



Designated by Government  
to issue  
European Technical  
Approvals

### JFC TWINWALL DRAINAGE SYSTEM

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 JFC TWINWALL DRAINAGE SYSTEM FOR FILTER AND CARRIER PIPES, AND COUPLINGS

• The system is for use in highway drainage for the collection and disposal of surface and sub-surface water in accordance with Highways Agency (HA) requirements, Manual of Contract Documents for Highway Works (MCHW), Volume 1, Clause 518 and Volume 2 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.

1.2 The general requirements for structural wall pipes and fittings are contained in the MCHW, Volume 1, Clause 518.

1.3 Further information and guidance is given in MCHW, Volume 2 and 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: 1 *Description* (1.3), 2 *Delivery and site handling* (2.1), 3 *General* and 12 *General* of the *Installation* part of the relevant accompanying Detail Sheet.

## Bibliography

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

Manual of Contract Documents for Highway Works, Volume 2 *Notes for Guidance on the Specification for Highway Works, (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 named, 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 JFC Twinwall Drainage System is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate O2/H069 is accordingly awarded to JFC Plastics Ltd.

On behalf of the British Board of Agrément

A handwritten signature in black ink, appearing to read 'G. A. Cooper'.

Date of Second issue: 23rd December 2005

Chief Executive

\*Original Certificate issued on 28th March 2002. This amended version, now converted to a Detail Sheet format, includes a new company name, product name and revised Conditions of Certification.

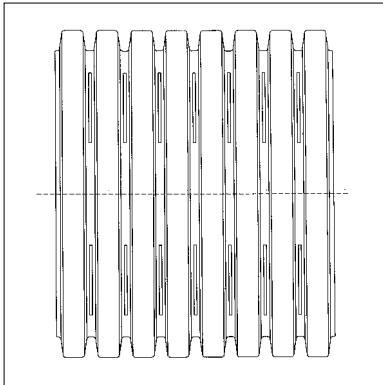


JFC Plastics Ltd

JFC TWINWALL 150 mm, 225 mm AND 300 mm  
DIAMETER HIGH-DENSITY POLYETHYLENE FILTER  
AND CARRIER PIPES AND COUPLINGS

Roads and Bridges  
Certificate No 02/H069  
**DETAIL SHEET 2**

## Product



• THIS DETAIL SHEET RELATES TO JFC TWINWALL 150 mm, 225 mm, 300 mm HIGH-DENSITY POLYETHYLENE FILTER AND CARRIER PIPES AND COUPLINGS.

• The pipes and couplings are for use in highway drainage for the collection and disposal of surface and sub-surface water.

• The products must be used in accordance with the conditions set out in the Design Data and Installation parts of this Detail Sheet.

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 JFC Twinwall 150 mm, 225 mm and 300 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings are manufactured from a blended, black polyethylene by a twin extrusion process. The 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.

Table 1 Material properties/specification

Property	Test method reference	Specification
Tensile properties	EN 638, ISO 527-2	≥20 MPa
Oxygen induction time	EN 728	≥8 mins
Melt flow rate	ISO 1133	0.32.5 5 kg (10 mins) <sup>1</sup>
Density	ISO 1183-3, ISO 4451	0.950 (±1%) gm <sup>3</sup>
Melt flow rate	ISO 4440	N/A
Heat reversion	ISO 12091	N/A
Effects of heating (injection moulded fittings only)	EN 763	N/A

