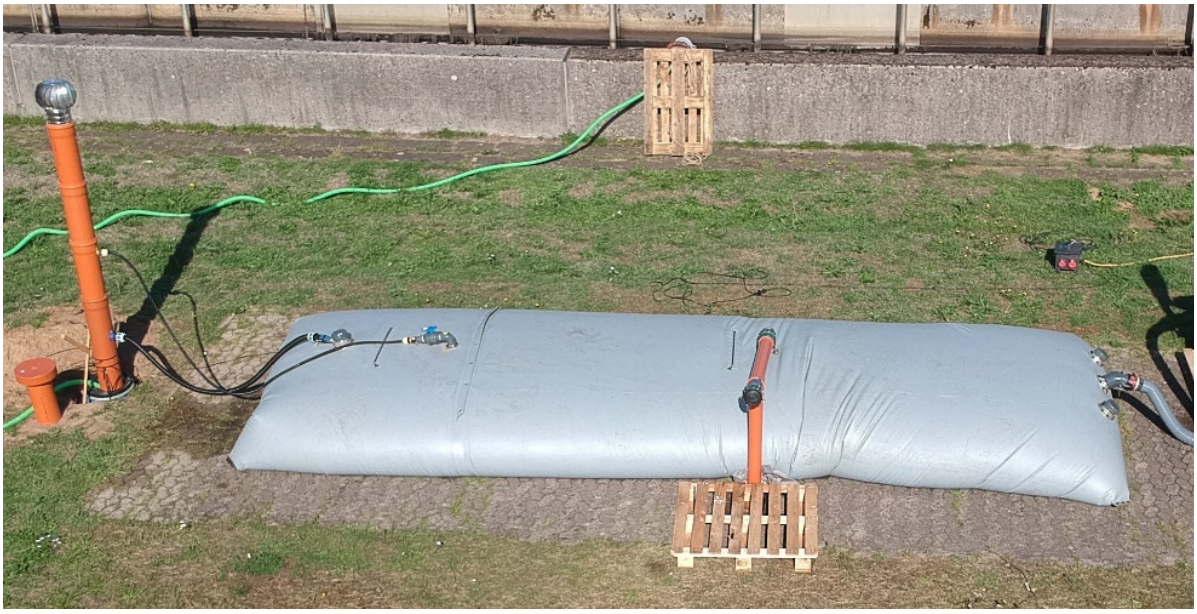
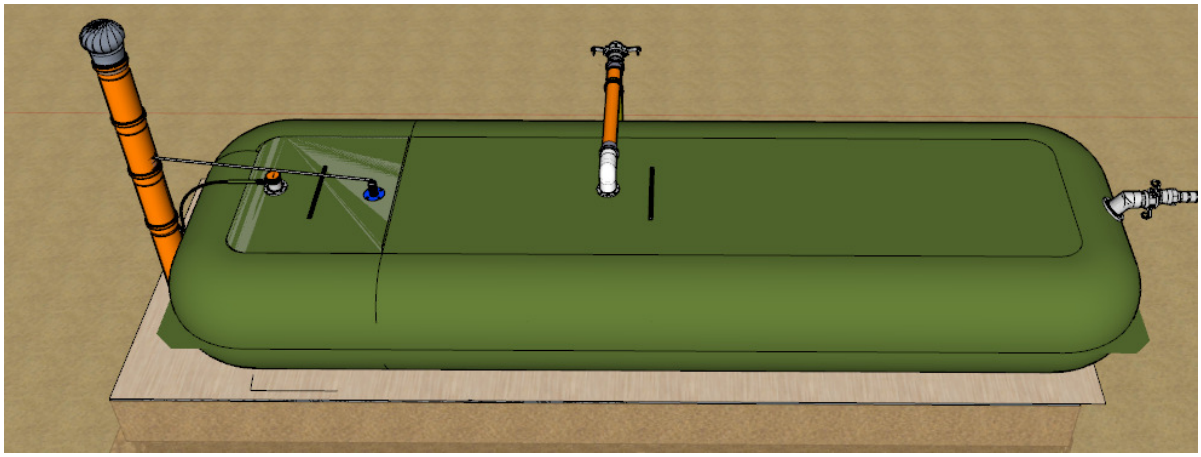
SEPTIC BAG Installation Instructions

Sanitation System for Emergency Situations





Installation Manual

Intended Use

This system is designed to treat wastewater from toilets in the first phase of emergency response and therefore focuses on rapid provision of a sanitation solution rather than on adherence to specific effluent levels.

In contrast to pit latrines or septic containments, this system separates solids from liquids, which significantly extends maintenance intervals (time between emptying) and therefore requires less time and effort from service personnel.

Requirements

To set up the tank, a flat surface of at least 8 m x 3 m is required.

This area should:

- have no incline, if possible
- be able to bear the weight of the tank when full
- be free from sharp or pointed objects
- offer the possibility to construct a below-ground infiltration channel or to safely drain away the pre-treated water

Constructing the Infiltration Channel

The water discharged from the tank must be drained away. Preferably, this should be done through an in-ground channel fitted with infiltration blocks. Where space is limited, the infiltration channel can be located under the tank.

