

## Polypipe Civils

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HAPAS Certificate

**02/H068**

Product Sheet 6

## RIDGIDRAIN ADVANCED DRAINAGE SYSTEM

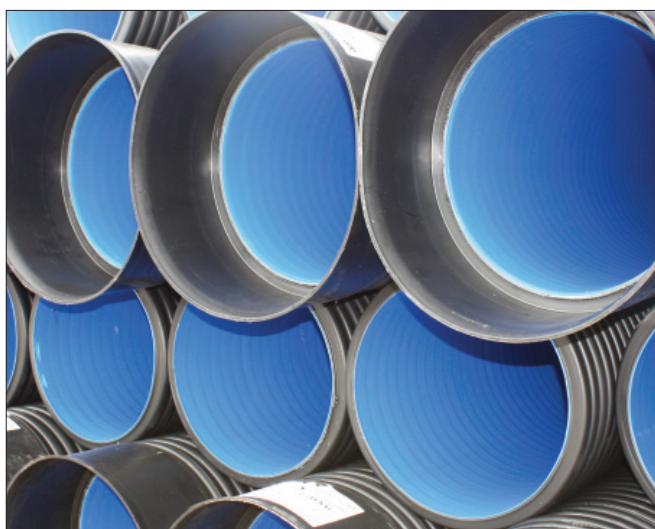
### RIDGIDRAIN (HDPE) 400 MM TO 600 MM PIPES AND COUPLERS

This HAPAS Certificate Product Sheet<sup>(1)</sup> is issued by the British Board of Agrément (BBA), supported by the Highways Agency (HA) (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 Certificate Product Sheets are normally each subject to a review every five years.  
(1) Hereinafter referred to as 'Certificate'.

This Certificate relates to Ridgidrain (HDPE) 400 mm to 600 mm Pipes and Couplers, a range of high density polyethylene pipes (perforated and unperforated) and couplers for use as filter and carrier pipes for 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 five-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 cleansed 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

Date of First issue: 23 October 2012

Brian Chamberlain

Head of Approvals — Engineering

Greg Cooper

Chief Executive

*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](http://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.*

# Requirements

In the opinion of the BBA, Ridgidrain (HDPE) 400 mm to 600 mm Pipes and Couplers, when used in accordance with the provisions of this Certificate, will meet or contribute to meet the following requirements of the Manual of Contract Documents for Highways Works (MCHW)<sup>(1)</sup> 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: The Highways Agency (HA), Transport Scotland, the Welsh Assembly Government and the Department for Regional Development (Northern Ireland).

# Regulations

## Construction (Design and Management) Regulations 2007

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

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

See sections: 1 Description, 2 Delivery and site handling and 13 Installation of this Certificate.

# Technical Specification

## 1 Description

1.1 Ridgidrain (HDPE) 400 mm to 600 mm Pipes and Couplers are manufactured from high density polyethylene to the material specification given Table 1.

Table 1 Material properties/specification<sup>(1)</sup>

Property	Test Method Reference	Proposed specification
Tensile properties	BS EN ISO 527	Sample 1B at 50 mm min <sup>-1</sup> ≥ 18 MPa
Thermal stability (OIT)	BS EN 728	≥ 4 min
Melt mass-flow rate	BS EN ISO 1133	≤ 1.0 g (10 min) <sup>-1</sup> 2.16 kg at 190°C
Reference density	BS EN ISO 1183	≥ 935 kg·m <sup>-3</sup>
Heat Reversion	ISO 12091	110°C ± 2°C (pass)

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

1.2 The pipes are of structured-wall construction and have a corrugated outer wall and smooth inner wall. The outer wall is coloured black and the inner wall blue as standard, although other internal colours are available on request<sup>(2)</sup>.

(2) Further information can be obtained from the Certificate holder.

1.3 The 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 and offset symmetrically for alternate dwells along the pipe length (see Tables 2 and 3 and Figure 1). Alternatively, the slots are located on one half only of the pipe and thus the permeable area is approximately halved.

