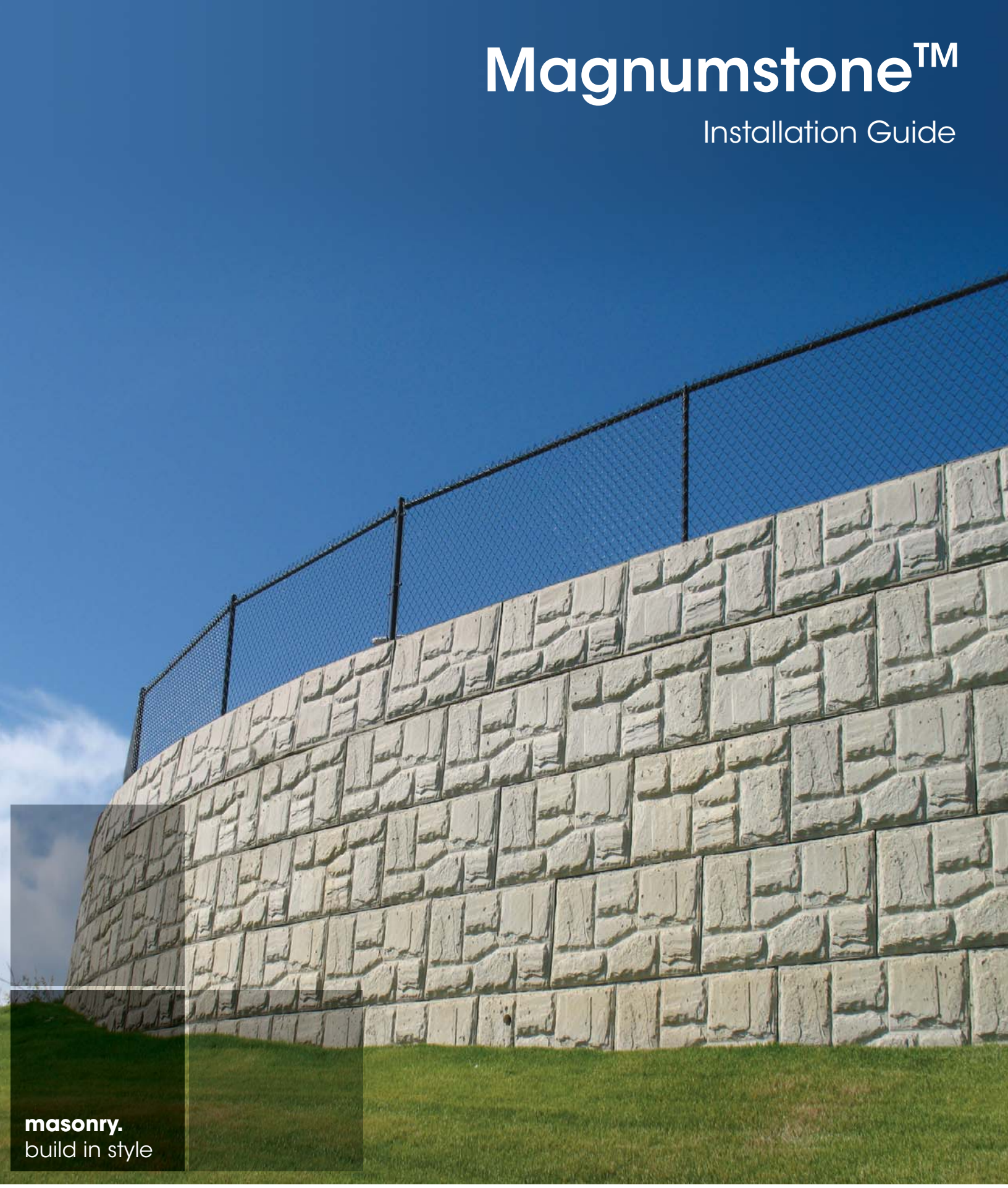
Magnumstone™

Installation Guide



masonry.
build in style

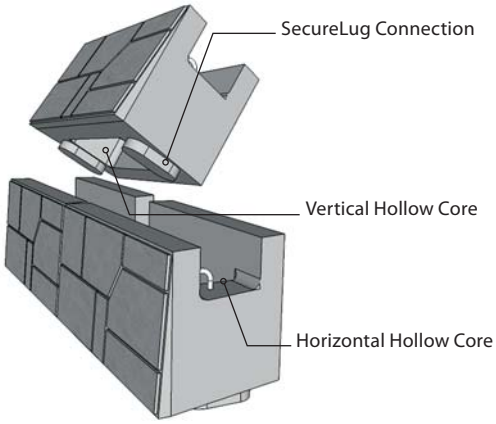
austral masonry®

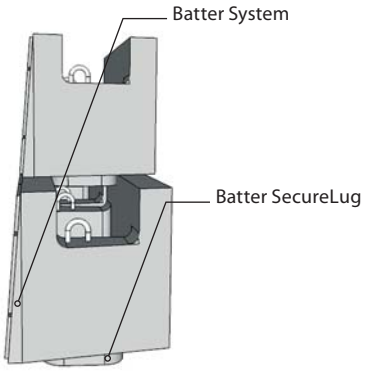
> > > MAGNUMSTONE™ OVERVIEW

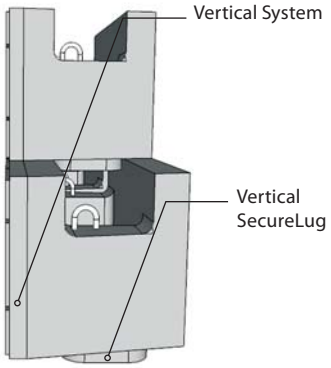
NOTE: BOLDED TERMS ARE DEFINED IN OUR ONLINE GLOSSARY AT WWW.CORNERSTONEWALLSOLUTIONS.COM

The MagnumStone™ retaining wall system was developed with the installer in mind. MagnumStone's durable, high shear strength concrete SecureLugs fit into the lower units' hollow cores, allowing significant lateral movement without losing unit to unit interlock. Tapered sides make it easy to build tight curves and straight walls with complete accuracy. MagnumStone's large vertical and horizontal hollow cores filled with gravel, along with its high strength SecureLug, provide a superb geogrid to block connection.

MagnumStone™ is committed to providing complete technical and construction information to installers and engineers to ensure the successful completion of any retaining wall project. Your best choice is MagnumStone™ for value, beauty, durability, ease of construction, and complete retaining wall excellence.







Design Advantage

- **MagnumStone**™ units are made from high strength, wet cast concrete that provides durability and resistance to weathering.
- **MagnumStone's** large vertical and horizontal hollow cores reduce efflorescence problems and the use of costly pigments.
- **MagnumStone**™ units provide excellent solutions for gravity, geogrid reinforced, steel/concrete, plantable and other types of wall structures.
- **MagnumStone**™ units are nearly half the weight per face foot of solid block systems, providing superior environmental advantages both by using far less concrete in manufacturing and by the resulting efficiency of transportation.
- **MagnumStone**™ provides superior flexibility in creating curves, corners, steps and terraced walls.

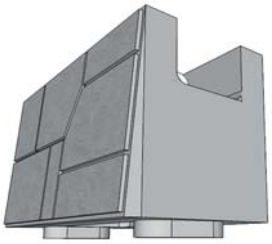
Installation Advantage

- A small crew can easily install 74 to 140 square meters of wall a day
- The one-step **SecureLug** system outperforms the pins or clip method, speeding up installation time considerably.
- **MagnumStone's** hollow core makes it easy to saw cut, add special lighting, or place fence posts into when adding creative details.

Economic Advantage

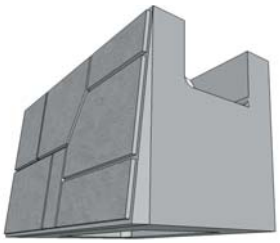
- **MagnumStone**™ system will save time, labor, and material costs.
- **MagnumStone**™ walls can cost considerably less than conventional cast in place concrete walls or traditional masonry systems.
- **MagnumStone**™ light-weight, hollow core units are less expensive to ship and handle.
- **MagnumStone**™ labor and equipment costs are low because no special equipment is required and semi-skilled workers will find the units easy to install.

MAGNUMSTONE™ BATTER UNIT SPECIFICATIONS



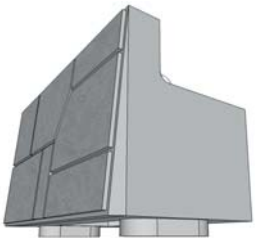
STANDARD UNIT

621 kgs



STANDARD BASE UNIT

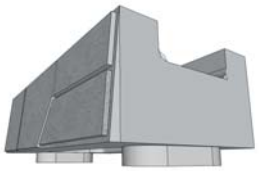
621 kgs



STANDARD TOP UNIT

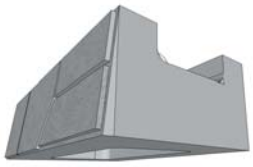
553 kgs

Dimensions	1219 W x 610 H x 610 mm D	**Gravel Filled Weight**	975 kgs
Face Area	0.745 m³	**Batter/Setback**	4.5° 5 cm / Unit & Vertical Opt Avail.
Volume of Voids	.180 m³		
Faces	Varies		



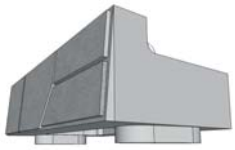
HALF HIGH UNIT

340 kgs



HALF HIGH BASE UNIT

328 kgs



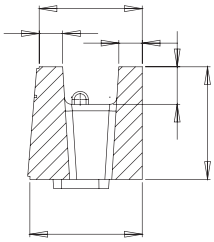
HALF HIGH TOP UNIT

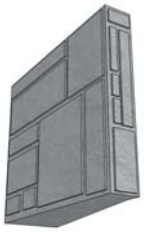
308 kgs

Dimensions	1219 W x 305 H x 610 mm D	**Gravel Filled Weight**	490 kgs
Face Area	0.37 m³	**Batter/Setback**	4.5° 2.5 cm / Unit & Vertical Opt Avail.
Volume of Voids	0.09 m³		
Faces	Varies		

STEP/CAP

1219 W x 152 H x 610cm D
Face Area: .186 m²
Weight: 131 kg



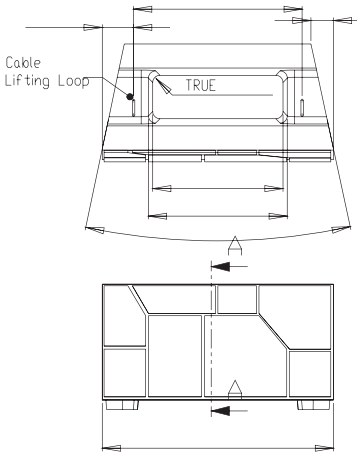


STANDARD CORNER/END UNIT

660 TFW x 711 BFW x 610 H x 51 TNF x 102 BNF mm
Face Area: 0.434 m²
Weight: 154kg
Faces: Varies

HALF HIGH CORNER/END UNIT

686 TFW x 711 BFW x 610 H x 76 TNF x 102 BNF cm
Face Area: 0.217m²
Weight: 77kg
Faces: Varies



*Weights and dimensions are nominal. Specifications may change. Verify exact information with your local producer.

