



Designated by Government
to issue
European Technical
Approvals

Product

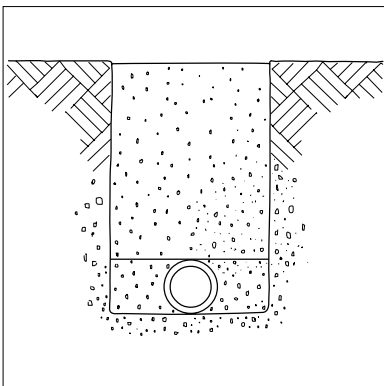
• *THIS CERTIFICATE RELATES TO THE MARLEY QUANTUM SEWER PVC-U TWINWALL UNDERGROUND DRAINAGE AND SEWERAGE SYSTEM, THE COMPONENTS OF WHICH ARE REFERRED TO IN THE ACCOMPANYING DETAIL SHEETS.*

• *The product is for use in domestic drains and public and private sewers at depths up to 10 metres when pipes and fittings to SN4 or SN8 of BS EN 1401-1 1998 can be used.*

• *Components of the system can be used individually or in combination as described in the Detail Sheets.*

• *This Certificate does not cover the use of any of the products for untreated trade effluents.*

These Front Sheets must be read in conjunction with the accompanying Detail Sheets, which provide information specific to the system.



Marley Extrusions Ltd

Lenham
Nr Maidstone
Kent ME17 2DE
Tel: 01622 858888 Fax: 01622 858725


**Agrement
Certificate
No 94/2985**
*Second issue**

MARLEY QUANTUM SEWER PVC-U TWINWALL UNDERGROUND DRAINAGE AND SEWERAGE SYSTEM

Eléments de drainage souterrains
Dränungssystem


Building Regulations — Detail Sheet 1

1 The Building Regulations 1991 (as amended) (England and Wales)

 The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of drainage systems with the Building Regulations. In the opinion of the BBA, the Marley Quantum Sewer PVC-U Twinwall Underground Drainage and Sewerage System, if used in accordance with the provisions of this Certificate, will meet the relevant requirements.


Requirement:	H1(1)	Foul water drainage
Comment:		The underground drainage system will convey the flow of foul or surface water and minimise the risk of blockages or leaks. See the marked sections of the relevant Detail Sheets.
Requirement:	H3	Rainwater drainage
Comment:		The underground drainage system will convey the flow of rainwater and minimise the risk of blockages or leaks. See the marked sections of the relevant Detail Sheets.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The system is acceptable.

2 The Building Standards (Scotland) Regulations 1990 (as amended)

 In the opinion of the BBA, the Marley Quantum Sewer PVC-U Twinwall Underground Drainage and Sewerage System, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations and related Technical Standards as listed below.

Regulation:	10	Fitness of materials
Standard:	B2.1	Selection and use of materials and components
Comment:		The system is acceptable.
Regulation:	24	Drainage and sanitary facilities
Standard:	M2.1	Drainage system of a building
Comment:		The system can meet the relevant requirements of this Standard. See the marked sections of the relevant Detail Sheets.

3 The Building Regulations (Northern Ireland) 1994 (as amended)

 In the opinion of the BBA, the Marley Quantum Sewer PVC-U Twinwall Underground Drainage and Sewerage System, if used in accordance with the provisions of this Certificate, will satisfy the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable.
Regulation:	N5	Underground foul drainage
Comment:		See the marked sections of the relevant Detail Sheets.
Regulation:	N7	Rain-water drainage
Comment:		See the marked sections of the relevant Detail Sheets.

Conditions of Certification

4 Conditions

4.1 This Certificate:

- (a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (d) is copyright of the BBA.

4.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, shall be construed as references to such publication in the form in which it was current at the date of this Certificate.

4.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabricating process(es) thereof:

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked by the BBA or its agents; and

(c) are reviewed by the BBA as and when it considers appropriate.

4.4 In granting this Certificate, the BBA makes no representation as to:

- (a) the presence or absence of any patent or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the nature of individual installations of the product, including methods and workmanship.

4.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.



