

**Marley Plumbing and Drainage**

Lenham  
Kent ME17 2DE  
Tel: 01622 858888 Fax: 01622 858725  
e-mail: marketing@marleyext.com  
website: www.marley.co.uk

Agrément Certificate  
**09/H146**  
Product Sheet 1

**MARLEY QUANTUM HIGHWAY PVC-U TWINWALL SURFACE WATER DRAINAGE SYSTEMS**

**MARLEY QUANTUM 150 MM, 225 MM AND 300 MM DRAINAGE PIPES AND FITTINGS**

This Certificate is issued under the Highway Authorities' Product Approval Scheme (HAPAS) by the British Board of Agrément (BBA) in conjunction with the Highways Agency (HA) (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 SCOPE AND SUMMARY OF CERTIFICATE**

This Certificate relates to Marley Quantum 150 mm, 225 mm and 300 mm Drainage Pipes and Fittings, PVC-U twinwall pipes and fittings complying with MCHW1, Clause 518, for use underground in highway works for the conveyance of surface water when pipes and fittings to BS EN 1401-1 : 1998 can be used.

**AGRÉMENT 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 5).

**Performance of joints** — the system will remain watertight under normal service conditions (see section 6).

**Flow characteristics** — the pipes are smooth bore and the system is resistant to blockages (see section 7).

**Maintenance** — the system may be cleaned using standard techniques (see section 9).

**Durability** — the system will have a service life in excess of 50 years (see section 10).



The BBA has awarded this Agrément 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



Date of First issue: 8 May 2009

Brian Chamberlain  
Head of Approvals — Engineering

Greg Cooper  
Chief Executive

Originally certified on 31 March 1998

*The BBA is a UKAS accredited certification body — Number 1113. 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 of this Agrément Certificate by either referring to the BBA's website ([www.bbacerts.co.uk](http://www.bbacerts.co.uk)) or contacting the BBA direct.*

# HAPAS Requirements

## Requirements

The general requirements for drains are contained in the Manual of Contract Documents for Highway Works (MCHW)<sup>(1)</sup>, Volume 1 and Volume 2.

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

Further information and guidance is given in 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 or 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), 4 Practicability of installation and 11 General.

## General

This Certificate relates to Marley Quantum 150 mm, 225 mm and 300 mm Drainage Pipes and Fittings, PVC-U twinwall pipes and fittings for use underground in highway works for the conveyance of surface water when pipes and fittings to BS EN 1401-1 : 1998 can be used.

The pipes and couplers comply with MCHW, Volume 1, Clause 518, and are for use in highway drainage for the collection and disposal of surface and sub-surface water.

This Certificate does not cover the use of the products for domestic sewage, combined sewerage systems or untreated trade effluents.

## Technical Specification

### 1 Description

1.1 Marley Quantum 150 mm, 225 mm and 300 mm twinwall pipes are manufactured in a golden-brown coloured PVC-U by a twin extrusion process. Two PVC-U pipes are extruded simultaneously, one inside the other, and heat welded together in one continuous process.

1.2 The pipe is available with one plain end and the other with an integral socket. One seal, to be fitted to the plain end, is supplied with each length. The seals are to BS EN 681-1 : 1996, type WC.

1.3 The outer wall is corrugated and the inner wall is smooth finished. Details and dimensions of the pipe and socket are shown in Table 1 and Figures 1 and 2.

1.4 Quantum Highway fittings are golden-brown in colour and manufactured in PVC-U with socketed ends. The sockets are not ribbed and have the same socket depths as the corresponding diameter of pipe socket. Where appropriate, the body of the 150 mm fittings is ribbed; the 225 mm and 300 mm fittings are not ribbed and are either formed from pipe to BS EN 1401-1 : 1998, SN4<sup>(1)</sup>, or are injection moulded. The range of fittings covered by this Certificate is detailed in Table 2.

(1) Ring stiffness (SN) of 4 kNm<sup>-2</sup> with a standard dimension ratio (SDR) of 41.

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

#### Pipes

- dimensional accuracy
- weight
- impact resistance
- heat reversion/delamination
- stiffness.

#### Fittings

- dimensional accuracy
- stress relief of injection moulded products.

