

Site sewer construction guide



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Introduction

Sewers are expensive to construct and if not built correctly, remedial works can be disruptive, time consuming, costly and in some circumstances, have adverse effects on a company's reputation. In many instances, a lot of mistakes can be avoided by considering the specification and requirements before and during construction.

This document has been produced as an on-site guide for contractors and operatives constructing sewers, with advice notes provided to avoid some of the common on site errors.

Technically approved drawings and manufacturer's recommendations should be adhered to. Should this not be practicable, design changes or amendments must be agreed with United Utilities before construction.

It is a contractor's responsibility to ensure that all operatives are competent and experienced to complete works to the required standards. As set out in the Design Construction Guide (DCG).



SAFETY IN SEWERS

The Health and Safety of workers on the Public Sewer Network is our number one priority. **All work on public sewerage apparatus must be agreed in writing by United Utilities** (see page 26 for further details). As a minimum requirement, workers carrying out sewer construction on the public sewer must hold a current City and Guilds or SQA standard or CABWI Level 2 Award Certificate for Working in Medium or High Risk Confined Spaces in the Water Industry. In addition, those carrying out the work must be suitably experienced.

All excavation works should be carried out in a safe manner taking into account:

- underground services and structures
- confined space working
- ground conditions and collapses
- preventing falls
- safe access and egress

REMEMBER: Access to the public sewer network must be agreed in writing. You must **'Log On'** before starting work and **'Log Off'** the sewer network by telephoning **0782 653 94 59** and quoting the unique Access Certificate or Sewer Connection reference number.



Only **Intrinsically Safe** CCTV equipment can be used in public sewers

Keep this booklet with you on site as a quick reference guide

Version 1.0 March 2024

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 transmitted to the pipe. Should ground conditions be unsuitable for pipe laying and manhole construction, please consult with your engineer to design an agreed 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.



Do not let site water enter the sewer network.



Discharge to public sewer only permitted by approval from United Utilities in writing

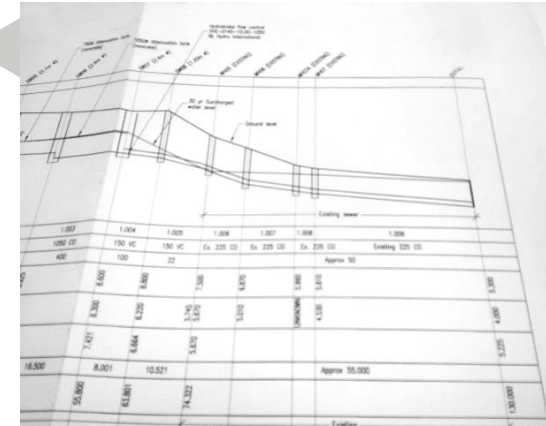
Agreed drawings

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.

Safety in sewers and excavations



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 DCG specification.

Storage of materials

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



Manhole chambers

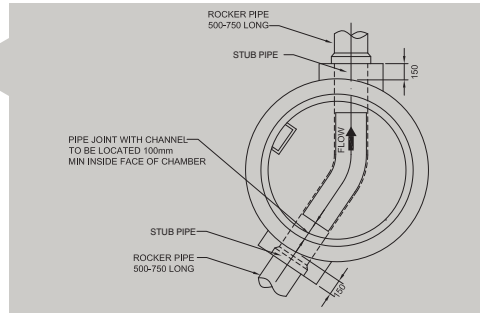
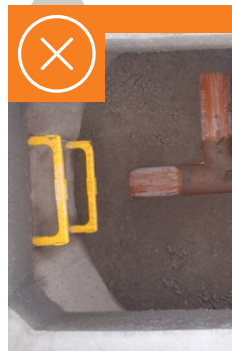
Typical manhole chambers up to 3m deep

Manholes should be constructed where there is a change of direction and/or a change of gradient, or where access is required for maintenance purposes. Such changes in direction or gradient must be made within the channel and not outside of the manhole or concealed by benching.

The outside edge of a manhole should be positioned 0.5m away from the kerb.

Sizing of manhole chamber

Manhole bases should be sized to accommodate the main channel, lateral connection channels and provide a minimum 600 x 450mm square landing area beneath the step rungs or ladder for main channels up to 375mm. However, should there be several channels, the size of the chamber may need increased. Please note, road cambers should be considered when positioning manholes with double covers across the centre of a carriageway. Where using a wide wall chamber rings, a permanent watertight seal must be achieved. The choice of chamber rings must be suitable for groundwater conditions and leaks must be rectified prior to adoption.

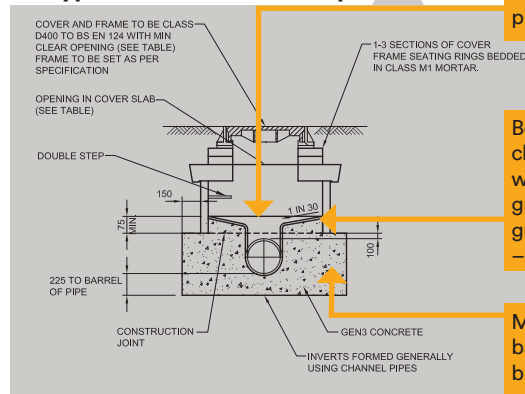


Manhole base and channel construction

The manhole base should be a minimum of 225mm deep to the barrel of the channel. To prevent the ingress of ground water and associated calcified deposits bleeding through the benching, the concrete should not be a dry mix and sufficiently compacted or poked to remove voids and entrained air. Channels must be steep sided to at least the crown of the pipe.

Preformed bases must be suitable for intended application considering incoming and outgoing gradients. Channels should be configured to and channels finished to achieve self-cleansing flow.

UU Type 4 manhole ≤1.5m deep



Steep sided channel to pipe crown or above.

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

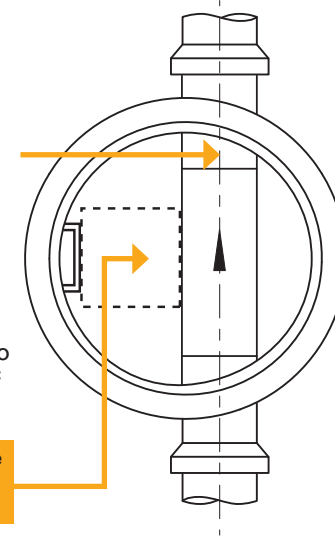
Min 225mm concrete base, with 75mm blinding.