In the opinion of the British Board of Agrément, the Marley Quantum Sewer PVC-U Twinwall Underground Drainage and Sewerage System is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 94/2985 is accordingly awarded to Marley Extrusions Ltd.

On behalf of the British Board of Agrément

A handwritten signature in black ink, appearing to read 'P. C. Newson'.

Date of Second issue: 13th October 1998

Director

**Original Certificate issued 4th March 1994, this revised version issued to include revised product title, reference to the revised national Building Regulations, reference to BS EN standards and the revised Conditions of Certification.*



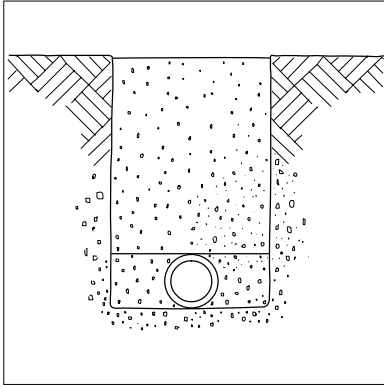
Marley Extrusions Ltd

**THE QUANTUM SEWER PVC-U TWINWALL
UNDERGROUND DRAINAGE SYSTEM –
INSTALLATION**

Certificate No 94/2985

DETAIL SHEET 2

Product



- THIS DETAIL SHEET RELATES TO THE INSTALLATION OF QUANTUM SEWER 150 MM PVC-U TWINWALL UNDERGROUND DRAIN PIPES AND FITTINGS CERTIFICATED BY THE BBA AS DESCRIBED IN THIS CERTIFICATE.
- This Detail Sheet covers use in domestic drains and private sewers.
- This Detail Sheet does not cover Adoptable Sewers.

Installation

1 General

Installation should be carried out in accordance with BS 5955 : Part 6 : 1980, BS 8301 : 1985 and this Detail Sheet.

2 Laying pipes

On trench bottom in granular material (see Figure 1)

2.1 Where the as-dug material is suitable* for use as bedding, the bottom of the trench may be trimmed to form the pipe bed.

*Suitable material is defined as granular material in accordance with the recommendations of BS 5955 : Part 6 : 1980, Appendix A, having a nominal particle size not exceeding 10 mm or 14 mm for 110 mm and 160 mm diameter pipes respectively.

2.2 The pipe should be laid with the red identification stripe placed uppermost.

2.3 Small depressions should be made to accommodate sockets or couplings. After the pipe has been laid these should be carefully filled to ensure that no voids remain under, or around, the socket.

2.4 When the formation is prepared, the pipes should be laid upon it true to line and level within the specified tolerances. Each pipe should be checked and any necessary adjustments to level made by raising or lowering the formation, ensuring that the pipes finally rest evenly on the

adjusted formation throughout the length of the barrels. Adjustment should never be made by local packing.

2.5 Where the formation is low and does not provide continuous support, it should be brought up to the correct level by placing and compacting suitable material.

On granular beds (see Figures 2 and 3)

2.6 When the as-dug material is not suitable as a bedding, a layer of suitable granular material (see section 2.1) must be spread evenly on the trimmed trench bottom before the pipes are installed. The trench should be excavated to allow for the thickness of granular bedding under the barrels.

2.7 The trench formation should be prepared, the bedding placed and the pipes laid in accordance with BS 5955 : Part 6 : 1980 and BS 8301 : 1985.

2.8 Where the as-dug material can be hand trimmed by shovel and is not puddled when walked upon, a 50 mm depth of bedding material may be used. In this case the material must be nominal 10 mm single-sized aggregate with no sharp edges, ie pea gravel (see Figure 2).

2.9 When the pipes are to be laid on rock, compacted sand or gravel requiring mechanical means of trimming, or in very soft or wet ground, the bedding should be a minimum of 100 mm in accordance with BS 5955 : Part 6 : 1980 (see Figure 3).

