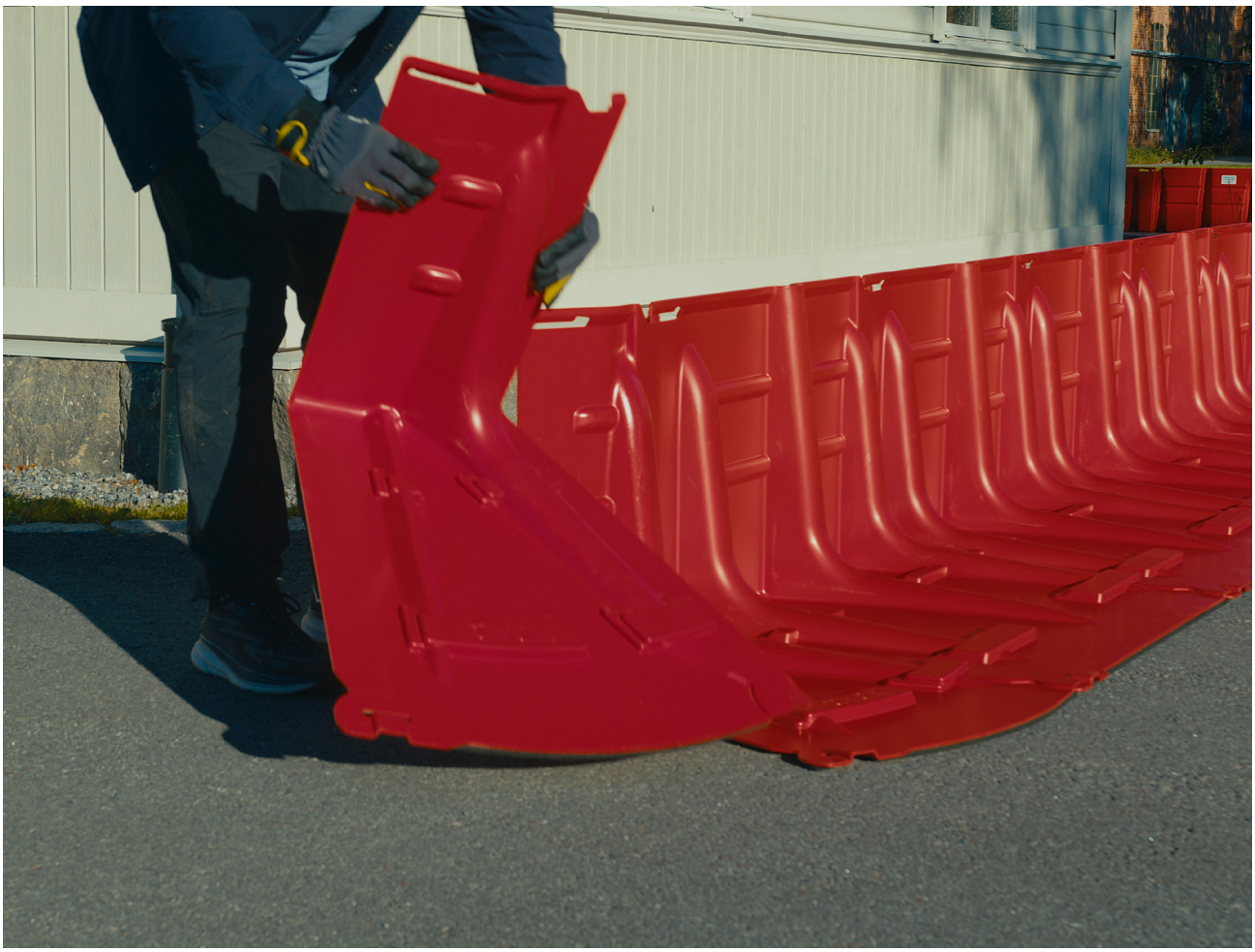
NOAQ® BOXWALL™
BW52-series

User Instructions

noaq.com



No assembly tools required - wearing gloves is recommended.

Scan to download PDF
noaq.com/support

Swedish Flood Tech
since 1995

NOAQ
Flood Protection AB

Contents

Important notice

Floods result from a course of events controlled by forces of nature that can only be controlled to a limited degree. Furthermore, no two events are the same, which means that all protective equipment must be used not only with good knowledge of its function and limitations, but also with generally sound judgement. Those who provide the equipment, manufacturers, resellers, hirers, etc. can never accept liability for the actual use and any possible personal injury or damage to property that might arise.

