Hunter

**QUALITY ASSURANCE**

All products are manufactured using a quality management system that has been assessed by BSI as complying with the requirements of BS EN ISO9001:2000. Hunter hold many kitemark licences. Products conforming to the appropriate standards are kitemarked. Additional ranges are covered by BBA certificates or compatible European standards (EN's).

**CONDITIONS OF SALE**

All orders are taken in good faith and delivery dates, where specified, will be met. However, if any goods are unavailable at time of despatch we will endeavour to supply such goods at the earliest opportunity.

All goods are sold according to Hunter Plastics Ltd standard conditions of sale which are available on request.

Hunter Plastics Ltd reserve the right, in view of their continuous programme of development, to revise or alter their range of products and prices without prior notice.

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**SALES HOTLINE: (020) 8317 1551**


| DRAINAGE/SEWERAGE | | SOIL | | RAINWATER | | | WASTE | |
|---|---|---|---|---|---|---|---|---|
| BS 4660 | BS EN 1401 | BS 4514 | BS EN 1329 | BS EN 12200 | BS EN 607 | BS EN 1462 | BS EN 1451 | BS EN 1566 |

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*hunterplastics.co.uk*

# QUANTUM STRUCTURED WALL DRAINAGE SYSTEM

## DESIGN AND INSTALLATION GUIDE

**AUGUST 2007**

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## THE RANGE

Hunter offer two different pipe systems for different applications; PVCu solid wall system and Quantum structured wall. The comprehensive range of Quantum pipe and fittings are featured on pages 9-13 of this guide.

The revolutionary high performance PVCu structured wall Quantum Sewer pipe with Water Industry approval for gravity sewer applications is a lightweight, cost effective, modern alternative to clay or concrete pipes.

Available in 150, 225 and 300mm diameters, Quantum Highway Pipe system has Department of Transport approval for use in highway carrier and filter drains.

## QUANTUM FOR SEWERS

Working with the UK Water Industry and using the agreed performance criteria, the revolutionary Quantum PVCu sewer system:

### Absorbs shock and deformation without breaking.

Typically, in impact tests, Quantum proved twice as strong as a standard PVCu pipe, and even better against traditional materials.
*(see page 8)*

### Minimises handling health & safety risks.

Its twin-wall structure is a lightweight alternative to traditional materials, enhancing site handling and installation, reducing the cost of site plant and helping towards minimising health & safety risks on site. *(see page 27)*



### Virtually maintenance free.

The smooth, non-porous bore of the pipe improves flow characteristics by lowering frictional resistance that, together with the reduction in joints, actually minimises the risk of blocking.
*(see page 7)*

### If an operational blockage does occur:

Blockages could actually be removed from Quantum pipework for jetting pressures as low as 1000 psi (70 bar).
*(see page 26)*

### Quantum Sewer systems use primarily in adoptable drainage systems.

The 150mm range of pipes and fittings has also been independently tested by the British Board of Agrément Certificate no 94/2985 for foul drainage installations subject to Building Control approval, thereby providing an alternative to solid wall systems.

Manufactured to meet the performance requirements of the manual of contract documents Volume 1 Specification for Highway Works, June 2001, for the collection and disposal of surface and sub-surface water. The system has also been assessed by the British Board of Agrément for compliance with Department of Transport requirements and awarded Roads & Bridges Certificate No 92/RO70

## TECHNICAL SERVICES

Hunter know that not all site installations are a text book situation.

Hunter Technical Services team are available to assist with site and installation advice, you can contact the technical Support team on 0208 855 9851.

FACT

***Research carried out by WRC showed that 40% of new clay sewers offered for adoption may contain a defect of some kind and 20% may have structural defects.***

Source: WRC Research Report "Reliability of New Sewer Construction" 1989

## BRITISH AND EUROPEAN STANDARDS

British Standard BS 8301 (Code of Practice for Building Drainage) has now been withdrawn and replaced by BS EN 752: Parts 1-7: 1997 Drain and sewer systems outside buildings BS EN 1610: 1998 Construction and testing of drains and sewers

The following design and installation details have been written to incorporate the requirements of these new standards. However, Hunter underground drainage products may also be used in drainage systems which are designed, installed and tested in accordance with BS 8301.

The design and layout of drainage and sewerage systems should comply with the relevant Building Regulations, Water Authority Specifications and other requirements as issued by the appropriate specifying or approving Authority.

## COMPATIBILITY WITH QUANTUM

Although the method of jointing solid wall and Quantum drainage pipes and fittings is different, 160mm solid wall fittings are fully compatible with 150mm diameter Quantum Highway and Sewer pipe systems. A separate range of fittings is available to suit both systems.

## PIPE IDENTIFICATION

Quantum Sewer pipes are marked with the product name, size, material, stiffness rating, certification mark and manufacturing code for product traceability. In addition, Quantum Sewer pipes have a red strip printed along each length to distinguish the product from Quantum Highway.

## DIMENSIONS AND WEIGHTS

| | Nominal Size DN/ID (mm) | Mean Internal Diameter (mm) | Nominal External Diameter DN (mm) | Weight Minimum (kg/m) |
|---|---|---|---|---|
| Quantum Sewer | 150 | 146 | 160 | 1.85 |
| Quantum Sewer | 225 | 226 | 250 | 4.20 |
| Quantum Sewer | 300 | 297 | 330 | 7.00 |
| Quantum Highway | 150 | 148 | 160 | 1.25 |
| Quantum Highway | 225 | 230 | 250 | 2.75 |
| Quantum Highway | 300 | 302 | 330 | 4.65 |

## PIPE STRENGTH

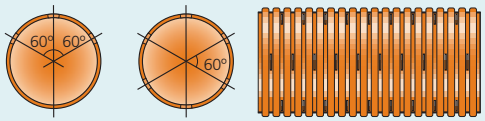
The minimum short term and two year ring stiffness of Quantum Sewer and Highway pipes is as follows:

| Pipe Type | SN N/m² @ 20°C |
|---|---|
| Minimum short term ring stiffness | |
| Quantum Sewer | 8000 |
| Quantum Highway | 6000 |
| Minimum two year ring stiffness | |
| Quantum Sewer | 4000 |
| Quantum Highway | 3000 |

## QUANTUM PERFORATED PIPES

Three sizes of Quantum Highway perforated pipes are available, 150, 225 and 300mm, half or fully slotted.

| Nominal Pipe Size (mm) | Slot Width (mm) | Slot Length (mm) | Area Half Slotted Pipe (mm²/m) | Area Fully Slotted Pipe (mm²/m) |
|---|---|---|---|---|
| 150 | 1.5 | 22 | 3000 | 6000 |
| 225 | 1.5 | 38 | 3500 | 7000 |
| 300 | 1.5 | 58 | 4000 | 8000 |




Half slotted pipe

Fully slotted pipe

The slotted cross sectional area for both solid wall and Quantum pipes exceed the perforation requirements of the Department of Transport 'Specification for Highway Works' 2001. This requires a minimum perforated area of 1000mm²/m irrespective of pipe diameter.





## WHY CHOOSE QUANTUM ?

Provides a flexible structure ➡ More readily tolerates ground movement without failure.

Does not corrode ➡ There is no known corrosion or ageing mechanism for PVCu buried underground.

Low frictional resistance ➡ Improves base flow velocities and aids self cleansing.
(A smooth non-porous bore for good hydraulic performance.)

Smoother bore ➡ Fewer joints and closer tolerances reduces the risk of blockages.
Fewer joints withcloser tolerances to reduce the likelihood of leakage and blockages.

➡ A high level of chemical resistance to the wide range of substances found in both effluent and contaminated soils

➡ Cost effective in comparison with traditional pipe materials

FACT

***It is estimated that over 20% of the nations sewers are defective and in a Grade 3 or worse condition*** Source: OFWAT Information Note 35

## DESIGN AND INSTALLATION GUIDELINES

The following information is provided only as a general guide to good practice for the design of underground drainage systems. For full details please consult the relevant documents referred to above.

## FOUL WATER DRAINS

When calculating flow rates for foul water drains it is recommended that reference is made to BS EN 12056-2: 2000 and BS EN 752-4: 1998 to determine peak discharge rates.

The procedure detailed in the above standards takes into consideration appliance discharge unit values and frequency of use to derive peak flow rates from which pipe sizes and gradients can be established.

*remember*

- Foul water drainage systems are generally designed to run at a maximum of three quarters full bore.
- Pipe gradients should ensure the velocity does not fall below 0.70m/s to promote self-cleansing.
- The proportional velocity for pipes running part full must be considered to comply with this requirement.

