



# Retaining Walls

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## About National Masonry®

National Masonry® has quickly established itself as the industry leader with exceptional product quality and outstanding customer service with a clear vision of customers for life. We are obsessed with ensuring every customer has a memorable experience with us and to leave you with no doubt that you have made the right choice.

**National Masonry®, the new benchmark in masonry.**

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Product Disclaimer: Concrete Blocks, Bricks, Pavers and Retaining Wall products supplied by National Masonry® are manufactured using raw materials that inherently vary in nature. Whilst all effort is made to produce uniformity in our range of products, variation in colour, texture, and finish can be present. The dimensional characteristics of all products are nominal and variations in length, height, and width can occur from unit to unit which needs to be taken into consideration when installing these products.

# Engineered Solutions



The Keystone 133 Elite® is the professionals choice for larger soil reinforced retaining wall applications. With its unique interlocking pin system, the Keystone 133 Elite® is a strong and secure wall system that accommodates a large range of applications. Ability to be used in a variety of soil conditions.

## Benefits

- Near vertical walls
- Capable of wall heights in excess of 12mtrs
- Versatile
- Fast & Ease of installation
- RTA, QTMR approved walling system
- Genuine splitface finish
- Blends into environment



Keystone 133 Elite®



Flushface Cap

## Where to use



## Which colour

Available in 3 unique and contemporary colours



Charcoal Desert Sands Parchment

Product Name	Size (mm)	Available Colours	Weight per unit (kg)	Units per m <sup>2</sup>	Units per pallet
Keystone Elite®133® Standard Unit	600x285x200	Charcoal, Desert Sands, Parchment	46.0	8.3	40
Flushface Cap	485x275x100	Charcoal, Desert Sands, Parchment	24.6	2.06 l/m	90

## Overview

### Work smarter with The Keystone 133 Elite®

The Keystone 133 Elite® is perfect for large wall applications. Its large face dimension creates a larger-scale look, aesthetically matching the larger wall look and feel, while reducing the number of units required to complete the job.

Never before have wall designers had so much flexibility in creating the perfect appearance for their Keystone wall.

The Keystone 133 Elite® can satisfy a wide array of design requirements including straight and curved walls. The Keystone 133 Elite® is simply the best combination of strength, beauty, and efficiency on the market.

### Product Design

Efficiency is the bottom line for the Keystone 133 Elite®. Its design provides a number of forward-thinking innovations that make it easy to use on a wide-variety of projects. For example: The tail section of Keystone 133 Elite® reduces the weight of the unit and also makes an excellent carrying handle for installers to use in manoeuvring the unit.

### Positive Mechanical Connection

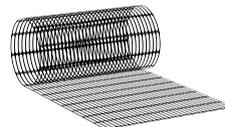
Keystone's patented pin system provides dependable strength where it's needed most. High-strength fibreglass pins provide built-in alignment for the Keystone 133 Elite® and ensure that each unit is securely interlocked within the wall face. In addition, this unique retaining wall system allows for a mechanical connection with Geogrid soil reinforcement, securing its placement between units and allowing for proper tension and maximum efficiency of the Geogrid.

### Speed of Installation

The large face dimensions make a real difference when installing larger walls. With fewer units per square metre than its rivals, less effort and time is required with the Keystone 133 Elite® to construction the wall. This advantage combined with the ability to use lifting bars provides fast and safe installation.

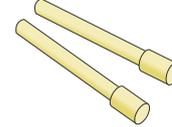
### Perfect Scale for Large Structures

Using smaller segmental retaining wall units on larger walls can overwhelm the visual senses. The larger face dimensions of the Keystone 133 Elite® provides a more appropriate visual scale for big walls.



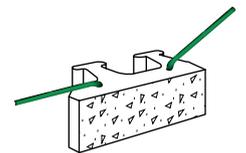
#### Geogrid

As per design requirements



#### Shouldered Pins

2 pins per full unit (high strength protruded fibreglass)