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Installation Step by Step

> > > GRAVITY MAGNUMSTONE™ WALL

Gravity (SRW) segmental retaining wall systems are structures lower in height that use the MagnumStone™ unit weight combined with gravel core infill to resist earth pressures behind and on top of the wall. The 4.5 degree batter or setback of the MagnumStone™ wall along with proper soil conditions below and behind the wall provide the stability of the structure. For walls 1.2m and taller a qualified engineer should be consulted.

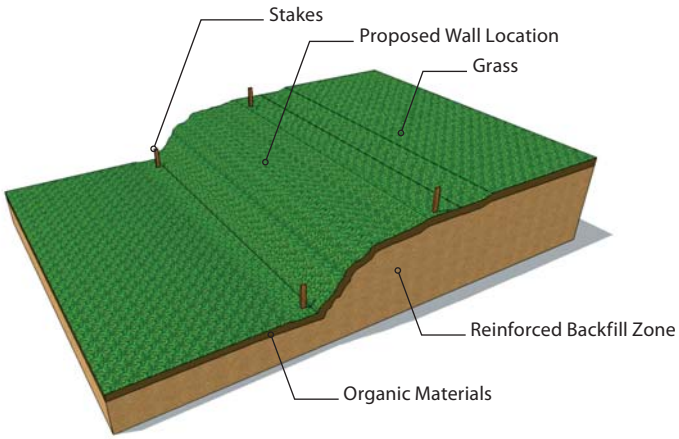
> > > STEP 1
PLANNING

· Mark the bottom and top of the wall excavation location with spray paint or stakes

· Establish proper elevation bottom and top of wall before excavating

· **Organic Materials** should not be used in **Reinforced Backfill Zone**

· Store and protect **Reinforced Backfill Materials** from inclement weather during construction



> > > STEP 2
EXCAVATION

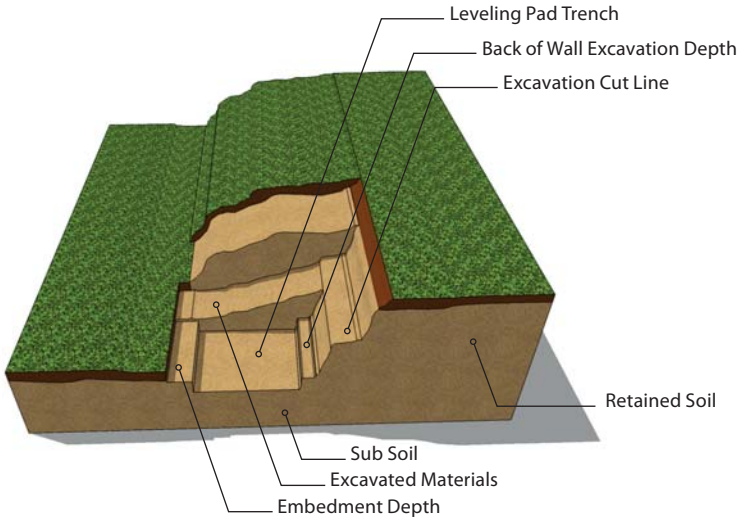
· Excavate and prepare **Sub Base Leveling Trench** 150mm below first course

· **Leveling Pad Trench** is approximately 1m to 1.3m wide

· Normal wall **Burial Depth** or **Embedment Depth** is 150mm to 300mm

· Excavate cut line to a 2 to 1 slope or greater

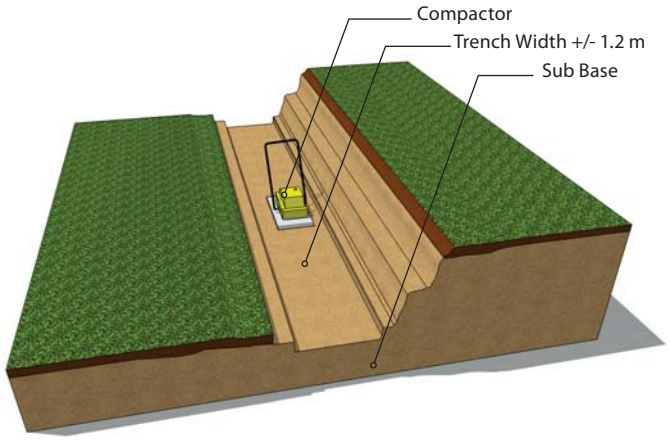
· Back of wall excavation depth into the bank should be 300mm beyond the back of the **Sub Base Leveling Trench**



> > > STEP 3
SUB BASE COMPACTION

· Compact **Sub Base** to **98% Standard Maximum Dry Density** or greater

· Remove any **Organic** or poor soils in the **Sub Base** and replace with proper **Reinforced Fill Materials** before compacting



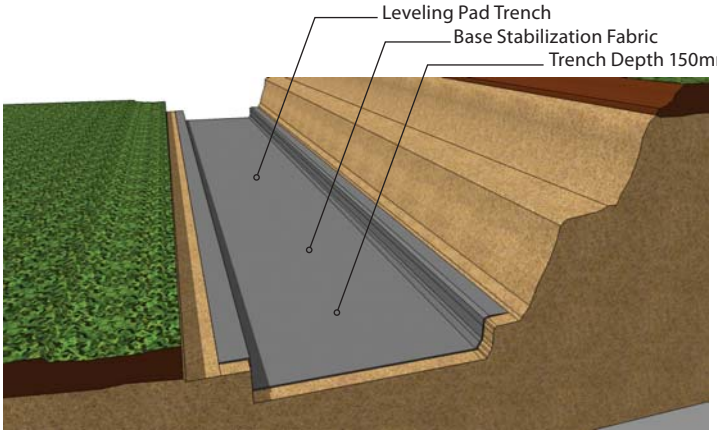
> > > STEP 4

BASE STABILIZATION

· (Optional) place 2m wide **Base Stabilization Fabric** on top of leveling pad trench

· **Base Stabilization Fabrics** will help prevent sub base materials from mixing with the gravel base leveling pad during compaction

· Fabric also provides extra **Structural Bearing Stability** to the base leveling pad

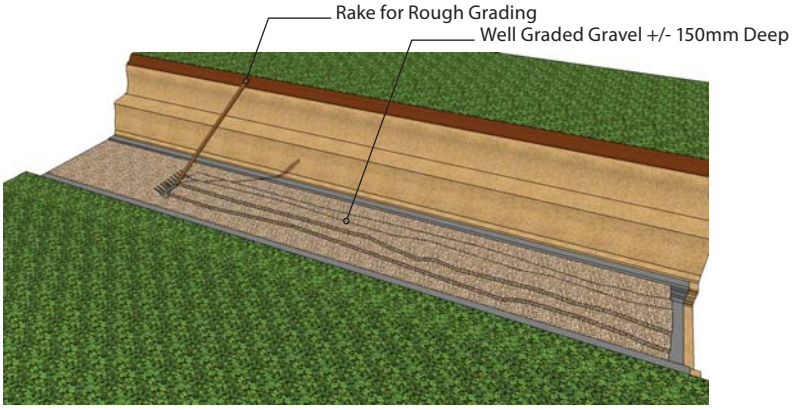


> > > STEP 5

ROUGH LEVELING PAD

· Place well graded gravel on top of fabric in the leveling pad trench approximately 150mm deep

· Rough grade gravel with a rake close to finish base elevation

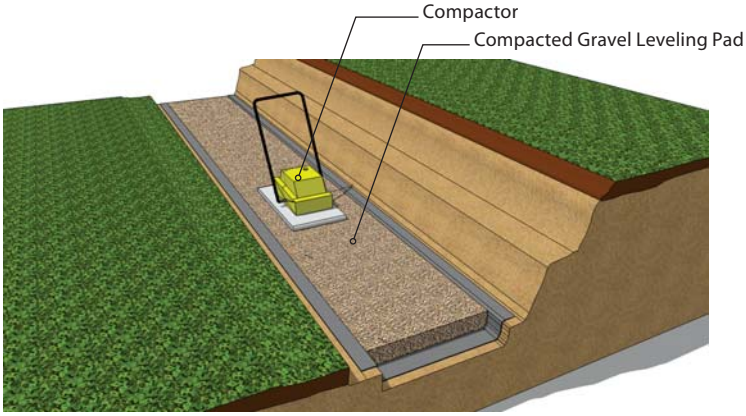


> > > STEP 6

COMPACT LEVELING PAD

· **Compact Gravel Leveling Pad** to **98% Standard Maximum Dry Density** or greater

· Correct **Moisture Content** in the gravel will help in reaching proper compaction



> > > STEP 7
LEVEL SCREED PIPES

· Place first 1.22m long **Screed Pipe** across the trench at one end of the wall or at the lowest elevation

· Scratch a trench for the pipe in the compacted gravel with a chipping hammer

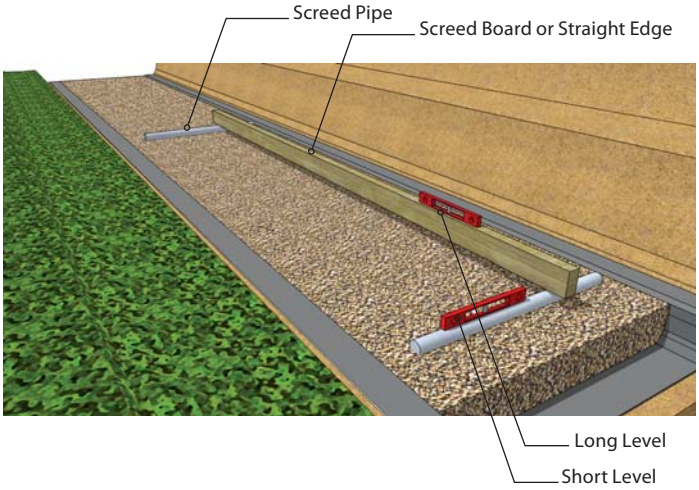
· Use a short level or **Laser Level** to set the **Screed Pipe** to the proper level

· Gravel is added underneath and around the **Screed Pipe** to support while leveling

· Place the second **Screed Pipe** across the trench approximately 3m from the first **Screed Pipe**

· Level the second **Screed Pipe** to the same elevation as the first **Screed Pipe** by using a long level on top of a **Screed Board, Straight Edge** or with a **Laser Level**