The table below is taken from BS EN 752-4: 1998 and provides guidance on minimum gradients for different size drains.

| Peak Flow (a) litres/second | PVCu Pipe Size (mm) | Minimum Gradient |
|---|---|---|
| <1 | 82 | 1:40 |
| | 110 | 1:40 |
| >1 | 82 | 1:80 |
| | 110 | 1:80 (b) |
| | 160 | 1:150 (c) |
| (a) Peak flow based on probability flow calculation method | | |
| (b) Minimum one WC | | |
| (c) Minimum five WCs | | |

In cases where discharge rates are very low or where continuous flow containing solid matter will be less than 1.0 l/s a steeper gradient of not less than 1:40 will be required. In addition, where ground settlement is likely, it is also recommended that steeper gradients are used and shorter 3m lengths of pipe are installed.

## SURFACE WATER DRAINS AND SEWERS

Surface water drainage systems may be designed to run full bore when subjected to an agreed 'Design Storm'. Recommended design frequencies are shown in BS EN 752-4: 1998. The flow rates are generally derived from considering the size and nature of the catchment area, geographical location and rainfall intensities associated with particular storm return periods. Flat rates of rainfall of 50mm/hr can be used for areas where ponding is considered acceptable during and after heavy rainstorms for a few minutes. Alternatively, 75mm/hr can be used where ponding cannot be tolerated.

For larger systems and adoptable surface water sewers it is recommended that the appropriate deign method is adopted from the 'Wallingford Procedure for the Design and Analysis of Urban Storm Drains' Volumes 1, 3 and 4.

## FOUL WATER SEWERS

When designing foul water sewers reference should be made to the 'Sewers for Adoption Manual' which gives guidance on design flows based on the number of dwellings or population served. When designing for commercial and industrial developments flow rates should be established in consultation with the Planning and Adopting Authorities.

The minimum size for adoptable foul sewers is specified as 150mm diameter and the flattest recommended gradient is 1:150 provided that at least 10 dwellings are connected to the system.

## ROUGHNESS VALUES

The pipe roughness values to be used when calculating pipe sizes for adoptable sewers are given in the 'Sewers for Adoption Manual' (1.5mm for foul water and combined systems and 0.6mm for surface water systems). These values are to be applied to all types of pipe materials.

For non-adoptable systems, where an opportunity exists to refine the hydraulic design to take account of the improved performance of PVCu pipe, the roughness values recommended in the Hydraulic Research Station Report (The Measurement of the Hydraulic Roughness of Slimed Sewer Pipes) should be used. In this situation, prior consultation should be carried out with the approving or specifying Authority over the selection of roughness values.

## VENTILATION

All drainage and sewerage systems require adequate ventilation to the open air in order to reduce the build up of toxic or explosive gases and to maintain atmospheric pressure when effluent flows through the drainage system.

Ventilation should be provided at the head of a drain, normally through a soil and vent pipe or separate vent stack.

Gullies incorporated in a foul water or combined drainage system must have a 50mm minimum water seal.

## MEANS OF ACCESS

No part of the drain or sewer system should be more than 45m away from a manhole. The distance between each access point should therefore not exceed 90m.

| | Access Fitting | | To Branch or Junction | Shallow Inspection Chamber | Manhole or Deep Inspection Chamber |
|---|---|---|---|---|---|
| | 1 | 2 | | | |
| Start of external drain* | 12 | 12 | - | 22 | 45 |
| Rodding eye | 22 | 22 | 22 | 45 | 45 |
| Type 1 access fitting 150 x 100mm | - | - | 12 | 22 | 22 |
| Type 2 access fitting 225 x 100mm | - | - | 22 | 45 | 45 |
| Shallow inspection chamber | 22 | 45 | 22 | 45 | 45 |
| Manhole or deep inspection chamber | - | - | - | 45 | 90 |

* Stack or ground floor appliance

Access is required to drainage installations for testing, inspection and removal of debris. Access to drainage allowing rodding in both directions can be provided by inspection chambers, manholes and other access fittings. Rodding eyes provide access for clearance of debris in the direction of flow only and should thus be used in conjunction with an access chamber or manhole at a point downstream.

For full guidance as to provision of access, reference should be made to BS EN 752 Part 3: 1997. The table below details the maximum spacing of the access points as detailed in the above standard.

FACT

**Structured wall pipe has been used for UK sewer schemes since 1989, for adoptable schemes AND capital works**

Also used extensively in mainland Europe, Australia, Canada and Japan.

## ADOPTABLE SEWERS (England & Wales)

The layout of adoptable sewers should comply with the design requirements in the 'Sewers for Adoption Manual' and any supplementary guidelines issued by the particular Adopting Authority. Manholes are required at all changes in vertical or horizontal alignment, at the head of all sewers and wherever there is a change in pipe size. The maximum spacing of manholes should not exceed 90m.

Adoptable sewers should be situated within Highways or public open spaces. When this is not practicable, the layout must permit access to the sewer in a manner acceptable to the Adopting Authority and a formal Deed of Easement entered into.

Full design details of the proposed sewer system must be submitted to the relevant Adopting Authority for approval and a formal Adoption Agreement prepared.

## ADOPTABLE SEWERS (Scotland)

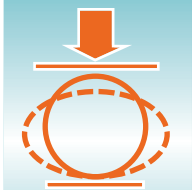
For details relating to adoptable sewers reference should be made to 'The Standard Specification for Water and Sewage Schemes' and supplementary guidelines issued by the relevant Scottish Regional Water Authority.

## DEFORMATION

To ensure satisfactory performance of a PVCu pipeline it is generally recommended that a limiting negative deformation of 6% of the vertical diameter of the pipe be used in calculations. Practical experience and test work indicate that the vast majority of any deformation will occur within the first two years following installation and any increase thereafter will be negligible.

This level of deformation has very little effect on the flow carrying properties of the pipeline, in fact a 6% deformation will cause less than a 1% reduction in full bore capacity. Using the design guides referred to above it is therefore possible to calculate the theoretical initial deflection value and then, if considered necessary, this can be compared with actual field measurements.

**Flexible Pipe Stiffness**

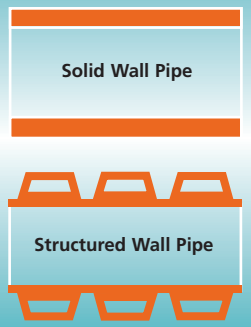


Stiffness Class determined by load requirement to deform the pipe by a stated percentage of diameter

**Structural Analogy**


Material removed from areas which do not provide additional strength

**Solid Wall versus Structured Wall Pipe**

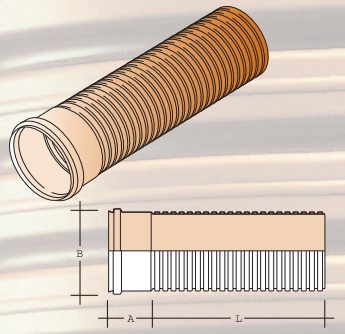



## BEDDING AND BACKFILL

In practice standard bedding and backfill details have been evolved for PVCu pipes which, when correctly installed, will ensure the above guidelines are adhered to. Typical bedding and backfill details are illustrated on pages 15 and 16.



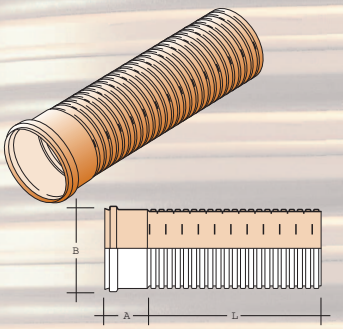





## HIGHWAY DRAINAGE PIPE

| Size mm | Code | Effective ■ Length m | A | B | |
|---|---|---|---|---|---|
| 150 | UPH16* | 6 | 90 | 175 | h |
| 225 | UPH26 | 6 | 125 | 275 | h |
| 300 | UPH36 | 6 | 110 | 340 | h |

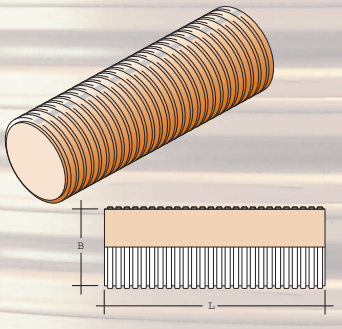
Integral socket/spigot. The appropriate number of seals are supplied with pipes/fittings when ordered
*Product illustrated




## PERFORATED HIGHWAY DRAINAGE PIPE

| Size mm | Code half slotted | Code fully slotted | Effective ■ Length m | A | B | |
|---|---|---|---|---|---|---|
| 150 | USH16* | UHH16 | 6 | 90 | 175 | h |
| 225 | USH26 | UHH26 | 6 | 125 | 275 | h |
| 300 | USH36 | UHH36 | 6 | 110 | 340 | h |