Figure 1 Pipes laid on trench bottom

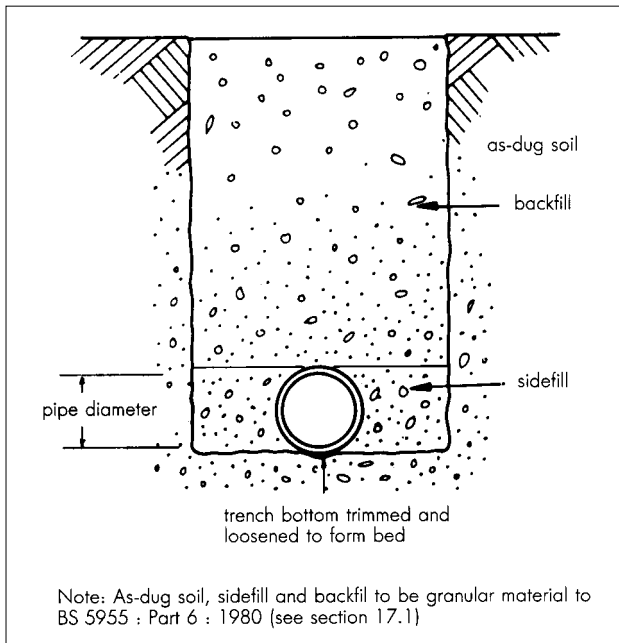


Figure 3 Pipes laid on 100 mm minimum granular bedding

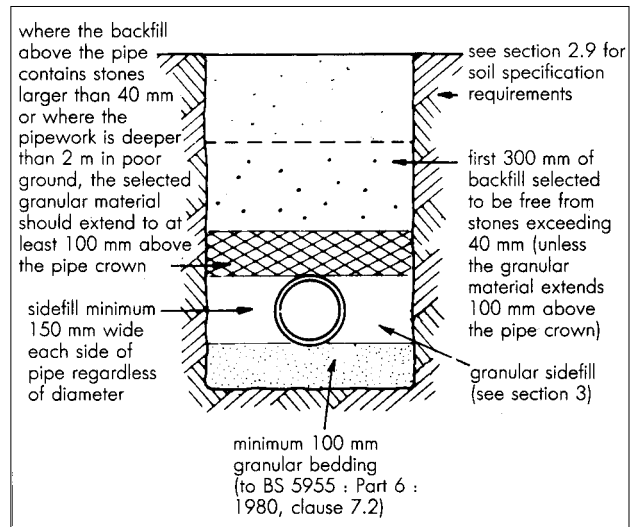
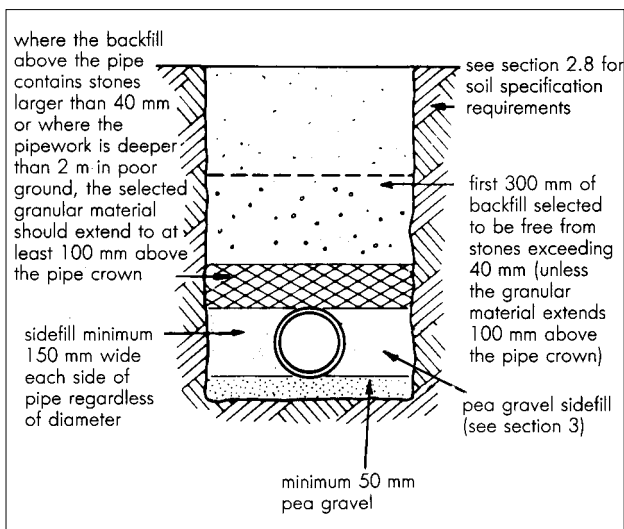


Figure 2 Pipes laid on 50 mm minimum pea gravel bedding



3 Sidefill

In all cases the sidefill must be of the same specification as the bedding material and extend to the level of the crown of the pipe and be placed and compacted in accordance with BS 5955 : Part 6 : 1980.

4 Backfill

Backfill above the level of the crown of the pipe must be in accordance with BS 5955 : Part 6 : 1980 (see Figures 1, 2 and 3).

