

# MAGNUMSTONE EXTENDERS

*retaining walls installation manual*



# CONTENTS

## *MagnumStone Extenders Technical Manual*

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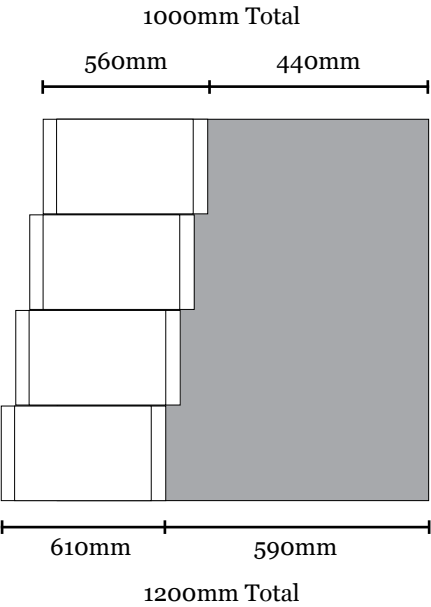
# MAGNUMSTONE EXTENDERS

## Overview

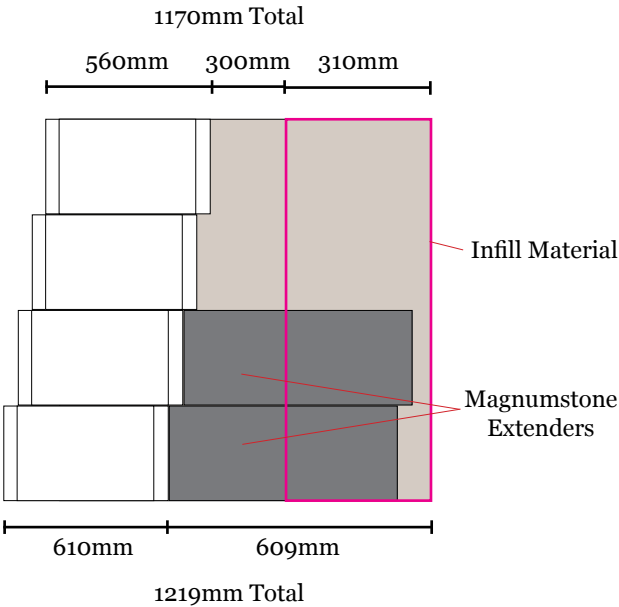
The MagnumStone Extenders system is an innovative product which links a concrete extender to MagnumStone units. MagnumStone Extenders act in a similar function to geogrid materials, by creating an anchor thats embedded under backfill materials and held in place by materials laid on top of them to secure them in place and support the wall in resisting lateral forces.

The example below compares MagnumStone when used with no fines concrete, a commonly used retaining wall construction system, with the use of MagnumStone extenders, which achieve the same outcome.

### MagnumStone and No Fines Concrete

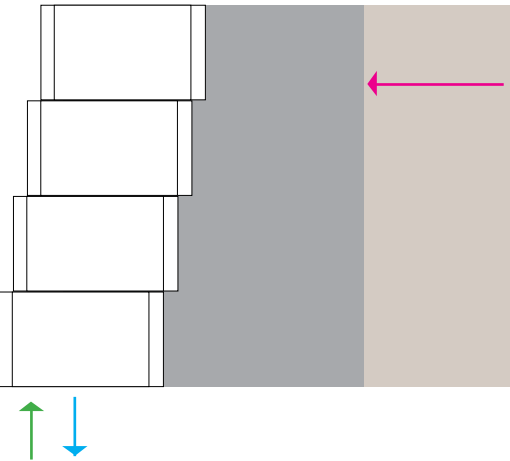


### MagnumStone and Extenders



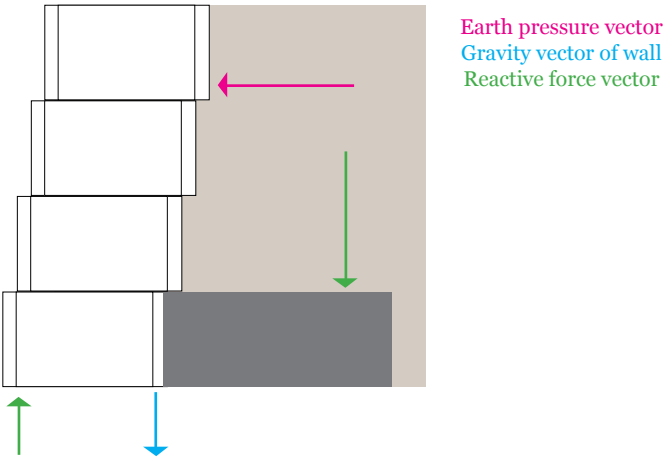
## How the systems work

### MagnumStone and No Fines Concrete



MagnumStone with No Fines Concrete uses a gravity wall system which retains the earth behind it, mainly through its own weight.

### MagnumStone and Extenders



MagnumStone Extenders use a cantilever wall system which utilises the same earth pressure trying to topple the wall to stabilise itself with a second lever arm.

# MAGNUMSTONE EXTENDER VS NO FINES CONCRETE

## A Simple Comparison

Based on the design shown on the opposite page, an estimation of costs based on quotes for materials and installation in Sydney, New South Wales, has been provided to give a better understanding of the savings that can be achieved when using the MagnumStone Extenders system instead of No Fines Concrete.

As the below identifies, the key savings achieved are captured primarily through substitution of no fines concrete, an expensive material required in considerable volumes for this application, with MagnumStone extenders together with aggregate and backfill materials which are considerably more affordable.

MagnumStone and No Fines Concrete		MagnumStone and Extenders	
Wall Height - 4 blocks	2.4 m	Wall Height - 4 blocks	2.4 m
Length of Wall	50 m	Length of Wall	50 m
m2 of wall	120 m <sup>2</sup>	m2 of wall	120 m <sup>2</sup>
no. of Blocks	162 units	no. of Blocks	162 units
Depth of No Fines Concrete (from wall face)	1 m	<b>no. of Short Extenders (2nd Course)</b>	<b>81 units</b>
Void per Block	0.18 m <sup>3</sup>	Void per Block	0.18 m <sup>3</sup>
Void behind Block wall	0.38 m <sup>3</sup>	Additional void for drainage material	0.22 m <sup>3</sup>
		Depth of infill/backfill material	0.31 m <sup>3</sup>
		<b>Volume of Aggregate</b>	<b>64.92 m<sup>3</sup></b>
		<b>Volume of Backfill</b>	<b>37.02 m<sup>3</sup></b>
<b>Volume of No Fines Concrete</b>	<b>91.25 m3</b>		
		Cost of Short Extender	79 each
		<b>Cost of Aggregate</b>	<b>64 \$/m<sup>3</sup></b>
<b>Cost of No Fines Concrete</b>	<b>180 \$/m<sup>3</sup></b>	<b>Cost of Backfill</b>	<b>45 \$/m<sup>3</sup></b>
<b>Total Cost</b>	<b>\$16,424.75</b>	<b>Total Cost</b>	<b>\$12,220.24</b>

**Saving = 25.60%**

All figures noted above are based on a 1 metre high retaining installed in good soils and with supply of materials and installation in Sydney, New South Wales. Pricing noted has been quoted by independant third parties.



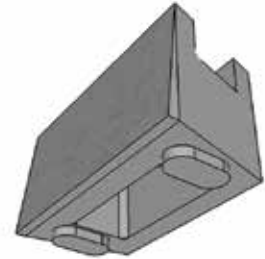
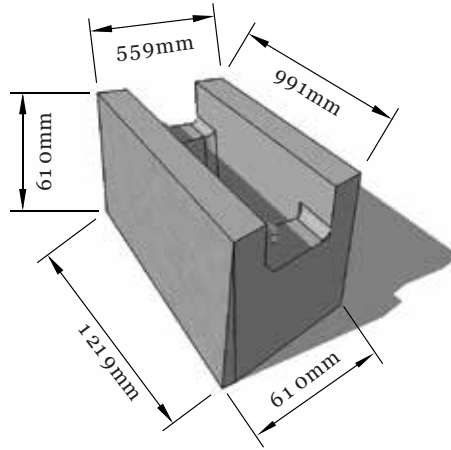
The user is responsible for the final design and use of the MagnumStone™ products. All drawings, illustrations, and text are accurate to the best of our knowledge but a qualified engineer shall do the analysis and structural design for all aspects of the segmental retaining wall project. The sole responsibility of the suitability of the products or information in this manual lies with the user.



# UNIT SPECIFICATIONS

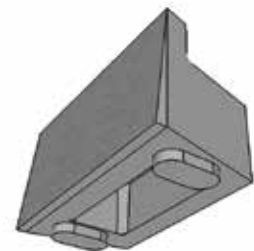
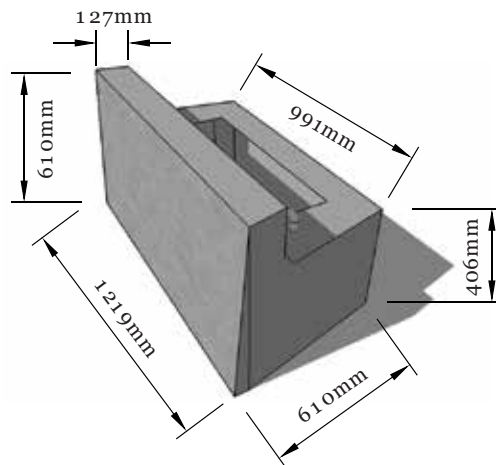
## Standard Block

Height	610mm
Depth	610mm
Face Width	1219mm
Back Width	991mm
Weight	621 Kgs
Volume Voids	0.180 m <sup>3</sup>
Gravel Filled Weight	975 Kgs
Face Area	0.745 m <sup>2</sup>
Batter/Setback	4.5 deg



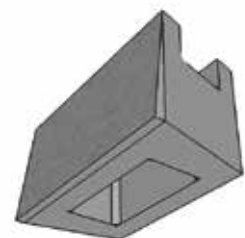
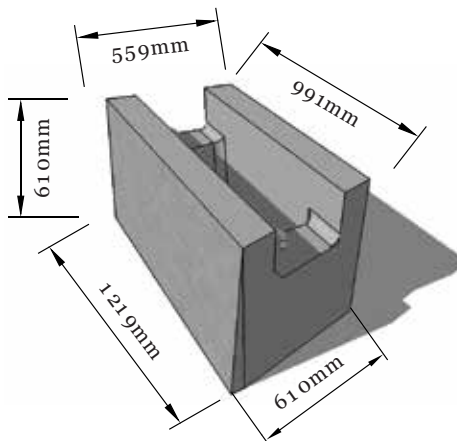
## Top Block

Height	610mm
Depth	610mm
Face Width	1219mm
Back Width	991mm
Weight	553 Kgs
Volume Voids	0.180 m <sup>3</sup>
Gravel Filled Weight	909 Kgs
Face Area	0.745 m <sup>2</sup>
Batter/Setback	4.5 deg



## Base Block

Height	610mm
Depth	610mm
Face Width	1219mm
Back Width	991mm
Weight	602 Kgs
Volume Voids	0.180 m <sup>3</sup>
Gravel Filled Weight	966 Kgs
Face Area	0.745 m <sup>2</sup>
Batter/Setback	4.5 deg

