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HAPAS Certificate
02/H069
Product Sheet 1

JFC CORRIPIPE TWINWALL DRAINAGE SYSTEM

JFC CORRIPIPE TWINWALL HIGH-DENSITY POLYETHYLENE 150 MM TO 600 MM DIAMETER FILTER AND CARRIER PIPES AND COUPLERS

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

This Certificate relates to JFC CorriPipe Twinwall High-Density Polyethylene 150 mm to 600 mm Diameter Filter and Carrier Pipes and Couplers, a range of pipes and couplers for use in highway drainage for the collection and disposal of surface and sub-surface water.

CERTIFICATION INCLUDES:

- factors relating to compliance with HAPAS requirements
- factors relating to compliance with Regulations where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.



KEY FACTORS ASSESSED

Strength — the pipes and couplers have adequate strength to resist loads associated with installation and service (see section 6).

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

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

Durability — the system will have a service life in excess of 50 years (see section 11).

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

On behalf of the British Board of Agrément

Simon Wroe
Head of Approvals — Engineering

Claire Curtis-Thomas
Chief Executive

Date of Second issue: 20 January 2016

Originally certificated on 28 March 2002

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Requirements

In the opinion of the BBA, JFC CorriPipe Twinwall High-Density Polyethylene 150 mm to 600 mm Diameter Filter and Carrier Pipes and Couplers, when used in accordance with the provisions of this Certificate, will meet or contribute to meeting the following requirements of the *Manual of Contract Documents for Highways Works (MCHW)*⁽¹⁾, *Specification for Highways Works (SHW)*, Volume 1 and Volume 2.

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

Further information and guidance is given in the MCHW, Volume 3, Drawing Numbers F1 and F2.

Additional site requirements may be included on particular contracts.

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

Regulations

Construction (Design and Management) Regulations 2015

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, Principal Designer/CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: 1 *Description* (1.2 and 1.3), 3 *Delivery and site handling* (3.1) of this Certificate.

Technical Specification

1 Description

1.1 JFC CorriPipe Twinwall High-Density Polyethylene 150 mm to 600 mm Diameter Filter and Carrier Pipes and Couplers comprise a range of polyethylene pipes (see sections 1.2 to 1.4) jointed with polyethylene and polypropylene couplers (see sections 1.5 and 1.6).

1.2 The pipes are manufactured from black high-density polyethylene (HDPE) to the material specification given in Table 1.

Table 1 Material properties/specification

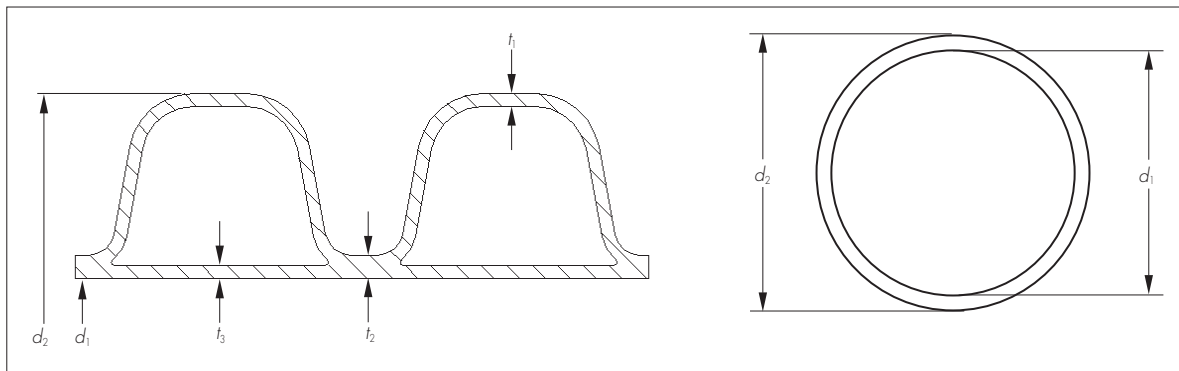
Property	Test method reference	Specification
Tensile properties	EN 638, ISO 527-2	≥18 MPa
Oxygen induction time	BS EN 728	≥4 mins
Melt flow rate	BS EN ISO 1133	≤0.75 g (10 mins) 2.16 kg at 190°C
Density	BS EN ISO 1183-3	≥935 kg·m ⁻³
Heat reversion	BS EN ISO 12091	N/A

1.3 The pipes are manufactured with two plain ends and are of structured twinwall construction, with a corrugated outer wall and smooth inner wall. Pipe details and dimensions for those pipe sizes covered by the Certificate are given in Table 2 and Figure 1.

