

User Instructions

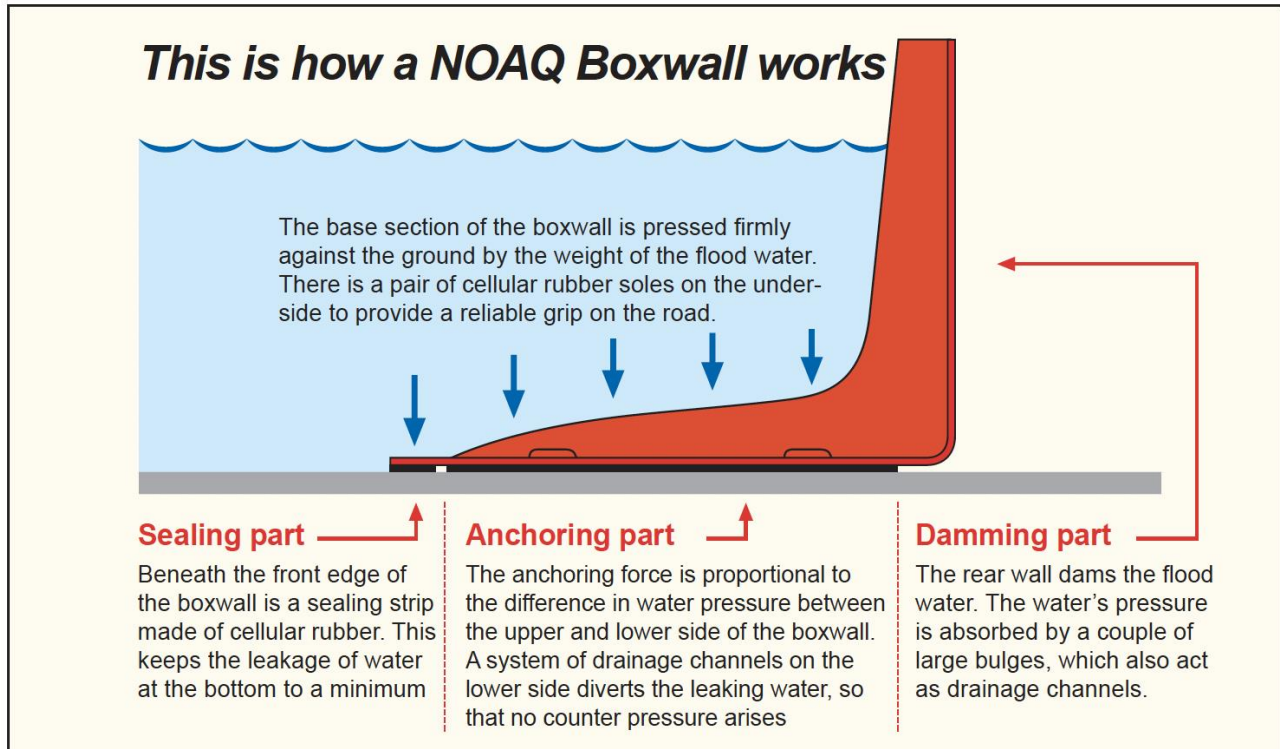
NOAQ Boxwall BW102-system



A NOAQ Boxwall is a modular free-standing, self-anchoring, mobile flood barrier system. NOAQ Boxwall BW102 dams water to a height of 40". Because a Boxwall is so light and easy to assemble, it can be quickly deployed to protect critical infrastructure, properties, and other valuable assets against floodwater damage. A Boxwall is intended to be used on a relatively level and smooth surface, such as a paved street, tarmac, asphalt, or concrete floor, but will also work on a lawn.

The NOAQ Boxwall is also available in a lower model (BW52), which has a dam capacity of 20". There is a user instruction manual available specifically for the BW52.

A Boxwall consists of sections ("boxes") that are connected to each other with a simple coupling/locking mechanism. No tools are required. There are specific corner boxes (BW102-OC and BW102-IC) for making curves and corners. There are also special gables (BW102-GL and BW102-GR) for navigating curbs, steps, and other raised platforms, as well as to make it possible to connect boxes of different heights (BW102 and BW52).



