

NAYLOR METRODRAIN TWINWALL HIGHWAY DRAINAGE SYSTEM

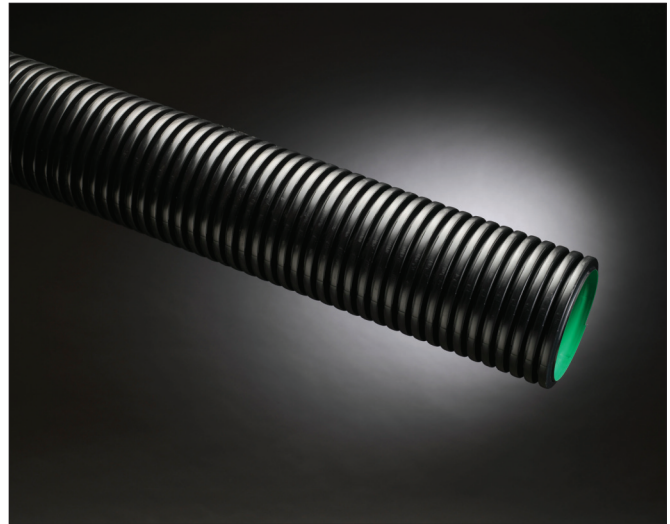
NAYLOR METRODRAIN TWINWALL HIGHWAY DRAINAGE SYSTEM 150 MM TO 750 MM PIPES AND COUPLERS

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 Infrastructure, 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 Naylor Metrodrain Twinwall Highway Drainage System 150 mm to 750 mm Pipes and Couplers, for use as filter and carrier pipes in highway drainage.

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

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

Durability — the products 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 products described herein. These products have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Paul Valentine
Technical Excellence Director

Claire Curtis-Thomas
Chief Executive

Date of Fifth issue: 2 July 2018

Originally certificated on 2 April 2009

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.
Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.*

Requirements

In the opinion of the BBA, Naylor Metrodrain Twinwall Highway Drainage System 150 mm to 750 mm Pipes and Couplers, when used in accordance with the provisions of this Certificate, will meet or contribute to meeting the requirements of the *Manual of Contract Documents for Highways Works (MCHW)*⁽¹⁾, Volume 1 *Specification for Highways Works (SHW)*.

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

Regulations

Construction (Design and Management) Regulations 2015

Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See sections: 3 *Delivery and site handling* (3.1) and 13 *General* of this Certificate.

Technical Specification

1 Description

1.1 Naylor Metrodrain Twinwall Highway Drainage System 150 mm to 750 mm Pipes and Couplers comprise a range of polyethylene pipes with a black outer layer and a green inner layer, and black polypropylene or polyethylene couplers. The pipes are available in both perforated and unperforated forms.

1.2 The raw material specification of the pipes is given in Table 1.

Table 1 Material properties and specifications⁽¹⁾

Property	Test method/reference	Specification
Tensile properties	BS EN ISO 527-3	> 20 MPa
Oxygen induction time	BS EN 728	≥ 4 min
Melt flow rate	BS EN ISO 1133-1	≤ 0.5 g (10 min) ⁻¹ 2.16 kg at 190°C
Density	BS EN ISO 1183-1, BS EN ISO 17855-1	> 850 kg·m ⁻³