Table 2 Pipe dimensions

Nominal internal pipe diameter d_1 (mm)	Nominal external pipe diameter (d_2) (mm)	Minimum pipe wall thicknesses (mm)			Nominal pipe length (m)	Minimum weight per metre of pipe (kg·m ⁻¹)	Pitch of corrugations (mm)
		t_1	t_2	t_3			
150	178	0.6	1.7	0.8	6	1.4	20.0
225	265	0.9	2.6	1.2	6	3.0	25.5
300	354	1.0	2.8	1.5	6	5.0	31.0
375	426	1.5	3.5	1.5	6	6.0	39.9
450	512	1.8	4.0	1.5	6	8.5	50.1
600	680	2.1	4.3	1.8	6	14.5	66.9

Figure 1 JFC CorriPipe Twinwall pipe

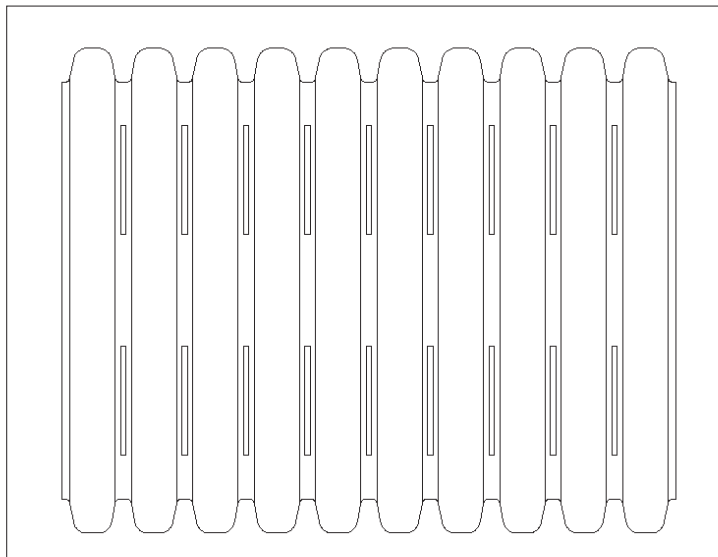


1.4 The pipes are supplied either slotted or unslotted. For the 150 mm, 225 mm and 300 mm diameter pipes, slots are cut in every dwell between corrugations and are equally spaced around the pipe circumference. For the larger pipe sizes, the slots are cut in every alternate dwell (see Table 3 and Figure 2).

Table 3 Slotted pipe details

Internal pipe diameter (nominal) (mm)	No of slots per dwell		Number of dwells per metre	Slot length (mm)	Slot width (mm)	Permeable area (minimum) (mm ² ·m ⁻¹)
	Slots in every dwell	Slots cut in alternate dwells				
150	4	n/a	51	15 to 20	2.0 to 2.5	6120
225	4	n/a	39	15 to 30	2.0 to 2.5	4680
300	4	n/a	32	20 to 40	2.0 to 2.5	5120
375	n/a	3	25	42 to 85	2.7 to 3.3	4263
450	n/a	3	20	48 to 85	2.8 to 3.5	4024
600	n/a	3	15	76 to 106	2.9 to 3.5	4942

Figure 2 Details of slots (optional)