Each box consists of a damming part (the back wall part), an anchoring part (the horizontal part that sits on the ground) and a sealing part (the front underside edge of the horizontal part). Under the front edge and the side edge are sealing strips made of cellular plastic. Each box is also fitted with three cellular rubber soles, to provide good ground contact and grip.

A Boxwall is built up by snapping one box into the previous one, one at a time. It is easiest to work from left to right (viewed from the dry side). You should avoid building from two directions, as it is difficult to get the two wall sections to meet at the same point.

As with all mobile flood barriers, a certain amount of leakage can be expected. This can be minimized by covering the barrier with a plastic liner. But water also leaks through the ground itself and under the barrier, and water can also be supplied to the protected area by rain and through streams now blocked by the barrier itself. **Therefore, you always need one or more pumps to keep the protected side of the barrier dry.**

The Boxwall components can also be used to create temporary pools of varying sizes. You then get a so-called NOAQ Boxpool. There is a separate user instructions manual specifically for this product.



NOAQ Boxwall BW102 straight box, BW102-GL/GR gables, BW102-OC outer corner box, BW102-IC inner corner box

Follow these instructions:

1. Inspect the area where the Boxwall is to be built

The Boxwall is specially designed for firm, smooth, even surfaces, such as asphalt or concrete, but will also work on lawns too. It is therefore most suitable for deploying on streets and roads, over parking lots, in industrial areas, around shopping centers, in harbors and at airports. It can also be placed on floor surfaces. It should not be used on surfaces that are very uneven or ground that is prone to erosion. Inclinations of the ground up to 20% are no problem, but abrupt transitions between one sloping surface to another should be made perpendicular to the boundary line. However, potholes and bumps should be avoided. The straight boxes are 39" long but overlap each other so that each box contributes 35" to the total length of the barrier. The Boxwall requires a ground surface with a free width of 47".

Build the Boxwall between two safe end points, so that the flood water cannot go round the Boxwall. A safe end point can be a height where the water does not reach, or a solid wall or a solid building that can withstand water contact.

Loose sand and loose gravel must be brushed away where the Boxwall is to be erected. The soles that are fitted on the underside of each box have good road grip like the rubber soles on your shoes. With sand on the road surface, you run the risk of slipping and sliding, and the same therefore applies to the Boxwall.

The coupling/locking mechanism between the individual boxes has a built-in flexibility of $\pm 2^\circ$, which means that the Boxwall can be drawn in curves. Special corner boxes are available for tighter corners. These have an angle of 30° and are available for both inside and outside corners. The Boxwall can be placed on already flooded land, but if the ground surface is difficult to see through the water, you must take extra care to make sure that the boxes are not placed on uneven surfaces or on the wrong side of stormwater wells, drains etc.

The boxes are easy to handle and move, and you can also adjust the position of a connected Boxwall, providing the water has not started to press it firmly against the ground. **However, you should avoid dragging the boxes on the ground because the sealing strips and soles on the underside are sensitive to abrasion and can be damaged.**



2. Place the boxes and connect them one by one

Start from the left (seen from the dry side) and connect one box at a time to the previous one. The boxes have a **coupling mechanism** (at the front edge) and a **locking mechanism** (at the top edge). Angle the box slightly forward and connect with the previous box by inserting the protruding “tongue” (far left) under the “bridge” (far right of the previous box).

Now tilt the box slightly to the side, press down on its rear edge and insert the protruding pin of the locking mechanism into the groove on the previous box. Feel free to hold the box up with the help of your right foot (see the middle picture above) to be able to use both hands for the connection. Set the box down so that the pin ends up in the middle of the groove. This is the normal mode. However, the locking mechanism has a certain flexibility, so that the boxes can be turned up to $\pm 2^\circ$ towards each other if necessary (see photos on the next page).

To help the sealing strip on the underside close tightly against an uneven surface, you can put a weight on the front edge of each box, for example a sandbag. It may also be necessary to ballast the boxes with something heavy in strong winds, before the water arrives. The Boxwall is not that sensitive to wind from the front, but if the wind comes from behind (the dry side), it will want to lift the box.

