AND 900 mm PIPES AND COUPLERS.

• The polypropylene copolymer filter and carrier pipes and couplers are for use in highway drainage for the collection and disposal of surface and sub-surface water.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the product's position regarding the Building Regulations and the Conditions of Certification, respectively.

Technical Specification

1 Description

1.1 Ridgidrain ADS — 750 mm and 900 mm filter and carrier (perforated and unperforated) pipes are manufactured in black polypropylene copolymer by a twin extrusion process. Two polypropylene copolymer pipes are extruded simultaneously, one inside the other, and heat welded together in one continuous process. The inner wall is usually coloured blue but other colours are available on request. The outer wall is coloured black.

1.2 The products tested and covered by this Detail sheet are manufactured from material with the specification given in Table 1.

1.3 The outer wall is corrugated and the inner wall is smooth finished. Details and dimensions are given in Table 2 and Figure 1.

Table 1 Material properties/specification⁽¹⁾

Property	Test method reference	Specification
Tensile properties	EN 638, ISO 527	Sample 1B at 50 mm min ⁻¹ ≥ 21 MPa
Oxygen induction time	EN 728	≥ 4 min
Melt flow rate	ISO 1133, ISO 4440	< 1.8 g (10 min) ⁻¹ 2.16 kg at 230°C
Density	ISO 1183, ISO 4451	≥ 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) This table is in the format of Appendix 5/7 of MCHW, Volume 2. It is used to satisfy Clause 518.2 of MCHW, Volume 1.

1.4 The 750 mm pipe can be supplied with a plain end and a welded integral socket end. The 900 mm is

only available with an integral socket. The integral socket end is designed to connect with the plain end or spigot pipe end and is the same as half the coupler (see Table 3 and Figure 2).

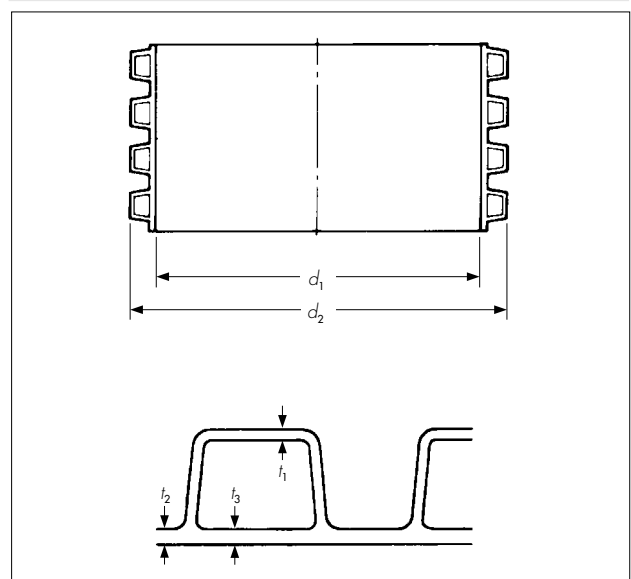
Table 2 Pipe dimensions

Nominal internal pipe diameter, d_1 (mm)	Nominal external pipe diameter, d_2 (mm)	t_1 min (mm)	t_2 min (mm)	t_3 min (mm)	Nominal length (m)	Nominal weight (kgm ⁻¹)
750	883	3	5	2.5	6	32
900	1036	3	6	3.0	6	45

Table 3 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)
750	887	430	70
900	1043	443	75

