



Polypipe Civils Ltd

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

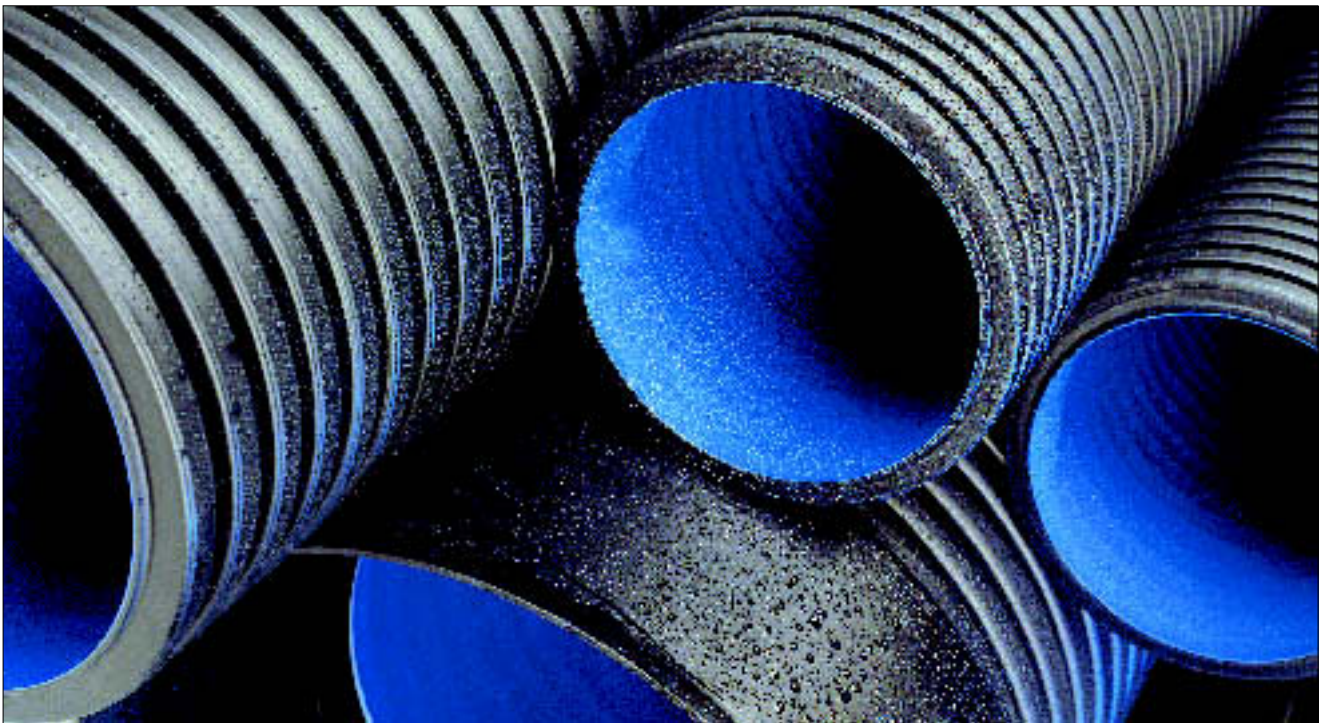
Designated by Government
to issue
European Technical
Approvals

RIDGIDRAIN ADVANCED DRAINAGE SYSTEM

Canalisations et raccordements
Leitungsrohre und Anschlüsse

This Certificate is issued under the Highway Authorities' Product Approval Scheme (HAPAS) by the BBA in conjunction with the Highways Agency (acting on behalf of the overseeing organisations of the Department for Transport; the Scottish Executive; the Welsh Assembly Government; the Department for Regional Development, Northern Ireland), the County Surveyors' Society, the Local Government Technical Advisers' Group, and industry bodies. HAPAS Agrément Certificates are normally each subject to a review every five years.

Product



• THIS CERTIFICATE RELATES TO THE RIDGIDRAIN ADVANCED DRAINAGE SYSTEM (ADS) FOR FILTER AND CARRIER HIGHWAY DRAINAGE.

• The system is for use in highway drainage for the collection and disposal of surface and sub-surface water in accordance with the Highways Agency requirements and the conditions set out in the Design Data and Installation parts of the accompanying Detail Sheets.

This Front Sheet must be read in conjunction with the accompanying Detail Sheets, which provide specific details of the product.

HAPAS Requirements — Detail Sheet 1

1 Requirements

- 1.1 The general requirements for drains are contained in the Manual of Contract Documents for Highway Works (MCHW), Volume 1 and Volume 2.
- 1.2 The general requirements for structured wall pipes and fittings are contained in the MCHW Volume 1, Clause 518.
- 1.3 Further information and guidance is given in MCHW, Volume 3, Drawing Numbers F1 and F2.
- 1.4 Additional site requirements may be included on particular contracts.

Regulations

2 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 12 *Procedures* (12.1) of the accompanying Detail Sheets.

Bibliography

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)

Manual of Contract Documents for Highway Works, Volume 3 *Highway Construction Details*, March 1998 (as amended)

Conditions of Certification

3 Conditions

3.1 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.

3.2 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.

3.3 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;
- (c) are reviewed by the BBA as and when it considers appropriate; and
- (d) remain in accordance with the requirements of the Highway Authorities' Product Approval Scheme.

3.4 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.

3.5 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 02/H068 is accordingly awarded to Polypipe Civils Ltd.

On behalf of the British Board of Agrément

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

Date of Third issue: 2nd December 2004

Chief Executive

*Original Certificate issued 27th March 2002. This amended version includes reference to a revised Highways Agency statement, and new Conditions of Certification.

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



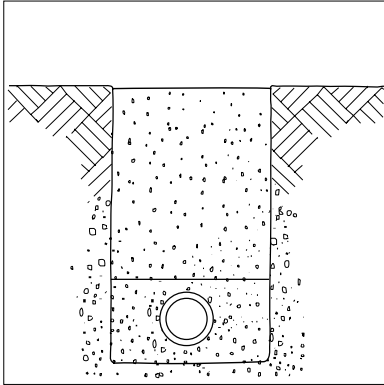
For technical or additional information, contact the Certificate holder (see front page).
For information about the Agrément Certificate, including validity and scope, tel: Hotline 01923 665400, or check the BBA website.



Polypipe Civils Ltd

**RIDGIDRAIN ADS 150 mm, 225 mm,
300 mm AND 375 mm
PIPES AND COUPLERS**

Product



• THIS DETAIL SHEET RELATES TO RIDGIDRAIN ADS 150 mm, 225 mm, 300 mm AND 375 mm HIGH DENSITY POLYETHYLENE FILTER AND CARRIER PIPES AND COUPLERS.

• The pipes and couplers comply with DTLR, HA Manual of Contract Documents for Highway Works (MCHW), Volume 1, Clause 518 and 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 Sheet, which gives additional information on the HAPAS Requirements, Regulations and Conditions of Certification.

Technical Specification

1 Description

1.1 Ridgidrain ADS 150 mm, 225 mm, 300 mm and 375 mm filter and carrier (slotted and unslotted) pipes are manufactured in a black polyethylene outer layer and a blue polyethylene inner layer by a twin extrusion process. The inner is available in other colours. For information contact the manufacturer. Two high-density polyethylene pipes are extruded simultaneously, one inside the other, and heat-welded together in one continuous process.

1.2 The products tested and covered by this Certificate 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 @ 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 @ 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

(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.

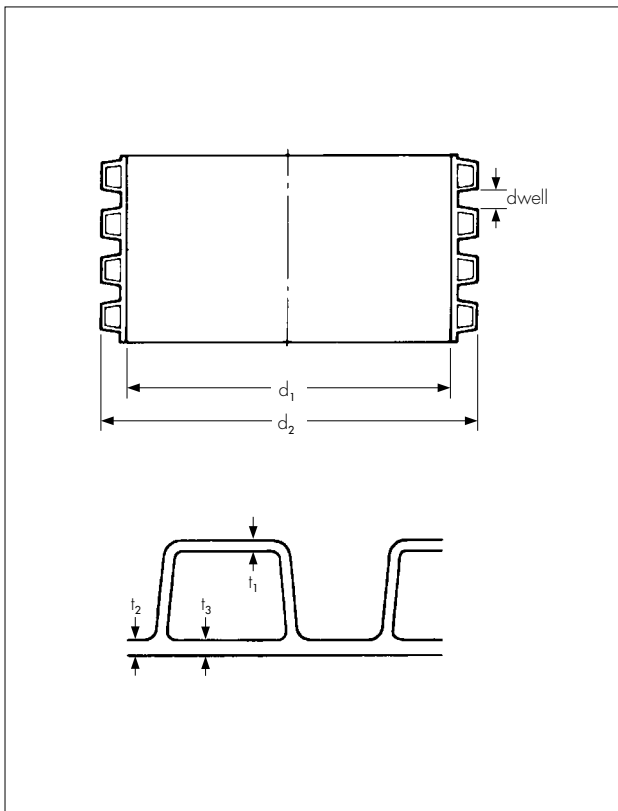
Table 2 Pipe dimensions

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)
150	149	178.2	0.7	1.0	0.8	6	1.30
225	221	267.0	0.7	1.3	0.8	6	3.20
300	294	355.3	0.9	1.5	0.8	6	4.90
375	372	435.5	1.6	2.9	1.5	6	6.70

(1) Nom = nominal.