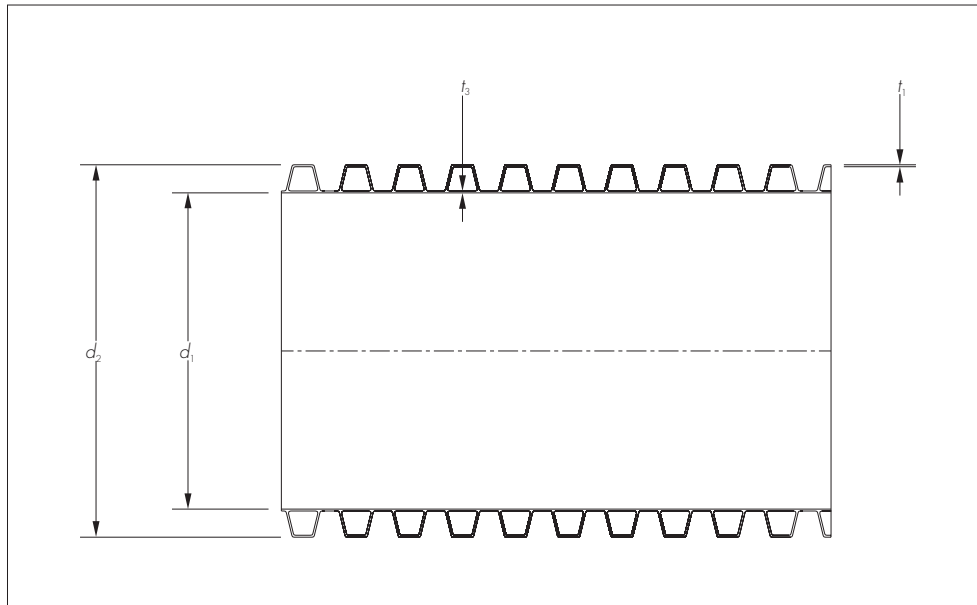
(1) This table is in the format of Appendix 5/7 of the MCHW, Volume 2. It is used to satisfy Clause 518.2 of the MCHW, Volume 1.

1.3 Naylor Metrodrain Twinwall pipes are supplied with plain ends in sizes 150, 225, 300, 375, 450, 600 and 750 mm. Pipes of 375, 450, 600 and 750 mm are also available with an integrally formed socket at one end. 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 Twinwall pipe dimensions

Nominal internal pipe diameter (d_1) (mm)	Minimum internal pipe diameter (d_1) (mm)	Nominal external pipe diameter (d_2) (mm)	t_1 (minimum) (mm)	t_3 (minimum) (mm)	Nominal length (m)	Nominal mass (kg·m ⁻¹)
150	147.9	173.0	0.5	0.8	6	1.4
225	225.0	264.9	1.0	0.9	6	3.0
225	225.0	266.0	1.0	0.9	6	3.0
300	300.5	352.9	1.3	1.3	6	5.0
375	373.5	432.5	1.7	1.5	6	7.4
450	446.0	518.3	2.0	1.8	6	10.8
600	593.0	692.4	2.4	1.9	6	18.6
750	738.0	860.0	2.9	3.4	6	26.8

Figure 1 Twinwall pipe dimensions



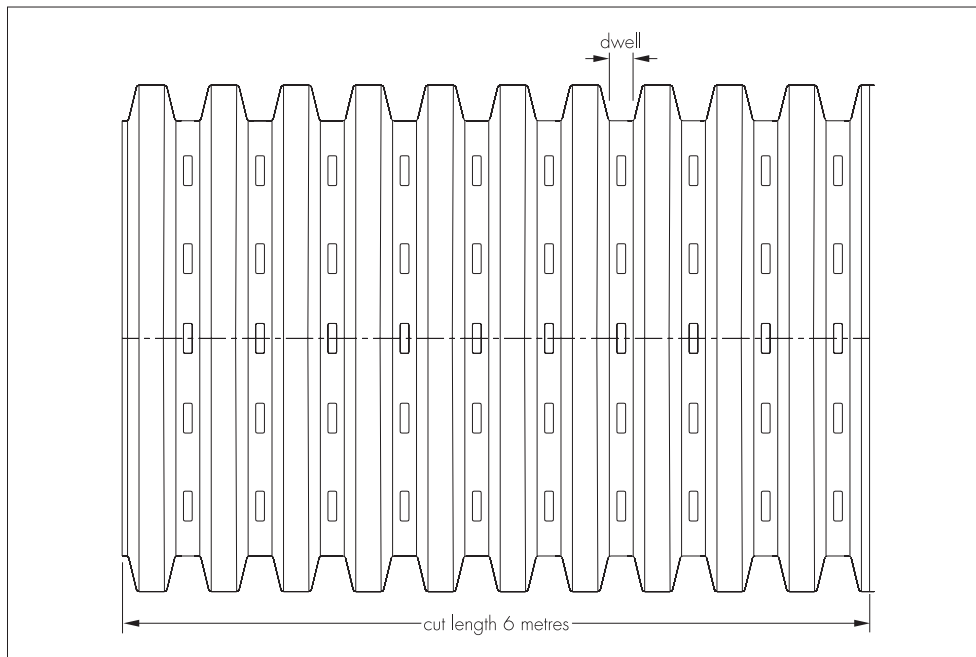
1.4 Pipes can be supplied either perforated or unperforated. Perforated pipes are available with the slots in the dwell between corrugations equally spaced around the circumference (see Table 3 and Figure 2). Alternatively, the slots are located on one half of the pipe only and thus the permeable area is approximately halved. For the 750 mm pipes, two perforation patterns are offered, slots or holes.