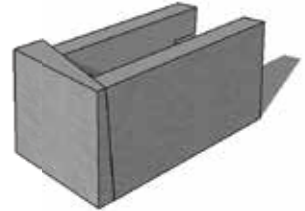
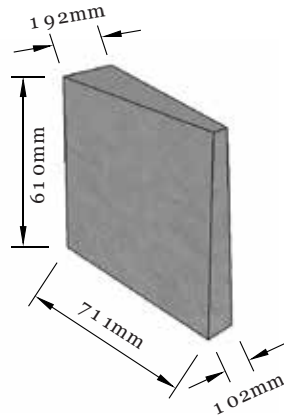


\*Face Style Varies Check with local producer / Weights and dimensions are nominal Assumption:  
Concrete = 6.85 kPa (2.306 T/m<sup>3</sup>) / Aggregate 5.27 kPa (1.762 T/m<sup>3</sup>)

# UNIT SPECIFICATIONS

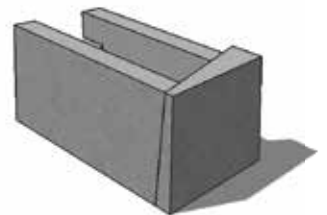
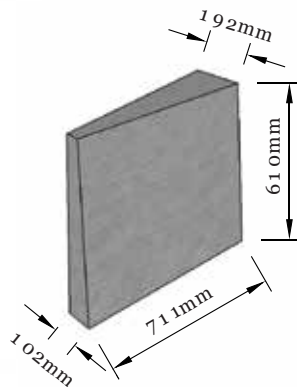
## Standard Left End Cap

Height	610mm
Depth	203mm
Top Narrow Width	1219mm
Bottom Narrow Width	991mm
Weight	154 Kgs
Face Area	0.434 m <sup>2</sup>



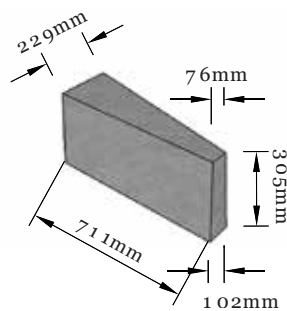
## Standard Right End Cap

Height	610mm
Depth	203mm
Top Narrow Width	1219mm
Bottom Narrow Width	991mm
Weight	154 Kgs
Face Area	0.434 m <sup>2</sup>



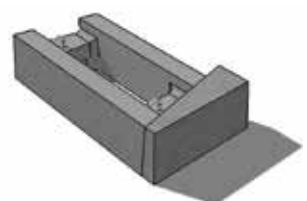
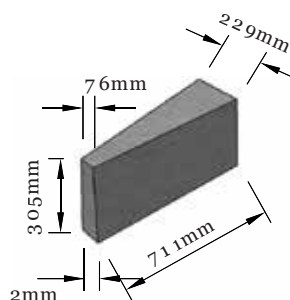
## Half Height Left End Cap

Height	305mm
Depth	229mm
Top Narrow Width	76mm
Bottom Narrow Width	102mm
Weight	77 Kgs
Face Area	0.217 m <sup>2</sup>



## Half Height Right End Cap

Height	305mm
Depth	229mm
Top Narrow Width	76mm
Bottom Narrow Width	102mm
Weight	77 Kgs
Face Area	0.217 m <sup>2</sup>

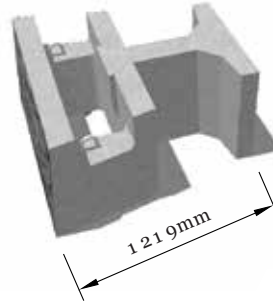




## UNIT SPECIFICATIONS

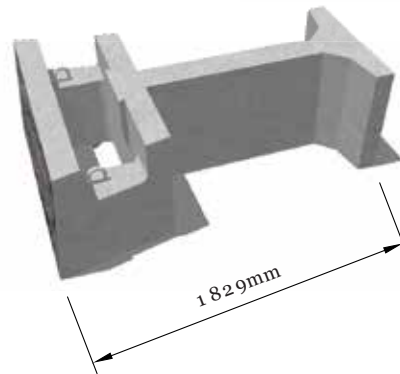
### 1219mm

Height	610mm
Depth	1219mm
Face Width	1219mm
Back Width	991mm
Weight	870 Kgs
Volume Voids	0.511 m <sup>3</sup>
Gravel Filled Weight	1780 Kgs



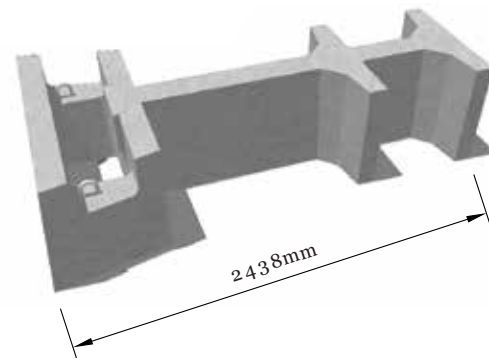
### 1829mm

Height	610mm
Depth	1829mm
Face Width	1219mm
Back Width	991mm
Weight	1006 Kgs
Volume Voids	0.894 m <sup>3</sup>
Gravel Filled Weight	2600 Kgs



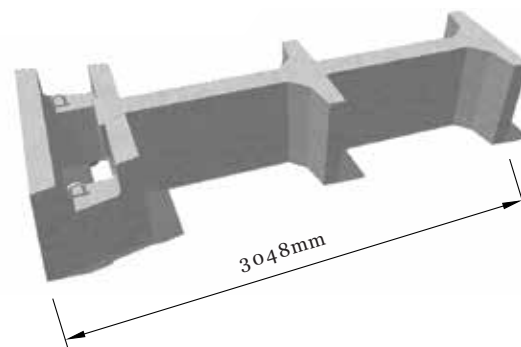
### 2438mm

Height	610mm
Depth	2438mm
Face Width	1219mm
Back Width	991mm
Weight	1267 Kgs
Volume Voids	1.271 m <sup>3</sup>
Gravel Filled Weight	3533 Kgs



### 3048mm

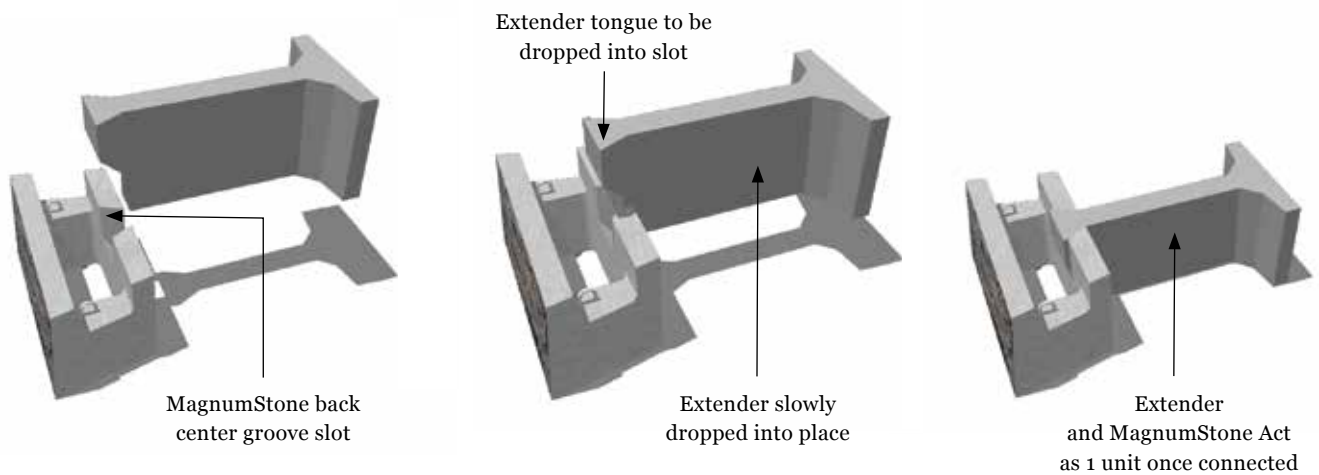
Height	610mm
Depth	3048mm
Face Width	1219mm
Back Width	991mm
Weight	1405 Kgs
Volume Voids	1.534 m <sup>3</sup>
Gravel Filled Weight	4139 Kgs



# EXTENDER TO MAGNUMSTONE BLOCK INSTALLATION

After the MagnumStone block with the extender has been laid in it's appropriate place the extender unit is slowly dropped into the back center hollow portion.

Once connected the MagnumStone and extender will act as 1 unit and be secured with back fill materials and compaction.



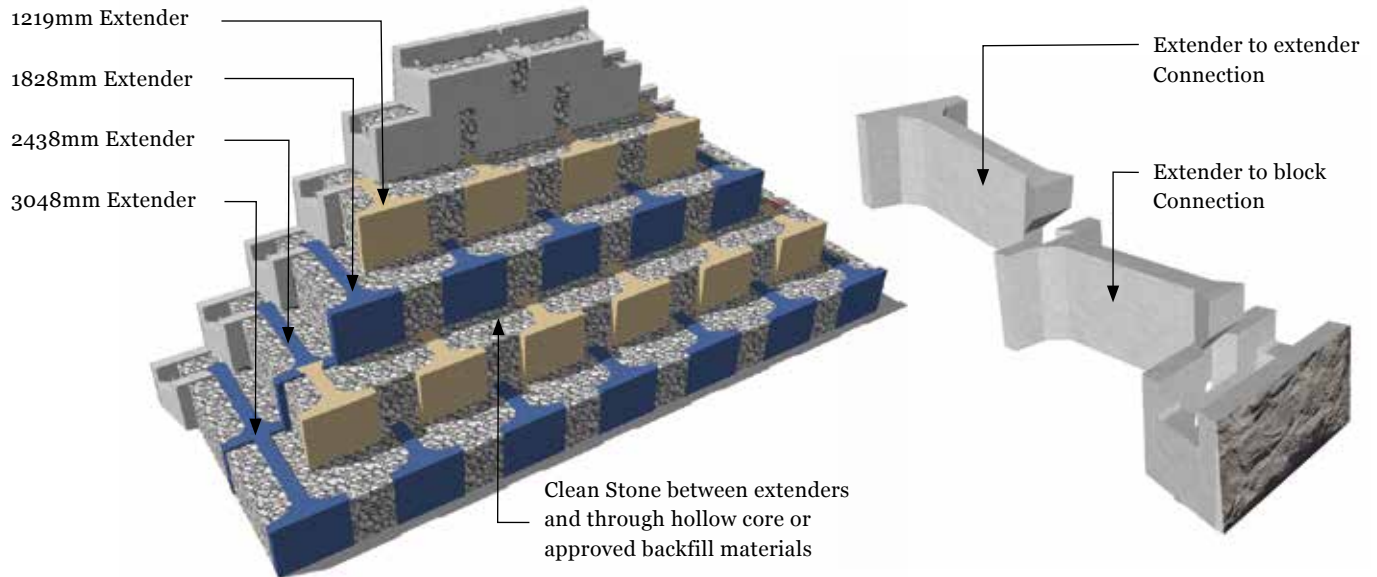
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## EXTENDER TO EXTENDER INSTALLATION

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MagnumStone extenders can be used in any combination of standard lengths. The design will be based on what is best suited for the soils and loads. MagnumStone engineering design software will allow the user to choose what is best suited for the project.