(2) Min = minimum.

Figure 1 Ridgidrain pipe



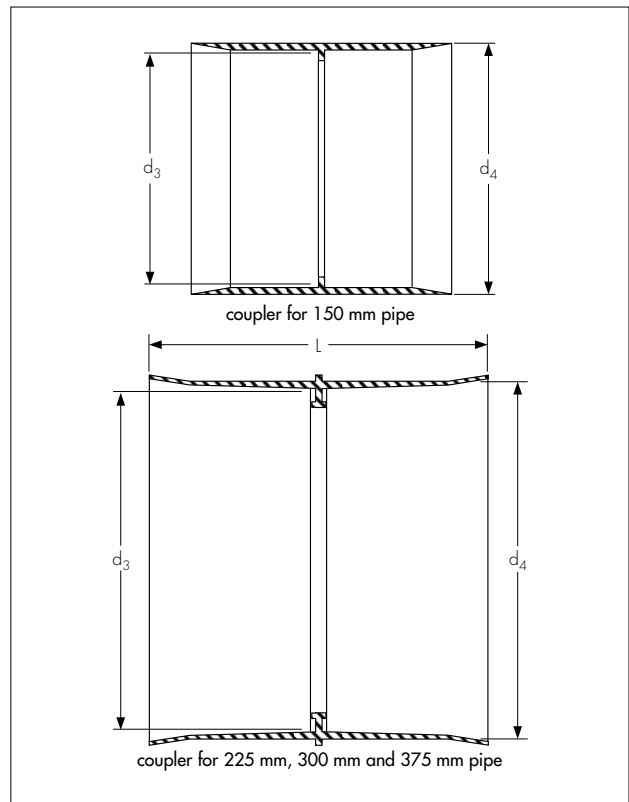
1.4 Black polypropylene couplers are made by Polypipe Civils Ltd and are available for each size of pipe (see Table 3 and Figure 2).

Table 3 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)
150	177.4	186(184) ⁽¹⁾	183	15
225	265.4	275	260	22
300	353.0	365	280	27
375	433.0	447	333	33

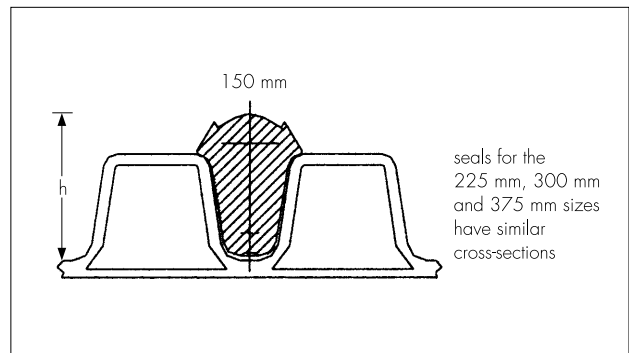
(1) Tapered along coupler length

Figure 2 Couplers



1.5 Each coupler requires two rubber seals which can be obtained from Polypipe Civils Ltd, manufactured 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.

Figure 3 Seals



1.6 Pipes can be supplied either slotted or unslotted. Slotted 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 Table 4 and Figure 4). Alternatively, the slots are located on one half only of the pipe and thus the permeable area is approximately halved.

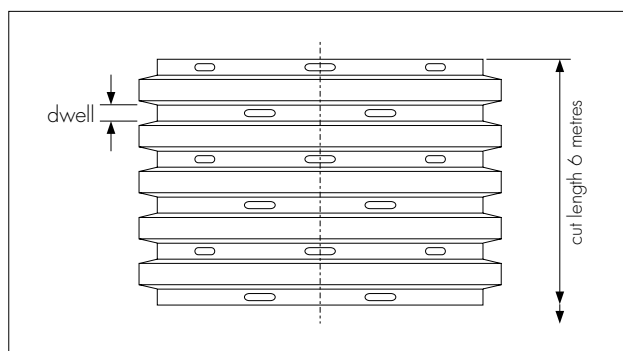
(1) Pipe sizes 300 mm and 375 mm do not have the offset for alternate dwells.

Table 4 Slotted pipe details

Nominal internal pipe diameter (mm)	No of slots per dwell	No of dwells per metre	Slot length (mm)	Slot width (mm)	Permeable area (minimum) (mm ² m ⁻¹)
150	4	49	10–25	1.5–2.5	2940
150 ⁽¹⁾	3	54	20–52	1–2	3240
150 ⁽²⁾	2	54	20–52	1–2	2160
225	4	40	15–30	1.5–2.7	3600
225 ⁽¹⁾	3	39	25–60	1–2	3042
225 ⁽²⁾	2	39	25–60	1–2	1951
300	5	29	15–35	1.5–3.4	3260
300 ⁽¹⁾	6	31	25–71	1–2	4650
300 ⁽²⁾	4	28.5	25–71	1–2	2550
375	5	19	20–45	1.5–3.6	2850

(1) Perforated
(2) Half perforated

Figure 4 Details of slots



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

Pipes

dimensional accuracy
impact resistance
short-term stiffness

Couplers

dimensional accuracy.

1.8 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, Ridgidrain ADS slotted and unslotted 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 months to 12 months — may have significant effect on the impact resistance and physical properties.

Over 12 months — damage will occur unless protection provided.

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

2.4 Pipes are generally delivered in prepacked bundles and should be retained in their packaging until installation.

Design Data

3 General

Ridgidrain ADS 150 mm, 225 mm, 300 mm and 375 mm Pipes and Couplers (slotted and unslotted) comply with the requirements of the Department for Transport, Local Government and the Regions, Highways Agency (DTLR, HA) Manual of Contract Documents for Highway Works (MCHW), Volume 1, Clause 518.5 for pipe, Clause 518.6 for couplers and Clause 518.7 for the system. When installed in accordance with the recommendations given in this Certificate, they are suitable for use in highways for the collection and disposal of surface and sub-surface water.

4 Strength

4.1 The pipes have a ring stiffness in excess of 6 kNm⁻² and a creep ratio of less than 4 and have adequate resistance to static loads.

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

4.3 The pipes can be used as an alternative to the plastic pipes for surface water drains listed in Table 5/1 of the MCHW, Volume 1, and for safe bedding depth purposes may be assumed to have a standard dimension ratio (SDR) equivalent of not greater than 41.

5 Performance of joints

5.1 Joints on filter pipes made from pipe and couplers without the rubber seals are not partially watertight as defined in the MCHW, Volume 1, Clause 504.3.

5.2 Correctly made, the joints constructed from pipe and couplers with rubber seals remain watertight when subjected to deflection and

distortion, and comply with the MCHW, Volume 1, Clauses 504.3 and 518.7 (see section 13).

6 Water infiltration

The slot area for the pipes exceeds the DTLR minimum requirement given in MCHW, Volume 1, Clause 518.3 of 1000 mm² per metre length (see Table 3).

7 Flow characteristics

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

7.2 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.

8 Practicability of installation

The pipes are installed easily using traditional drain-laying methods in accordance with DTLR requirements and MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8. The lengths in which the pipes are available and their lightness in weight are a significant advantage in handling and installation. Jointing of the pipes is achieved easily.

9 Maintenance

9.1 The slots are designed to restrict the ingress of silt into the drains.

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

9.3 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 clearing systems, could damage the pipes and couplers and should not be used.

9.4 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 utilised in accordance with MCHW, Volume 1, Clause 520.

10 Durability

In the opinion of the BBA, when used in the context of this Detail Sheet, the material from which the pipes and couplers are manufactured will not significantly deteriorate and the anticipated life of the system will be in excess of 50 years.