Table 3 Twinwall perforated pipe dimensions

Nominal internal pipe diameter (mm)	Number of slots per dwell	Number of rows of slots	Number of dwells per metre	Slot length (nominal) (mm)	Slot width (nominal) (mm)	Permeable area (nominal) ($\text{mm}^2 \cdot \text{m}^{-1}$)
Fully perforated						
150	12/0 ⁽¹⁾	12	56	15	1.9	9576
225	8	8	39	20	2.1	13104
225	8	8	33	20	2.1	11088
300	8	8	27	30	2.1	13608
375	8	8	23	40	3.5	25760
450	8	8	19	40	3.5	21280
600	8	8	15	40	3.5	16800
750 (slots)	4	4	11	88	3	11616
750 (holes)	16	16	11	9	9	11197
Half perforated						
150	6/0 ⁽¹⁾	6	56	15	1.9	4788
225	4	4	39	20	2.1	6552
225	4	4	33	20	2.1	5544
300	4	4	27	30	2.1	6804
375	4	4	23	40	3.5	12880
450	4	4	19	40	3.5	10640
600	4	4	15	40	3.5	8400
750 (slots)	2	2	11	88	3	5808
750 (holes)	8	8	11	9	9	5598

(1) Slots in alternate dwells only.

Figure 2 Twinwall perforated pipe dimensions



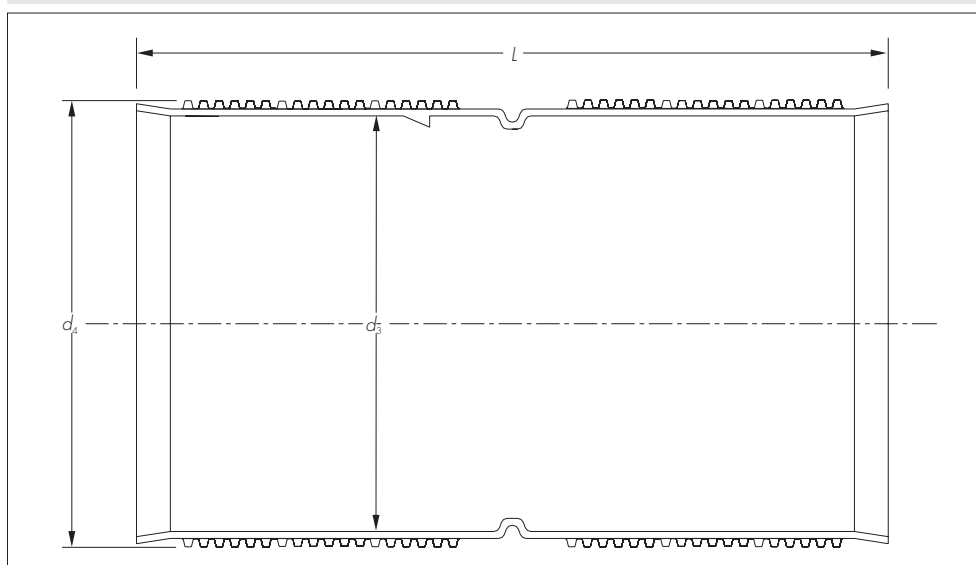
Couplers

1.5 Couplers are available for each size of pipe (see Table 4 and Figure 3).

Table 4 Twinwall coupler dimensions

Nominal internal pipe diameter (mm)	Minimum internal diameter d_3 (mm)	Nominal external diameter d_4 (mm)	Nominal length L (mm)	Nominal seal height h (mm)
150	173.0	184.4	176.0	15.0
225	267.0	289.1	284.0	23.5
300	354.0	379.8	353.0	31.5
375	434.3	465.3	330.0	33.9
450	520.0	563.2	396.0	40.5
600	694.3	740.6	484.5	56.2
750	864.0	914.0	700.0	75.0

Figure 3 Twinwall coupler dimensions⁽¹⁾

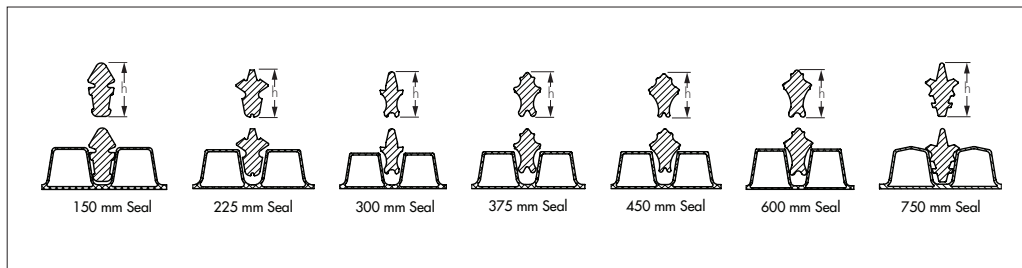


(1) The illustration is for information only. "d3" is taken at the seal location. The actual coupler design may differ from that shown.

Seals

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

Figure 4 Twinwall seal dimensions



2 Manufacture

2.1 The pipes are manufactured by a twin extrusion process in which two pipes are extruded simultaneously, one inside the other, and heat-welded together in one continuous process.