Channels

The pipe joint adjacent to the channel should be a minimum of 100mm from the internal face of the manhole.

Lateral connections into the manhole must also enter the chamber as channels, again at 100mm from the internal face of the chamber and connect to the main channel at soffit level, swept with the direction of main flow.

Remember 450mm landing area should be provided from the ladder or steps to the channel edge.



Minimum length of channel

Chamber diameter	"X" min
1200	950
1500	1050
1800	1150
2100	1300
2400	1450
2700	1550
3000	1700



Preformed plastic inspection chamber bases must not be installed within manhole rings or brickwork chambers.

Channel types

Channel inverters must be constructed using channel fittings for pipe diameters (up to and including 300mm for channel use in manholes). Clay and suitably fixed plastic channels are acceptable. Granolithic channels formed on-site for smaller diameter channels often are either not sufficiently finished or the profile of the channel is not maintained, causing the accumulation of solids and associated odour complaints and as such are **not acceptable**. Granolithic channels above 300mm diameter must be finished with a steel float.

Preformed plastic bases constructed within manhole rings are also not permitted. Preformed concrete and plastic coated concrete bases are permitted.

All backdrops should be concrete encased, whether Type A, B or ramped.

Channels should be configured in such a way to achieve self-cleansing and equal 'Ts' should be avoided.

All backdrop arrangements should be configured to contain flows within the channels.

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. Lateral connections should be configured to achieve free discharge and maintain main channel flow.

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

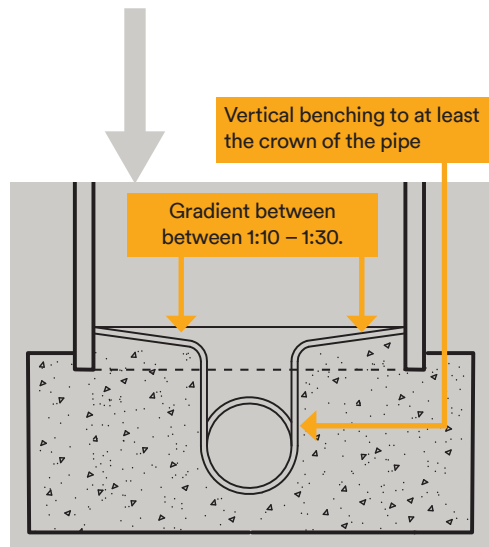


Manhole benching

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.

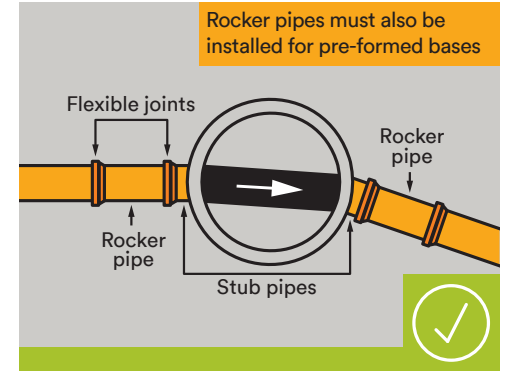
Short 90 degree channel bends should be avoided and long-radius or 45 degree channels should be constructed.



Stub and rocker pipes

Rocker pipes are not required on Thermoplastic sewers, only for ridged type material. Please note, no rocker pipes are required on concrete pipes in excess of 1050mm, please see variable features table.

Rocker pipes must also be installed where using pre-formed bases connecting to rigid pipe materials.

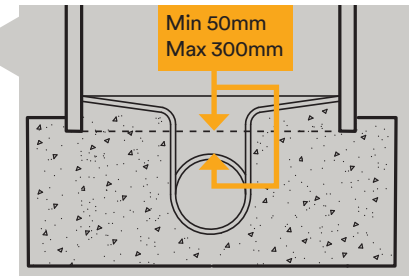


Setting out position of 1st ring and cover slab

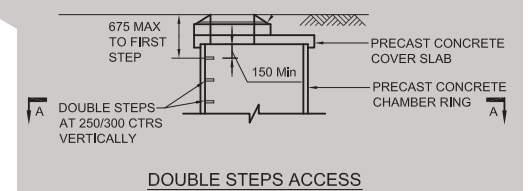
The underside of the manhole ring must be situated between 50 – 300mm above the crown of the pipe.

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.



Setting out of preformed bases

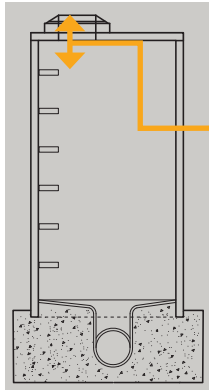
When using preformed manhole bases, the depth of the base and ring construction should achieve 1 to 3 raising pieces / courses of brickwork above the cover slab or a maximum of 675mm from cover level to top step.

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.

Manhole rings and step rungs and ladders

Sealing or mastic strips should be trimmed flush with the chamber wall as per Civil Engineering Specification for Water Industry.

Manhole rings must be seated on a mortar bed and adequately pointed to prevent the ingress of ground water. Alternatively, proprietary bitumen or mastic bedding materials can be used. Manhole ring lifting eyes must be pointed flush with the chamber walls.



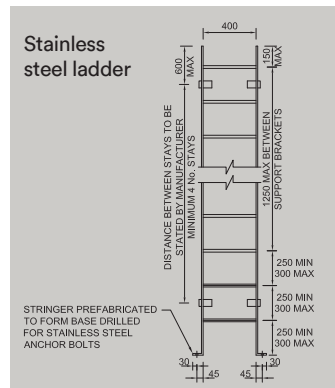
The choice of manhole ring construction should be determined according to on-site specific ground conditions, with standard chamber construction, wide wall rings or concrete encasement selected to provide sealed chambers.

The distance from ground level to the 1st step or ladder rung **must be no more than 675mm**. Remember the top step must be a minimum of 150mm from the underside of the cover slab. A site engineer should set out the cover slab levels prior to construction so that this specification is achieved.

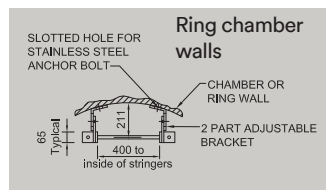
In areas of traffic loading, high ground water table levels or contaminated ground, 150mm GEN 3 concrete surrounds to manhole chambers must be provided. Alternatively, wide wall rings can be considered.