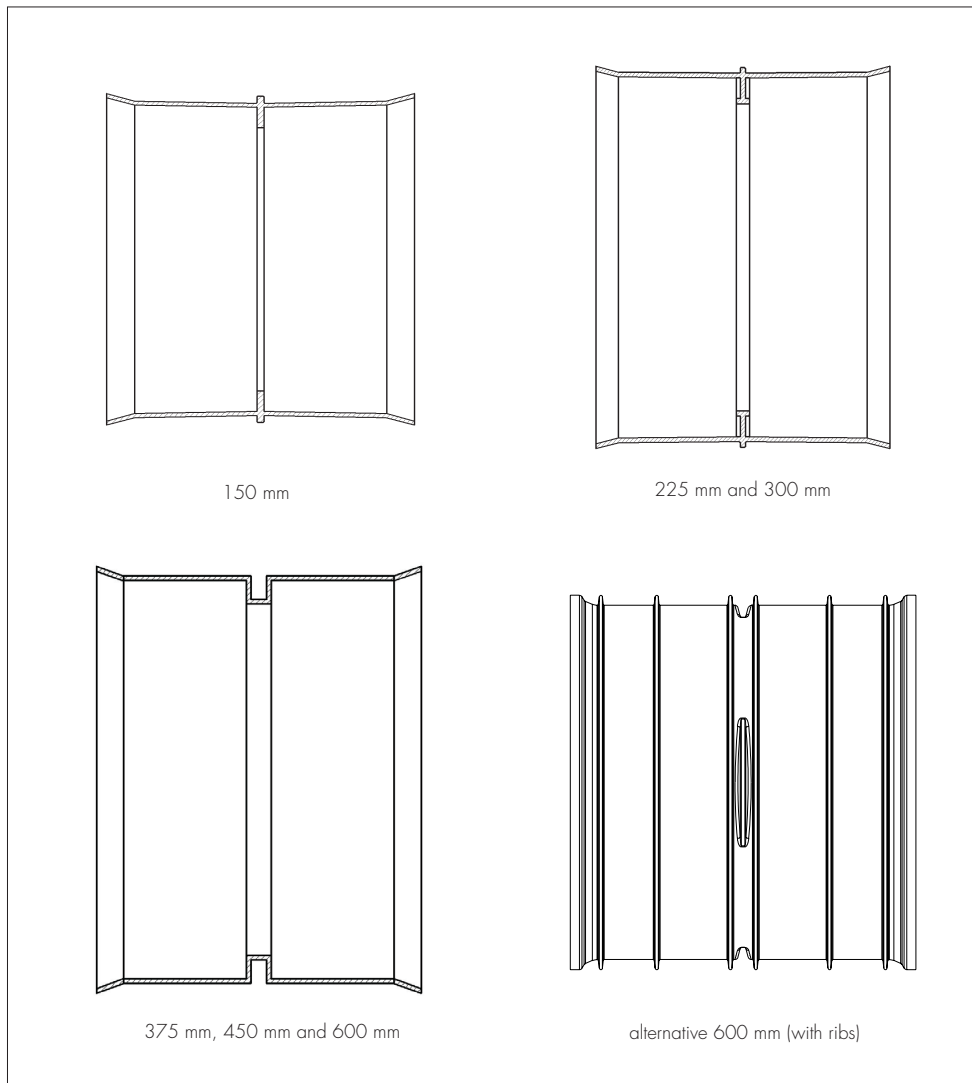


1.5 The pipes are jointed using couplers supplied by the Certificate holder. Black polypropylene couplers are used for the 150 mm, 225 mm and 300 mm pipe sizes, and black polyethylene couplers for the 375 mm, 450 mm and 600 mm pipe sizes (see Table 4 and Figure 3).

Table 4 Coupler and seal dimensions

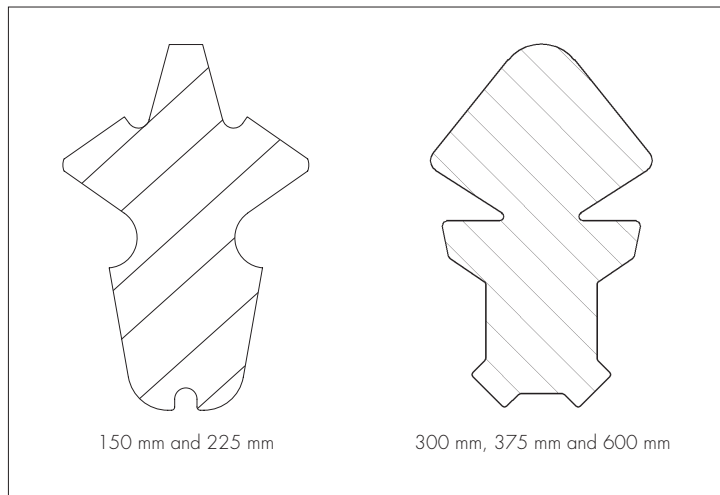
Nominal internal/ external pipe diameter (mm)	Internal diameter (mm)		Length of coupler (mm)	Height of seal (mm)
	at first dwell	at second dwell		
150/178	178	180	180	16.5
225/265	265	267	216	23.5
300/354	354	356	241	31.8
375/426	429	429	334	32.5
450/512	514	514	396	36.9
600/680	686	686	633/680	49.1

Figure 3 Couplers



1.6 Each coupler requires two rubber seals to ensure a watertight joint. The seals are supplied by the Certificate holder and must be fitted in accordance with the installation instructions. The seals are manufactured to and CE marked in accordance with BS EN 681-1 : 1996 (see Figure 4).