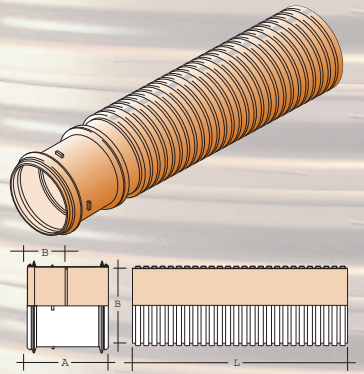
Integral socket/spigot. Seals to be ordered separately, 4 required. *Product illustrated




## SEWER DRAINAGE PIPE

| Size mm | Code | Effective ■ Length m | |
|---|---|---|---|
| 150 | ULS13 | 3 | h K |
| 150 | ULS16 | 6 | h K |
| 225 | ULS23 | 3 | h K |
| 300 | ULS33 | 3 | h K |

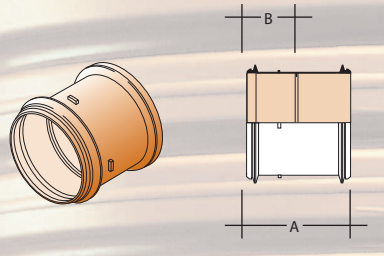
The appropriate number of seals are supplied with pipes/fittings when ordered




## SEWER DRAINAGE PIPE & COUPLING/SOCKET

| Size mm | Code | Effective ■ Length m | |
|---|---|---|---|
| 150 | UPS13* | 3 | h K |
| 150 | UPS16* | 6 | h K |
| 225 | UPS23 | 3 | h K |
| 225 | UPS26 | 6 | h K |
| 300 | UPS33 | 3 | h K |
| 300 | UPS36 | 6 | h K |

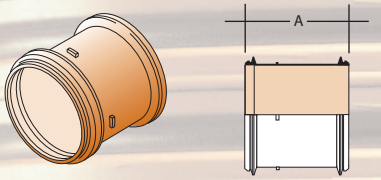
The appropriate number of seals are supplied with pipes/fittings when ordered. *Products illustrated (Larger sizes with integral socket/spigot)
■ Guaranteed actual length is 2.97m and 5.97m




## COUPLING

| Size mm | Code | A | B | |
|---|---|---|---|---|
| 150 | UME15Q* | 170 | 83 | h K |
| 225 | UME25 | 220 | 94 | h K |
| 300 | UME35 | 237 | 110 | h K |

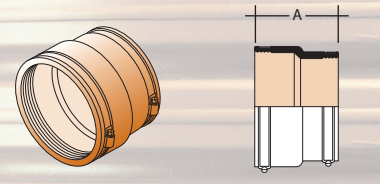
Double socket
*Product illustrated




## SLIP COUPLING

| Size mm | Code | A | |
|---|---|---|---|
| 150 | UME16Q* | 170 | h K |
| 225 | UME26 | 190 | h K |
| 300 | UME36 | 220 | h K |

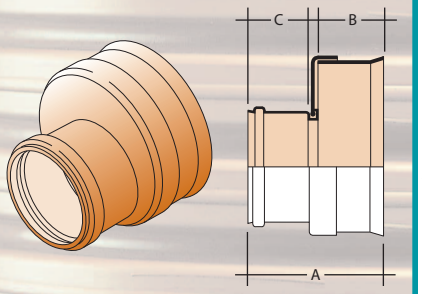
Double socket
*Product illustrated




## FLEXIBLE COUPLING

| Size mm | Code | A | |
|---|---|---|---|
| 150 | UMD17 | 150 | K |
| 225 | UMD27 | 130 | K |
| 300 | UMD37 | 160 | K |

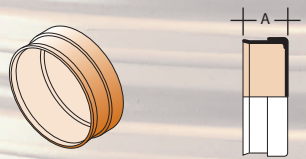
Manufactured to BS EN 295 Part 4 from synthetic elastomeric rubber with stainless steel clamping bands




## LEVEL INVERT REDUCER

| Size mm | Code | A | B | C | |
|---|---|---|---|---|---|
| 225 x150 | UML21 | 200 | 95 | 90 | h |
| 300 x 225 | UML32 | 240 | 110 | 95 | h |

The 150mm socket of the UML21 is fitted with a seal which must be removed to accept Quantum pipe



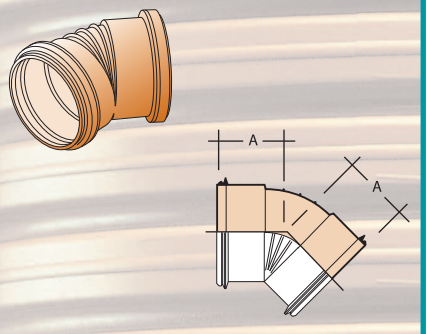

## END CAP

| Size mm | Code | A | |
|---|---|---|---|
| 150 | UMK11 | 70 | h |
| 225 | UMK21* | 95 | h |
| 300 | UMK31 | 110 | h |

Push fits over Quantum pipe with the seal in the first corrugation of the pipe. *Product illustrated



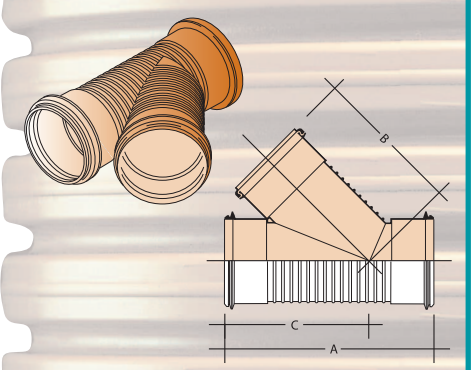





## BEND

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

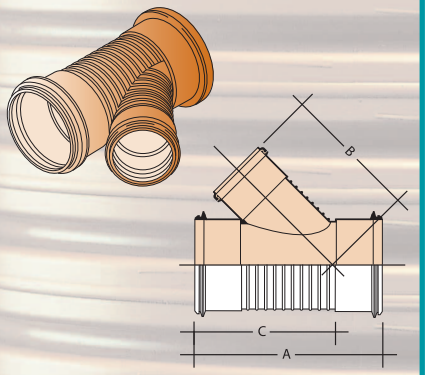
Double socket. *Product illustrated




## EQUAL BRANCH

| Size mm | Code | Angle | A | B | C | |
|---|---|---|---|---|---|---|
| 150 | UMY11Q* | 45° | 400 | 280 | 280 | h |
| 150 | UMY13Q | 87½° | 400 | 200 | 280 | h |
| 225 | UMY22 | 45° | 655 | 430 | 460 | h |
| 300 | UMY33 | 45° | 800 | 540 | 575 | h |

All socket. *Product illustrated



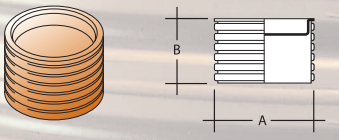

## UNEQUAL BRANCH

| Size mm | Code | Angle | A | B | C | |
|---|---|---|---|---|---|---|
| 150x110 | UMY10Q* | 45° | 316 | 232 | 236 | h |
| 150x110 | UMY12Q | 87½° | 340 | 180 | 236 | h |
| 225x110 | UMY20 | 45° | 370 | 300 | 300 | h |
| 300x110 | UMY30 | 45° | 520 | 375 | 425 | h |

All socket, 110mm sockets fitted with seal to accept solid wall pipe. *Product illustrated

| Size mm | Code | Angle | A | B | C | |
|---|---|---|---|---|---|---|
| 225x150 | UMY21 | 45° | 440 | 340 | 340 | h |
| 300x150 | UMY31 | 45° | 590 | 425 | 460 | h |
| 300x225 | UMY32 | 45° | 700 | 520 | 480 | h |

All socket, UMY31 150mm socket has seal which must be removed to accept Quantum pipe. To convert UMY21 150mm socket for solid wall pipe a snap cap and seal kit must be fitted

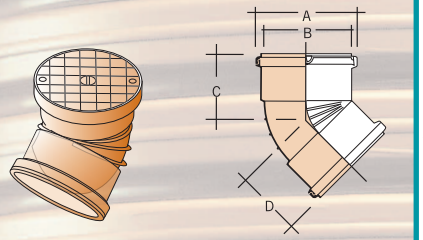



## SOCKET PLUG

| Size mm | Code | A | B | |
|---|---|---|---|---|
| 150 | UMJ11 | 160 | 100 | h |

Push fits into socket with Quantum seal fitted into first corrugation

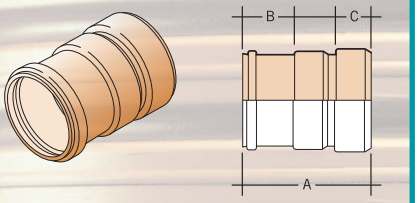
## RODDING POINT TERMINAL




| Size mm | Code | Angle | A | B | C | D |
|---|---|---|---|---|---|---|
| 150 | URP2Q | 45° | 190 | 160 | 115 | 105 |

