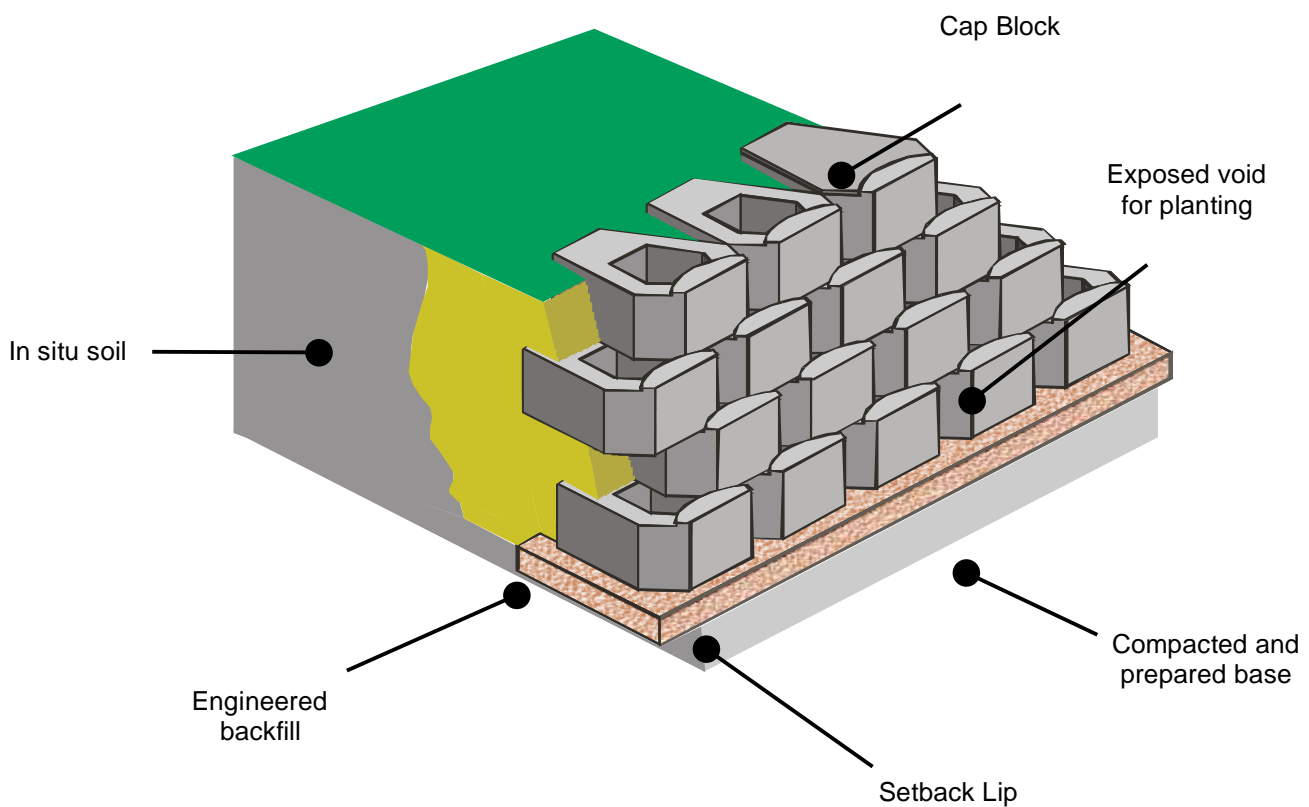


# ARMOR-BLOCK

## Installation guide





## Installation Manual: ARMOR-BLOCK Retaining Wall System

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### FOUNDATIONS

Foundation soils on which the ARMOR-BLOCK system will be placed must be stiff, firm, and have sufficient capacity to support the weight of the retaining wall. Any loose, soft, or compressible material should be removed and replaced with properly compacted backfill. The bearing capacity of the foundations should be specifically designed by a registered engineer.

ARMOR-BLOCK retaining walls up to 5 blocks high are typically placed on a prepared base that is 1600 mm wide and 250 mm deep. The base should be constructed from hard fill with a particle size less than 65 mm (GAP65 or a suitable equivalent) that is compacted to the requirements of a registered engineer.

Care should be taken to ensure the prepared base is both flat and level. A uniform, level base will accelerate the construction of the entire wall and prevent any misalignment of the blocks up the height of the wall.