Once a back fill is chosen the contractor can backfill and compact around the extender units. Typically a free draining material clean stone or approved material will be used.

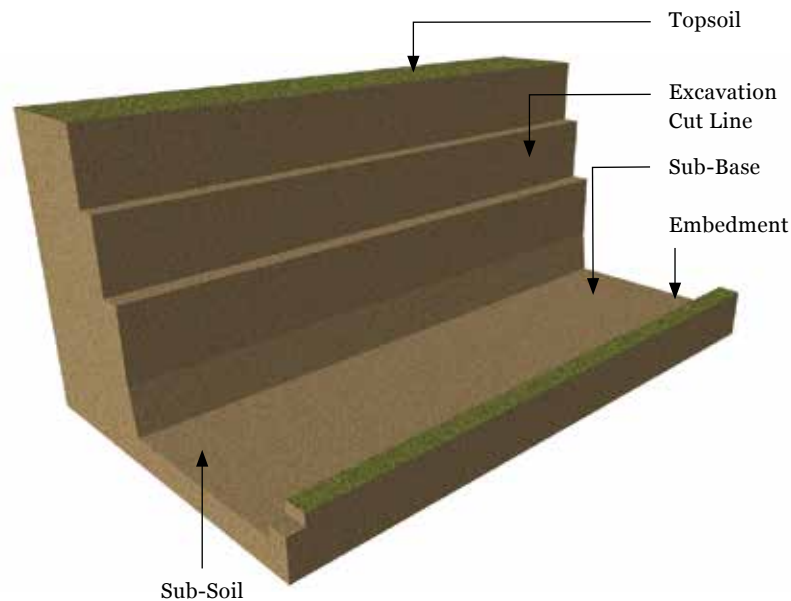




# GRAVITY RETAINING WALL INSTALLATION

## Excavation

Follow proper procedures for excavation cut lines and slopes etc.  
Consult your local Engineer for a proper design and soils testing / analysis.



## Base Preparation

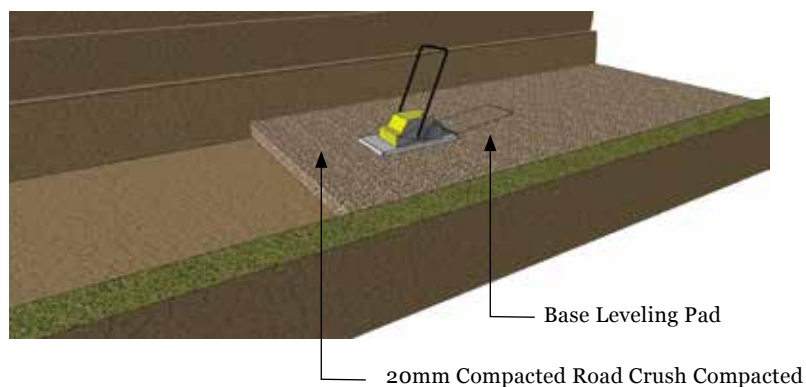
Follow proper procedures for excavation cut lines and slopes etc. The width of the base leveling pad should be the depth of the block and or extender(s) on the first course plus 152mm front and back.

Example for a standard unit 610mm + 152mm (front) + 152mm (back) = 1219mm total.

Material should be a 20mm road crush or equivalent.

The depth of the leveling pad should be minimum of 152mm thick compacted to 95% standard proctor density.

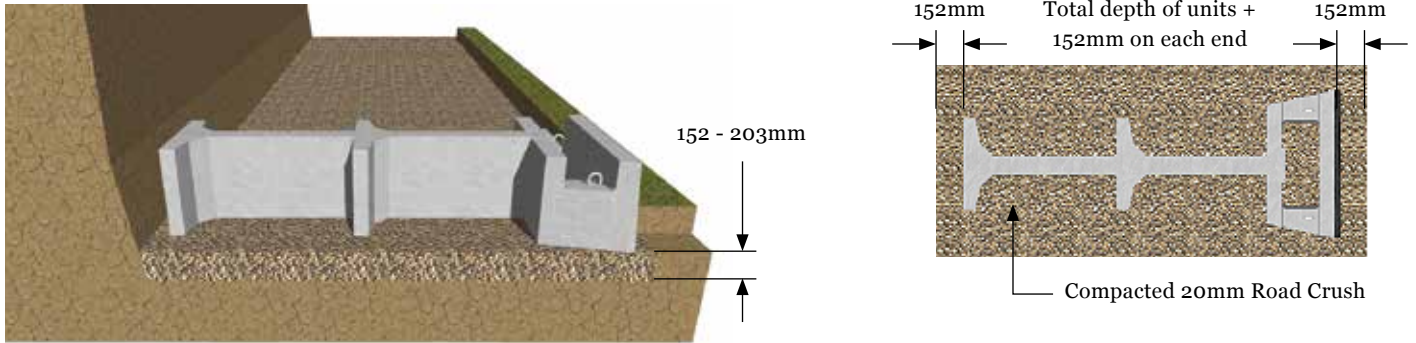
Soil separating fabrics may be used between the sub-base and leveling pad.



# GRAVITY RETAINING WALL INSTALLATION

## MagnumStone Block Installation

All MagnumStone Units shall be installed and leveled front to back and side to side.



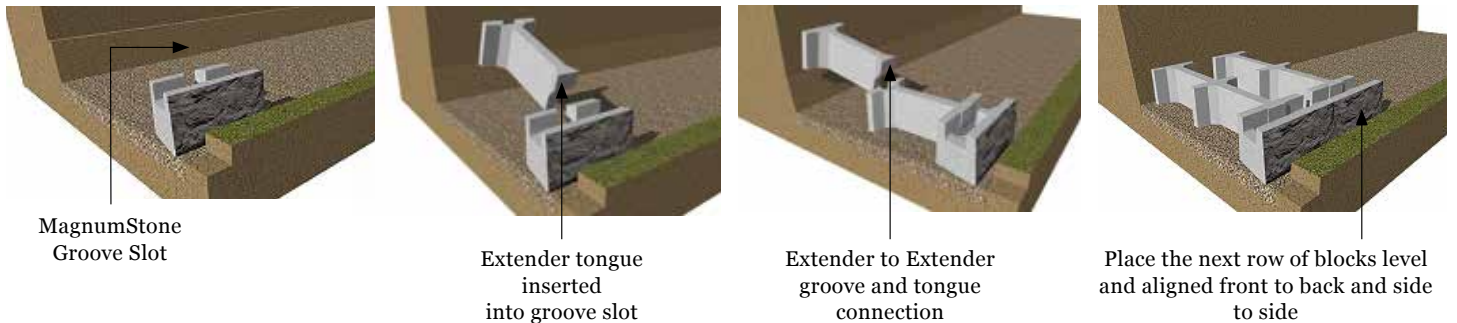
## MagnumStone Block and Extender Installation

Install the MagnumStone base block on the leveling pad. The base block should not have the lugs on the bottom.

Ensure that the blocks are level front to back and side to side.

Place the tongue of the extender block inside the groove of the MagnumStone block.

If extender to extender blocks are required place them in the same manner as the previous ensuring that the blocks stay level and true.



## Backfill MagnumStone Blocks and Extender Units

Backfilling the MagnumStone blocks and extender units with a clear crush gravel (#57 Stone) slightly above the units.

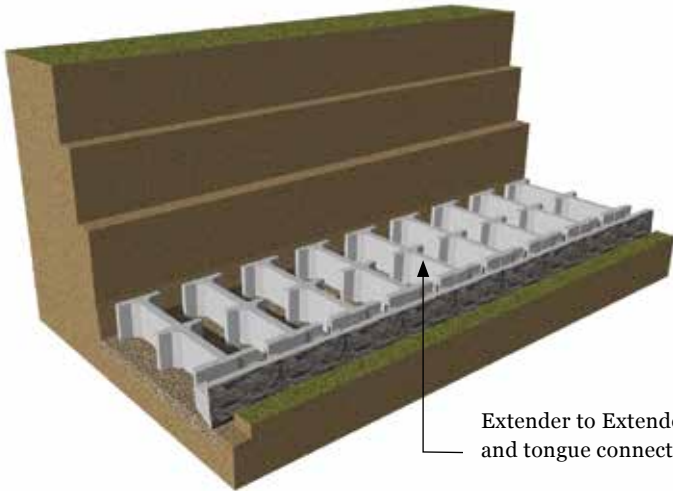
Run a plate vibratory compactor over the stones and units allowing them to settle in the hollow cores.

Sweep any excess stones off the top of the units and blocks.

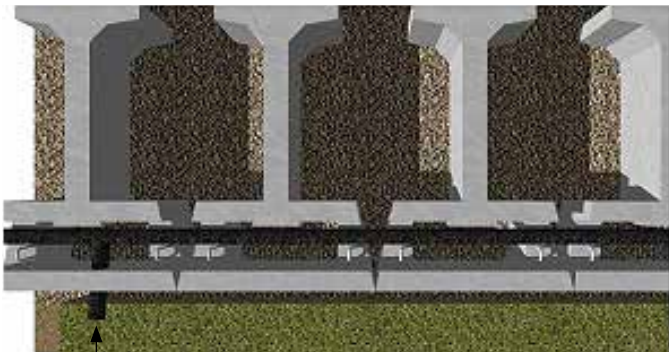


# GRAVITY RETAINING WALL INSTALLATION

## Drainage



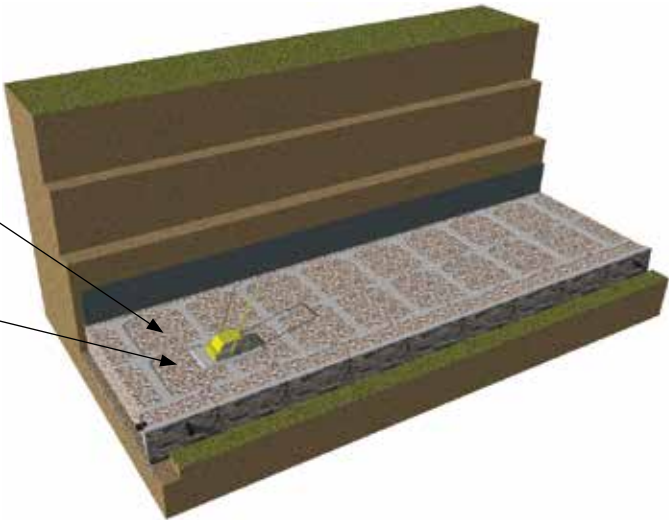
Extender to Extender groove and tongue connection



102mm Perforated Drain Pipe  
Daylight front of wall min 11m

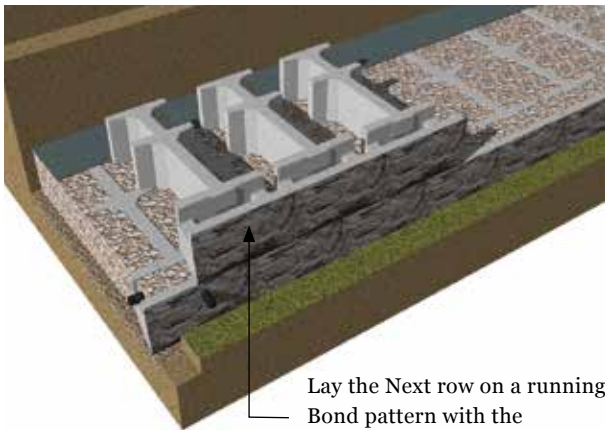
Back Fill the Hollow cores and between extender units with cleanstone or approved Backfill

Install the drain gravel slightly above the the units and compact with a plate vibratory compactor. Sweep access rock and debris off the blocks before installing the next course

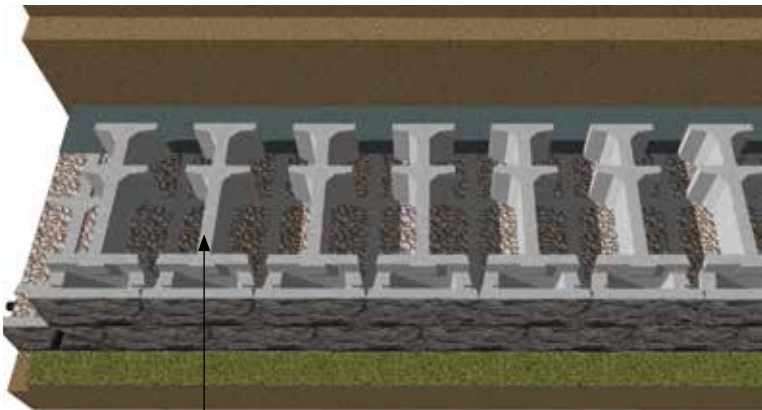


## MagnumStone Block and Extender Installation

Every MagnumStone block and extender unit should be installed with proper care ensuring they are level and aligned.