1.6 The manufacturer's name, diameter of the pipe and the BBA logo incorporating the number of this Certificate are printed along each length of pipe.

### 2 Delivery and site handling

2.1 Handling, storage and transportation should be in accordance with BS 5955-6 : 1980.

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

Table 1 Nominal dimensions

Nominal pipe diameter	External diameter $d_1$ (mm)	Internal diameter $d_2$ (mm)	$P$ (mm)	$t_1$ (mean) (mm)	$t_2$ (mean) (mm)	Length $L_1$ (mm)	Weight (min) ( $\text{kgm}^{-1}$ )	Integral socket	
								Length $L_2$ (mm)	Diameter $d_3$ (nom) (mm)
150	160	148	16	0.63	0.80	6000	1.25	90	161
225	250	228	24	1.00	1.00	6000	2.75	125	251
300	329	301	31.5	1.30	1.40	6000	4.65	110	330

Figure 1 Twinwall pipe

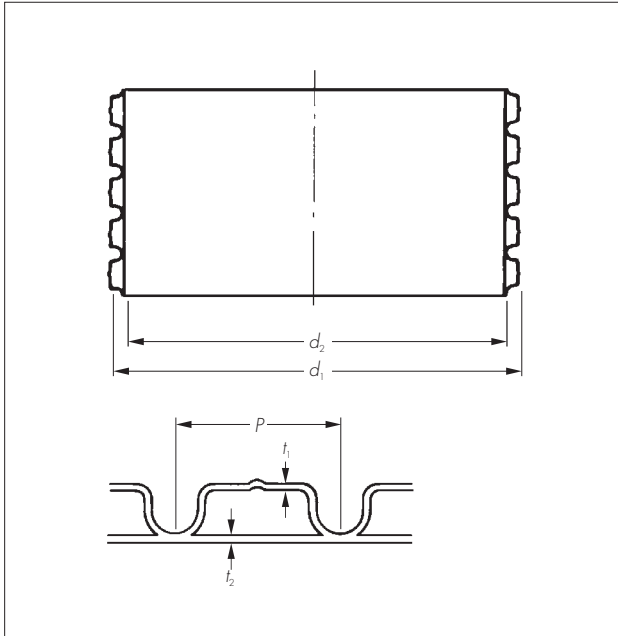


Figure 2 Pipe socket

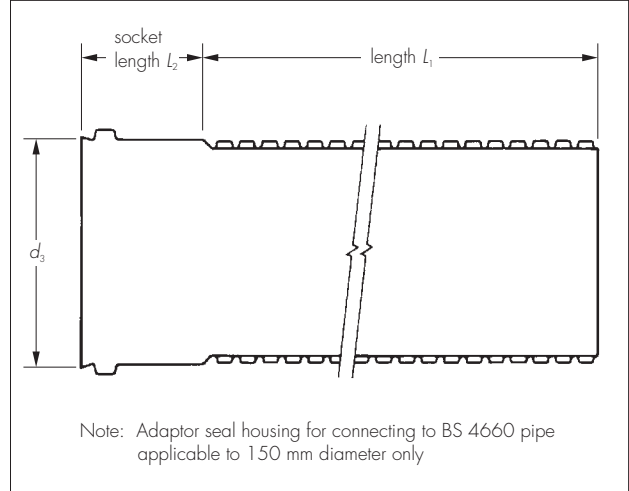
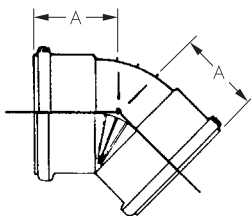


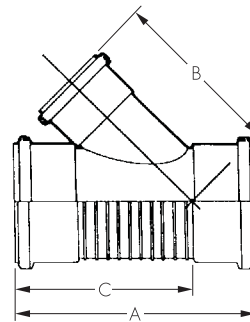
Table 2 Fittings

Bends (double socket)



Size (mm)	Code	Angle	Dimension A (mm)
150	UMB19Q	87½	200†
150	UMB14Q	45	115
150	UMB13Q	30	105
150	UMB11Q	15	95
225	UMB29	90	595†
225	UMB24	45	160
225	UMB23	30	145
225	UMB21	15	125
300	UMB39	90	730†
300	UMB34	45	195
300	UMB33	30	175
300	UMB31	15	150