A layer of sand (GAP 7 or equivalent) approximately 25 mm thick should be placed on top of the prepared base surface. The sand should be screeded to achieve a flat surface that is level both along and across prepared base. The out of tolerance of the sand layer should not exceed +/- 5 mm.

If the planned grade along the wall frontage is required to change elevation, the prepared base may be stepped in 1000 mm increments (equivalent to one ARMOR-BLOCK height). The prepared base surface should always be started at the lowest level and worked upward.

Rigid concrete footings are not required nor recommended. Because the ARMOR-BLOCK units are installed without mortar they are free to move in relation to each other. A degree of flexibility in the foundation of the ARMOR-BLOCK retaining walls allows the blocks to accommodate minor deflections without damage occurring to the structure.

### PLACING BOTTOM COURSE

Make sure that the prepared surface is level and begin placing the base course units. If the levelling pad is stepped, begin at the lowest point and place the entire length of the lowest course before proceeding to the next course.

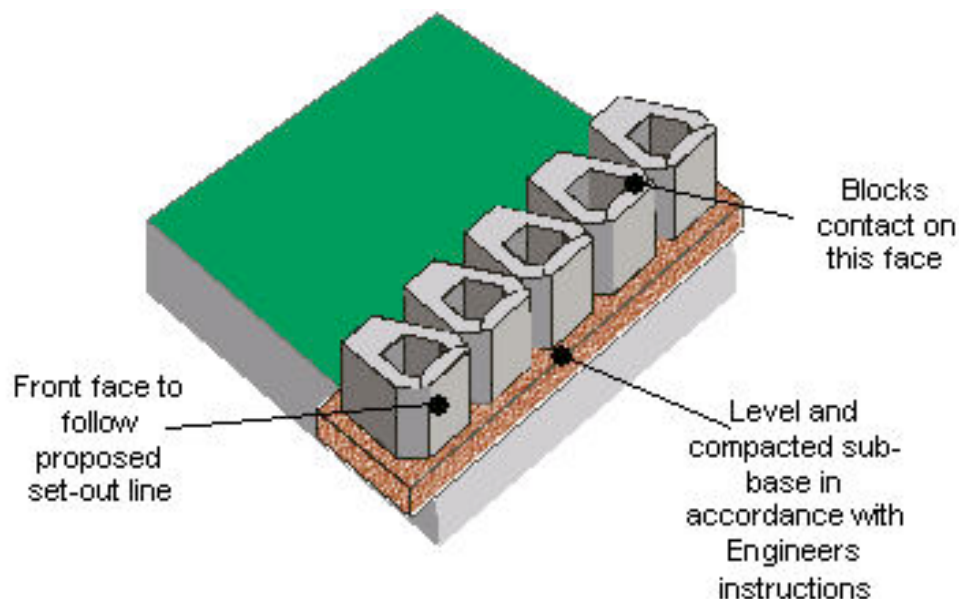
## Installation Manual: ARMOR-BLOCK Retaining Wall System

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The units should be lifted into place using the Swift-Lift anchors located in the top face of the blocks. The location of the Swift-Lift points ensures the blocks hang slightly down at the front to facilitate placement. The blocks are typically lifted and placed using an excavator or directly from the delivery vehicle using a truck mounted hiab.

Lower the ARMOR-BLOCK units directly into position, taking care not to disturb the prepared base. It is recommended that the blocks be suspended approximately 25 mm above the prepared base in the correct lateral location and then lowered down into the correct position. Each block should be checked for level both across and along the length of the wall. Care should be taken to ensure the top of adjacent blocks form a flat plane to facilitate the placement of subsequent courses.