The step rungs must be plumb, in vertical alignment and equally spaced, leading to a landing area with a minimum of 450mm from the ladder or steps to the edge of the channel.

To maintain a 600 x 600mm square clear opening, the step rungs or ladders must be plumb and in alignment with the cover slab opening. The top rung of ladders must also be no greater than 675mm from ground level and should not impede the opening. Adequate footing from the chamber construction to the ladder rungs must also be provided



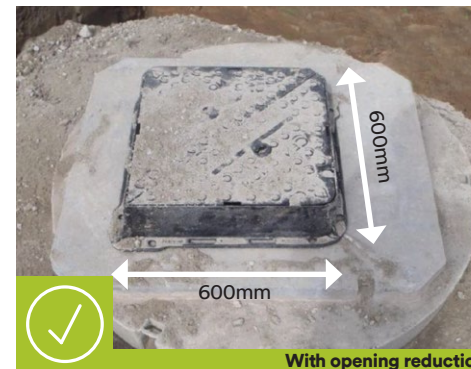
Where the distance from ground level to the benching landing area is in excess of 3m, step irons are not permitted and a ladder must be installed. Stainless steel or in certain circumstances GRP ladders are acceptable, but please consult with United Utilities who will confirm the relevant specification.



Cover slabs and access openings

For 600 x 600mm square openings on 1050mm diameter chamber rings and above, United Utilities Standard Detail Specification is that a 600 x 750 mm cover slab is fitted, reduced to a 600 x 600mm square opening by the use of an eccentric raising piece to suit the manhole cover and frame used.

Generally, where manhole chambers are between 1.5 – 3.0m deep from finished ground level to benching landing area, a 600 x 600mm clear unobstructed opening is normally suitable.



Where chambers are less than 1.5m deep from finished ground level to benching landing area, consideration should be given to accessing and carrying out maintenance activities within the chamber.

For 1050mm and 1200mm diameter rings less than 1.5m deep to benching, 750 x 750 cover slabs and covers shall be fitted.

For 1500mm diameter rings less than 1.5m deep to benching, 1200 x 675 covers and matching cover slabs shall be fitted.

Please note, cover slabs must not be cut to increase opening dimensions as this will significantly weaken the cover slab.

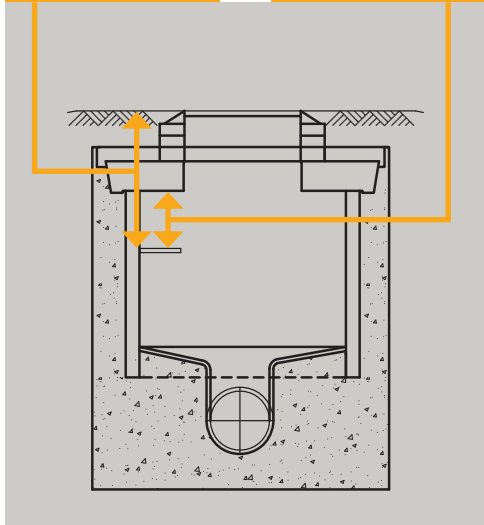
DEPTH TO SOFFIT FROM COVER LEVEL < 1.5M	DEPTH TO SOFFIT FROM COVER LEVEL ≥ 1.5M
MINIMUM CLEAR OPENING SIZES 750 x 750 ON 1050 AND 1200 CHAMBER / SHAFT 1200 x 675 ON 1500 AND ABOVE CHAMBERS / SHAFTS	MINIMUM CLEAR OPENING SIZES 600 x 600 FOR DOUBLE STEP ACCESS 600 x 600 FOR LADDER ACCESS 750 x 600 FOR FEATURE LADDER ACCESS

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 (750mm by 750mm minimum opening if the distance to landing area is less than 1.5m). 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.



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.

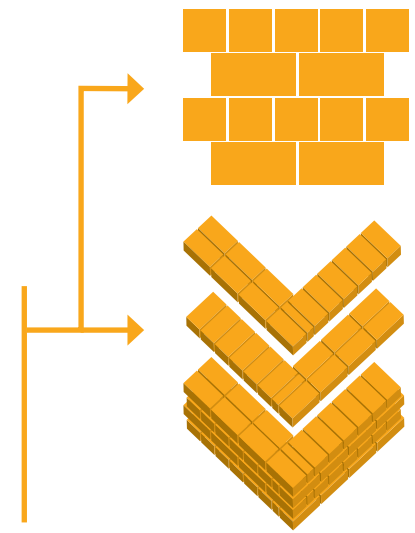
Please note when calculating the number of masonry courses, the mortar bed beneath the manhole frame must not exceed 12mm when using sand and cement in type 4 roads and other traffic areas.

Polyester resin bedding mortar must be used for frames of manhole cover in NRSWA type roads 0, 1, 2, and 4.

Both adjusting brickwork and raising pieces must be of sound construction, plumb, in alignment with the cover slab, free from holes and mortar snots with the mortar joints suitably pointed flush with the masonry. Please note, the rendering of adjusting brickwork and concrete raising units 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.



Manhole cover and frames

The DCG specifies that all manhole frames located in adopted highways must be a minimum of 150mm deep and only 100mm frames are permitted in residential cul-de-sacs. Covers must be Kitemarked and comply with BS EN124 with Class D400 covers used in all areas used by road vehicles. It is however recommended that all cover and frames subject to traffic loading should have 150mm deep cover and frames. 150mm deep frames should also be used in block paved areas. 100mm frame and covers may be acceptable in conjunction with highways acceptance.

In areas where heavier traffic loading is to occur, type E600 cover are to be used.

Inappropriate bedding of manhole frames often leads to movement of both the manhole cover within the frame and the disintegration of the surrounding ground, especially in trafficked areas.



Manhole covers must be correctly selected in accordance with the given location and must be correctly seated in alignment with the adjusting brick work or raising pieces below.

Before final surfacing, it is recommended that all frames are checked for alignment and sound bedding. Resetting frames and associated reinstatement can be costly, time consuming and spoil the appearance of a newly surfaced area.



Generally covers must be bolted together with manhole key holes free from debris and ready for inspection.

Block paved or masonry inset covers must not be installed on United Utilities public sewerage apparatus.



