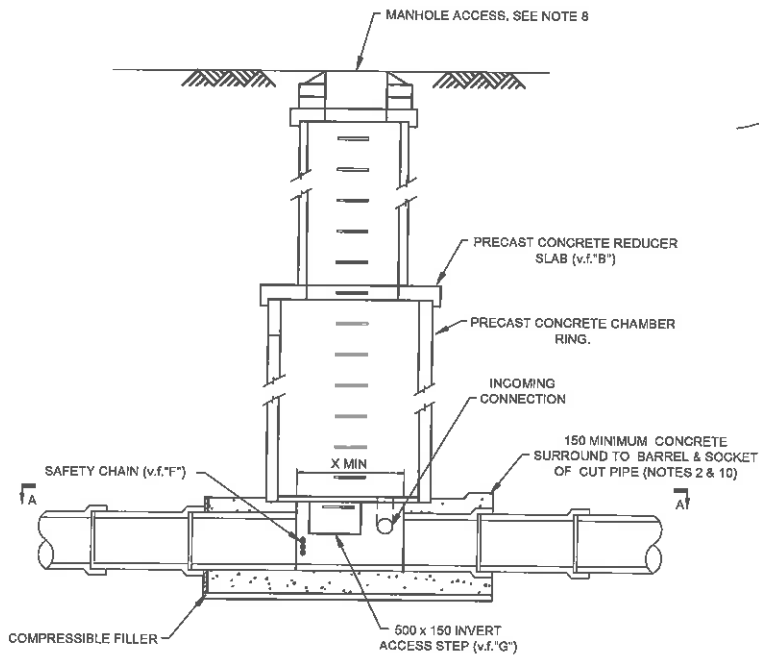
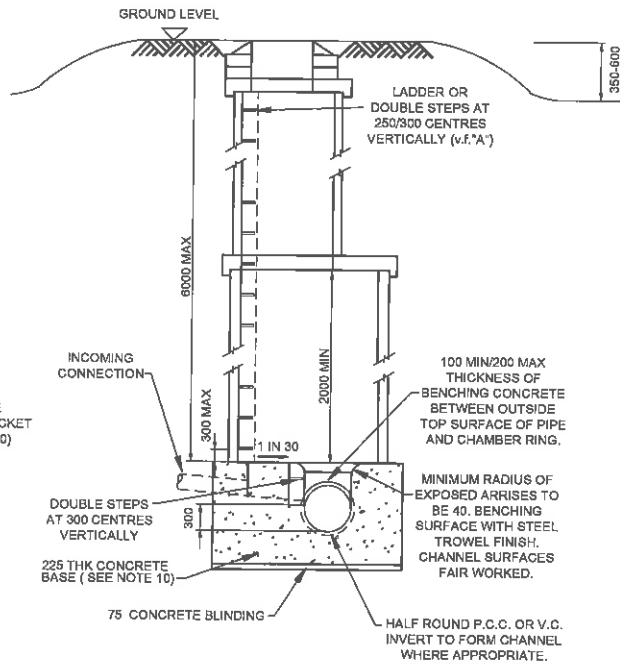




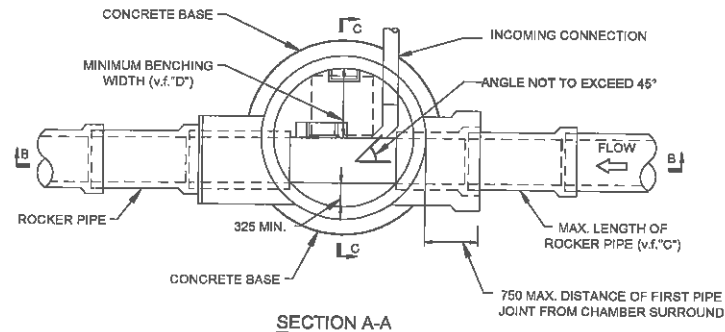
Developer Services Construction Details



SECTION B-B



SECTION C-C



SECTION A-A

MANHOLE TYPE 1 - PIPES NOT EXCEEDING 525 DIAMETER (DEPTH TO BENCHING NOT EXCEEDING 6000)

NOTES

- ALL DIMENSIONS ARE IN MILLIMETRES
- CONCRETE BENCHING AND PIPE SURROUND**
SHALL BE PLACED IN SINGLE CONTINUOUS OPERATION FROM TOP OF BASE SLAB TO TOP OF BENCHING AND PIPE SURROUND
- CONNECTION INTO MANHOLES**
SHALL BE CONSTRUCTED WITH THE SOFFITS LEVEL UNLESS DETAILED DIFFERENTLY ON CONTRACT DRAWINGS
- METALWORK**
LADDERS, HANDRAILING AND SAFETY CHAIN SHALL BE AS SHOWN ON DEVELOPER SERVICES DETAIL 9 (STND/19/009)
- CONCRETE SURROUND TO MANHOLES**
A CONCRETE SURROUND IS NOT NORMALLY REQUIRED TO MANHOLES UNLESS INSTALLED IN AREAS OF UNSTABLE GROUND, UNDER CONDITIONS OF FLOTATION OR WHERE SUBJECTED TO EXCEPTIONAL OR ECCENTRIC LOADS. IN WHICH CASES A 150 SURROUND OF AT LEAST 20 N/mm² CONCRETE SHALL BE PROVIDED. ANY JOINTS SHOULD BE STAGGERED WITH PRECAST CONCRETE JOINTS
- MINIMUM LENGTH OF CHANNEL (X Min)**

CHAMBER DIA	"X" MIN
1050	800
1200	950
1350	1000
1500	1050
1800	1150
2100	1300
2400	1450
2700	1550
3000	1700

- CUT ENDS OF REINFORCED CONCRETE PIPES**
SHALL BE TREATED WITH EPOXY RESIN PAINT/MORTAR
- MANHOLE ACCESSSES FOR MANHOLE ACCESS**
OPTIONS AND DETAILS SEE DEVELOPER SERVICES DETAIL 10 (STND/19/010)
DOUBLE STEPS SHALL BE PLASTIC ENCAPSULATED CARBON STEEL TO BS EN 1247-2. DOUBLE STEPS SHALL NOT BE USED WHERE COVER-TO-SOFFIT DIMENSION IS >3.0m
- COVER AND FRAME**
150 DEEP COVERS ARE TO BE USED IN CATEGORY 1, 2, 3 ROADS. 100 DEEP COVERS ARE TO BE USED IN CATEGORY 4 ROADS. DOUBLE TRIANGULAR COVERS ARE TO BE USED IN CARRIAGEWAY. ROAD CATEGORY TO BE DESIGNATED BY THE HIGHWAY AUTHORITY. FRAME TO BE SET AS PER SPECIFICATION
- CONCRETE**
ALL IN-SITU CONCRETE TO BE DC - 3 OR FNDS
- VARIABLE FEATURES (V.F.)**
WHERE V.F. APPEARS IN ANNOTATION REFER TO VARIABLE FEATURES AS SHOWN ON DEVELOPER SERVICES DETAIL 10 (STND/19/010)

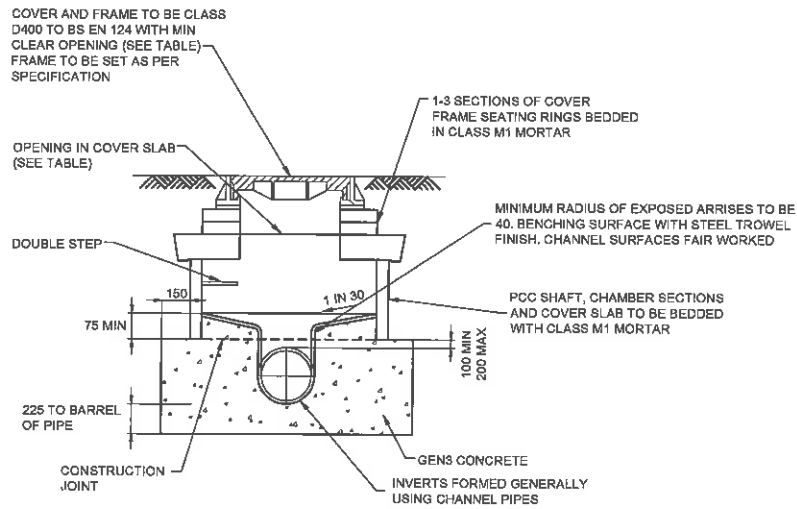
CURRENT ISSUE INFORMATION

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VERSION	DATE	BY	REVISED		DATE