Installation

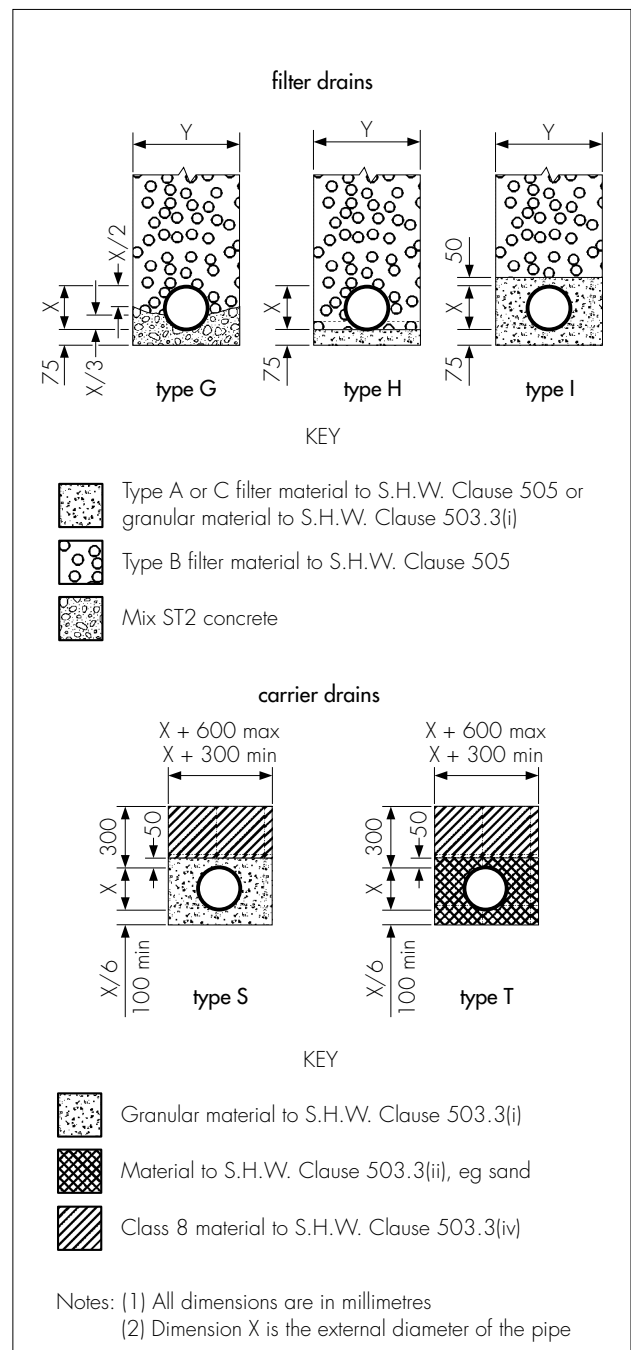
11 General

Ridgidrain ADS 150 mm, 225 mm, 300 mm and 375 mm Pipes and Couplers (slotted and unslotted) must be installed in accordance with DTLR, HA requirements and MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

12 Procedures

12.1 For typical laying, trench and backfilling specification details reference should be made to Figure 5 and the MCHW, Volume 3, Drawing Nos F1 (Type T and S) and F2 (Type G, H and I).

Figure 5 Installation details



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

12.3 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.

12.4 Ridgidrain slotted and unslotted pipes and couplers must be protected against damage from site construction traffic.

12.5 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.

Technical Investigations

The following is a summary of the technical investigations carried out on Ridgidrain ADS 150 mm, 225 mm, 300 mm and 375 mm Pipes and Couplers.

13 Tests

13.1 Tests were carried out on the pipe to determine compliance with MCHW, Volume 1, Clause 518.5 on:

determination of ring stiffness to

BS EN ISO 9969 : 1995

creep ratio to BS EN ISO 9967 : 1995

resistance to longitudinal bending to MCHW, Volume 1, Clause 518.11.

impact strength at 0°C and 23°C to BS EN 1411 :

1996 with a d25 striker of 1.0 kg mass
rodding resistance to MCHW, Volume 1,

Clause 518.12

water jetting WRc method.

13.2 Tests were carried out on joined pipe to establish compliance with MCHW, Volume 1, Clause 518.7 on:

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.

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

14 Other investigations

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

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

14.3 Calculations were carried out to determine the slot area.

14.4 Visits to sites in progress were carried out to assess the practicability of installation.

14.5 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 *Plastics pipework (thermoplastics materials)*

BS 5955-6 : 1980 *Code of practice for the installation of unplasticized PVC pipework for gravity drains and sewers*

BS EN 681 *Elastomeric seals. General requirements for pipe joint seals used in water and drainage application*

BS EN 681-1 : 1996 *Vulcanized rubber*

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

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

BS EN ISO 9969 : 1995 *Thermoplastic 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, May 2001 *Specification for Highway Works*

Manual of Contract Documents for Highway Works, Volume 2, May 2001 *Notes for Guidance on the Specification for Highway Works*

Manual of Contract Documents for Highway Works, Volume 3 *Highway Construction Details* : 2001, Drawing Nos F1 and F2



On behalf of the British Board of Agrément

Date of issue: 27th March 2002

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

Chief Executive

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Electronic Copy

British Board of Agrément

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

©2002

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



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contact the Certificate holder (see
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Certificate, including validity and
scope, tel: Hotline 01923 665400,
or check the BBA website.



Polypipe Civils Ltd

**RIDGIDRAIN ADS 400 mm, 450 mm,
500 mm AND 600 mm
PIPES AND COUPLERS**

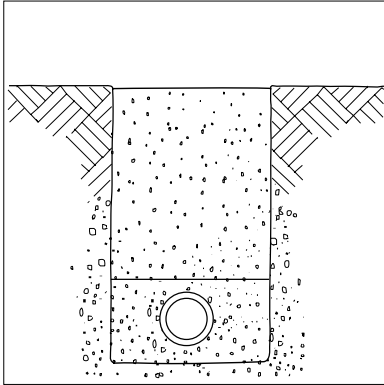
H A P A S

Roads and Bridges
Certificate No 02/H068

DETAIL SHEET 3

Second issue*

Product



• THIS DETAIL SHEET RELATES TO RIDGIDRAIN ADS 400 mm, 450 mm, 500 mm AND 600 mm POLYPROPYLENE COPOLYMER FILTER AND CARRIER PIPES AND COUPLERS.

• The pipes and couplers comply with HA Manual of Contract Documents for Highway Works (MCHW), Volume 1, Clause 518 and 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 Sheet, which gives additional information on the HAPAS Requirements, Regulations and Conditions of Certification.

Technical Specification

1 Description

1.1 Ridgidrain ADS 400 mm, 450 mm, 500 mm and 600 mm filter and carrier (perforated and unperforated) pipes are manufactured with a black polypropylene copolymer outer layer and a blue polypropylene copolymer inner layer, by a twin extrusion process. The inner layer is available in other colours. For information, contact the manufacturer. Two polypropylene copolymer pipes are extruded simultaneously, one inside the other, and heat-welded together in one continuous process.

1.2 The products tested and covered by this Certificate 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	< 1.8 g (10 min) ⁻¹ 2.16 kg at 230°C
Density	ISO 1183, ISO 4451	≥ 890 kgm ⁻³
Melt flow rate	ISO 4440	≤ 1.0 g (10 min) ⁻¹ 2.16 kg at 230°C
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.

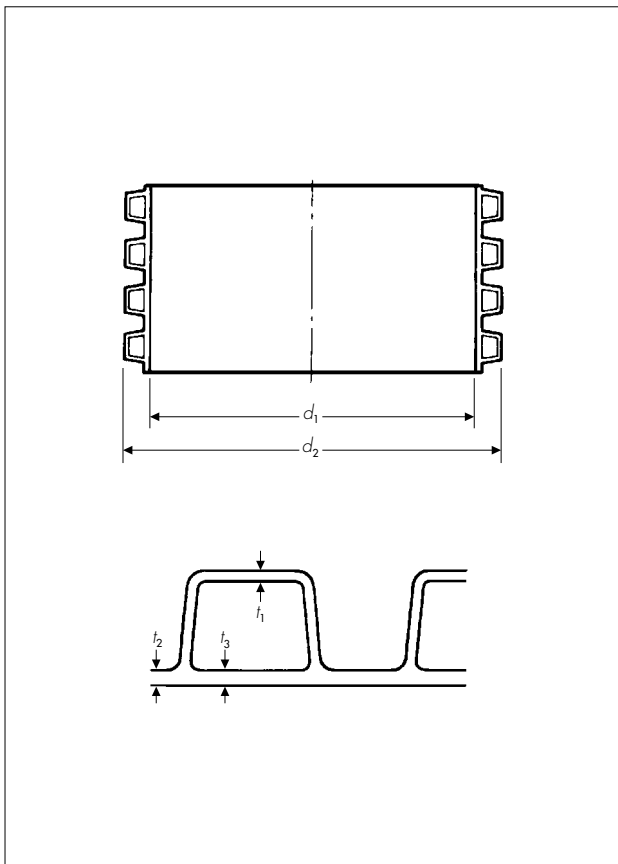
Table 2 Pipe dimensions

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)
400	395	457.5	1.7	3.0	1.5	6	7.3
450	445	512.25	1.7	3.0	1.5	6	9.4
500	496	569.5	1.8	3.2	1.6	6	11.0
600	588	674.5	1.8	3.3	1.7	6	14.0

(1) Nom = nominal.