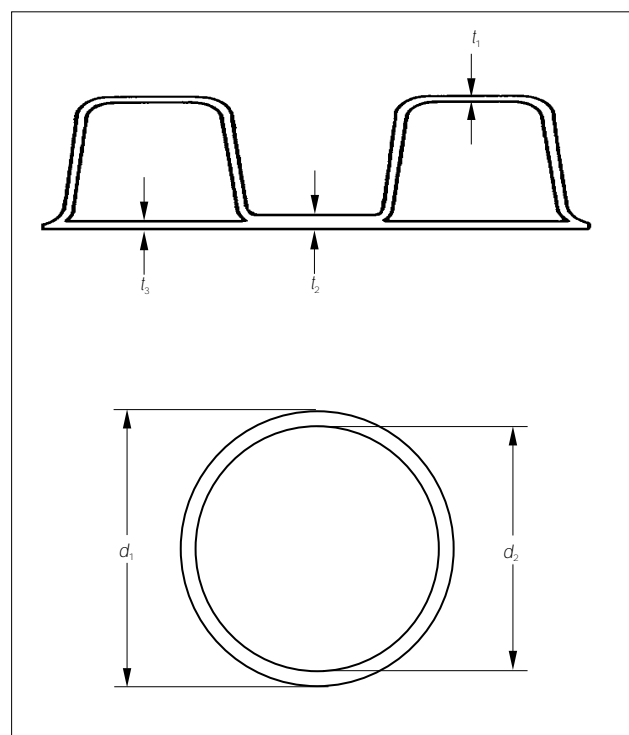
Note: This table is in the format of Appendix 5/7 of MCHW Volume 2. It is used to satisfy Clause 518.1 of MCHW Volume 1.

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 2 Pipe dimensions

Nominal internal pipe diameter, $d_1$ (mm)	External pipe diameter, $d_2$ (mm)	$t_1$ min (mm)	$t_2$ min (mm)	$t_3$ min (mm)	Nominal length (m)	Nominal weight (kgm <sup>-1</sup> )	Pitch (mm)
150	178.24	1.2	2.2	1.2	6	1.4	20.0
225	267.52	1.1	3.2	1.2	6	3.3	25.5
300	353.53	1.3	3.2	1.5	6	5.0	31.0

Figure 1 Twinwall pipe



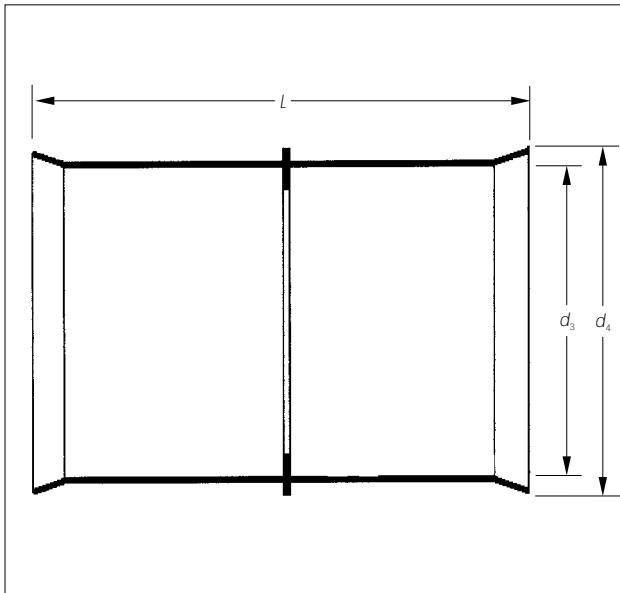
1.4 Black polypropylene couplings are available for each size of pipe (see Table 3 and Figure 2).

Table 3 Coupler dimensions

Nominal internal pipe diameter (mm)	Mean internal $d_3$ diameter (min) (mm) <sup>(1)</sup>	Nominal external, $d_4$ diameter (mm)	Nominal length ( $L$ ) (mm)	Nominal seal height ( $h$ ) (mm)
150	179-180	192	180	17.0
225	268-270	284	220	22.5
300	355-356	375	245	25.0

(1) Tapered along coupler length.