UNITED UTILITIES LTD
DEVELOPER SERVICES
DETAIL 1
MANHOLE TYPE 1

SCALE	SHEET NO.
NTS	A3
STND/19/001	A

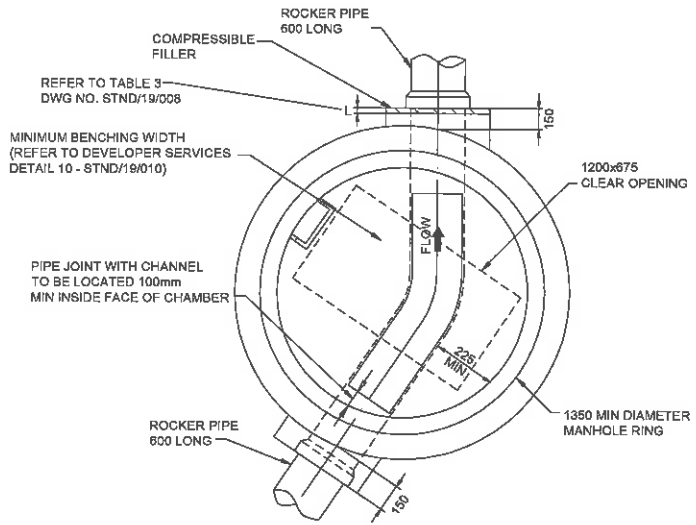


NOMINAL INT PIPE DIA	MINIMUM INTERNAL CHAMBER DIA	MINIMUM CLEAR OPENING SIZE	COVER SLAB ACCESS HOLE	COVER FRAME SEATING RING
100	1050	750 x 675	750 X 750 CENTRAL	750 X 750 CENTRAL
150	1050	750 x 675	750 X 750 CENTRAL	750 X 750 CENTRAL
225	1350	1200 x 675	1200 X 675 CENTRAL	1200 X 675 CENTRAL
300	1350	1200 x 675	1200 X 675 CENTRAL	1200 X 675 CENTRAL
375	1350	1200 x 675	1200 X 675 CENTRAL	1200 X 675 CENTRAL

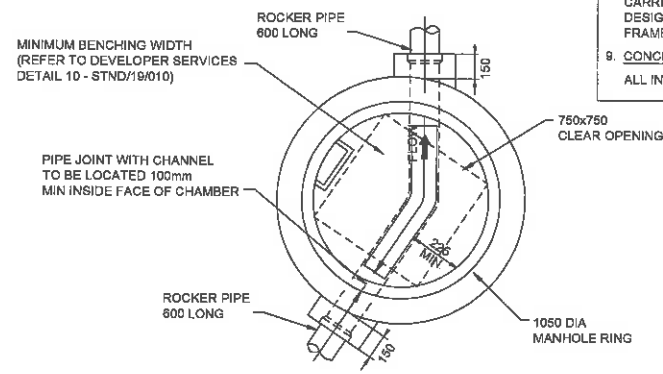
NOTES

- ALL DIMENSIONS ARE IN MILLIMETRES
- CONCRETE BENCHING AND PIPE SURROUND**
SHALL BE PLACED IN SINGLE CONTINUOUS OPERATION FROM TOP OF BASE SLAB TO TOP OF BENCHING AND PIPE SURROUND
- CONNECTION INTO MANHOLES**
SHALL BE CONSTRUCTED WITH THE SOFFITS LEVEL UNLESS DETAILED DIFFERENTLY ON CONTRACT DRAWINGS
- CONCRETE SURROUND TO MANHOLES**
A CONCRETE SURROUND IS NOT NORMALLY REQUIRED TO MANHOLES UNLESS INSTALLED IN AREAS OF UNSTABLE GROUND, UNDER CONDITIONS OF FLOTATION OR WHERE SUBJECTED TO EXCEPTIONAL OR ECCENTRIC LOADS. IN WHICH CASES A 150 SURROUND OF AT LEAST 20 N/mm CONCRETE SHALL BE PROVIDED. ANY JOINTS SHOULD BE STAGGERED WITH PRECAST CONCRETE JOINTS
- DOUBLE STEPS SHALL BE PLASTIC ENCAPSULATED CARBON TO BS EN 1247-2 MANHOLE STEPS
- MINIMUM LENGTH OF CHANNEL (X Min)**

CHAMBER DIA	"X" MIN
1050	800
1200	950
1350	1000
1500	1050
1800	1150
2100	1300
2400	1450
2700	1550
3000	1700
- CUT ENDS OF REINFORCED CONCRETE PIPES**
SHALL BE TREATED WITH EPOXY RESIN PAINT/MORTAR
- COVER AND FRAME**
150 DEEP COVERS ARE TO BE USED IN CATEGORY 1, 2, 3 ROADS. 100 DEEP COVERS ARE TO BE USED IN CATEGORY 4 ROADS. DOUBLE TRIANGULAR COVERS ARE TO BE USED IN CARRIAGEWAY. ROAD CATEGORY TO BE DESIGNATED BY THE HIGHWAY AUTHORITY. FRAME TO BE SET AS PER SPECIFICATION
- CONCRETE**
ALL IN-SITU CONCRETE TO BE DC - 3 OR FND3



CIRCULAR PRE-CAST CONCRETE MANHOLE (MH4)
< 1.5m TO SOFFIT (225mm TO 375mm DIAMETER PIPE)



CIRCULAR PRE-CAST CONCRETE MANHOLE (MH4)
< 1.5m TO SOFFIT (100mm TO 150mm DIAMETER PIPE)