Figure 4 Seals



2 Manufacture

2.1 The pipes are manufactured by a twin extrusion process, with the inner and outer skins of HDPE extruded simultaneously, one inside the other, and heat-welded together in one continuous process. The moulded pipes are cooled, perforated if required and cut to length.

2.2 The couplers are manufactured, either by the Certificate holder or the Certificate holder's nominated supplier, depending on the coupler size.

2.3 The seals are manufactured to the Certificate holder's specification by the Certificate holder's nominated seal supplier.

2.4 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the Certificate holder the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.5 The management systems for the Certificate holder's two production facilities have been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by BSI (Certificate FM 38354) and by SGS (Certificate IE96/7559) respectively.

3 Delivery and site handling

3.1 The 150 mm to 450 mm diameter pipes are packaged in bundles ('packs') of between 4 and 33 pipes per pack, depending on the pipe size, supported with wooden frames and secured with banding. The 600 mm diameter pipes are delivered to site strapped together in pairs with steel banding.

3.2 Each pack bears a label showing the product type, size and pipe length, the production date, pack quantity and a unique production number traceable to that production run. The label also includes the BBA logo and the number of this Certificate.

3.3 The couplers are delivered to site on pallets. Each coupler includes a moulded name plate.

3.4 The seals are delivered to site in plastic bags.

3.5 The pipes and couplers should be stored on a flat surface. Care should be taken not to drop them on their ends, particularly during cold weather conditions.

3.6 When long-term storage is envisaged, the pipes 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 is provided.

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

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on JFC CorriPipe Twinwall High-Density Polyethylene 150 mm to 600 mm Diameter Filter and Carrier Pipes and Couplers.

Design Considerations

4 General

JFC CorriPipe Twinwall High-Density Polyethylene 150 mm to 600 mm Diameter Filter and Carrier Pipes and Couplers comply with the requirements of Highways England (HE)'s *Manual of Contract Documents for Highway Works* (MCHW), Volume 1, Clause 518.5 for pipes, Clause 518.6 for couplings and Clause 518.7 for the system, and are satisfactory for use in highway constructions for the collection and disposal of surface and sub-surface water.

5 Practicability of installation

The pipes are installed using traditional drain-laying methods in accordance with HE requirements and the MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8. Owing to the lightweight nature of the pipe material, handling and jointing are easily conducted.

6 Strength

6.1 The pipes have a ring stiffness in excess of $6 \text{ kN}\cdot\text{m}^{-2}$, a creep ratio of less than 4, and have adequate resistance to static loads.

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

7 Performance of joints

7.1 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.

7.2 When correctly made, the joints constructed from carrier 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).

8 Water infiltration

The slot area for the pipes exceeds the minimum requirement of 1000 mm^2 per metre length as given in the MCHW, Volume 1, Clause 518.3 (see Table 4).

9 Flow characteristics

9.1 The pipes will have normal flow characteristics associated with polyethylene pipes.

9.2 Full-bore velocities are available from the *Tables for the Hydraulic Design of Pipes, Sewers and Channels*, Volume 2, 8th Edition, by H R Wallingford and D I H Barr. 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.

10 Maintenance

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

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

10.3 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 couplers and should not be used.

10.4 Tests indicate that the pipes have adequate resistance to cleaning using pressure jetting equipment (see section 15.1). It is recommended that low-pressure, high-volume systems are used in accordance with MCHW, Clause 521.

11 Durability

In the opinion of the BBA, the HDPE and polypropylene materials from which the pipes and couplings are manufactured will not significantly deteriorate and the anticipated life of the system will be in excess of 50 years.

12 Reuse and recyclability

The pipes and couplers contain polypropylene and polyethylene, which can be recycled.

