

## General Advice

These instructions should be read in conjunction with the contract specification and drawings. They are intended to provide guidance in normal installation situations. If there are any questions related to the design, unusual installation challenges, or any doubt, consult ABG for further advice. In all situations, responsibility for installation remains with the Installer.

## Description

**Cavidrain Liner** is a cusped LLDPE, impermeable membrane supplied in 2.2m wide rolls, including a plain 80-100mm selvedge along each edge to facilitate welding. **Cavidrain Liner** provides a combined waterproofing and drainage layer around tunnel walls to collect and guide groundwater infiltration to the tunnel carrier systems. Sprayed concrete can be applied to the back surface of **Cavidrain Liner**.

## Products Supplied

- **Cavidrain Liner**
- **Abfix Rondels**

## Equipment Required

- Safety knife
- Hot air welder
- Nail gun

## Preparation for Laying and Storage

### Step 1.1

**Cavidrain Liner** is supplied in rolls and should be stored on a level surface and protected by tarpaulin. Whilst **Cavidrain Liner** is flexible, the surface to which it is fixed should be relatively smooth (+/- 100mm). A rough cut rock wall should be smoothed with a minimum 50mm thick shotcrete or as specified.

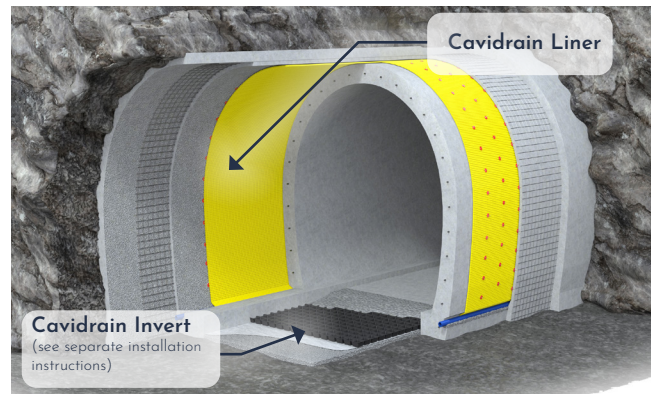


Fig. 1: Cavidrain Liner cut-away diagram

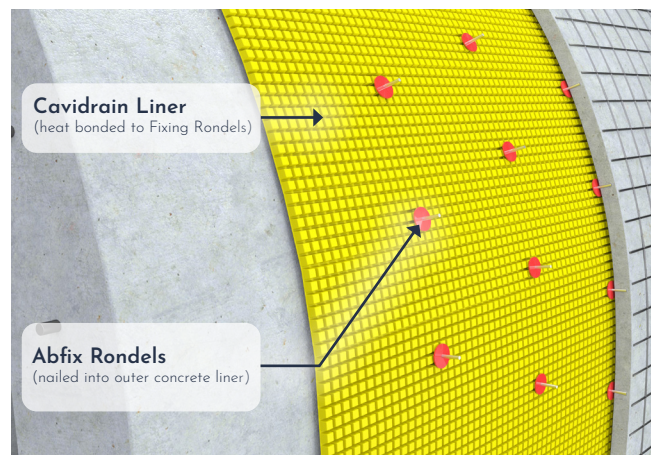


Fig. 2: Cavidrain Liner tunnel wall cross-section

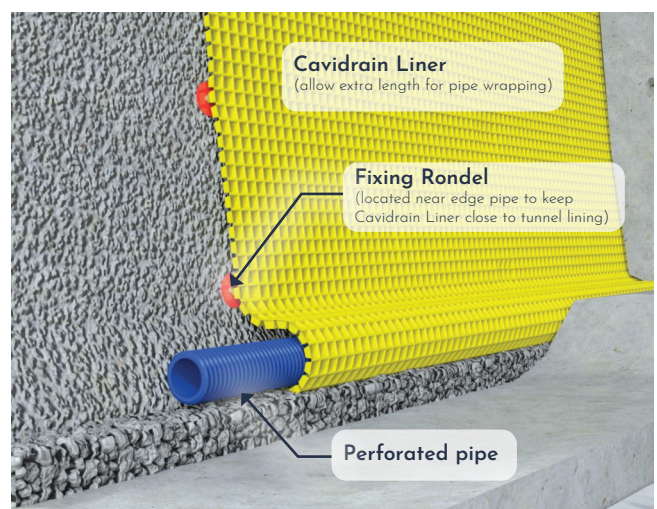


Fig. 3: Example of edge pipe detail

Cavidrain Liner INSTALL

## Fixing First Panel

### Step 1.1

Measure the tunnel wall perimeter allowing for the sidewall drainage detail (**Fig. 3**) as shown on the Contract Drawings. Cut panels from the main roll to the required length with a sharp knife.

### Step 1.2

Mark centreline of cut panel then re-roll with the dimples facing the outer concrete lining. Re-roll from either end towards the center line. Stack the rolls ready for placement.

