



Marley Extrusions Ltd

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**Roads and Bridges
Agrément Certificate
No 92/R070**
Second issue*

Designated by Government
to issue
European Technical
Approvals

QUANTUM HIGHWAY PVC-U TWINWALL DRAINAGE SYSTEM

Canalisations et raccords
Leitungsrohre und Anschlußteile

Product



- THIS CERTIFICATE RELATES TO QUANTUM HIGHWAY PVC-U TWINWALL DRAINAGE SYSTEM, TWINWALL FILTER AND CARRIER PIPES FOR UNDERGROUND HIGHWAY AND DRAINAGE SYSTEMS, THE COMPONENTS OF WHICH ARE REFERRED TO IN THE ACCOMPANYING DETAIL SHEETS.

- The system is for use in highway drainage where pipes and fittings to BS 4660 : 1989 and BS 5481 : 1977(1989) can be used in accordance with the Department of Transport (DOT) requirements and the conditions set out in the Design Data and Installation parts of this Certificate.
- 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 the products for untreated trade effluents.

Department of Transport Requirements

1 Requirements

- 1.1 The general requirements for drains and sewers are contained in the Department of Transport's (DOT) *Manual of Contract Documents for Highway Works (MCHW) Volume 1, Specification for Highway Works*.
- 1.2 Further information and guidance is given in MCHW Volume 2, *Notes for Guidance on the Specification for Highway Works* and Volume 3, *Highway Construction Details* (Drawing Numbers F1 and F2).
- 1.3 Additional site requirements may be included on particular contracts.

Additional Information

The management systems of Marley Extrusions Ltd have been assessed and registered as meeting the requirements of BS EN ISO 9002 : 1994 by the British Standards Institution Quality Assurance (Certificate No FM 30637).

Bibliography

BS 4660 : 1989 *Specification for unplasticized polyvinyl chloride (PVC-U) pipes and plastics fittings of nominal sizes 110 and 160 for below ground gravity drainage and sewerage*

BS 5481 : 1977(1989) *Specification for unplasticized PVC pipe and fittings for gravity sewers*

BS EN ISO 9002 : 1994 *Quality systems — Model for quality assurance in production, installation servicing*

Conditions of Certification

2 Conditions

2.1 Where reference is made in this Certificate to any Act of Parliament, Regulation made thereunder, Statutory Instrument, Code of Practice, British Standard, manufacturer's instruction or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this Certificate.

2.2 The quality of materials and the method of manufacture have been examined and found satisfactory by the BBA and must be maintained to this standard during the period of validity of this

Certificate. This Certificate will remain valid for an unlimited period provided:

- (a) the specification of the product is unchanged; and
- (b) the manufacturer continues to have the product checked by the BBA.

2.3 This Certificate will apply only to the product that is installed, used and maintained as set out in this Certificate.

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

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

2.5 It should be noted that any recommendations relating to the safe use 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 or Common Law duties of care, or of any duty of care which 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 or Common Law duties 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 use of this product.



In the opinion of the British Board of Agrément, the Quantum Highway PVC-U Twinwall Drainage System is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 92/R070 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. Q. Newton', is written over a white background.

Date of Second issue: 27th March 1997

Director

*Original Certificate issued 1st December 1992. These revised Front Sheets include reference to an extended product range and revised DOT manuals, and addition of the Bibliography.



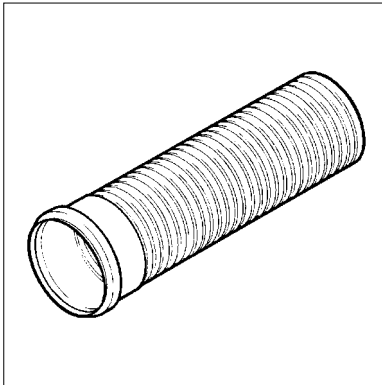
Marley Extrusions Ltd

Roads and Bridges
Certificate No 92/R070

QUANTUM HIGHWAY 150 mm, 225 mm AND
300 mm PVC-U TWINWALL PIPES AND FITTINGS

DETAIL SHEET 1
Second issue*

Product



• THIS DETAIL SHEET RELATES TO QUANTUM HIGHWAY 150 mm, 225 mm AND 300 mm PVC-U TWINWALL FILTER AND CARRIER PIPES AND FITTINGS.

• The pipes and fittings are for use in highway drains where pipes and fittings to BS 4660 : 1989 and BS 5481 : 1977(1989) can be used.