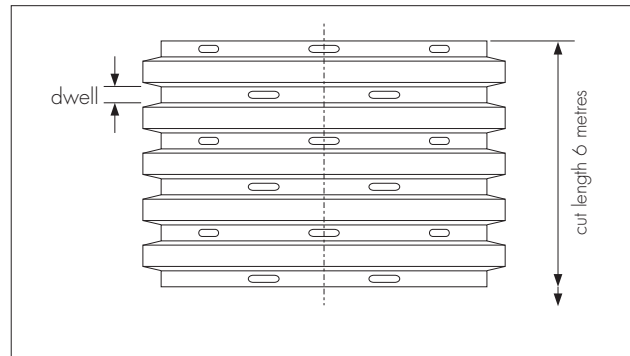
Table 2 Perforated pipe details — fully perforated

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 <sup>2</sup> ·m <sup>-1</sup> )
400	2	20	70–90	3–4	8400
450	2	13	70–90	3–4	5460
500	2	22	70–90	3–4	9240
600	2	10	80–100	3–4	4800

Table 3 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) ( $\text{mm}^2 \cdot \text{m}^{-1}$ )
400	1	20	70-90	3-4	4200
450	1	13	70-90	3-4	2730
500	1	22	70-90	3-4	4620
600	1	10	80-100	3-4	2400

Figure 1 Details of perforations

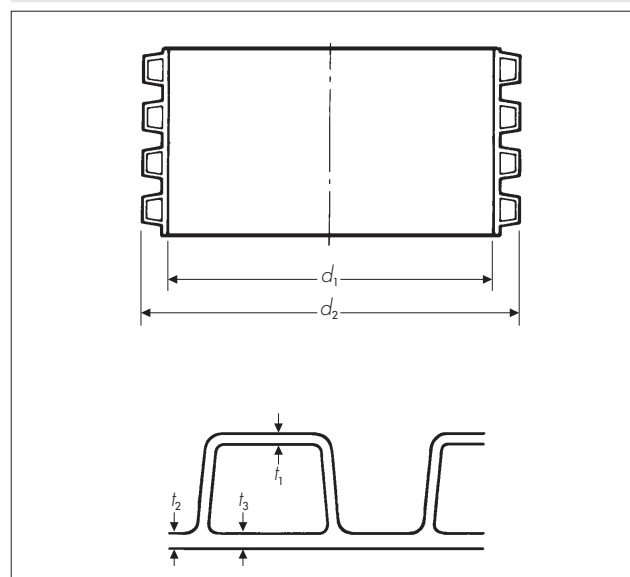


1.4 The pipes are manufactured in nominal internal diameters of 400, 450, 500 and 600 mm and to the dimensions shown in Table 4 and Figure 2.

Table 4 Ridgidraon (HDPE) 400 to 600 mm - Pipe dimensions

Nominal internal pipe diameter, $d_1$ (mm)	Minimum internal pipe diameter (mm)	Nominal external pipe diameter $d_2$ (mm)	$t_1$ minimum (mm)	$t_2$ minimum (mm)	$t_3$ minimum (mm)	Nominal length (m)	Nominal weight ( $\text{kg} \cdot \text{m}^{-1}$ )
400	392	458	1.4	2.8	1.2	6	8
450	441	523	1.5	3.9	1.4	6	9
500	490	576	1.6	3.0	1.5	6	12
600	588	700	2.0	5.0	1.7	6	14

Figure 2 Ridgidrain (HDPE) pipe



1.5 The pipes are supplied with either two plain ends, or with one plain end and a welded integral socket. The integral socket is to the same profile as that of half a coupler (see Table 5 and Figure 3).