Lay the Next row on a running Bond pattern with the SecureLugs Connected in the hollow core below



Complete the 2nd row installation ensuring everything is level



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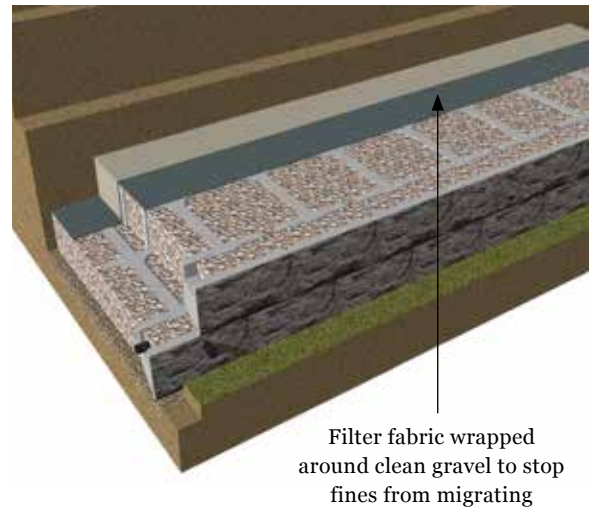
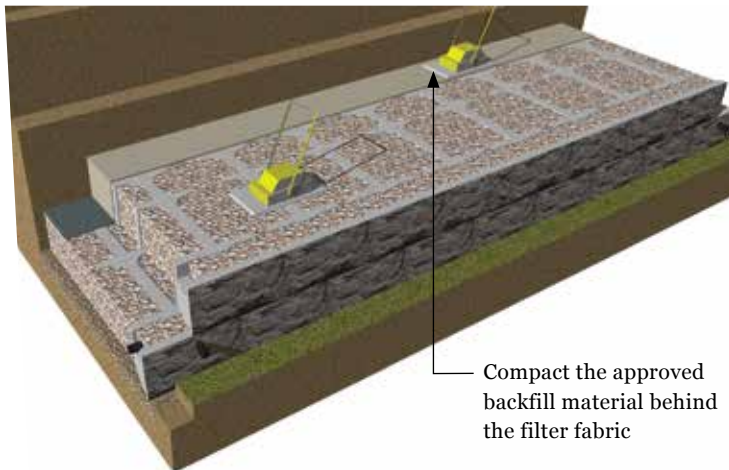
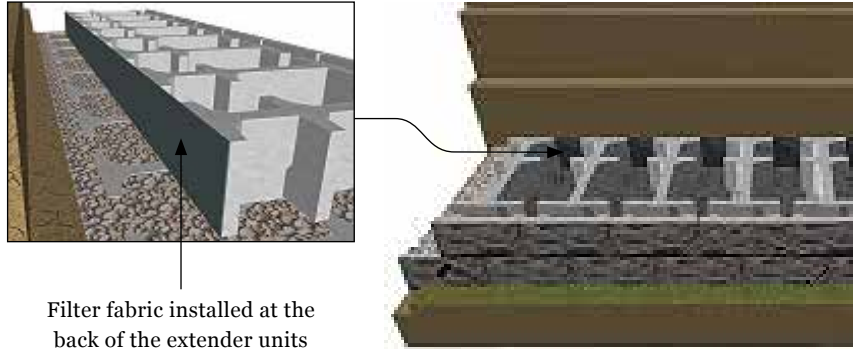
# GRAVITY RETAINING WALL INSTALLATION

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## Soil Separation Fabric

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Install a soil separating fabric to separate the fines and compacted backfill material from the drainage aggregate. The filter fabric can be installed directly behind the MagnumStone extender units.



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## Compaction

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Once the blocks have been placed and leveled compact the approved backfill materials.



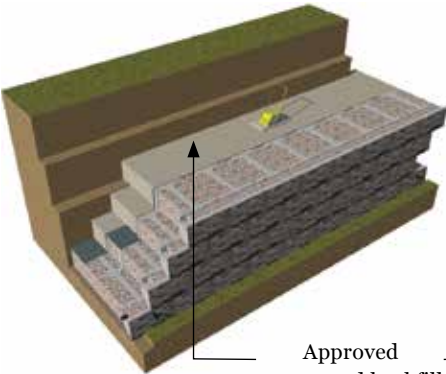
# GRAVITY RETAINING WALL INSTALLATION

## Installation

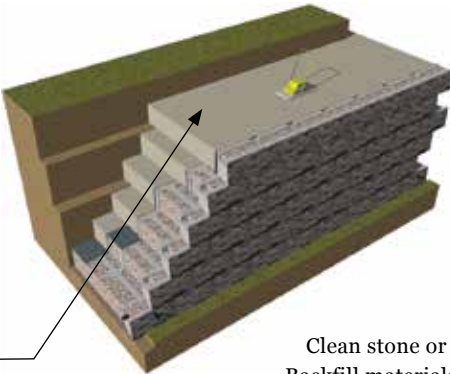
Ensure that proper installation procedures and techniques are being used while installing each course.  
The blocks should be installed and levelled front to back and side to side.



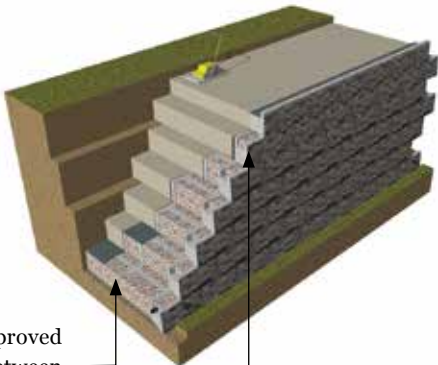
Filter Fabric placed behind extender units



Approved compacted backfill



Clean stone or approved Backfill materials between extender units and inside hollow cores



