

## Transport, Storage and Construction Information

### Bunker Walls

Moore Concrete Freestanding Bunker Walls are designed by Chartered Structural Engineers in accordance with Eurocodes and manufactured in accordance with BS EN 15258 Precast concrete products: retaining walls. Care must be taken during transport, offloading and installation to guarantee the integrity of the units.

The full design strength of the Retaining Walls will only be achieved after **28 days**. The date of manufacture will be specified on the product label fixed to the unit, this label also shows the unit weight. If this label is missing please contact Moore Concrete for advice.

#### **Choosing the correct product for your project**

Bunker walls of varying heights and profiles are available and suitable for retaining different materials. It is therefore important that the wall you purchase is suitable for the worst case scenario during its lifetime. The Declaration of Performance contains information on the mechanical strength of the wall however, the most onerous case can be overturning or sliding of the wall. Please refer to the table at the end of this document for suitable cases. If your case falls outside these options, please get in touch.

The table at the end of this document assumes a standard friction factor for sliding of 0.4 between two concrete surfaces. Where the bunker walls are to be placed on a power floated concrete surface, there is likely to be less friction and therefore bolts to prevent sliding may actually be required. If this is the case for your application, please raise this with the sales person and we will discuss your specific application and measures which may be taken to prevent sliding.

## Transport

- Units will be delivered on a **curtainsider trailer**, as per images below. Should delivery on a flat trailer be necessary, please advise the Sales Team asap.
- Each unit will be placed on timber laths and units will be spaced at an adequate distance apart to ensure no damage occurs to the units during transit.
  - Bunker Walls at 1.5m & 2.4m high will be transported in their upright position and will require strapping.
  - Bunker Walls at 3m, 3.6m, 4.0m and 4.3m high are transported on their side due to height restrictions & will require strapping.
- Walls should be stacked a suitable distance apart to ensure they are not damaged and strapped down securely with ratchet straps.
- The driver collecting the units from Moore Concrete will be responsible for securing and the stability of the units before departing the yard.



*2.4m Bunker Walls being transported in their upright position*



*3.0m Bunker Walls being transported on their side*

## Offloading & Storage

| Wall Type                         | Product Code | Product Weight (KG) | Lifter diameter                 |
|-----------------------------------|--------------|---------------------|---------------------------------|
| 1.5m (5') Bunker Wall             | BW5          | 1200                | 2 Nr. Rd24 sockets*             |
| 2.4m (8') Bunker Wall             | BW8          | 2100                | 1Nr. Rd24 + 1Nr. spread anchor* |
| 2.4m (8') Bunker Wall for Silage  | BW8S         | 2800                | 2Nr. Rd30 sockets               |
| 3.0m (10') Bunker Wall            | BW10         | 2800                | 2Nr. Rd24 sockets               |
| 3.0m (10') Bunker Wall for Silage | BW10S        | 3040                | 2Nr. Rd30 sockets               |
| 3.6m (12') Bunker Wall            | BW12         | 3000                | 2Nr. Rd24 sockets               |
| 4.0m (13') Bunker Wall            | BW13         | 3550                | 2Nr. Rd30 sockets               |
| 4.3m (14') Bunker wall            | BW14         | 3640                | 2Nr. Rd30 sockets               |

\*Not required for offloading, 1.5m & 2.4m standard Walls travel to site in their upright position. Table 1

Handling of the panel units should be completed by competent persons in line with a specific risk assessment and "Lifting Operations Lifting Equipment Regulations - 1998 or 1999 (NI)". If a crane is required, the installation should be completed in line with a Lift Plan in accordance with BS 7121-1:2016 'Safe Use of Cranes'.

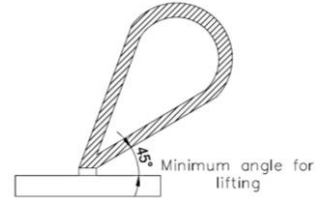
- All equipment should be checked before use, to ensure that it is in a good condition and capable of lifting the units.
- Appropriate lifting tackle & equipment should be used and also must be capable of the lifting load. Lifting Loops or Swivel Eyes can be supplied by on request along with certification. Diameter will vary depending on product weight (see table 1 above).
- Lifting Loops must not be used with an angled lift less than 45° (see diagram below)



Swivel Eye



Lifting Loop



- 1.5m & 2.4m Bunker Walls can be offloaded using suitable equipment with fork toes, as below



1.5m high Bunker Wall



2.4m high Bunker Wall

- It is advisable to use an approved mounted hook which should be secured the forks to prevent movement. (see Figure 1 & 2 Swivel Eyes, Hook & Spreader beam below). If a spreader beam is not available ensure that chain length allows for a minimum angle of 45 degrees.