Pipes and bedding

Sewer pipes and bedding specification

Pipes used on main adoptable sewer lengths must comply with the DCG specification. Should there be any queries as to the suitability of materials, these should be clarified before construction. Vitrified clay pipes should comply with requirements BS EN 295 for foul pipes and BS 65 for surface water pipes.

Thermoplastic structural walled pipes must comply with Water Industry Standard 4-35-01 and achieve Class 8k/Nm² nominal short term ring stiffness. Please note, not all structural walled pipes meet this specification and pipes which do not meet these requirements are unacceptable. Pipes must be Kitemarked or have a similar E.U. certification mark.

Handling and storage of pipes

Pipes are expensive and should be handled with care and stored safely in flat areas, away from excavations, stacked no greater than manufactures recommendations. In particular, Thermoplastic pipes should be stored on surfaces that prevent distortion of both the pipe circumference and linear profile.

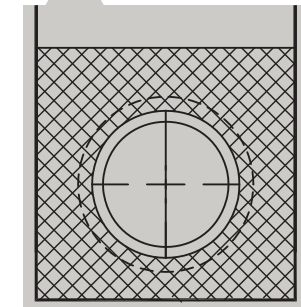


Protection of sewers

Sewers located within highway or areas of traffic should have 1.2m of cover. In other areas, 0.9m of cover is required. Where this is not possible, a full protective concrete bed and surround must be provided, inclusive of flexible joints. Please consult with UU Developer Engineer if site constraints impact this.

Pipe bedding

Pipes must be evenly bedded along the length of the pipe. Under normal circumstances, United Utilities' specification for the bedding of pipes is Class S, full bed and surround for rigid, semi rigid and flexible pipe materials. Please consult with the pipe manufacturer's recommendations and agreed drawings.



Recycled pipe bedding materials

Recycled materials must comply with BS EN 13242.

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 and once backfilling is complete.

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 and exceeding 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

Granular pipe bedding and surround should be placed 300mm above of pipe crown, then drench backfill material compacted in 150mm layers. 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 and including 1000mm 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

For sewers subject to a S104 Agreement, the sewer must be cleaned and then CCTV surveyed by means of a qualified contractor and submitted to UU for review. 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 6% 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, unless otherwise agreed with United Utilities.

CCTV surveys records during the jetting works or surveys of dry pipelines are not suitable as an indication of the level of the pipe can not be accurately assessed.

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

Connections to existing public sewers

Depending on the number of properties that are served by the drain or sewer and the diameter of the main public sewer, connections can be made to:

- an existing public sewer manhole
- a new manhole constructed on the public sewer
- by the installation of a pre-formed oblique junction, matching the main sewer material, using proprietary couplings
- by core-drilling the barrel of the pipe at 2 or 10 o'clock and installing a proprietary saddle fitting



Connections to existing public sewer manholes

The dimensions and configuration of the existing public sewer manhole must be able to accommodate the new connection. Where this is not possible, a new manhole will need to be constructed.

Connections should where possible be made via a core drill so that the chamber remains in good order.

Connecting pipe work should meet the main channel at 'soffit to soffit' level. High level external back drop pipes must also be core drilled.

Internal backdrop connections are generally not permitted.

Channels should be used to turn the discharge to the direction of the main flow. Channels and high level pipes must not conflict with existing access, step irons and must maintain a clear 600 x 600mm unobstructed opening and landing area below the step rungs.



New manholes on existing public sewers

The diameter or size of a manhole chamber should provide sufficient access for maintenance such as jetting, CCTV surveys and man entry to the channels where required. A minimum 600 x 600mm clear opening should be provided for manholes 1.5 - 3m deep from benching to finished ground level. Where less than 1.5m deep, for 1050mm and 1200mm diameter manholes, a minimum of 750x750mm opening is required. For 1500mm diameter manholes, a 1200mm x 675mm opening is required.

New connection channels must not be constructed in the landing area. Connecting channels must be swept with the direction of main flow.



The new connecting pipe work must meet the main channel at pipe 'soffit to soffit' level.

Channels must be formed from half barrel and not intrude into the main sewer flow.

Where existing chambers do not provide sufficient space to make a new connection, chambers may have to be re-constructed with a larger chamber.

Please note, 'T' Junctions should not be used.



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 can weaken 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 1/3 of the main sewer internal diameter.

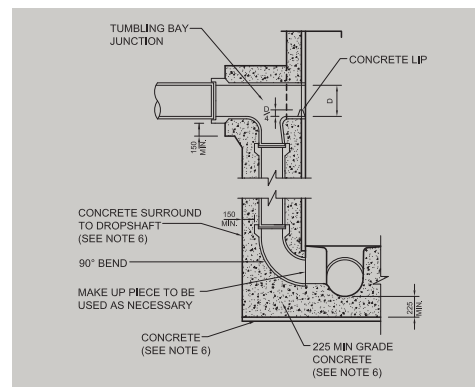


Back drop connections

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.

Backdrop flows must be contained within channels. All backdrops including connections to preformed manhole bases must be encased in concrete, and all backdrop pipework and high level tumbling bay junction must be constructed in plum alignment.

