



**DURA.PORT
INSTALLATION
GUIDELINE**

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GENERAL GUIDELINES

This manual provides guidelines for the rehabilitation of DN1000 manholes with DURA.Port elements. The manual intends to provide the user with an overview of the most critical steps during the installation phase. The manual takes into consideration the conditions that are usually present on the construction site. Deviations from the standard modus operandi or project-specific challenges should be discussed with the supplier.

SAFETY

The necessary precautions should be taken to ensure the safety on the construction site. The required personal safety equipment has to be taken into consideration to protect the person in and around the manhole.

The required safety material for entering and exiting the manhole has to be taken into consideration. When applying epoxy, the necessary precautions should be taken to ensure the safety of the user. If adaptations to the DURA.Port panels are required on-site, a saw will be used. The user needs to apply the correct safety measures (gloves, FFP2 mask, wetting of the element) to ensure a safe handling of the DURA.Port panels.

MATERIALS

The delivery will include the following elements, assuming a full rehabilitation including the invert and cover slab is performed:

- DURA.Port invert piece (tailor-made) – amount depending on project
- DURA.Port berm pieces (tailor-made) – amount depending on project
- DURA.Port vertical wall pieces (tailor-made) – amount depending on project
- DURA.Port vertical wall pieces 100 mm (standard) – 3 pieces
- DURA.Glue – amount depending on project
- DURA.Repair – amount depending on project

Note: the contractor will need to supply their own mortar for mortar-in-mortar installation and backfilling of the system.

PRELIMINARY ON-SITE ACTIONS

SEWER ASSESSMENT

It is recommended to first perform an inspection of the manhole in order to select the required actions for the renovation. Damages and infiltrations need to be charted, as is the case with blockages of the system

3D SCAN/MODEL

A 3D scan is mandatory to ensure that the DURA.Port elements will be provided to the job-site having the correct dimensions and geometry. A model will then be provided to you, along with the installation order of the panels.

HANDLING AND STORAGE

The DURA.Port panels will be delivered on a pallet or in a box, depending on the required elements. Care should be taken that these are placed on an even ground to avoid any damages to the DURA.Port elements.

The elements are tailor-made to your specific needs, based on the 3D scan. This allows a smooth introduction. Should minor deviations still occur on the jobsite due to alignment, the panels can be adapted on-site by wet cutting (saw). DURA.Port cover slab pieces (tailor made) – amount depending on project

The DURA.Glue 2-component epoxy and DURA.Repair fast hardening repair mortar will be delivered in buckets and should be kept dry and at room temperature.

INSTALLATION

PREPARATION OF THE EXISTING MANHOLE

The following preparation works usually have to be conducted before the start of the installation of the panels:

BY-PASS

- Close of the inflow of the water to the manhole
- Ensure that connections to the manhole are non-operational and/or closed off

CLEANING

- Clean residual deposits and/or obstacles in the manhole
- Remove any climbing anchors in the existing manhole
- If the existing manhole has suffered from H₂S degradation, it is recommended to remove the degraded layer
- If the reinforcement of the concrete is visible, a concrete repair has to be performed before installation of the DURA.Port elements

INFILTRATIONS

If infiltrations are present, it is recommended to fix the infiltrations with the DURA.Repair mortar

DRILLING

To ensure that the DURA.Port invert element will fit, a check of dimensions is required. If required, the existing invert needs to be drilled open to ensure a good alignment between the new DURA.Port invert and the existing connections to the manhole. The necessary safety precautions should be taken into account when operating the drill to guarantee the personal safety of the personnel

INSERTION OF DURA.PORT INVERT ELEMENTS IN THE MANHOLE

The necessary safety measures need to be taken into account to transport the elements into the manhole. It is recommended to use a small crane to lift all panels inside.

INSTALLATION OF THE DURA.PORT INVERT ELEMENTS

Alignment of the invert elements

To ensure a good connection to the existing bottom connections, the alignment of the DURA.Port invert piece needs to be verified before installation of the piece.

Preparation of the glue and mortar

To ensure the stability of the new invert, the piece will be placed in a mortar bed. It is recommended that the mortar bed has a thickness greater than 40 mm to ensure a good stability of the DURA.Port invert piece. Care has to be taken that the opening between the DURA.Port element and the existing connection is less than 10 mm. This gap will be closed off with DURA.Glue before any backfilling can be performed.