This Detail Sheet must be read in conjunction with the Front Sheet which gives Conditions of Certification and the product's position regarding the Department of Transport Requirements.

Technical Specification

1 Description

1.1 Quantum Highway 150 mm, 225 mm and 300 mm twinwall filter and carrier pipes (slotted and unslotted) are 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.

1.2 The pipe is available with one end plain and the other with an integral socket. One seal, to be fitted to the plain end, is supplied with each length. The seals are type D elastomeric ring seals to BS 2494 : 1990.

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.

Table 1 Nominal dimensions

Nominal pipe diameter	External dia d_1	Internal dia d_2	P	t_1	t_2	Length L_1	Weight (min)	Integral socket	
	(mm)	(mm)		(mm)	(mm)			(mm)	Length L_2
150	160	147.5	16	0.70	0.80	6000	1.45	90	161
225	250	230.0	24	1.00	1.10	6000	2.75	110	251
300	329	302.0	31.5	1.30	1.40	6000	4.65	110	330

1.4 Pipes can be supplied either slotted or unslotted. Slotted pipe has slots located either on one half only of the pipe or with slots equally spaced around the circumference and with the number of slots per dwell and the permeable area doubled (see Table 2 and Figure 3).

Figure 1 Twinwall pipe

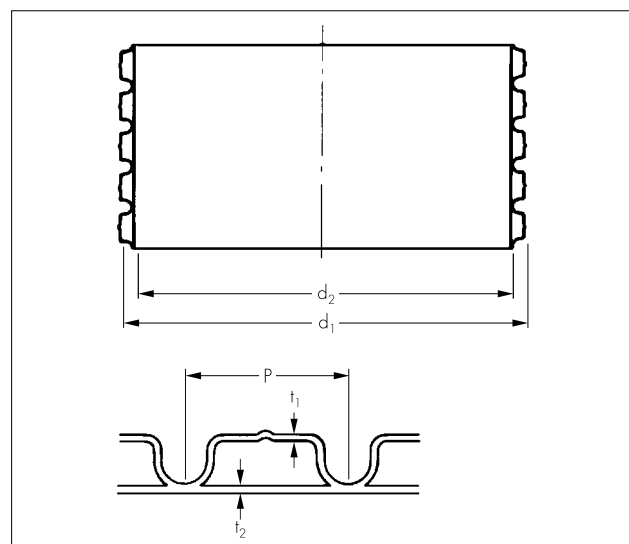


Figure 2 Pipe socket

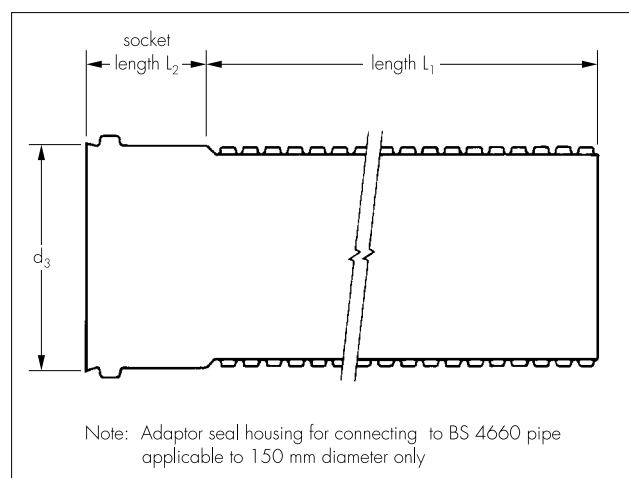
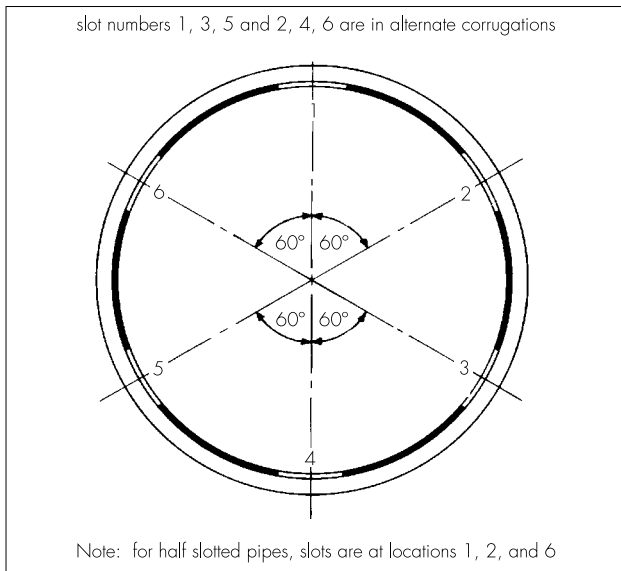