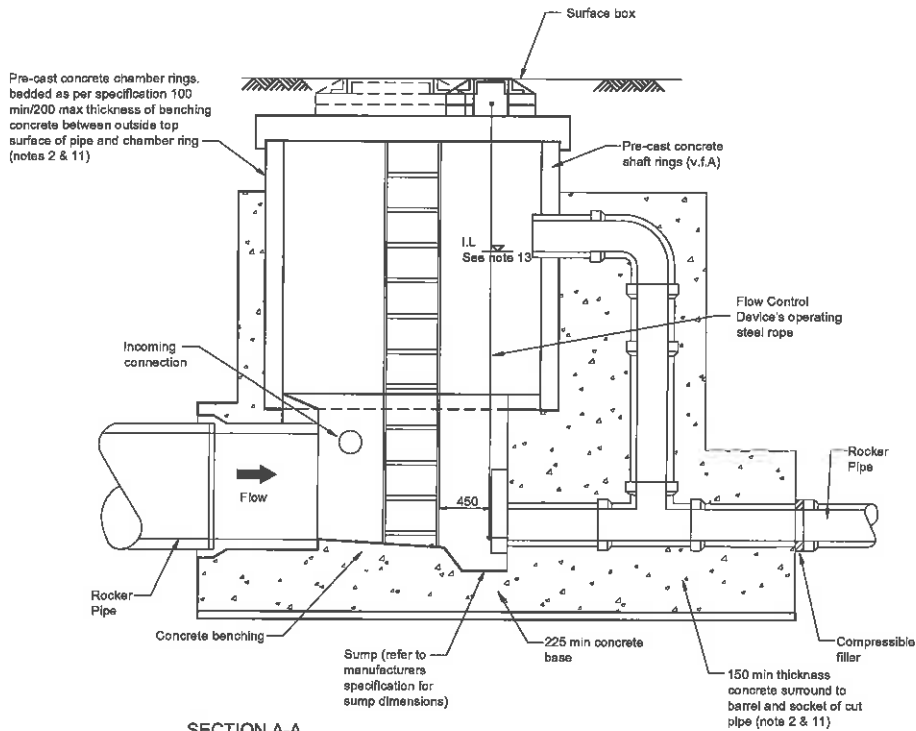
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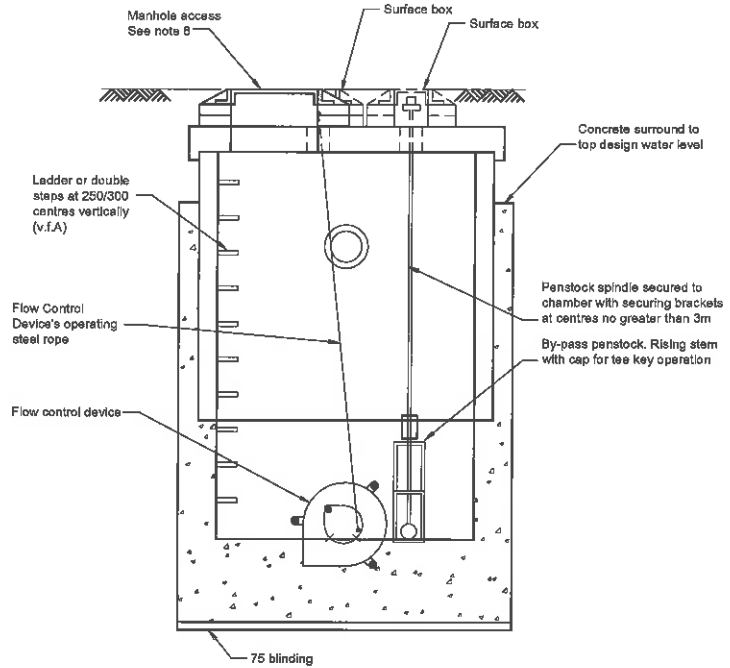


UNITED UTILITIES LTD
DEVELOPER SERVICES
DETAIL 3
SHALLOW MH DETAIL FOR
SMALL DIAMETER PIPES (MH TYPE 4)

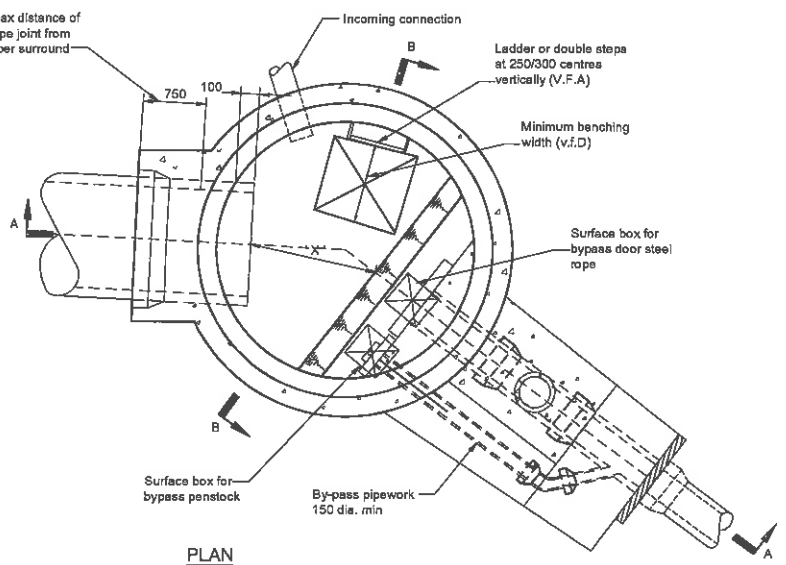
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DESIGNED BY	STND/19/003	REVISION	A



SECTION A-A



SECTION B-B



PLAN

NOTES

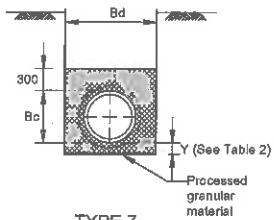
- All dimensions are in millimetres
- CONCRETE BENCHING AND PIPE SURROUND**
Shall be placed in single continuous operation from top of base slab to top of benching and pipe surround
- CONNECTION INTO MANHOLES**
Shall be constructed with the soffits at the level unless detailed differently on contract drawings
- METALWORK**
Ladders, handrailing and safety chain shall be as shown on Developer Services Detail 9 (STND/19/009)
- CONCRETE SURROUND TO MANHOLES**
A 150mm surround of at least 20N/mm² concrete shall be provided to the top design water level. Any joints should be staggered with precast concrete joints
- MINIMUM LENGTH OF CHANNEL (X Min)**

CHAMBER DIA	"X" MIN
1050	800
1200	950
1350	1000
1500	1050
1800	1150
2100	1300
2400	1450
2700	1550
3000	1700
- CUT ENDS OF REINFORCED CONCRETE PIPES**
Shall be treated with epoxy resin paint/mortar
- MANHOLE ACCESSSES AND VARIABLE FEATURES (v.f.)**
Refer to Developer Services Detail 10 (STND/19/010). Double steps shall be plastic encapsulated carbon steel. Double steps shall not be used where cover-to-soffit dimension is >3.0m
- INVERT ACCESS DETAILS**
Refer to Developer Services Detail 2 (STND/19/002)
- COVER AND FRAME**
150mm deep covers are to be used in category 1, 2, 3 roads.
100mm deep covers are to be used in Category 4 roads.
Double triangular covers are to be used in carriageway.
Road category to be designated by the highway authority.
Frame to be set as per specification
- CONCRETE**
All in-situ concrete to be DC-3 or FND 3
- Minimum headroom shall be 2000. Where 2000 cannot be achieved with benching set at half pipe level then the manhole cover size shall be increased to be in accordance with BS EN 752. Refer to Developer Services Detail 4 (STND/19/004)
- Invert level for overflow to be site specific

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UNITED UTILITIES LTD
DEVELOPER SERVICES
DETAIL 5
FLOW CONTROL MANHOLE DETAIL

SCALE	DATE
NTS	A3
DESIGN NUMBER	REVISION
STND/19/005	A

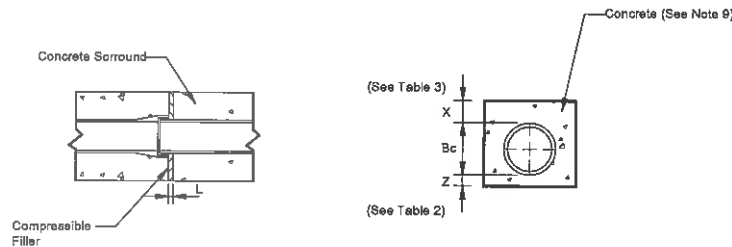


TYPE 7
EMBEDMENT CLASS S

BEDDING FACTOR (See note 5)	
2.2	Narrow Trench
2.2 or 2.5	Wide Trench
2.2	Embankment

NOMINAL INT PIPE DIA	DIMENSION Y1 EVEN TRENCH BOTTOM (MIN)	DIMENSION Y2 ROCK OR UNEVEN TRENCH BOTTOM (MIN)	PROCESSED GRANULAR MATERIAL	DIMENSION Z (MIN)	MAX PERMITTED TRENCH WIDTH
150	100	200	10mm single sized or 14mm to 5mm graded	100	750
225	100	200		100	825
300	100	200		100	925
375	100	200	14mm single sized or 14mm to 5mm graded	100	1050
450	150	200		150	1150
525	150	250		150	1200
600	150	250	20mm single sized or 20mm to 5mm graded	150	1350
675	150	250		225	1450
750	225	300		225	1500
825	225	300		225	1600
900	225	300		225	1900
975	225	300		300	2000
1050	225	300		300	2100
1125	225	300		300	2200
1200	250	350		300	2300
1350	375	450		375	2500
1500	375	450	375	2700	
1650	375	450	450	2800	
1800	375	500	450	3100	
1950	400	500	40mm single sized or 40mm to 5mm graded	525	3200
2100	425	650		525	3400
2400	450	675		600	3700