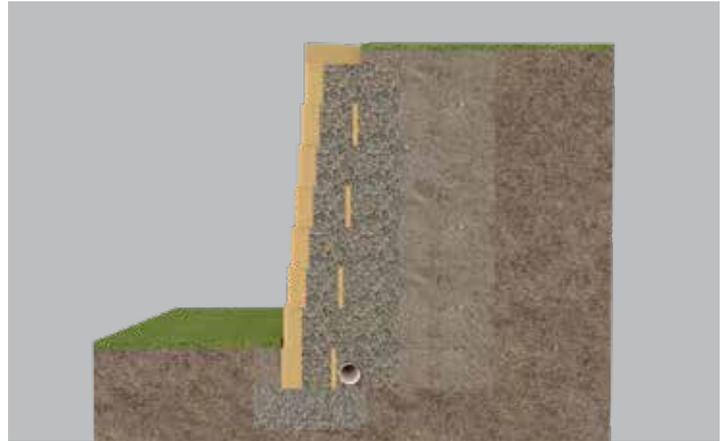
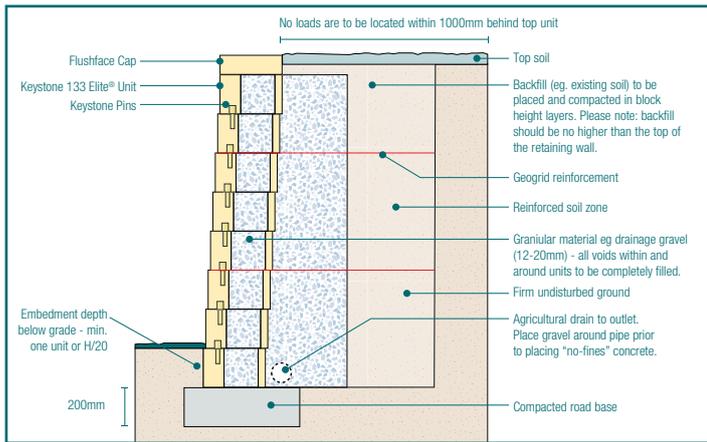
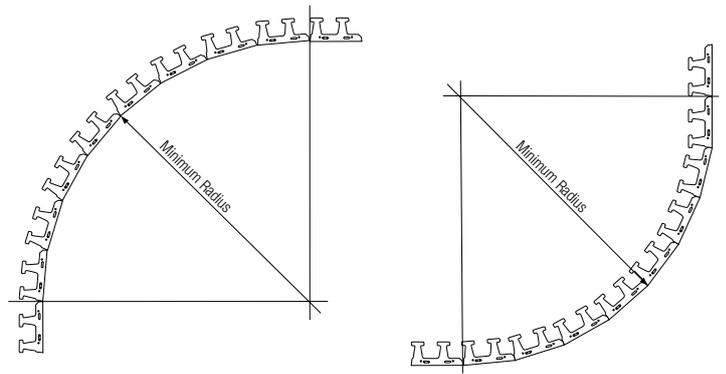
#### Lifting Bars

Keystone 133 Elite® units should be lifted by two people using the Keystone® lifting bars.

\* Available to Hire through National Masonry®

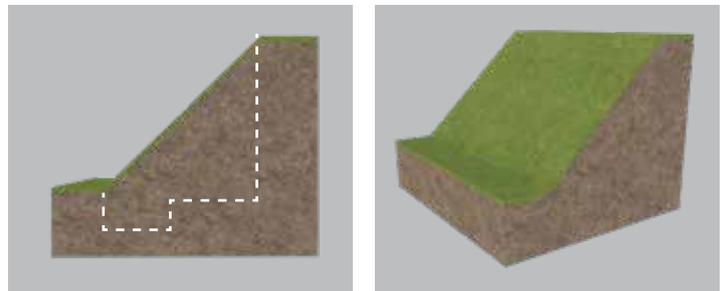
## General Notes

- Unit depth (face to tail) may vary up to 25mm due to texture variations.
- Remove any excess concrete slag from pin holes and receiving channel as required to assemble wall. During manufacturing, some concrete crumbs may deposit in these areas and should be removed to permit pins to be placed in the appropriate holes and receiving channels.
- Cut or split units as required (with a masonry saw, hydraulic break or chisel and hammer) wherever units need to be altered to allow construction to be finalized.
- When cutting concrete units, always wear safety goggles, gloves, and filter mask per manufacturer's recommendation.
- Convex and Concave radius = 4.9m