Bibliography

- BS 5955 *Plastics pipework (thermoplastics materials) Part 6 : 1980 Code of practice for the installation of unplasticized PVC pipework for gravity drains and sewers*
- BS 8301 : 1985 *Code of practice for building drainage*



On behalf of the British Board of Agrément

P. C. NEWTON

Date of issue: 4th March 1994

Director



Marley Extrusions Ltd

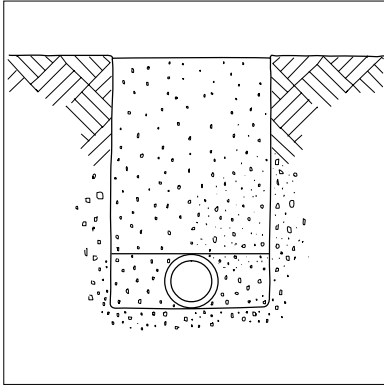
**MARLEY QUANTUM SEWER 150 MM, 225 MM
AND 300 MM PVC-U UNDERGROUND DRAINAGE
AND SEWERAGE TWINWALL PIPES AND FITTINGS**

Certificate No 94/2985

DETAIL SHEET 3

*Second issue**

Product



- THIS DETAIL SHEET RELATES TO MARLEY QUANTUM SEWER PVC-U UNDERGROUND DRAINAGE AND SEWERAGE PIPES AND FITTINGS.
- Marley Quantum Sewer PVC-U Twinwall pipes and fittings are for use in domestic drains and public and private sewers at depths of up to 10 metres.

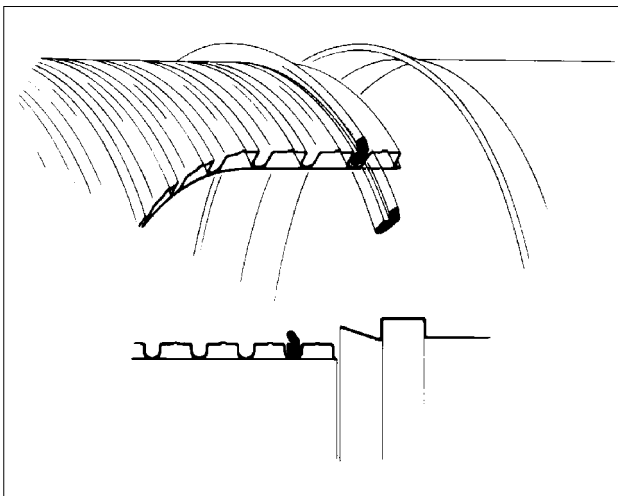
This Detail Sheet must be read in conjunction with the Front Sheets, which give the product's position regarding the Building Regulations and the Conditions of Certification, respectively.

Technical Specification

1 Description

1.1 Marley Quantum Sewer 150 mm, 225 mm and 300 mm Underground Drainage and Sewerage Pipe is manufactured in golden brown 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. The outer wall is corrugated and the inner wall is smooth. The pipe corrugations provide a housing for the Quantum seal, a type WC elastomeric ring seal to BS EN 681-1 : 1996 (see Figure 1).