1. Introduction

NOAQ Boxwall is a modular, free-standing, self-anchoring, mobile flood barrier system designed for rapid and scalable deployment on relatively firm and even ground surfaces, such as tarmac, asphalt, concrete, lawns etc.

The flood barrier system contains several components (“boxes”) that are interconnected to form a continuous wall to either hold back or redirect floodwater. There are five types of boxes; straights, 30° inward corners, 30° outward corners and a pair of gables.

The BW52-series can hold back water levels up to 50 cm (19”) in depth. There is also a bigger model (BW102-series) for water levels up to 1 meter (39”). See separate user instructions for BW102-series.

BW52 straight boxes are 980 mm (39”) long, but overlap one another, which means each box adds 900 mm (35.4”) to the total barrier length. This is also known as the effective length. Corner boxes and gables are shorter.

Boxwall compontents can also be used to create temporary basins of various shapes and sizes - so called NOAQ Boxpool. See seperate user instructions for NOAQ Boxpool.

Components

BW52
Straight

BW50-OC
30° Outward Corner

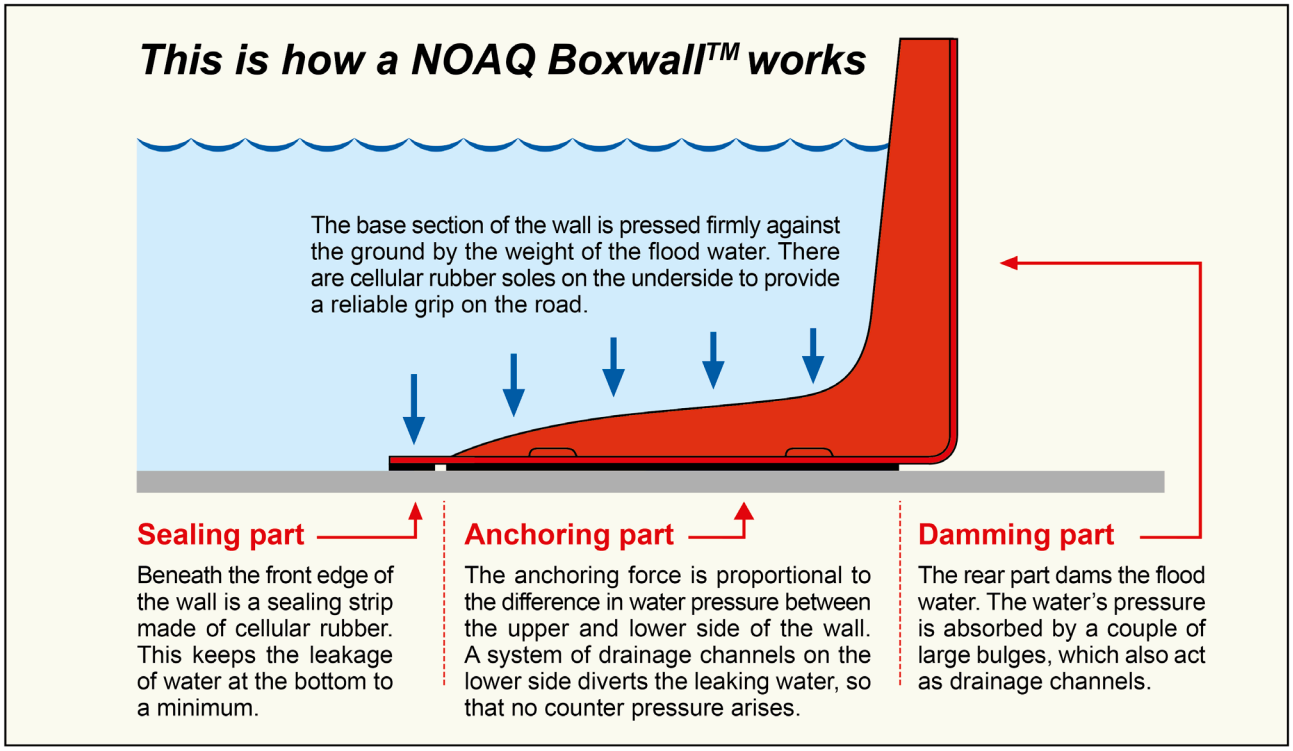
BW50-IC
30° Inward Corner

BW52-GL/GR
Gable Left/Right

Accessories

BW-SA
Storm Anchor

WC-52
Wall Connection



2. How Boxwall works

Each box consists of a damming part (the vertical rear wall section), an achoring part (the horizontal base section) and a sealing part (the front edge of the horizontal base section).