Drainage Through Hollow Core

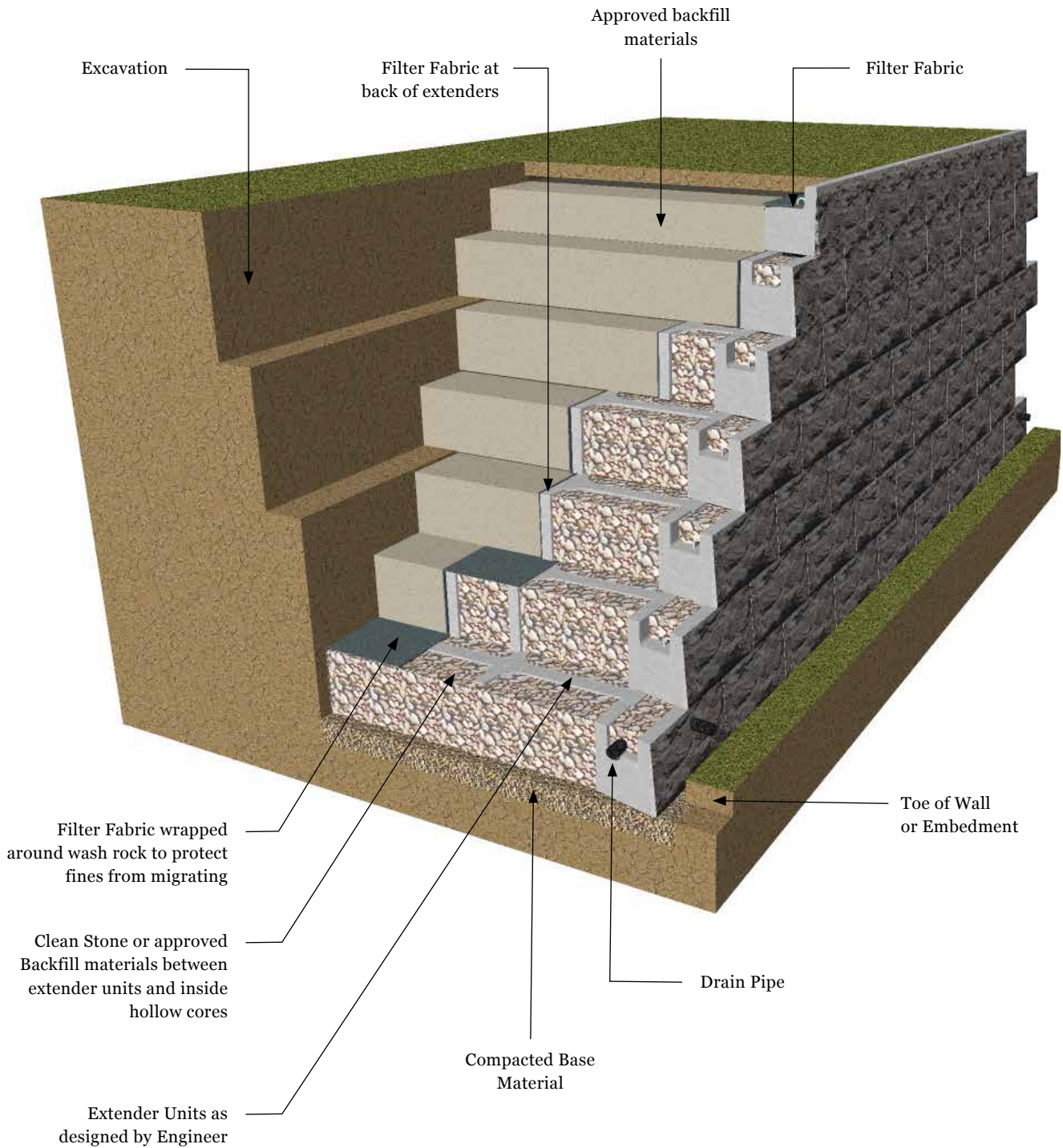


Filter Fabric

MagnumStone Top Unit

# GRAVITY RETAINING WALL INSTALLATION

## Typical Completed Cross Section

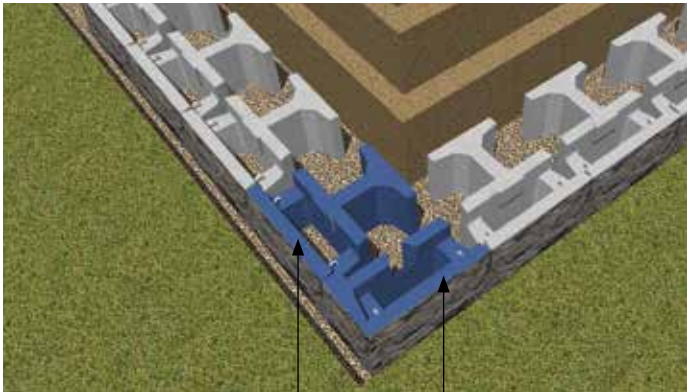




# GRAVITY RETAINING WALL CORNERS

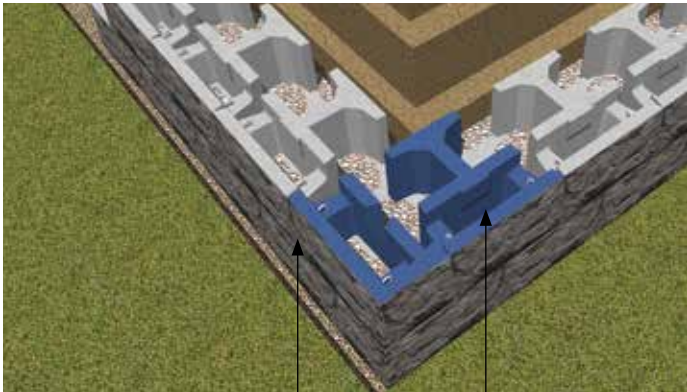
## 1219mm Extender Outside Corner

Corners in retaining walls are unavoidable. With the MagnumStone gravity system we have developed a solution that fits any situation.



1219mm Extender & Base Block

Corner/End Cap Base Block

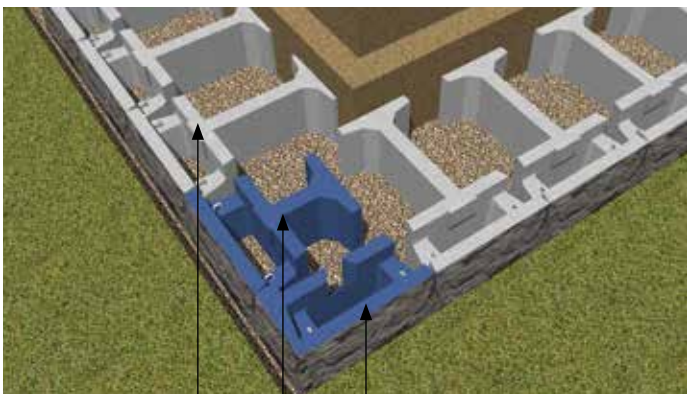


Standard Corner/End Cap

1219mm Extender & Standard Block

## 1829mm Extender Outside Corner

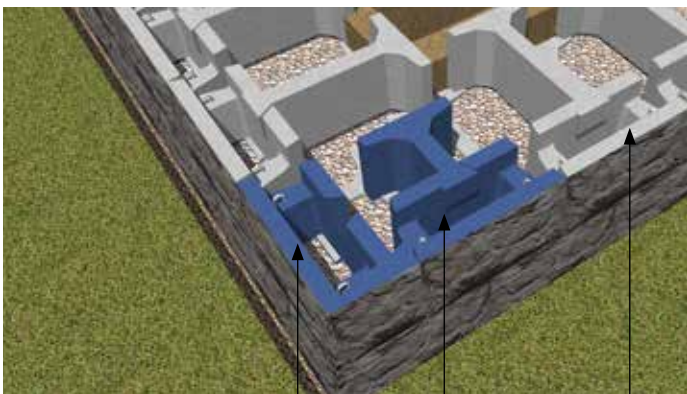
Follow proper procedures for excavation cut lines and slopes etc.



1829mm Extender & Base Block

1219mm Extender & Base Block

Corner/End Cap Base Block



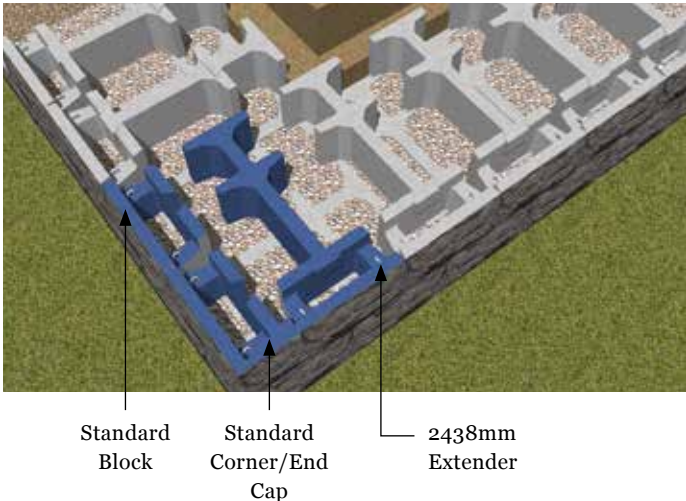
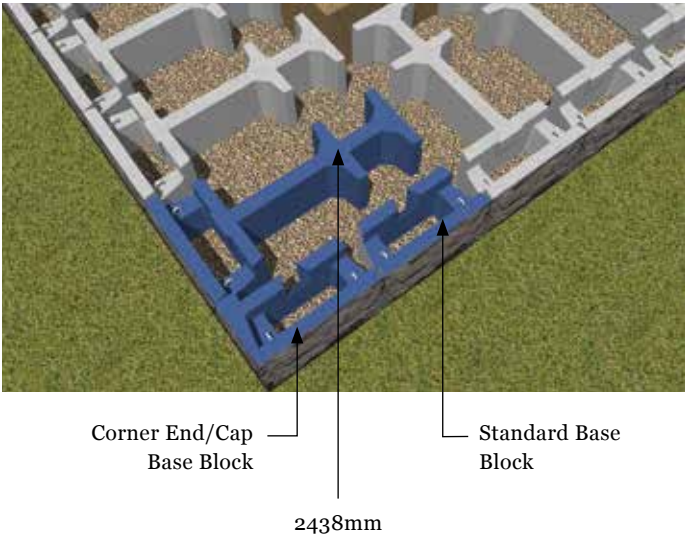
Standard Corner/End Cap

1219mm Extender & Standard Block

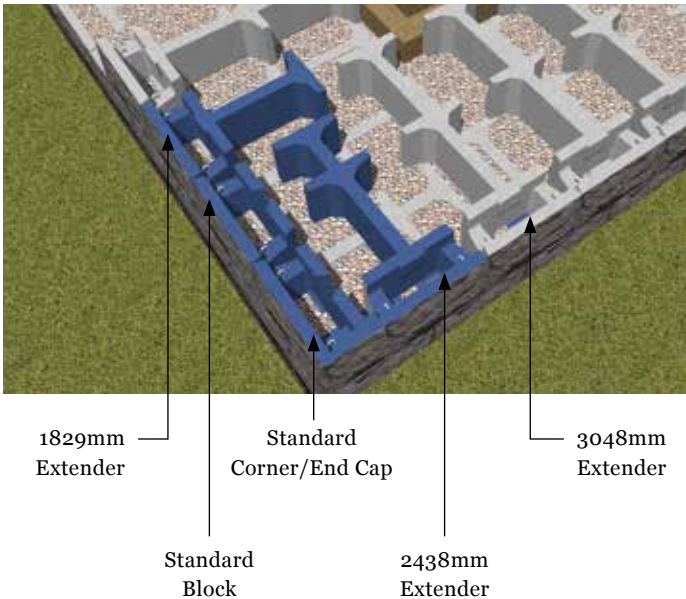
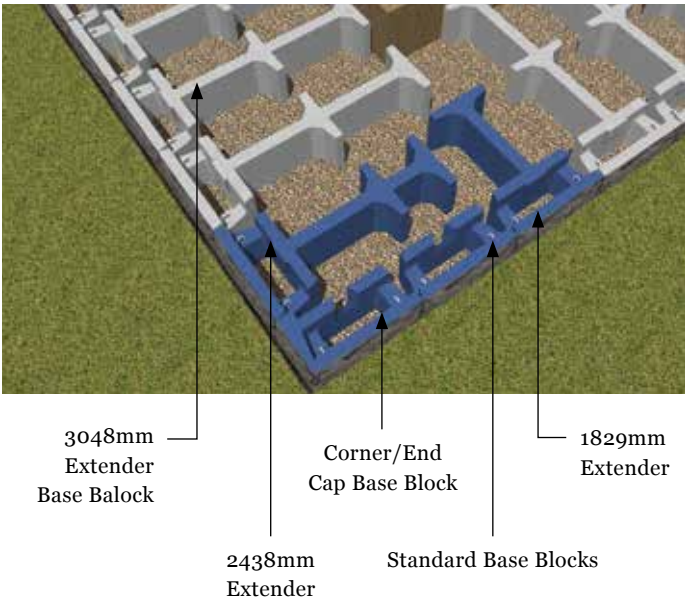
1829mm Extender & Standard Block

# GRAVITY RETAINING WALL CORNERS

## 2438mm Extender Outside Corner



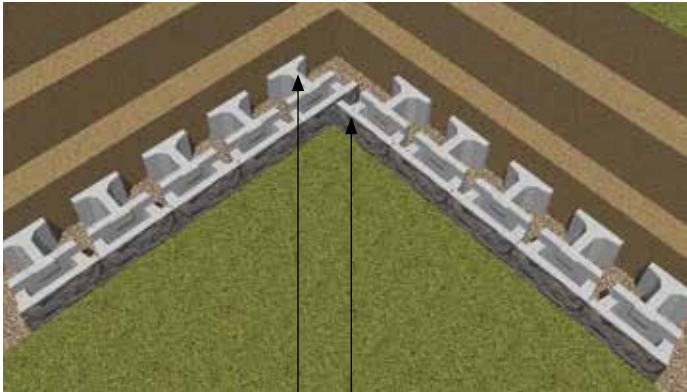
## 3048mm Extender Outside Corner





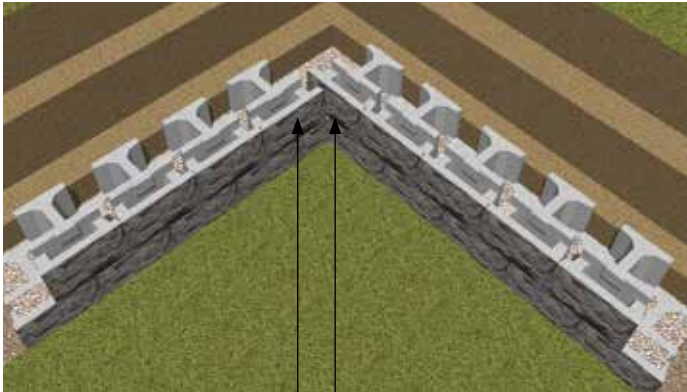
# GRAVITY RETAINING WALL CORNERS

## 1219mm Extender Inside Corner



1219mm Extender &  
Base Block

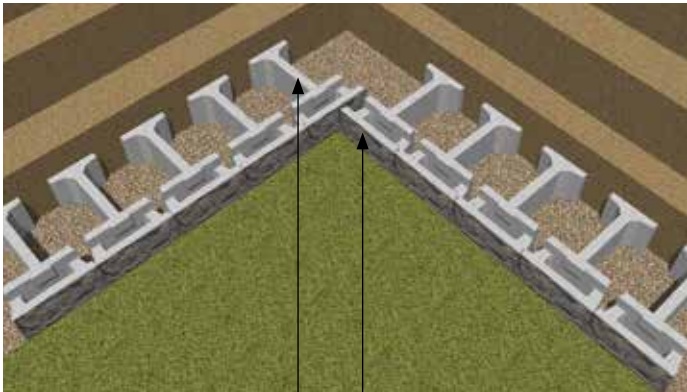
1219mm Extender &  
Base Block in middle  
of adjacent block