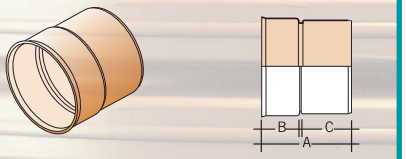
Aluminium cover and frame with two fixing screws Tested to 35kN test load, suitable for driveway applications when supported with concrete surround

## ADAPTOR




| Size mm | Code | A | B | C | |
|---|---|---|---|---|---|
| 150 | UMA45 | 230 | 90 | 60 | h |

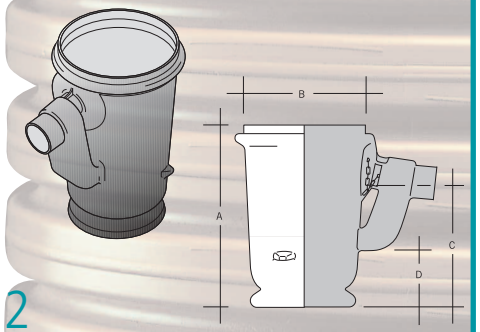
Socket/spigot, Quantum or solid wall pipe to clayware coupling. Socket fitted with seal which must be removed to accept Quantum pipe




| Size mm | Code | A | B | C | |
|---|---|---|---|---|---|
| 150x160 | UMA17 | 160 | 71 | 82 | h |

Quantum socket to solid wall spigot

## GULLY POT LINER



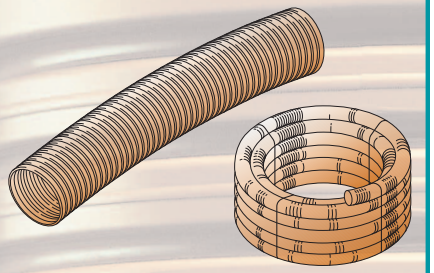

| Size litres | Code | A | B | C | D | |
|---|---|---|---|---|---|---|
| 90 | UMA43 | 760 | 500 | 520 | 220 | h |
| 112 | UMA49 | 920 | 500 | 680 | 380 | h |

Supplied with SNC6 snap cap and SR61T seal for use with Quantum bend or coupling to provide connection to gully spigot. British Board of Agrément Approved, Roads & Bridges Certificate No 91/RO66 and complies with Department of Transport 'Specification for Highway Works'





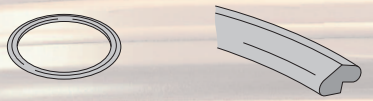
## FLEXIBLE GULLY CONNECTING PIPE



| Size mm | Code | Length m | |
|---|---|---|---|
| 150 | UMA44 | 50 coil | K |

Corrugated single wall PVCu pipe kite marked to BS 4962. With UMR11 seal can be jointed to Quantum fittings

## SPARE QUANTUM PIPE SEALS



| Size mm | Code | |
|---|---|---|
| 150 | UMR11 | h K |
| 225 | UMR21 | h K |
| 300 | UMR31 | h K |

Conforming to the requirements of BS EN 681-1 1996 Type WC

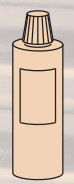
The appropriate number of seals are supplied with Quantum fittings

## SNAP CAP & SEAL

| Size mm | Code | | |
|---|---|---|---|
| 160 | UR61T | Seal | h |
| 160 | SNC6 | Snap cap | h |

To convert 150mm Quantum fittings to accept 160mm solid wall pipe

## LUBRICANT



| Size | Code |
|---|---|
| 1kg | SC966 |

Ozone friendly SZ400 non-flammable, C.F.C. free propellant

## PIPE LAYING

The following information is based on the recommendations in BS 5955: Part 6 'Installation of PVCu pipework for gravity drains and sewers' and BS EN 1610 and is intended as a general guide to good practice in the selection of bedding and backfill materials for Hunter solid wall and Quantum underground drainage systems.

## EXCAVATION

Trenches should not be open too long in advance of pipelaying and should be backfilled as soon as possible. It is essential that the sides of the trench are adequately supported during pipelaying. Trench widths should be as narrow as is practicable but not less than the pipe diameter plus 300mm to allow adequate sidefill to be placed.

Deeper excavations should ideally incorporate a sub-trench in accordance with the diagram opposite.

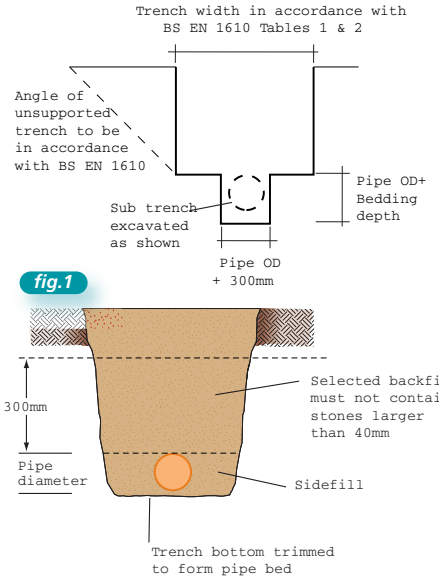



fig.1

## BEDDING & BACKFILL

Where the as-dug material is suitable*, the bottom of the trench may be trimmed to form the pipe bed and the as dug soil used as sidefill and backfill in accordance with BS EN 1610 bedding construction type 3, as shown in fig.1.

**Suitable material is defined as material in accordance with the recommendations of BS 5955: Part 6: 1980 Appendix A, having a maximum particle size not exceeding 20mm.*

Where the as-dug material is un-suitable as bed and surround installation should be carried out in accordance with BS EN 1610 bedding construction type 1 as shown below in fig.2.

Trenches should be excavated to allow for the depth of bedding material which should be laid evenly along the bottom of the trench before any pipework is installed.

The sidefill material must be the same as the bedding material and extended to the crown of the pipe and be thoroughly compacted.

Where the backfill above the pipe contains stones larger than 40mm or where the pipework is deeper than 2m in poor ground, the granular material must extend at least 100mm above the pipe crown. Alternatively, backfill material can be graded to eliminate stones exceeding 40mm and this selected material used for the first 300mm above the pipe.

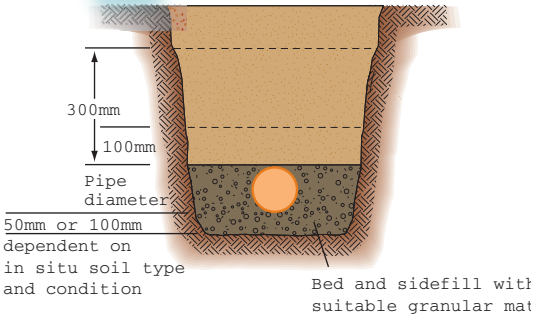



fig.2

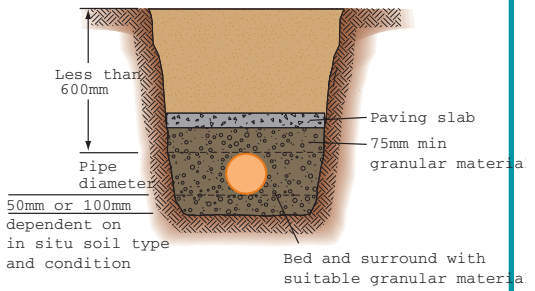
Where the as-dug material can be hand trimmed by shovel and is not puddled when walked upon, bedding material may be used, in accordance with Agrément Certificate No. 88/1977, Detail Sheet 3.

When the pipes are to be laid in rock, compacted sand or gravel, or in very soft or wet ground requiring mechanical means of trimming, the bedding should be a minimum of 100mm.

## SHALLOW DOMESTIC DRAINS

Pipes laid at depths less than 600mm not under a road should, where necessary, be protected against risk of damage by placing over them a layer of concrete paving slabs or similar. A minimum 75mm cushioning layer of granular material must be laid between pipes and slabs.

Where drains are laid in fields and additional protection may be required from heavy vehicles and equipment, it is recommended that installation is carried out with a concrete slab spanning the trench as diagram 11 in the Building Regulations.




## CONCRETE BED & SURROUND

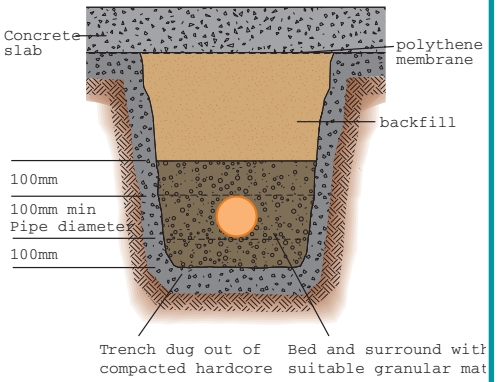
The flexible nature of PVCu pipes enables them to accommodate ground movement and other differential settlement that may occur under normal conditions. Therefore, the use of concrete bed and surround is not recommended and only under special circumstances, at very shallow cover depths or where it is necessary to safeguard foundations, should it be used. Where the use of concrete bed and surround is unavoidable, it is recommended that pipes are laid in 3 metre lengths and a compressible board is shaped to fit around each joint. Pipes should also be wrapped with polythene to prevent the ingress of cement slurry into ring seal joints.