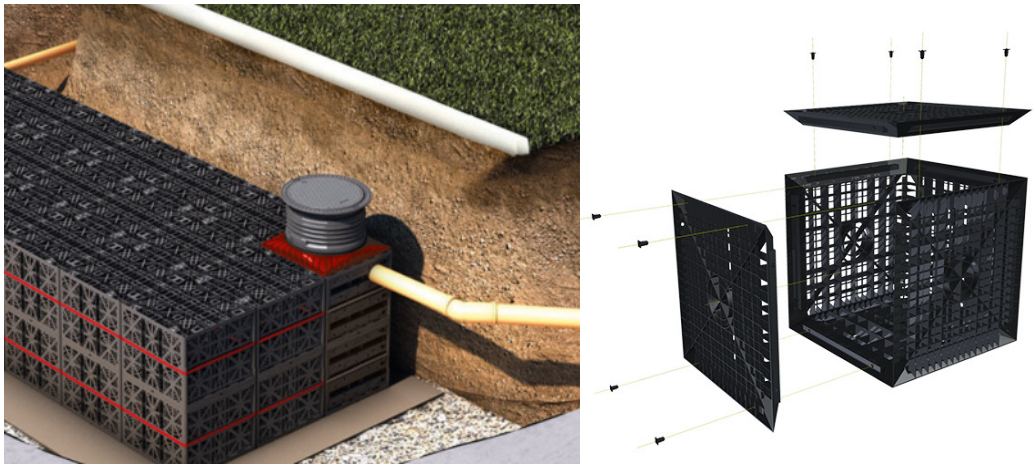


Illustration 1 On-site assembly of the infiltration block

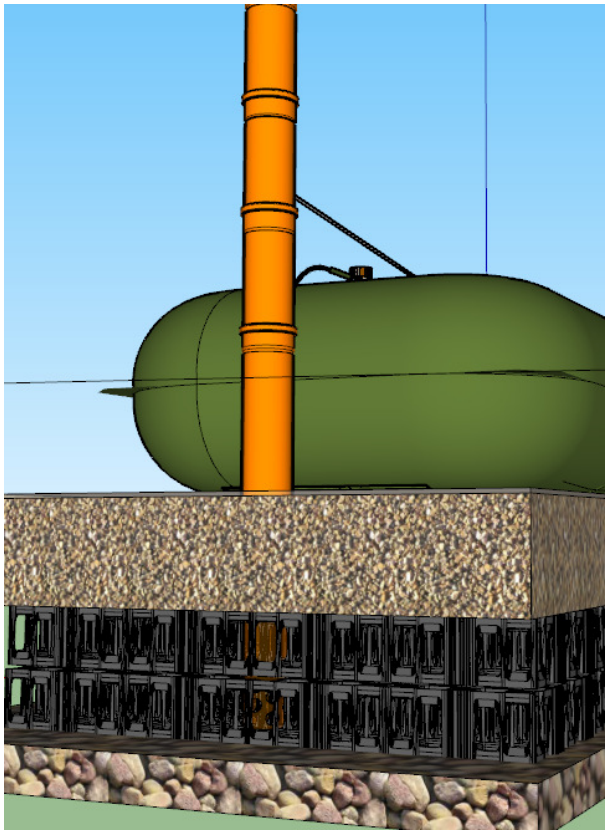
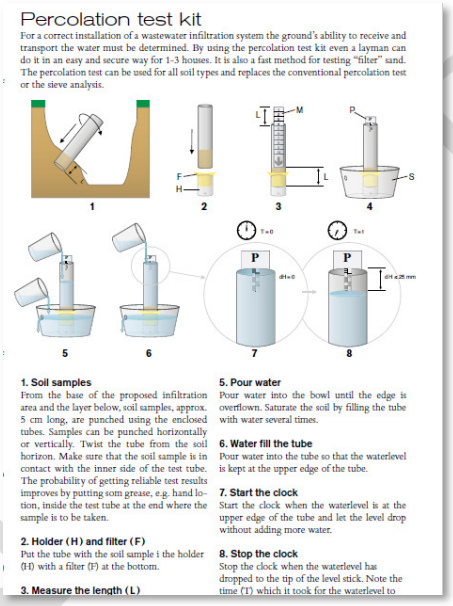


Illustration 2 Infiltration channel installed under the tank

Determining the Required Size of the Infiltration Channel

The number of infiltration blocks required depends on the infiltration capacity of the soil. A test kit for determining soil infiltration properties will be included with the final product.

If infiltration is not possible or desired, the wastewater can also be discharged into a nearby waterbody. However, it should be noted that the effluent might affect the groundwater quality.



Percolation test kit

For a correct installation of a wastewater infiltration system the ground's ability to receive and transport the water must be determined. By using the percolation test kit even a layman can do it in an easy and secure way for 1-3 houses. It is also a fast method for testing "filter" sand. The percolation test can be used for all soil types and replaces the conventional percolation test or the sieve analysis.