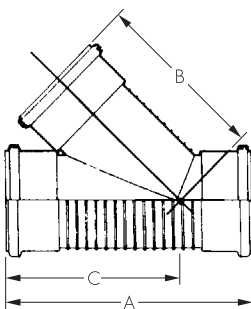
Unequal branch (socket)



Size (mm)	Code	Angle	Dimension (mm)		
			A	B	C
150 × 110	UMY10Q	45	316	232	236
150 × 110	UMY12Q	87½	313	170	130†
225 × 110	UMY20*	45	370	300	300
225 × 150	UMY21*	45	440	340	340
300 × 110	UMY30	45	520	375	425
300 × 150	UMY31	45	590	425	460
300 × 225	UMY32	45	700	520	480

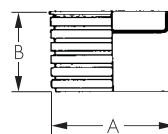
\*injection moulded fittings  
†intended for use in back drop manholes

Equal branch (socket)



Size (mm)	Code	Angle	Dimension (mm)		
			A	B	C
150	UMY13Q	87½	376	180	150†
150	UMY11Q	45	400	280	280
225	UMY22	45	655	430	460
225	UMY33	45	800	540	575

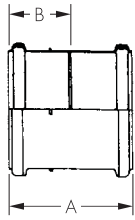
Socket plug (push-fit in socket)



Size (mm)	Code	Dimension (mm)	
		A	B
150	UMJ11Q	160	100

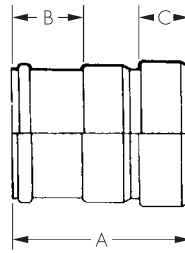
Table 2 Fittings (continued)

Coupling (double socket)



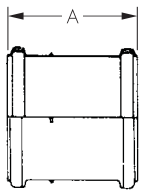
Size (mm)	Code	Dimension (mm)	
		A	B
150	UME15Q	170	83
225	UME25	220	94
300	UME35	237	110

Adaptor twinwall or solid-wall PVC-U to clayware pipe



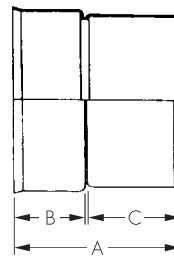
Size (mm)	Code	Dimension (mm)		
		A	B	C
150	UMA45	230	90	60

Slip coupling (double socket)



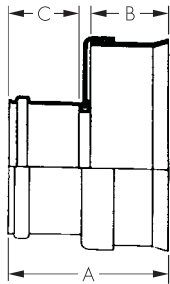
Size (mm)	Code	Dimension A
		(mm)
150	UME16Q	170
225	UME26	190
300	UME36	220

Adaptor (socket/spigot) twinwall pipe to solid-wall PVC-U socket (BS 4660/BS 5481)



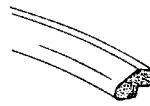
Size (mm)	Code	Dimension (mm)		
		A	B	C
150 x 160	UMA17	160	71	82
225 x 250	UMA27	240	94	134
300 x 315	UMA37	265	110	144

Level invert reducer (double socket)



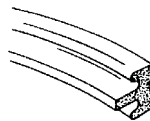
Size (mm)	Code	Dimension (mm)		
		A	B	C
150 x 150	UML21	200	95	90
300 x 225	UML32	240	110	95

Pipe seal for twinwall pipe



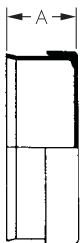
Size (mm)	Code
150	UMR11
225	UMR21
300	UMR31

Pipe seal for connection to solid-wall PVC-U pipe and PVC-U spigot-end fittings



Size (mm)	Code
150	SR61T (seal)
150	SNC6 (seal retaining cap)

End cap (push fit over pipe)



Size (mm)	Code	Dimension A
		(mm)
150	UMK11	70
225	UMK21	95
300	UMK31	110

# Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Marley Quantum 150 mm, 225 mm and 300 mm Drainage Pipes and Fittings.

## Design Considerations

### 3 Use

3.1 Marley Quantum 150 mm, 225 mm and 300 mm Drainage Pipes and Fittings comply with the requirements of the MCHW, Volume 1, Clause 518.5 for pipe, Clause 518.6 for couplers and Clause 518.7 for the system. When installed in accordance with the recommendations given in this Certificate, they are suitable for use in highways for the collection and disposal of surface and sub-surface water.