Figure 2 Couplings



1.5 Each coupling requires two rubber seals which are 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

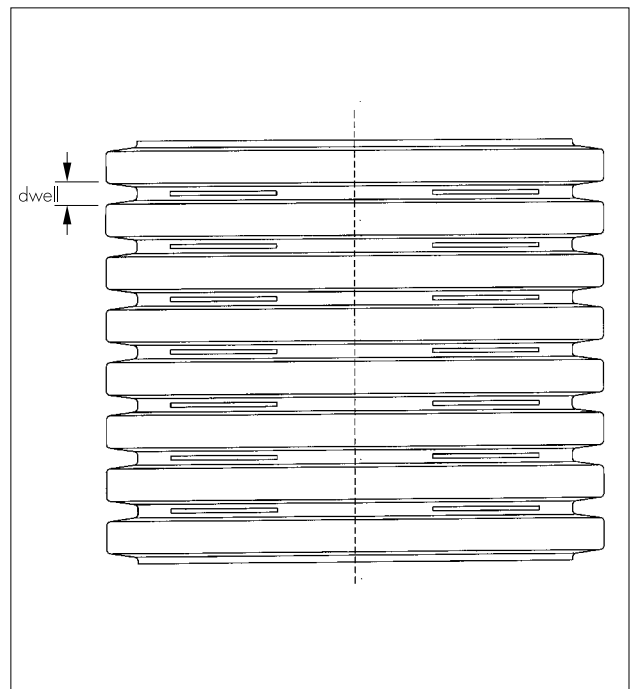


1.6 Pipes can be supplied either slotted or unslotted. Slotted pipe is available with the slots in the dwell between corrugations equally spaced around the circumference (see Table 4 and Figure 4).

Table 4 Slotted pipe details

Nominal internal pipe diameter (mm)	No of slots per dwell	No of dwells per metre	Nominal slot length (mm)	Nominal slot width (mm)	Permeable area (minimum) ( $\text{mm}^2\text{m}^{-1}$ )
150	4	51	15-20	2.0-2.5	6120
225	4	39	15-30	2.0-2.5	4680
300	4	32	20-40	2.0-2.5	5120

Figure 4 Details of slots (optional)



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

#### Pipes

- dimensional accuracy
- impact resistance
- short-term stiffness

#### Couplings

- dimensional accuracy/visual check.

1.8 A label bearing the BBA identification mark 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, JFC Twinwall slotted and unslotted pipes and couplings should 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

JFC Twinwall 150 mm, 225 mm and 300 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings 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, and is 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<sup>-2</sup> 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.

### 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 14).

### 6 Water infiltration

The slot area for the pipes exceeds minimum requirement of 1000 mm<sup>2</sup> per metre length as given in the MCHW, Volume 1, Clause 518.3 (see Table 3).

### 7 Flow characteristics

7.1 The pipes will have normal flow characteristics associated with thermoplastics 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. Appropriate 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 is applicable, but for designs a value of 0.6 is generally used.

### 8 Practicability of installation

The pipes are installed using traditional drain-laying methods in accordance with Highways Agency (HA) requirements and MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8. Due to the light weight nature of the pipe material, handling and jointing are easily performed.

### 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 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 couplings and should not be used.

9.4 Tests indicate that the pipes have adequate resistance to cleansing using pressure jetting equipment (see section 13.1). It is recommended that low-pressure, high-volume systems are utilised in accordance with MCHW, Clause 520.

### 10 Durability

In the opinion of the BBA, 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

11.1 JFC Twinwall 150 mm, 225 mm and 300 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings must be installed in accordance with HA, requirements and MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

11.2 JFC Twinwall slotted and unslotted pipes and couplings must be protected against damage from site construction traffic.