Sealing strips made of cellular plastic are fitted under the front and side edge. These strips are compressed by the weight of the floodwater pressing down on the barrier to provide a tight sealing and limit leakage.

Each box is also fitted with cellular rubber soles to create good ground surface grip. It is the friction force against the ground generated by the weight of the floodwater that firmly anchors the barrier in place. We call this flood technology the “Bookend Principle” as it works in the same way that a simple bookend holds books upright on the bookshelf.

All Boxwall boxes have the same simple integrated coupling and locking mechanism. This allows for quick and easy connection without the need for any tools.

3. Inspect and prepare the deployment area

Ensure the ground surface is relatively firm and even. Boxwall must not be used on surfaces that are very uneven or on ground that is prone to erosion. Also make sure that there is sufficient space at the designated deployment area. A BW52 barrier requires a free width of 680 mm (27”).

Holes or bumps should be avoided. Loose sand and gravel must be brushed away. Ground inclinations of up to 20° is no problem, but abrupt transitions from a surface with one inclination to another need to be done perpendicularly.

Build up the barrier between two secure end points so that the floodwater cannot flow around it. Suitable end points could be higher ground that the floodwater cannot reach, or a solid wall or building that can withstand contact with water.

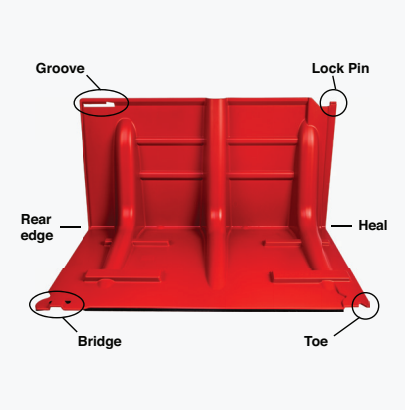
Be observant of any stormwater drains and draw the wall behind them. If there is a risk of stormwater pipes or road culverts directing flood water under the embankment and into the protected area, these channels must be plugged or blocked appropriately.

The Boxwall barrier can be placed on land that is already flooded, but if the ground surface is difficult to see through the water, care must be taken to ensure that the boxes are not placed on uneven or rough surfaces or on the wrong side of surface water drains etc.

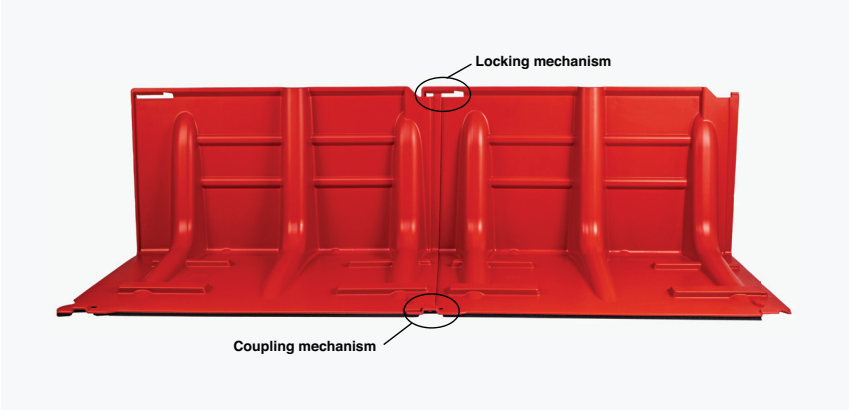
4. How to deploy Boxwall

Deploy Boxwall working from left to right as seen from behind the barrier (the dry side) and connect the boxes one by one.

All Boxwall BW52-series components have the same simple integrated coupling (at the bottom) and locking (at the top) mechanism **(see below photos)**. This allows for quick and easy connection without the need for any tools.