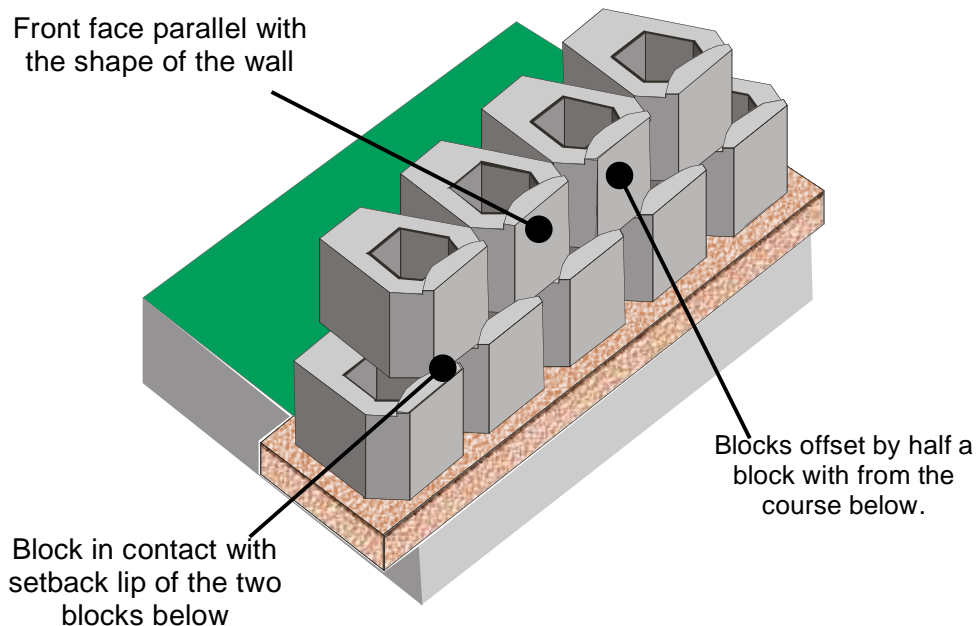
The blocks should be placed to ensure a tight fit of the vertical surfaces on the widest part of the block, as shown below. A string line may be helpful for obtaining the correct placement of blocks in a straight wall. The front face of the blocks should directly follow the shape of the required wall. See the note in a subsequent section for guidance on placing blocks in curved walls.



### PLACING ADDITIONAL COURSES

Sweep the top of the installed units to remove any debris that may interfere with the placement of additional courses. Blocks in additional courses are placed offset by half a unit width to the course below to maintain a “running bond” pattern, as shown below. Blocks should be moved into location until the front edge of the block engages with the front lip on the top surfaces of the blocks below. The block should then be lowered into position and dragged forward until in full contact with the front lips on the blocks below.

For curved walls, the blocks should be orientated at half of the angle between the two blocks below (bisect the angle). This ensures the face of the block is always oriented parallel to the direction of the wall. Correct alignment of the blocks will ensure the wall is erected quickly and will prevent misalignment of the blocks in subsequent courses.



### BACKFILLING

The ARMOR-BLOCK units should be back filled with standard concrete. It is important that drainage requirements for individual walls should follow the instructions of a registered engineer.

As each successive course of ARMOR-BLOCK units is set back from the previous it is preferable to backfill behind each course before the next is laid. Proper placement and compaction of backfill is important for the stability of a retaining wall and the backfilling of the ARMOR-BLOCK retaining wall should follow the instruction of a registered soils engineer.

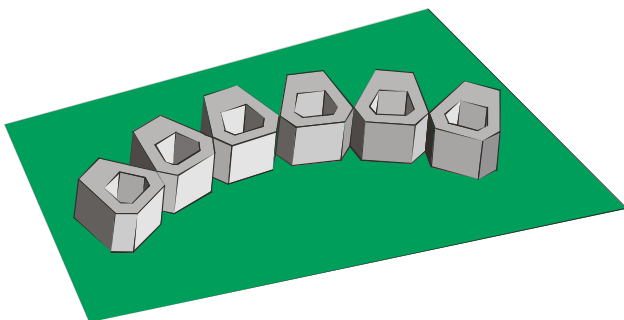
Fill material can be placed in the voids of the ARMOR-BLOCK to increase the stability of the wall. Any fill material placed in the void must be undertaken before the next course is laid to allow adequate access to the voids. Topsoil may be placed in the top 400 mm of the void to allow for planting in the exposed void area after the wall is constructed.

### CURVES

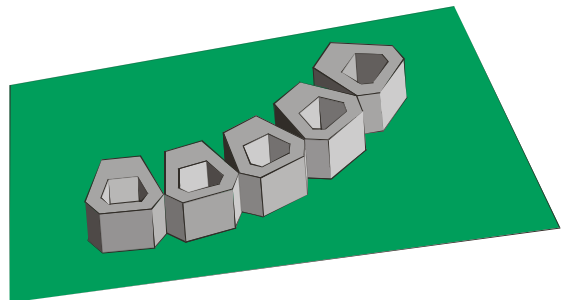
The trapezoidal shape of the ARMOR-BLOCK permits construction of concave, convex, and serpentine curves. The general construction requirements described in this guide (levelling pad preparation, placement and backfilling) remain the same for a curved installation.