Note:
Bc = Outside Diameter of pipe
Bd = Effective trench width measured 300mm above crown of pipe



FLEXIBLE JOINT DETAIL FOR CONCRETE BED AND CONCRETE SURROUND SPIGOT AND SOCKET PIPES

CONCRETE SURROUND (CLASS Z)

Nominal Internal Pipe Dia	Dim. X mm	Compressible Filler L mm
<400	160	18
400-700	200	36
725-1200	300	36
>1200	300	54

GENERAL NOTES

- All dimensions in millimetres
- The pipe embedments indicate the minimum trench dimensions which should be assumed for initial design purposes; the minimum trench widths shown will usually be sufficient to allow adequate compaction of the embedment material.
All pipework should be designed in accordance with BS EN 1295-1
- For narrow trenching techniques the minimum trench width may be reduced, providing that the design indicates that the reduced embedment width is sufficient to support the pipework
- Where selected excavated material may migrate into the native soil or vice versa, geotextile membrane shall be provided around the embedment material
- Bedding factors are derived from "A guide to design loadings for buried rigid pipes" and IGN 4-11-02 "Revised bedding factor for Vitrified Clay drains and sewers"
- Embedment dimensions shall be in accordance with Table 2
PROCESSED GRANULAR MATERIAL:
- Processed granular material shall comply with WIS 4-08-02. The grading of processed granular material shall be as specified
- Limestone material shall not be used where the native ground or ground water is acidic, ie pH of 6 or less
CONCRETE EMBEDMENTS & SURROUND:
- Gen 3 concrete shall be used in non aggressive ground. Elsewhere the cement type and mix design should be selected to suit the sulphate content and pH of the ground and groundwater
- Concrete surround details shall be adopted where cover to pipework is less than 1.2M and where it is necessary to protect the pipework from traffic loading
- Pipes to be bedded/surrounded with concrete shall be supported on precast concrete setting blocks, the top face of each block being covered with two layers of compressible bedding
- PVC and PE pipes shall be wrapped with a layer of plastic sheeting complying with UU CESWI 6 class 2.95
- GRP pipes shall be wrapped with compressible filler material 100mm wide at the end of the concrete surround
- Compressible filler shall comply with UU CESWI 6 class 2.19

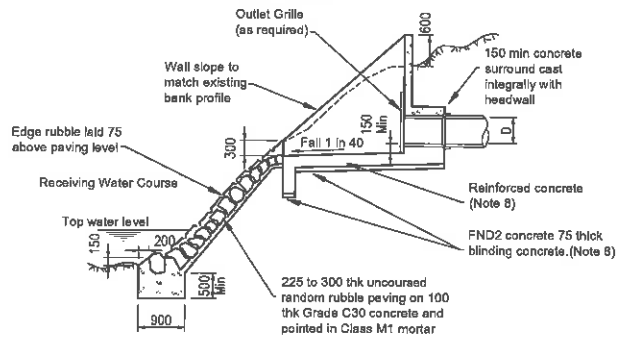
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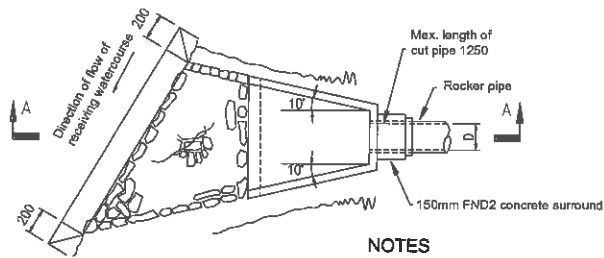


UNITED UTILITIES LTD
DEVELOPER SERVICES
DETAIL 8
PIPE BEDDING DETAIL

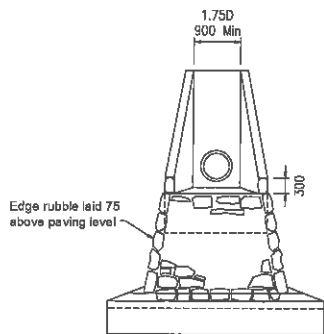
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SECTION A-A



PLAN

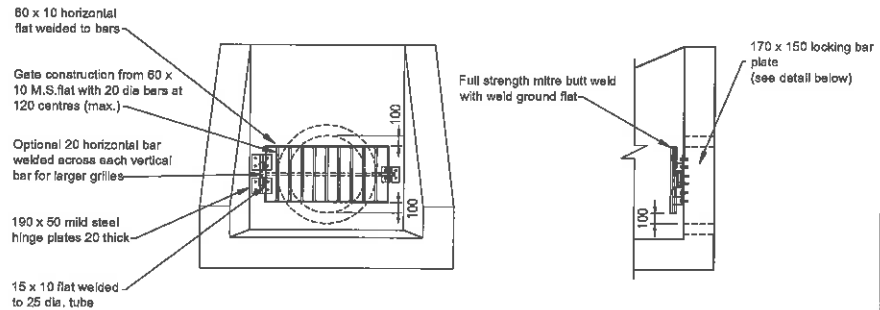


ELEVATION

TYPICAL DETAIL D
TYPICAL OUTFALL DETAIL TYPE 1

NOTES

- All dimensions in millimetres
- Generally the angle between the direction of flow of the receiving watercourse and the outfall pipe should be 45°
- All reinforced concrete edges to be finished with a 25 x 25 fillet
- Min cover to reinforcement in the top face of the base slab to be 40
- The bed and opposite bank of the watercourse may, in certain circumstances need to be protected by 225 to 300 thick uncoursed rubble pitching laid on a 100 thick bed of FND2 concrete (Note 8) and pointed in Class M1 Mortar. The stone for pitching shall consist of large smooth faced stones roughly dressed square and shall be of a hard durable and inert material. Bunter sandstone, Keuper waterstones and Carboniferous shales and mudstones are not to be used
- An Outlet Grille as shown on Typical Detail G must be provided on all outfalls where the pipe size exceeds 450mm. Where pipe diameters are 375 to 450, 20 dia. stainless steel bars are to be provided across outlet at max. 120mm c/c leaving 100mm max. clear opening
- Where outlets have a flap valve, a special detailed grille must be provided on all outlets 375mm diameter and above
- Secure handrailing shall be supplied where a person may fall 2 metres or more or where a fall of less than 2 metres carries an increased risk of injury due to the landing surface
- FND2 to be used for soil conditions Sulphate class 1 only. Designated mix references FND3, FND4A & FND4B to be used in soil conditions with sulphate classes 3,4A and 4B respectively (refer to specification clause 4.3.1)

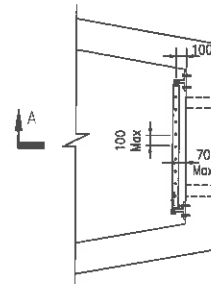


FRONT ELEVATION

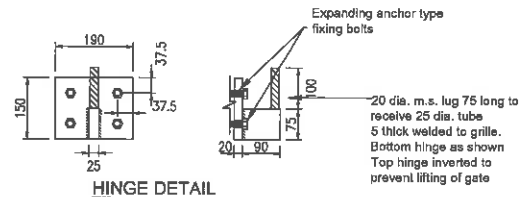
SECTION A-A

NOTES

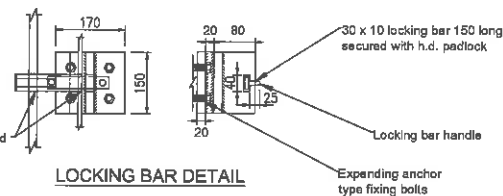
- All dimensions in millimetres
- All grilles and fittings are to be manufactured with mild steel 'hot dip' galvanised to BS 729 and treated with 2 no coats of bituminous paint
- The sizes detailed on the grille indicate the preferred member size in normal locations. Consideration should be given to up-sizing members where the grille is in exposed locations or is of particularly large size