Figure 1 The Marley Quantum seal

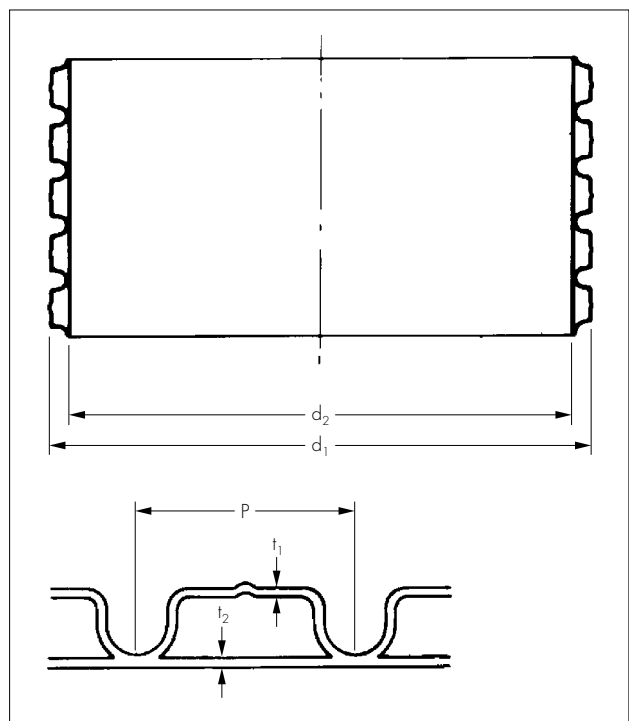


1.2 Plain ended pipe is available in lengths of 3 m or 6 m. Dimensions of the pipe are given in Table 1 and Figure 2.

Table 1 Nominal dimensions

Nominal pipe diameter	External dia d_1 (mm)	Internal dia d_2 (mm)	P (mm)	t_1 (mean) (mm)	t_2 (mean) (mm)	Length L_1 (mm)	Weight (min) (kgm^{-1})
150	160	146.3	16	0.8	1.3	6000	1.85
225	250	226.4	23.6	1.0	1.7	or	4.20
300	330	297.0	31.5	1.2	2.0	3000	7.00

Figure 2 Twinwall pipe

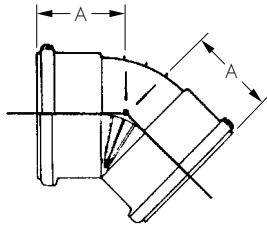


1.3 Quantum sewer fittings are golden brown in colour and manufactured in PVC-U with socketed ends. The sockets are not ribbed and have socket

insertion depths in excess of those required by BS EN 1401-1 : 1998. 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 SN4 of BS EN 1401-1 : 1998 or are injection moulded. The range of fittings covered by this Detail Sheet is detailed in Table 2.

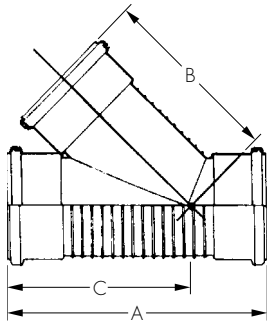
Table 2 Fittings

Bends (double socket)



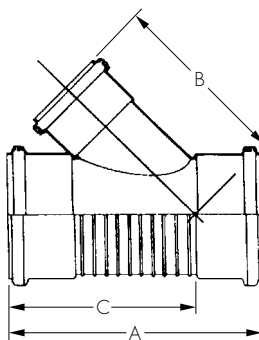
Size (mm)	Code	Angle	Dimension A (mm)	
			A	B
150	UMB19Q	87½	200†	
150	UMB14Q	45	115	
150	UMB13Q	30	105	
150	UMB11Q	15	95	
225	UMB29	90	595†	
225	UMB24	45	160	
225	UMB23	30	145	
225	UMB21	15	125	
300	UMB39	90	730†	
300	UMB34	45	195	
300	UMB33	30	175	
300	UMB31	15	150	

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

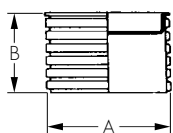
Unequal branch (socket)



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

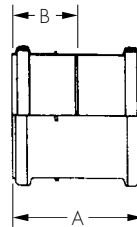
*injection moulded fittings
†intended for use in back drop manholes

Socket plug (push-fit in socket)



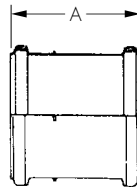
Size (mm)	Code	Dimension (mm)	
		A	B
150	UMJ11	160	100
225	UMJ21	250	130

Coupling (double socket)



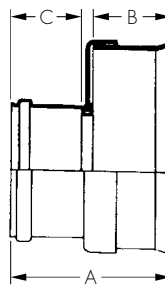
Size (mm)	Code	Dimension (mm)	
		A	B
150	UME15Q	170	83
225	UME25	220	94
300	UME35	237	110

Slip coupling (double socket)



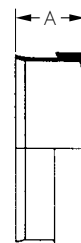
Size (mm)	Code	Dimension A (mm)	
		A	B
150	UME16Q	170	
225	UME26	190	
300	UME36	220	

Level invert reducer (double socket)



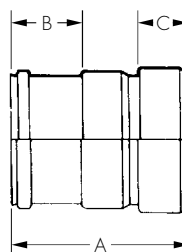
Size (mm)	Code	Dimension (mm)		
		A	B	C
150 × 150	UML21	200	95	90
300 × 225	UML32	240	110	95

End cap (push fit over pipe)