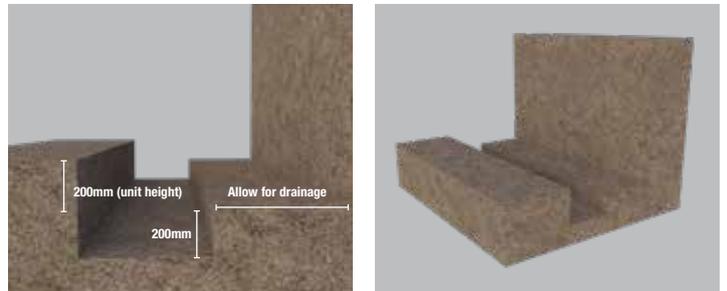
## Preparation

You'll need a few tools to build your retaining wall. Ensure you have a shovel, wheelbarrow, stakes and stringlines, measuring tape, a level and Screed, a rake, compactor, square, marking pen, cutting saw, lump hammer and bolster, and safety gear, such as glasses, ear protection and gloves. You also need to ensure you have all the materials ready to go onsite. You'll need your retaining wall blocks and caps if required, landscape strength adhesive, Geogrid, gravel, road base and agg pipe.



## 1. Excavation

Excavate the area and ensure the embedment depth is a minimum of one unit height, plus 200mm for the road base. Allow additional width for agg pipe and gravel for drainage as per engineering.



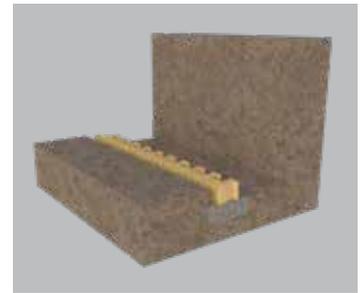
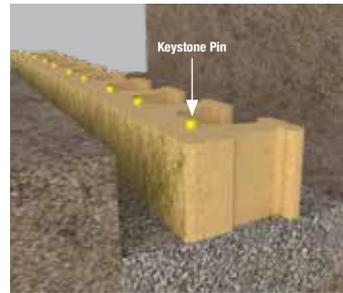
## 2. Levelling Pad

Level the prepared base with 200mm of well-compacted granular fill (gravel, road base, or 10 - 20 mm crushed stone). Compact to 95% or greater. Do not use PEA GRAVEL or SAND for levelling pad.



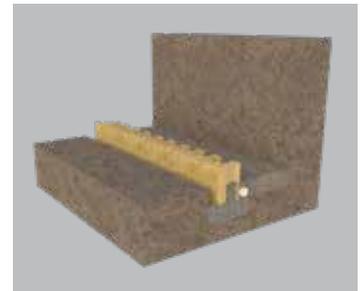
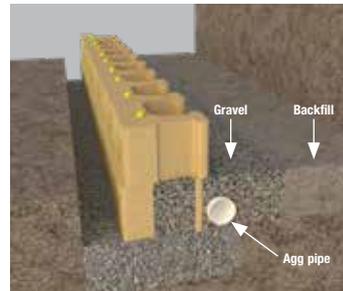
### 3. Install First Row and Insert Pins

Install the first row of blocks, ensuring they are level. Install Keystone Pins into each block in preparation for the next row of blocks.



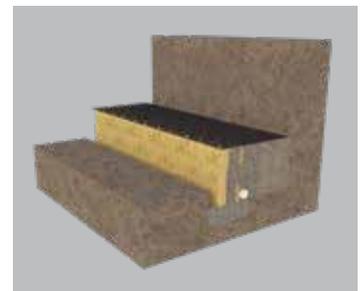
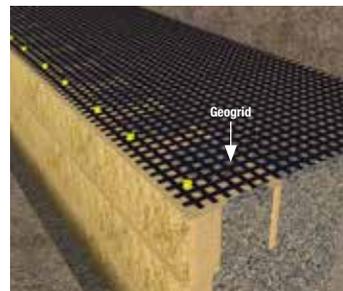
### 4. Drainage, Backfill & 2nd Row

Install the Agricultural pipe and ensure it is connected to a drain outlet. Place gravel around pipe and backfill to the height of the first row of blocks. All voids within and around units to be completely filled with gravel. Backfill (eg. existing soil) to be placed and compacted in block height layers.



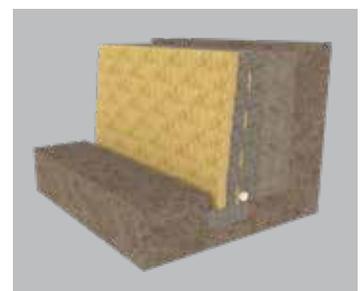
### 5. Geogrid Reinforcement

GeoGrid must be installed at every level indicated as per engineering. Ensure the GeoGrid is secured over the Keystone Pins as this forms part of the mechanical lock keeping the blocks in place.



