



Manholes

**The Pocket Guide to
Installing Concrete
manholes (with
minimum 125mm
wall thickness)**



Introduction

As the construction industry strives for improved safety, quality and performance, reduced waste, lower costs, faster build times and minimised environmental impacts, precast concrete drainage manufacturers continue to innovate.

Production techniques continue to advance and the use of modern logistics systems ensure excellent product quality and reliable service. Sourcing constituent parts from local suppliers and the high use of recycled materials keeps embodied impacts to a minimum. The design flexibility of concrete drainage systems means that many features can be factory manufactured to meet customers' specific site requirements.

These offsite solutions improve site safety and product quality, reduce waste and costs and speed up installation.

An example of this is the precast concrete manhole system, where high performance seals and extra-thick chamber walls ensure long term watertightness and durability.



Typical precast manhole base.

Precast Manhole Base systems

The system comprises a precast concrete base unit with channel and benching and predetermined combinations of flexible and watertight inlet(s) and outlet. Base units and chamber rings are made with thicker stronger walls, eliminating the need for a concrete or granular surround, unless specifically required by the client.

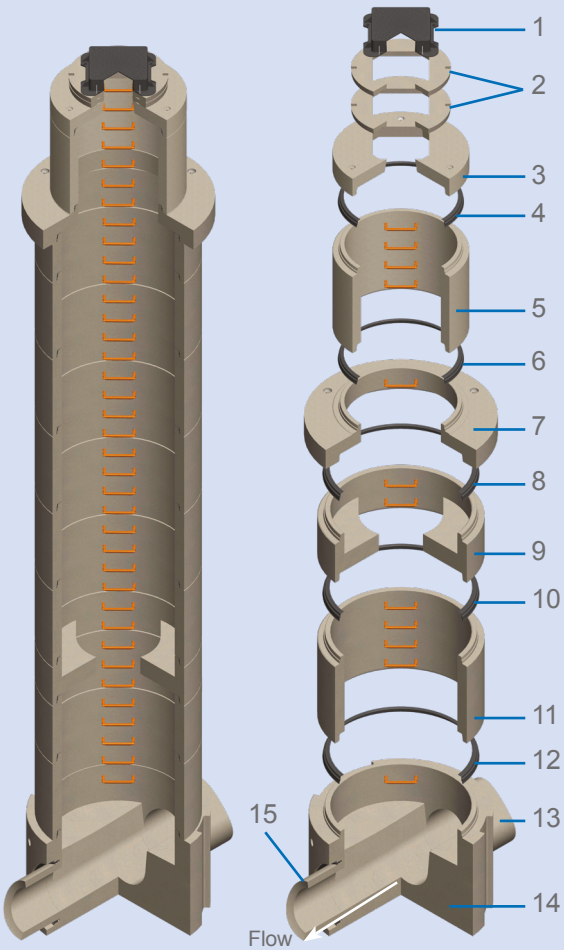
The excavation is backfilled sooner minimising the risks associated with open excavations and there is less need to work in confined spaces. This reduces time spent in the excavation, further improving site safety and reducing installation costs.

To help safer offloading the base units and chamber rings are supplied with cast-in lifting anchors or lifting holes and the cover slab includes cast-in lifting anchors.

The Precast manhole base system offers designers, contractors and asset owners

- *Reduced construction time*
- *Decreased installation costs*
- *Improved safety on site*
- *Superior and consistent quality*
- *Watertight system*
- *Low carbon footprint*
- *High jetting pressure resilience*
- *Natural resistance to flotation*
- *Can be backfilled using excavated soil*
- *Suitable for a wide range of pipe connections*
- *Cover slab transfers loads directly onto chamber wall – no need to isolate chamber from traffic loads*
- *Can be retro-fitted with new pipeline connections without complete replacement of the chamber*
- *Does not combust in a fire*
- *120 year design life*

Precast Manhole Base with Sealed Chamber Rings



Cut away Detail

Cutaway illustration of available components

- 1. Manhole Cover
- 2. Adjusting Units
- 3. Cover Slab
- 4. Seal
- 5. Shaft Section
- 6. Seal
- 7. Reducing Slab
- 8. Seal

- 9. Landing Slab
- 10. Seal
- 11. Chamber Section
- 12. Seal
- 13. Socket Butt Pipe
- 14. Precast Base
- 15. Spigot Butt Pipe

Installing precast concrete manhole systems

Introduction

Traditional manhole installation with in-situ construction of the base, including benching and channelling, used to take up to 48 hours to allow for the curing of concrete and was not always successful, particularly in reference to long term water-tightness.

Now, with the precast concrete base manhole systems and innovations championed by the BPDA members, manhole installation can be completed in about an hour with the following seven simple steps.

1 Safety



Safety must always be the first priority for any construction project and all site activities must be preceded by an appropriate risk assessment.

Typical activities when using precast concrete manhole base systems include: vehicle offloading; movement of components to/from storage to place of installation; trench excavation and positioning and movement of trench support; placing, compacting and levelling of backfill material; lifting, positioning and fitting together of components.

For assistance refer to relevant legislation and MPA British Precast, BPDA and BPDA member companies' safety and installation guidelines.

2 Preparation



Excavate a trench of appropriate dimensions to accommodate the manhole structure. The trench must allow sufficient working space outside the chamber for access and backfilling to the required specification, taking into account the ground conditions, depth of excavation and any other relevant factors. The heights of the manhole components supplied by the manufacturers are nominal, so it is beneficial to measure the units prior to installation in order to assist with obtaining the required height of the completed chamber.