Figure 1 Ridgidrain ADS pipe

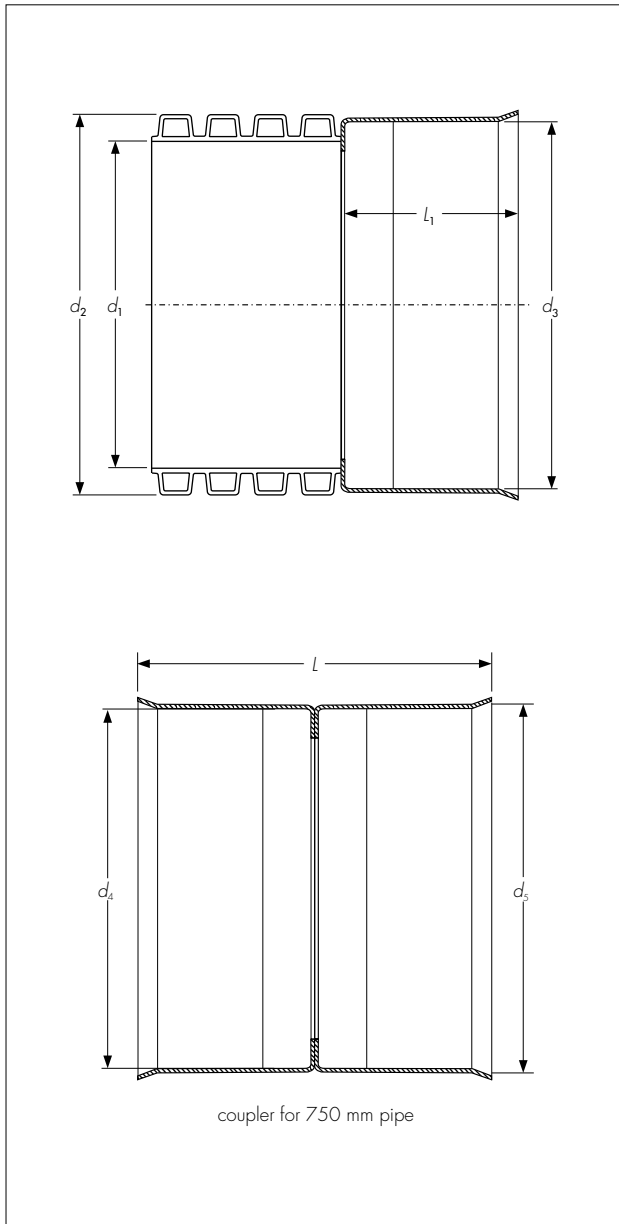


1.5 Black polyethylene copolymer couplers are manufactured by Polypipe Civils Ltd and are available for the 750 mm pipe (see Table 4 and Figure 2).

Table 4 Coupler dimensions

Nominal pipe size (mm)	Nominal internal diameter, d_4 (mm)	Nominal external diameter, diameter, d_5 (mm)	Nominal length (l) (mm)	Nominal seal height (h) (mm)
750	888	934	600	70

Figure 2 Welded integral socket and couplers



1.6 Each coupler requires two rubber seals that are supplied by the Certificate holder to BS EN 681-1 : 1996 (see Figure 3). The seals must be fitted in accordance with the installation instructions to ensure a watertight joint.

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 (see Table 5 and Figure 4). Alternatively, the slots are located on only one half of the pipe and thus the number of slots per dwell and the permeable area is halved.

Figure 3 Seal

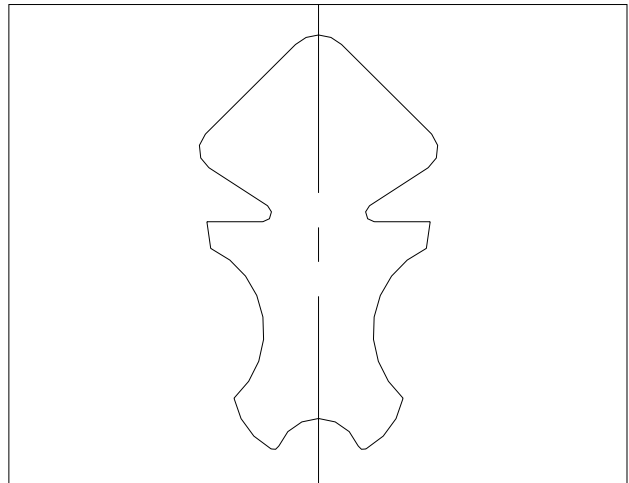


Table 5 Perforated pipe details

Nominal pipe diameter (mm)	No of slots per dwell	No of dwells per metre	Slot length (range) (mm)	Slot width (range) (mm)	Permeable area (minimum) (mm^2m^{-1})
750	1.0 or 2.0 ⁽¹⁾	9	120–170	3.0–4.0	4860
750	3.0	9	120–170	3.0–4.0	9720
900	1.0 or 2.0 ⁽¹⁾	9	120–170	3.0–4.0	4860
900	3.0	9	120–170	3.0–4.0	9720

(1) Alternates between one or two slots per dwell.