PLAN



HINGE DETAIL



LOCKING BAR DETAIL

DETAIL G
TYPICAL OUTLET GRILLE

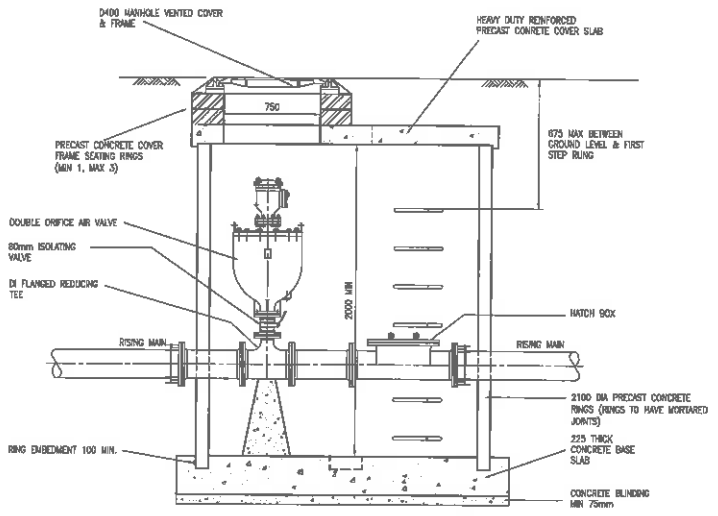
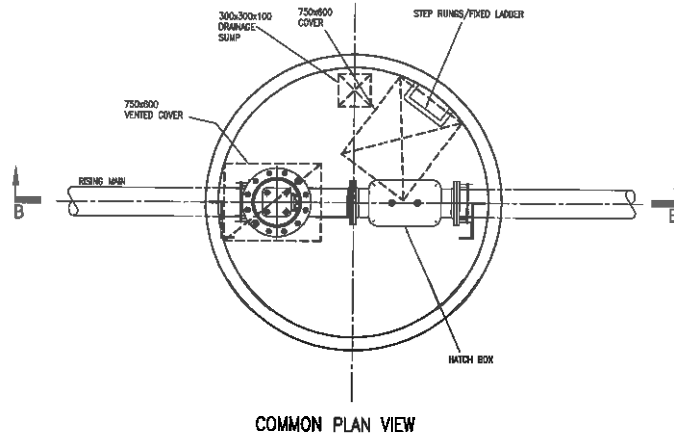
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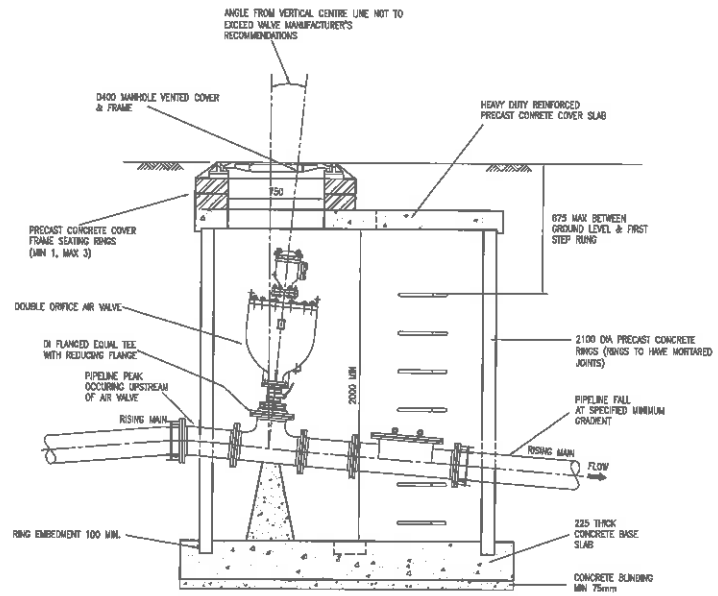


UNITED UTILITIES LTD
DEVELOPER SERVICES
DETAIL 11
HEADWALL TYPE 1

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TYPE A: AIR VALVE INSTALLATION FOR PRESSURISED SYSTEMS



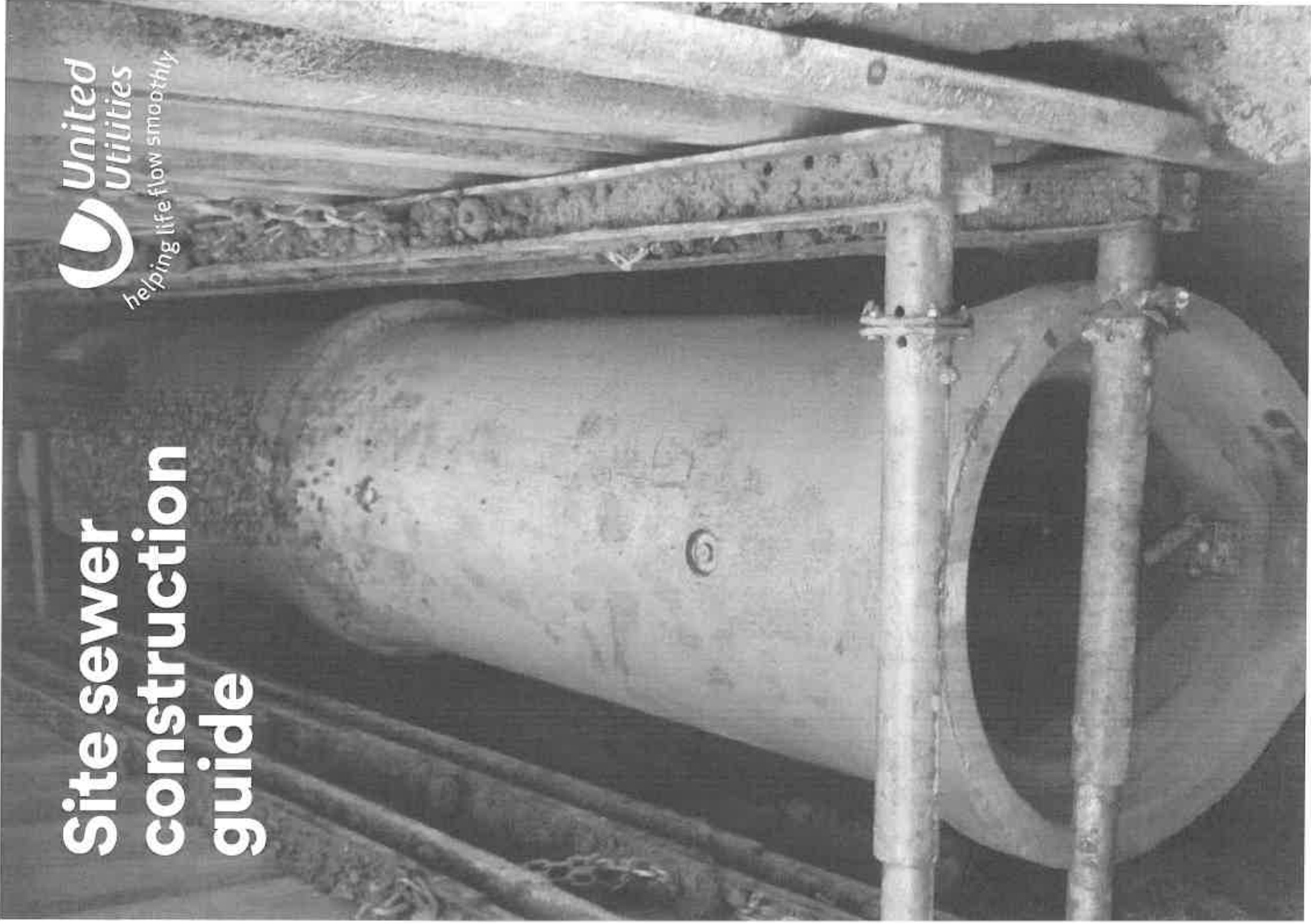
TYPE B: AIR VALVE FOR GRAVITY SYSTEM OR PRESSURED SYSTEMS WHERE LOCATED AT PIPELINE PEAK