1219mm Extender &  
Standard Block  
in middle of  
adjacent block

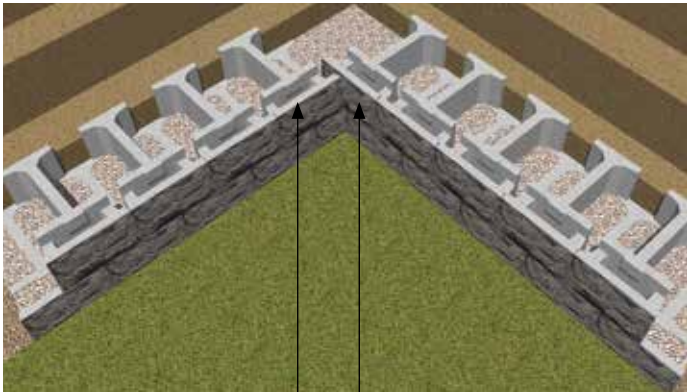
1219mm Extender &  
Standard Block

## 1829mm Extender Inside Corner



1829mm Extender &  
Base Block

1829mm Extender &  
Base Block in middle  
of adjacent block



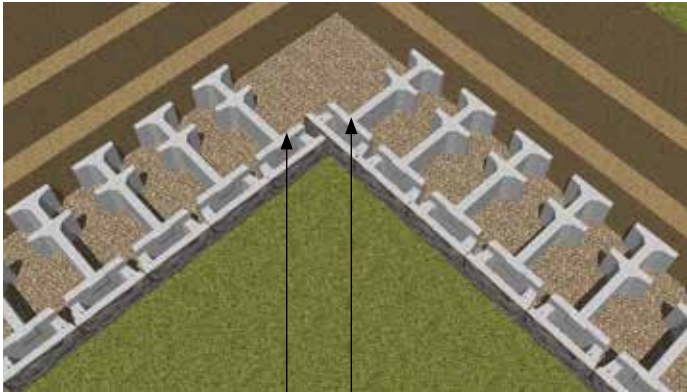
1829mm Extender &  
Standard Block  
in middle of  
adjacent block

1829mm Extender &  
Standard Block



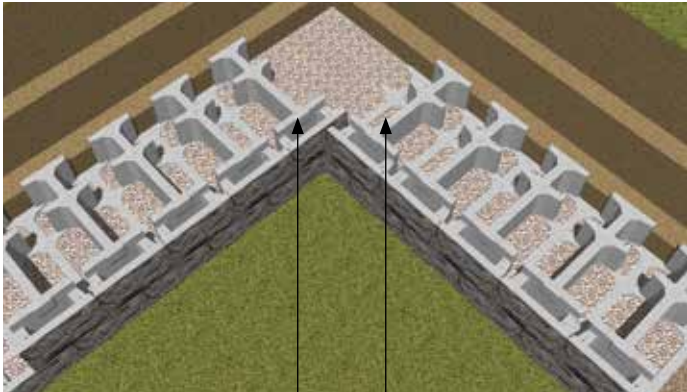
# GRAVITY RETAINING WALL CORNERS

## 2438mm Extender Inside Corner



2438mm Extender &  
Base Block

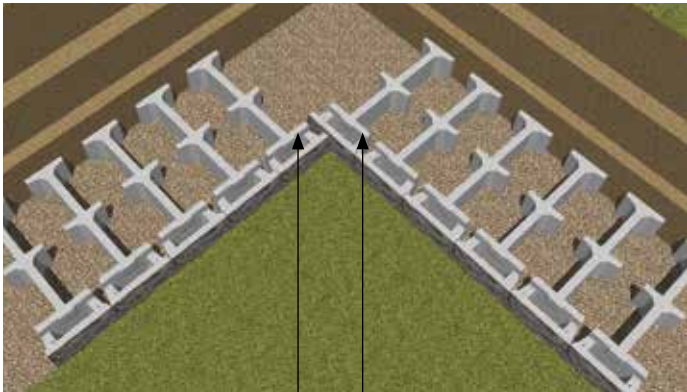
2438mm Extender &  
Base Block in middle  
of adjacent block