Even when deploying in deep water, the boxes need to be ballasted from the start to keep them in place, otherwise they risk floating away. A level difference between the water in front of and behind the Boxwall is required to create the pressure difference that anchors the boxes. Avoid trying to push down the entire dam by walking on it, as the coupling mechanism can then be overloaded.

If you want to improve the seal further, you can also cover the Boxwall and its connections with a special plastic liner. The liner for BW102 is four meters wide and is conveniently fixed with clamps along the top edge and with a row of sandbags on the ground in front of the front edge. By covering the Boxwall with a plastic liner, it can also be used on a more uneven surface, because the plastic liner is more flexible.



Assembly position



3° in one direction



Normal position



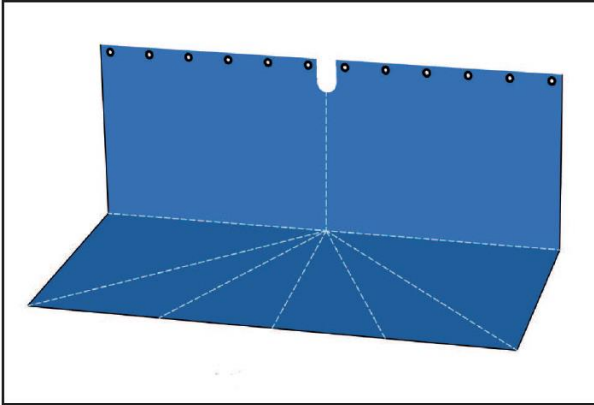
3° in the other direction

3. Corners

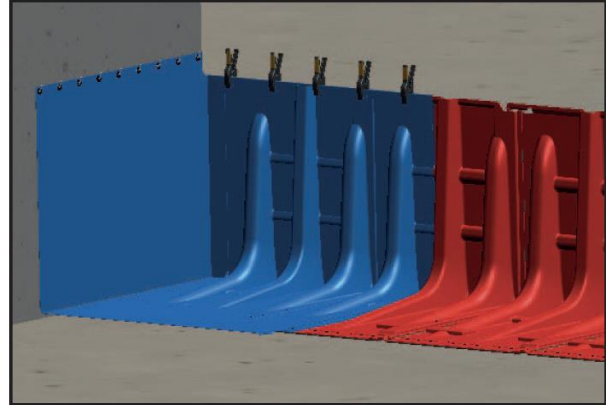
To create corners, there are a couple of special corner boxes, one for inside corners (BW102-IC) and one for outside corners (BW102-OC). Both have an angle of 30°, so with three corner boxes connected you create a right angle. The corner boxes can be easily connected to the straight boxes, and to each other, as all boxes have the same coupling mechanism.

The outer corner box is used mostly when you need to enclose and protect an exposed object, for example a building or a car. To enclose a rectangular area, it is convenient to use 4 x 3 outer corner boxes for the corners and any number of straight boxes for the sides. By inserting corner boxes in suitable places within the wall, it is possible to navigate it around various obstacles along the defence line, as well as make it swing around street corners, etc.

With inner corner boxes, temporary pools can also be quickly built up. Twelve boxes are enough for a circular pool, called a “NOAQ Boxpool” (see separate instructions for use). By combining the corner boxes with several straight boxes, pools of any size can be built.



The NOAQ Wall Connector can be folded to the desired angle



The NOAQ Wall Connector hung against the wall with hooks in the eyelets and attached to the box with clamps

4. Connections to a wall or a facade

A Boxwall can easily be connected to a wall or an exterior building wall. The connection can be perpendicular but can also be made at an oblique angle, or with the Boxwall parallel to the wall. However, the connection must be made so that the rear wall of the Boxwall comes closest to the wall.