1 2 3 4 5 6 7 8

1. Soil samples
From the base of the proposed infiltration area and the layer below, soil samples, approx. 5 cm long, are punched using the enclosed tubes. Samples can be punched horizontally or vertically. Twist the tube from the soil horizon. Make sure that the soil sample is in contact with the inner side of the test tube. The probability of getting reliable test results improves by putting som grease, e.g. hand lotion, inside the test tube at the end where the sample is to be taken.

2. Holder (H) and filter (F)
Put the tube with the soil sample i the holder (H) with a filter (F) at the bottom.

3. Measure the length (L)

5. Pour water
Pour water into the bowl until the edge is overflown. Saturate the soil by filling the tube with water several times.

6. Water fill the tube
Pour water into the tube so that the waterlevel is kept at the upper edge of the tube.

7. Start the clock
Start the clock when the waterlevel is at the upper edge of the tube and let the level drop without adding more water.

8. Stop the clock
Stop the clock when the waterlevel has dropped to the tip of the level stick. Note the time (T) which it took for the waterlevel to

Figure 1 Excerpt from the test kit instructions

Illustration 3 Test kit

Setting Up the Infiltration Column

Prior to filling the infiltration blocks, the bottom end of the infiltration shaft must be firmly fixed in the infiltration blocks. When filling, make sure that no soil falls into the shaft and that the shaft protrudes far enough out of the ground to allow connection to the remaining components.

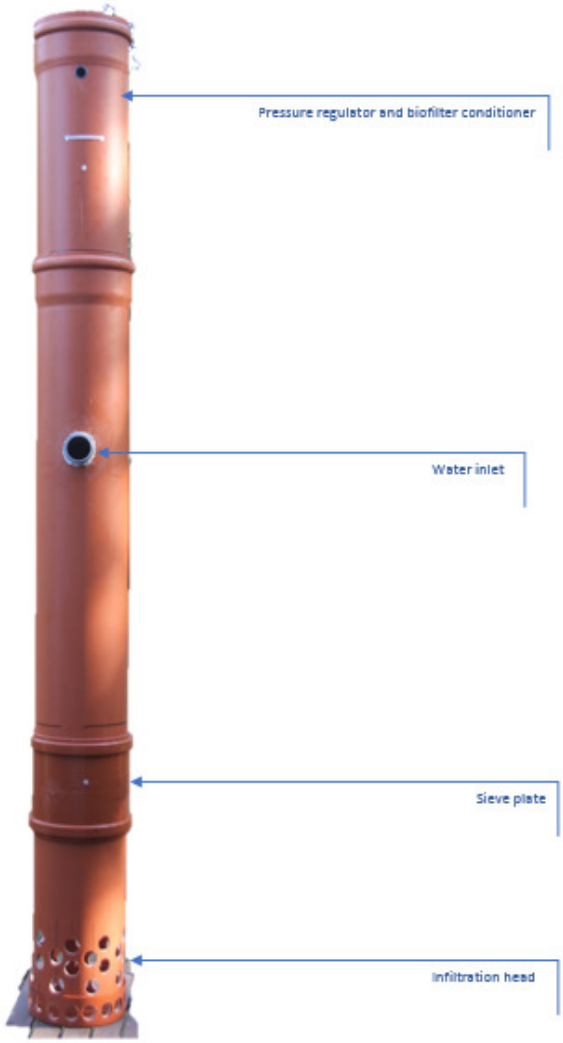


Figure 2 The Infiltration Column without the ventilation on top

Insert the bottom (first) section of the infiltration unit (the section with the sieve tray):

Figure 3 Bottom (first) section of the infiltration unit

Then add the middle (second) section of the infiltration unit, taking care to guide the transparent tube up through the pipe and out the top.

Illustration 4 Middle (second) section of the infiltration unit

Figure 4 Tube leading up out of the second section of the infiltration unit

Then add the top (third) section of the infiltration unit and attach the transparent tube to the designated nozzle.