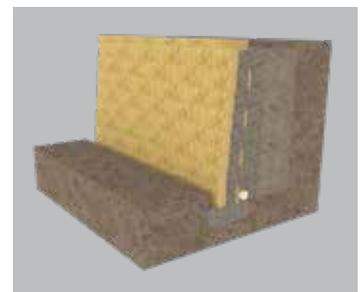
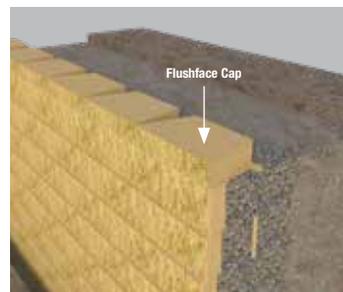
### 6. Complete Remaining Rows

Install each remaining row ensuring row is level and Keystone Pins have been properly inserted. The final row of blocks does not require Pins. Geogrid must be installed at all remaining indicated levels as per engineering.



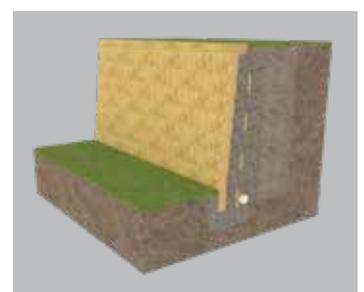
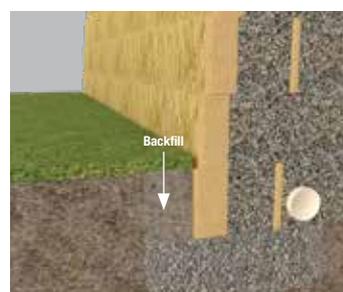
### 7. Install Capping

Keystone Flushface Capping is then installed.

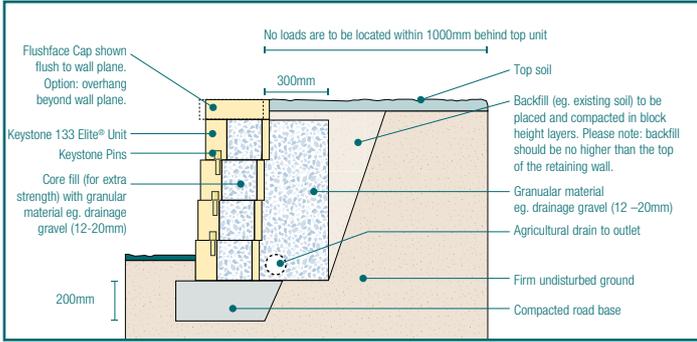


### 8. Final Backfill, Clean Up and Sealing

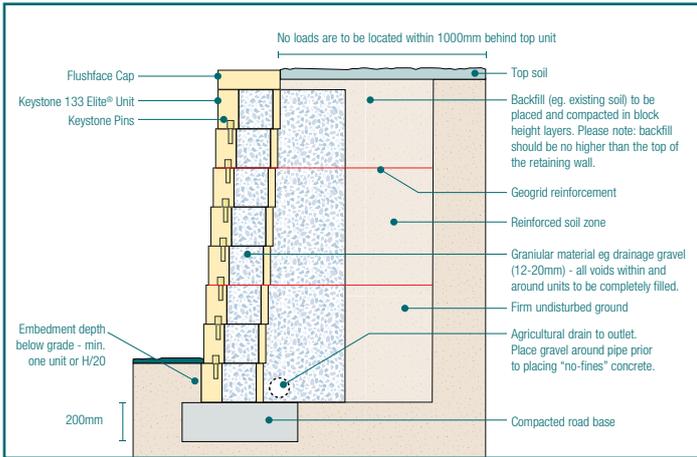
Backfill the remaining spaces at the first row and the top row capping. Lay turf or mulch ensuring no loads are located within 1000mm behind top unit. National Masonry® recommends sealing all masonry products.



## Gravity Wall Near Vertical Detail (2.5°+ batter)



## Reinforced Wall - Near Vertical Detail (2.5°+ batter)



The following charts assume the use of a coated polyester Geogrid with a minimum allowable design strength of  $LTDS = 27 \text{ kN/m}$  or  $Tal = 18 \text{ kN/m}$ . Information on specific Geogrids is available from the Geogrid manufacturer.