NOAQ BW52 key parts

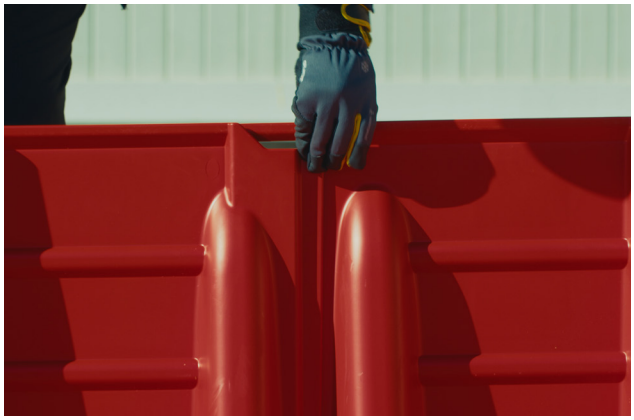


NOAQ BW52 coupling and locking mechanism

Lift box with both hands and tip slightly forward

Insert the toe under the bridge

Overlap the heal and press down the rear edge



Insert the lock pin into the groove

To connect the boxes, lift the box with two hands and tip it slightly forwards. Insert the protruding “toe” (on the left-hand side) under the “bridge” (on the right-hand side) of the previous box **(see above photos)**.

Next swing the box a little to the left so that the “heal” overlaps the previous box and press down its rear edge. Then insert the “pin” of the locking mechanism into the “groove” of the previous box **(see above photos)**.

Turn the box so that the pin ends up in the middle of the groove. This is the normal neutral position to deploy the boxes in a straight line.

3° in one direction to deploy in a gradual inward curve

Normal neutral positon to deploy boxes in straight line

3° in other direction to deploy in a gradual outward curve

The coupling between the individual boxes has a built-in flexibility of +/-3°, which means the boxes can be turned against one another in either direction allowing the barrier to be drawn in gradual inward and outward curves **(see above photos)**.

For abrupt changes in direction, corner boxes can be installed. These have an angle of 30° and are available for both inward and outward corners **(see section 6 about corners and turns)**. The minimum curve radius for BW52 is 1 meter in both directions.

The position of the boxes can still be adjusted even after they have been connected. However, avoid dragging the boxes on the ground, as the sealing strips and the soles on the underside are vulnerable to wear and may become damaged.

5. Activating Boxwall

Once the flood water has arrived it is essential to achieve a difference in water levels between the front and the back side of the wall, as this creates the difference in water pressure that forces the barrier and its rubber soles firm against the ground. The rubber soles will then create the friction force needed to hold the barrier safely in place. The bigger the difference, the better the anchoring. With the same water level on both sides of the barrier, it will attempt to float.

To keep the dry side dry, or at least hold down the water level on the intended dry side, one or more pumps are always needed behind the barrier.

In an early stage, when the water level is still low, the anchoring pressure of the water is low too, which means that the sealing against the ground is not very good. Without a good sealing water will freely pass under the barrier, and the water level on the protected side prevails. To help the sealing strip underneath create a tight seal against an uneven or rough surface, you can place a weight on the front edge of each box.

When deploying the barrier in deep water the boxes need to be ballasted from the start to prevent them from floating. A heavy weight such as a single sandbag can be used. Avoid trying to press the wall down through the water by walking on it, as the coupling mechanism can then be overloaded.

It can also be necessary to ballast the boxes if there is a strong wind before the water arrives. The barrier is not very susceptible to winds coming from the front, but winds from behind will try to lift it. In this situation the barrier can be ballasted using NOAQ Storm Anchor BW-SA units **(see section 12 about Boxwall storm protection).**

6. How to make Boxwall corner and turn

To make Boxwall corner and turn there are specific corner components, one for outward cornering and one for inward cornering. Both have an angle of 30°, so three connected corner boxes make a 90° angle **(see below photos)**.

Corner boxes can easily be connected to straight boxes, and with one another, as they all share the same simple integrated coupling and locking mechanism.

Inward corner boxes can also be used to build temporary basins, a so called NOAQ Boxpool **(see below photo)**. See separate user instructions for NOAQ Boxpool.

90° outward corner made using three connected BW50-OC

90° inward corner made using three connected BW50-IC

NOAQ Boxpool made using twelve connected BW50-IC

Corners used to provide full parimeter protection

Corners used to navigate the urban landscape

Outward corner boxes can be used to protect a single object, like a detached building. To surround a rectangular area, 4 x 3 outward corner boxes for the corners can be combined with an appropriate number of straight boxes for the sides **(see above photo)**.

Inserting corner boxes at appropriate positions in the wall makes it possible to navigate around different obstacles along the flood defence line **(see above photo)**.

7. How to make Boxwall pass curbs

By using a pair of “gables”, Boxwall can pass curbs. However, the passage must be perpendicular. When the barrier is built up on a street (constructed from the left) and reaches a curb, it ends against the curb with a right-hand gable. A new barrier section is started on the higher ground (pavement) with a left-hand gable. The gables are screwed together, staggered in height, through the slots in each gable **(see below photos)**.