If multiple invert pieces are required due to extra connections or bends, the project specific installation instructions delivered to the construction site will show the placement of the pieces.

Fixation of the invert elements

The pieces will be glued together using the DURA.Glue epoxy to ensure the new system is watertight.

INSTALLATION OF THE DURA.PORT BERM ELEMENTS

The alignment of the berm has to be carefully considered, as it will influence the vertical straightness of the total system. Care has to be taken to ensure a good alignment with both the invert piece and the vertical elements to ensure a smooth installation. The following steps need to be considered:

ALIGNMENT OF THE BERM ELEMENTS

To align the berm elements, insert the elements into the manhole and fix the elements at the same height by means of spigots. To ensure a good circularity, it is recommended to enter the vertical DURA.Port wall elements in the manhole and place them in the folded joint. The alignment is correct if a complete circle can be created with the vertical wall DURA.Port elements. Furthermore, instructions on the project specific installation document should be followed if additional remarks are present. These additions might be present due to vertical deviations in the existing manhole that need to be compensated during the placement of the DURA.Port berm elements. Check the alignment in the horizontal direction by means of a level.

Tip: a row of wall segments (height 10 cm) can be placed on the berm before fixation of the elements to check that a full circle can be formed on top of the berm elements

Note: this step is the most critical step in the process. It is mandatory to critically check the alignment both in the vertical and horizontal dimensions.

PREPARATION OF THE GLUE AND MORTAR

To ensure the stability of the new DURA.Port berm, the pieces will be placed in a mortar bed. It is recommended that the mortar bed has a thickness greater than 40 mm to ensure a good stability of the DURA.Port berm pieces. Care has to be taken that the entire area is covered and that there are no holes in the mortar bed.

FIXATION OF THE BERM ELEMENTS

After a final alignment of the berm pieces, the elements can be fixed into place.

Tip: the access to the new berm plate can be sped up if a fast-hardening mortar is used for this step.

The gap between the DURA.Port invert piece and the DURA.Port berm pieces will be filled with DURA.Glue to ensure watertightness of the system. Care needs to be taken that there are no openings in the gap.

INSTALLATION OF THE DURA.PORT WALL ELEMENTS

The following steps can be identified in the process of installation:

1. Installation of the first wall segment row
2. Backfilling of the first wall segment row
3. Installation of other wall segment rows up to the cover slab and layer-by-layer backfilling

INSTALLATION OF THE FIRST WALL SEGMENT ROW

Alignment of the first wall segment row

If the berm elements have been installed, a complete ring of wall segments can be formed on top of the berm elements.

Preparation of the glue

Prepare the DURA.Port berm element with DURA.Glue epoxy on the folded joints. It is recommended to apply the DURA.Glue already on the folded joint, similar to the connections made in the previous step. Care needs to be taken that all gaps are covered with DURA.Glue.

Fixation of the first wall segment row

Insert the DURA.Port wall elements into the manhole on onto the folded joint, following the project specific installation instructions. In general, the following alignment should be taken into consideration, unless the specific installation instruction deviates:

- it is recommended to avoid having a vertical joint between 2 DURA.Port wall elements above a connection
- the DURA.Port wall elements can be fixed by using spigots on the backside, between the DURA.Port wall element and the existing manhole
- check the alignment with a level

BACKFILLING

Backfilling can be performed after the first wall segment row is finished and the epoxy is hardened. It is recommended to do a backfilling after the first row of DURA.Port vertical wall panels is installed, to create a strong, stable foundation for the subsequent elements.

Before the backfilling can start, any relevant connection should be closed with a balloon to avoid intrusion of the mortar into the sewer system.

For preparing the backfill mortar, follow the instructions of the backfill mortar's supplier. The mortar can then be applied between the existing manhole wall and the new DURA.Port vertical wall elements. This can be done with a pump, a bucket, or similar equipment.

Tip: a fast-hardening backfill material can be used to speed up the process

When the backfill material is completely hardened, the balloons can be removed. DURA.Glue should be applied on any open backfill surface inside the connections, in order to avoid direct exposure from the backfill mortar to the air/water. Ensure that all the backfill surfaces are covered with DURA.Glue to avoid any future damages to the system.