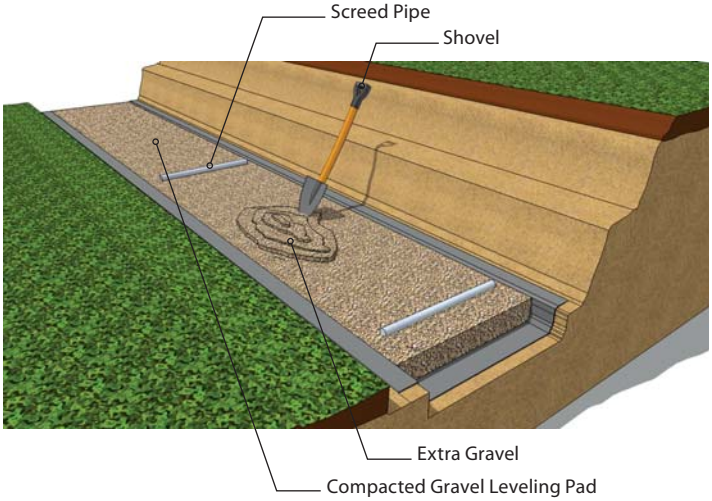
· Continue to place and level **Screed Pipes** the full length of the trench leveling pad or until reaching a base elevation change



> > > STEP 8
EXTRA GRAVEL

· Place or remove extra **Well Graded Gravel** level to the top of the **Screed Pipes** as needed

· (If more than 35mm inches of loose gravel is added, repeat the compaction steps again before screeding)



> > > STEP 9
SCREEDING LEVELING PAD

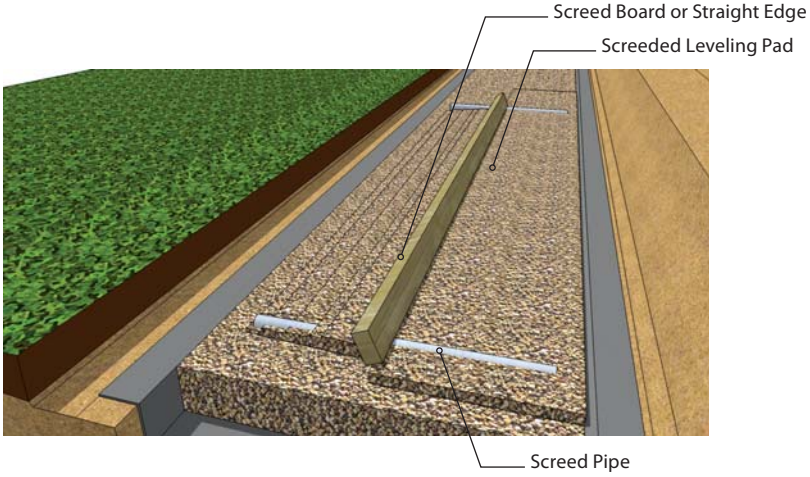
· **Screed** the gravel leveling pad with a **Screed Board** or **Straight Edge** across the trench on top of two **Screed Pipes**

· The coarser the gravel the more back and forth the screeding action when drawing the **Screed** across the leveling pad

· Too much pressure on the screed straight edge may dislodge the level of the screed pipes while screeding

· A second screed pass may be needed to insure an accurate level has been achieved

· Continue to screed the leveling pad until completing the full length of the trench or up to the first elevation change

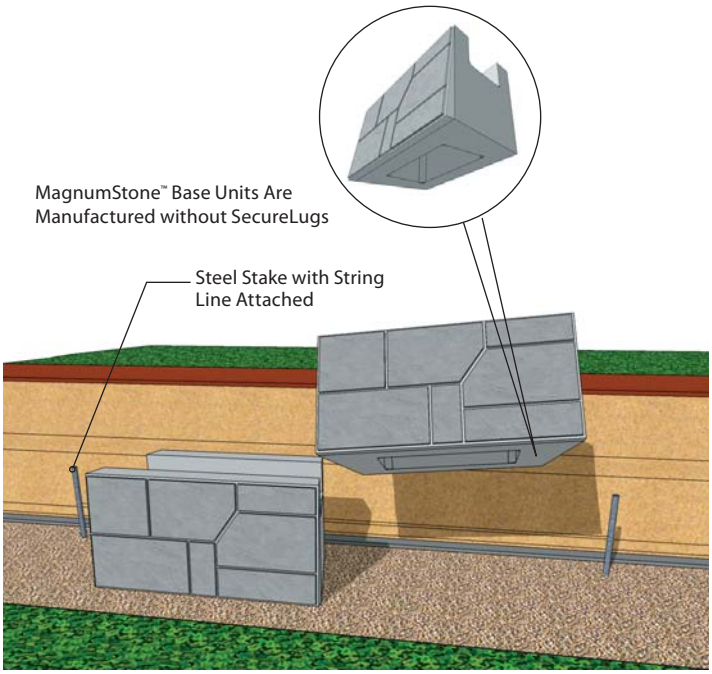


> > > STEP 10

REMOVED SECURELUGS

· **MagnumStone**™ base units, placed on the leveling pad, are manufactured without **SecureLugs**

· Place each unit on top of the leveling pad in such a way as not to disturb the level gravel



> > > STEP 11

LAY FIRST COURSE

· Remove the **Screed Pipes** from the leveling pad

· Place a steel stake at either end of the leveling pad to establish the back of the first course of units

· Secure tightly a string line to the stakes at either end which will provide the guide to line up the back of each **MagnumStone**™ base unit

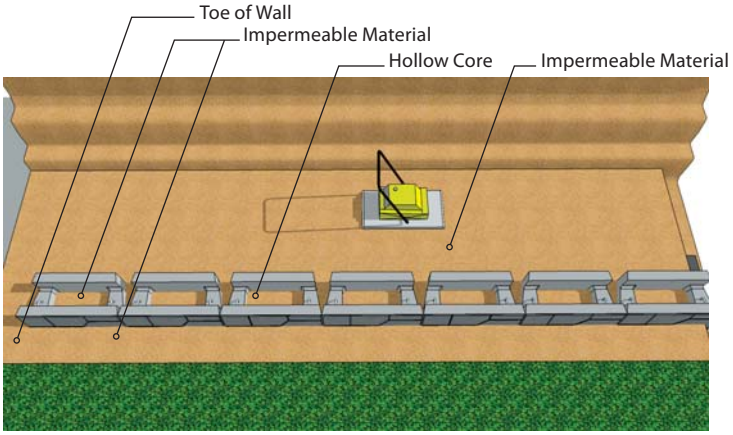
· The distance of the string line between the steel stakes may vary due to heavy winds

> > > STEP 12

IMPERMEABLE FILL

· Backfill behind, in front **(toe of wall)** and in the hollow cores of the units with **Impermeable Materials** up to the desired level of the **Perforated Drain Pipe**

· Compact the impermeable materials behind, in front and in the hollow cores of the units



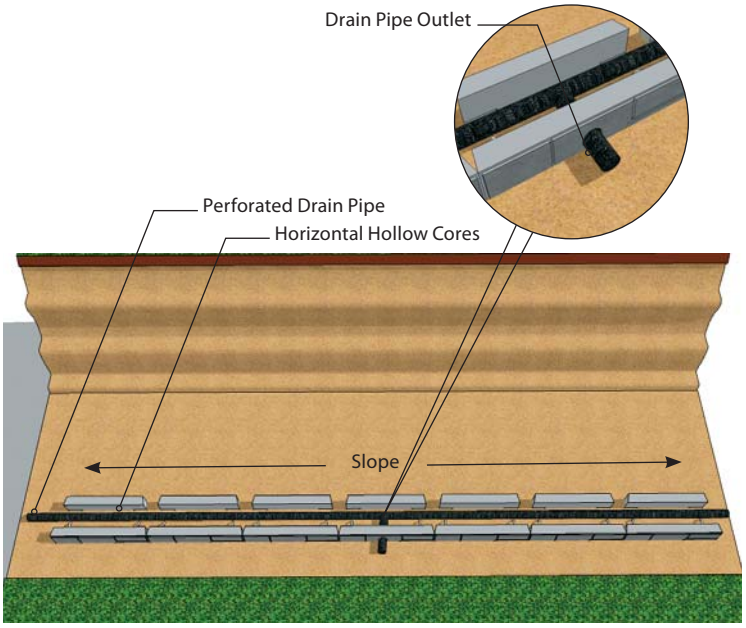
> > > STEP 13

DRAIN PIPE OUTLET

· **Perforated Drain Pipe** should have adequate slope to drain water in the right direction towards each **Drain Pipe Outlet**

· **Drain Pipe Outlet** can be every 10m or 15m

· **Perforated Drain Pipe**, laid in the **Horizontal Cores**, can be a **Sock Wrapped** system to help prevent fines from migrating into the pipe



> > > STEP 14

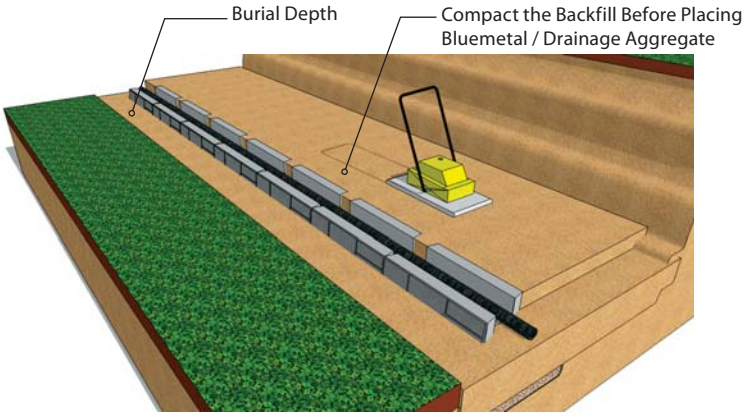
BACKFILL

· Place and compact **Backfill Materials** in maximum **Lifts** of 200mm

· **Lifts** may be less than 200mm depending on the type of soil or size of equipment

· Each **Lift** should be compacted to **98% Standard Maximum Dry Density** or greater

· The correct **Moisture Content** in the **Backfill Materials** will help in reaching proper **Compaction Density**



> > > STEP 15

DRAINAGE GRAVEL

· **Bluemetal / Drainage Aggregate** is placed in the vertical and horizontal hollow cores after placing and compaction of the backfill materials

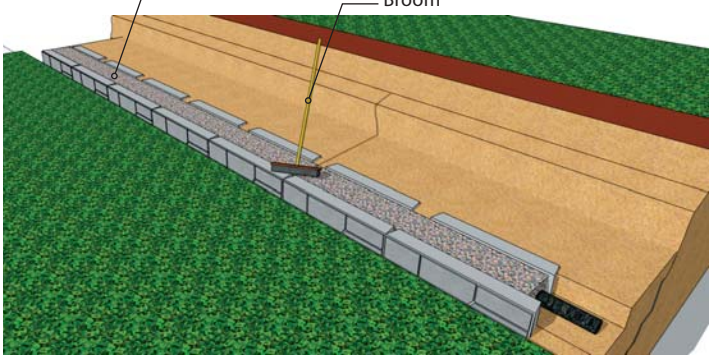
· The **Drainage Aggregate** should be 50mm below the top of units to allow for **SecureLug** connection