### 12 Procedures

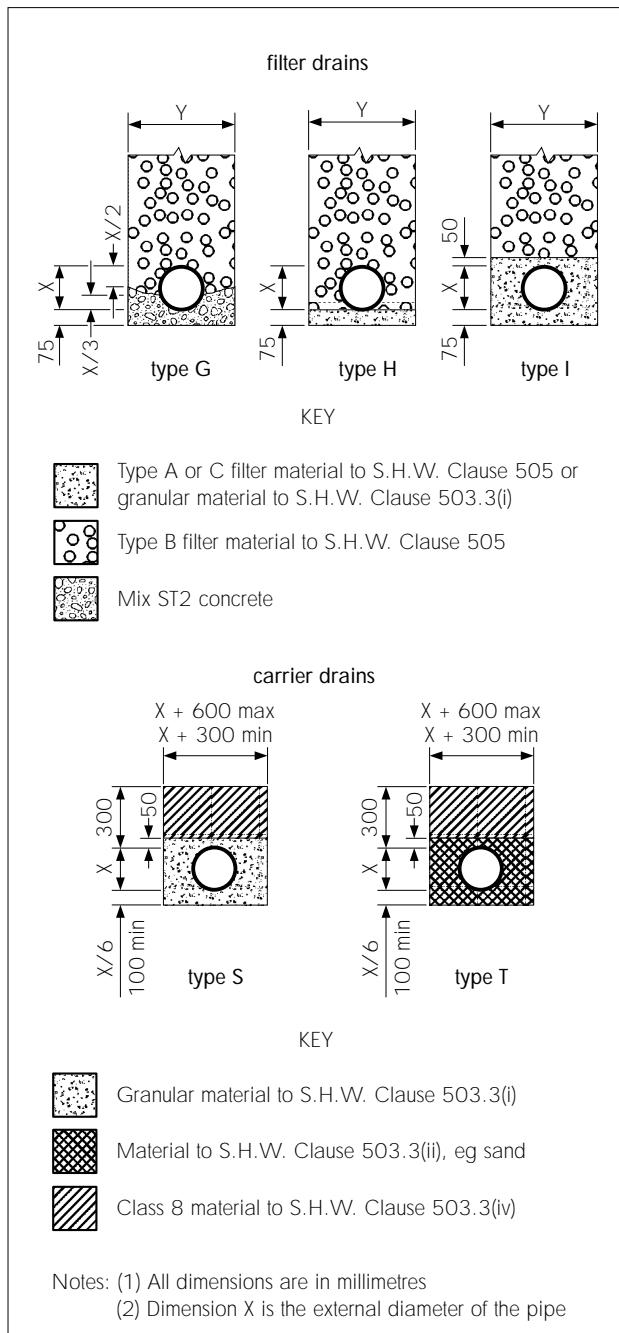
12.1 For typical laying, trench and backfilling specification details reference should be made to Figure 5 and the MCHW, Volume 3, Drawing No F1 (Type T and S) and F2 (Type G, H and I).

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 the 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 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 Installation details



The following is a summary of the technical investigations carried out on JFC Twinwall 150 mm, 225 mm and 300 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings.

### 13 Tests

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

- ring stiffness to BS EN ISO 9969 : 1995
- creep ratio to BS EN ISO 9967 : 1995
- longitudinal bending to MCHW, Volume 1, Clause 518.11
- rodding resistance to MCHW, Volume 1, Clause 518.12
- impact resistance at 0°C and 23°C to BS EN 1411 : 1996 with a striker of 1.0 kg mass and 25 mm diameter conical head
- water jetting WRc method.

13.2 Tests were carried out on the system to establish:

- leaktightness of joint to BS EN 1277 : 2003, Method 4, Conditions A, B and C
- insertion force (ease of jointing).

13.3 Tests were carried out to establish the dimensional accuracy of the pipe, coupling 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 slot area.