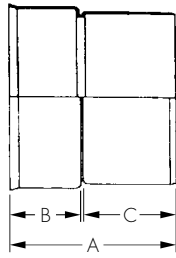
Size (mm)	Code	Dimension A (mm)	
		A	B
150	UMK11	170	
225	UMK21	190	
300	UMK31	110	

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



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

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



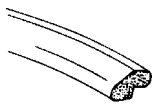
Size (mm)	Code	Dimension (mm)		
		A	B	C
150 x 160	UMA17	160	71	82
225 x 250	UMA27	240	94	134
300 x 315	UMA37	265	110	144

Adaptor (double socket)
twinwall to solid-wall PVC-U pipe



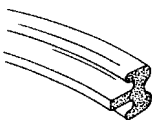
Size (mm)	Code	Dimension (mm)		
		A	B	C
225 x 250	UMA28	240	94	110
300 x 315	UMA38	270	110	125

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)

1.4 Continuous quality control is exercised during manufacture to maintain product quality and includes checks for:

Pipes

dimensional accuracy
weight
initial ring stiffness (STIS)
impact resistance
stress relief (reversion).

Fittings

dimensional accuracy
stress relief of injection moulded fittings.

1.5 Each pipe length is ink-jet printed with the manufacturer's name, the legend Marley Quantum Sewer, the nominal internal diameter, a code indicating date of manufacture, and the BBA identification mark incorporating the number of this Certificate. A continuous red stripe is printed onto the pipe to differentiate this product from the Marley Quantum twinwall highway pipe (subject of BBA Roads and Bridges Certificate No 92/70 and BBA Certificate No 98/3486).

2 Delivery and site handling

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

2.2 When long-term storage is envisaged, it is recommended that Marley Quantum Sewer and Sewerage PVC-U Twinwall underground drainage pipes should be protected from direct sunlight.

2.3 Pipes are generally delivered in prepacked bundles and should be retained in their packaging until installation.

3 General



Marley Quantum Sewer 150 mm, 225 mm and 300 mm PVC-U Pipes and Fittings have been assessed for use in domestic underground drains and public and private sewers for the conveyance by combined or separate systems of surface water and domestic sewage, as is permitted to be discharged into public sewers by the Water Industry Act 1991, and surface water and sewage as is permitted and defined by the Sewerage (Scotland) Act 1968 and the Water and Sewerage Services (Northern Ireland) Order 1973.

4 Strength



4.1 The pipe and fittings have adequate strength for use in situations when pipe and fittings to SN4 or SN8 of BS EN : 1401-1 1998 are suitable.

4.2 The nominal short-term stiffness of the pipe is not less than 8 kNm⁻².

4.3 The nominal 50-year stiffness of the pipe is not less than 3 kNm⁻².

4.4 Quantum Sewer Pipe meets the requirements of a B50 impact test carried out at 0°C with a 7.5 kg striker (150 mm pipe) and 12.5 kg (225 mm and 300 mm pipe) and a falling height of not less than 1.0 m (see section 14).

5 Performance of joints



5.1 The performance of joints will not be adversely affected by thermal expansion or contraction when correctly made.

5.2 Joints in the pipeline remain watertight under conditions of pipeline movement in excess of those expected to occur in normal good drainage practice.

6 Flow characteristics



The products will have normal flow characteristics associated with PVC-U underground drainage systems.

7 Resistance to chemicals



7.1 The products are suitable for use where pipes and fittings to BS EN 1401-1 1998. They have adequate resistance to the type

and quantities of chemicals usually to be found in domestic sewage.

7.2 Details of the chemical resistance of PVC-U are given in CP 312 : Part 1 : 1973.

8 Resistance to elevated temperatures



The products are for use where pipes and fittings to BS EN 1401-1 : 1998 are normally used and have adequate resistance to the temperatures likely to be found in domestic sewage.

9 Practicability of installation



The products are easily installed under normal site conditions.

10 Rodding and cleaning



Drains and sewers incorporating the product can be maintained using jetting equipment, or rodded using conventional flexible drain rods. Toothed root cutters, as used with some mechanical cleaning systems, could damage the pipe and fittings and should not be used.