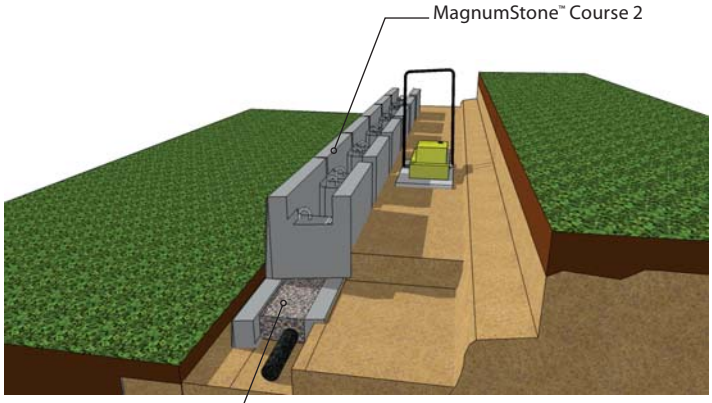
· **Clear Crush Drain Gravel** does not need to be compacted

· Sweep the top of the **MagnumStone**™ units clean of all rock and dirt before placing second course of **MagnumStone**™ units

· Make sure the **Backfill Materials** directly behind the wall are placed flush to the top of the units

· Make sure the **Backfill Materials** are well compacted and level as possible



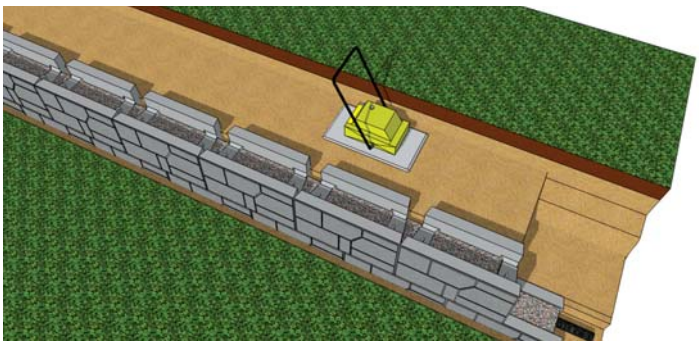


> > > STEP 16

CONTINUE INSTALLATION

· Continue to install each course of units following the same steps as above

· Install and compact **Backfill Materials** in 200mm **Lifts** until wall is complete



> > > STEP 17
TOP OF WALL UNITS

· Complete the top of the wall with **MagnumStone™ Top Units**

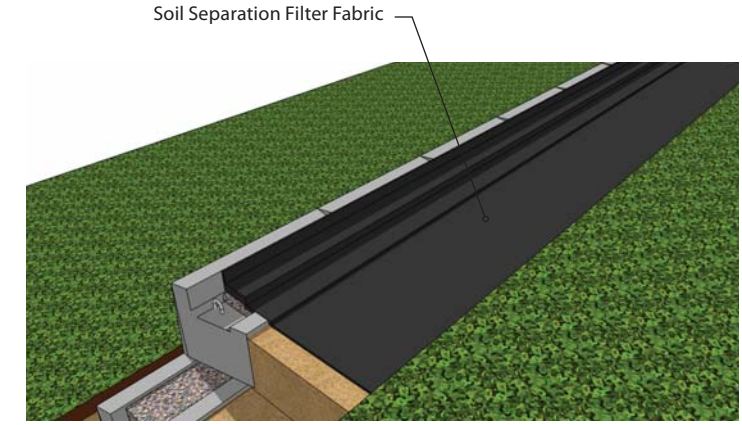
· **MagnumStone™ Top Units** are manufactured with the back panel 204mm lower than the front face panel

· The **Bluemetal / Drainage Aggregate** and backfill materials will be placed flush to the top of lowered back panel. There are times when more than 204mm of top soils may be required

> > > STEP 18
SOIL SEPARATION FABRIC

· Place a 1.83mt wide **Soil Separating Filter Fabric** on top of the backfill and drainage gravel and against the back of the last units before placing the planting soils

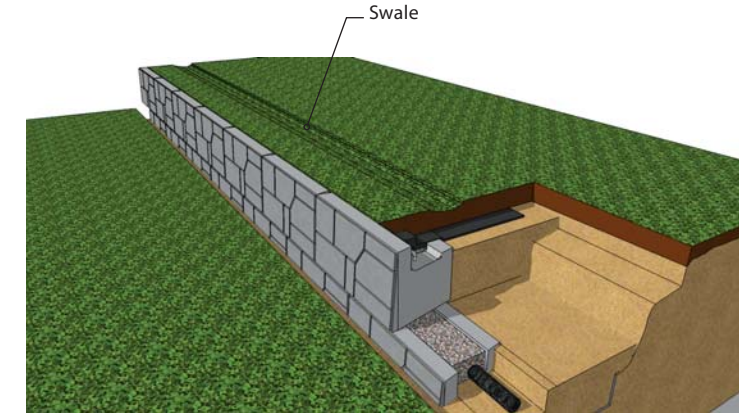
· The fabric will prevent planting soil fines from staining the face of the wall and migrating into the **Bluemetal / Drainage Aggregate** (Angular Aggregate free of fines)



> > > STEP 19
FINAL GRADING

· Insure that final grading is done on top and bottom of the wall

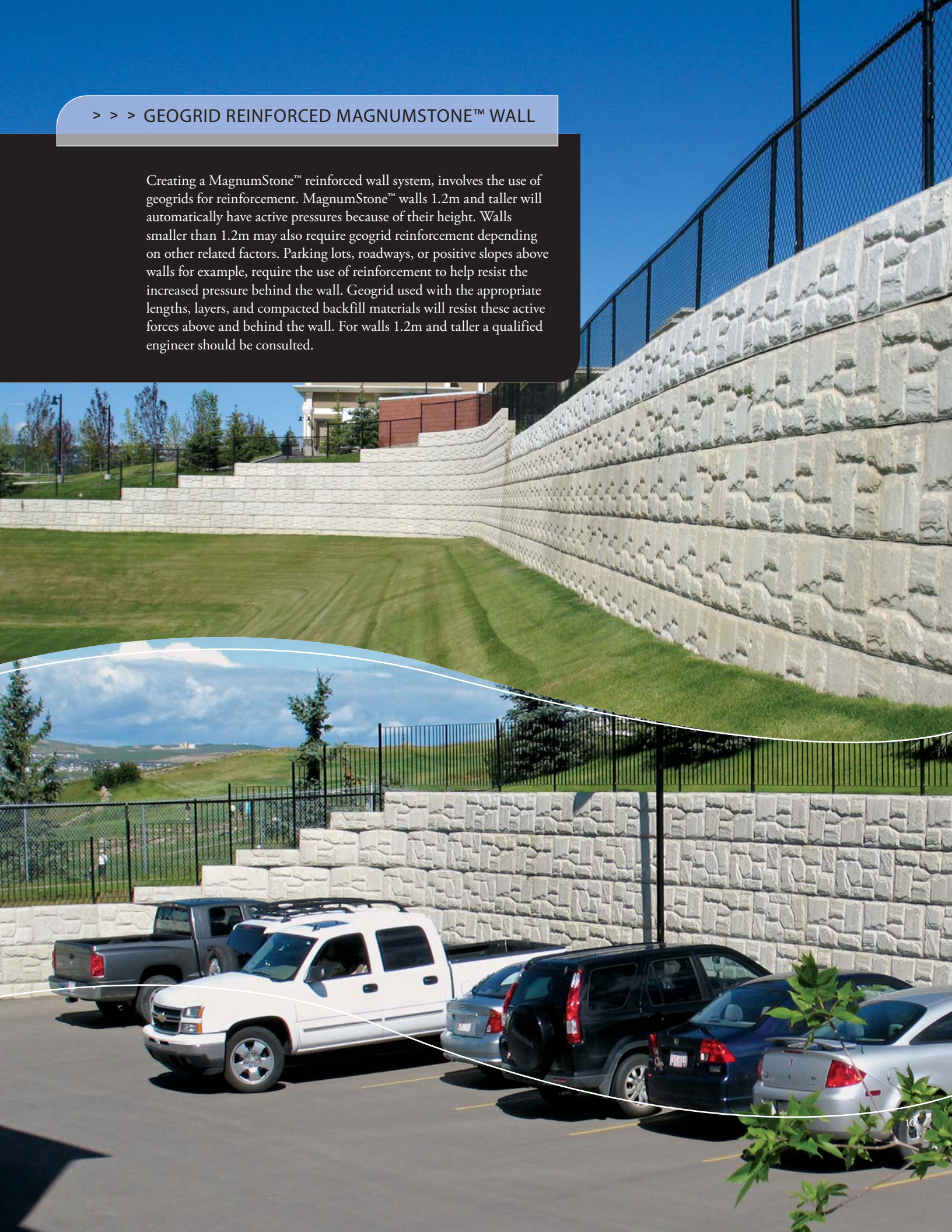
· Make sure to protect newly placed planting soil from erosion during heavy rains or surface runoff



*Final determination of the suitability of the contemplated use, and its manner of use are the sole responsibility of the user

> > > GEOGRID REINFORCED MAGNUMSTONE™ WALL

Creating a MagnumStone™ reinforced wall system, involves the use of geogrids for reinforcement. MagnumStone™ walls 1.2m and taller will automatically have active pressures because of their height. Walls smaller than 1.2m may also require geogrid reinforcement depending on other related factors. Parking lots, roadways, or positive slopes above walls for example, require the use of reinforcement to help resist the increased pressure behind the wall. Geogrid used with the appropriate lengths, layers, and compacted backfill materials will resist these active forces above and behind the wall. For walls 1.2m and taller a qualified engineer should be consulted.



> > > STEP 1

PLANNING

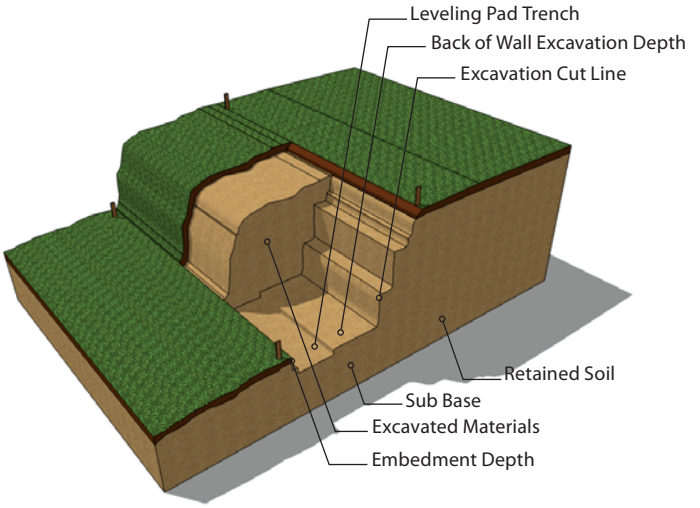
· Excavate and prepare **Sub Base Leveling Trench** 150mm below first course

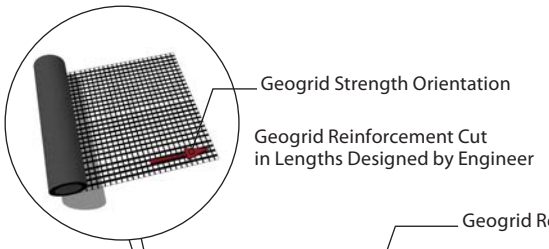
· **Leveling Pad Trench** is approximately 1m to 1.3m wide