Figure 1 Swivel Eyes, Hook & Spreader Beam



Figure 2 Swivel Eyes, Hook & Spreader Beam

- Offloading and storage must be carried out safely and carefully on to firm and level ground, leaving appropriate distance between unit for turning where necessary.
- The units should be laid safely on the ground on a timber skid or lathes to prevent damage to the unit when setting onto ground.

The above procedure can be viewed on a video by clicking on this link - [Offloading Video for Bunker Walls](#)

## **Installation/Turning**

During turning/installation of the units the operator must:

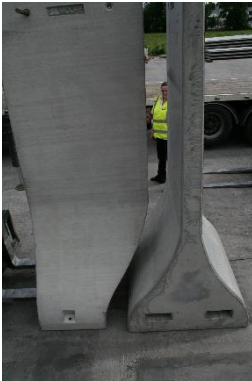
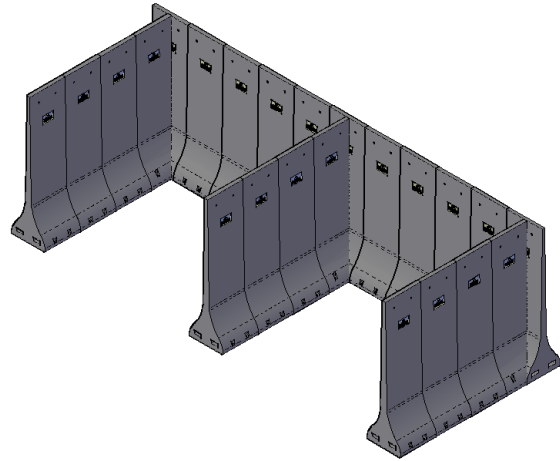
- Plan the lift ensuring the surrounding area is free from obstacles and that there are no overhead obstacles such as power lines.
- All equipment should be checked before use, to ensure that it is in a good condition and capable of lifting the units
- Insert the pin as illustrated below through the 30mm top opening/hole of the wall. (see photo's below). Turning Pin is available to purchase.
- Lift vertically and slowly, maintaining control at all times until the unit is in an upright position as illustrated below
- Before approaching the upturned bunker wall ensure that it is balanced and will not tilt or fall
- The walls can be moved into position using the fork lift recess(es) cast into the unit
- Walls must be placed on a firm level base and may require to be bolted down depending on the application. Moore Concrete Sales Team can advise.



The above procedure can be viewed on a video by clicking on this link - [Turning Video for Bunker Walls](#)

## Positioning & Fixing Corner Unit to Create Bays

- Corner walls will have a profiled base so that they sit perpendicular to a row of bunker walls
- The Corner Wall has a 20mm socket cast into the edge of the wall, this is located at the same height as the 30mm diameter openings near the top of the wall.
- Carefully guide the corner wall into position lining up with one of the holes.
- Guide the M20 mm bolt through the hole & screw into the socket cast onto the wall to secure in place. It is advisable to place a washer at either side of the hole to prevent damage to the wall



The manufacturer assumes no liability for damage incurred by improper handling.

Care should be taken to ensure that load capacities are never exceeded, wither during installation or end use.

