

# FREESTONE ECO

*Retaining Wall System*

The Freestone ECO Retaining Wall System™ is a more sustainable DIY, vertical retaining wall which is manufactured with up to 40% recycled glass aggregate to provide unique smooth surface finishes that glistens in the light.



Ebony

Patent no. 2012216310



Mist

- **Prestige & quality**
- **DIY vertical wall**
- **Large blocks - 10/m<sup>2</sup>**
- **Smooth surface finish**
- **No concrete footings**



Limestone

*“No one knows Blocks and Pavers better”*

## **Freestone ECO retaining walls are suitable for most retaining or garden wall situations, engineering design assistance is available.**

Each Freestone ECO block has self-locating lugs which easily lock into the block above to provide a vertical wall. Purpose made 90 degree corner and bullnose capping are available to provide a complete system. Freestone ECO blocks have a minimal setback which allows all available space to be utilised to the maximum. The large sized hollow blocks allow for steel reinforcing and concrete core fill where required, providing an earthquake resistant wall which can also accommodate fences and services.

There are two high quality surface finishes available, a smooth finish and an exposed aggregate finish. To enhance the unique surface finish and highlight the glass aggregate features, Freestone ECO can be sealed with a proprietary masonry surface sealer.

# **CONSTRUCTION METHODS**

## **The Freestone ECO Retaining Wall System™ can be built using three different construction methods.**

The most suitable method to build the Freestone ECO wall is always selected with consideration to the overall wall height, soil conditions and any loads that impact on the retaining wall such as vehicle traffic, fences or steep slopes.



### **OPTION 1 Backfilled with 300mm wide blue metal drainage layer**

This is a common method for building low non load bearing gravity garden wall. Freestone ECO blocks are built over a compacted gravel footing on a 25mm sand bed; all blocks are filled with 20 mm blue metal. An ag-pipe drain is set up at the back of the wall base and then subsequently backfilled with a 300mm drainage layer.

Suitable for low walls dependant on soil conditions and any loads, refer to design table 1.



### **OPTION 2 Backfilled with no-fines concrete drainage layer**

Per option 1, Freestone ECO blocks are built as a gravity wall over a compacted gravel footing on a 25mm sand bed. However, to increase the strength of the wall and therefore build higher walls, the blue metal block infill and drainage layer in option 1 is replaced with a "no-fines" concrete mix which both strengthens and increases the mass of the wall. The "no-fines" concrete still allows water to flow into the drain below.

Suitable for walls up to 2 metres high subject to engineers design. Refer to design table 2.



### **OPTION 3 Reinforced and concrete filled on a concrete footing**

Freestone ECO blocks are built on a reinforced concrete footing. The Freestone ECO blocks are simply stacked together and reinforced with horizontal and vertical steel, placed in the purpose made locations within the blocks. The blocks are then core filled with concrete to form a reinforced block retaining wall, without the use of mortar.

Suitable for walls up to 3 metres high subject to engineers design. Refer to design table 3.

# INSTALLATION GUIDE



## Step 1 - Base Preparation

Dig out trench approx. 250mm deep. The trench should be 600mm wide. Place and well compact 150mm to 200mm of fine crushed rock (gravel). This base thickness depends on the wall height e.g. 200mm thick for 1 metre high, extra thickness for higher walls may be required, subject to engineers design.



## Step 2 - Sand Bed

Spread 25mm of either sharp sand or metal dust over the compacted base. This should be in a straight line and checked with a level. If the wall is stepped, start at the lowest point.



## Step 3 - Laying 1st Course

The first block course is now bedded into the sand bed. The use of a level and string line is recommended to ensure that the first course is laid correctly. For walls up to 1 metre high, make sure at least 100mm of the first block course is buried below the finished ground level. Allow approx. 200mm for walls over 1 metre high and 300mm for walls over 2 metres high. Compact gravel along the front of the blocks to stabilise.