(2) Min = minimum.

Figure 1 Ridgidrain pipe



1.4 All sizes of pipe can be supplied with a plain end and a welded integral socket end. 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 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)
400	461	196	32
450	517	215	35
500	574	240	38
600	678	275	44

1.5 Black polypropylene copolymer couplers are manufactured by the Certificate holder and are available for each size of pipe (see Table 4 and Figure 2).

Figure 2 Welded integral socket and couplers

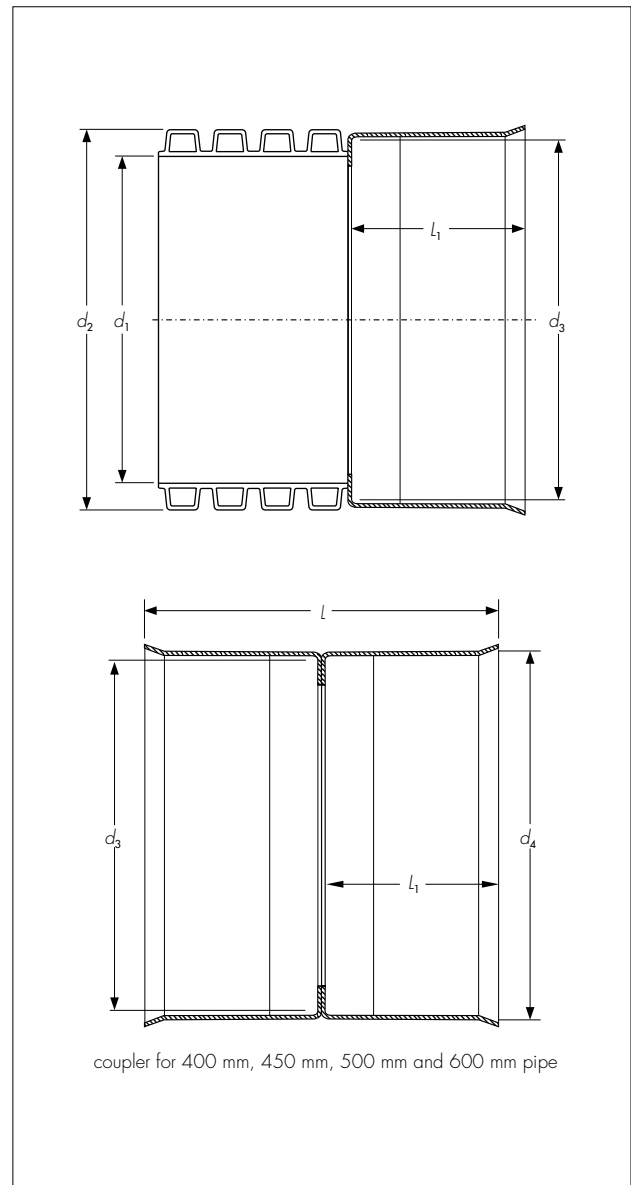
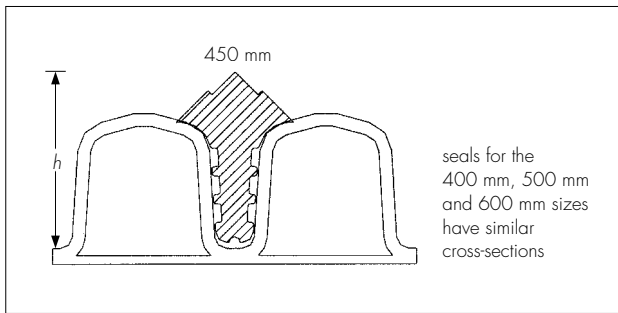


Table 4 Coupler dimensions

Nominal pipe size (mm)	Nominal internal diameter, d_3 (mm)	Nominal external diameter, d_4 (mm)	Nominal length (L) (mm)	Nominal seal height (h) (mm)
400	461	479	400	32
450	517	529	438	35
500	574	583	489	38
600	678	688	560	44

1.6 Each coupler requires two rubber seals which can be obtained from the Certificate holder, manufactured to BS EN 681-1 : 1996. The seals (see Figure 3) must be fitted in accordance with the installation instructions to ensure a watertight joint.

Figure 3 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 symmetrically for alternate dwells along the pipe length (see Tables 5 and 6 and Figure 4). Alternatively, the slots are located on one half only of the pipe and thus the permeable area is approximately halved.

Table 5 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})
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

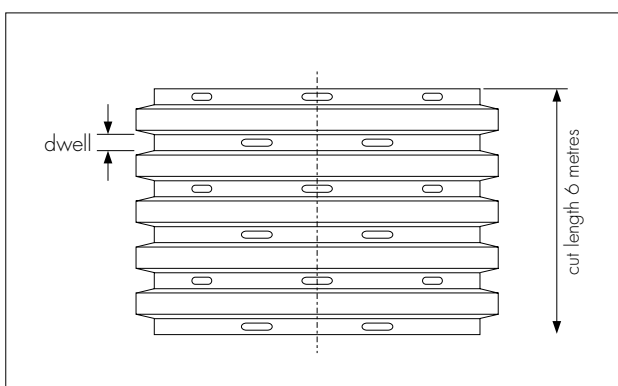
(1) (H) = Produced at Horncastle site.

Table 6 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})
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 4 Details of slots



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

Pipes

- dimensional accuracy
- impact resistance
- short-term stiffness

Couplers

- dimensional accuracy.

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

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

2.4 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

Ridgidrain ADS 400 mm, 450 mm, 500 mm and 600 mm Pipes and Couplers (perforated and unperforated), comply with the requirements of the Highways Agency (HA) Manual of Contract Documents for Highway Works (MCHW), Volume 1, Clause 518.5 for pipe, Clause 518.6 for couplers and Clause 518.7 for the system. When installed in accordance with the recommendations given in this Certificate, they are suitable for use in highways for the collection and disposal of surface and sub-surface water.

4 Strength

4.1 The pipes have a ring stiffness in excess of 6 kNm^{-2} and a creep ratio of less than 4 and have adequate resistance to static loads.

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

4.3 The pipes can be used as an alternative to the plastic pipes for surface water drains listed in Table 5/1 of the MCHW, Volume 1, and for safe bedding depth purposes may be assumed to have a standard dimension ratio (SDR) equivalent of not greater than 41.

5 Performance of joints

5.1 Joints on filter pipes made from pipe and couplers without the rubber seals are not watertight as defined in the MCHW, Volume 1, Clause 504.3.

5.2 Correctly made, the joints constructed from pipe and couplers with rubber seals remain watertight when subjected to deflection and distortion, and comply with the MCHW, Volume 1, Clauses 504.3 and 518.7 (see section 13).

6 Water infiltration

The slot area for the pipes exceeds the HA minimum requirement given in MCHW, Volume 1, Clause 518.3 of 1000 mm^2 per metre length (see Tables 5 and 6).

7 Flow characteristics

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

7.2 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.

8 Practicability of installation

The pipes are installed easily using traditional drain-laying methods in accordance with HA requirements and MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8. The lengths in which the pipes are available and their lightness in weight are a significant advantage in handling and installation. Jointing of the pipes is achieved easily.

9 Maintenance

9.1 The slots are designed to restrict the ingress of silt into the drains.

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

9.3 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 clearing systems, could damage the pipes and couplers and should not be used.

9.4 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 utilised in accordance with MCHW, Volume 1, Clause 520.

10 Durability

In the opinion of the BBA, when used in the context of this Detail Sheet, the material from which the pipes and couplers are manufactured will not significantly deteriorate and the anticipated life of the system will be in excess of 50 years.

Installation

11 General

Ridgidrain ADS 400 mm, 450 mm, 500 mm and 600 mm Pipes and Couplers (perforated and unperforated) must be installed in accordance with HA requirements and MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

12 Procedures

12.1 For typical laying, trench and backfilling specification details reference should be made to Figure 5 and the MCHW, Volume 3, Drawing Nos F1 (Type T and S) and F2 (Type G, H and I).