The manhole can be built on either:-

- 5-20mm graded, 14mm or 20mm single-sized, suitably compacted aggregate to provide a ≥ 150 mm level base, with an additional blinding layer of fine material where required to account for unevenness or any other environmental factors.

- 150mm deep GEN 1(C8/10) concrete. The base unit should be placed whilst concrete is wet so it can be set level otherwise a levelling screed with a minimum depth of 15mm-50mm will be required between the foundation and the unit to prevent point loading.

Precast manholes are quick turn-round from order to delivery to enable faster build times. Some configurations are stock items (e.g. straight through) available for Just-In-Time delivery keeping stored site material to a minimum. Additionally, chamber rings and cover slabs are typically ex-stock items which helps keep costs and build times to a minimum.

3 Installing the precast manhole base



Prior to lowering into the trench, the precast base unit may be pre-fitted with a lubricated outlet if required. A plastomeric sealing strip/elastomeric seal is used to form a waterproof joint between units. It may be fitted before lifting into position or after each unit has been individually placed. Concrete to concrete contact between units must be avoided.

Place the base unit onto the prepared granular bed and mate the stub pipe with the installed outlet seal. Check the base position for alignment, level and inverts. Note that precast bases have an inbuilt fall across the main channel enabling the foundation to be laid level.

Precast concrete manhole bases can accommodate a wide range of standard pipe materials and sizes.

The versatility of concrete also means that as requirements change over time, new pipe connections can be retro-fitted into existing chambers without compromising or needing to replace the existing system.

4 Fitting the chamber rings



Make sure that the joints are clean and free from foreign objects before fitting the next chamber ring unit.

The plastomeric sealing strip/elastomeric seal should already be in place on the installed unit and ready to receive the next chamber ring unit.

Repeat with further ring units until the chamber has been constructed to the required height.

A plastomeric sealing strip/elastomeric seal is an integral part of the system to ensure watertightness.

5 Fitting the Cover Slab



Place the cover slab directly on the last chamber ring (pre-fitted with sealant/seal) with the access opening lined-up with the steps.

Apply slight pressure onto the cover slab (using suitable protection e.g. timber) to seal the chamber.

There is no need to isolate the cover slab from the chamber walls. The precast concrete chamber and sealant/seal are designed to accommodate loads from traffic transferred directly through the cover and frame assembly. Using precast manholes reduces the risk of differential settlement and failure of sunken covers at the road surface (when compared to flexible material constructed chambers). This simple design detail can mean faster installation, reduced construction costs and lower risk of failure.

6 Backfilling



When using "wide wall" precast concrete manhole chamber rings, the excavated soil can be returned as backfill, unless an alternative arrangement is specified by the client.

Compact the backfill soil as specified in the design.

Ensure that the steps are correctly aligned. Use precast concrete adjusting units to obtain a maximum distance of 675mm to the first step rung from the cover level.

Total time from Step 1 to 6 is typically around 1 hour.

It is not necessary to use concrete or granular backfill material to install the precast concrete manhole system. This can lead to time and cost savings and lower environmental impact.

Due to the self-weight of precast concrete manholes, they are naturally resistant to flotation in areas of high groundwater and during flooding.

7 Operation and Maintenance



Precast concrete manhole base systems adopt offsite principles and provide a high quality, robust product made in a factory controlled environment. They are strong and durable and eliminate the risk of inconsistent quality from site based operations. They are designed to remain watertight and maintain their structural integrity for over 120 years.

Concrete drainage systems have been in use since Victorian times. In recognition of their proven performance, they are fully adoptable by all UK water utilities, highways and other major asset owners.

Manhole Access

Whatever the shape of the manhole, if it includes stepping for access, the Health and Safety Executive's confined spaces regulations recommend 900mm clearance between the stepping and the back of the shaft.

Stepping usually protrudes by at least 120mm, so for compliance users will need to consider a circular manhole with a diameter not less than 1050mm.

Further, if the sewer is to be adopted, users also need to be aware that 1050 diameter manholes have a cross section that is too small to comply with the Sewers for Adoption minimal nominal internal dimension requirements and the chamber will need to be up-sized to 1200mm.

The minimum size of the chamber is also determined by the size of connecting pipework.

Sewers for Adoption minimum chamber size

<i>Size of connecting pipework</i>	<i>Minimum chamber size</i>
<i>Pipes <375mm diameter</i>	<i>1200mm diameter</i>
<i>Pipes 375 – 450mm diameter</i>	<i>1350mm diameter</i>
<i>Pipes 450 – 700mm diameter</i>	<i>1500mm diameter</i>
<i>Pipes 700 – 900mm diameter</i>	<i>1800mm diameter</i>

Standards and Certification

Precast concrete manhole systems have widespread utility & client approval and can be included in standard specifications. They are kitemarked to BS 5911-3:2010+A1:2014, and compliant to Standards BS EN 752:2017 and BS EN 476:2011 and all UK water industry adoption standards.



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For further details on manhole design and installation consult the BPDA Technical Guide which can be downloaded from www.precastdrainage.co.uk

The British Precast Drainage Association (BPDA) is the main trade association representing the interests of the manufacturers of concrete pipes, manholes, box culverts and sustainable drainage systems in the UK. The association is active in the research and promotion of the many technical, commercial and environmental benefits of precast concrete drainage systems. BPDA is a product association of the British Precast Concrete Federation Ltd.



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