3.2 This Certificate does not cover use of the pipe for domestic sewage, combined sewerage systems or untreated trade effluent.

### 4 Practicability of installation

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

### 5 Strength

5.1 The pipes have a ring stiffness in excess of  $6 \text{ kNm}^{-2}$  and a creep ratio of less than 2.5 and have adequate resistance to static loads.

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

5.3 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 an SDR equivalent to or not greater than 41.

### 6 Performance of joints

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.

### 7 Flow characteristics

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

7.2 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 mm is applicable but, for designs, a value of 0.6 mm is generally used.

### 8 Resistance to chemicals

The pipes and fittings will be unaffected by those types and quantities of chemicals likely to be found in surface water drainage pipes and fittings. Details of the chemical resistance of PVC-U is given in ISO/TR 10358 : 1993.

### 9 Maintenance

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

9.2 The system can be rodded easily using flexible drain rods. In common with other standard plastic drainage systems, toothed root cutters and rods with metal ferrules, as used with some mechanical clearing systems, could damage the pipes and couplers and should not be used.

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

### 10 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.

## 11 General

Marley Quantum 150 mm, 225 mm and 300 mm Drainage Pipes and Fittings must be installed in accordance with HA requirements and MCHW, Volume 1, Clauses 503, 505, 518.7 and 518.8.

## 12 Procedure

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

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

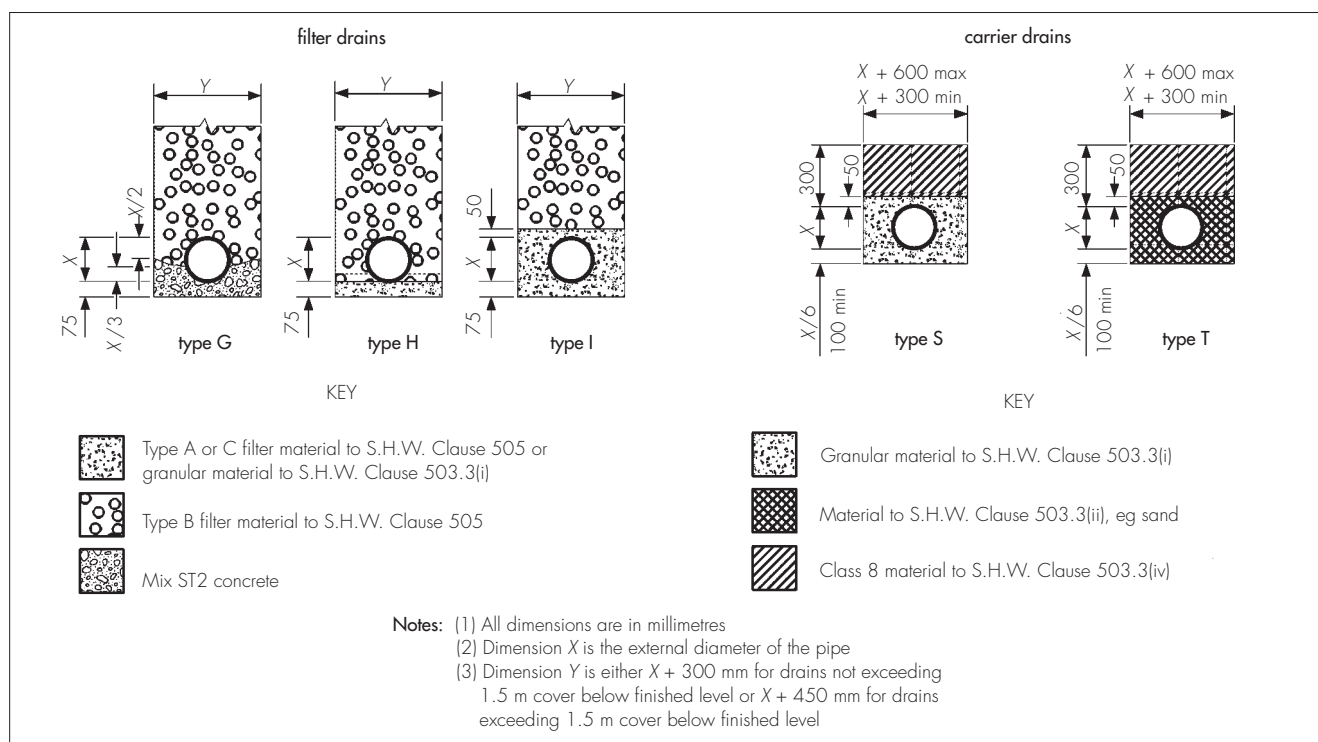
12.3 For a watertight joint, the pipe ends and coupler should be cleaned and the handed rubber seal fitted the correct way round<sup>(1)</sup> in the first corrugation. The seal and inside of the coupler should be lubricated and the pipe pushed fully home to the central register either by hand, or using a lever if necessary.