Table 2 Design details

Pipe diameter (nominal) (mm)	No of slots per dwell*	No of slots per metre	Slot length (mm)	Slot width (mm)	Permeable area* (mm ² m ⁻¹)
150	1 or 2	93	22	1.5	3069
225	1 or 2	63	38	1.5	3591
300	1 or 2	48	58	1.5	4176

*Slots located on one half of the pipe only (see section 1.7 and Figure 3). The permeable area is double this figure when the pipes are fully slotted.

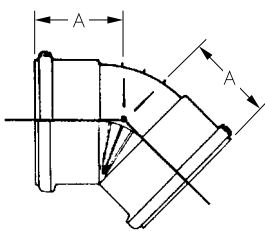
Figure 3 Details of slots



1.5 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 are ribbed; the 225 mm and 300 mm fittings are not ribbed and are either formed from SDR41 pipe (as BS 4660/5481 wall thickness class) or are injection moulded. The range of fittings covered by this Detail Sheet is detailed in Table 3.

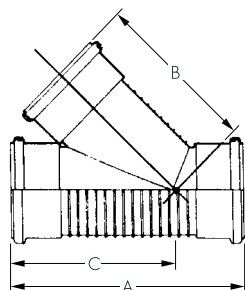
Table 3 Fittings

Bends (double socket)



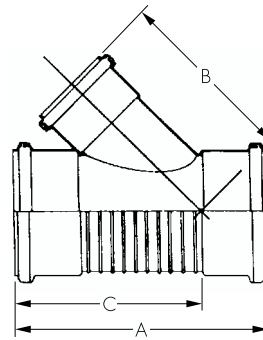
Size (mm)	Code	Angle	Dimension A (mm)
150	UMB19Q	87½	200
150	UMB14Q	45	115
150	UMB13Q	30	105
150	UMB11Q	15	95
225	UMB29	90	595
225	UMB24	45	160
225	UMB23	30	145
225	UMB21	15	125
300	UMB39	90	730
300	UMB34	45	195
300	UMB33	30	175
300	UMB31	15	150

Equal branch (socket)



Size (mm)	Code	Angle	Dimensions (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

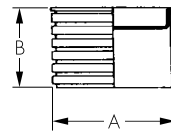
Unequal branch (socket)



Size (mm)	Code	Angle	Dimensions (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

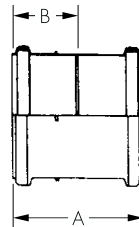
*injection moulded fittings

Socket plug push-fit in socket



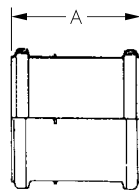
Size (mm)	Code	Dimensions (mm)	
		A	B
150	UMJ11	160	100
225	UMJ21	250	130

Coupling (double socket)



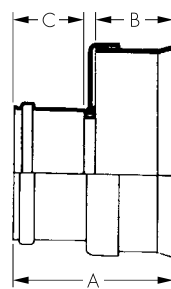
Size (mm)	Code	Dimensions (mm)	
		A	B
150	UME15Q	170	83
225	UME25	220	94
300	UME35	237	110

Slip coupling (double socket)



Size (mm)	Code	Dimension A (mm)
150	UM16Q	170
225	UME26	190
300	UME36	220

Level invert reducer (double socket)



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

End cap (push fit over pipe)



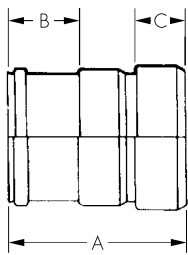
Size (mm)	Code	Dimension A (mm)
150	UMK11	70
225	UMK21	95
300	UMK31	110

continued

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Adaptor

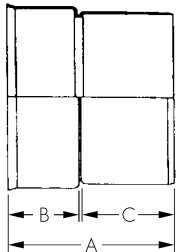
twinwall or solid-wall PVC-U to clayware pipe



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

Pipe seal

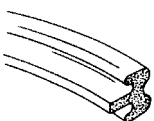
for twinwall pipe



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)

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

Pipes

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

Fittings

dimensional accuracy
stress relief of injection moulded products.