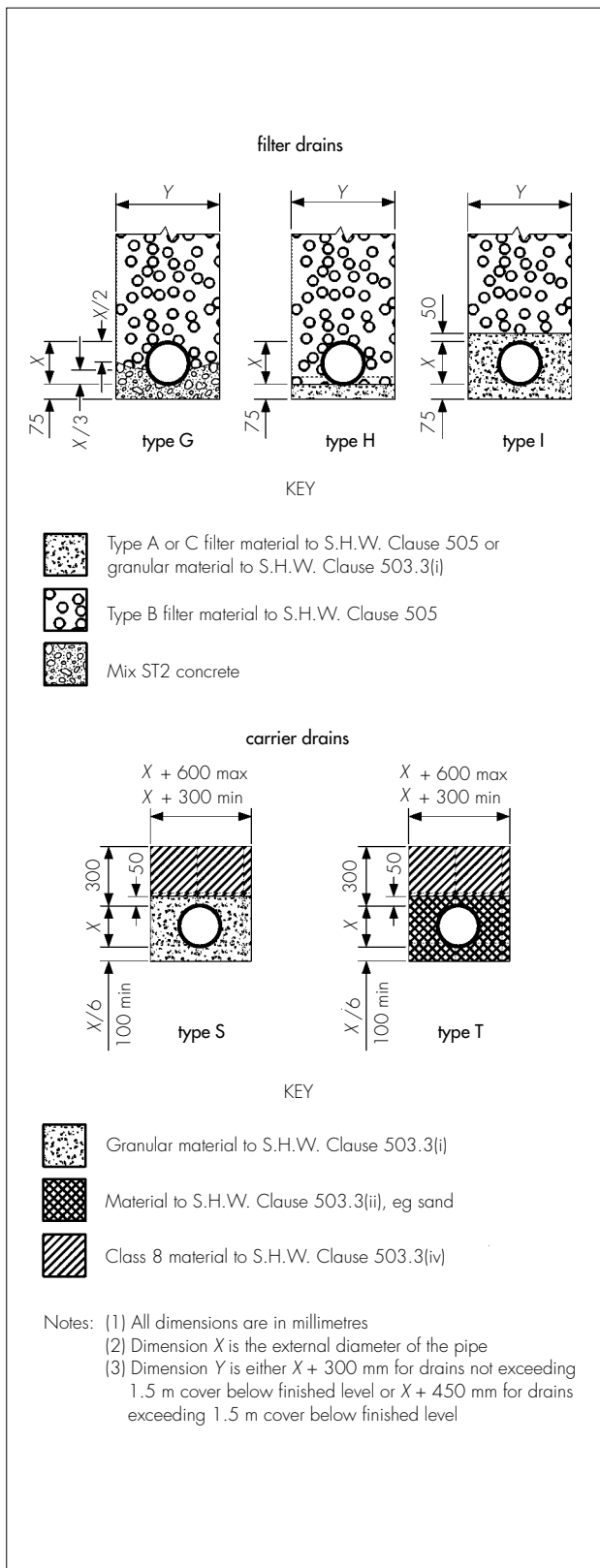
12.2 Pipes are cut easily using conventional hand tools, and should be cut square between the corrugations.

12.3 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.

12.4 Ridgidrain ADS perforated and unperforated pipes and couplers must be protected against damage from site construction traffic.

12.5 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 5 Trench and bedding details



Technical Investigations

The following is a summary of the technical investigations carried out on Ridgidrain ADS 450 mm, 500 mm and 600 mm Pipes and Couplers.

13 Tests

13.1 Tests were carried out to determine compliance with MCHW, Volume 1, Clause 518.5 on:

- determination of ring stiffness to BS EN ISO 9969 : 1995
- creep ratio to BS EN ISO 9967 : 1995
- impact strength at 0°C and 23°C to BS EN 1411 : 1996 with a d25 striker of 1.0 kg mass
- rodding resistance to MCHW, Volume 1, Clause 518.12
- water jetting WRc method.

13.2 Tests were carried out on joined pipe to establish compliance with MCHW, Volume 1, Clause 518.7 on:

- 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.

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

14 Investigations

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

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

14.3 Calculations were carried out to determine the slot area.

14.4 A visit to a site in progress was carried out to assess the practicability of installation.

14.5 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 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 1411 : 1996 *Plastics piping and ducting systems. Thermoplastics pipes. Determination of resistance to external blows by the staircase method*

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

BS EN ISO 9969 : 1995 *Thermoplastic 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)

Manual of Contract Documents for Highway Works, Volume 3 *Highway Construction Details*, March 1998 (as amended)



On behalf of the British Board of Agrément

Date of Second issue: 2nd December 2004

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

Chief Executive

*Original Detail Sheet issued on 27th March 2002. This amended version issued to include revised HAPAS references and new test data.

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British Board of Agrément

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

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

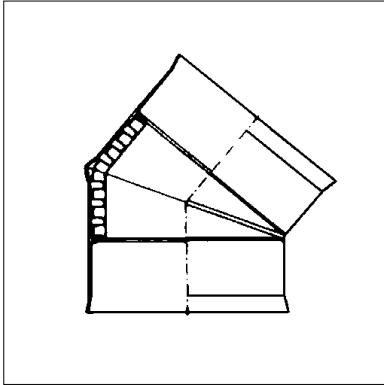


For technical or additional information,
contact the Certificate holder (see
front page).
For information about the Agrément
Certificate, including validity and
scope, tel: Hotline 01923 665400,
or check the BBA website.



Polypipe Civils Ltd

RIDGIDRAIN ADS FITTINGS

H A P A SRoads and Bridges
Certificate No 02/H068
DETAIL SHEET 4**Product**

• THIS DETAIL SHEET RELATES TO THE RIDGIDRAIN ADS FITTINGS, A RANGE OF FITTINGS IN SIZES OF 150 mm, 225 mm, 300 mm, 375 mm, 400 mm, 450 mm, 500 mm AND 600 mm FOR HIGHWAY DRAINAGE.

• The fittings are for use with the pipes described in Detail Sheets 2 and 3 of this Certificate for the collection and disposal of surface and sub-surface water.

This Detail Sheet must be read in conjunction with the Front Sheet, which gives additional information on the HAPAS Requirements, Regulations and Conditions of Certification.

Technical Specifications**1 Description**

1.1 Ridgidrain ADS Fittings are either fabricated from twin wall pipe and couplers (as certified in Detail Sheets 2 and 3) welded together or are injection moulded. Details and dimensions of the fittings are given in Figure 1.

1.2 The ring seals described in Detail Sheets 2 and 3 are available for each size of pipe for connection to the fittings.

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

dimensional accuracy

airtightness

visual examination.

1.4 Each fitting carries a label bearing the BBA identification mark incorporating the number of this Certificate, and the angle of the bends and junctions.

2 Delivery and site handling

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

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

Design Data**3 General**

Ridgidrain ADS Fittings, when used with the pipes described in Detail Sheets 2 and 3 and installed in accordance with the recommendations given in this Certificate, are suitable for use in highways for the collection and disposal of surface and sub-surface water.

4 Strength

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

5 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 (see section 12).

6 Flow characteristics

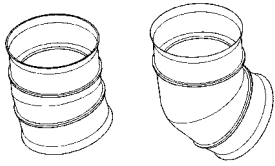
When used with the pipes described in Detail Sheets 2 and 3, the fittings will increase the hydraulic resistance of the system. Loss coefficients (K values) may be taken as:

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

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Figure 1 Ridgidrain ADS fittings (all measurements in mm — unless otherwise stated)

Bends (fabricated) 11.25°, 22.5°, 45° and 90°



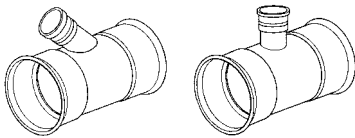
Nominal size
225
300
375
400
450
500
600

Equal junctions (fabricated) 45° and 90°

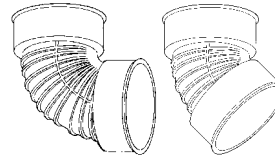
Nominal size
225
300
375
400
500
600

Unequal junctions (fabricated) 45° and 90°

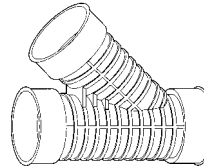
Nominal size
225 x 100
300 x 100
300 x 225
375 x 100
375 x 150
375 x 225
375 x 300
400 x 100
400 x 150
400 x 225
400 x 300
400 x 375
450 x 100
450 x 150
450 x 225
450 x 300
450 x 375
450 x 400
500 x 100
500 x 150
500 x 225
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600 x 150
600 x 225
600 x 300
600 x 375
600 x 400
600 x 450
600 x 500



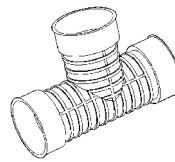
Injection moulded fittings



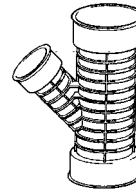
Bends	Nominal size
Bend 15°	150
Bend 30°	150
Bend 45°	150
Bend 87.5°	150



Nominal size	
Equal junction 45°	150 x 150

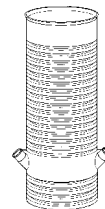


Nominal size	
Equal junction 90°	150 x 150



Nominal size	
Unequal junction 45°	150 x 100
	225 x 150
	300 x 150

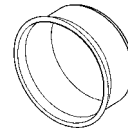
Special long fittings, single or double 45° branch



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

(1) Equal double branch not covered by this Certificate.