- NOTES**
- All dimensions in millimetres.
 - All flexible couplings to be anchored.
 - Where the base of the chamber is above the ground water table the sump shall extend through the base and be filled with 20mm single size granular material.
 - CONCRETE SURROUND TO HATCHHOLE**
A concrete surround is not normally required to hatchholes unless installed in areas of unstable ground, under conditions of flotation or where subjected to exceptional or accessible loads, in which case a 150mm surround of at least 20kN/m² concrete shall be provided. Any joints should be staggered with precast concrete joints.
 - COVER AND FRAME**
150mm Deep covers are to be used in category 1,2, & 3 Roads. 100mm Deep covers are to be used in category 4 Roads. Double triangular covers are to be used in carparking. Road category to be designated by the Highway Authority. Frame to be as per specification.
 - CONCRETE**
All in situ concrete to DC-3 or FHD 3
 - DESIGN GUIDANCE**
To accommodate a double orifice air valve the depth to the soffit of the rising main is required to be greater than 1600mm for a DN60 air valve.
 - Size and type of air valve to be determined by hydraulic requirements.
 - Hydraulic design shall comply with UK Standards Specification S37 - Hydraulic Design.
 - Specific minimum gradients shall be taken from the hydraulic profile.
 - Step rings shall be used where cover-to-base dimension is <3.0m. Where cover-to-base dimension is >3.0m a ladder is required.

A. FOR INFORMATION		PAGE	1	OF	50	COLLNO	00
REV. DESCRIPTION		REV.	(CHKD)	DATE			
		INFORMATION ONLY THIS IS NOT A CONTRACT DOCUMENT THE CONTRACT DOCUMENTS SHALL BE USED TO DETERMINE THE SCOPE AND CONTENT OF THE WORK.					
		PROJECT No. [REDACTED] PROJECT [REDACTED] TITLE STANDARD DETAIL AIR VALVE CHAMBER FOR WASTEWATER RISING MAINS					
ISSUED	DATE	DESIGN	DATE	SCALE	DATE	BY	
BY	DATE	DATE	DATE	DATE	DATE	DATE	DATE
STANDARD	STND/00/035	SCALE		DATE	BY		

Site sewer construction guide

 **United
Utilities**
helping life flow smoothly



Safety in sewers and excavations

Trenches and excavations

Trenches must be adequately supported, free from boulders and tree roots must be taken out. Muddy ground, water and soft areas in the trench base must be removed. Materials, spoil and equipment must be stored safely and plant should be operated within a safe working distance. The trench must be adequately protected from slips, trips, falls, site traffic and have a safe means of access and egress.



Trenches should be adequately dewatered to provide a firm base but not dug wider than necessary as excessive loading may be placed on the pipe. Should ground conditions be unsuitable for pipe laying and manhole construction, please consult with your engineer to design a solution.



Control of site and trench groundwater

The discharge of site ground water and excavation dewatering to the public sewer is only permitted by approval from United Utilities in writing. In addition, care must be taken to prevent site debris, sludge or silt from entering the sewer network which could ultimately cause flow restrictions, blockages, flooding, pollution and also affect the receiving wastewater treatment works. Costs associated with such incidents may be recovered from those responsible. In addition, should an inappropriate discharge of site groundwater or construction material cause a pollution incident, this may lead to prosecution.



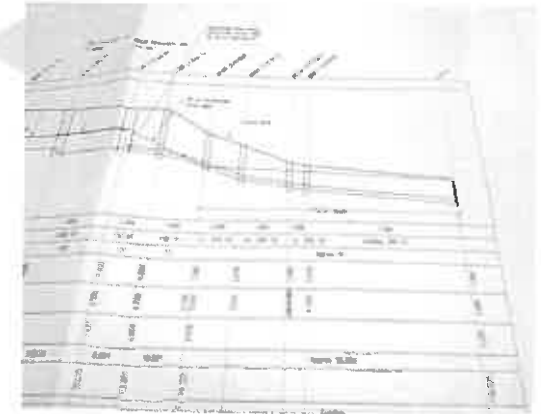
Safety in sewers and excavations

Agreed drawings

For sewer adoption and diversion works, construction must comply with the drawings agreed by United Utilities. Similarly for public sewer connections, works must comply with the details which have been agreed by the Local Authority, the relevant Building Control Authority and the approval given by United Utilities for the works to proceed.

It is recommended that a site copy of the agreed drawings are available to those carrying out construction to avoid any mistakes or deviation from specification.

Any deviation from the agreed drawings must be agreed with United Utilities before construction.



Construction materials

All materials including pipes must comply with the United Utilities agreed drawings to Water Industry Standards (WIS) and be Kitemarked or have a similar EU certification mark. Should it be necessary to change to an alternative product or material, this must be agreed in advance with United Utilities, before construction commences.

Please note when ordering, suppliers should be made aware that the products selected must comply with United Utilities Standard Details and the current edition of Sewers for Adoption specification.

Storage of materials

All materials should be handled with care and stored safely in accordance with manufacturer's recommendations.



Manhole chambers

Lateral connection manhole channels

Lateral connections within manholes must meet the main channel at 'soffit to soffit' level with the channel commencing 100mm from the chamber wall.

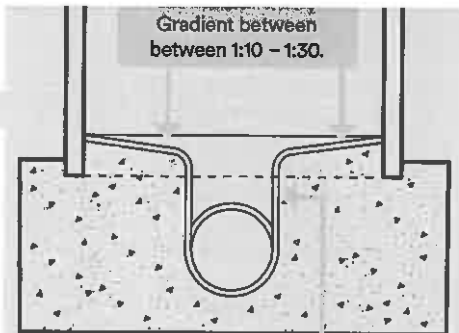
All lateral channels must meet the main channel, swept in the direction of the main flow.



Manhole benching

Benching should be self-cleansing and formed with high strength concrete at a gradient of between 1:10 – 1:30.

To maintain a smooth flow within the main channel, the benching must be formed vertically from the edge of the channel to at least the crown of the pipe.



Vertical benching to at least the crown of the pipe

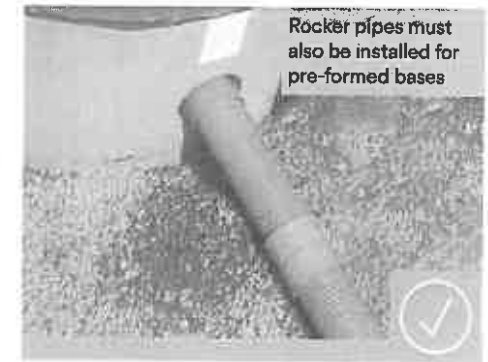


Manhole chambers

Stub and rocker pipes

The manhole stub pipe must terminate within 150mm from the external face of the manhole. The length of the rocker pipe used must correspond to the sewer diameter. For sewers up to 600mm diameter, the rocker length must be 500–750mm long.

Please note, no rocker pipes are required on concrete pipes in excess of 1050mm diameter.

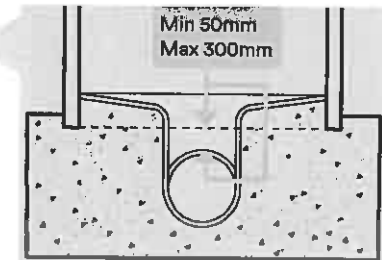


Setting out position of 1st ring and cover slab

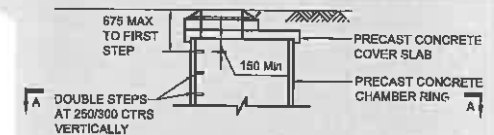
The underside of the manhole ring must be situated between 50 – 300mm above the crown of the pipe.