## DRAINS UNDER SOLID GROUND FLOORS

Drains often have to be laid under buildings in order to connect sanitary pipework which has been positioned some distance from the outer walls.

Where this occurs, deep hardcore within the foundation boundaries should be compacted first. The trench for the pipe should then be excavated and suitable material employed for the bedding and backfilling operation. If trenches are dug from original ground, pipes may be laid and surrounded as necessary before the top layer of hardcore is formed.

Where a pipe passes through a wall or foundation of a building, a lintel or sleeve should be built-in to provide clearance around the pipe.



## DRAINS UNDER PRIVATE ROADS

If the depth of cover under a road or driveway is less than 0.9m, a concrete slab spanning the trench width should be provided.

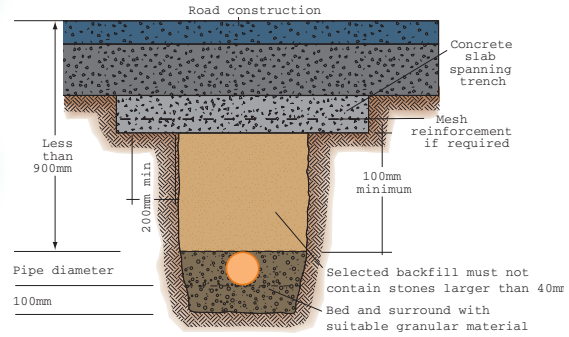
## ADOPTABLE SEWERS UNDER ROADS

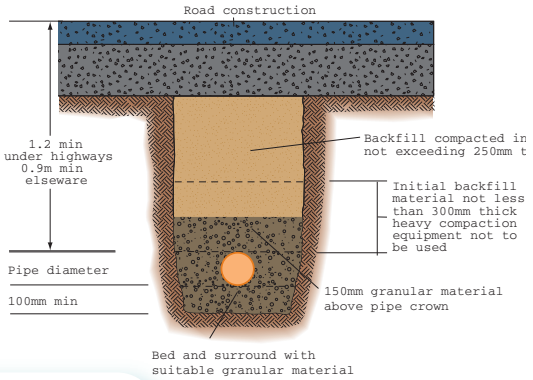
Pipe bedding details should be in accordance with the Water Industry Specification No.4-08-01.

Selected as-dug material may be used for bedding and sidefill provided it meets the evaluation procedure and compaction fraction test values specified in WIS 4-08-01.

The minimum cover under public roads should be 1.2m to the top of the pipe. Where it is proposed to install sewers with less cover, prior approval should be sought from the Adopting Authority regarding proposed protection details.

The above information is for general guidance only and detailed proposals with regard to bedding and sidefill materials for sewers must be submitted to the relevant Adopting Authority for formal approval at the design stage of the project.




## GRANULAR MATERIAL FOR BED & SURROUND OF PVCU DRAINS AND SEWERS

Suitable imported granular material for bedding and surrounding PVCu solid wall wall pipes for private drainage schemes and Quantum Pipes for adoptable sewer applications is detailed in the table below:

| Nominal pipe size | Granular material size |
|---|---|
| 100/110mm | 10mm nominal single-size<br>14 to 5mm course graded |
| 150/160mm | 10 or 14mm nominal single-size<br>14 to 5mm course graded |
| 200/225mm and over | 10, 14 or 20mm nominal single-size<br>14 or 20 to 5mm course graded |

Grading complying with the requirements of BS EN 1610. Granular material also includes aggregates to BS 882, air cooled blast furnace slag to BS 1047 and sintered pulverised fuel ash to BS 3797.

## HIGHWAY DRAINAGE CARRIER DRAINS

For applications in accordance with DTp requirements, the pipe bedding and backfill details shown below are recommended for PVCu pipes, as specified in the DTp Advice Note HA 40/89 'Determination of Pipe and Bedding Combinations for Drainage Works'.

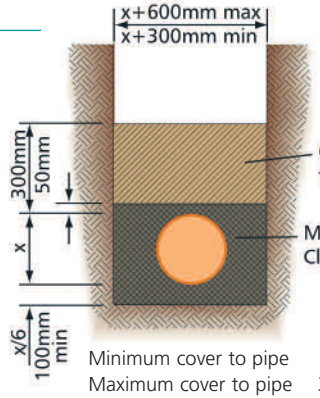
Special consideration should be given to the protection of pipes from construction site traffic.

*Note:*

1. *Clause numbers quoted opposite refer to the DTp 'Specification for Highway Works' 2001.*
2. *The minimum and maximum trench width applies on and below a line 300mm above the outside top of the pipe*

### BEDDING AND BACKFILL DETAILS

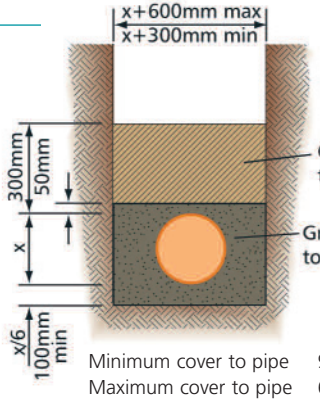
Type 'T' – Field Loading




Dimension x = external diameter of pipe

| | |
|---|---|
| Minimum cover to pipe | 1000mm |
| Maximum cover to pipe | 3000mm (150mm dia)<br>2700mm (225 & 300mm dia) |

Type 'S' – Main Road Loading




Dimension x = external diameter of pipe

| | |
|---|---|
| Minimum cover to pipe | 900mm |
| Maximum cover to pipe | 6000mm (150mm dia)<br>5500mm (225 & 300mm dia) |

## FILTER DRAINS

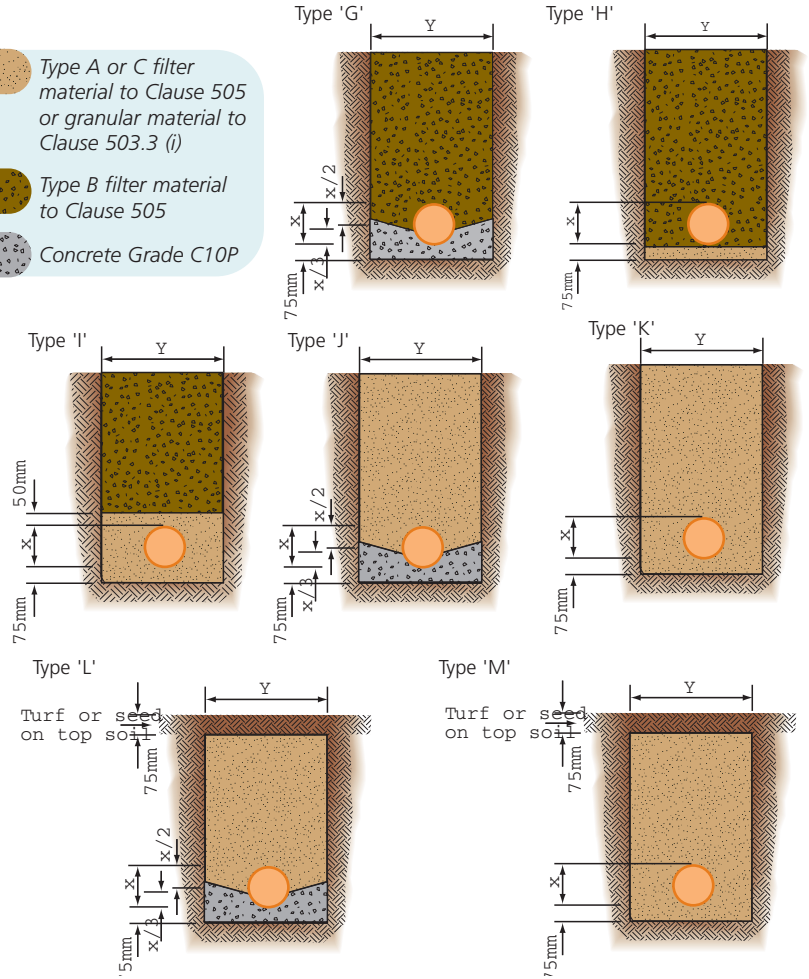
For applications in accordance with DTp requirements, the pipe bedding and backfill details shown opposite are as recommended in DTp Advice Note HA 40/89 'Determination of Pipe and Bedding Combinations for Drainage Works'.