To minimize the leakage that occurs between the Boxwall and the wall, a so-called NOAQ Wall Connector is used. This is hung with half the wall connector over the top edge of the Boxwall and the other half against the wall. The part that hangs over the upper edge of the Boxwall is secured in place with a series of clamps. To seal between the short side edge of the wall connector and the Boxwall, the edge can be taped to the box. For the part that is hung against the wall, you need to arrange some kind of suspension points in the form of hooks, screws, or nails. Along the upper edge of the wall connector, there are a row of eyelets that you hook onto the attachment points. If you do not want to nail into the facade, the wall connector can instead be held up with the help of strings or straps that are threaded through the eyelets, and which are attached in a suitable way higher up. A third way to hold up the wall connector against the facade is to stack a pile of sandbags against it. Here, too, you can supplement with tape if the facade surface is smooth.

The wall connector is wide enough to cover the horizontal part of the Boxwall and reach a bit above the ground. If the connection takes place at an angle, the wall connector needs to be folded in the middle of the connection. This fold is then suitably fixed by placing something heavy on it.

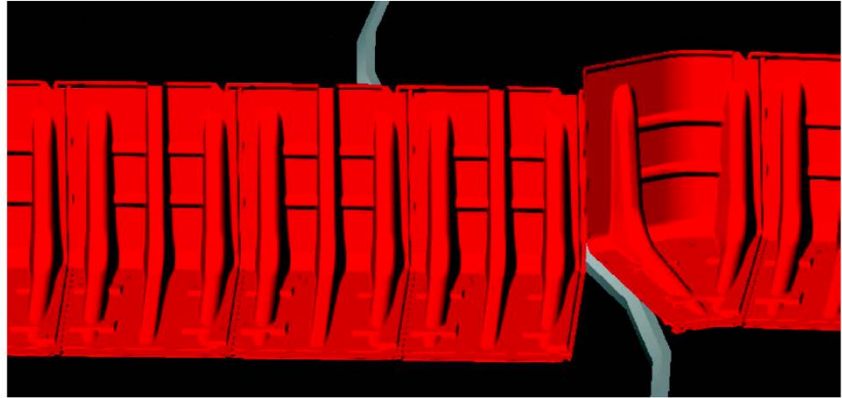
5. Openings in the erected wall

If the Boxwall is built before the water comes, you may want to keep some openings in the erected wall for pedestrians and for vehicles that need to be able to pass. Such openings are preferably made approx. 3,2 ft – 3,4ft wide, so that they just fit a loose box. Alternatively, make the opening 6,2 ft – 6,3 ft wide to fit two connected boxes, 9,3ft – 9,5 ft wide to fit three connected boxes.

When the water approaches, the wall is closed by placing a box in the opening and covering it with a wall connector. For an opening for two connected boxes, two wall connectors in combination are required. For an opening with three interconnected boxes, only two wall connectors are still required, one for each gap. The wall connector is fixed to the upper edge of the boxes with a series of clamps and to the ground with some weights. Here, too, you can supplement with tape.



Gables navigating a curb



An alternative arrangement for navigating curbs

6. Curbs

With the help of a couple of “gables”, a Boxwall can navigate curbs, steps, and other raised platforms. However, the passage must be perpendicular. When a Boxwall on a street (construction direction from the left) reaches a curb, it ends against the curb with a right-hand gable (BW102- GR). A new Boxwall section is started up on the pavement with a left-hand gable (BW102-GL). The gables are screwed together, staggered in height, through the gap in each gable. See middle image above.

Depending on the design of the curb, it may sometimes be necessary to seal next to it to reduce under-leakage. It can be done with a plastic liner.

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 Connector.

7. Length adjustment

If a Boxwall needs to have an exact length measurement, for example, between two buildings, there are several ways to adjust its length. Since the boxes can be joined at an angle of $\pm 2^\circ$, a straight Boxwall can be shortened by instead pulling it in a slight arc between the end points. Another way is to put in some corner boxes, either in the middle of the constructed wall, or at its outer ends. A third way is to draw the Boxwall slightly diagonally, instead of the shortest (perpendicular). The three ways can be combined.

8. Pump out leaking 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 flows down towards the barrier but does not reach the river or the lake because the flood barrier itself is in the way. If the land is level or if it slopes towards the flood, this water must be pumped away. If the ground slopes away from the flood (for example, on the crest of a permanent levee), the water drains away without the aid of pumps.