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



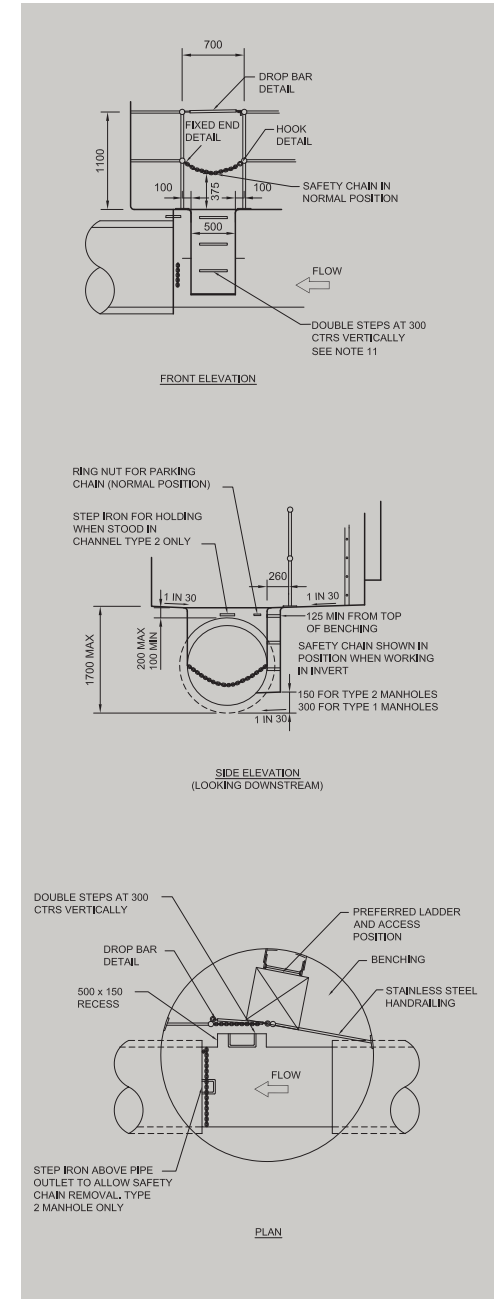
Access

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 450mm x 600mm landing area.

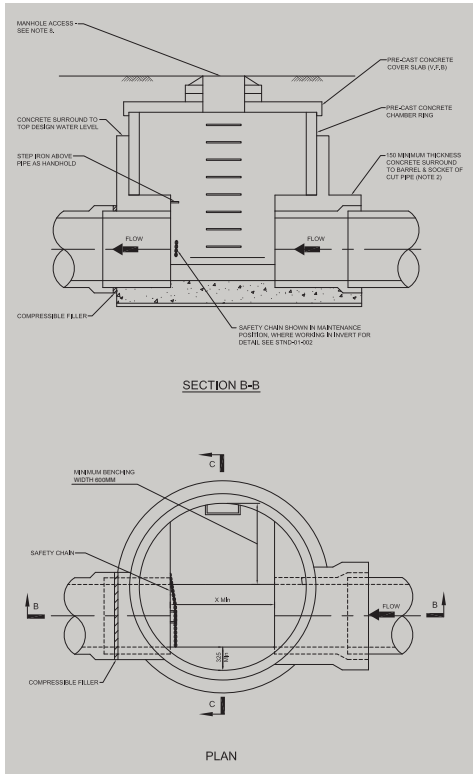
For 450mm diameter channels and above, a 500mm x 150mm recess must be cast within the manhole base, for step irons to be installed to lead down to the main channel invert, safety chains and a grab handle must be fitted above the outlet of the manhole for sewers 600mm and above.

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



Alternative access arrangements for larger diameter surface water sewer manholes

For 600mm diameter surface water sewers and above with headroom limited to 2m or less, suitable access into the channel can be achieved by forming a recess within the manhole base, with step rungs installed leading down to a landing area formed and finishing at a point 150mm above channel invert. Step rungs must be plumb and vertical alignment as shown below.

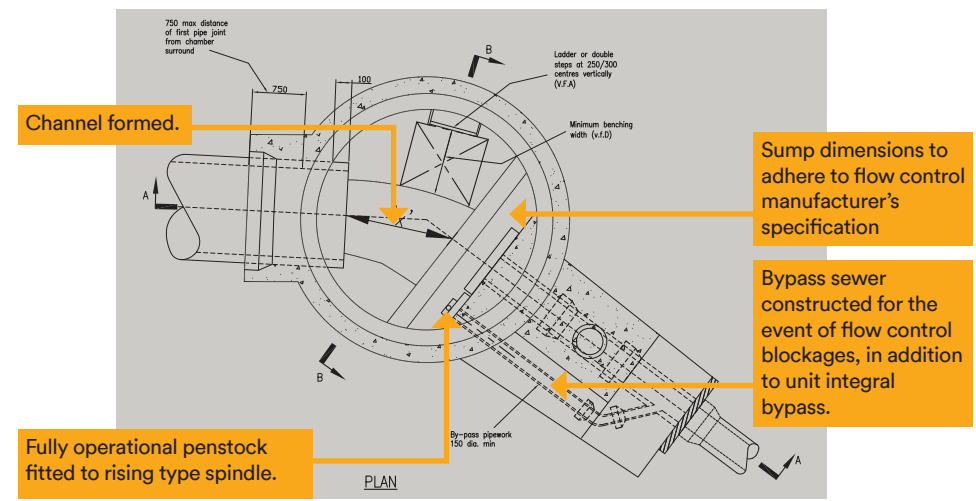
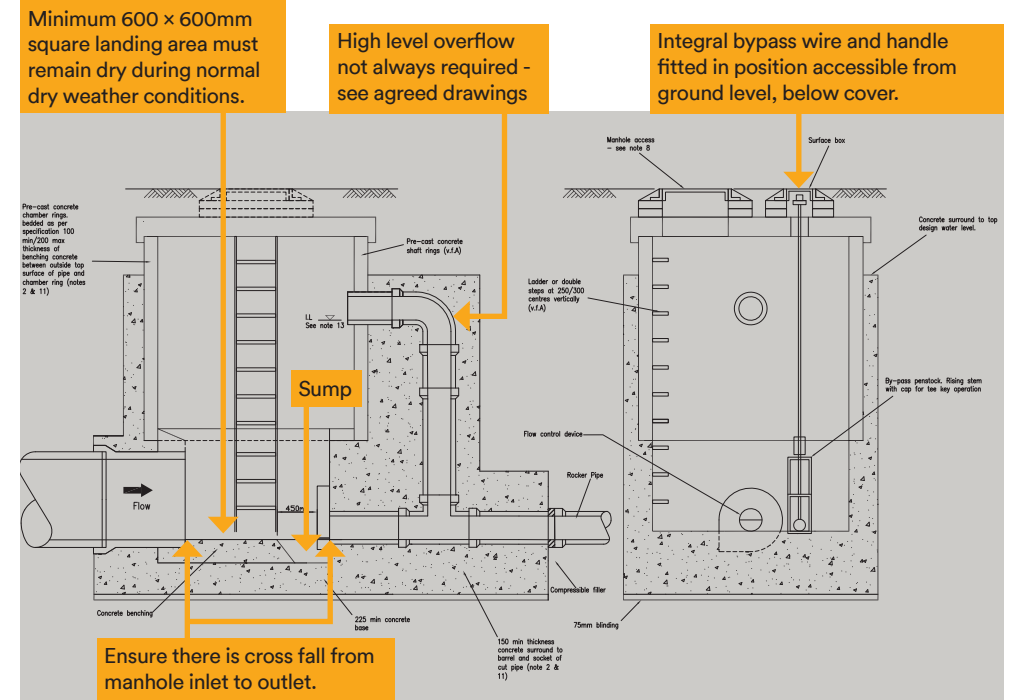


'Boxed out' benching positioned flush with manhole ring above.