Depending on the design of the curb, it may sometimes be necessary to seal between the curb and the barrier to reduce under-leakage. It can be done with a plastic liner or any other suitable water-resistent material.

Another possibility to pass curbs is to place the nearest boxes so that their rear walls almost meet. The remaining gap is then covered with a NOAQ Wall Connection WC-52.

Gables used for passing curbs

Gables connected with straight boxes

8. How to connect Boxwall to a permanent wall or façade

Boxwall can easily be connected against a wall or facade. The connection may be perpendicular but can also be made in some other angle, or with the barrier parallel with the facade. Regardless, the connection must still be made with the rear part of the box in near contact with the facade.

To reduce the leakage that may occur between the barrier and the facade a NOAQ Wall Connection WC-52 can be installed. This is hung up with half of it over the upper edge of the barrier, where it is fixated by a row of clamps, and the other half up against the facade, by inserting hooks (screwed into the facade) into the eyelets along the upper edge of the fabric.

An alternative to using hooks is to hang up the Wall Connection with strings or straps, fastened higher up, or to pile several sandbags against it.

The Wall Connection is wide enough to cover the horizontal part of the barrier, but also protrude over the ground. If the connection to the facade is made in an angle the fabric needs to be folded over itself right in front of the connection. This fold is then compressed by putting something heavy on it.

9. Making openings in the barrier

If Boxwall is deployed before the water arrives, one may want to keep some openings for as long as possible to allow people and vehicles to pass through. Such openings are preferably made 1.00 - 1.05 meters wide, so that they just fit a loose box. Alternatively, the openings are made 1.90 - 1.95 meters wide to fit two connected boxes, or 2.85 - 2.90 meters wide to fit three connected boxes.

When the water approaches, the barrier is closed by placing a box in the opening and covering it with the NOAQ Wall Connection WC-52. For an opening for two connected boxes, two Wall Connection units are required in combination. For an opening with three interconnected boxes, still only two Wall Connection units are required, one for each remaining gap. The fabric is fixed to the upper edge of the boxes with a series of clamps and to the ground with some weights.

10. How to adjust the length of the barrier

If the barrier needs to have an exact length measurement (e.g. between two buildings), there are several ways to adjust its length. Since the boxes can be joined at an angle of +/-3°, a straight Boxwall can be shortened by pulling it in a slight arc between the end points.

Another way is to insert some inward corner boxes, either in the middle of the wall, or at its outer ends. A third way is to draw the barrier slightly diagonally, instead of the shortest (perpendicular) way. A fourth option is to part the barrier in two and cover the gap with the NOAQ Wall Connection WC-52.

The four alternatives can of course be combined.

11. Pump out leak water

When using mobile flood barriers, one or more pumps are always needed to pump away the water that collects on the “dry” side of the barrier. Some leakage will always occur, through the barrier, under the barrier and even through the ground itself. Added to this is rainwater that runs down towards the barrier but is unable to reach the river or the lake because the barrier itself is in the way.

If the ground is level or if it slopes towards the flood, this water must be pumped away (over to the flood side). If the ground slopes away from the flood (e.g. on the crest of a permanent levee), the water drains away without the aid of pumps.

Water leaking through or under a mobile flood barrier is not a problem providing the capacity of the pumps placed behind the barrier is sufficient.

12. Boxwall storm protection

Once Boxwall is in action as a flood barrier, with water covering the horizontal base part, it is not affected by winds. But before the water arrives, it is wind susceptible.

To protect Boxwall against storm winds it can be pre-secured by installing NOAQ Storm Anchor BW-SA units. These units are placed on the horizontal base part of the boxes (one per box) and then filled with water **(see below photos)**.

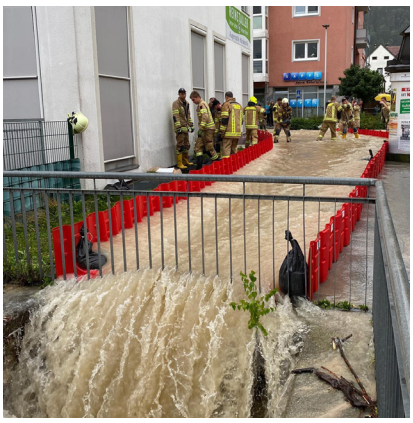
The Storm Anchor is optimised to fit BW102 straight boxes but it will also work on BW52 straight boxes. Fitted with this ballast, Boxwall can withstand wind speeds up to 45 m/s (100 mph), corresponding to category 2 hurricanes.