1.7 The manufacturer's name, diameter of the pipe, the legend *Quantum Highway* and the BBA logo incorporating the number of this Certificate

are ink-jet printed along each length of pipe. Each fitting is either engraved with, or carries a label bearing, the manufacturer's name, the diameter and type of fitting, a product code, and the BBA logo incorporating the number of this Certificate. Each 300 mm diameter branch fitting additionally carries a sticker with the legend *Handle with care*.

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, Quantum Highway slotted and unslotted twinwall pipes, fittings and adaptors must be protected from direct sunlight.

Design Data

3 General

The pipes and fittings are for use in highway drainage for the conveyance of surface water as is permitted to be discharged into public sewers by the Water Industry Act 1991, Chapter 56, the Sewerage (Scotland) Act 1968 and the Water and Sewerage Services (Northern Ireland) Order 1973.

4 Strength

4.1 The predicted 50-year ultimate pipe stiffness of the pipes exceeds the minimum requirement of the highway specifications. For design purposes the 50-year value should be taken as 1.4 kNm^{-2} .

4.2 The pipe can be used as an alternative to the plastics pipe for filter and surface water drains in Table 5/1 of the MCHW, Volume 1, and for safe bedding depth purposes may be assumed to have a standard dimensions ratio (SDR) equivalent of not greater than 41.

4.3 The pipes and fittings have adequate impact resistance when tested to BS 4962 : 1989, Appendix E, modified in accordance with Department of Transport requirements.

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 and comply with the MCHW, Volume 1, Clause 504.3.

6 Water infiltration

The total perforated area of the pipes exceeds the DOT's minimum requirement of 1000 mm^2 per metre length as detailed in the DOT's *Specification for Highway Works* (see Table 2).

7 Flow characteristics

7.1 The products will have similar flow characteristics to those associated with PVC-U smooth-bore pipes to BS 4660 : 1989 and BS 5481 : 1977(1989).

7.2 Standard full-bore velocities are shown in Table 4. The values are based on the Colebrook-White equation. An appropriate value of roughness coefficient should be selected when designing the drainage system.

Table 4 Full-bore discharges and velocities

Pipe internal diameter = 148.0 mm

Gradient	Roughness R (mm)							
	R = 0.06		R = 0.60		R = 1.50		R = 5.00	
	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)
1.0	13.35	229.71	10.07	173.30	8.73	150.13	6.95	119.55
10.0	4.14	71.16	3.18	54.63	2.76	47.40	2.20	37.78
20.0	2.89	49.77	2.24	38.55	1.95	33.49	1.55	26.71
30.0	2.34	40.32	1.83	31.43	1.59	27.33	1.27	21.80
40.0	2.02	34.70	1.58	27.19	1.37	23.65	1.10	18.88
50.0	1.79	30.87	1.41	24.29	1.23	21.14	0.98	16.88
60.0	1.63	28.05	1.29	22.16	1.12	19.29	0.90	15.41
70.0	1.50	25.87	1.19	20.49	1.04	17.85	0.83	14.26
80.0	1.40	24.11	1.11	19.16	0.97	16.69	0.78	13.34
90.0	1.32	22.65	1.05	18.05	0.91	15.73	0.73	12.57
100.0	1.25	21.42	0.99	17.11	0.87	14.92	0.69	11.93
120.0	1.13	19.45	0.91	15.60	0.79	13.61	0.63	10.88
140.0	1.04	17.91	0.84	14.42	0.73	12.59	0.59	10.07
160.0	0.97	16.68	0.78	13.48	0.68	11.78	0.55	9.42
180.0	0.91	15.66	0.74	12.69	0.64	11.10	0.52	8.88
200.0	0.86	14.80	0.70	12.03	0.61	10.52	0.49	8.42
250.0	0.76	13.13	0.62	10.73	0.55	9.40	0.44	7.53
300.0	0.69	11.90	0.57	9.78	0.50	8.57	0.40	6.87
400.0	0.59	10.19	0.49	8.44	0.43	7.41	0.35	5.95
500.0	0.52	9.03	0.44	7.53	0.38	6.62	0.31	5.32
600.0	0.48	8.17	0.40	6.85	0.35	6.03	0.28	4.85
700.0	0.44	7.51	0.37	6.33	0.32	5.58	0.26	4.49
800.0	0.41	6.98	0.34	5.91	0.30	5.21	0.24	4.20
900.0	0.38	6.55	0.32	5.56	0.29	4.91	0.23	3.96
1000.0	0.36	6.18	0.31	5.26	0.27	4.65	0.22	3.75