## Sand Gravel: $\phi=34^\circ$ , $\gamma=19\text{kN/m}^3$

## Chart Notes

### Gravity Walls Maximum Un-reinforced Wall Height

Maximum Height Near Vertical 'H' (mm)	Level	3H:1V
Sand / Gravel ( $\phi = 34^\circ$ )	0.7m	0.7m
Silty Sand ( $\phi = 30^\circ$ )	0.7m	0.5m
Silt / Lean Clay ( $\phi = 26^\circ$ )	0.5m	0.5m

Friction angle (PHI) for use in earth pressure calculations of Geogrid reinforced walls is evaluated at  $26^\circ$ ,  $30^\circ$ , and  $34^\circ$  only. For other soil type analysis, refer to KeyWall software program or consult with a qualified engineer.

Moist unit weight for the three soil types used is  $120 \text{ lbs./ft.}^3$  ( $19\text{kN/m}^3$ ).

Sliding calculations use 8 inch (200mm) crushed-stone leveling pad as the compacted foundation material.

All backfill soils are calculated as compacted to 95% Standard Proctor density.

The information provided herein is for preliminary design use only. A qualified engineer should be consulted for design and analysis of structures. Keystone Retaining Wall Systems, Inc., assumes no liability for the improper use of this information.

The Keystone Geogrid charts are graphically presented to show the proper orientation and lengths of Geogrids used with Keystone 133 Elite® units at the near vertical  $2.5^\circ$  batter.

Design Chart Wall sections are shown to increase in 400mm increments beginning at 1.3m and ending 3.3m. Engineering judgement should be used when interpolating between heights. Walls under 1.3m in height may require Geogrid reinforcement depending upon the soil types, and surcharge loadings. (see Gravity Walls chart).

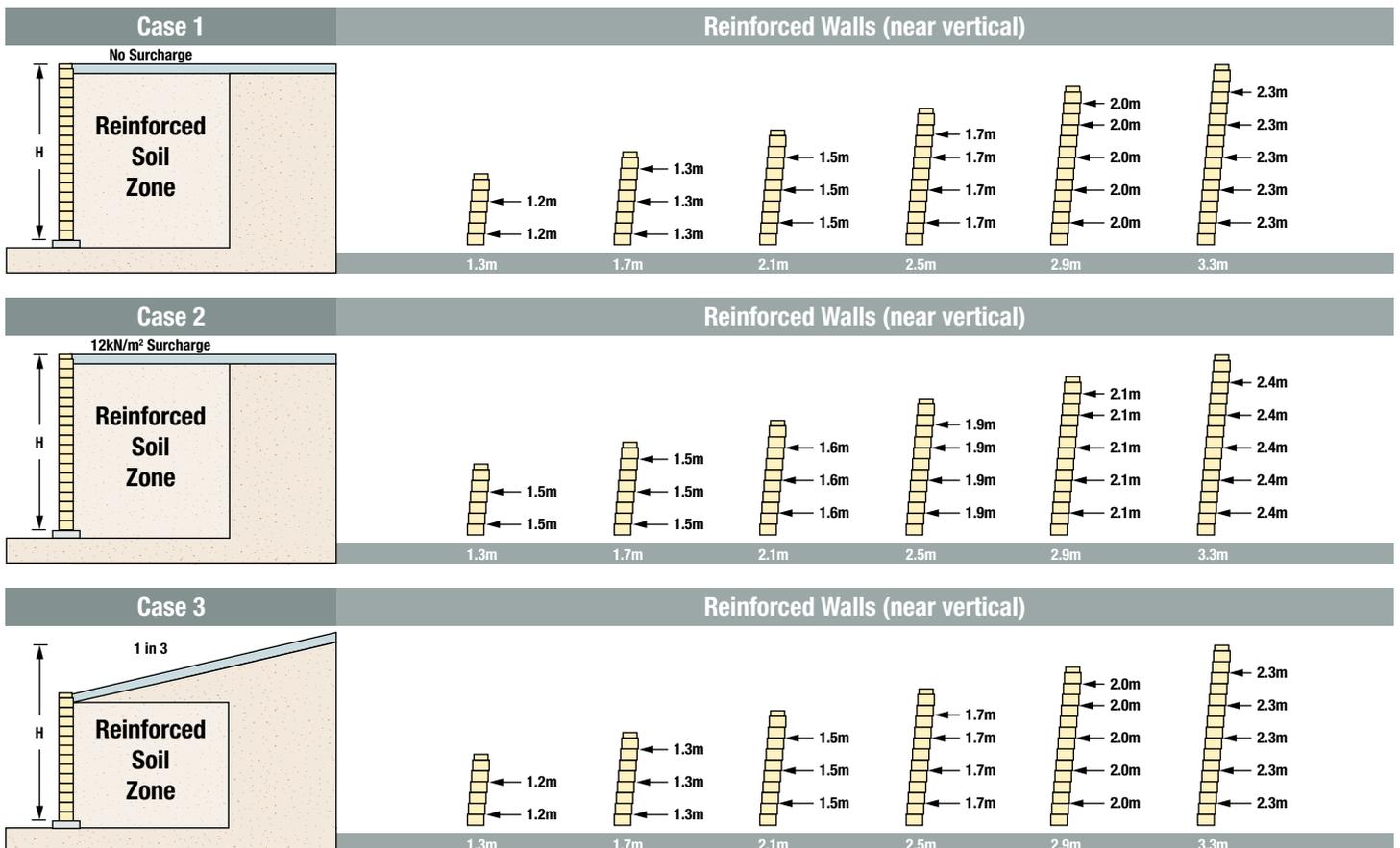
Soil ranges are selected to approximate good ( $34^\circ$ ), medium ( $30^\circ$ ), and poor ( $26^\circ$ ), soil conditions which span the typical design range. Wall height is the total height of the all from top of leveling pad to top of wall.