Step rungs in plumb and vertical alignment equally distanced apart.

Typical surface water flow control manhole



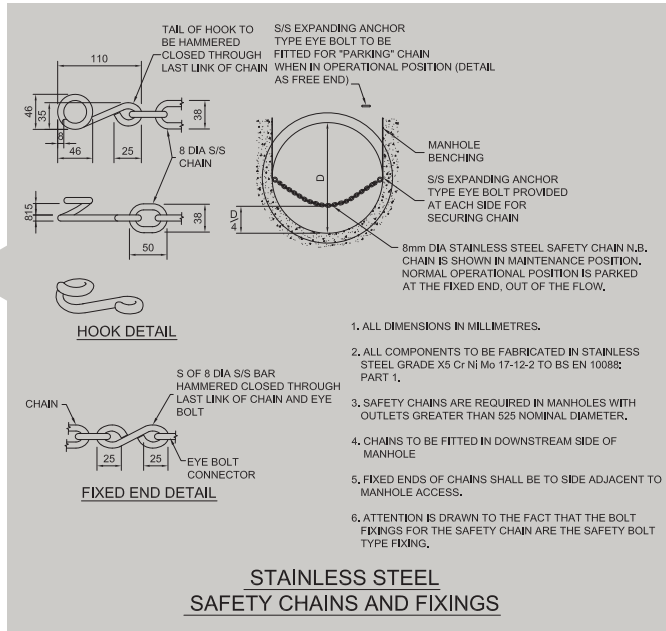
Fixings and rails

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

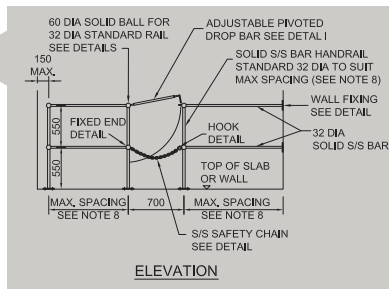
Safety chains

Safety chains are required on sewer outlets 600mm and above. 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.



S104 Adoptable Pump Station Compounds

The DCG gives industry guidance and recommendations for the design and construction of new pump stations, this should be read in conjunction with United Utilities' Pump Station Addendum.

Mechanical and electrical components must be agreed with United Utilities before construction to avoid any changes to constructed work or installed equipment.

Compound layout

The Site should be arranged so that:

- There is adequate parking space to accommodate a tanker.
- There is sufficient space between various units in the compound to safely carry out operations and pump maintenance.
- The doors of the kiosk open clear of the bollards.
- The need for personnel entry to confined spaces is minimised.
- The pump delivery pipework (within the wet well) should be opposite the inlet sewer.

It should be noted that the local planning authority can determine the requirements for fencing, site layout, landscaping, appearance, etc.

Enclosed pumping station compounds must be secure with lock fittings meeting Water Industry Standards. Where security fencing is required, 1.8m high palisade or paladin fencing or a 1.8m high brick wall is acceptable. Gates should provide similar security with a sliding locking bar and padlock.

On-site tanker parking should be hardstanding and surrounded by a 125mm kerb upstand. The hardstanding area should be 200mm thick reinforced concrete laid on 500mm compacted MOT Type 1 sub-base.

A provision of impermeable hardstanding around the wet well opening and valve chamber should be provided to give a safe working area.

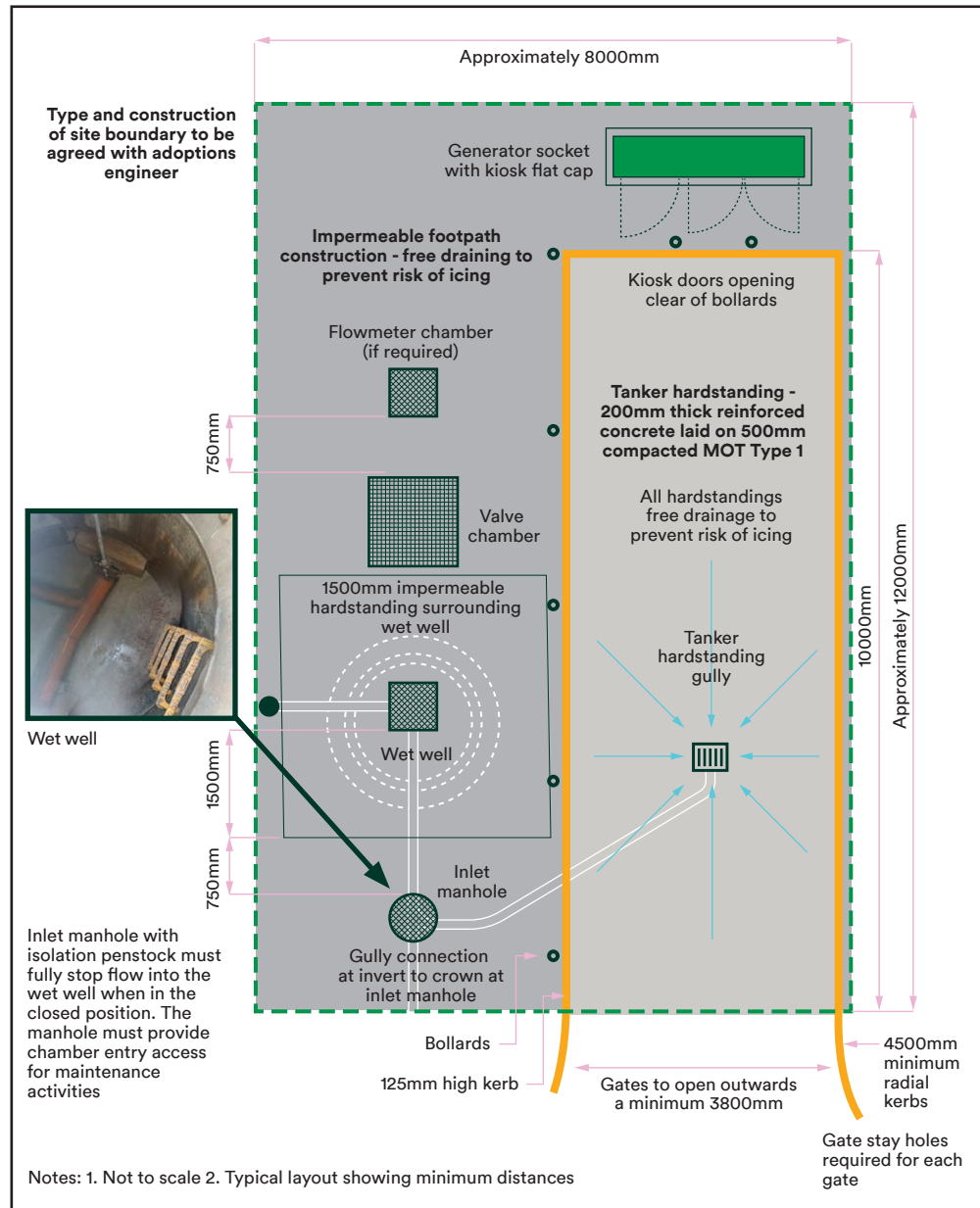
The whole area in an enclosed compound should be covered in impermeable hardstanding, usually typical footpath construction is acceptable.