2.2 The couplers are injection-moulded in polypropylene, or rotationally moulded in polyethylene.

2.3 As part of the assessment and ongoing surveillance of product quality, the BBA has;

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

2.4 The management system of Naylor Drainage Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 by BSI (Certificate FM 01420).

3 Delivery and site handling

3.1 Pipes with nominal internal diameters up to 450 mm are generally delivered packed in stillages and should be retained in their packaging until installation. 600 and 750 mm pipes are delivered loose and should be kept on firm, flat ground prior to installation.

3.2 Handling, storage and transportation of the pipes and couplers must be in accordance with the Certificate holder's instructions, with care taken to avoid damage by dropping or dragging. They should be adequately supported at all times, and contact with sharp projections, protuberances and abrasive surfaces should be avoided.

3.3 When long-term storage is envisaged, the pipes and couplers must be protected from direct sunlight. If protection cannot be provided, consideration must be given to the effects of daily exposure to direct sunlight:

- up to 3 months — negligible UV degradation but possible extreme surface temperatures of up to 80°C may cause some localised distortion
- 3 to 12 months — may have significant effect on the impact resistance and physical properties of the products
- over 12 months — damage will occur unless protection is provided.

3.4 The Certificate holder can manufacture the pipes with enhanced UV stability if required.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Naylor Metrodrain Twinwall Highway Drainage System 150 mm to 750 mm Pipes and Couplers.