NOAQ Storm Anchor BW-SA

BW-SA fitted to BW52 (CAD)

BW-SA connected to BW52 and filled with water (CAD)

Boxwall diverting and redirecting flashfloods



Boxwall as a canal to redirect floodwater through city streets

13. How to handle flash flooding

Boxwall can also be used to protect against water rushing down from higher ground, like in flash floods. Here, it is primarily about diverting the water away from low entrances and threatened objects and redirecting it towards areas that can withstand flooding. In the same way, Boxwall can be used during snowmelt, when fast running water may want to take unauthorised paths.

Even when used this way it is important to keep in mind that Boxwall must be used on firm and even surfaces and non-erosive ground.

If water is already running fast at the place of the intended deployment, the first measure may be to place several boxes in the water flow, to break down the speed of it and reduce its power. To do this, place the boxes close to each other, facing upstream and somewhat diagonally to the direction of the flow. They will be anchored directly by the weight of the water flowing upon them.

Protected behind this row of boxes, build up a continuous wall of the correct length and direction to direct the water where you want it. When this wall is constructed, the front boxes can be removed. However, for limited amounts of water and moderate water speed a continuous wall can be assembled directly.

In this way Boxwall can also be used to create canals, which can lead the masses of water via the street network through a city and out of it in a controlled manner. This not only protects the buildings along the road, but also reduces the problems upstream.

Boxwall as a temporary detention basin

BW52 connected with BW102

14. Creating temporary detention basins

Boxwall can also be used to make temporary detention basins. The idea is to catch and hold a substantial part of the running water by erecting a wall across the stream. When the water level reaches the upper edge of the wall excess water will run over it and continue downstream. But as a large amount of water has been detained, the flow will be spread out over a longer time, lowering the peak flow.

To create a temporary detention basin with Boxwall make sure that the water will not be able round the end parts of the barrier. One way to avoid this is to choose, if possible, a location where the ground near the end parts is higher than the middle part of the barrier. If such a location is not available, an alternative is to create a “U-shape” barrier, with the legs of the “U” pointing uphill. Such a shape can be achieved by inserting 2 x 3 inward corner between the straight boxes in the wall **(see above photo)**.

15. Combine Boxwall BW52 and BW102

It is possible to combine Boxwall BW52 and BW102. The two models can be connected by screwing a BW52 gable together with a BW102 gable. If the height of the ground varies along the length of the wall, it can be smart to even out the difference in height by combining lower and higher boxes. Where the ground is higher, lower boxes (BW52) are used, where the ground is lower, higher boxes (BW102) are used. In this way, the continuous wall can protect to one and the same level **(see above photo)**.

16. Combine NOAQ Boxwall and NOAQ Tubewall

It is possible to combine NOAQ Boxwall with NOAQ Tubewall**.** The walls are deployed so that they overlap each other by a few metres, preferably with the Tubewall closest to the flood. One or a pair of Tubewall joint covers are used to seal between the two wall parts. See seperate user instructions for NOAQ Tubewall.

Lift and tilt the box to slide lock pin to the disassembly position

Tip the box forward to remove the pin from the groove

Pull back the box to remove the toe from under the bridge

17. After use

Recover Boxwall boxes one by one working from right to left as seen from behind the barrier (the dry side). Remove any installed NOAQ Wall Connection first.

To disconnect the boxes, start with the last connected box in the wall. Lift the box at the top-right hand corner with your right hand and tilt it towards the other connected box. This action will slide the pin of the locking mechanism to the disassembly position **(see above photo)**.

Tip the box slightly forward to remove the pin out from the groove. Then pull the box towards yourself to remove the toe from under the bridge of the previous box **(see above photos)**.

Once removed, place the box on the ground, on its toe side edge ready to be collected and carried to either the cleaning or transportation area.

To clean the boxes, rinse with water from a hose or by hand. Do not use a pressure jet washer as this method could damage the soft parts (sealing strips and soles).

Stand the boxes on their side edge to dry so the water runs off more quickly from the pores of the soft parts.

If there is a risk of freezing temperatures, the boxes must be taken indoors and stored in a heated area until all soft parts have dried out properly.

Inspect all soft parts. Damaged or worn sealing strips can be replaced, but if the soles have suffered big damage, the entire box should instead be replaced.

Once all boxes are dry, stack them on their toe side edge into one another and place on a pallet or load into a transportation case to take up as little space as possible.

Store in a dry location away from direct sunlight.