# Technical Specification - Bunker Walls

Maximum Retained Heights & Anchoring Requirements



| Mould Name | Bunker Wall Height | Grain<br>8 kN/m <sup>3</sup> |             | Silage*<br>8 kN/m <sup>3</sup> |             | Root Vegetables<br>9 kN/m <sup>3</sup> |              | Green Waste<br>9 kN/m <sup>3</sup> |              | Fertiliser<br>12.5 kN/m <sup>3</sup> |              | Solid Fuel (Coal)<br>11 kN/m <sup>3</sup> |              | Aggregate<br>20 kN/m <sup>3</sup> |             | Road Salt<br>20 kN/m <sup>3</sup> |             | Soil<br>20 kN/m <sup>3</sup> |             |             |             |
|------------|--------------------|------------------------------|-------------|--------------------------------|-------------|--|--------------|------------------------------------|--------------|--------------------------------------|--------------|---|--------------|-----------------------------------|-------------|-----------------------------------|-------------|------------------------------|-------------|-------------|-------------|
|            |                    | Level Fill                   | Surcharged  | Level Fill                     | Surcharged  | Level Fill                             | Surcharged   | Level Fill                         | Surcharged   | Level Fill                           | Surcharged   | Level Fill                                | Surcharged   | Level Fill                        | Surcharged  | Level Fill                        | Surcharged  | Level Fill                   | Surcharged  |             |             |
| BW5        | 1.5m (5')          | ✓                            | ✓           | Unsuitable                     | Unsuitable  | ✓                                      | ✓            | ✓                                  | ✓            | ✓                                    | ✓            | ✓   | ✓            | ✓                                 | ✓           | ✓                                 | ✓           | ✓                            | ✓           |             |             |
|            | Anchor Req         | Not required                 | 2 M16 Bolts |                                |             | Not required                           | 2 M16 Bolts  | Not required                       | 2 M16 Bolts  | Not required                         | 2 M16 Bolts  | Not required                              | 2 M16 Bolts  | Not required                      | 2 M16 Bolts | 2 M16 Bolts                       | 2 M16 Bolts | 2 M16 Bolts                  | 2 M16 Bolts | 2 M16 Bolts | 2 M16 Bolts |
| BW8        | 2.4m (8')          | ✓                            | ✓           |                                |             | Not required                           | 4 M16 Bolts  | Not required                       | 4 M16 Bolts  | Not required                         | 4 M16 Bolts  | 2 M16 Bolts                               | 4 M16 Bolts  | 4 M16 Bolts                       | 4 M16 Bolts | 4 M16 Bolts                       | 4 M16 Bolts | 4 M16 Bolts                  | 4 M16 Bolts | 4 M16 Bolts | 4 M16 Bolts |
|            | Anchor Req         | Not required                 | 2 M16 Bolts |                                |             | Not required                           | 4 M16 Bolts  | Not required                       | 4 M16 Bolts  | Not required                         | 4 M16 Bolts  | 2 M16 Bolts                               | 4 M16 Bolts  | 2 M16 Bolts                       | 4 M16 Bolts | 4 M16 Bolts                       | 4 M16 Bolts | 4 M16 Bolts                  | 4 M16 Bolts | 4 M16 Bolts | 4 M16 Bolts |
| BW10/12    | 3.0m (10')         | ✓                            | ✓           |                                |             | Not required                           | 4 M16 Bolts  | Not required                       | 4 M16 Bolts  | Not required                         | 4 M16 Bolts  | 2 M16 Bolts                               | 4 M16 Bolts  | 2 M16 Bolts                       | 4 M16 Bolts | 4 M16 Bolts                       | 4 M16 Bolts | 4 M16 Bolts                  | 4 M16 Bolts | 4 M16 Bolts | 4 M16 Bolts |
|            | Anchor Req         | Not required                 | 4 M16 Bolts | Not required                   | 4 M16 Bolts | Not required                           | 4 M16 Bolts  | Not required                       | 4 M16 Bolts  | 2 M16 Bolts                          | 4 M16 Bolts  | 2 M16 Bolts                               | 4 M16 Bolts  | 4 M16 Bolts                       | 4 M20 Bolts | 4 M16 Bolts                       | 4 M20 Bolts | 4 M16 Bolts                  | 4 M20 Bolts |             |             |
|            | Anchor Req         | 4 M16 Bolts                  | 4 M16 Bolts | 4 M16 Bolts                    | 4 M16 Bolts | 4 M16 Bolts                            | 4 M16 Bolts  | 4 M16 Bolts                        | 4 M16 Bolts  | 4 M20 Bolts                          | 4 M16 Bolts  | 4 M20 Bolts                               | 4 M16 Bolts  | Unsuitable                        | 4 M16 Bolts | Unsuitable                        | 4 M16 Bolts | Unsuitable                   | Unsuitable  |             |             |
| BW14       | 2.4m (8')          | ✓                            | ✓           | Unsuitable                     | Unsuitable  | ✓                                      | ✓            | ✓                                  | ✓            | ✓                                    | ✓            | ✓   | ✓            | ✓                                 | ✓           | ✓                                 | ✓           | ✓                            | ✓           |             |             |