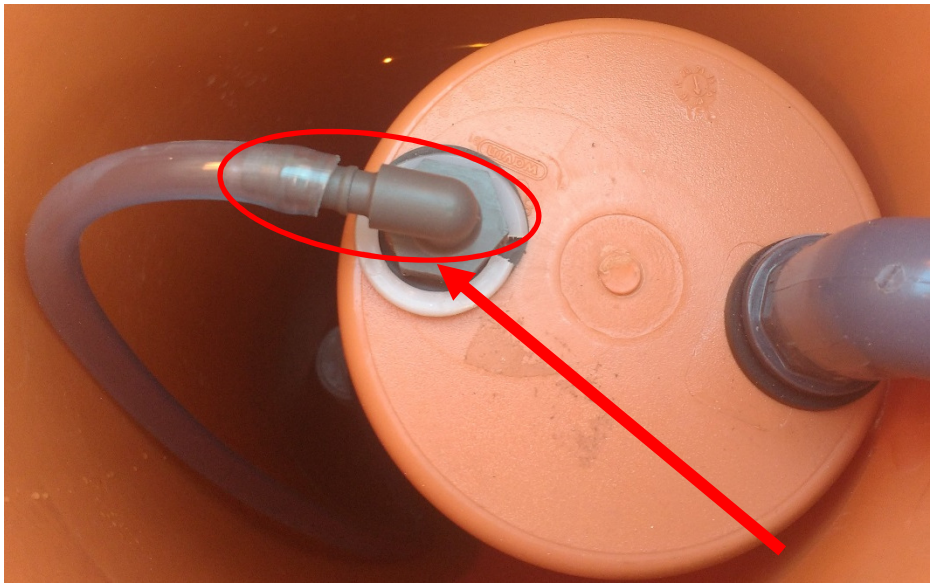


Figure 5 View from above looking into the top (third) section, with tube attached

Filling the Water Trap

The infiltration unit's built-in gas trap must now be filled with water, using the included syringe. Filling is complete the moment water comes out of the overflow tube.

Figure 6 Syringe

Figure 7 Filling the water trap

Adding the Reagent

To minimise odour, the infiltration unit is equipped with a biofilter. This filter cleans the air escaping from the infiltration channel and can also neutralise the smell of the biogas produced, if this is not used. The biofilter consists of a sieve tray filled with special pellets, through which the air flows from below.

In this step, the odour-absorbing pellets (the reagent) are poured into the infiltration unit from above, up to the yellow mark.

If it rains during installation, care must be taken to keep the reagent as dry as possible.

Figure 8 Organic filter material

Adding the Ventilation Unit - Mounting the Fan

The next two segments of the shaft are for ventilation. Attach the simple pipe and the pipe with the fan carrier, then attach the fan to the mounting bracket.

This completes the assembly of the infiltration shaft.

Illustration 5 Mounting the fan

Figure 9 Ventilation: the top 2 segments of the infiltration shaft with fan mounted

Laying Out the Tank

In this step, the tank is unfolded and laid out at the installation site.

- Check the installation area for sharp or pointed objects, and remove them.
- Cover the installation area with geotextile fabric
- Remove the tank from the pallet and spread it out with the flanges facing upwards
- Align the suction units so that the flanges are vertical
- The small chamber with the bristle filter should point in the direction of the infiltration column

The flanges of the two chambers must be vertically aligned to ensure safe filling of the tank.