- Minimum cover to drains to be 900mm, maximum cover to be 6000mm.
- Minimum trench width Y = X+300 for drains not exceeding 1.5m cover below finished level.
- Y = X+450 for drains exceeding 1.5m cover.
- Dimensions x = external diameter of pipe

*Type A or C filter material to Clause 505 or granular material to Clause 503.3 (i)*

*Type B filter material to Clause 505*

*Concrete Grade C10P*




## ADOPTABLE MANHOLES

For adoptable sewer applications manhole details should be in accordance with the 'Sewers for Adoption Manual' and any additional requirements specified by the relevant Adopting Authority.

All changes in direction between incoming and outgoing sewers should be accommodated within the manhole chamber as no external bends are permitted.

Typical manhole chamber sizes for sewers between 150mm and 300mm diameter are as follows:

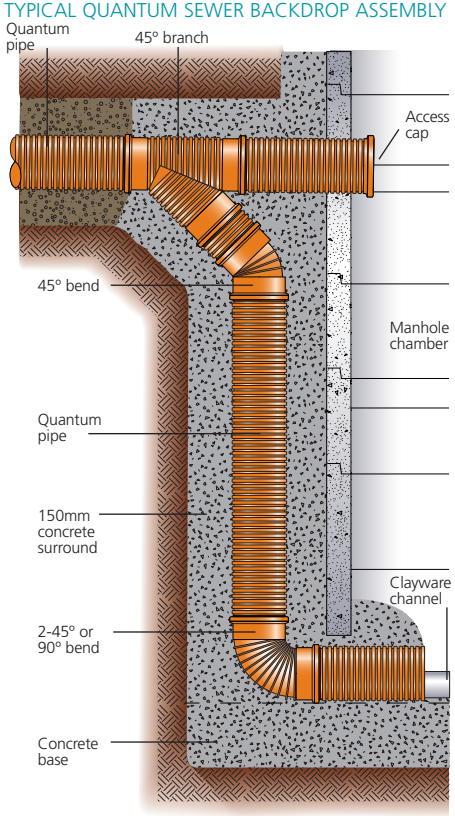
| Depth to Pipe Soffit | Chamber Size |
|---|---|
| Less than 1m | 1050 diameter or 900 x 675mm |
| 1m to 1.35m | 1350 diameter or 1240 x 675mm |
| 1.35m to 6.0m | 1200 diameter |

External backdrops may be used where appropriate but are subject to approval. A typical construction detail is shown opposite.

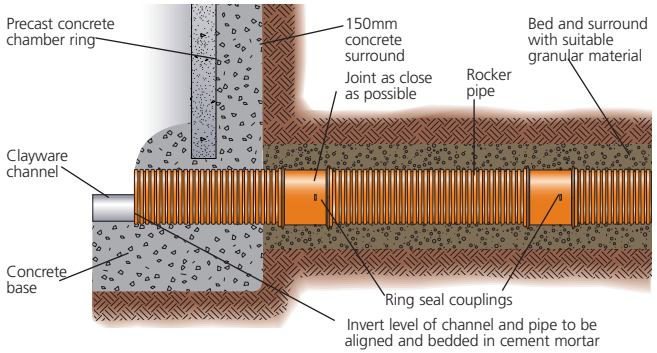
Certain Adopting Authorities now allow the use of pre-formed chamber bases built into traditional manholes as shown on page 42, providing that the directions of the sewers suit the angles of the inlets and outlet. However, prior approval of the Adopting Authority must be sought before utilising pre-formed chamber bases on adoptable sewer systems.

It is recommended that ring seal couplings are located as close as possible to entry and exit points of manholes to create 'rocker pipes' to accommodate any differential settlement that may occur following the backfilling operation.

### TYPICAL QUANTUM SEWER BACKDROP ASSEMBLY

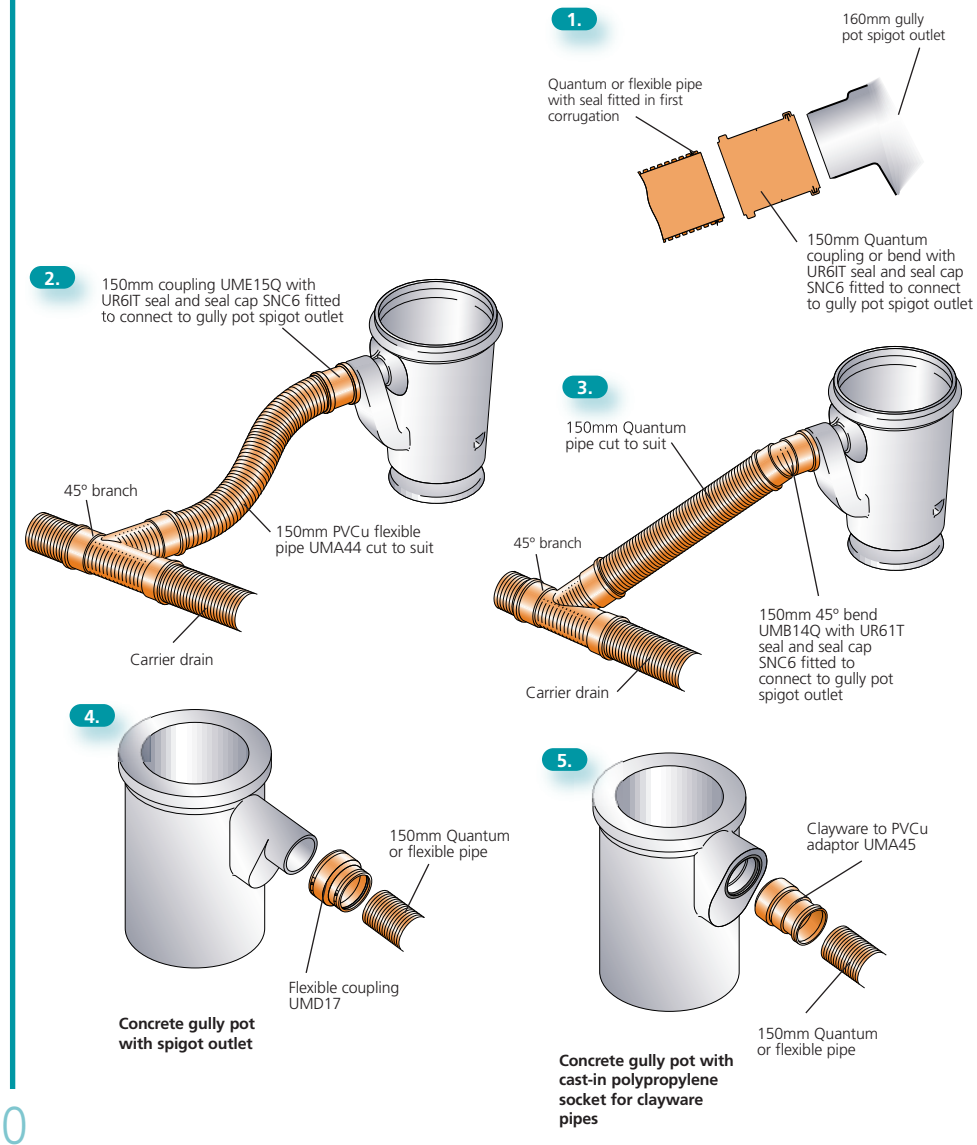



### TYPICAL QUANTUM SEWER MANHOLE CONNECTION



## HIGHWAY ROAD GULLIES

A standard UR61T seal and seal cap SNC6 are provided with each gully pot liner. These are to be fitted to a Quantum coupling or bend to enable a direct push fit connection to be made to the gully pot spigot outlet. The flexible connecting pipe is then jointed to the other end of the coupling or bend with a Quantum pipe seal UMR11 fitted in the first corrugation.








## QUANTUM SEWER

When installing Quantum Sewer Pipes we recommend that the red identification stripe remains uppermost to provide positive confirmation of the pipe grade at the inspection stage prior to backfilling. This will also enable easy identification at repair or retrofit situations.

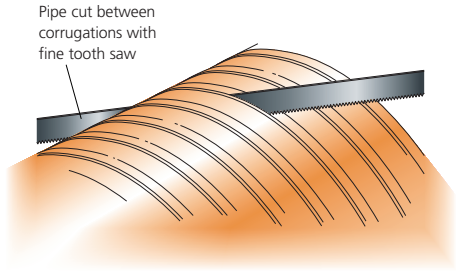
## CUTTING PROCEDURES

Cut length required using a fine tooth saw.

Simply cut square midway between the corrugations.

No chamfering required.