Table 5 Integral socket dimensions

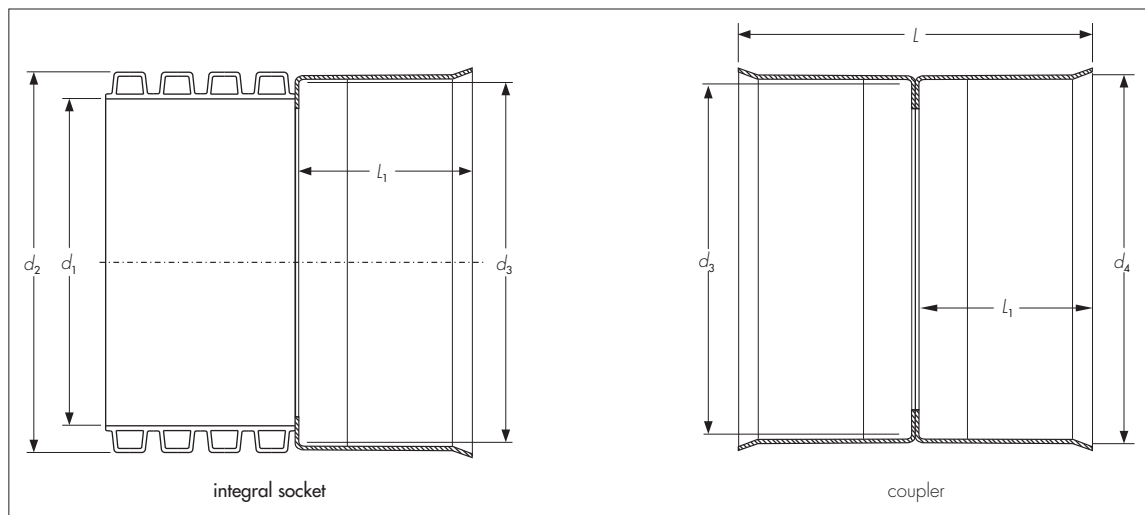
Nominal internal pipe diameter, $d_1$ (mm)	Nominal internal socket diameter, $d_3$ (mm)	Nominal socket depth, $L_1$ (mm)	Nominal seal height, $h$ (mm)
400	463	200	40
450	528	225	51
500	577	251	49
600	707	281	75

1.6 Black polyethylene couplers, manufactured by the Certificate holder are used for jointing the plain ended Ridgidrain (HDPE) 400 to 600 mm pipes (see Table 6 and Figure 3).

Table 6 Coupler dimensions

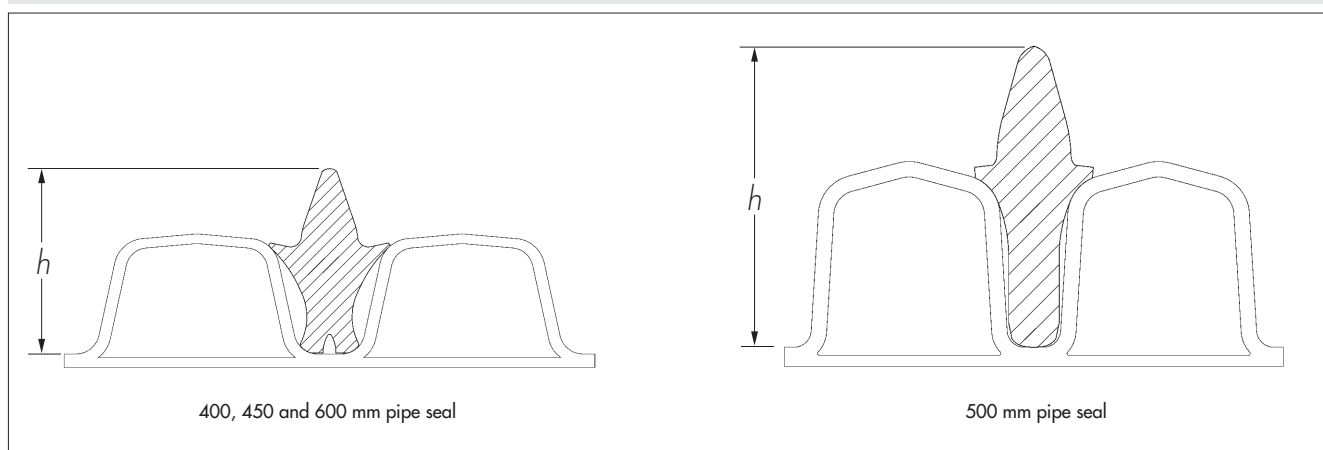
Nominal pipe size (mm)	Nominal internal diameter, $d_3$ (mm)	Nominal external diameter, $d_4$ (mm)	Nominal length $l$ (mm)	Nominal seal height, $h$ (mm)
400	463	475	400	40
450	528	540	435	51
500	577	589	489	49
600	707	719	560	75

Figure 3 Welded integral socket and couplers



1.7 Sealing of the integral socket joints and the joints formed using couplers requires rubber sealing rings supplied by the Certificate holder (See Figure 4). The rings are manufactured to BS EN 681-1 : 1996. The seals must be fitted in accordance with the Certificate holder's installation instructions to ensure a watertight joint.