14.4 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 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 763 : 1995 *Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Test method for visually assessing effects of heating*
- BS EN 1277 : 2003 *Plastics piping systems — Thermoplastics piping systems for buried non-pressure applications — Test methods for leaktightness of elastomeric sealing ring type joints*
- BS EN 1411 : 1996 *Plastics piping and ducting systems — Thermoplastics pipes — Determination of resistance to external blows by the staircase method*
- BS EN 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*

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

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

ISO 1183-3 : 1999 *Plastics — Methods for determining the density of non-cellular plastics — Gas pycnometer method*

ISO 4440-1 : 1994 *Thermoplastics pipes and fittings — Determination of melt-flow rate — Test method*

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 issue: 23rd December 2005

Chief Executive





# Electronic Copy

---

**British Board of Agrément**

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

©2005

e-mail: [mail@bba.star.co.uk](mailto:mail@bba.star.co.uk)  
website: [www.bbacerts.co.uk](http://www.bbacerts.co.uk)



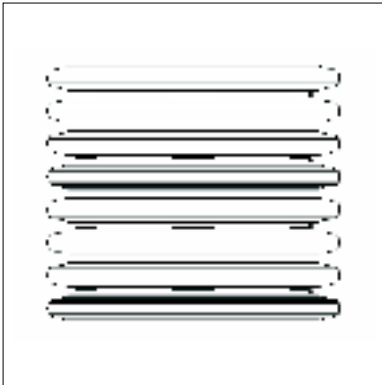
For technical or additional information, contact the Certificate holder (see front page).  
For information about the Agrément Certificate, including validity and scope, tel: Hotline 01923 665400, or check the BBA website.



JFC Plastics Ltd

JFC TWINWALL 375 mm, 450 mm AND  
 600 mm DIAMETER HIGH-DENSITY  
 POLYETHYLENE FILTER AND CARRIER PIPES  
 AND COUPLINGS

## Product



• THIS DETAIL SHEET RELATES TO JFC TWINWALL 375 mm, 450 mm AND 600 mm DIAMETER HIGH-DENSITY POLYETHYLENE FILTER AND CARRIER PIPES AND COUPLINGS.

• The pipes and couplings 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 JFC Twinwall 375 mm, 450 mm and 600 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings are manufactured from a blended black polyethylene by a twin extrusion process. The 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.

Table 1 Material properties/specification

Property	Test method reference	Specification
Tensile properties	BS EN ISO 6259-1, ISO 527-2	≥18 MPa
Oxygen induction time	BS EN 728	≥4 mins
Melt flow rate	ISO 1133	0.23.0 (10 mins) <sup>1</sup> (5 kg/190°C)
Density	ISO 1183-3, ISO 4451	0.950 (±1%) gm <sup>3</sup>
Melt flow rate	ISO 4440	N/A
Heat reversion	ISO 12091	N/A
Effects of heating (injection moulded fittings only)	BS EN 763	N/A

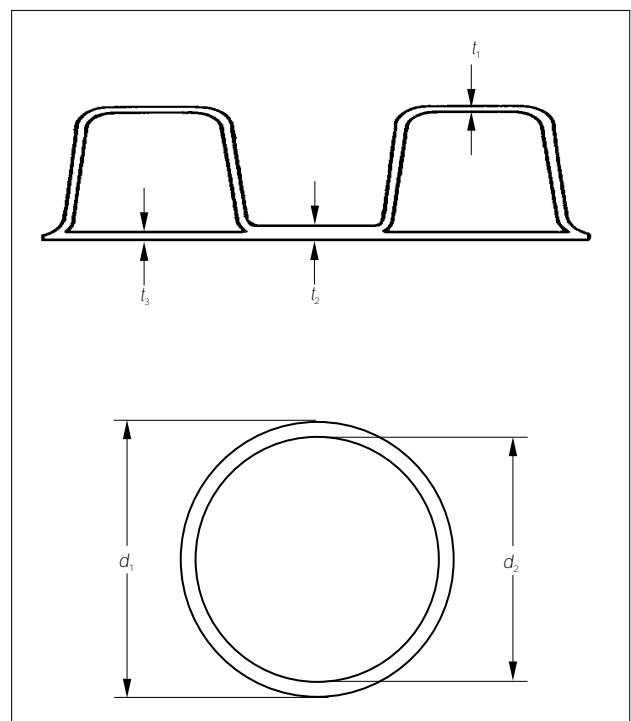
Note: This table is in the format of Appendix 5/7 of MCHW Volume 2. It is used to satisfy Clause 518.1 of MCHW Volume 1.