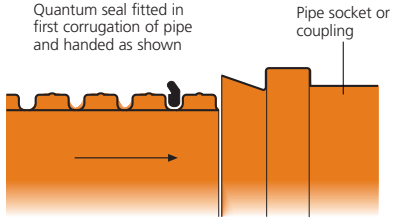
Unlike joints on standard solid wall pipe, on Quantum the ring seal is fitted around the pipe




## JOINTING PROCEDURES

1. Ensure the pipe end and socket are free from swarf etc.
2. Fit seal into the first corrugation of the pipe making sure that the seal is correctly handed, as shown opposite,
3. Ensure the seal is not twisted.
4. Apply lubricant around the pipe seal and socket.
5. Push pipe fully into the socket either by hand or by using a timber block and lever on the other end of the pipe.

Quantum couplings, bends, branches and reducers have an all socket configuration and jointing these to Quantum pipe is achieved in the same way as described above

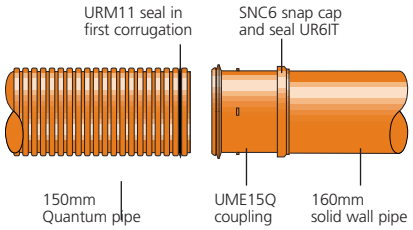



FACT

**An estimated 13,000km of structured wall plastic pipe has been laid in the UK in the last 10 years.**

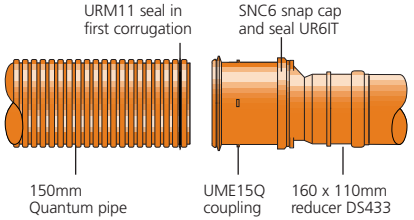
## CONNECTION TO 160MM SOLID WALL DRAINAGE PIPES

All 150mm Quantum sockets have been designed for use with Quantum pipes and 160mm solid wall pipes to BS EN 1401: 2000. To adapt a Quantum fitting to accept 160mm solid wall drainage pipe, a snap cap SNC6 and seal UR61T must be fitted to the end of the socket to enable a connection to be made, as shown opposite.




## CONNECTION TO 110MM SOLID WALL DRAINAGE PIPES

Connection between 150mm Quantum and 110mm solid wall pipe can be achieved by fitting a snap cap SNC6 and seal UR61T to the end of the socket. A connection can then be made to a reducer URM604 as shown opposite.




FACT

**Appreciated by installers for ease of installation:**

- Can weigh only 10% of equivalent traditional materials
- Excellent performance record Including inherent flexibility to cope with ground movement

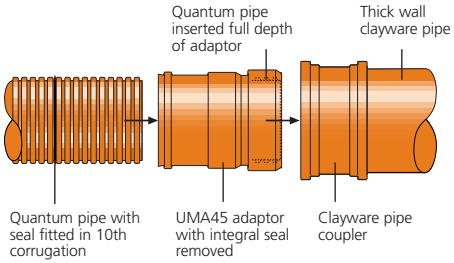




## QUANTUM TO THICK WALL CLAYWARE

The UMA45 adaptor may be used to connect 150mm Quantum pipe to Densleeve or Hepsleeve 188mm outside diameter clayware pipe.

The adaptor is designed to allow Quantum pipe to be jointed with clayware pipe using a standard clayware pipe coupler.




### INSTALLATION PROCEDURE

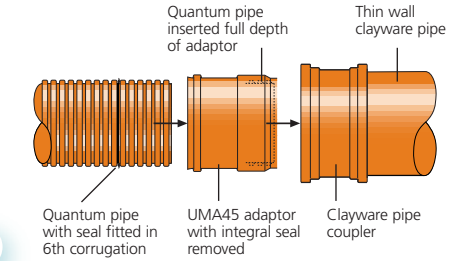
1. Remove factory fitted 'T' seal from adaptor socket.
2. Fit seal on the pipe in the 10th corrugation from the end of the pipe ensuring the seal is correctly handed as shown on page 22
3. Lubricate the seal socket of the adaptor. Push the adaptor over the pipe, ensuring the pipe passes completely through the adaptor until the end of the pipe aligns with the end of the adaptor.
4. Lubricate the adaptor spigot and push into the clayware pipe coupler up to the central register.

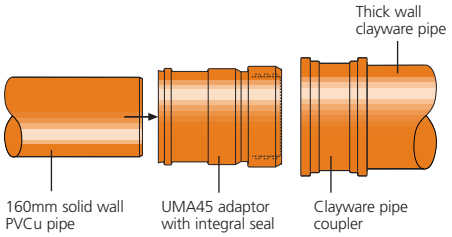
## QUANTUM TO THIN WALL CLAYWARE

The same adaptor can also be used to connect 150mm Quantum to Hepsleeve, Supersleeve or 178mm outside diameter clayware pipe.

First remove the end spigot of the adaptor using a fine tooth saw. The remaining section of the adaptor is then suitable for connecting directly into a standard polypropylene clayware pipe coupler as shown opposite.

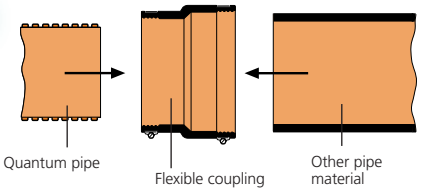
The installation sequence is as described above but the seal is fitted on the Quantum pipe in the 6th corrugation from the end of the pipe to take into account the shortened length of the adaptor.




## SOLID WALL PVCU PIPE TO CLAYWARE

The UMA45 adaptor can also be used as supplied to connect 160mm solid wall PVCu pipe to clayware drainage, as shown opposite.



## FLEXIBLE COUPLINGS

The range of flexible couplings allow connections to be made between Quantum pipes and pipes of other materials.

| Pipe | Flexible Coupling | Other Pipe Material |
|---|---|---|
| 150mm Quantum (160mm outside diameter) | **UMD17** | 150mm clayware, concrete<br>PVCu twin wall, Gully pot liners<br>200mm Max outside diameter |
| 225mm Quantum (250mm outside diameter) | **UMD27** | 225mm clayware, concrete ductile iron, 250mm PVCu pipes to BS 5481<br>290mm Max outside diameter<br>265mm Min outside diameter |
| 300mm Quantum (330mm outside diameter) | **UMD37** | 300mm clayware, concrete<br>315mm PVCu pipes to BS 5481<br>385mm Max outside diameter |

## INSTALLATION PROCEDURE

1. Ensure pipe ends and couplings are clean and free from dirt and grit.
2. Loosen clamps and slide coupling fully over the Quantum pipe.
3. Mark the end of the second pipe at half a coupling width.
4. Butt pipes together and slide coupling back over joint using the mark to ensure the coupling is centralised on the joint.
5. Fully tighten the worm drive clamps.
7. Slide couplings back over joints using marks to ensure couplings are centralised on joints.

   The above method of constructing a new connection to an existing drain meets the requirements of BS EN 1610: 1997 Clause 9-2.

## FUTURE CONNECTIONS

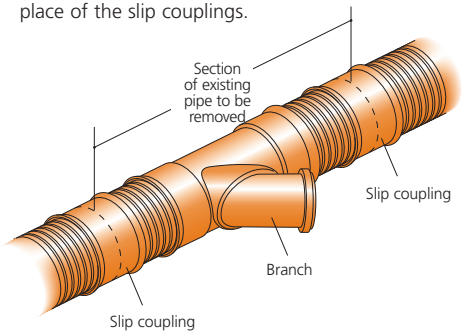
If a drainage system is likely to be extended in the future, branches at appropriate locations should be installed with the branch pipes blanked off with socket plugs. However, should it be required to install a new branch connection into an existing drain the following procedure should be adopted:

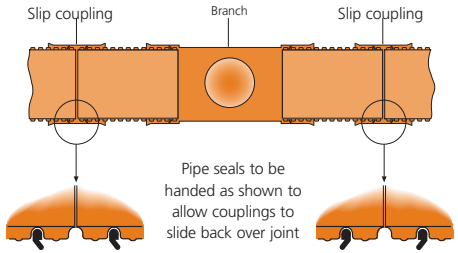
Materials required:- Branch fitting of appropriate size Two short lengths of pipe (minimum length 300mm).

Quantum pipe seals. Two slip couplings.

2. Fit the two short lengths of pipe into the branch fitting using the standard jointing procedure shown on page 21. Mark ends of pipe at half a coupling depth.
3. Use this assembly to mark the length of existing pipe to be removed and then cut out the section of pipe.
4. Ensure pipe ends are free from swarf, etc. Lubricate two slip couplings and slide fully over the ends of the existing pipe, past the first corrugation.
5. Fit Quantum pipe seals to the first corrugation of each pipe end with the seals handed as illustrated to allow the couplings to slide back over the seals.
6. Lubricate all pipe seals and place branch assembly into position with branch pipe in desired plane.

A Quantum branch fitting can be installed into an existing concrete or clayware drain by following a similar procedure as described above but utilising place of the slip couplings.








## TESTING DRAINAGE SYSTEMS

Air or water testing of systems should be carried out as required by the particular approving Authority. Reference should be made to the following documents for guidance:

Building Regulations Part H-Clause 2.26.