· Normal wall **Burial Depth** or **Embedment Depth** is 300mm to 600mm or one block (for more information refer to design manual)

· Excavate cut line to a 2 to 1 slope or greater

· Back of wall excavation depth into the bank at the base of the wall should be from the face of wall to the designed length of **Geogrid**





> > > STEP 2

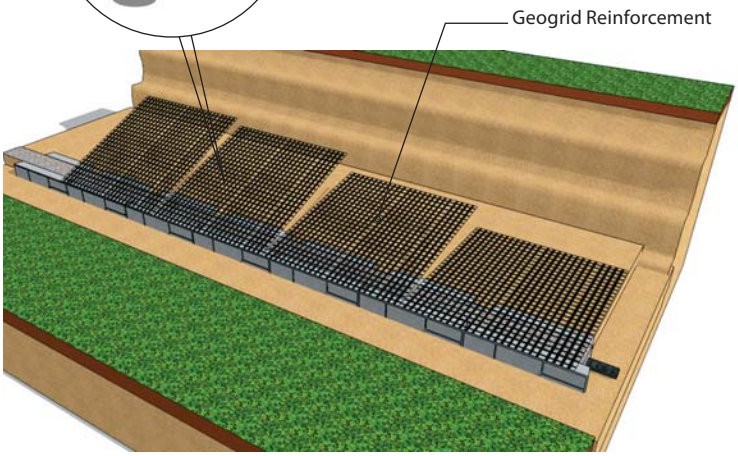
CUT GEOGRID

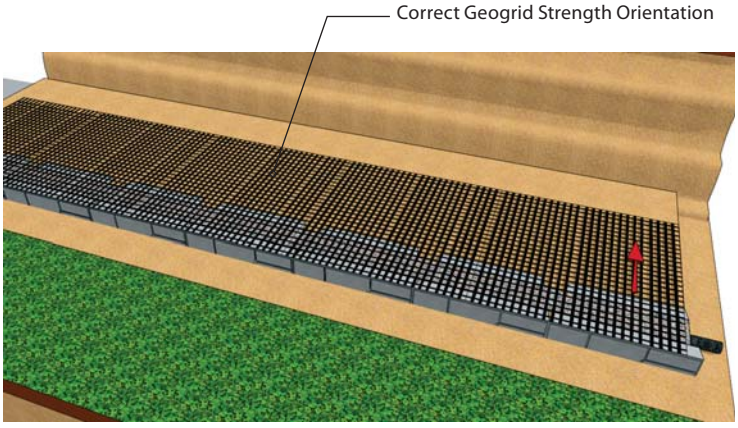
· Cut **Geogrid Reinforcement** to the length specified in the design

· **Geogrids** are manufactured in two directions Uni-axial or Bi-axial. Uni-axial grid has one direction of strength and that direction has to be oriented perpendicularly to the face of the wall during installation. Bi-axial grid can be laid in two directions, perpendicular and lengthwise to the face of wall (ensure that the lengthwise direction is still in accordance to the length specified by the Engineer's design)

· **Correct geogrid orientation, strength and length is crucial to the success of the wall project**

· Each **Geogrid** length should be laid parallel and adjacent to each other but never overlapping





> > > STEP 3

LAY GEOGRID

· Place the **Geogrid** as far forward on the **MagnumStone**™ units as possible without revealing it on the face

· Place the next course of **MagnumStone**™ units on top of the lower units and **Geogrid** at a half bond to the lower units

· The two **SecureLugs** will fit securely into the hollow cores of the two units below and lock the **Geogrid** into the gravel core

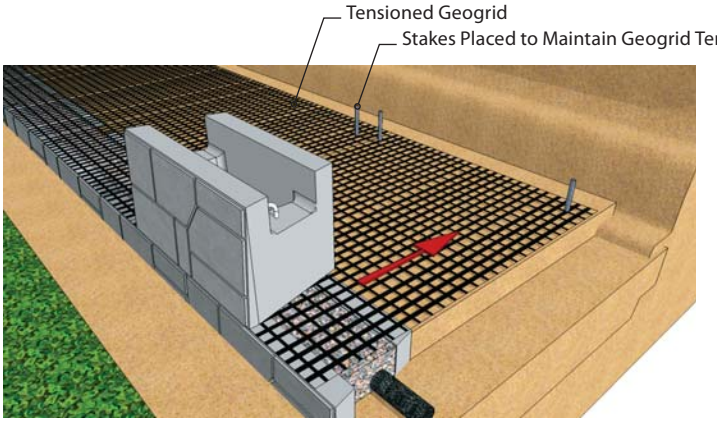
· The gravel in the lower units will be recessed 50mm or more to allow for the **SecureLugs** connection

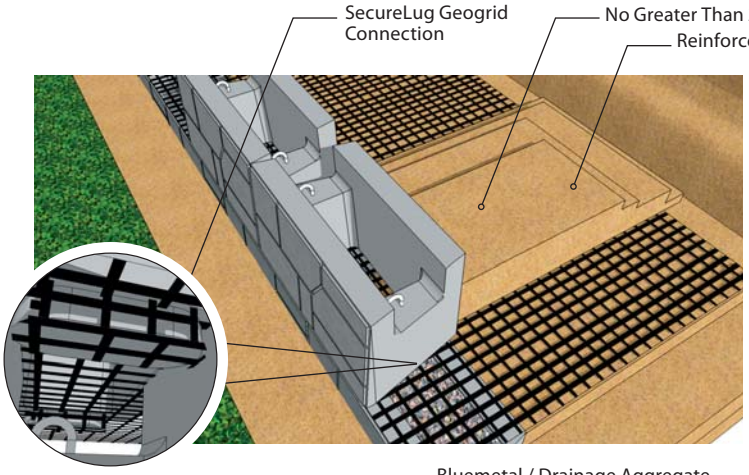
· Complete the installation of units on the **Geogrid Reinforced** courses

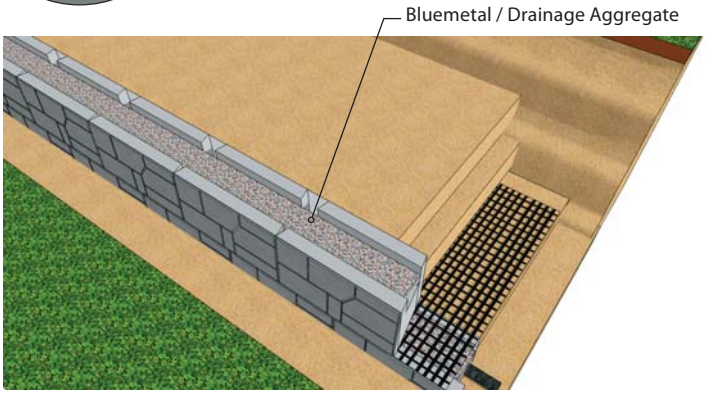
· Make sure each unit is installed against the unit next to it leaving no gaps between unit joints

· Use stakes or backfill materials to maintain the tension of the **Geogrid** during backfilling

· Do not drive equipment directly on top of **Geogrid**







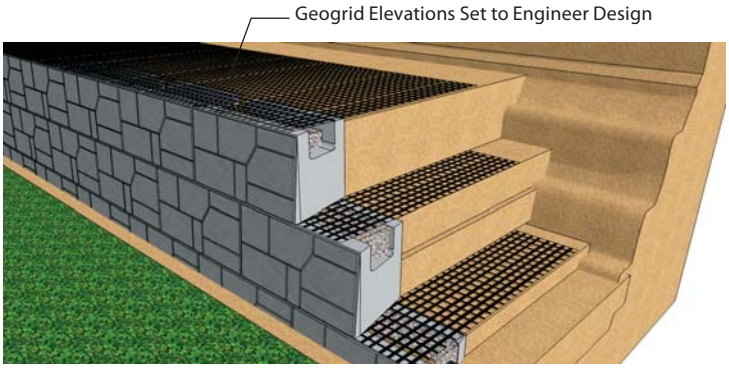
> > > STEP 4

REINFORCED BACKFILL

· **Backfill** the **Reinforced Zone** by placing materials from the back of the wall towards the end of the **Geogrid**

· Install drainage gravel in the cores after placing and compacting backfill materials

· Install and compact backfill materials in **Lifts** no greater than 200mm until wall is complete



> > > MAGNUMSTONE™ POSITIVE CONNECTION

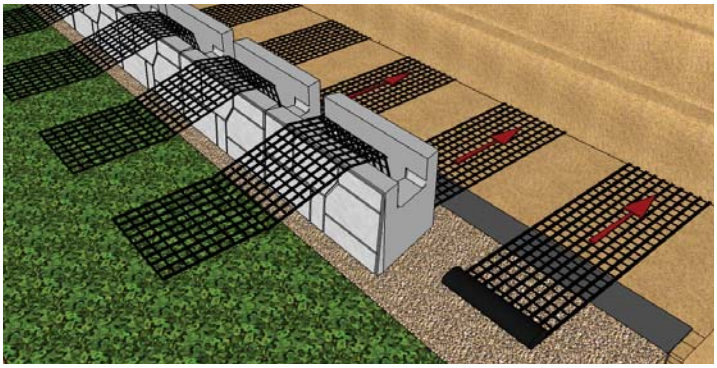
One single length of geogrid is wrapped through the hollow core providing equal length reinforcement at the bottom and top of a single MagnumStone™ unit. The geogrid wrapped hollow core is then filled with gravel making this the ultimate geogrid positive connection.