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 2 Pipe dimensions

Nominal internal pipe diameter, $d_1$ (mm)	External pipe diameter, $d_2$ (mm)	$t_1$ min (mm)	$t_2$ min (mm)	$t_3$ min (mm)	Nominal length (m)	Nominal weight (kgm <sup>1</sup> )	Pitch (mm)
375	426 ± 3	1.5	3.5	1.2	6	6.0	39.9
450	512 ± 3	1.8	4.0	1.5	6	8.5	50.1
600	680 ± 4	2.1	4.3	1.8	6	14.5	66.9

Figure 1 Twinwall pipe



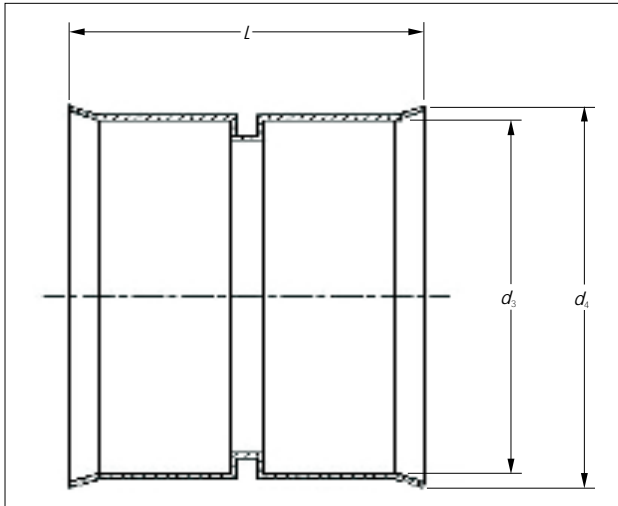
1.4 Black polyethylene couplings are available for each size of pipe (see Table 3 and Figure 2).

Table 3 Coupler dimensions

Nominal internal pipe diameter (mm)	Mean internal $d_3$ diameter (min) (mm) <sup>(1)</sup>	Nominal external, $d_4$ diameter (mm)	Nominal length (L) (mm)	Nominal seal height (h) (mm)
375	429	446	321	32.5
450	514	537	390	36.9
600	686	720	675	49.0

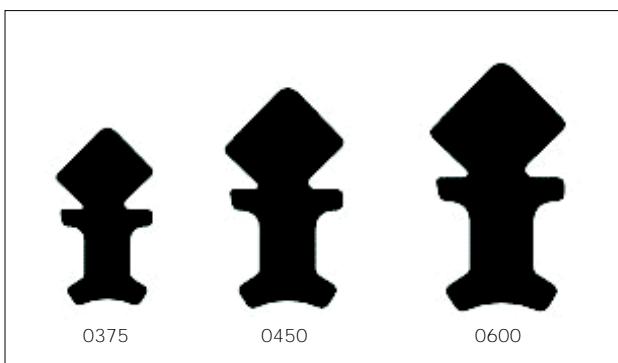
(1) Tapered along coupler length.