The distance from finished ground level to the top step rung beneath the cover slab **must not exceed 675mm**. A minimum distance of 150mm between the underside of the cover slab to the top step iron must also be provided.

It is recommended that your site engineer sets out the cover slab, concrete base and manhole ring levels to ensure that the above distances are provided.



The edge of the step rungs must be plumb and in alignment with the edge of the cover slab opening.



DOUBLE STEPS ACCESS

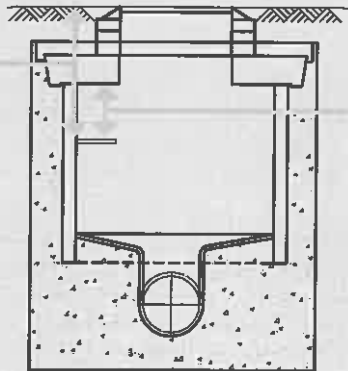
The top rung of ladders must also be no greater than 675mm from ground level, with the rungs positioned a minimum of 211mm from the chamber wall to the centre of the rung.

Positioning of cover slabs

Cover slabs must be positioned in square alignment with step irons or ladders and provide a minimum 600 x 600mm square unobstructed opening. The internal face of the cover slab must be plumb with the outer edge of the step irons.

Remember, the distance from ground level to the 1st step should be no more than 675mm.

Remember, the top step must be a minimum of 150mm from the underside of the cover slab.



Step rings must not be constructed in adjusting brickwork openings.



Defective or damaged cover slabs must be replaced.

Adjusting brickwork, raising pieces and manhole cover and frames

1-3 courses of solid Class B engineering bricks should be used, free from thin masonry splits constructed using 3:1 cement sand mortar in English Bond. Please note, normal house building mortar is unsuitable for constructing adjusting brickwork. Furthermore, masonry splits should only be used to achieve road cambers and gradients.

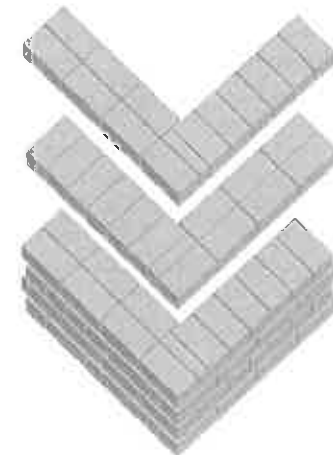
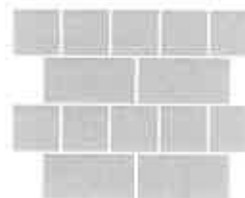
Alternatively, pre-cast raising pieces can be used, bedded on 3:1 sand / cement mortar or stronger. Proprietary shimming pieces should be used to achieve road cambers and gradients etc.

Please note when calculating the number of masonry courses, the mortar bed beneath the manhole frame must not exceed 12mm.

Both adjusting brickwork and raising pieces must be of sound construction, plumb, in alignment with the cover slab, free from holes, mortar snots with the mortar joints suitably pointed or flush with the brickwork. Please note, the rendering of adjusting brickwork or concrete seating rings is not permitted.

English bond adjusting brickwork

English bond must be constructed as per the diagrams below taking particular care to ensure that the bond is maintained throughout the courses with no vertical straight joints, using 1/2 brick Queen Closures at the corners.



Pipes

Laying and jointing of pipes

Pipes should be laid in 3m maximum lengths with the joints 'pushed home' into sockets. Furthermore, care must be taken to ensure the pipe jointing seals are free from grit, silt etc. which will likely cause the pipe length to fail later air testing. It is recommended that sewers are air tested at regular intervals as pipes are laid.

Pipes should be cleanly cut, be free from defects and laid without back fall and dips. It is recommended that sewers are laid using pipe lasers to achieve a single consistent gradient. Where there is little fall such as gradients up to 1:150 extra care should be taken to prevent dips.

Back laying of pipes should be avoided where possible as level errors and the positioning of unforeseen existing services may require corrective measures which can be either expensive or impossible to rectify.

Backfilling

Pipes should be backfilled and compacted in 150mm layers to 300mm above the pipe crown. Care should be taken during compaction so that the sewer remains in good line and level, in particular adjacent to manhole chambers to prevent rocker pipes being pushed down from stub pipes.



Testing of sewers

Sewers up to 750mm diameter must be available for testing either by air or water.

Air testing

For air testing, the sewer must hold a head from 100mm to a minimum of 75mm for 5 minutes once the pressure is initially stabilised.

Water testing

The sewer should be filled with water to provide 1.2 – 6.0m head of water above the soffit of the pipes at the highest point. To allow for absorption, after 2 hours water should be added at 5 minute intervals and the volume of water required to keep the water at the initial level recorded. The rate of water loss must not exceed 0.5 litres / per 30 minutes / metre diameter / linear metre.



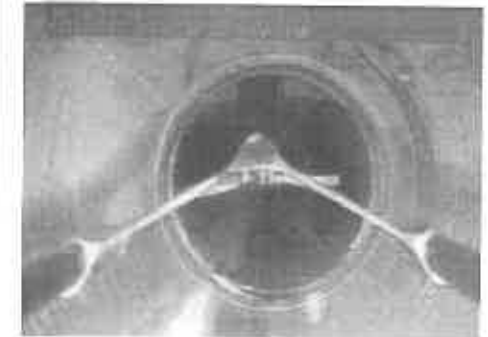
CCTV surveys

All sewers proposed for adoption must be inspected by CCTV survey. For sewers subject to a S104 Agreement, United Utilities will survey the sewers. In advance of the CCTV survey, it is the developer's responsibility to ensure that sewers are suitably cleansed otherwise the survey work will be abandoned.

Thermoplastic pipes are also subject to profile laser light-line surveying which measures any deformation within the pipeline. Pipes with deformation in excess of 5% must be replaced.

For sewers subject to S185 Sewer Diversion Agreements, it is the developer's responsibility to provide CCTV footage of cleansed sewers before flows are diverted. However, CCTV surveys recorded during the jetting works or surveys of dry pipelines are not suitable as an indication of the level of the pipe can not be achieved.

Please note, pipe defects, dips, back fall and poor jointing highlighted by these surveys will need to be repaired.



Connections

Pre-formed junction connections

Oblique preformed junctions only must be installed using proprietary couplings. 'T' junctions must not be used.

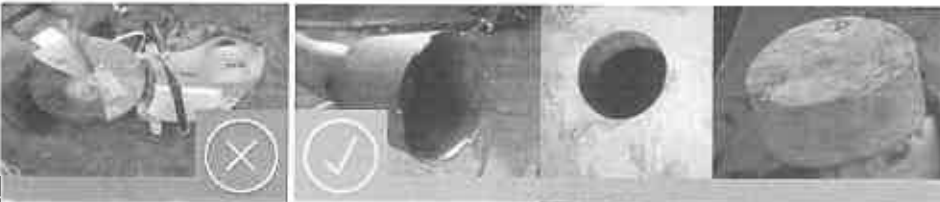
Openings in the existing sewer must be squarely and accurately cut, free from rough edges. The installed fitting should be in good alignment with the existing sewer.



Core-drilled saddle connections

All saddle connections must be core-drilled.

Please note, forming openings using circular cutting wheels weakens the pipe and causes structural defects.



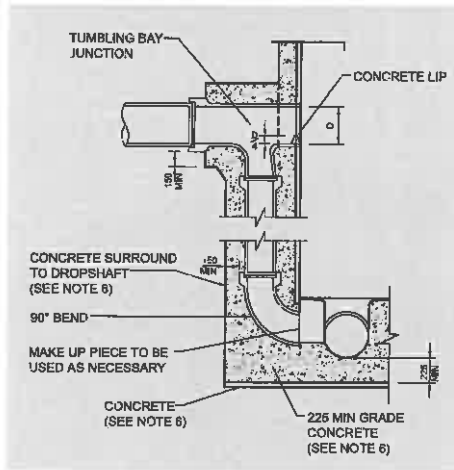
Oblique saddle fittings must be used on pipes less than 450mm diameter. Proprietary saddle fittings must be used on all connections.