The top of the wet well and valve chamber must be level and will set the finished ground level for the impermeable hardstanding area which must be free of trip hazards. All hardstanding areas must be free draining to prevent risk of icing.

Please see overleaf for typical layout of a Type 3 Pump Station Compound.

Please contact Sewer Adoptions as soon as possible during pump station construction for a Telemetry Quotation in order to progress the adoption of the pump station in a timely manner.

Typical type 3 pumping station layout



Outfall Structures

Consents and design

The Developer should obtain all necessary statutory consents and other permissions before the S104 Agreement is signed. For outfall structures, permission should be obtained from the relevant authority (Environment Agency for main rivers, Lead Local Flood Authority for non-main rivers etc. (ordinary watercourses,)) for construction of outfalls or works within close proximity to a watercourse.

Design should be carried out in accordance with Chapter 28 of the CIRIA Report C753 'The SuDS Manual'

Where necessary, surface water outfalls discharging to watercourses should be fitted with non-return valves to prevent the backflow of water in the event of high-water levels.



Large diameter surface water outfalls

A hinged, lockable safety grill should be fitted to any surface water pipe that is 350mm in diameter or larger.

Access should be provided for cleaning and maintenance of the grill, and for inspection of the outfall.

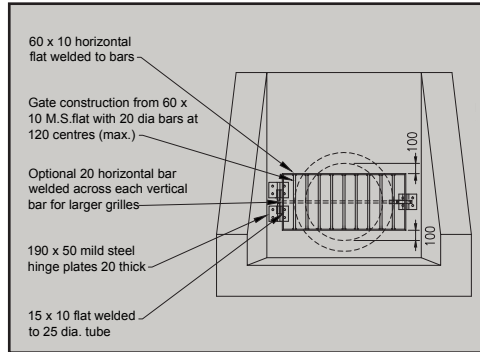
General public should not be able to gain access to spillways. Vertical drops exceeding 1.2m (headwalls/inlets/outlets) if unavoidable, must be protected with galvanised steel handrails to prevent falling from height.

Embankments

Basin slopes should not be constructed steeper than 1 in 3 gradient to allow safe working for maintenance activities. Soils, aggregates and planting must meet the specified design criteria for the basin.



Other information



Outfalls less than 350mm diameter

For outfalls with pipe diameters less than 350mm with a stone pitching type headwall specified, 150mm thick stones bedded in in-situ concrete and pointed with mortar are to be constructed, or a precast headwall can be used subject to relevant stakeholder permissions.

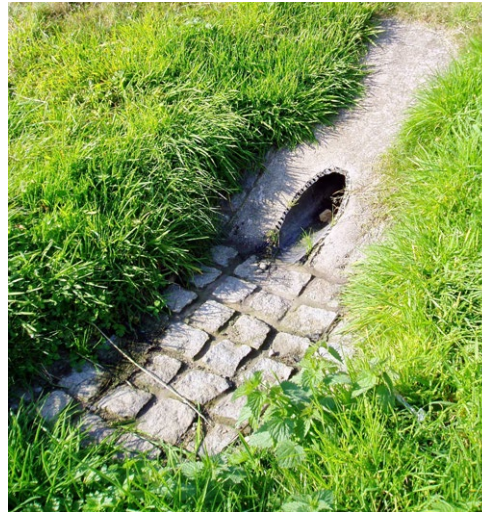
Headwalls should be kept free of site debris, vegetation and litter through preventative measures such as gully guards and regular maintenance.

Where necessary, the outfall structure should be angled with the direction of main flow to reduce the risk of bank erosion. In some instances scour protection is needed to protect the opposite bank from erosion, however this detail may be subject to the Lead Local Flood Authority and or the Environment Agency consent depending on classification of the watercourse.

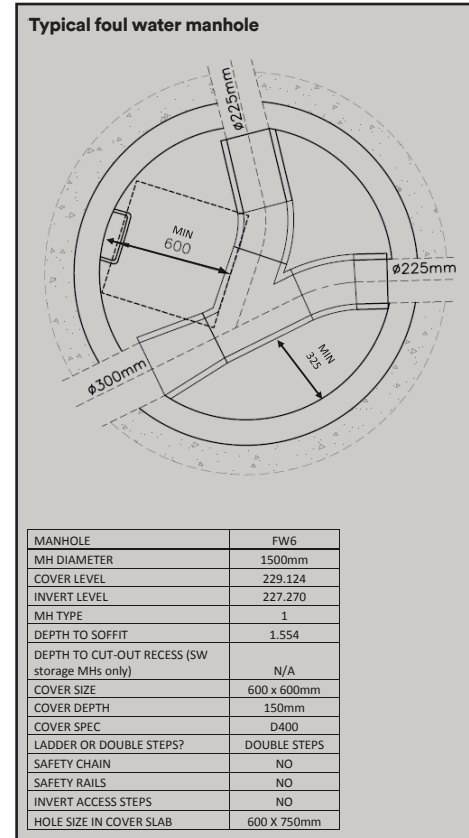
Erosion Control

Erosion control is an important consideration especially immediately after construction when the vegetation is not fully established. Scour protection can consist of stone pitching, riprap, gabion mattresses or synthetic products adjacent to inlets and outlets.