Design Considerations

4 Use

Naylor Metrodrain Twinwall Highway Drainage System 150 mm to 750 mm Pipes (perforated and unperforated) and Couplers comply with the requirements of the MCHW, Volume 1, Clause 518.5 for pipes, Clause 518.6 for couplers, couplers and Clause 518.7 for the system. When installed in accordance with the recommendations given in this Certificate, they are satisfactory for use in highways for the collection and disposal of surface and sub-surface water.

5 Practicability of installation

The products must be installed by competent contractors experienced with these types of products using traditional drain-laying methods in accordance with HE requirements and the MCHW, Volume 1, Clauses 503, 505, 518.8 and 518.9. The lengths in which the pipes are available and their lightness in weight are a significant advantage during handling and installation, and jointing of the pipes can be readily achieved.

6 Strength

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

6.3 The pipes can be used as an alternative to the plastic pipes for surface water drains listed in the MCHW, Volume 1, Table 5/1, and for safe bedding depth purposes may be assumed to have a standard dimension ratio (SDR) not greater than 26.

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 504.4.

7.2 When correctly made, joints constructed from pipe and couplers or plain and socketed pipe ends 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 given in the MCHW, Volume 1, Clause 518.3 of 1000 mm^2 per metre length (see Table 3).

9 Flow characteristics

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

9.2 Full-bore velocities are available from *Tables of the Hydraulic Design of Pipes, Sewers and Channels*, Volume 2, 8th 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.

10 Maintenance

10.1 Access to the products for cleaning should be provided by conventional methods.

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

10.3 The products can be rodded readily 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 Results of tests indicate that the pipes have adequate resistance to water cleansing using pressure-jetting equipment. It is recommended that low-pressure, high-volume systems are used in accordance with the MCHW, Volume 1, Clause 521.

11 Durability

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

12 Reuse and recyclability

The products are manufactured from polyethylene or polypropylene, which are recyclable.