Figure 4 Seals



## 2 Manufacture

2.1 The pipes are manufactured by a twin extrusion process, with the inner and outer skins 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 made from two injection moulded half couplers, which are then welded together to form the completed coupler.

2.3 The integral sockets are made using one half coupler, which is spin welded on to the end of the pipe.

2.4 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 check that the specifications and quality control operated by the manufacturer are being maintained.

2.5 The management system of Polypipe Civils has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by BSI Certificate Q06225.

## 3 Delivery and site handling

3.1 The 400 mm diameter pipes are delivered to site packaged in wooden support frames, with five pipe lengths to the pack. Pipes of 450 mm diameter and greater are supplied loose.

3.2 Each pipe bears a label showing the following information:

- Polypipe Civils
- Product code
- Ridgidrain unperforated, perforated, half perforated
- Job/pack number
- Operator
- Length
- The BBA logo, with this Certificate and product sheet number.

3.3 The Ridgidrain (HDPE) product range has '/1' at the end of the product code.

3.4 Handling, storage and transportation should be in accordance with the requirements of MCHW.

3.5 When long-term storage is envisaged, the 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.

3.6 The Certificate holder has the option of adding chemicals to provide enhanced UV stability on request.

3.7 Pipes should be stored on a flat surface. Where they delivered as loose lengths, they 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.

## Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Ridgidrain (HDPE) 400 mm to 600 mm Pipes and Couplers.

## Design Considerations

### 4 General]

Ridgidrain (HDPE) 400 mm to 600 mm Pipes and Couplers (perforated and unperforated), comply with the requirements of the MCHW, Volume 1, Clause 518.5 for the pipes, Clause 518.6 for the 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.

## 5 Practicability of installation

The products are designed to be installed by a competent contractor experienced with this type of product in highway works.

## 6 Strength

6.1 The pipes have a ring stiffness in excess of  $6 \text{ kN}\cdot\text{m}^{-2}$  and 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.

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) equivalent of not greater than 41.

## 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 Correctly made, 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).

## 8 Water infiltration

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

## 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. 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  $0.006 \text{ mm}$  is applicable, but for design purposes, a value of  $0.6 \text{ mm}$  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 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 water cleansing using pressure jetting equipment (see section 15.1). It is recommended that low pressure, high volume systems are utilised in accordance with the MCHW, Volume 1, Clause 520.

## 11 Durability

In the opinion of the BBA, when used in the context of this Certificate, 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.

## 12 Reuse and recyclability

The product is manufactured from polyethylene and can be recycled.

# Installation

## 13 General

13.1 Ridgidrain (HDPE) 400 mm to 600 mm Pipes and Couplers must be installed in accordance with HA requirements and the MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

13.2 The pipes are installed using traditional drain-laying methods. 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.