Headwall toes must be constructed to prevent erosion underneath the structure and minimise movement.

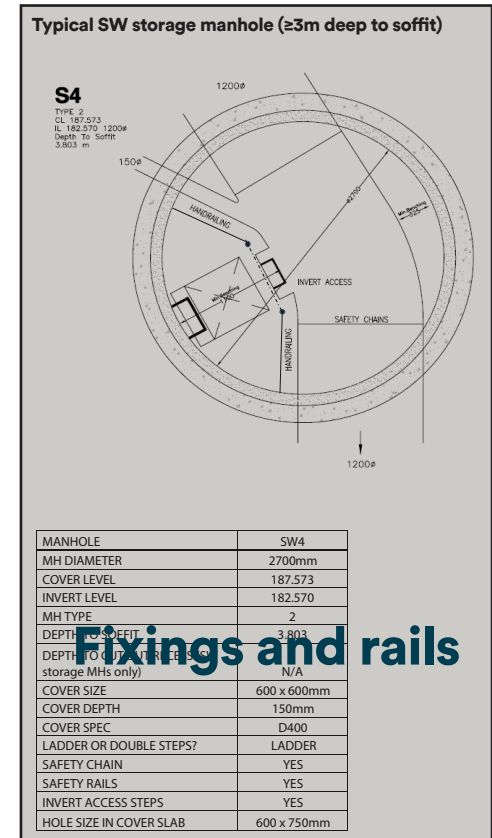


Typical 1:20 manhole details



Minimum length of channel

Chamber diameter	"X" min
1200	950
1500	1050
1800	1150
2100	1300
2400	1450
2700	1550
3000	1700



Fixings and rails

VARIABLE FEATURES (V.F.)			
A	MANHOLE SHAFT AND LADDER / DOUBLE STEP ACCESS	FOR 1200, 1350 AND 1500 MANHOLE CHAMBERS (OR WHERE THE DEPTH TO SOFFIT IS < 3M) A FULL HEIGHT (NO ACCESS SHAFT CONSTRUCTION IS TO BE USED). FOR DEPTHS TO BENCHING FROM COVER LEVEL < 3.0m DOUBLE STEP ACCESS SHALL BE USED. FOR MANHOLES DEEPER THAN 3.0m TO BENCHING A LADDER IS REQUIRED FOR DOUBLE STEP ACCESS MINIMUM INTERNAL MANHOLE ACCESS SHAFT DIAMETER SHALL BE 1050. FOR LADDER ACCESS MINIMUM INTERNAL SHAFT DIAMETER SHALL BE 1200.	
	MANHOLE COVER	DEPTH TO SOFFIT FROM COVER LEVEL < 1.5M MINIMUM CLEAR OPENING SIZES 750 x 750 ON 1050 AND 1200 CHAMBER / SHAFT 1200 x 675 ON 1350 AND ABOVE CHAMBERS / SHAFTS BENEATH ALL MAN-ACCESS COVERS GREATER THAN 600x600 A RETRACTABLE SAFETY HANDHOLD SHALL BE PROVIDED. IT SHALL EXTEND 1200 ABOVE GROUND LEVEL.	
B	COVER SLAB CHAMBER DIA 1050 1200 1350 TO 1500 1800 AND ABOVE	COVER FRAME SEATING RING ON COVER SLAB DOUBLE STEP ACCESS	COVER FRAME SEATING RING ON COVER SLAB DOUBLE STEP ACCESS LADDER ACCESS
		HOLE SIZE IN COVER SLAB	HOLE SIZE IN COVER SLAB
		750 x 750 C.O. 750 x 750 E.O. 1200 x 675 C.O. 1200 x 675 E.O.	600 x 600 E.O. 750 x 600 E.O. 750 x 800 E.O. 750 x 600 E.O.
		NOTE: FOR LADDER ACCESS THE ECCENTRIC SEATING RING IS TURNED THROUGH 180 DEGREES C.O. = CENTRAL OPENING EO = ECCENTRIC OPENING	
	REDUCING SLAB CHAMBER DIA 1200 TO 1500 1800 AND ABOVE	HOLE DIAMETER IN REDUCING SLAB REDUCING SLAB NOT USED 1050 FOR DOUBLE STEP ACCESS OR 1200 FOR LADDER ACCESS	
FEATURE RELATED TO PIPE DIAMETER		DIAMETER OF LARGER PIPES	
C	ROCKER PIPES	225	300
		375	450
		525	600
		675	750
		825 AND ABOVE	
D	BENCHING WIDTH	ROCKER PIPE EFFECTIVE LENGTH: 600	
E	BENCHING RAILINGS	MINIMUM 600	
F	SEWER SAFETY CHAINS	NOT REQUIRED	
G	INVERT ACCESS STEP	NOT REQUIRED	
H	CHANNEL FITTINGS	VITRIFIED CLAY	
		NOT REQUIRED (CHANNELS FORMED USING GRANOLITHIC CONCRETE)	

Other information

Other contact information and advice

United Utilities Wastewater Developer Services

Tel. 03456 723 723

Permission to work on public sewers will either require the completion and acceptance of the S106 Sewer Connection Part 2 form (see Sewer Connection below) or by the issuing of a United Utilities Access Certificate

Logging On /Off United Utilities Public Sewer Network Tel. 07826 539459. Please note, to 'Log On' you will be required to provide either a valid Sewer Connection or Access Certificate Number.

United Utilities website

unitedutilities.com

Building over public sewers

unitedutilities.com/build-over-sewer.aspx

Closing or removing sewers

unitedutilities.com/sewer-close.aspx

Connecting to public sewers

unitedutilities.com/connecting-public-sewer.aspx

Laying sewers in third party land

unitedutilities.com/wastewater-requisitions.aspx

Offering sewers for adoption

unitedutilities.com/sewer-adoption.aspx

Sewer diversions

unitedutilities.com/sewer-diversion.aspx

Design and construction guidance for foul and surface water sewers offered for adoption

www.water.org.uk/wp-content/uploads/2021/07/SSG-App-CDes-Con-Guide.pdf



Water for the North West

United Utilities Wastewater Developer Services and Planning
Grasmere House
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Great Sankey
Warrington
WA5 3LP