Installation

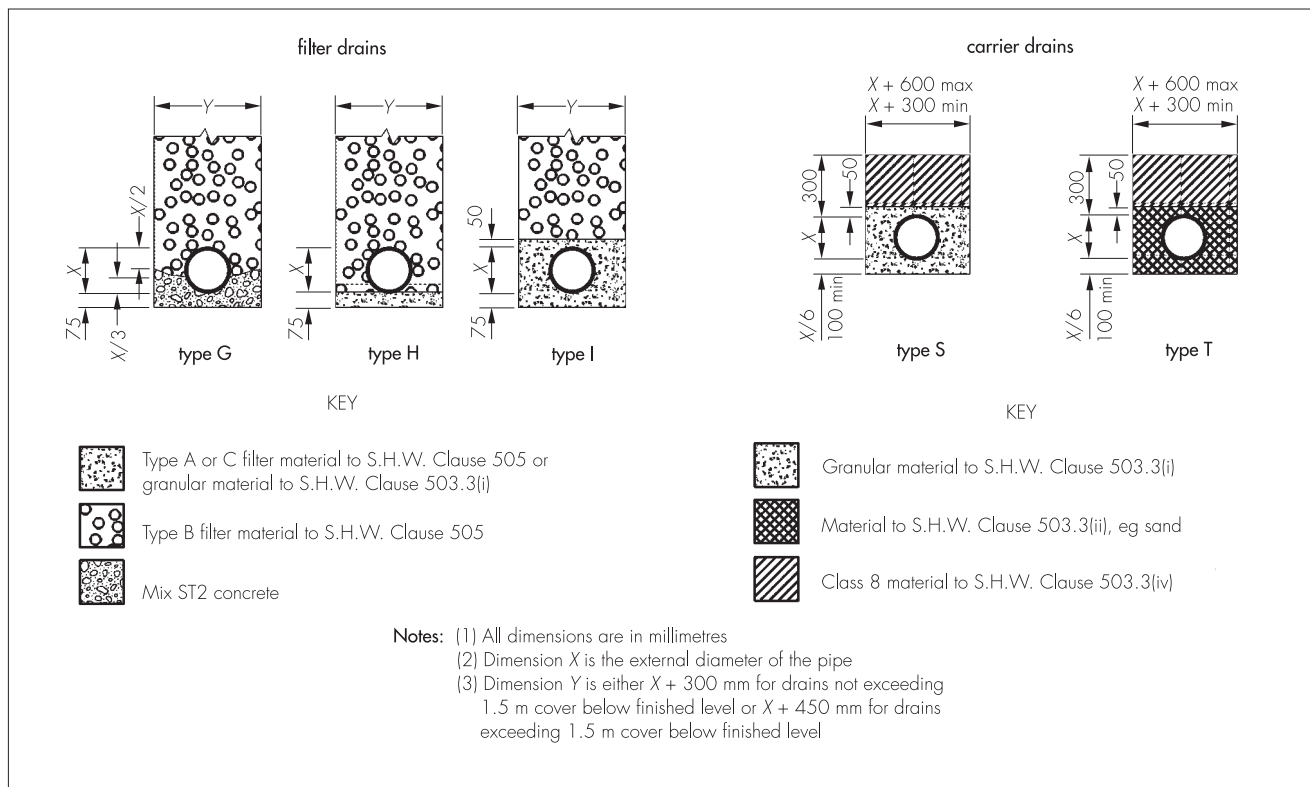
13 General

Naylor Metrodrain Twinwall Highway Drainage System 150 mm to 750 mm Pipes and Couplers must be installed in accordance with HE requirements and the MCHW, Volume 1, Clauses 503, 505, 518.8 and 518.9.

14 Procedure

14.1 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



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

14.3 For a watertight joint, the pipe ends and coupler or socket pipe end should be cleaned and a rubber seal fitted. For sizes between 150 and 600 mm the seal is fitted externally between the first and second corrugation in the pipe. For 750 mm pipe the seal is fitted between the first and the second corrugation if using a socketted pipe, and between the second and the third corrugation if using a coupler. The seal and inside of the coupler or socket pipe end should be lubricated with a Naylor-approved lubricant and the pipe pushed fully home to the register, either by hand or using a lever if necessary.

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

14.5 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

15 Tests

15.1 Tests were carried out on the pipe and the results assessed to determine compliance with the MCHW, Volume 1, Clause 518.5, including:

- determination of ring stiffness to BS EN ISO 9969 : 2016
- creep ratio to BS EN ISO 9967 : 2016
- resistance to longitudinal bending to the MCHW, Volume 1, Clause 518.11
- impact strength at 0 and 23°C to BS EN 1411 : 1996 with a d25 striker of 1.0 kg mass
- rodding resistance to the MCHW, Volume 1, Clause 518.12
- water jetting WRc method.

15.2 Tests were carried out on jointed pipe to establish compliance with the MCHW, Volume 1, Clauses 504.3 and 518.7, of:

- leaktightness of joints to BS EN 1277 : 2003 when subjected to diameter distortion and angular deflection
- resistance to rodding.

15.3 Tests were carried out to establish the dimensional accuracy of the pipe, coupler 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 the slot area of perforated pipes.

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

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

Bibliography

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

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

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 527-3 : 1996 *Plastics — Determination of tensile properties — Test conditions for films and sheets*

BS EN ISO 1133-1 : 2011 *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Standard method*

BS EN ISO 1183-1 : 2012 *Plastics — Methods for determining the density of non-cellular plastics — Immersion method, liquid pycnometer method and titration method*

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

BS EN ISO 9967 : 2016 *Thermoplastic pipes — Determination of creep ratio*

BS EN ISO 9969 : 2016 *Thermoplastic pipes — Determination of ring stiffness*

BS EN ISO 17855-1 : 2014 *Plastics — Polyethylene (PE) moulding and extrusion materials — Designation system and basis for specifications*

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

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

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

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.