### Step 1.3

Working from a mobile tunnel platform, mark out the tunnel centreline on the tunnel crown (**Fig 4**). This will be a guide to position the centreline of each **Cavidrain Liner** panel.

### Step 1.4

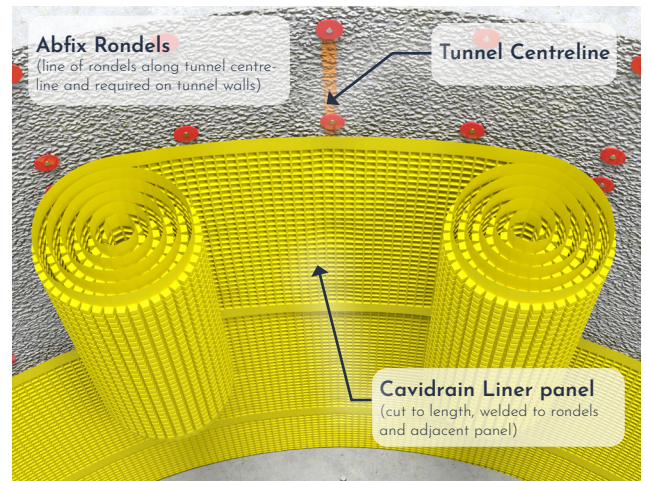
Fix a matrix of **Abfix Rondels** at a minimum rate of 5/m<sup>2</sup> over the prepared tunnel surface using a nail gun. Include a line of rondels at 0.5m spacings (or as required) along the marked out tunnel centreline (**Fig 4**). Nail length is determined by the strength of the tunnel perimeter material. On extremely hard rock walls such as granite, a drill and plug fixing may be required.

### Step 1.5

Place the first panel at the tunnel crown, aligning the centreline of the panel with the mark, as it will form the guide for all subsequent panels (**Fig 4**). Heat bond the panel to the centreline of rondels (**Fig. 5**). Ensure that each panel is provided with temporary support until all welds have set.

### Step 1.6

Unroll the **Cavidrain Liner** panel down each side from the tunnel crown, heat bonding to rondels as the panel is unrolled. Follow the surface of the tunnel wall, avoiding spanning of hollows (**Fig. 6**).



**Fig. 4:** Align with tunnel crown and weld to rondels



**Fig. 5:** Cavidrain Liner welding to rondel



**Fig. 6:** Cavidrain Liner installed on tunnel walls

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## Fixing Additional Panels

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### Step 2.1

Cut the next panel of **Cavidrain Liner** to size as required and re-roll, then install a matrix of rondels, as per steps 1.1 to 1.4.

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### Step 2.2

The second panel is placed with the selvedge overlapping fully onto the selvedge of the previous panel. Ensure that the centreline of the panel is in line with the tunnel crown centreline. If the tunnel alignment is curved, then ensure selvedge overlap is sufficient to maintain a consistent weld.

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### Step 2.3

Heat bond the **Cavidrain Liner** panel to the rondels as per Steps 1.5 to 1.6.

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### Step 2.4

Weld the **Cavidrain Liner** panels together along the selvedge overlap by extrusion weld or hot air weld methods<sup>NOTE 1</sup> (**Fig. 7**). Welding requires equipment intended for the purpose and must be performed by trained and experienced persons who will carry out suitable weld tests to verify the integrity of the weld, e.g. air pressure drop tests (**Fig. 8**).

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## Notes

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1. The first and last panel of **Cavidrain Liner** is sealed to the tunnel wall with butyl fixing tape.

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## Terms and Conditions

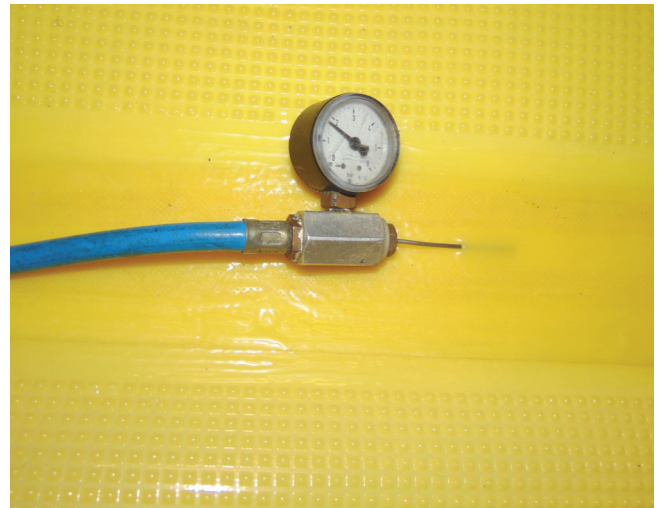
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Site specific engineering design should be carried out after the site investigation has provided all the necessary information.

The assessment of suitable safety factors in relation to each particular project must always remain the responsibility of the design engineer.



**Fig. 7:** Double weld on selvedges of two panels



**Fig. 8:** Air testing of welds or as specified