2438mm Extender &  
Standard Block  
in middle of  
adjacent block

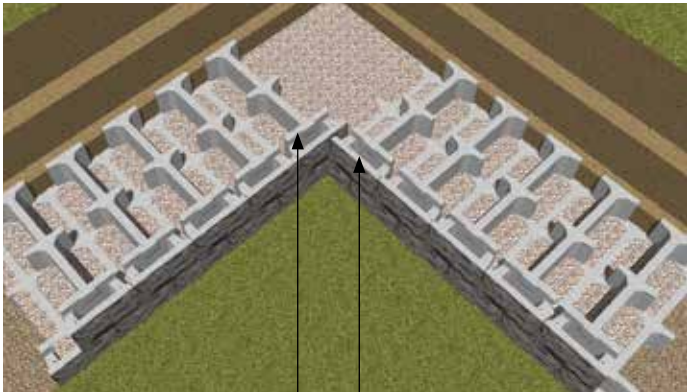
2438mm Extender &  
Standard Block

## 3048mm Extender Inside Corner



3048mm Extender &  
Base Block

3048mm Extender &  
Base Block in middle  
of adjacent block

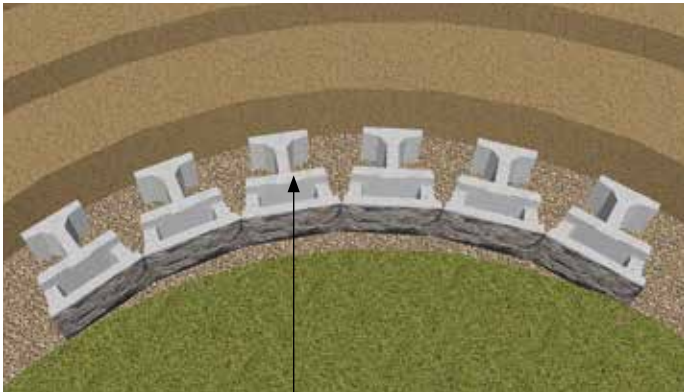


3048mm Extender &  
Standard Block  
in middle of  
adjacent block

3048mm Extender &  
Standard Block

# GRAVITY RETAINING WALL CURVES

## 1219mm Inside Curve

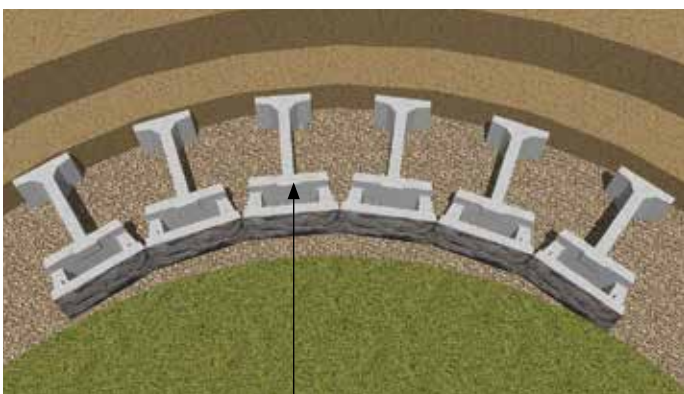


1219mm Extender &  
Base Block

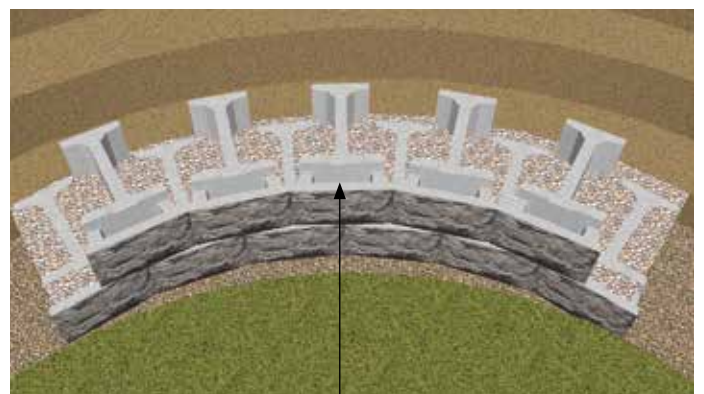


1219mm Extender &  
Standard Block

## 1829mm Inside Curve



1829mm Extender &  
Base Block

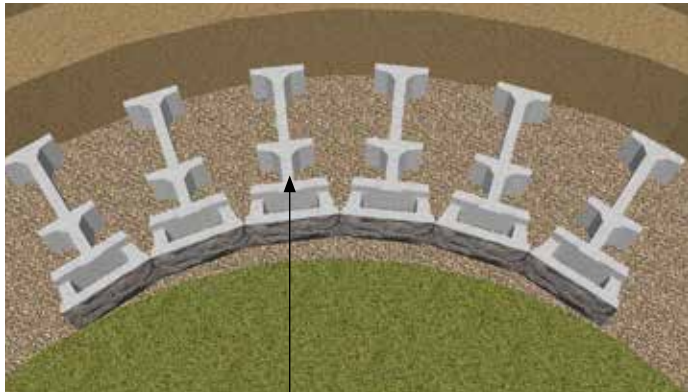


1829mm Extender &  
Standard Block

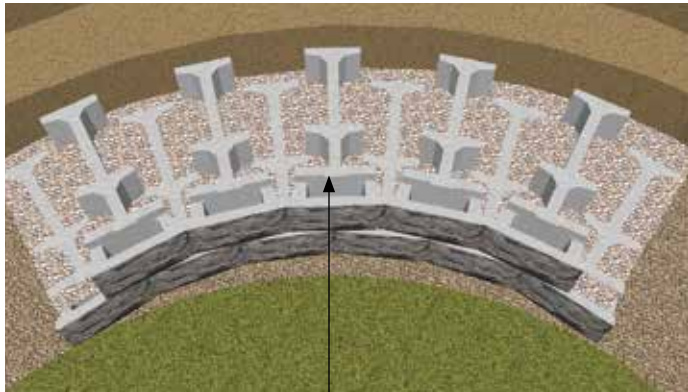


# GRAVITY RETAINING WALL CURVES

## 2438mm Inside Curve

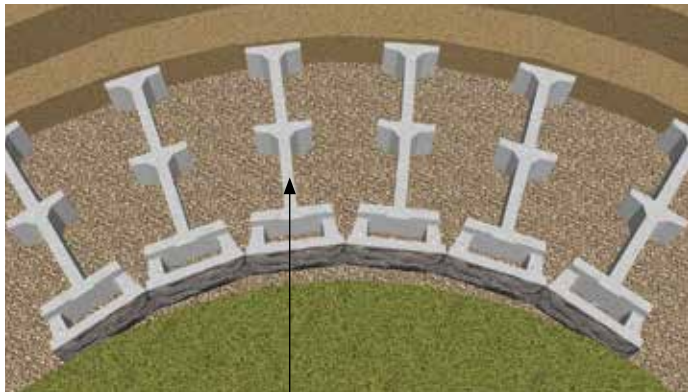


2438mm Extender &  
Base Block

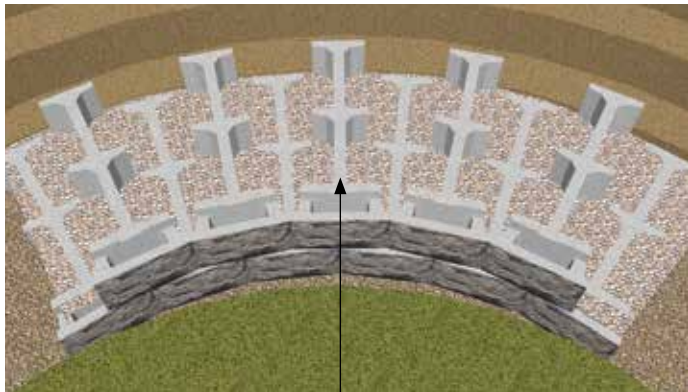


2438mm Extender &  
Standard Block

## 3048mm Inside Curve



3048mm Extender &  
Base Block

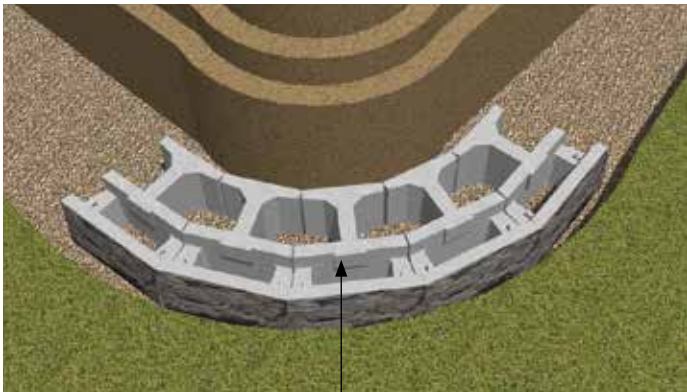


3048mm Extender &  
Standard Block

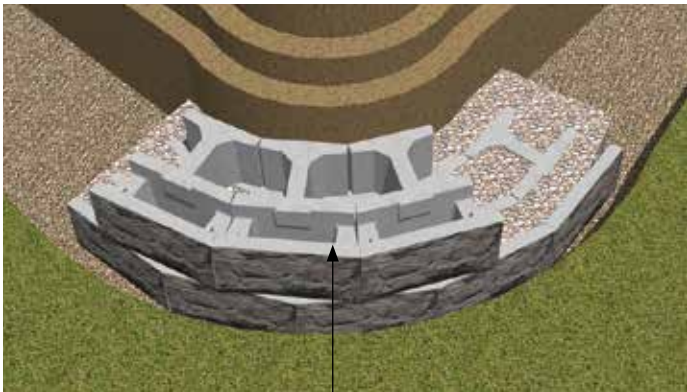


# GRAVITY RETAINING WALL CURVES

## 1219mm Outside Curve

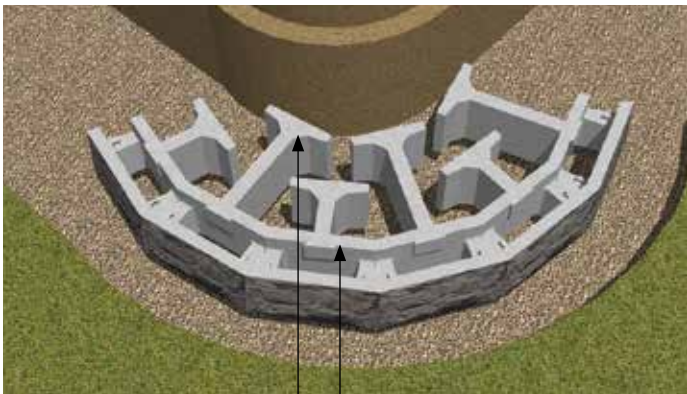


1219mm Extender &  
Base Block



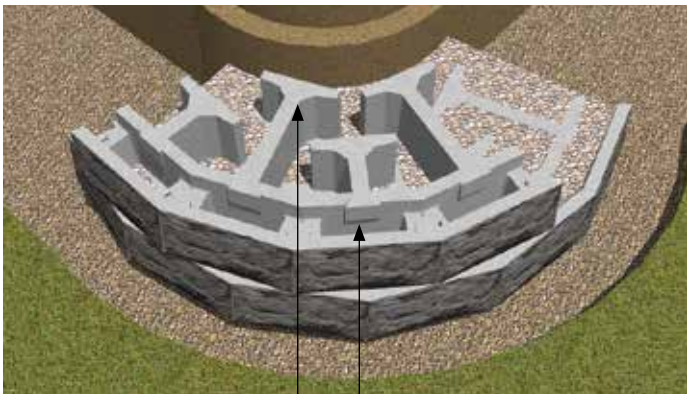
1219mm Extender &  
Standard Block

## 1829mm Outside Curve



1829mm Extender &  
Base Block

1219mm Extender  
& Base Block

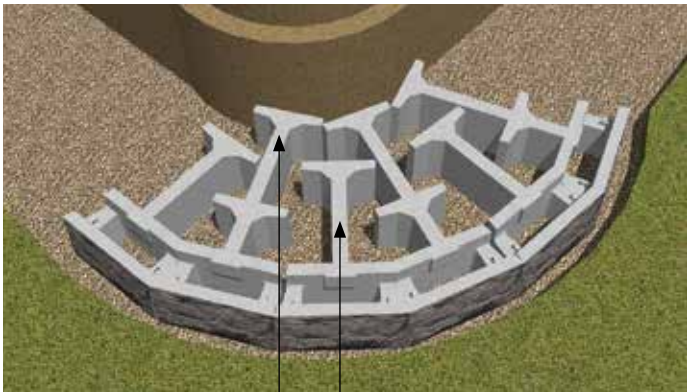


1829mm Extender &  
Standard Block

1219mm Extender &  
Standard Block

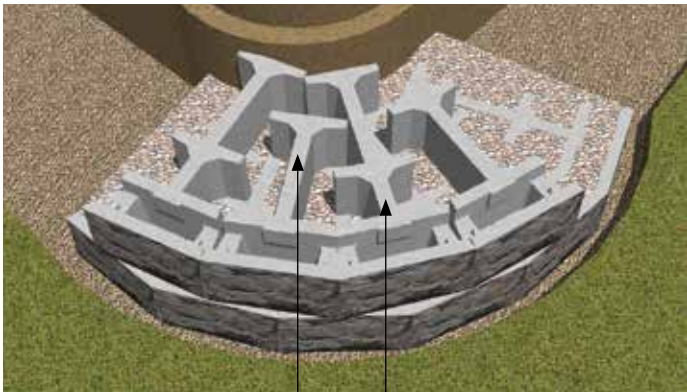
# GRAVITY RETAINING WALL CURVES

## 2438mm Outside Curve



2438mm Extender & Base Block

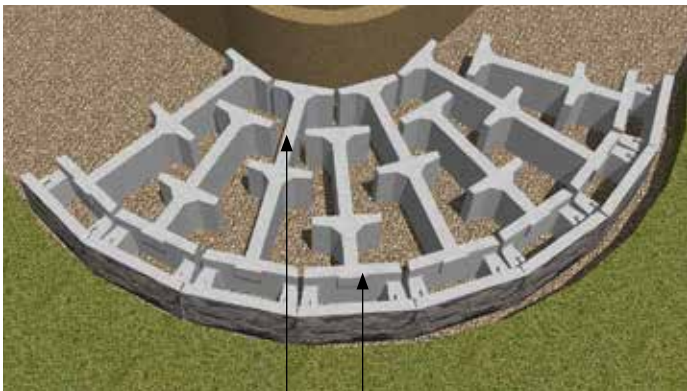
1829mm Extender & Base Block



1829mm Extender & Standard Block

2438mm Extender & Standard Block

## 3048mm Outside Curve



3048mm Extender & Base Block

2438mm Extender & Base Block



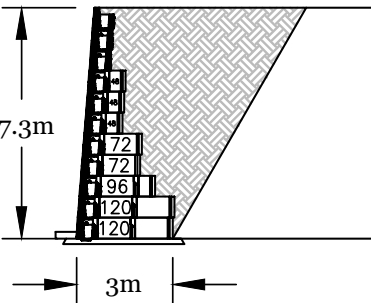
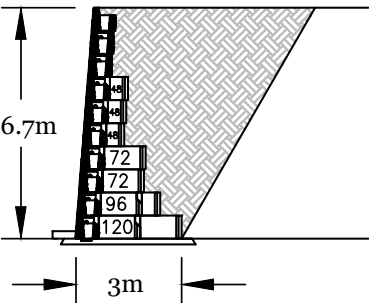
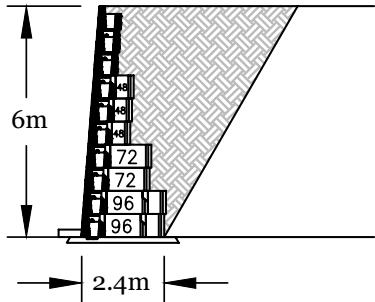
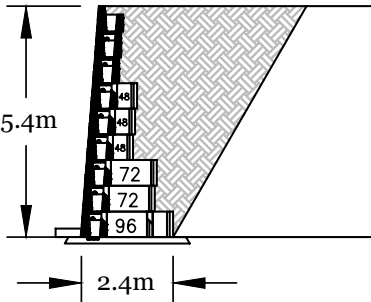
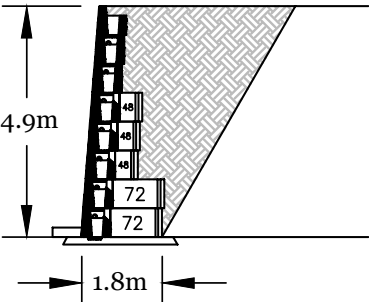
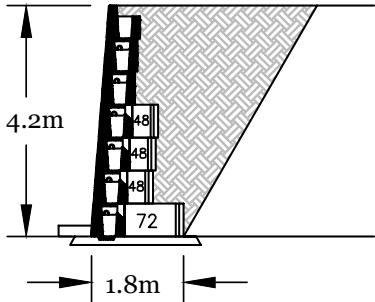
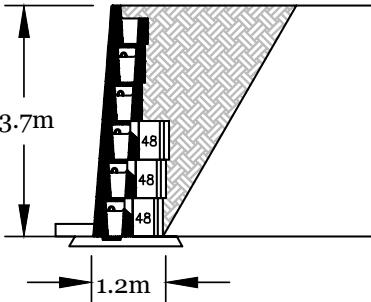
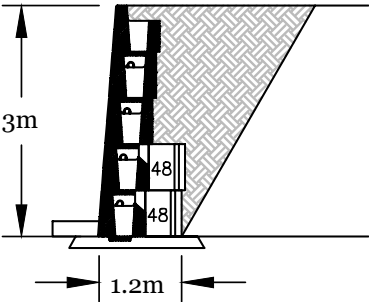
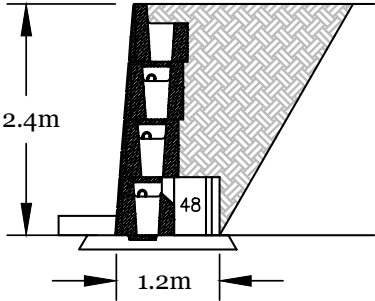
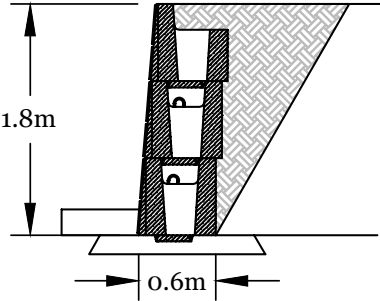
3048mm Extender & Standard Block

2438mm Extender & Standard Block

# GRAVITY RETAINING WALL ESTIMATION CHARTS

Slope Angle	0 Degrees
Live Load	0 kPa
Retained Soil	34 Degrees
Unit Refill	Crushed Gravel

**Note:** Calculations are for preliminary use only and should not be used for construction without the review of a qualified professional.