Pipe internal diameter = 230.0 mm

Gradient	Roughness R (mm)							
	R = 0.06		R = 0.60		R = 1.50		R = 5.00	
	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)
1.0	17.49	726.80	13.38	555.72	11.69	485.85	9.48	393.73
10.0	5.44	226.14	4.22	175.31	3.69	153.47	3.00	124.46
20.0	3.81	158.50	2.98	123.78	2.61	108.45	2.12	87.98
30.0	3.10	128.59	2.43	100.96	2.13	88.50	1.73	71.82
40.0	2.67	110.79	2.10	87.35	1.84	76.61	1.50	62.19
50.0	2.37	98.67	1.88	78.07	1.65	68.50	1.34	55.62
60.0	2.16	89.73	1.71	71.21	1.50	62.51	1.22	50.76
70.0	1.99	82.79	1.59	65.89	1.39	57.85	1.13	46.99
80.0	1.86	77.21	1.48	61.59	1.30	54.10	1.06	43.95
90.0	1.75	72.59	1.40	58.04	1.23	50.99	1.00	41.44
100.0	1.65	68.68	1.32	55.03	1.16	48.36	0.95	39.31
120.0	1.50	62.40	1.21	50.18	1.06	44.13	0.86	35.87
140.0	1.38	57.53	1.12	46.42	0.98	40.84	0.80	33.21
160.0	1.29	53.61	1.04	43.38	0.92	38.18	0.75	31.06
180.0	1.21	50.37	0.98	40.87	0.87	35.98	0.70	29.28
200.0	1.15	47.64	0.93	38.74	0.82	34.13	0.67	27.77
250.0	1.02	42.31	0.83	34.59	0.73	30.50	0.60	24.83
300.0	0.92	38.39	0.76	31.53	0.67	27.82	0.55	22.66
400.0	0.79	32.91	0.66	27.23	0.58	24.06	0.47	19.62
500.0	0.70	29.19	0.58	24.30	0.52	21.50	0.42	17.54
600.0	0.64	26.46	0.53	22.14	0.47	19.60	0.39	16.00
700.0	0.59	24.35	0.49	20.46	0.44	18.13	0.36	14.81
800.0	0.55	22.65	0.46	19.10	0.41	16.94	0.33	13.85
900.0	0.51	21.25	0.43	17.98	0.38	15.96	0.31	13.05
1000.0	0.48	20.07	0.41	17.03	0.36	15.13	0.30	12.38

Pipe internal diameter = 302.0 mm

Gradient	Roughness R (mm)							
	R = 0.06		R = 0.60		R = 1.50		R = 5.00	
	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)	Velocity Flow (ms ⁻¹)	Velocity Flow (ls ⁻¹)
1.0	20.64	1478.58	15.90	1139.28	13.98	1001.15	11.44	819.11
10.0	6.44	461.08	5.02	359.54	4.42	316.30	3.61	258.94
20.0	4.52	323.53	3.54	253.92	3.12	223.53	2.56	183.06
30.0	3.67	262.69	2.89	207.13	2.55	182.43	2.09	149.44
40.0	3.16	226.47	2.50	179.24	2.20	157.93	1.81	129.40
50.0	2.82	201.79	2.24	160.21	1.97	141.21	1.62	115.73
60.0	2.56	183.59	2.04	146.16	1.80	128.87	1.47	105.63
70.0	2.37	169.46	1.89	135.24	1.67	119.28	1.37	97.79
80.0	2.21	158.08	1.77	126.44	1.56	111.55	1.28	91.46
90.0	2.08	148.67	1.66	119.15	1.47	105.15	1.20	86.23
100.0	1.96	140.71	1.58	112.99	1.39	99.73	1.14	81.79
120.0	1.79	127.91	1.44	103.05	1.27	91.00	1.04	74.66
140.0	1.65	117.98	1.33	95.33	1.18	84.22	0.96	69.11
160.0	1.54	109.98	1.24	89.11	1.10	78.75	0.90	64.64
180.0	1.44	103.37	1.17	83.96	1.04	74.23	0.85	60.93
200.0	1.37	97.79	1.11	79.60	0.98	70.40	0.81	57.80
250.0	1.21	86.91	0.99	71.09	0.88	62.92	0.72	51.68
300.0	1.10	78.90	0.90	64.81	0.80	57.40	0.66	47.17
400.0	0.95	67.71	0.78	56.00	0.69	49.66	0.57	40.83
500.0	0.84	60.10	0.70	49.99	0.62	44.37	0.51	36.51
600.0	0.76	54.51	0.64	45.55	0.56	40.47	0.47	33.32
700.0	0.70	50.19	0.59	42.11	0.52	37.44	0.43	30.84
800.0	0.65	46.71	0.55	39.33	0.49	34.99	0.40	28.84
900.0	0.61	43.83	0.52	37.03	0.46	32.97	0.38	27.18
1000.0	0.58	41.41	0.49	35.08	0.44	31.26	0.36	25.78