> > > STEP 1

LAY FIRST COURSE

· **Geogrid** positive reinforcement will be cut in .61m wide strips and twice the length specified in the design plus .61m for the unit height. (if specified **Geogrid** length is 3m the length will be 6.6m long)

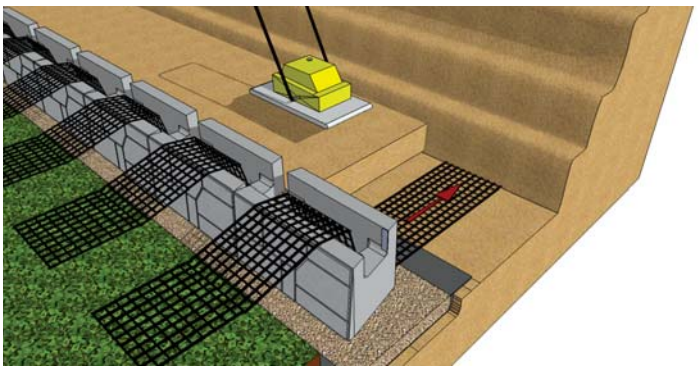
· Place the base units vertical open core over the half rolled length of **Geogrid**. Make sure the **Geogrid** is placed to the correct design length, perpendicular and centered to the unit before placing **MagnumStone™**



> > > STEP 2

COMPACT BACKFILL

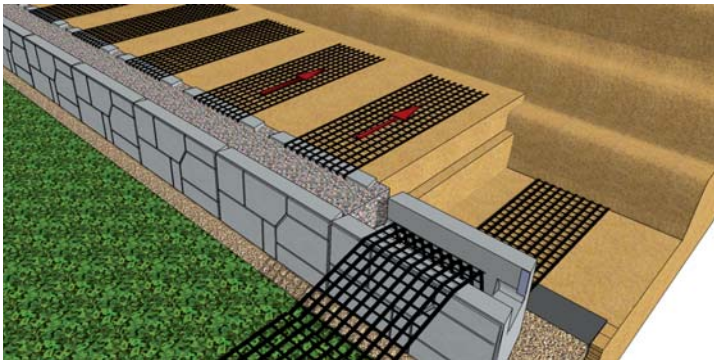
· Backfill and compact the **Reinforced Zone** by placing materials from the back of the wall towards the end of the **Geogrid**. Install and compact **Backfill Materials** in 200mm **Lifts**



> > > STEP 3

WRAP GEOGRID

· Pull rolled **Geogrid** out of the vertical core and place perpendicular to top of first unit on top of compacted backfill. Tension **Geogrid** before installing drainage gravel. Install the **Bluemetal / Drainage Aggregate** 50mm below the top of units to allow for **Securelug** connection

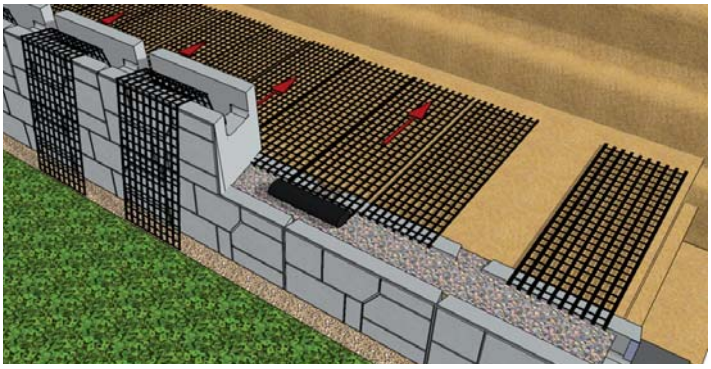


> > > STEP 4

LAY SECOND COURSE

· Place the second **MagnumStone™** units vertical open core over the second layer of half rolled **Geogrid**. Make sure **Geogrid** is placed to the correct design length perpendicular to the unit and centered to the two adjacent **Geogrid** strips before placing the unit

· Repeat above steps for each course of **MagnumStone™** Positive Reinforced Wall



> > > MAGNUMSTONE™ WALL DETAILS

This section provides detailed, illustrated step-by-step instructions for using MagnumStone™ to construct wall details including: inside curves, outside curves, elevation changes, and both inside and outside corners.

Curves, corners and elevation changes are the portions of a wall project that adapt to the specifics of the site and the needs of its users. Correct construction and professional completion of these wall details greatly enhances the visual appeal of the finished project and avoids the time and costs associated with improper installation.

> > > STEP 1

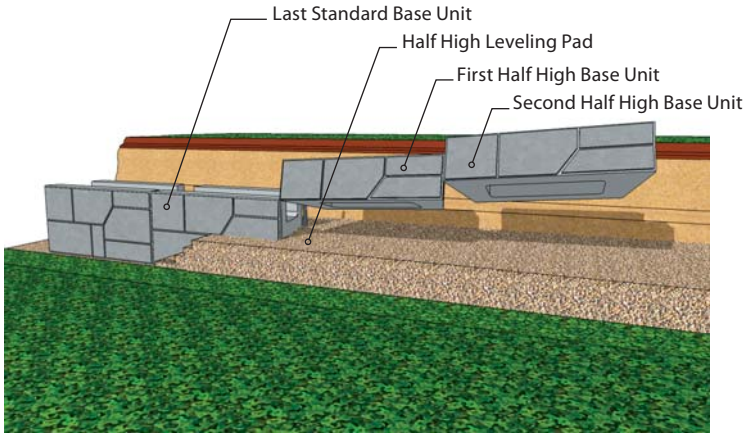
BASE ELEVATION CHANGES

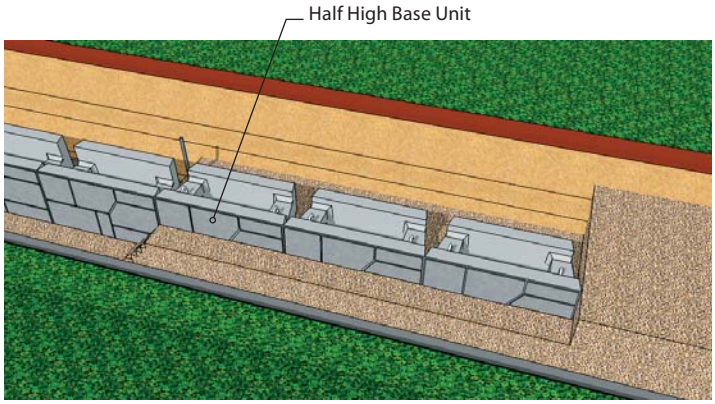
· The top of the last **Standard Base Unit** will be used to establish the **Half High Base Units** gravel leveling pad elevation

· Make sure to backfill and compact the gravel in and around the last **Standard Base Unit**

· Finished grade of the leveling pad should be 4mm to 8mm above half the height of the last **Standard Base Unit** to allow for a small amount of settlement to the first **Half High Base Unit**

· Repeat steps 5 through 9 in the gravity section on preparing the step up gravel leveling pad





> > > STEP 2

LAY ELEVATION CHANGES

· Place the first **Standard Unit**, (with **SecureLugs**), on the second course at a half bond on top of last & second last **Half High Base Units**

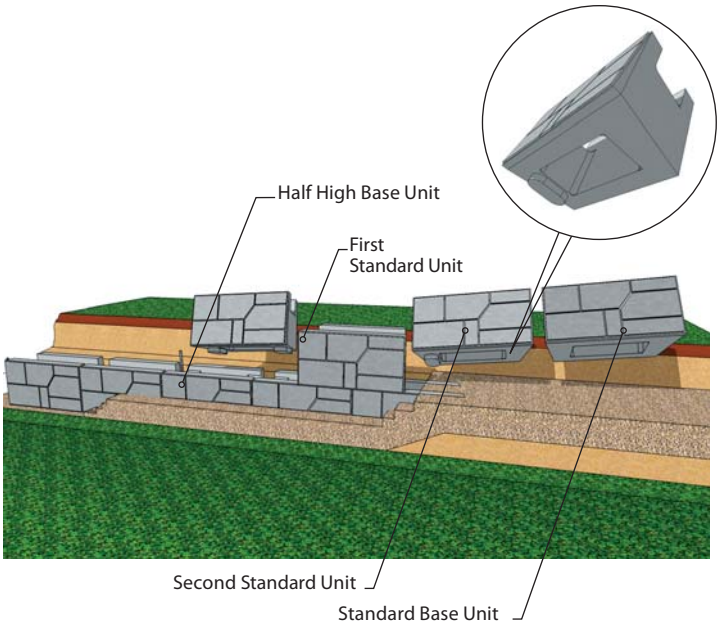
· The two **SecureLugs** will fit into the hollow cores of the two **Half High Units** below. To align the wall, place a string line at the back of the units for a straight wall or place a **PVC Flex Pipe** for a curved wall

· The batter or set back will be 50mm/unit (4.5 degree)

· Place the second **Standard Unit** half on the last **Half High Unit** and half on the gravel leveling pad. Ensure that the **SecureLug** is removed on the leveling pad side of the unit

· Complete the installation of the **MagnumStone**™ units in either direction of the elevation change

· Make sure each unit is in line and laid tight to each other



Convex/Outside Curves

> > > STEP 1

CONVEX FIRST COURSE

· If possible, start building a curve from the center and work left and right through the curve

· Use **PVC Flex Pipes** to create smooth and accurate **Convex** curves

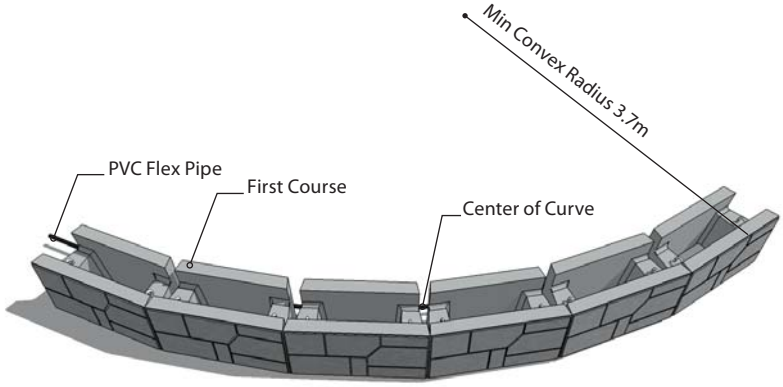
· Use the back of the unit for alignment

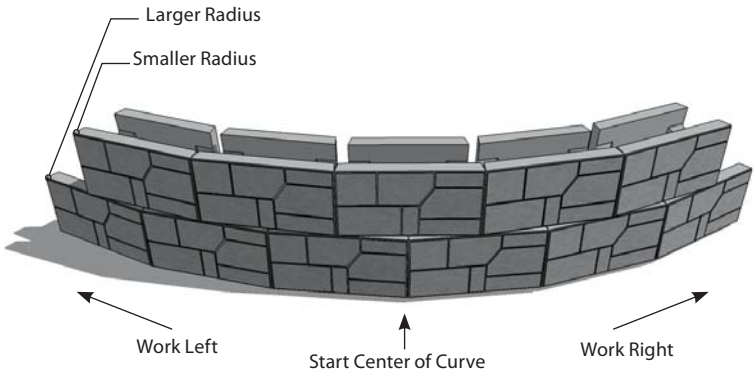
· Build each course of units by starting at the same place and the same bond as the last course

· **Convex** curves have a slight increase in batter or setback to the standard 50mm/unit

· The taller the wall the larger the **Convex** first course needs to be. The radius of each additional course will be slightly smaller than the lower course

· **MagnumStone™** minimum **Convex** curve is approximately 4m radius





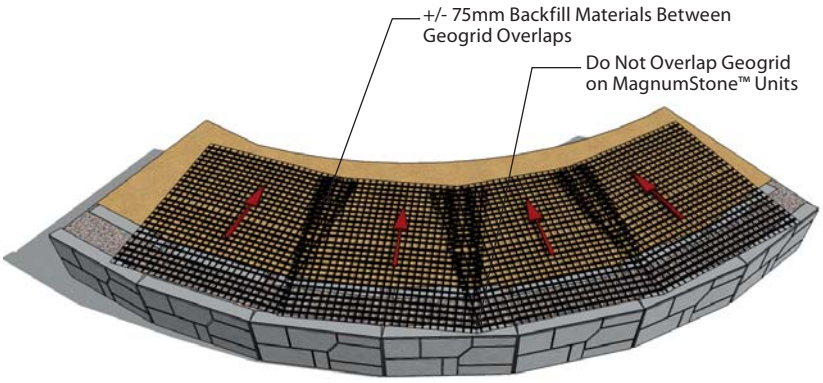
> > > STEP 2

CONVEX GEOGRID CURVE

· Each **Geogrid** length should be laid perpendicularly to the wall face

· **Geogrid** should not overlap on the **MagnumStone™** units

· **Correct geogrid orientation, strength and length is crucial to the success of the wall project**