Illustration 6 Tank laid out flat

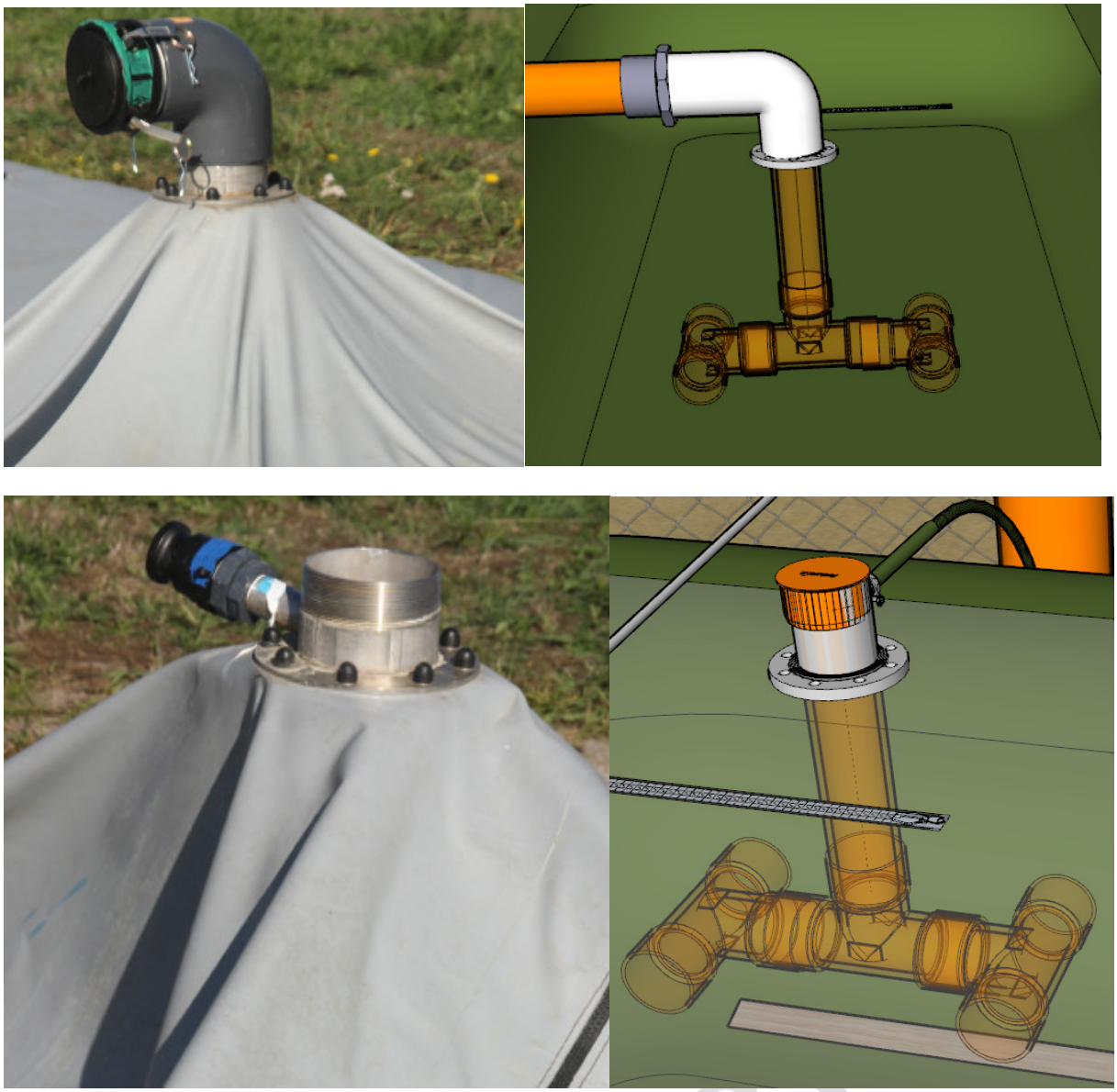


Figure 10 Vertical alignment of the flanges

Connecting the Discharge and Supply Lines

All connections use colour-coded Camlock quick connect couplings:

Wastewater Intake: Red

Desludging: Green

Biogas line: Yellow

Wastewater Discharge: Blue

Fit the same-colour couplings together and lock them in place by pressing the down to the coupling. Use the safety pins to secure the levers against accidental release.

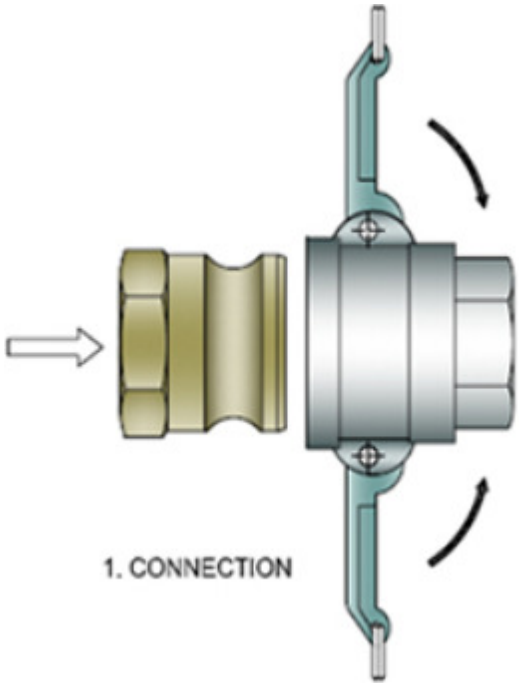


Figure 11 Connecting and locking the couplings

The blue wastewater discharge line and the yellow biogas line should only be connected after the tank has been filled for the first time.

Connecting the Wastewater Intake Line

Before filling, the wastewater intake line must be connected in order to prevent water from escaping through this opening. The wastewater intake is located on the narrow end of the larger chamber (farthest from the infiltration column) and is marked in red.

Figure 12 Wastewater intake connection

Insert the wastewater intake hose into the coupling and lock it by pressing down all four levers.

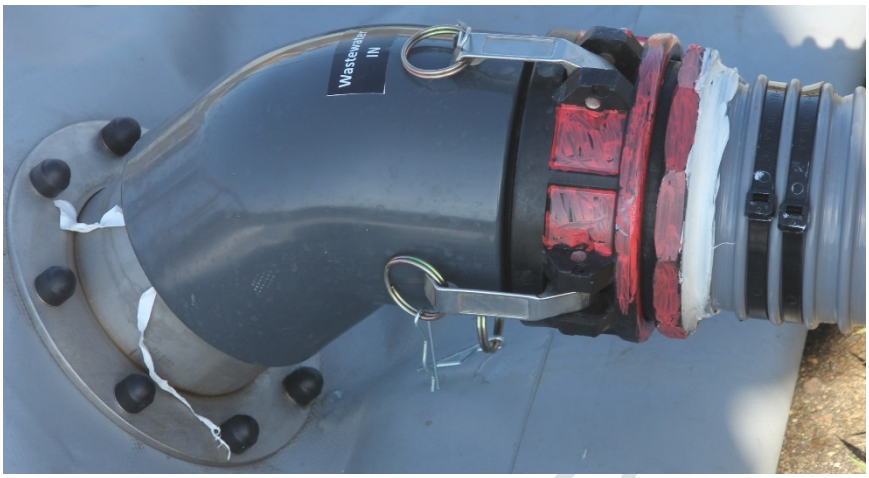


Figure 13 Inserted and locked wastewater intake hose

Initial Filling

Before connecting the toilets, the tank must be completely filled with water. Greywater can be used for this purpose, as long as it is free of solids.