As each successive course of ARMOR-BLOCKS is set back from the previous by approximately 200 mm, the radius of the curve for each course varies up the height of the wall. Care must be taken with the initial setout of a curved wall to ensure the correct half block offset (running bond) pattern is maintained.

With concaved walls (inside curve) the effective bend radius of each successive course increases up the height of the wall. There is no minimum bend radius for concaved walls, however gaps may appear between adjacent blocks while maintaining the correct running bond pattern. The size of the gaps will increase in successive course up the height of the wall. Filler panels can be located in the vertical grooves of adjacent ARMOR-BLOCK units to bridge these gaps.



**Concaved (inside curve)**



**Convex (outside curve)**



## Installation Manual: ARMOR-BLOCK Retaining Wall System

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The radius of a convex curve (outside curve) will increase up the height of an ARMOR-BLOCK wall. Care must be taken when placing the bottom blocks of the curve to allow a suitable lateral clearance between blocks. This will ensure the top course of blocks can be installed without clashing while maintaining the correct running bond pattern. Spaces between the blocks should be filled with spacer panels using the vertical groves on the sides of the ARMOR-BLOCK. The minimum allowable radius for the top course of a convex wall is 2.3 m. The minimum radius of the bottom course of blocks can be calculated using the table below.

Number of Courses	Minimum Allowable Radius of the Bottom Course
1	2.3 m
2	2.5 m
3	2.7 m
4	2.9 m
5	3.1 m
6	3.3 m

### Additional Features

If speed of erection is required the voids of the ARMOR-BLOCK units can be filled with concrete. Additional corrosion resistant reinforcement can also be added to provide strength to the wall allowing for taller walls. Advice on these features should be sought from a registered engineer.

ARMOR-BLOCK retaining walls in excess of 6 m can be achieved with use of geo-textile reinforcement, oversized base blocks, and ground anchor ties. Please contact CSP Pacific to discuss these options.



# Installation Manual: ARMOR-BLOCK Retaining Wall System

## Design Table – ARMOR-BLOCK

**Sandy Gravel**

		Slope (Degrees)						
Blocks High		0	5	10	15	20	25	30
No Traffic	1							
	2							
	3							
	4							
	5							

**Traffic**

1								
2								
3								
4								

**Loose Sand**

		Slope (Degrees)						
Blocks High		0	5	10	15	20	25	30
No Traffic	1							
	2							
	3							
	4							
	5							

**Traffic**

1								
2								
3								
4								

**Silty Sand**

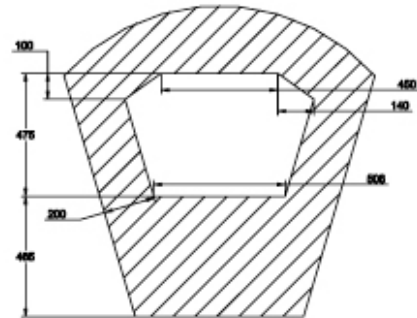
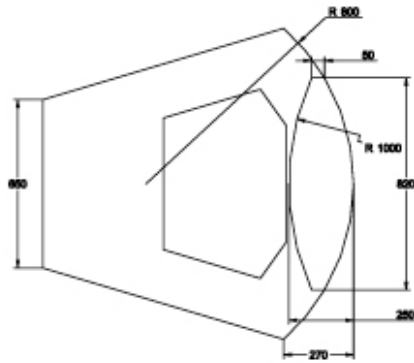
		Slope (Degrees)						
Blocks High		0	5	10	15	20	25	30
No Traffic	1							
	2							
	3							
	4							
	5							

**Traffic**

1								
2								
3								
4								

Note: Yellow Boxes are zones that need additional support (bigger foundations, tie backs, geotextile grid, etc)  
 Traffic loading assumes a 12 kPa loading in accordance with Transit New Zealand recommendations  
 Conservative estimates of soil properties (ie. A specific design will give much better results)

## Profile Drawings



SECTION A-A