## Step 4 - Drainage & Backfill

Place P.V.C. ag-pipe with a geotextile sock drain behind the wall, with a 1 in 100 fall. Backfill behind the blocks 300mm wide, with clean, free-draining material (eg. 20mm blue metal). Ensure that each block is also filled with free-draining material. Backfill behind the drainage layer with your chosen backfill material in a maximum of 200mm layers. Compaction rate of 95% must be achieved (use only hand operated plate compactors close to wall). Do not use soft or wet clay to backfill. Be careful not to mechanically compact too close to the wall.



## Step 5 - Laying Additional Courses

Lay the next course and subsequent courses to a string line following the same procedure, as outlined previously, ie. clean the top of the blocks, fill the block cores and form a 300mm drainage layer behind the blocks, backfilling in max. 250mm layers, as per step 4. Ensure backfill is compacted to 95%. Corner blocks require adhesive fixing with Landscape Liquid Nails or Anchorloc 2-part epoxy.



## Step 6 - Laying Capping Units

Once backfilling and cleaning is completed as per step 5, fix the purpose made Freestone ECO Capping blocks with adhesive. Landscape Liquid Nails or Anchorloc 2-part epoxy is recommended.



## Step 7 - Sealing

To enhance the unique surface finish and highlight the glass aggregate features, Freestone Eco Blocks and capping can be sealed with a proprietary masonry surface sealer. There are two high quality finishes available, a smooth finish and an exposed aggregate shot blasted finish.

Smooth Finish - Sealing is recommended  
Exposed Aggregate Finish - Sealing is optional only

**View DIY installation video at**

**[www.islandblock.com.au/sustainable-products/freestone-eco-system-2/](http://www.islandblock.com.au/sustainable-products/freestone-eco-system-2/)**



# WALL HEIGHT DESIGN TABLES

## Maximum Wall Heights For Freestone ECO Block Retaining Walls

(Tables are a guide only and subject to an engineer's final design)

**TABLE 1**

Maximum wall heights for Freestone ECO gravity retaining walls, backfilled with a 300mm blue metal drainage layer.

**TABLE 2**

Maximum wall heights for Freestone ECO gravity retaining walls, backfilled with no fines concrete to the specified width behind the wall.

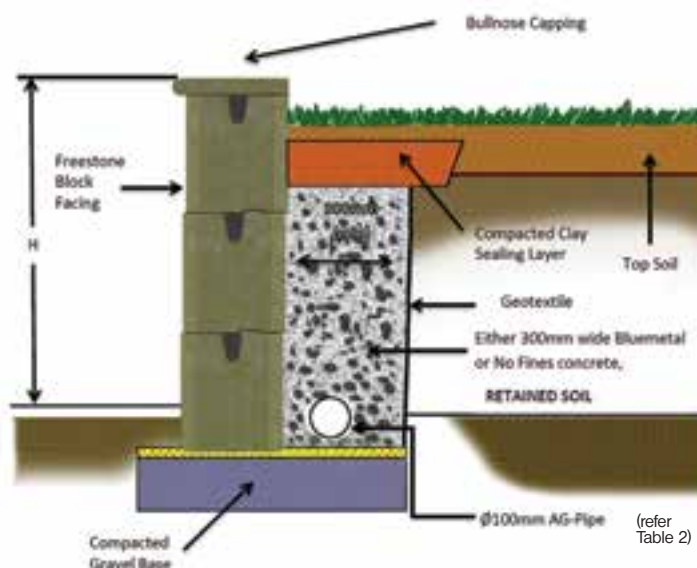
**TABLE 3**

Indicative wall heights for Freestone ECO retaining walls, laid on a reinforced concrete footing and reinforced with vertical and horizontal steel as specified.

**TABLE 1**

Freestone ECO Gravity Wall backfilled with 300mm blue metal drainage layer.

Maximum Wall Height 'H' (m)		
Backslope Conditions/Loadings	Wall Height	Retained Soil Types
Level with: No Surcharge	0.6	Type 1
	0.7	Type 2
	0.7	Type 3
Level with: Domestic Vehicles	0.5	Type 1
	0.6	Type 2
	0.6	Type 3
1:4 with: No Surcharge	0.5	Type 1
	0.6	Type 2
	0.6	Type 3
1:4 with: Domestic Vehicles	0.5	Type 1
	0.5	Type 2
	0.6	Type 3



**TABLE 2**

Freestone ECO Gravity Wall backfilled with no fines concrete drainage layer.