|            | Anchor Req         | Not required                 | 2 M16 Bolts |                                |             | 4 M16 Bolts                            | Not required | 2 M16 Bolts                        | Not required | 2 M16 Bolts                          | Not required | 4 M16 Bolts                               | Not required | 2 M16 Bolts                       | 2 M16 Bolts | 4 M16 Bolts                       | 2 M16 Bolts | 4 M16 Bolts                  | 2 M16 Bolts | 4 M16 Bolts | 4 M16 Bolts |
| BW14       | 3.0m (10')         | ✓                            | ✓           |                                |             | Not required                           | 4 M16 Bolts  | Not required                       | 4 M16 Bolts  | Not required                         | 4 M16 Bolts  | 2 M16 Bolts                               | 4 M16 Bolts  | 4 M16 Bolts                       | 4 M16 Bolts | 4 M20 Bolts                       | 4 M16 Bolts | 4 M20 Bolts                  | 4 M16 Bolts | 4 M20 Bolts |             |
|            | Anchor Req         | Not required                 | 4 M16 Bolts |                                |             | 4 M20 Bolts                            | 4 M16 Bolts  | 4 M16 Bolts                        | 4 M16 Bolts  | 4 M16 Bolts                          | 4 M16 Bolts  | 2 M16 Bolts                               | 4 M16 Bolts  | 4 M16 Bolts                       | 4 M16 Bolts | 4 M20 Bolts                       | 4 M16 Bolts | 4 M20 Bolts                  | 4 M16 Bolts | 4 M20 Bolts | 4 M16 Bolts |
| BW14       | 3.6m (12')         | ✓                            | ✓           |                                |             | 4 M16 Bolts                            | 4 M16 Bolts  | 4 M16 Bolts                        | 4 M16 Bolts  | 4 M16 Bolts                          | 4 M24 Bolts  | 4 M16 Bolts                               | 4 M20 Bolts  | 4 M16 Bolts                       | 4 M16 Bolts | 4 M16 Bolts                       | 4 M16 Bolts | 4 M16 Bolts                  | 4 M16 Bolts | 4 M16 Bolts | 4 M16 Bolts |
|            | Anchor Req         | 4 M16 Bolts                  | 4 M16 Bolts | Unsuitable                     | Unsuitable  | 4 M16 Bolts                            | 4 M24 Bolts  | 4 M16 Bolts                        | 4 M24 Bolts  | 4 M16 Bolts                          | Unsuitable   | 4 M16 Bolts                               | Unsuitable   | 4 M24 Bolts                       | Unsuitable  | Unsuitable                        | 4 M24 Bolts | Unsuitable                   | Unsuitable  |             |             |
| BW13       | 4.0m (12')         | ✓                            | ✓           | 4 M16 Bolts                    | 4 M24 Bolts | 4 M16 Bolts                            | 4 M24 Bolts  | 4 M16 Bolts                        | 4 M16 Bolts  | Unsuitable                           | 4 M16 Bolts  | Unsuitable                                | Unsuitable   | Unsuitable                        | Unsuitable  | Unsuitable                        | Unsuitable  | Unsuitable                   | Unsuitable  |             |             |
|            | Anchor Req         | 4 M16 Bolts                  | 4 M24 Bolts | Unsuitable                     | Unsuitable  | 4 M16 Bolts                            | 4 M24 Bolts  | 4 M16 Bolts                        | 4 M16 Bolts  | Unsuitable                           | 4 M16 Bolts  | Unsuitable                                | Unsuitable   | Unsuitable                        | Unsuitable  | Unsuitable                        | Unsuitable  | Unsuitable                   | Unsuitable  |             |             |
| BW14       | 4.3m (12')         | ✓                            | ✓           | 4 M16 Bolts                    | Unsuitable  | 4 M16 Bolts                            | Unsuitable   | 4 M20 Bolts                        | Unsuitable   | 4 M20 Bolts                          | Unsuitable   | Unsuitable                                | Unsuitable   | Unsuitable                        | Unsuitable  | Unsuitable                        | Unsuitable  | Unsuitable                   | Unsuitable  |             |             |
|            | Anchor Req         | 4 M16 Bolts                  | Unsuitable  | Unsuitable                     | Unsuitable  | 4 M16 Bolts                            | Unsuitable   | 4 M20 Bolts                        | Unsuitable   | 4 M20 Bolts                          | Unsuitable   | Unsuitable                                | Unsuitable   | Unsuitable                        | Unsuitable  | Unsuitable                        | Unsuitable  | Unsuitable                   | Unsuitable  |             |             |

A standard friction factor for sliding of 0.4 between two concrete surfaces has been assumed. Where the bunker walls are to be placed on a power floated concrete surface, there is likely to be less friction and therefore bolts to prevent sliding may be required. If this is the case for your application, please raise this with the sales person and we will discuss your specific application and measures which may be taken to prevent sliding. Where bolting down is required, units should be bolted to a reinforced concrete slab or foundation with a minimum reinforcement of 1No. sheet of A393 mesh positioned 50mm from the top surface of the slab surface. The slab should extend at least 1m from the bunker wall. Where units are used to retain silage, the slab must be detailed as per the drawing supplied by the Sales Team.