13.3 The perforated and unperforated pipes and couplers must be protected from damage from site construction traffic.

## 14 Procedure

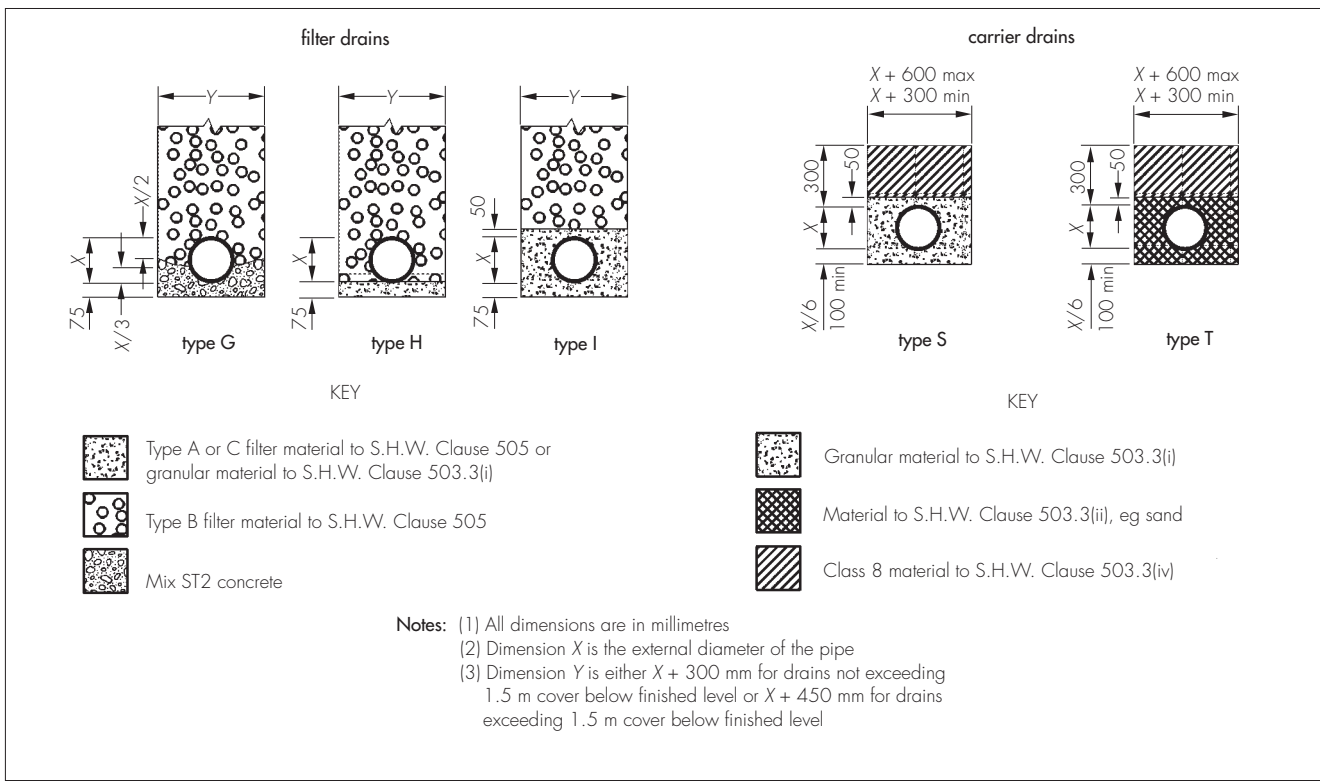
14.1 For typical laying, trench and backfilling specification details reference should be made to Figure 5 and the MCHW, Volume 3, Drawing Numbers F1 (Type T and S) and F2 (Type G, H and I).

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

14.3 For a watertight joint, the pipe ends and socket / 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 socket / 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 backfilling 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

### 15 Tests

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

- ring stiffness to BS EN ISO 9969 : 2007
- creep ratio to BS EN ISO 9967 : 2007
- 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.

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

- leaktightness of joints to BS EN 1277 : 2003 when subjected to diameter distortion and angular deflection from 0.5 bar to -0.3 bar

15.3 Tests were carried out to establish the dimensional accuracy of the pipes and couplers.

### 16 Investigations

16.1 An assessment was made of the effect of production tolerances on the performance of the products.

16.2 An assessment has been made of material properties, chemical resistance and durability.

16.3 Calculations were carried out to determine the slot area.

16.4 The following were assessed based on the performance of similar products manufactured by the Certificate holder:

- practicability of installation
- ease of jointing
- flow characteristics.

16.5 The manufacturing process, including the quality and composition of the materials used and the methods adopted for quality control, have been assessed.

## 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 *Plastics piping and ducting systems — 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 527-1 : 1993 *Plastics — Determination of tensile properties — General principles*
- BS EN ISO 3451-1 *Plastics — Determination of ash. General methods*
- BS EN ISO 9001 : 2008 *Quality management systems*
- BS EN ISO 9967 : 2007 *Thermoplastic pipes. Determination of creep ratio*
- BS EN ISO 9969 : 2007 *Thermoplastic pipes. Determination of ring stiffness*
- 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 12091 : 1995 *Structural wall thermoplastics pipes — Oven test*
- 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.