Maximum Wall Height 'H' (m)*					
Backslope Conditions/Loadings	Wall Height (m)	Base thickness (m)	Width of no fines concrete		
			Width of no fines concrete backfill behind blocks		
			Type 1	Type 2	Type 3
Level with: No Surcharge	1.0	0.20	0.35	0.3	0.3
	1.25	0.20	0.45	0.45	0.35
	1.5	0.25	0.65	0.65	0.55
	1.75	0.30	0.95	0.95	0.85
	2.0	0.35	*	1.15	1.15
Domestic Vehicles	1.0	0.15	0.55	0.45	0.45
	1.25	0.20	0.65	0.65	0.55
	1.5	0.25	0.95	0.75	0.75
	1.75	0.30	1.25	1.05	1.05
	2.0	0.35	1.55	1.35	1.15
1:4 Backslope	1.0	0.15	0.65	0.55	0.55
	1.25	0.20	0.85	0.75	0.75
	1.5	0.25	1.45	1.15	0.95
	1.75	0.30	*	1.55	1.25
	2.0	0.35	*	1.75	1.75

### No-Fines Concrete Backfill/Infill Spec.

No-fines concrete infill placed behind retaining walls shall be free-draining, allowing water to pass readily through it to the drainage system. In its unhardened state, no-fines concrete shall have low slump and shall not exert a lateral pressure in excess of 4 kPa per metre depth on the retaining wall facing restraining it. No-fines concrete used to provide enhanced stability to a retaining wall shall have a bulk density not less than 1800 kg/m<sup>3</sup>. No-fines concrete shall form a coherent mass, capable of adhering to the retaining wall facing.

No-fines concrete shall meet the following specs:

- Aggregate to GP cement ratio shall be not greater than 6 : 1
- Aggregate shall be GP (poorly graded) nominal 20mm crushed rock.
- Compressive strength shall be not less than 10 MPa.

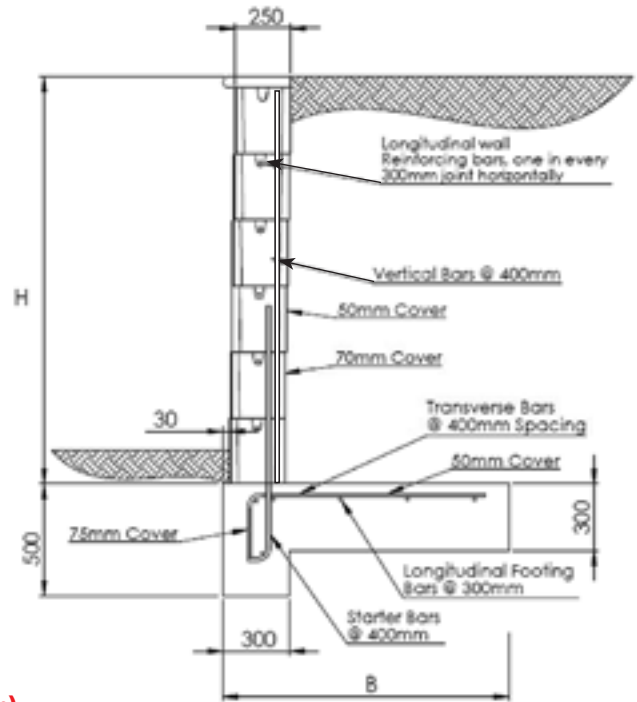
### Construction Notes

- 1 Blocks should be backfilled with no-fines concrete every 2 courses (500mm) high, blocks should be filled first prior to backfilling behind the wall to reduce pressure.
- 2 Blocks should be wetted prior to core filling to increase flow of no-fines concrete.
- 3 At least 25% of Freestone ECO block wings should be removed from the rear of the blocks prior to backfilling.

**TABLE 3**

Freestone ECO Reinforced Retaining Wall laid on a reinforced concrete footing.