During filling, the gas vent must be open.

Figure 14 Gas valve open for initial filling

The tank is filled through the middle flange. This is best done with a pump or a vacuum truck/tanker. An extension pipe with brace is included, to enable easier connection of the filling hose.

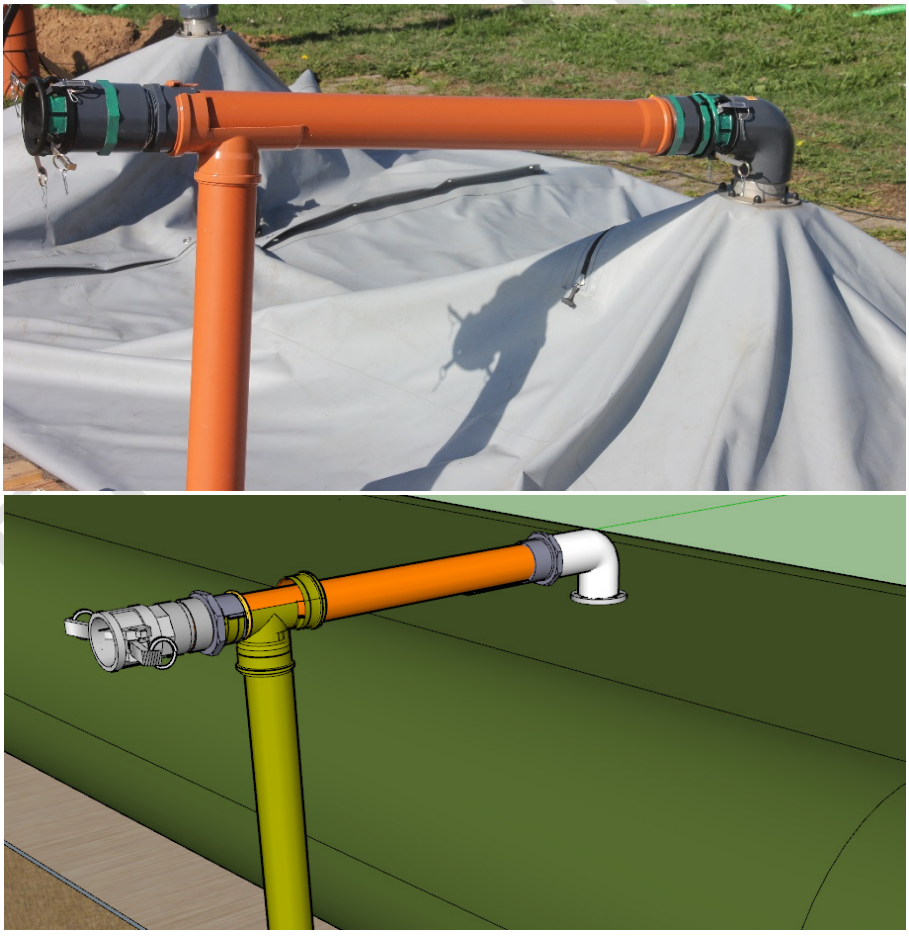


Figure 15 Extension pipe attached to the intake nozzle (middle flange)

The tank is completely filled as soon as water comes out of the discharge nozzle.

Figure 16 Water flowing out of the discharge nozzle

When water comes out:

- Stop the flow of water into the tank
- Disconnect the filling hose
- Remove the extension pipe, if this was used
- Close the filling opening with the cap
- Close the gas valve

Some pumps deliver larger amounts of air along with the water. If this is the case, wait to close the gas valve until there is no more air escaping from the nozzle.

Connecting the Wastewater Discharge and Biogas Lines

After filling the tank, the wastewater discharge and biogas lines are connected.

First, connect the blue-marked wastewater discharge hose to the tank.

Then cut the hose to length and attach it to the vertical infiltration pipe using the crimp connection.