The internal saddle fitting diameter must not be greater than $\frac{1}{3}$ of the main sewer internal diameter.

Back drop connections

Generally, internal backdrop connections are not permitted. Should an external backdrop have a high risk of blockages, a rodding point extending to ground level should be provided.

Remember, once connections have been made, please leave the area exposed for inspection by United Utilities.



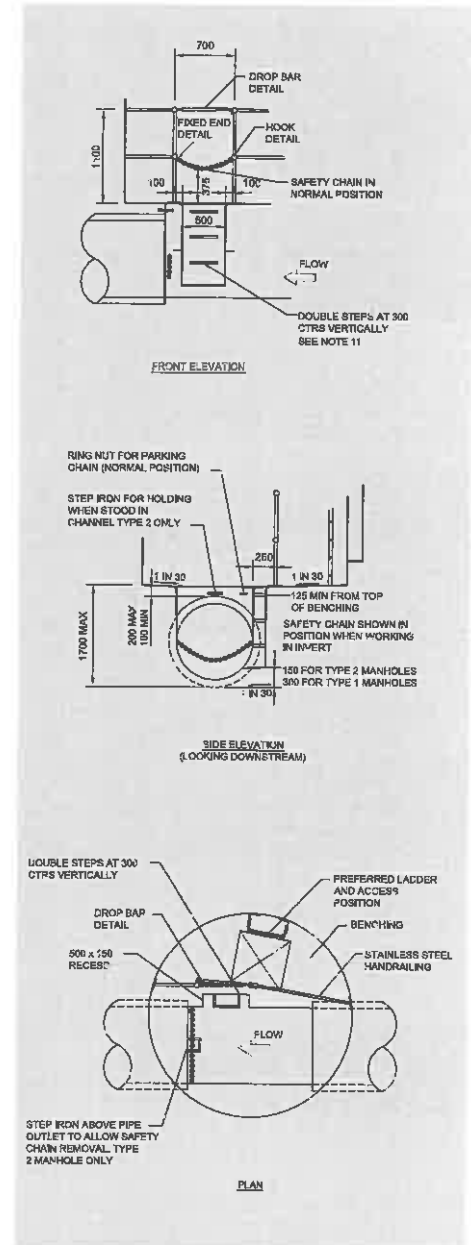
Access

Bespoke or manhole chambers for storage systems

Chamber ring diameters should be selected on size of manhole inlets and outlets and should also be able to accommodate the number of connections, associated channels and provide a minimum 600mm x 600mm landing area.

For 600mm diameter pipes and above, where benching and a landing area is constructed 50% diameter above invert, a 500mm x 150mm recess must be cast within the manhole base, for step irons to be installed to lead down to the main channel invert.

Handrails must also be installed to United Utilities Standard Detail Specification.



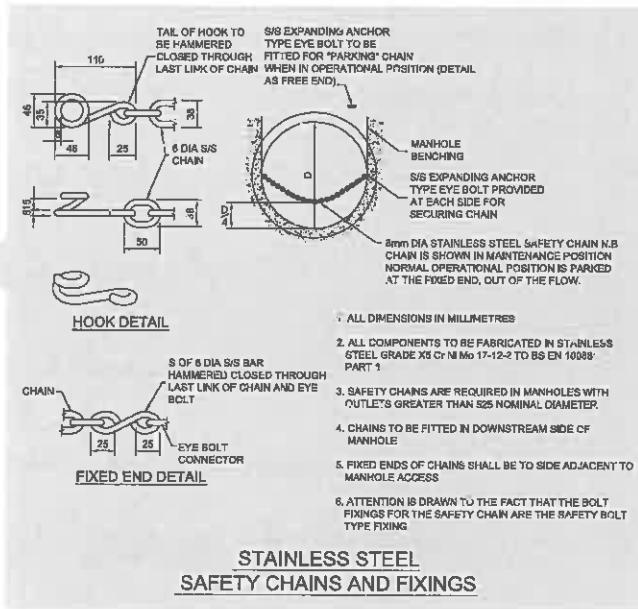
Fixings and rails

Metal fixings and chains

The specification for United Utilities metal work fixings and chains is stainless steel, grade X5 Cr Ni Mo 17-12-2 to BS EN 10088: Part 1

Safety chains

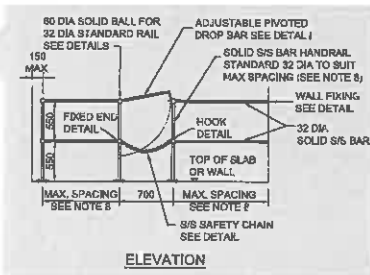
Safety chains are required on sewer outlets greater than 525mm internal diameter. The chain must be 8mm diameter and made from stainless steel.



Hand rail and balustrades

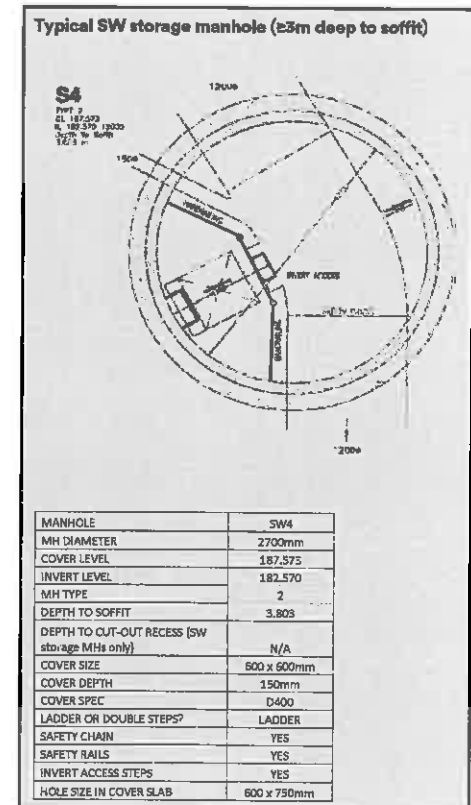
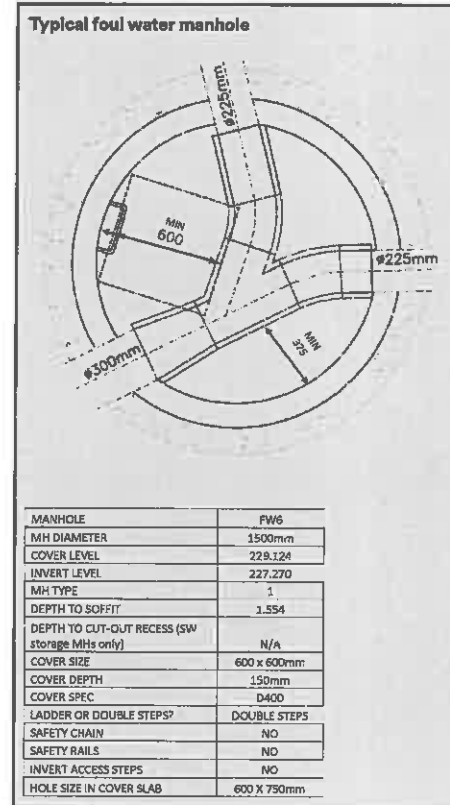
Stainless steel

and in some circumstances GRP handrails and balustrades are permitted. Please contact United Utilities with regards to the relevant application and associated specification.



Other information

Typical 1:20 manhole details



Minimum length of channel

Chamber Diameter	X ^{min}
1200	950
1500	1050
1800	1150
2100	1300
2400	1450
2700	1550
3000	1700



**United Utilities Wastewater Developer Services and Planning
Warrington North Wastewater Treatment Works
Barnard Street off Liverpool Old Road
Gatewarth Industrial Estate
Warrington
WA5 1DS**