INSTALLATION OF OTHER WALL SEGMENT ROWS UP TO THE COVER SLAB AND LAYER-BY-LAYER BACKFILLING

Alignment and fixation of the wall segments

Installation of the subsequent wall segment rows follows the same approach as the first row: DURA.Glue epoxy is applied in the folded joint of the lower row. The DURA.Port wall elements can then be fixed in place. Fixation can be fine-tuned by means of spigots.

In general, the following alignment should be taken into consideration, unless the specific installation instruction deviates:

- it is recommended that 2 subsequent rows of panels are installed out-of-phase to avoid a coinciding of the vertical joints
- the DURA.Port wall elements can be fixed by using spigots on the backside, between the DURA.Port wall element and the existing manhole
- check the alignment with a level
- if any connections are present within the existing wall, follow the project-specific instructions that are delivered together with the elements

Connections above the invert level

If any connections are present above invert level, the alignment should be done according to the project-specific installation instructions.

Ensure that connections above invert level are well aligned to ensure a smooth transition between the existing connection and the new DURA wall element opening.

Before backfilling, it is required to close off the annular gap between the existing manhole and the new DURA.PORT manhole. This can be done with a fast-hardening mortar or with a short piece of pipe or liner.

Layer-by-layer backfilling

Backfilling can be performed under similar conditions as the first backfilling. If any connections are present in the existing wall, a balloon will be used to avoid intrusion of the backfilling into the sewer system. After hardening of the backfill material, care needs to be taken that the whole backfill surface inside the connection is covered with DURA.Glue to avoid any degradation of the material.

Tip: it is recommended to backfill the system at least every meter to ensure a smooth installation.

The vertical wall elements that are provided for the jobsite will ensure an installation up to +- 10 cm from the cover slab. In this way, it is still possible to backfill through this gap.

INSTALLATION OF THE FINAL DURA.PORT WALL SEGMENT ROW (MORTAR-IN-MORTAR)

ALIGNMENT OF THE FINAL DURA.PORT WALL SEGMENT ROW

The last wall segment row will need to be cut-to-size on site, depending on the alignment. After measurement of the required height, the last wall segment row is taken out of the manhole and cut on site. Care has to be taken that the required safety measures are taken (gloves, mask, wetting of element).

To decide on the final height, it is recommended to leave an open space between the existing cover slab and the top of the last wall segment row of ± 5 cm. In that way, the DURA.PORT cover slab piece can be installed using the mortar-in-mortar method.

PREPARATION OF THE GLUE AND MORTAR

To ensure the stability of the DURA.Port pieces, the pieces will be placed mortar-in-mortar against the existing manhole. Care has to be taken that the entire area is covered.

It is recommended to apply the DURA.Glue already on the folded joint, similar to the connections made in the previous step. Care needs to be taken that all gaps are covered with DURA.Glue.

FIXATION OF THE FINAL DURA.PORT WALL SEGMENT ROW

After applying the glue on the folded joint of the elements, the elements can be fixed into position.

INSTALLATION OF DURA.PORT COVER SLAB PLATES

ALIGNMENT OF THE DURA.PORT COVER SLAB PLATES

The project-specific installation instructions need to be applied during the installation of the cover slab plates. The elements can be placed upon the existing wall segments to help with the alignment of the system.

PREPARATION OF THE GLUE AND MORTAR

The DURA.Port cover slab can be aligned with the last row and can be directly fixed against the existing cover slab with the mortar-in-mortar method. It is recommended that the mortar bed has a thickness greater than 40 mm to ensure a good stability of the DURA.Port cover slab pieces. Care has to be taken that the entire area is covered and that there are no holes in the mortar bed.

The open space between the new cover slab piece and the wall segment need to be filled with DURA.Glue. Care needs to be taken that all gaps are covered with DURA.Glue.

FIXATION OF THE DURA.PORT COVER SLAB PLATES

It is recommended to mechanically fixate the cover slab pieces by means of a mechanical anchor into the existing cover slab, to ensure a stable new cover slab.

END OF WORKS

- Removal of residues
- Glue or mortar residues outside of the folded joint needs to be removed/cleaned before reopening the sewer system.
- Visual inspection on joints

After the hardening of the mortar, the new manhole is checked for any gaps. If any gaps are spotted, DURA.Glue can be used to make the system watertight.

RE-OPENING OF THE SEWER SYSTEM

All material should be removed from the manhole before the inflow can be restarted.