(1) As described on the seal packaging.

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

12.5 Care should be taken during the backfilling process, to maintain the line and level of the pipeline. If necessary, the pipe should be restrained to prevent uplift.

Figure 3 Installation details



## Technical Investigations

### 13 Tests

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

- impact strength at 0°C to BS 4962 : 1989, Appendix E, with modified striker of 1.0 kg mass and 50 mm diameter
- creep ratio to BS EN ISO 9967 : 2007
- dimensional accuracy
- resistance to penetration of simulated sharp aggregate
- tightness of joints to 0.5 bar positive pressure and 0.5 bar negative pressure and airtightness at 40 mm water gauge
- Vicat softening point to BS EN 727 : 1995
- stiffness
- water jetting to WRc method.

13.2 Tests were carried out on fittings to determine compliance with MCHW, Volume 1, Clause 518.6:

- ease of jointing
- dimensional accuracy
- drop strength to BS EN 12061 : 1999
- short-term ring stiffness to ISO 13967 : 1998
- flexibility of fabricated fittings to BS EN 12256 : 1998.

13.3 Tests were carried out on joined pipes/fittings to determine compliance with MCHW, Volume 1, Clause 518.7:

- effect of combined temperature and external load to WIS (IGN No 4-31-05, Appendix F)
- watertightness of joints to 0.5 bar positive pressure and 0.5 bar negative pressure when the pipe is subjected to a 15% distortion and the socket a 10% distortion and also when subjected to 3° angular deflection (leaktightness of joints to BS EN 1277 : 2003)
- insertion force (ease of jointing)
- dimensional accuracy of pipe, fittings and ring seal.

## 14 Investigations

14.1 An examination was made of data relating to:

- chemical resistance
- flow capacity
- practicability of installation
- material properties
- resistance to rodding.

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

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

## Bibliography

BS 4660 : 2000 *Thermoplastics ancillary fittings of nominal sizes 110 and 160 for below ground gravity drainage and sewerage*

BS 4962 : 1989 *Specification for plastics pipes and fittings for use as subsoil field drains*

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 727 : 1995 *Plastics piping and ducting systems — Thermoplastics pipes and fittings — Determination of Vicat softening temperature (VST)*

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 1401-1 : 1998 *Plastics piping systems for non-pressure underground drainage and sewerage. Unplasticized poly(vinylchloride) (PVC-U) — Specifications for pipes, fittings and the system*

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

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

BS EN ISO 9967 : 2007 *Thermoplastics pipes — Determination of creep ratio*

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

ISO/TR 10358 : 1993 *Plastics pipes and fittings — Combined chemical-resistance classification table*

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)

## 15 Conditions

15.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- 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.

15.2 Publications and documents referred to in this Certificate are those that the BBA deems to be relevant at the date of issue or re-issue of this Certificate and include any: Act of Parliament; Statutory Instrument; Directive; Regulation; British, European or International Standard; Code of Practice; manufacturers' instructions; or any other publication or document similar or related to the aforementioned.

15.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant 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
- remain in accordance with the requirements of Highways Authorities' Product Approval Scheme.

15.4 In granting this Certificate, the BBA is not responsible for:

- 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
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

15.5 Any information relating to the manufacture, supply, installation, use and maintenance 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 and maintained. It does 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; 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. 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 manufacture, supply, installation, use and maintenance of this product/system.