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 fitting 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 When long-term storage is envisaged, perforated and unperforated pipes and couplers must be protected from direct sunlight. If protection cannot be provided, consideration must be given to the effects of daily 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 significant effect on the impact resistance and physical properties
- over 12 months — damage will occur unless protection provided

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

2.3 Pipes should be stored on a flat surface. They are generally delivered as loose lengths and should not be stacked more than 4 m high. Care should be taken not to drop pipes or couplers on their ends, particularly during cold weather conditions.

Design Data

3 General

3.1 Ridgidrain perforated and unperforated pipes and couplers, when installed in accordance with the recommendations given in this Certificate, are suitable for use for the collection and disposal of surface and sub-surface water.

3.2 This Certificate does not cover the use of the pipe for domestic sewage, combined sewage 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 safe bedding depth purposes the pipes may be assumed to have a standard dimension ratio (SDR) equivalent of not greater than 41.

4.3 The pipes have adequate resistance to impact loads to which they may be subjected during installation and in service. Care should be taken during site handling and installation to not drop the pipes or couplers on their ends, particularly during cold weather conditions.

5 Performance of joints

Correctly made, the joints constructed from pipe and couplers with rubber seals remain watertight when subjected to deflection and distortion, and comply with BS EN 1277 : 1996, Method 4, conditions A, B, C.

6 Flow characteristics



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

6.2 Full-bore velocities are available from the *Table for the Hydraulic Design of Pipes, Sewers and Channels*, Volume 2, 7th 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 pipe 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.

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 of this Detail sheet. Installations will have a life in excess of 50 years.

Installation

10 General

10.1 Installation must be in accordance with the recommendations of BS EN 752-4 : 1998, BS 8005-1 : 1987 and BS 5955-6 : 1980, where appropriate.

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

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

The following is a summary of the technical investigations carried out on Ridgidrain ADS — 750 mm and 900 mm Pipes and Couplers.

12 Tests

12.1 The following tests were carried out to determine the stiffness characteristics of the pipe:

- initial pipe stiffness (STIS 5 min) to BS 4962 : 1989, Appendix B
- ultimate pipe stiffness (STES 50 years) to BS 4962 : 1989, Appendix B.
- pipe stiffness to BS EN ISO 9969 : 1995
- creep ratio to BS EN ISO 9967 : 1995.

12.2 Tests were carried out on jointed pipe to establish:

- watertightness of joints to BS EN 1277 : 1996, Method 4 : Conditions A, B and C
- the effects of an air test to MCHW requirements
- the effects of drop tests in accordance with BS 5481 : 1977.

12.3 Tests were carried out to establish the dimensional accuracy of the pipe, coupler and ring seal.

13 Investigations

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

13.2 An evaluation of existing data was made to assess material properties, chemical resistance and durability.

13.3 Calculations were carried out to determine the slot area.

13.4 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 4962 : 1989 *Specification for plastics pipes and fittings for use as subsoil field drains*

BS 5481 : 1977 *Specification for unplasticized PVC pipe and fittings for gravity sewers*

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

BS 8005-1 : 1987 *Sewerage — Guide to new sewerage construction*

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

BS EN 752-4 : 1998 *Drain and sewer systems outside buildings — Hydraulic design and environmental considerations*

BS EN 1277 : 1996 *Plastics piping systems. Thermoplastics piping systems for buried non-pressure applications. Test methods for leaktightness of elastomeric sealing ring type joints*

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

BS EN ISO 9969 : 1995 *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 527 *Plastics — Determination of tensile properties*

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

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

ISO 4440 : 1994 *Thermoplastics pipes and fittings*

ISO 4451 : 1980 *Polyethylene (PE) pipes and fittings — Determination of reference density of uncoloured and black polyethylenes*

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)



On behalf of the British Board of Agrément

Date of Third issue: 2nd December 2004

A handwritten signature in black ink, appearing to read 'P. C. Newson'.

Chief Executive

*Original Detail Sheet issued on 31st March 2000. This amended version issued to include new test data.