End caps



Nominal size
150
225
300

Sealing rings



Nominal size
150
225
300
375
400
450
500
600

7 Practicability of installation

The fittings are installed easily using conventional drain-laying techniques (see section 11).

8 Maintenance

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

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

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

9 Durability

Ridgidrain ADS fittings can be expected to have a life equivalent to that of other plastics fittings listed in Table 5/1 of MCHW, Volume 1.

Installation

10 General

Drains utilising the fittings must be installed in accordance with MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

11 Procedure

11.1 Typical laying, trench and backfilling specification details are given in section 11 of Detail Sheet 2 and section 12 of Detail Sheet 3.

11.2 To make a joint, a ring seal is fitted externally to the first corrugation in the pipe. The inside of the coupler is lubricated and the pipe pushed fully home to the central register.

11.3 Pipes and fittings must be protected from site construction traffic.

The following is a summary of the technical investigations carried out on Ridgidrain ADS Fittings.

12 Tests

Tests were carried out to determine:

dimensional accuracy

tensile strength of welds (before and after heat ageing at 70°C for 28 days)

resistance to internal pressure

rodding resistance to MCHW, Volume 1, Clause 518.12

resistance to an applied torque of 900 Nm⁻¹, or the torque at which the pipe and/or connector is damaged, whichever occurs first, test carried out with one end of the fitting fully restrained and connector and pipe fitted to the other

drop test to EN 12061 : 1999

fitting stiffness to ISO 13967 : 1998

strength of flexibility of fabricated fittings to EN 12256 : 1998

watertightness of fabricated fittings to EN 1053 : 1995

joint test to BS EN 1277 : 1996, Method 4, Conditions A, B and C

water jetting WRC method.

13 Investigations

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 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*

EN 1053 : 1995 *Plastics piping systems — Thermoplastics piping systems for non-pressure applications — Test method for watertightness*

EN 12061 : 1999 *Plastics piping systems — Thermoplastics fittings — Test method for impact resistance*

EN 12256 : 1998 *Plastics piping systems — Thermoplastics fittings — Test method for mechanical strength or flexibility of fabricated fittings*

ISO 13967 : 1998 *Thermoplastic fittings — Determination of ring stiffness*

Manual of Contract Documents for Highway Works, Volume 1 : *Specification for Highway Works* : May 2001 edition



On behalf of the British Board of Agrément

Date of issue: 19th May 2003

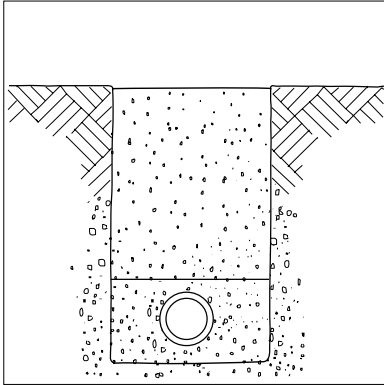
Chief Executive



Polypipe Civils Ltd

RIDGIDRAIN ADVANCED DRAINAGE SYSTEM 750 mm AND 900 mm PIPES AND COUPLERS

Product



• THIS DETAIL SHEET RELATES TO RIDGIDRAIN ADVANCED DRAINAGE SYSTEM⁽¹⁾ 750 mm AND 900 mm POLYPROPYLENE COPOLYMER FILTER AND CARRIER PIPES AND COUPLERS.

(1) Also known as Ridgidrain ADS.

• The pipes and couplers comply with HA Manual of Contract Documents for Highway Works (MCHW), Volume 1, Clause 518 and 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 Sheet, which gives additional information on the HAPAS Requirements, Regulations and Conditions of Certification.

Technical Specification

1 Description

1.1 Ridgidrain Advanced Drainage System 750 mm and 900 mm filter and carrier (perforated and unperforated) pipes are manufactured with a black polypropylene copolymer outer layer and a blue polypropylene copolymer inner layer⁽¹⁾, by a twin extrusion process. Two polypropylene copolymer pipes are extruded simultaneously, one inside the other, and heat-welded together in one continuous process.

(1) Other colours are available, details for which can be obtained from the Certificate holder.

1.2 The products tested and covered by this Certificate 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.

Table 2 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)
750	760	883	3	5	2.5	6	32
900	900	1036	3	6	3.0	6	45

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

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

1.5 Black medium-density polyethylene (MDPE) couplers are manufactured by the Certificate holder 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_3 (mm)	Nominal external diameter, d_4 (mm)	Nominal length (l) (mm)	Nominal seal height (h) (mm)
750	888	934	600	70

1.6 Each coupler requires two rubber seals which can be obtained from the Certificate holder, manufactured to BS EN 681-1 : 1996. The seals (see Figure 3) must be fitted in accordance with the installation instructions to ensure a watertight joint.

1.7 Pipes can be 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.

Table 5 Perforated pipe details

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 ² m ⁻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.