11 Durability



In the opinion of the BBA, no significant deterioration of the product will take place when used in the context of this Detail Sheet and installations will have a life equivalent to traditional solid wall PVC-U drainage systems.

Installation

12 General

Installation must be in accordance with Detail Sheet 2 of this Certificate, the *Marley Technical Brochure* and, when appropriate, BS 5955 : Part 6 : 1980, BS EN 1610 : 1998, BS EN 752 : Parts 1 to 4 : 1977.

13 Procedure

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

13.2 The Marley Quantum ring seal is fitted externally to the first corrugation in the pipe. The inside of the socket, the seal and the pipe are lubricated and the pipe pushed fully home. The lubricant is supplied by the manufacturer.

13.3 Jointing to 160 mm solid wall PVC-U pipes and spigot ended fittings to BS EN 1401-1 : 1998 can be achieved by fitting a seal cap (code No SNC6) to the mouth of a Quantum fitting socket and then inserting a Marley Standard 'T' seal (code No SR61T) into the seal housing of the

socket and then following the above jointing procedures.

13.4 After installation all underground pipelines must have adequate protection from site traffic, particularly prior to application of the final surfacing.

Technical Investigations

The following is a summary of the technical investigations carried out on Marley Quantum Sewer 150 mm, 225 mm and 300 mm PVC-U Underground Drainage and Sewerage Twinwall Pipes and Fittings.

14 Tests

Tests were carried out to determine:

Pipes

flexibility and pipe ring stiffness⁽¹⁾
short-term stiffness⁽¹⁾
impact⁽¹⁾
dimensional accuracy
thermal cycling⁽¹⁾
Vicat softening temperature to BS EN 727.

Joints

leaktightness whilst under angular deflection and diametric distortion⁽¹⁾
ease of jointing
dimensional accuracy.

Fittings

dimensional accuracy
drop strength to BS 5481, Appendix D : 1977(1989) (covers requirements given in Table 11 of BS EN 1401-1 : 1998)
short-term ring stiffness (STIS) to ISO/FDIS 13967
flexibility of fabricated fittings to BS EN 12256 : 1998.

(1) Water Industry Certification Scheme *Certificate And Product Assessment Criteria For Marley Quantum Pipe: PAC 1*

15 Other investigations

15.1 An examination was made of data relating to:

resistance to damage before installation
resistance to damage from sharp aggregate
practicability of installation
chemical resistance
flow capacities
resistance to high pressure jetting
resistance to rodding.

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

Bibliography

BS 5955 *Plastics pipework (thermoplastics materials)*
Part 6 : 1980 *Code of practice for the installation of unplasticized PVC pipework for gravity drains and sewers*

BS EN 681 *Elastomeric seals. Material requirements for pipe joint seals used in water and drainage applications*

BS EN 681-1 : 1996 *Vulcanized rubber*

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

BS EN 752 *Drains and sewer systems outside buildings*

Part 1 : 1996 *Generalities and definitions*

Part 2 : 1997 *Performance requirements*

Part 3 : 1997 *Planning*

Part 4 : *Hydraulic design and environmental considerations*

BS EN 1401 *Plastics piping systems for non-pressure underground drainage and sewerage — Unplasticized poly (vinyl chloride) (PVC-U)*

BS EN 1401-1 : 1998 *Specifications for pipes, fittings and the system*

BS EN 1610 : 1998 *Construction and testing of drains and sewers*

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

CP 312 *Code of practice for plastics pipework (thermoplastics materials)*

Part 1 : 1973 *General principles and choice of material*



On behalf of the British Board of Agrément

Date of Second issue: 13th October 1998

A handwritten signature in black ink, appearing to read 'P. C. Newson', is written over a light grey background.

Director

*Original Detail Sheet issued 4th March 1994, this revised version issued to include change of product title, extended product range and revised text, and reference to BS EN standards.

Electronic Copy

British Board of Agrément
P O Box No 195, Bucknalls Lane
Garston, Watford, Herts WD2 7NG
Fax: 01923 665301

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e-mail: bba@btinternet.com
<http://www.bbacerts.co.uk>



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information, tel: 01923 665300.
For information about Agrément
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Hotline: 01923 665400