Navigating the Boxwall around and behind stormwater wells or drains



Road drums may need to be plugged



Coupling between BW52 and BW102

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. However, if necessary, the leakage can be reduced by covering the barrier with a plastic liner. NOAQ provides such a 13-ft-wide liner in approx. 164 ft lengths.

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

9. Connecting Boxwalls of different heights

The Boxwall is also available in a lower version, BW52, with a dam height of 20" (see separate instructions for use). 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 erected 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, a continuous wall of Boxwalls of varying heights can protect the same level.

10. Connecting NOAQ Boxwall and NOAQ Tubewall

It is possible to combine a NOAQ Boxwall with a NOAQ Tubewall. The barriers are then laid so that they overlap each other by a few metres, preferably with the Tubewall closest to the flood and the Boxwall below and behind the Tubewall.



A BW102 straight box directs the water away



Several boxes built as a wall can hold back floodwater



A street converted to a canal using Boxwall

11. Flash flooding

The Boxwall can also be used during torrential heavy rainfall, with fast flowing water running across the surface, so-called flash flooding. Here, it is primarily about steering the water away from low entrances and threatened objects and redirecting it on towards areas that can withstand being flooded or will cause less damage. In the same way, the Boxwall can be used during snowmelt, when the water may want to take uncontrolled paths.

Even for these areas of use, the Boxwall is intended to be used on smooth and stable surfaces, such as asphalted streets.

If the water is already flowing fast in the place where you want to redirect it, you can place boxes one by one in the flowing water, to slow it down and reduce its force. The boxes are then anchored directly in place by the weight of the water that flows up onto them. To control the water current, the boxes are placed close to each other, and slightly diagonally to the direction of the current.

In the protected area behind this row of boxes, you can then, if you want, build up a continuous Boxwall of the right length and direction to direct the water where you want it to go. When this wall is finished, the front boxes can be removed.

In this way, the Boxwall can even 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.

12. Handling

The boxes fit into each other, which means that they take up very little space. Larger volumes of BW102 are delivered in plywood cases with the dimensions approx. 7 x 4.5 x 13.7. Each case holds 32 straight boxes (approx. 95 running feet) or 20 corner boxes.

The cases are also intended for storing the boxes.

The cases open from the front. With the help of the tool (located on the front of the case) you loosen the 20 green clips that hold the front and the lid in place. Use gloves! You can then easily lift or pull out the 32 (or 20) boxes. Remember how the boxes were placed so you can put them back the same way after use.

The clips between the short sides of the case and the back do not need to be loosened. These sides are preferably left in place until it is time to pack the boxes again.

The loading also takes place from the front, first the 16 boxes that should stand on the left, then the 16 that should stand on the right. See markings on the floor of the case. Between the two groups of 16 is placed the plastic pipe that acts as a support for the lid. It is placed over the small block in the floor.

To make it easier for the person who must carry the boxes (the straight ones) there are also a pair of NOAQ Carrying Sicks in the case. With such a carrying stick, placed diagonally under the centre bead, the weight of the box is balanced directly above the centre of gravity, which makes it easy to carry, see photo.



13. After use

Disconnect the boxes, by tilting the right box (the one with the pin) towards the left, it is easy to split them.

The boxes are rinsed clean with water from hose or by hand and set aside to dry. By being placed on its side, the water drains faster from the pores of the sealing strip. If there is a risk of sub-zero temperatures, the boxes must be brought inside and stored in a heated space until all the “soft parts” have had time to dry properly.

Inspect all soft parts. Any damaged or worn sealing strips can be replaced, but if the soles have major damage, the entire box must be replaced.

The boxes are stacked to take up as little space as possible during transport and storage.

Important

Floods involve a sequence of events that are controlled by natural forces and that can only be controlled to a small extent. In addition, each event is different, which means that all protective equipment must be used not only with a good knowledge of its function and limitations, but also with general good judgment. Those who provide the equipment, producers, dealers, lessors, etc., can never assume responsibility for the actual use and any personal or property damage that may occur.