Figure 1 Ridgidrain Advanced Drainage System pipe

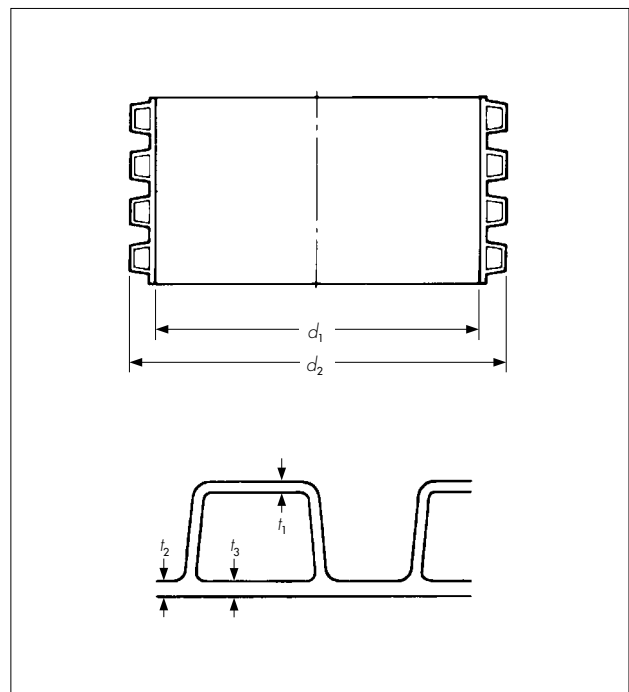


Figure 2 Welded integral socket and couplers

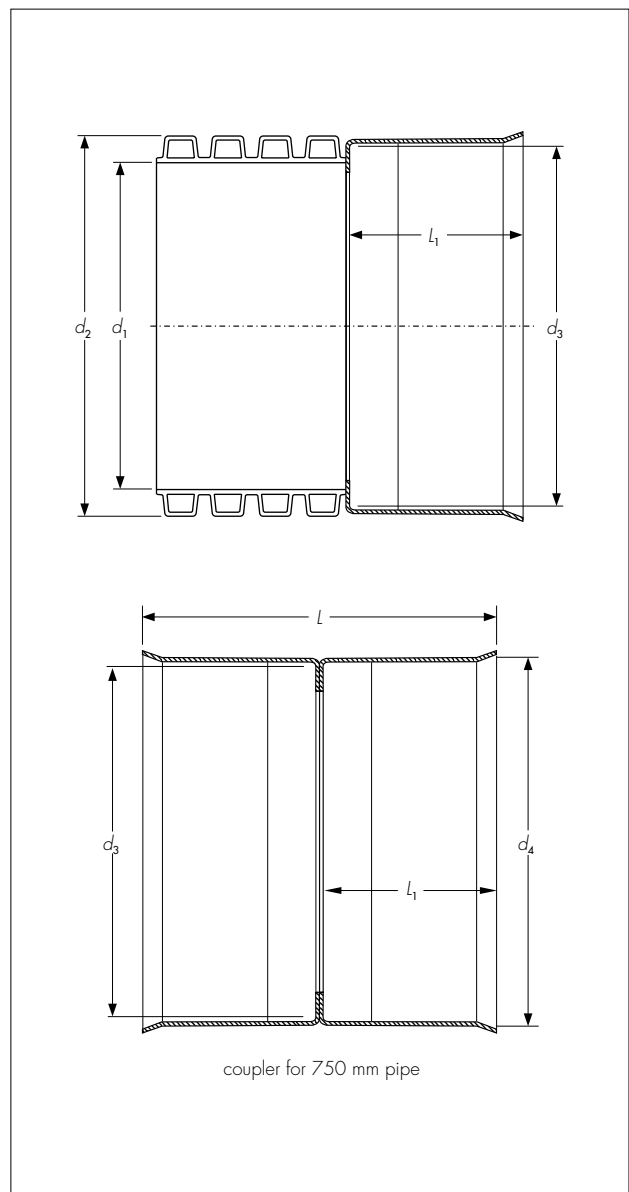


Figure 3 Seal

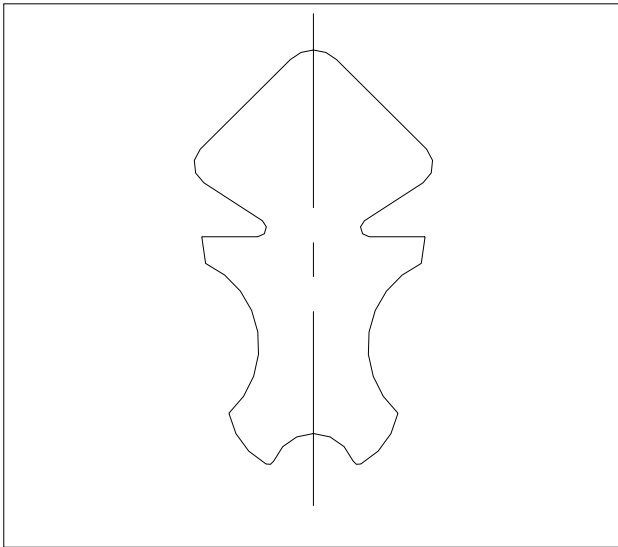
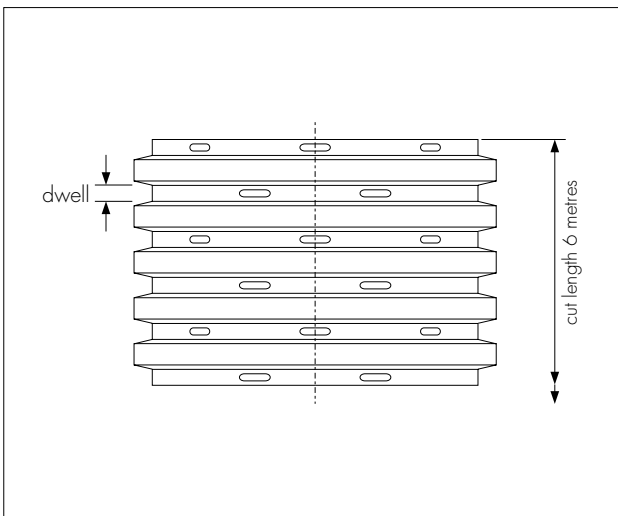


Figure 4 Details of slots



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

Pipes

- dimensional accuracy
- impact resistance
- short-term stiffness

Couplers

- dimensional accuracy.

1.9 Each pipe length and fitting or each pack of pipes, bears the Certificate holder's product label.

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, the system's 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 months to 12 months — may have significant effect on the impact resistance and physical properties
- over 12 months — damage will occur unless protection provided.

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

2.4 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

Ridgidrain Advanced Drainage System 750 mm and 900 mm Pipes and Couplers (perforated and unperforated), comply with the requirements of MCHW, Volume 1, Clause 518.5 for pipe, Clause 518.6 for couplers and Clause 518.7 for the system. When installed in accordance with the recommendations given in this Certificate, they are suitable for use in highways for the collection and disposal of surface and sub-surface water.

4 Strength

4.1 The pipes have a ring stiffness in excess of 6 kNm⁻² and a creep ratio of less than 4 and have adequate resistance to static loads.

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

4.3 The pipes can be used as an alternative to the plastic pipes for surface water drains listed in Table 5/1 of the MCHW, Volume 1, and for safe bedding depth purposes may be assumed to have a standard dimension ratio (SDR) equivalent of not greater than 41.

5 Performance of joints

5.1 Joints on filter pipes made from pipe and couplers without the rubber seals are not watertight as defined in the MCHW, Volume 1, Clause 504.3.

5.2 Correctly made, the joints constructed from pipe and couplers with rubber seals remain watertight when subjected to deflection and distortion, and comply with the MCHW, Volume 1, Clauses 504.3 and 518.7 (see section 13).

6 Water infiltration

The perforated area for the pipes exceeds the minimum requirement given in MCHW, Volume 1, Clause 518.3 of 1000 mm² per metre length (see Table 4).

7 Flow characteristics

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

7.2 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.

8 Practicability of installation

The pipes are installed easily using traditional drain-laying methods in accordance with MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8. The lengths in which the pipes are available and their lightness in weight are a significant advantage in handling and installation. Jointing of the pipes is achieved easily.

9 Maintenance

9.1 The perforations are designed to restrict the ingress of silt into the drains.

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

9.3 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 clearing systems, could damage the pipes and couplers and should not be used.

9.4 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 utilised in accordance with MCHW, Volume 1, Clause 520.

10 Durability

In the opinion of the BBA, when used in the context of this Detail Sheet, the material from which the pipes and couplers are manufactured will not significantly deteriorate and the anticipated life of the system will be in excess of 50 years.

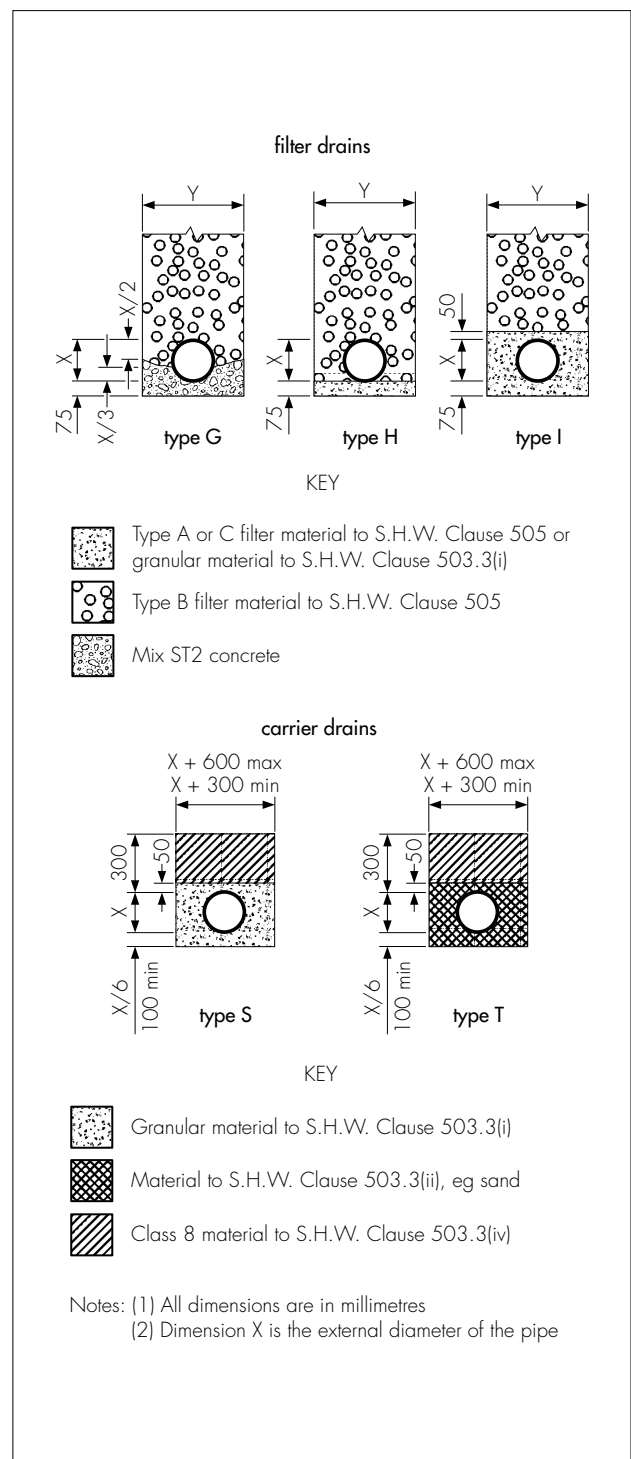
11 General

Ridgidrain Advanced Drainage System 750 mm and 900 mm Pipes and Couplers (perforated and unperforated) must be installed in accordance with MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

12 Procedures

12.1 For typical laying, trench and backfilling specification details reference should be made to Figure 5 and the MCHW, Volume 3, Drawing Nos F1 (Type T and S) and F2 (Type G, H and I).

Figure 5 Trench and bedding details



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

12.3 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.

12.4 The system's perforated and unperforated pipes and couplers must be protected against damage from site construction traffic.