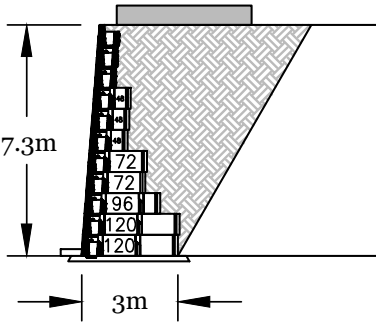
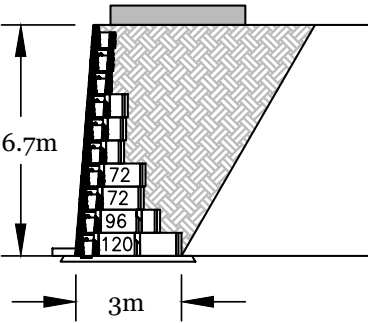
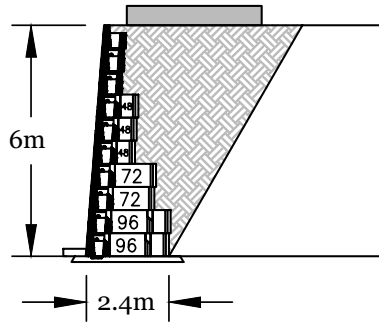
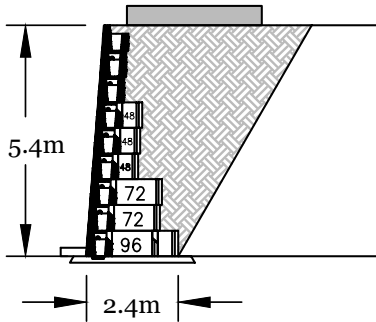
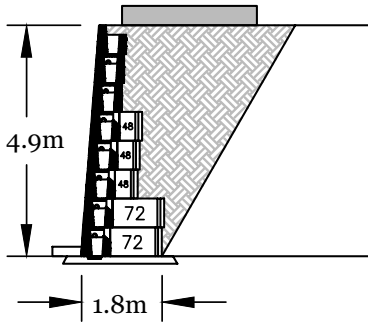
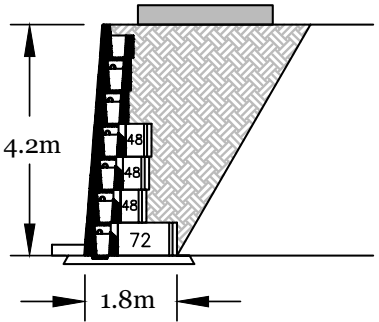
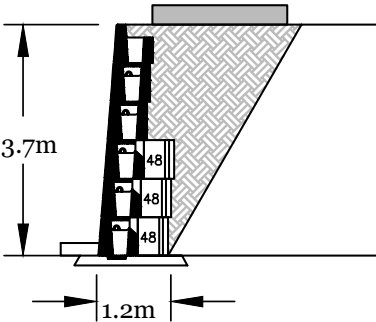
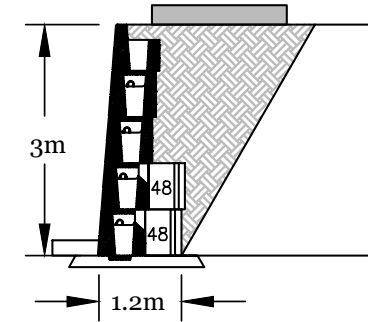
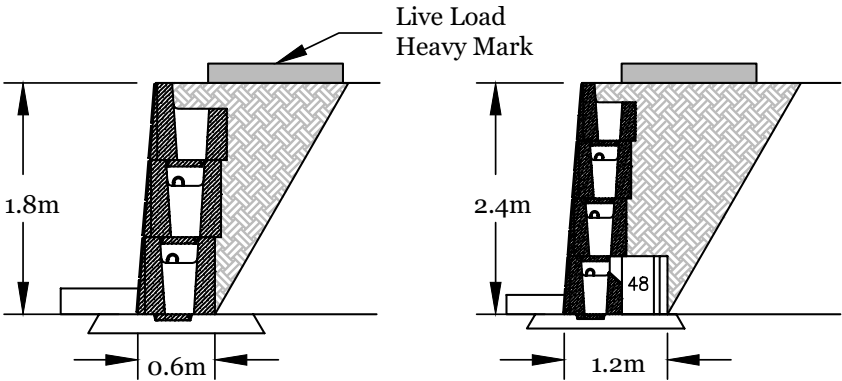




# GRAVITY RETAINING WALL ESTIMATION CHARTS

Slope Angle	0 Degrees
Live Load	12 kPa
Retained Soil	34 Degrees
Unit Refill	Crushed Gravel

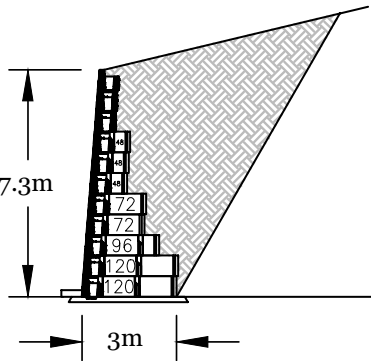
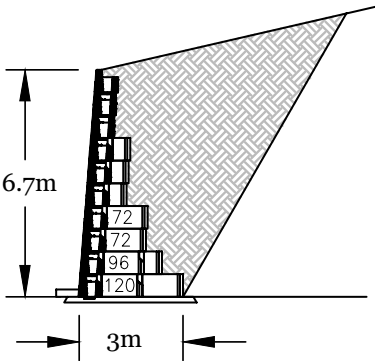
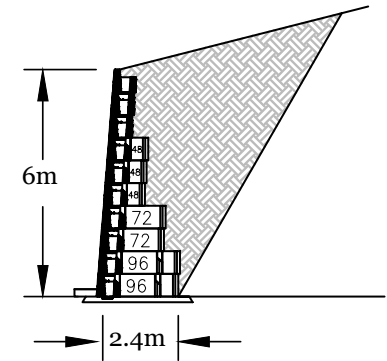
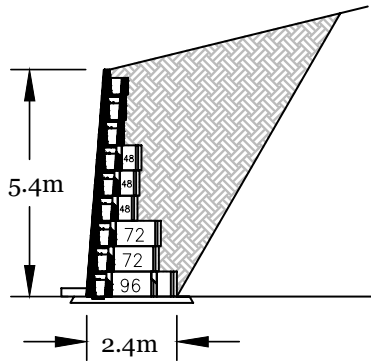
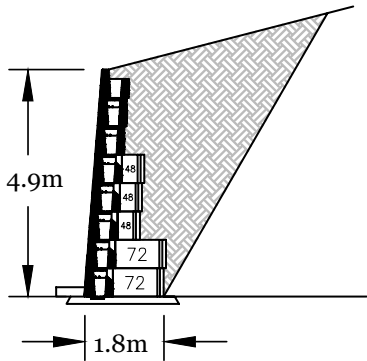
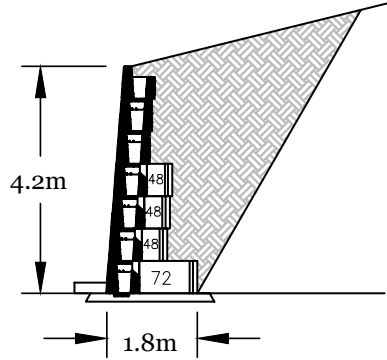
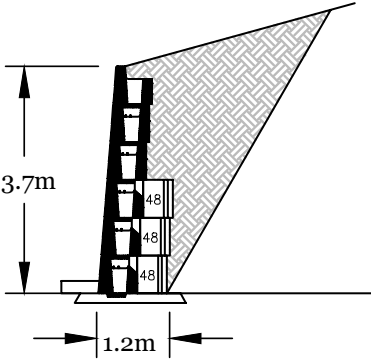
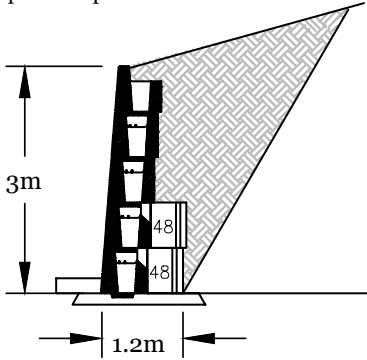
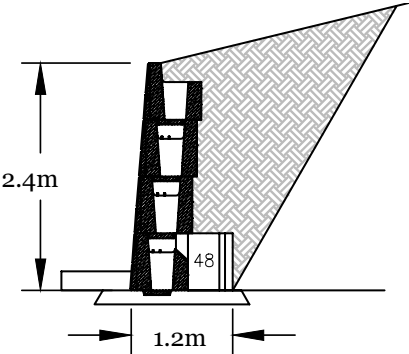
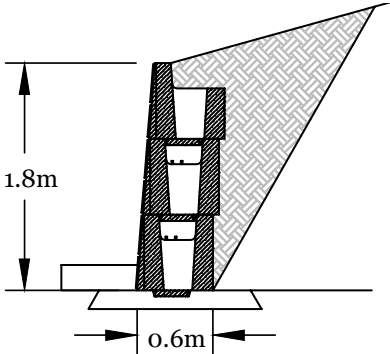
**Note:** Calculations are for preliminary use only and should not be used for construction without the review of a qualified professional.



# GRAVITY RETAINING WALL ESTIMATION CHARTS

Slope Angle	20 Degrees
Live Load	0 kPa
Retained Soil	34 Degrees
Unit Refill	Crushed Gravel

**Note:** Calculations are for preliminary use only and should not be used for construction without the review of a qualified professional.









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## *Brickworks*

Brickworks Building Products is one of Australia's largest and most diverse building material manufacturers. Under the Brickworks Building Products umbrella are some of Australia's best known building materials brands. Our products include bricks, pavers, masonry blocks, retaining wall systems, precast concrete panels, concrete and terracotta roof tiles, timber products, terracotta façades and specialised building systems.

With a broad product portfolio and manufacturing and sales facilities across Australia, Brickworks Building Products is uniquely placed to service the demands of the building industry.

With over 1,200 staff across Australia and New Zealand, we pride ourselves on our commitment to product, service excellence and our leadership position.

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