8 Resistance to chemicals

8.1 The products are suitable for use where pipes and fittings to BS 5481 : 1977 are normally used. They have adequate resistance to the type and quantities of chemicals likely to be found in surface water.

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

9 Practicability of installation

The pipes are installed easily using traditional drain-laying methods. The lengths in which the pipes are available and their lightness in weight is a significant advantage in handling and installation. Jointing of the pipes is achieved easily.

10 Rodding

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

11 Maintenance

9.1 The degree of ingress of silt into the drains will be similar to that for perforated pipes to BS 4962 : 1989 installed in the same manner and conditions.

9.2 Access to the system for cleaning should be provided by conventional means.

12 Durability

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

Installation

13 General

Quantum Highway 150 mm, 225 mm and 300 mm PVC-U Twinwall Pipes and Fittings must be installed in accordance with the DOT's requirements and clauses 503 and 505 of MCHW, Volume 1.

14 Procedure

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

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

14.3 A rubber sealing ring is fitted externally to the first corrugation in the pipe, ensuring that the seal is correctly handed. 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.

14.4 Quantum Highway slotted and unslotted twinwall pipes and fittings must be adequately protected against damage from the 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.

14.6 Jointing to other materials must be carried out in accordance with the Marley Quantum Highway Drainage System *Installation Details*.

Technical Investigations

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

15 Tests

Tests were carried out to determine:

Pipes

impact strength at 0°C to BS 4962 : 1989*, Appendix E, with modified striker of 1.0 kg mass and 50 mm diameter
specific tangential initial stiffness to BS 4962 : 1989*, Appendix B
specific tangential extrapolated stiffness to BS 4962 : 1989*, Appendix B
dimensional accuracy
ease of jointing
resistance to penetration of simulated sharp aggregate
watertightness of joints to 0.5 bar positive pressure and 0.5 bar negative pressure
Vicat softening point to BS 2782 : Part 1 : Method 120A : 1976(1983).

*Note: Original version prior to 1996 amendment.

Fittings

dimensional accuracy
drop strength to BS 5481 : Appendix D : 1977(1989)
short term ring stiffness (STIS) to ISO/TC 138/WG11 : Method A.
flexibility of fabricated fittings to draft prEN (document 15SN 1269E : June 1994)

Joints

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 subjected to 10% diametric distortion and also when subjected to 3° angular deflection
insertion force (ease of jointing)
dimensional accuracy of pipe, fitting and ring seal.

16 Other investigations

16.1 An examination was made of data relating to:
chemical resistance
adequacy of slot area
flow capacity
practicability of installation
material properties.

16.2 A visit to a site in progress was carried out to assess the practicability of installation.

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

Bibliography

BS 2494 : 1990 *Specification for elastomeric seals for joints in pipework and pipelines*

BS 2782 : 1970 *Methods of testing plastics*
Part 1 : Method 120A : 1976(1983)
Determination of the Vicat softening temperature of thermoplastics

BS 4660 : 1989 *Specification for unplasticized polyvinyl chloride (PVC-U) pipes and plastics fittings of nominal sizes 110 and 160 for below ground gravity drainage and sewerage*

BS 4962 : 1989 (prior to 1996 amendment)
Specification for plastics pipes and fittings for use as subsoil field drains

BS 5481 : 1977(1989) *Specification for unplasticized PVC pipe and fittings for gravity sewers*

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

CP 312 *Code of practice for plastics pipework (thermoplastics material)*
Part 1 : 1973 *General principles and choice of material*



On behalf of the British Board of Agrément

Date of Second issue: 27th March 1997

Director

**Original Detail Sheet issued 1st December 1992. This revised version includes extended product range, reference to revised DOT manual and addition of the Bibliography.*