Installation

13 General

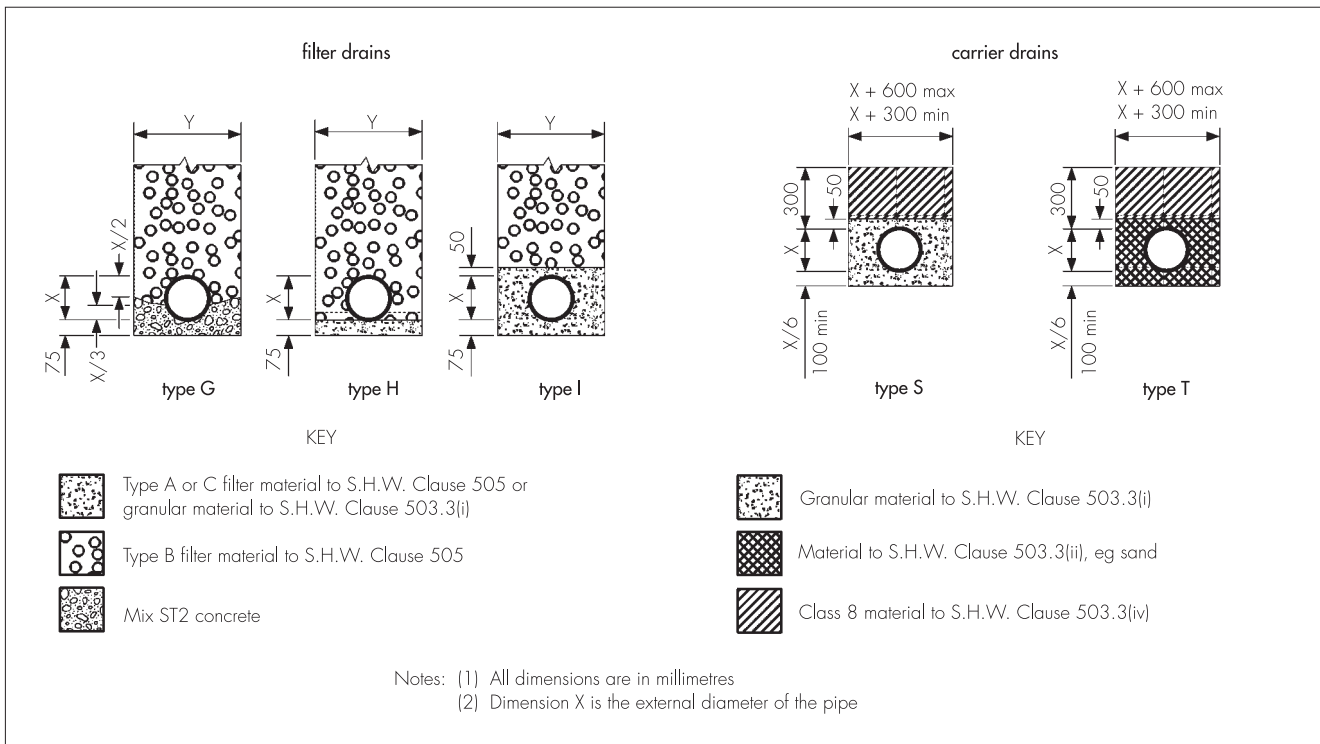
13.1 JFC CorriPipe Twinwall High-Density Polyethylene 150 mm to 600 mm Diameter Filter and Carrier Pipes and Couplers must be installed in accordance with HE requirements and the MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

13.2 The pipes and couplers must be protected against damage from site construction traffic.

14 Procedures

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

Figure 5 Installation details



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

14.3 For a watertight joint, the pipe ends and couplers must be clean and the rubber seal fitted externally in the first or second dwell. 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.

14.4 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.

Technical Specification

15 Tests

15.1 Tests were carried out on the pipe in accordance with the 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 the MCHW, Volume 1, Clause 518.11
- rodding resistance to the 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
- resistance to water jetting WRc method.

15.2 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).

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

16 Investigations

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

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

16.3 Calculations were carried out to determine slot area.

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

Bibliography

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

BS EN 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 *Thermoplastics pipes — Determination of creep ratio*

BS EN ISO 9969 : 1995 *Thermoplastics pipes — Determination of ring stiffness*

BS EN 638 : 1995 *Plastics piping and ducting systems — Thermoplastics pipes — Determination of tensile properties*

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

BS EN ISO 527-2 : 2012 *Plastics — Determination of tensile properties — Test conditions for moulding and extrusion plastics*

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

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

BS EN ISO 9001 : 2008 *Quality management systems — Requirements*

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

Manual of Contract Documents for Highway Works, Volume 1 Specification for Highway Works, 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)

17 Conditions

17.1 This Certificate:

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

17.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

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

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

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

17.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

17.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.