Concave/Inside Curves

> > > STEP 1

CONCAVE FIRST COURSE

· If possible, start building a curve from the center and work left and right through the curve

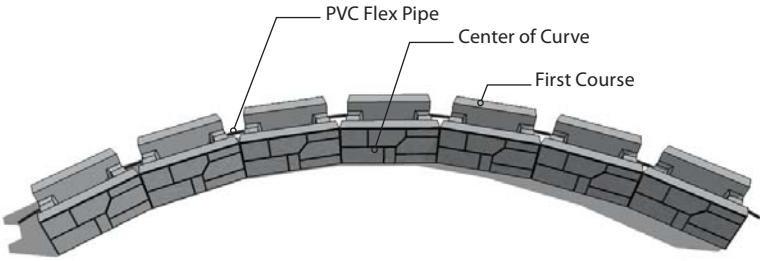
· Use **PVC Flex Pipes** to create smooth and accurate **Concave** curves

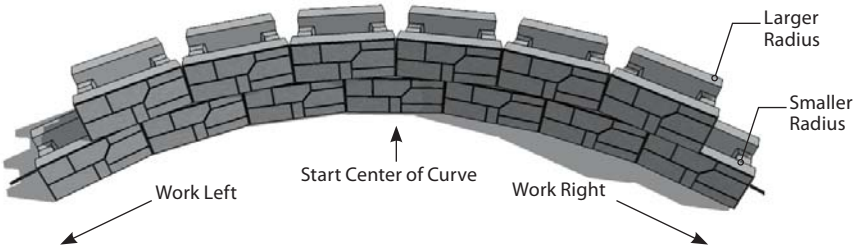
· Use the back of the unit for alignment

· Build each course of units by starting at the same place and the same bond as the last course

· **Concave** curves have a slight decrease in batter or setback to the standard 50mm/unit

· The taller the wall the smaller the **Concave** first course needs to be. The radius of each additional course will be slightly larger than the lower course





> > > STEP 2

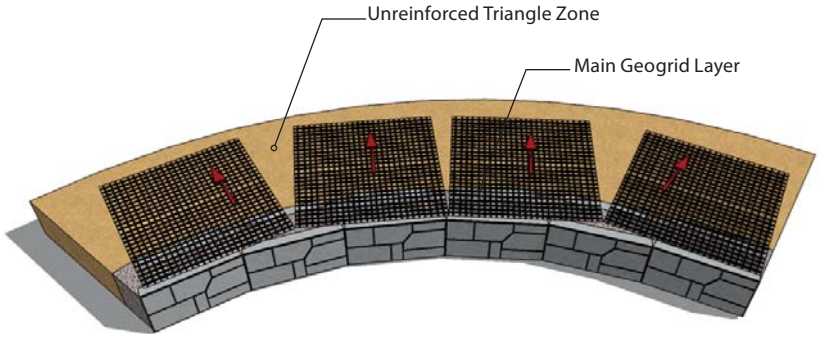
CONCAVE GEOGRID CURVE

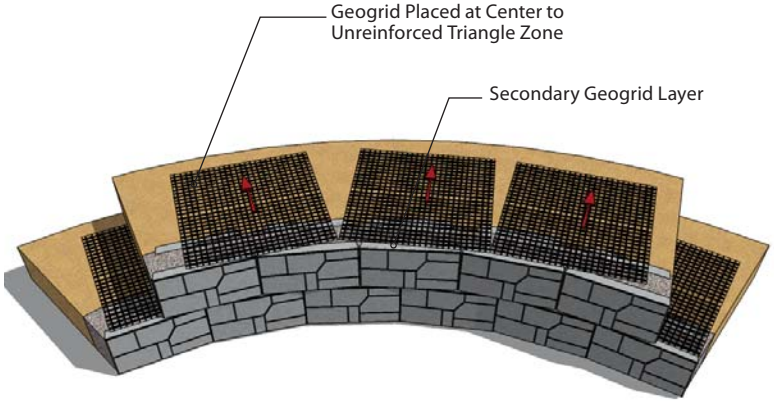
· Each **Geogrid** length should be laid perpendicularly to the wall face

· **Geogrid** should not overlap on the **MagnumStone™** units

· To ensure 100% coverage, place a second layer of **Geogrid** centered to the unreinforced triangle zone one course above the main **Geogrid** layer

· **Correct geogrid orientation, strength and length is crucial to the success of the wall project**





Outside Corners

> > > STEP 1

OUTSIDE FIRST COURSE

· Use a **Corner/End Unit** to build an outside corner

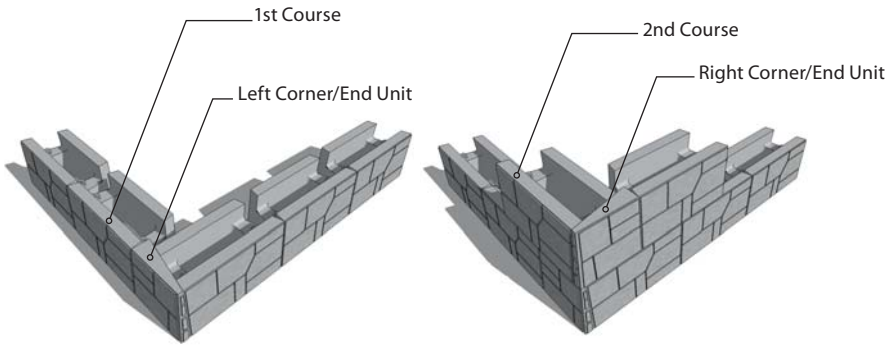
· Attach a **Left Corner/End Unit** to the first **MagnumStone™** base unit and place assembled corner unit on base leveling pad to start the outside corner

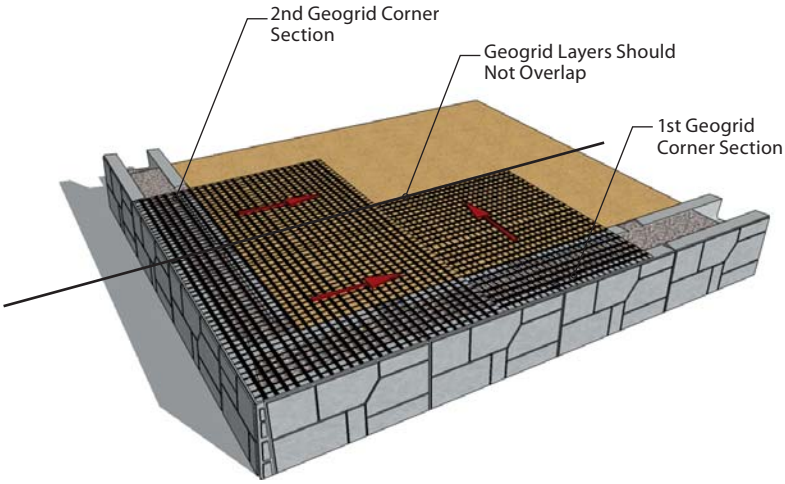
· Place a **MagnumStone™** unit on either side against the **Corner/End Unit**

· Continue to lay the **MagnumStone™** base course on either side of the corner until first course is completed

· Attach a **Right Corner/End Unit** to a **MagnumStone™** standard unit (with **SecureLugs**) and place on second course overlapping lower corner unit. Align the second course corner unit with lower corner unit to achieve proper setback

· Continue to lay the **MagnumStone™** second course on either side of the corner until second course is completed





> > > STEP 2

OUTSIDE GEOGRID CORNER

· Each **Geogrid** length should be laid perpendicularly to the wall face

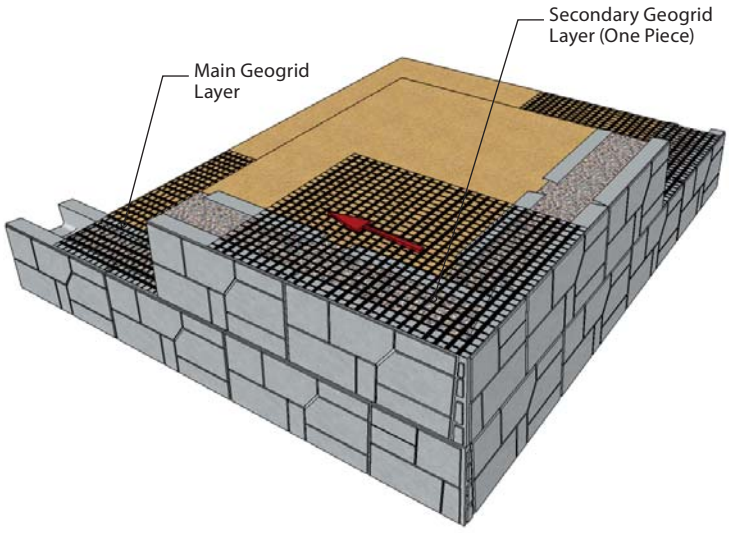
· **Geogrid** should not overlap on the **MagnumStone™** units

· Lay the 1st **Geogrid** corner section perpendicularly to one side of the corner

· Lay the 2nd **Geogrid** section perpendicularly to the other side of the corner but not overlapping the 1st **Geogrid** section

· Lay the secondary **Geogrid** layer one course above and perpendicular to the lower main **Geogrid** layer directional strength

· **Correct geogrid orientation, strength and length is crucial to the success of the wall project**



Inside Corners

> > > STEP 1

INSIDE FIRST COURSE

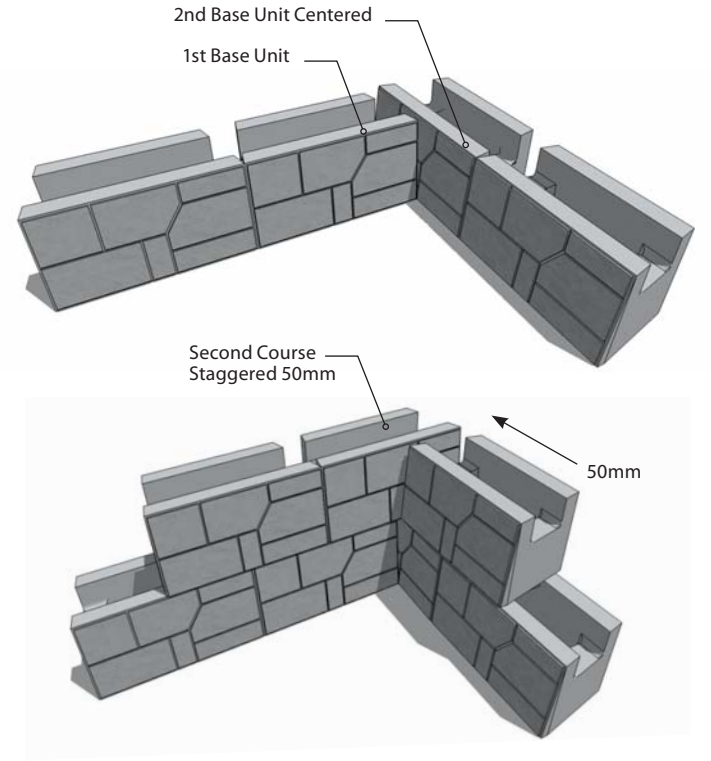
· Place the second unit at right angle and centered to the first **MagnumStone™** base unit. Continue to install the **MagnumStone™** base units right and left of the first inside corner units