Figure 17 Wastewater discharge hose connection on the side of the tank

A. Body
B. Screwcap

C. Split ring

D. Compression ring

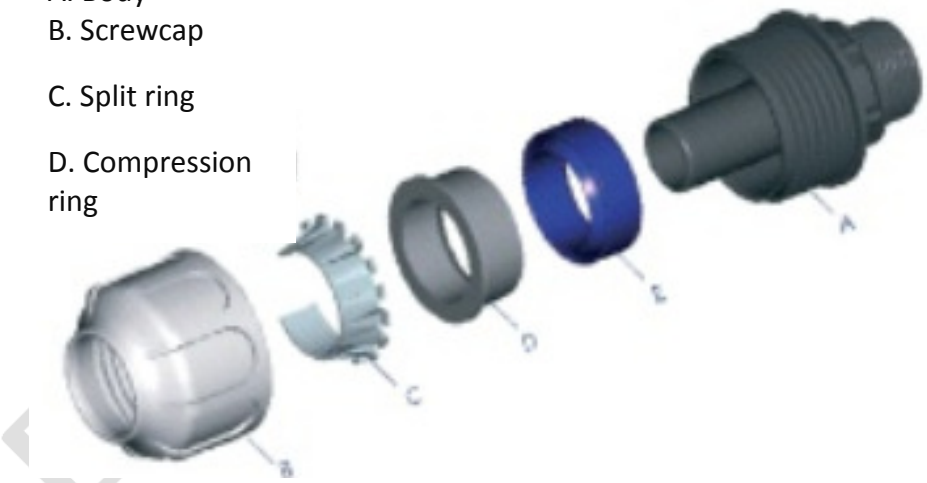
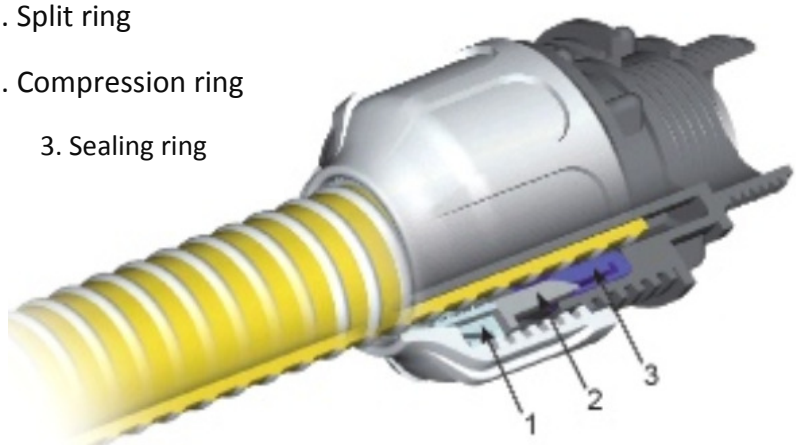


Figure 18 Connection to the infiltration unit

1. Split ring

2. Compression ring

3. Sealing ring



Then connect the yellow-marked biogas line in the same way:

Figure 19 Biogas line connections (tank and filtration unit)

This completes the setup and installation of the Septic Bag.

Maintenance

Changing the Bristle Filter

A bristle filter is integrated into the tank's discharge opening. This protects the infiltration channel from blockages caused by unsettled solid particles. The bristle filter must be cleaned at regular intervals (not yet determined), or when there is a problem with discharge from the tank.

Figure 20 Unused bristle filter

To clean the bristle filter, first unscrew the maintenance cap.

The prototype cap has fine threads that are easily damaged. Take special care when opening and closing this cap.

Figure 21 Bristle filter cap

The filter is under the cap.

Figure 22 Installed bristle filter

If the filter is pulled out too quickly, it may spray sludge.

To reduce the risk of spraying sludge, use the included plastic bag as a protective cover, as shown in the pictures below.

Figure 23 Bristle filter and flange covered with protective bag

To remove the filter, hold the protective bag in place with one hand. With the other hand, slowly pull the filter out of the tank and into the bag.

If the filter is removed too quickly, sludge or wastewater may escape from the bag.

Figure 24 Gripping the filter

Figure 25 Filter in protective bag after removal from tank

Now the filter can either be cleaned with a water hose or replaced with a new filter.

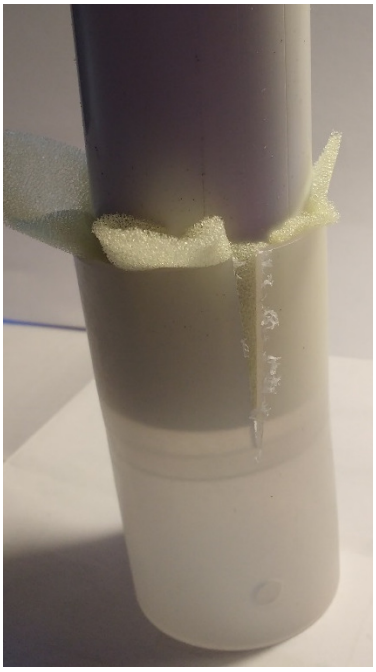
Instructions for the Infiltration Test Kit

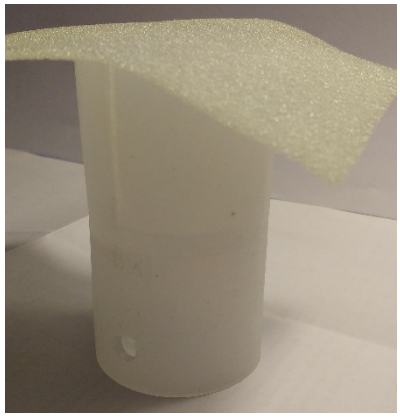
To determine the required size of the infiltration channel, the infiltration capacity of the soil must first be determined. This may be done with the included test kit. A stopwatch or a clock with a second hand is also required (not included).

0. Dig a small hole to the bottom of the planned infiltration area.

1. Use the white plastic tube to gouge out a soil core sample about 5 cm long.

2. Place the foam over the slit side of the transparent holder and push in the soil sample tube until it stops.





3. Use the ruler to determine the exact height of the sample and note the value in cm.

4. Place the level stick on the upper edge of the sample tube, so that the scale hangs inside the tube.

5. Place the holder with the sample tube in the bowl and fill the bowl with water until it comes out the overflow hole. Fill the sample tube with water until it overflows.