12.5 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.

Technical Investigations

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

13 Tests

13.1 Tests were carried out to determine compliance with MCHW, Volume 1, Clause 518.5 on:

- determination of ring stiffness to BS EN ISO 9969 : 1995
- creep ratio to BS EN ISO 9967 : 1995

- impact strength at 0°C and 23°C to BS EN 1411 : 1996 with a d25 striker of 1.0 kg mass

- water jetting WRc method.

13.2 Tests were carried out on joined pipe to establish compliance with MCHW, Volume 1, Clause 518.7 on:

- 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).

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

14 Investigations

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

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

14.3 Calculations were carried out to determine the slot area.

14.4 A visit to a site in progress was carried out to assess the practicability of installation.

14.5 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 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 1411 : 1996 *Plastics piping and ducting systems. Thermoplastics pipes. Determination of resistance to external blows by the staircase method*

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

BS EN ISO 9969 : 1995 *Thermoplastic 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 527-1 : 1993 *Plastics — Determination of tensile properties — General principles*

ISO 527-2 : 1993 *Plastics — Determination of tensile properties — Test conditions for moulding and extrusion plastics*

ISO 527-3 : 1993 *Plastics — Determination of tensile properties — Test conditions for films and sheets*

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

ISO 1183 : 1970 *Plastics — Methods for determining the density and relative density of non-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)

Manual of Contract Documents for Highway Works, Volume 3 *Highway Construction Details*, March 1998 (as amended)



On behalf of the British Board of Agrément

Date of Second issue: 2nd December 2004

A handwritten signature in black ink, appearing to read 'P. Q. Newman', is positioned above the title 'Chief Executive'.

Chief Executive

*Original Detail Sheet issued on 1st March 2004. This amended version includes new test data.

British Board of Agrément

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

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



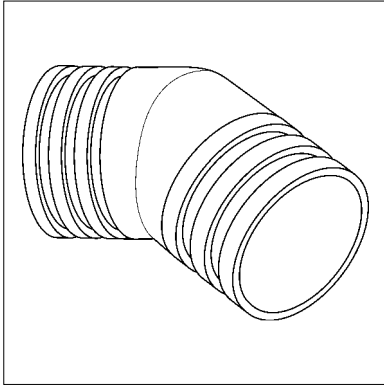
For technical or additional information,
contact the Certificate holder (see
front page).
For information about the Agrément
Certificate, including validity and
scope, tel: Hotline 01923 665400,
or check the BBA website.



Polypipe Civils Ltd

**RIDGIDRAIN ADVANCED DRAINAGE
SYSTEM FITTINGS**

Product



• THIS DETAIL SHEET RELATES TO THE RIDGIDRAIN ADVANCED DRAINAGE SYSTEM⁽¹⁾ FITTINGS, A RANGE OF FITTINGS IN SIZES OF 750 mm AND 900 mm FOR HIGHWAY DRAINAGE.

(1) Also known as Ridgidrain ADS.

• The fittings are for use with the pipes described in Detail Sheet 5 of this Certificate for the collection and disposal of surface and sub-surface water.

This Detail Sheet must be read in conjunction with the Front Sheet, which gives additional information on the HAPAS Requirements, Regulations and Conditions of Certification.

Technical Specifications

1 Description

1.1 Ridgidrain Advanced Drainage System Fittings are fabricated from twin wall pipe and couplers (as certified in Detail Sheet 5) welded together. Details and dimensions of the fittings are given in Figure 1.

1.2 The ring seals described in Detail Sheet 5 are available for each size of pipe for connection to the fittings.

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

- dimensional accuracy
- airtightness
- visual examination.

1.4 Each fitting carries a label bearing the BBA identification mark incorporating the number of this Certificate, and the angle of the bends and junctions.

2 Delivery and site handling

2.1 Fittings must be handled with care.

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

Design Data

3 General

Ridgidrain Advanced Drainage System Fittings, when used with the pipes described in Detail Sheet 5 and installed in accordance with the recommendations given in this Certificate, are suitable for use in highways for the collection and disposal of surface and sub-surface water.

4 Strength

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

5 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 (see section 12).

6 Flow characteristics

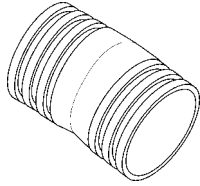
When used with the pipes described in Detail Sheet 5, the fittings will increase the hydraulic resistance of the system. Loss coefficients (K values) may be taken as:

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

Electronic Copy

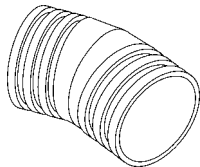
Figure 1 Ridgisewer fittings (all measurements in mm)

Short radius bends 11.25°⁽¹⁾



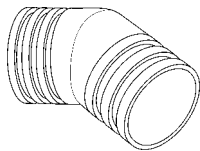
Nominal size
750
900

Short radius bends 22.5°⁽¹⁾



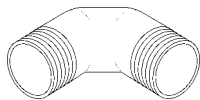
Nominal size
750
900

Short radius bends 45°



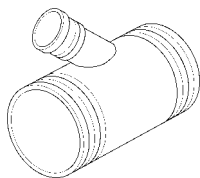
Nominal size
750
900

Short radius bends 90°⁽¹⁾



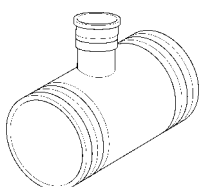
Nominal size
750
900

Unequal junctions 45°⁽¹⁾



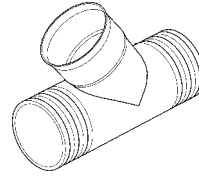
Nominal size
750 x 110
750 x 160
900 x 110
900 x 160

Unequal junctions 90°⁽¹⁾



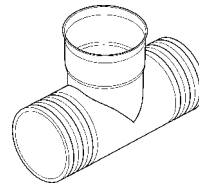
Nominal size
750 x 110
750 x 160
900 x 110
900 x 160
750 x 150
900 x 150

Equal junctions 45°⁽¹⁾



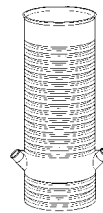
Nominal size
750
900

Equal junctions 90°⁽¹⁾



Nominal size
750
900

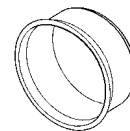
Special long fittings, single or double 45° branch



Nominal size	Length	Branch size	
		unequal	equal
750	3000	110, 150, 160	750 ⁽¹⁾
900	3000	110, 150, 160	900 ⁽¹⁾

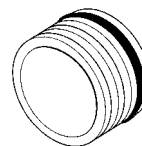
(1) Equal double branch not covered by this Certificate.

End caps



Nominal size
750
900

Socket plugs



Nominal size
750
900

Sealing rings



Nominal size
750
900

(1) Also available socketed on request from the Certificate holder.

7 Practicability of installation

The fittings are installed easily using conventional drain-laying techniques (see section 11).

8 Maintenance

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

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

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

9 Durability

Ridgidrain Advanced Drainage System fittings can be expected to have a life equivalent to that of other plastics fittings listed in Table 5/1 of MCHW, Volume 1.

Installation

10 General

Drains utilising the fittings must be installed in accordance with MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

11 Procedure

11.1 Typical laying, trench and backfilling specification details are given in section 11 of Detail Sheet 2 and section 12 of Detail Sheet 3.

11.2 To make a joint, a ring seal is fitted externally to the first corrugation in the pipe. The inside of the coupler is lubricated and the pipe pushed fully home to the central register.

11.3 Pipes and fittings must be protected from site construction traffic.

The following is a summary of the technical investigations carried out on Ridgidrain Advanced Drainage System Fittings.

12 Tests

Tests were carried out to determine:

- dimensional accuracy
- drop test to EN 12061 : 1999
- fitting stiffness to ISO 13967 : 1998
- strength of flexibility of fabricated fittings to EN 12256 : 1998
- joint test to BS EN 1277 : 1996, Method 4, Conditions A, B and C.

13 Investigations

13.1 An assessment was made of existing data in relation to:

- water jetting WRc method
- rodding resistance to MCHW, Volume 1, Clause 518.12.

13.2 An examination was made of data relating to:

- resistance to damage before installation
- practicability of installation
- chemical resistance
- design method
- flow capacities.

13.3 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 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*

EN 12061 : 1999 *Plastics piping systems — Thermoplastics fittings — Test method for impact resistance*

EN 12256 : 1998 *Plastics piping systems — Thermoplastics fittings — Test method for mechanical strength or flexibility of fabricated fittings*

ISO 13967 : 1998 *Thermoplastic fittings — Determination of ring stiffness*

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



On behalf of the British Board of Agrément

Date of issue: 1st March 2004

Chief Executive