BS EN 1610: 1997 Sections 12 and 13.

It is recommended that air test method LA is adopted. However the standard water test can also be used.

Due to the non-absorbent nature of plastic materials the one hour conditioning period is not necessary prior to commencing a water test.

## RODDING EQUIPMENT

Hunter underground drainage systems may be rodded using continuous flexible rods, sectional polypropylene rods or other similar flexible systems. Rodding heads should incorporate a guide roller, and rigid couplings between sectional rods should not exceed 100mm in length.

Pointed or boring type metal fittings are not recommended. Mechanical rodding techniques may be used with the exception of rotating toothed root cutters. These devices were primarily designed for use on traditional pipe materials where joint failure has occurred and allowed the ingress of roots. The incidence of PVCu ring seal joints failing in this way is extremely rare.

FACT

**Defective sewers can cause:**

- Ground water infiltration increasing flows at treatment works
- Effluent seepage causing pollution
- Ingress of tree roots causing loss of capacity and potential blockages.

## WATER JETTING PVCU DRAINS AND SEWERS

High pressure water jetting is now used extensively and is a recommended technique for the general cleaning, de-scaling and removal of blockages from both Hunter solid wall pipes and Quantum drainage systems.

The Code of Practice for Sewer Jetting published by The Water Research Centre contains detailed guidance on the use of this type of equipment for drain and sewer maintenance. Adherence to the recommendations contained in this document is strongly advised when jetting all pipe materials.

The Code of Practice recommends for all house drainage systems and sewers where exact details of the condition, age and pipe material cannot be verified that a jetting pressure of 130 bar (1900 psi) is not exceeded.

Independent jetting trials for blockage clearance in PVCu pipes have conclusively demonstrated that the improved hydraulic performance and smoother internal bore allows most types of blockages to be removed using standard rear facing jet nozzles at jetting pressures well below the maximum

recommended in the Code.

The Code of Practice recommends for all pipe materials that static jetting above 1900 psi is used only following confirmation that the pipeline being jetted is in good structural condition. Where up to date and accurate records of the condition of the sewer are unavailable a CCTV survey may be required prior to jetting above 1900 psi.

The Code of Practice recommends a maximum jetting pressure of 180 bar (2600 psi) for PVCu pipes, when using a standard jet head.

Where the distance from the access point to the blockage exceeds the travel capability of the standard jet head running at 180 bar (2600 psi) the use of a low impact jet head will allow higher pressures (thus great running distance) to be achieved without increased risk of pipe damage.





## SAFETY

The relevant regulations as outlined in the Health and Safety at Work Act 1974 should be followed. Also follow the recommendations contained in the booklet 'Safe Working in Sewers and Sewerage Works' published by the National Joint Health and Safety Committee for Water Services

## TRANSPORTATION AND HANDLING

PVCu pipes and fittings are strong and lightweight and therefore very easily handled, however, reasonable care should be exercised. During transportation loose pipes should preferably be loaded and unloaded by hand but if mechanical equipment is utilised, web or rope slings are recommended.

Larger quantities of pipes are delivered in secure bundles within timber frames and wherever possible the pipes should remain within this packaging until required for installation. It is recommended that pipe bundles are unloaded by forklift or by using web or rope slings.

Fittings are generally packed in cardboard boxes, plastic bags or in shrink-wrapped form

### PIPE BUNDLES

Solid wall pipes

| Size | Pipes per Bundle |
|---|---|
| 82mm | 156 |
| 110mm | 100 |
| 160mm | 46 |

Quantum sewer & highway drainage pipes

| Size | Pipes per Bundle |
|---|---|
| 150mm | 46 |
| 225mm | 16 |
| 300mm | 9 |

## STORAGE OF LOOSE PIPES ON SITE

Pipe bundles may be stacked up to three high on firm level ground ensuring that the frames are placed 'wood to wood' to avoid damaging the pipes. Pipes should not be removed from any position within stacked bundles. Before removing pipes the bundles should be placed at ground level and provision made to retain the frames in an upright position as pipes are removed. Although Hunter Quantum pipes have a corrugated external profile their unique design allows them to be easily slid out without the corrugations interlocking.

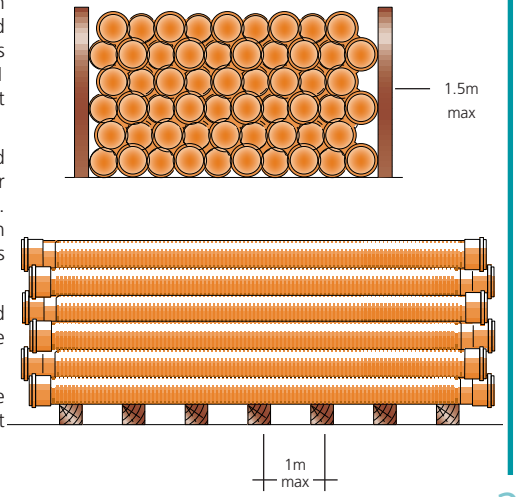
Pipes which have been delivered loose or have been removed from pre-packed bundles should be stored on a reasonably flat, level surface on timber battens not less than 75mm wide spaced at a maximum of 1 m centres. Side support should also be provided at intervals not exceeding 1 .5m.

Pipes of different sizes should preferably be stacked separately but where this is not possible larger diameter pipes should be placed at the bottom. Spigot and socket pipes should be stacked with sockets at alternate ends protruding to ensure pipes are evenly supported over their length.

Pipes stored in the open for long periods or exposed to strong sunlight should be covered with an opaque sheet (not black).

Fittings supplied in cardboard boxes or polythene bags should be stored in a cool place out of direct sunlight and away from any heat source.

### PIPE STORAGE



# BRITISH & EUROPEAN STANDARDS

BS 882: 1992, Specification for Aggregates from natural sources for concrete.

BS 1047: 1983, Specification for Air-cooled blast furnace slag aggregate for use in construction.

BS 3797: 1990, Specification for lightweight aggregates for masonry units and structural concrete.

BS 4660 & BS EN 1401: 1999, Plastic piping systems for non-pressure underground drainage and sewerage. Unplasticised polyvinyl chloride (PVCu).

BS 4962: 1989, Specification for plastic pipes and fittings for use as subsoil field drains.

BS EN 1451, Specification for polypropylene waste pipe and fittings (external diameter 34.6mm, 41.1mm & 54.1mm).

BS EN 1566, Specification for thermoplastics waste pipe and fittings.

BS 5955-6: 1980, Plastics pipework (thermoplastics materials). Code of practice for the installation of unplasticised PVC pipework for gravity drains and sewers.

BS 6209: 1982, Specification for solvent cement for non-pressure thermoplastic pipe systems.

BS 7158: 2001, Plastic inspection chambers for drains and sewers.

BS 8301: 1985, Code of practice for building drainage (Declared obsolescent).

BS EN 124: 1994, Manhole covers and frames.

BS EN 13598-1: 2003, Plastic piping systems for non-pressure underground drainage and sewerage. Unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and Polyethylene (PE) Specifications for ancillary fittings including shallow inspection chambers.

BS EN 295: 1991, Vitrified clay pipes & fittings and pipe joints for drains and sewers.

BS EN 681-1: 1996, Elastomeric seals. Material requirements for pipe joint seals used in water and drainage applications. Vulcanised rubber.

BS EN 752: Parts 1-7: 1997, Drain & Sewer Systems outside buildings.

BS EN 2006, Copper & Copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications.

BS EN 1295-1: 1998, Structural design of buried pipelines under various conditions of loading. General requirements.

BS EN 1610: 1998, Construction & Testing of Drains & Sewers.

BS EN 12056-2: 2000, Gravity drainage systems inside buildings: Sanitary pipework, layout and calculation.

BS EN 12056-3: 2000, Gravity drainage systems inside buildings. Roof drainage, layout and calculation.

BS EN ISO 9001: 2000, Quality management systems. 00

BBA 92/R070, Quantum Highway PVCu Twinwall Drainage System.

BBA 94/2985, Hunter Quantum Sewer PVCu Twinwall Underground Drainage and Sewerage System.

BBA 98/3486, Hunter Quantum Highway PVCu Twinwall Surface Water Drainage System.

WIS 4-08-01, Imported granular and selected as-dug bedding and sidefill materials for buried pipelines.

WIS 4-35-01: 2000, Specification for Structured Wall Pipes: Joints & Couplers.

BBA BRITISH BOARD OF AGREMENT
Certificate No. 92/R070
94/2985
98/3486

CERTIFIED TO BRITISH STANDARD
BS 4660 : 1999
BS EN 1401 : 1999

CERTIFIED TO WATER INDUSTRY SPECIFICATION
WIS 4-35-01