6. Pour water into the sample tube until water emerges from the hole in the bowl.

7. Simultaneously stop adding water and start the clock.

8. Stop the clock as soon as the water reaches the 25mm mark.

9. If the measured time is less than 1 minute, repeat the procedure 5-7 times. For a time between 1 and 5 minutes, perform the procedure 3-5 times. Use the mean value.

10. Record the time in seconds.

Appendix

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For a correct installation of a wastewater infiltration system the ground's ability to receive and transport the water must be determined. By using the percolation test kit even a layman can do it in an easy and secure way for 1-3 houses. It is also a fast method for testing "filter" sand. The percolation test can be used for all soil types and replaces the conventional percolation test or the sieve analysis.

Location
When locating an infiltration system a number of factors muss be considered, for instance distance to water supplies, lake, ditches, buildings and real estate boarders. Consult with the local authorities which also grants if the proposed infiltration system may be constructed.

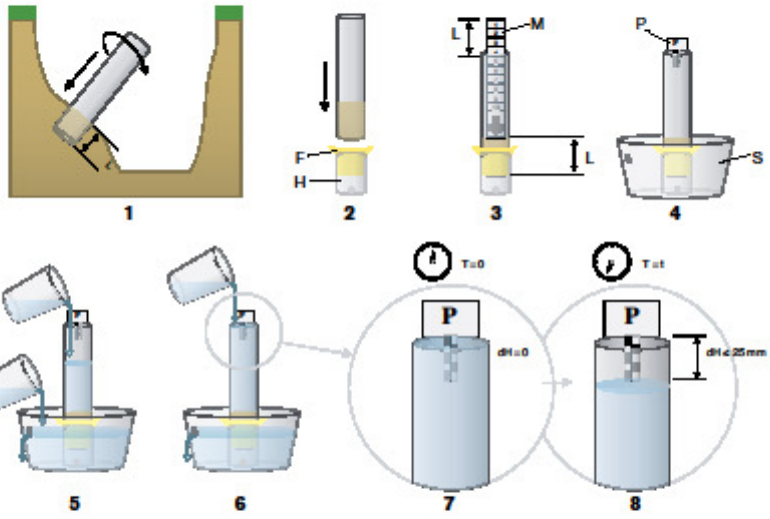
Test pits
Within the area of the proposed infiltration, 1-3 test pits are dug to study the soil profile and determine the depth to possible bedrock or groundwater.

Soil sampling
From the base of the proposed infiltration area and the layer below, soil samples, approx. 5 cm long, are punched using the enclosed tubes.

Percolation test
Immediately after taking the soil samples, they should be analyzed. Repeat the test at least twice in the same saple if the measured time is less than 5 minutes. The water level should drop at least 1mm/hour for a soil sample which is minimum 3 cm long if any infiltration system should be considered. A conventional infiltration system functions only with LTAR (Long Term Acceptance Rate) equal to or larger than 30. By using IN-DRÄN, infiltration system could easily be constructed for all soil types.

Test on sand
The percolation test on sand is performed in the same way as for other soil types, except that point 3 is modified. Before the length (L) is read and noted, the ruler (M) is used to pack the sand sample. The test ought to be repeated 3-5 times on each sample.

Diagram
By using the length (L) of the soil sample and the measured time (T) the LTAR can be read from the attached diagram.



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2. Holder (H) and filter (F)
Put the tube with the soil sample i the holder (H) with a filter (F) at the bottom.

3. Measure the length (L)
Measure the length (L) of the soil sample, using the ruler (M). Note the length! Test on sand: Use the ruler to pack the sand before measuring the length.

4. Level stick (P) and bowl (S)
Put the level stick (P) on the upper edge of the tube. Place the holder with the tube in the bowl (S).

5. Pour water
Pour water into the bowl until the edge is overflown. Saturate the soil by filling the tube with water several times.

6. Water fill the tube
Pour water into the tube so that the waterlevel is kept at the upper edge of the tube.

7. Start the clock
Start the clock when the waterlevel is at the upper edge of the tube and let the level drop without adding more water.

8. Stop the clock
Stop the clock when the waterlevel has dropped to the tip of the level stick. Note the time (T) which it took for the waterlevel to drop the length of the level stick.

Repeat points 5–7 at least 3–5 times if $T < 1$ minute and at least twice if $T < 5$ minutes. If the level drop < 25 mm at $T = 2$ h, note the level drop (dH).

$f(L, T) = \text{LTAR}$
$L \sim 5$ cm (not less than 3 cm)

$T < 1$ min, $dH = 25$ mm	$T < 5$ min, $dH = 25$ mm	$T = 2$ h, $2 < dH < 25$ mm
Repeat points 5–7 4 times	Repeat points 5–7 2 times	gives LTAR 10

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Illustration 7 Fully installed Septic Bag system