· Place the second unit at right angle and centered to the 1st unit on the second course

· Make sure second course units are placed at a 50mm/unit setback to the lower inside corner

· Continue to install the units left and right of the inside corner to complete the second course of the wall

· Repeat the above step by step installation until the wall height is completed or until reaching the first **Geogrid** layer



> > > STEP 2

INSIDE GEOGRID CORNER

· Each **Geogrid** length should be laid perpendicularly to the wall face

· **Geogrid** should not overlap on the **MagnumStone™** units

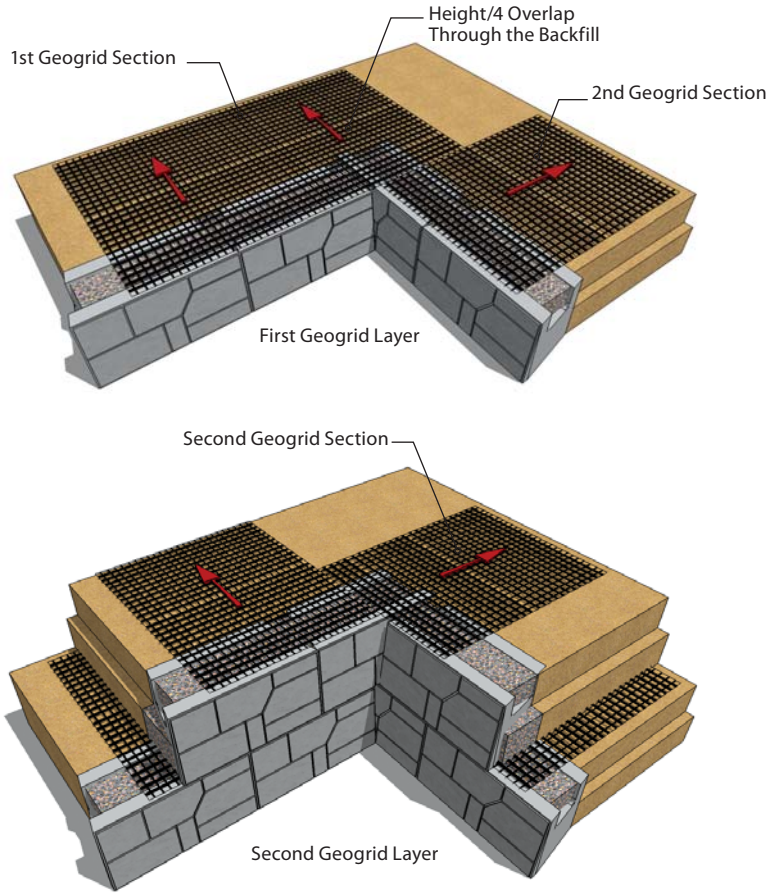
· Lay the 1st **Geogrid** corner section perpendicularly to one side of the corner and overlap h/4 through the backfill (Height of Wall ÷ 4)

· Lay the 2nd **Geogrid** section perpendicularly to the 1st **Geogrid**

· Lay the second **Geogrid** layer perpendicularly and overlap h/4 through the backfill opposite to the first **Geogrid** layer

· The h/4 overlap will alternate layer to layer to properly secure the inside corner

· **Correct geogrid orientation, strength and length is crucial to the success of the wall project**

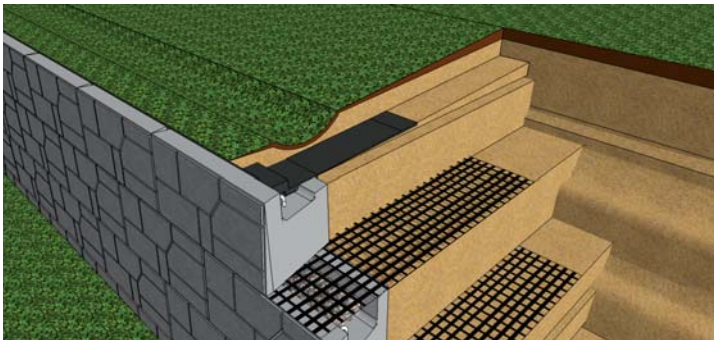


> > > MAGNUMSTONE™ TOP OF WALL DETAILS

Once again the large hollow cores provide yet another solution. This time it facilitates the easy embedment of traffic barriers, railings, fences or even large “Jersey” barriers that projects require for top of wall safety. The top of wall details can be secured by infilling the vertical and horizontal cores with concrete. Another benefit is the embedment system near the front of the wall face. This provides the designer and owner maximum usage of the land above the wall without sacrificing any structural integrity.

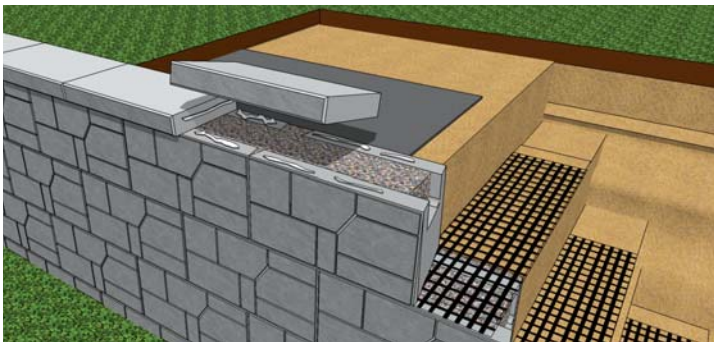
> > > GRASS SWALES

· An impermeable soil **Swale** can be created on top of the wall to take care of any water that may cascade over the wall face



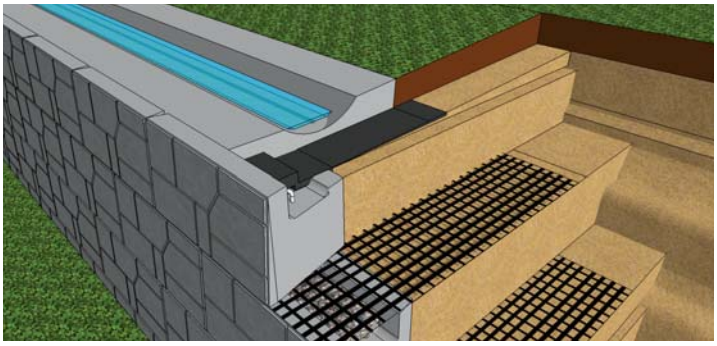
> > > STEP/CAPS

· Complete the top of wall with **MagnumStone™ Step/Caps**. Make sure all units are free of dirt and stones before installing the caps



> > > CONCRETE SWALES

· Concrete **Swales** can be placed on top of the **MagnumStone™** wall to take care of any possible surface water problems that may damage the backfill soils

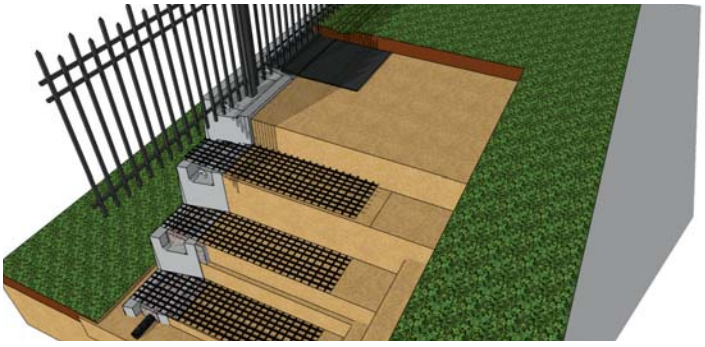


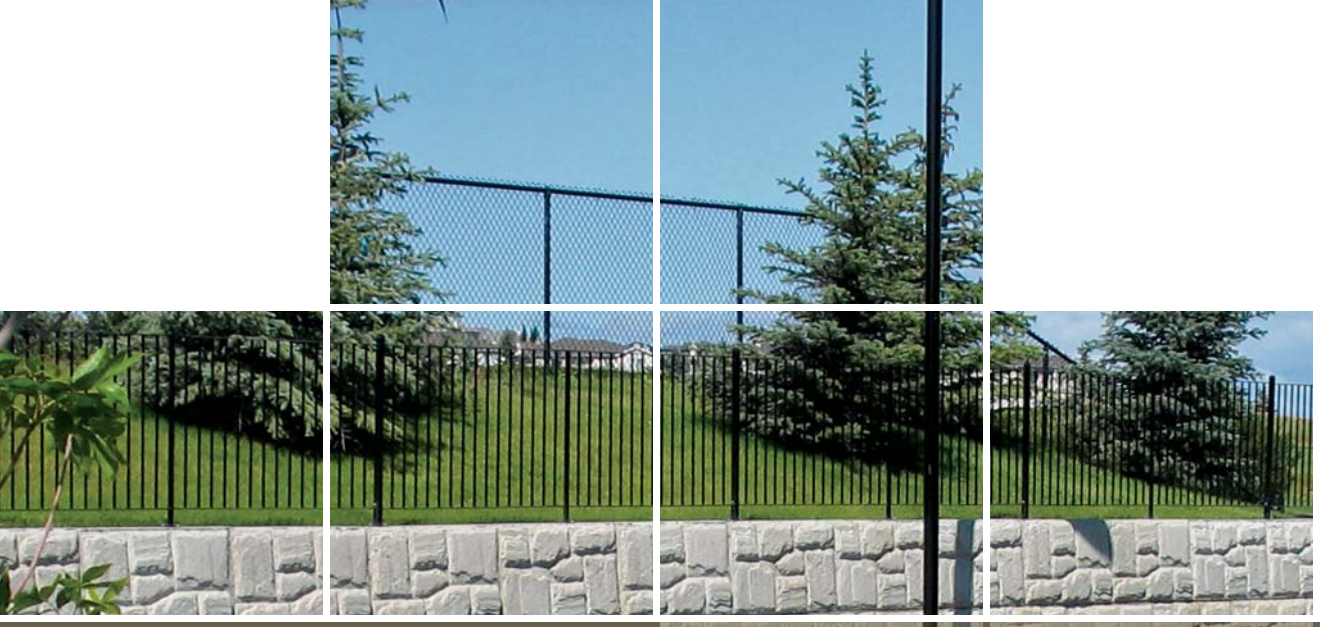
> > > FENCE POSTS

· Fence posts, railings or guard rails can be placed into the large vertical hollow cores

· Fill the vertical and hollow cores with concrete to the depth and length around each post that will resist lateral force

· Check with a qualified engineer





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