Figure 2 Couplings



1.5 Each coupling requires two rubber seals which are 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

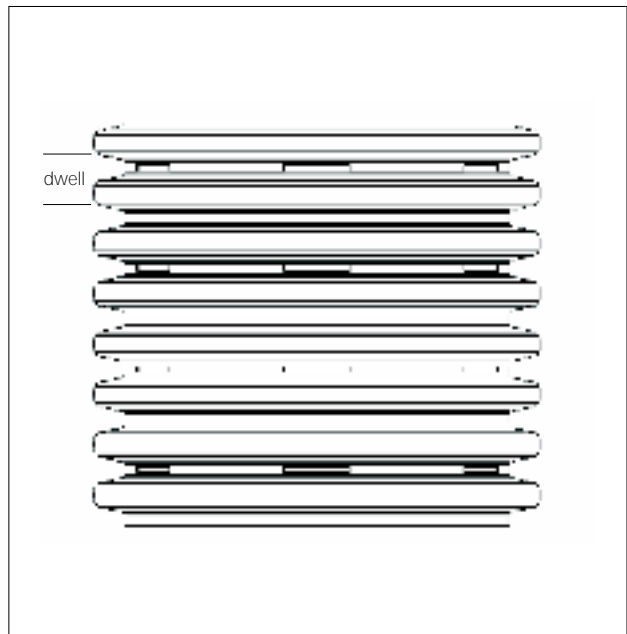


1.6 Pipes can be supplied either slotted or unslotted. Slotted pipe is available with the slots in the dwell between corrugations equally spaced around the circumference (see Table 4 and Figure 4).

Table 4 Slotted pipe details

Nominal internal pipe diameter (mm)	No of slots per alternate dwell	No of dwells per metre	Nominal slot length (mm)	Nominal slot width (mm)	Permeable area (minimum) (mm <sup>2</sup> m <sup>-1</sup> )
375	3	25	42-85	2.7-3.3	4263
450	3	20	48-85	2.8-3.5	4024
600	3	15	76-106	2.9-3.5	4942

Figure 4 Details of slots (optional)



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

#### Pipes

- dimensional accuracy
- impact resistance
- short-term stiffness

#### Couplings

- dimensional accuracy/visual check.

1.8 A label bearing the BBA identification mark 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, JFC Twinwall slotted and unslotted pipes and couplings should 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.

### 3 General

JFC Twinwall 375 mm, 450 mm and 600 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings comply with Highways Agency (HA) requirements and 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, and is 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  $6 \text{ kNm}^{-2}$  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.

### 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 15).

### 6 Water infiltration

The slot area for the pipes exceeds minimum requirement of  $1000 \text{ mm}^{-2}$  per metre length as given in the MCHW, Volume 1, Clause 518.3 (see Table 3).

### 7 Flow characteristics

7.1 The pipes will have normal flow characteristics associated with thermoplastics 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. Appropriate 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 is applicable, but for designs a value of 0.6 is generally used.

### 8 Practicability of installation

The pipes are installed using traditional drain-laying methods in accordance with HA requirements and MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8. Due to the light weight nature of the pipe material, handling and jointing are easily performed.

### 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 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 couplings and should not be used.

9.4 Tests indicate that the pipes have adequate resistance to 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, 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

11.1 JFC Twinwall 375 mm, 450 mm and 600 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings must be installed in accordance with HA requirements and MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

11.2 JFC Twinwall slotted and unslotted pipes and couplings must be protected against damage from site construction traffic.