Wall Height (m)	Base Width (m)	Starter Bar Type	Min. Bar Lap (mm)	Transverse Bar Type	Longitudinal Bar Type	Soil Types
1.25	1.4	N12	500	N12	N12	Type 1
	1.2	N12	500	N12	N12	Type 2
	1.0	N12	500	N12	N12	Type 3
1.5	1.5	N12	700	N16	N12	Type 1
	1.3	N16	700	N16	N16	Type 2
	1.1	N16	700	N16	N16	Type 3
1.75	1.6	N16	700	N16	N16	Type 1
	1.4	N16	700	N16	N16	Type 2
	1.2	N16	700	N16	N16	Type 3
2.0	1.8	N20	700	N20	N16	Type 1
	1.6	N16	700	N16	N16	Type 2
	1.4	N16	700	N16	N16	Type 3
2.25	2.1	N20	700	N20	N16	Type 1
	1.8	N16	700	N16	N16	Type 2
	1.5	N10	700	N16	N16	Type 3



(Tables are a guide only and subject to an engineer's final design)

# CONSTRUCTION NOTES

## Soil Type Descriptions

### TYPE 1 SOILS

Includes soft and firm clay, fine sands, silty clays.  
Internal Friction Angle  $\geq 20^\circ - 24^\circ$

### TYPE 2 SOILS

Includes stiff sandy clays and gravelly clays  
Internal Friction Angle  $\geq 25^\circ - 30^\circ$

### TYPE 3 SOILS

Includes FCR, rock, sandstone and gravels.  
Internal Friction Angle  $\geq 30^\circ+$

- The following assumptions have been made regarding soil properties:
  - Infill Soil Types – As Above: Internal Friction Angle  $\geq 20^\circ - 30^\circ+$
  - Bearing Pad
    - Compacted density angle: at least 18.6 kg/m<sup>3</sup>
    - Effective internal friction angle: at least 37°
    - Effective Cohesion: at least 5kPa
- Caution is required when using heavy or dry clays as retained soil or backfill.
- Surcharge loads are as follows:
  - Domestic Vehicles – 500 kg/m<sup>2</sup> (5 kPa)
  - Heavy Vehicles – To be separately assessed
- Drainage shall be supplied in the form of a slotted P.V.C. ag-pipe with geotextile sock drain (fall at 1:100 min. to S/W disposal system) or with weep holes. A 300mm drainage layer shall be provided behind the wall.
- Table 1 gravity wall design table should be used for low, non-structural garden walls only.
- Wall embedment is critical, ensure embedment parameters are followed and compacted fill is placed in front of wall.
- For backslope conditions greater than 1 in 4, seek specific engineering advice. Vehicle traffic should be allowed no closer than 1 metre behind the wall.

**Engineering - To comply with most council requirements, please seek specific engineering advice for walls over 1 metre high or for low walls carrying vehicle traffic, etc.**









# FREESTONE ECO

Retaining Wall System

**ECO PRODUCTS** (Made with recycled glass aggregate)

**EXPOSED AGGREGATE PRODUCTS**

RETAINING WALL RANGE	Colours	Number Per m <sup>2</sup> (Approx)	Number Per Pallet	Number Per Tonne
<b>Freestone Eco Block</b> 400 x 240 x 250mm 	Ebony, Limestone, Mist, Pewter.	10	48	43
<b>Freestone Eco Corner Block</b> 440 x 240 x 250mm 	Ebony, Limestone, Mist, Pewter.	N/A	40	35
<b>Bullnose Capping</b> 300 x 300 x 50mm 	Bluestone, Limestone, Mist, Pewter.	3.33 per linear metre	192	92
<b>Freestone Eco Block Exposed</b> 400 x 240 x 250mm 	Ebony, Limestone, Mist, Pewter.	10	48	43
<b>Freestone Eco Corner Exposed</b> 440 x 240 x 250mm 	Ebony, Limestone, Mist, Pewter.	N/A	40	35
<b>Square Edge Eco Capping Exposed</b> 400 x 300 x 50mm 	Ebony, Limestone, Mist, Pewter.	2.5 per linear metre	144	75

**STANDARD FINISH COLOURS AVAILABLE (sealing is recommended):**



**EXPOSED AGGREGATE FINISH COLOURS AVAILABLE (sealing is optional):**



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Pavers



Retaining Walls



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Stone



Landscaping

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