### 12 Procedures

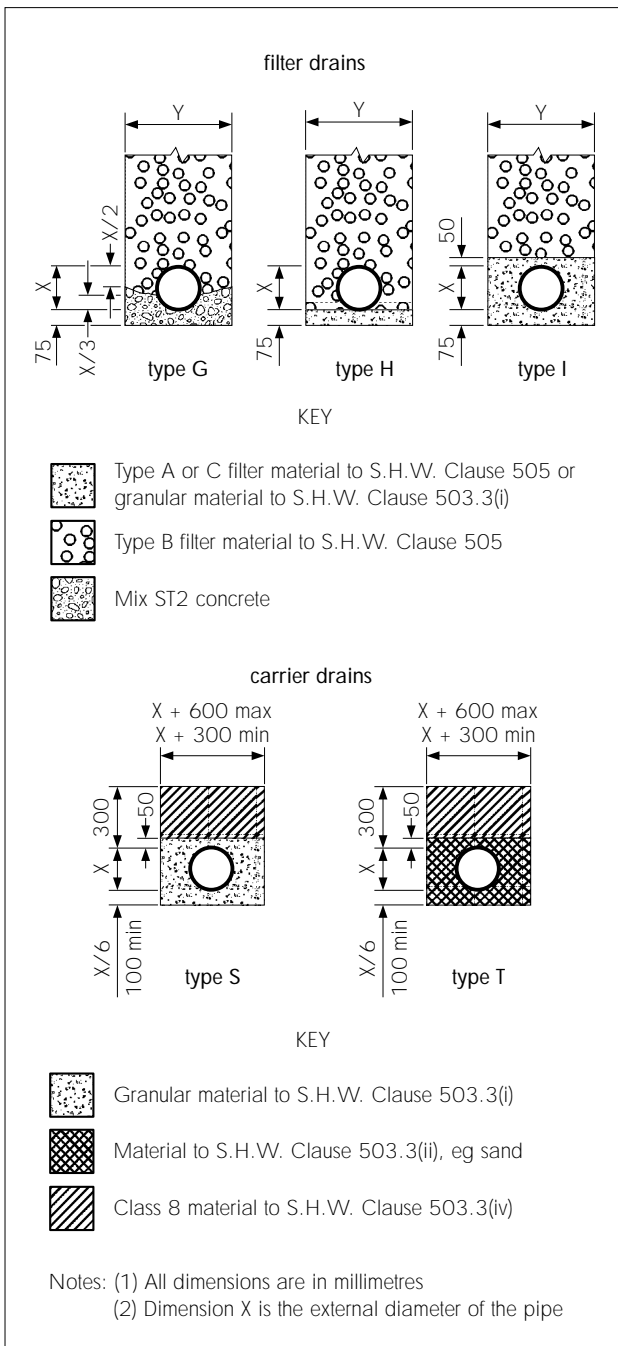
12.1 For typical laying, trench and backfilling specification details reference should be made to Figure 5 and the MCHW, Volume 3, Drawing No F1 (Type T and S) and F2 (Type F, H and I).

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 the 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 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 Installation details



## Technical Investigations

The following is a summary of the technical investigations carried out on JFC Twinwall 375 mm, 450 mm and 600 mm Diameter High-Density Polyethylene Filter and Carrier Pipes and Couplings.

### 13 Tests

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

- ring stiffness to BS EN ISO 9969 : 1995
- creep ratio to BS EN ISO 9967 : 1995
- longitudinal bending to MCHW, Volume 1, Clause 518.11
- rodding resistance to MCHW, Volume 1, Clause 518.12
- impact resistance to 0°C and 23°C to BS EN 1411 : 1996 with a striker of 1.0 kg mass and 25 mm diameter conical head
- water jetting WRc method.

13.2 Tests were carried out on the system to establish:

- leaktightness of joint to BS EN 1277 : 2003, Method 4, Conditions A, B and C
- insertion force (ease of jointing)

13.3 Tests were carried out to establish the dimensional accuracy of the pipe, coupling 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 slot area.

14.4 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 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 728 : 1997 *Plastics piping and ducting systems — Polyolefin pipes and fittings — Determination of oxidation induction time*

BS EN 763 : 1995 *Plastics piping and ducting systems — Injection moulded thermoplastics fittings — Test method for visually assessing effects of heating*

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

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

BS EN ISO 6259-1 : 2001 *Thermoplastic pipes — Determination of tensile properties — General test 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*

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

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

ISO 1183-3 : 1999 *Plastics — Methods for determining the density of non-cellular plastics — Gas pycnometer method*

ISO 4440-1 : 1994 *Thermoplastics pipes and fittings — Determination of melt-flow rate — Test method*

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

A handwritten signature in black ink, appearing to read 'G. A. Cooper'.

Date of issue: 23rd December 2005

Chief Executive





# Electronic Copy

---

**British Board of Agrément**

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

©2005

e-mail: [mail@bba.star.co.uk](mailto:mail@bba.star.co.uk)  
website: [www.bbacerts.co.uk](http://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.