All Geogrid lengths shown are the actual lengths of Geogrid required as measured from the connection pins to the end of the Geogrid.

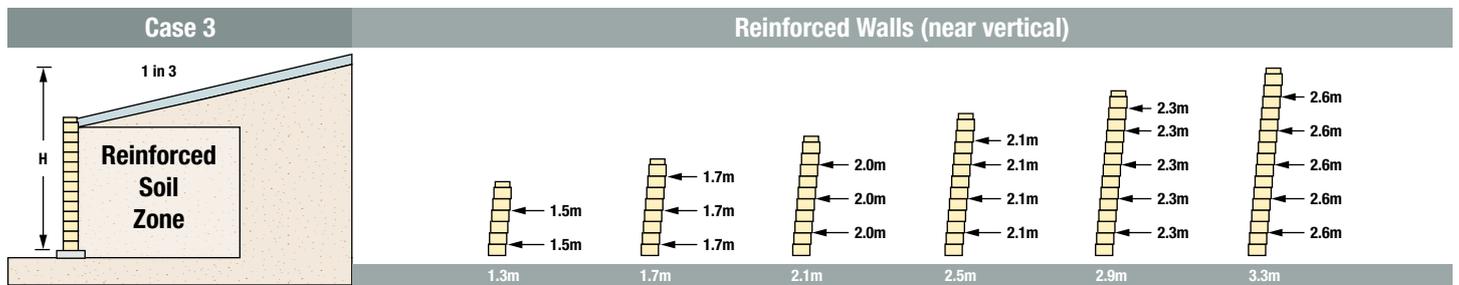
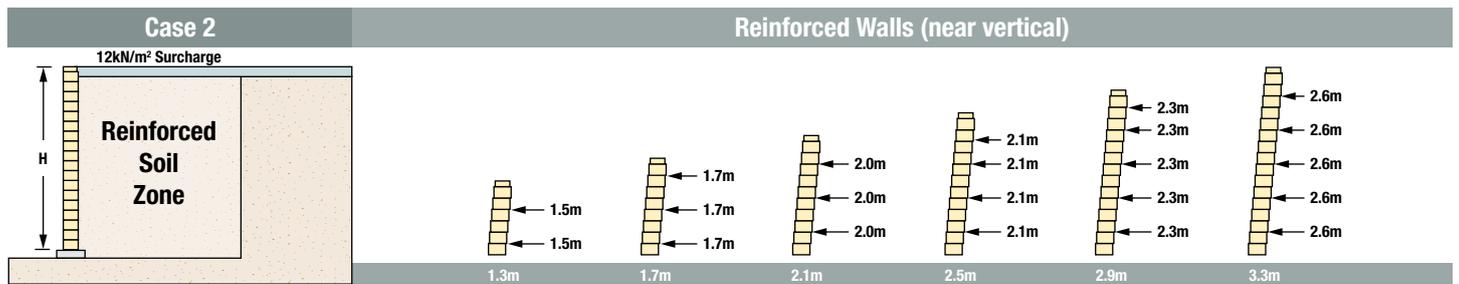
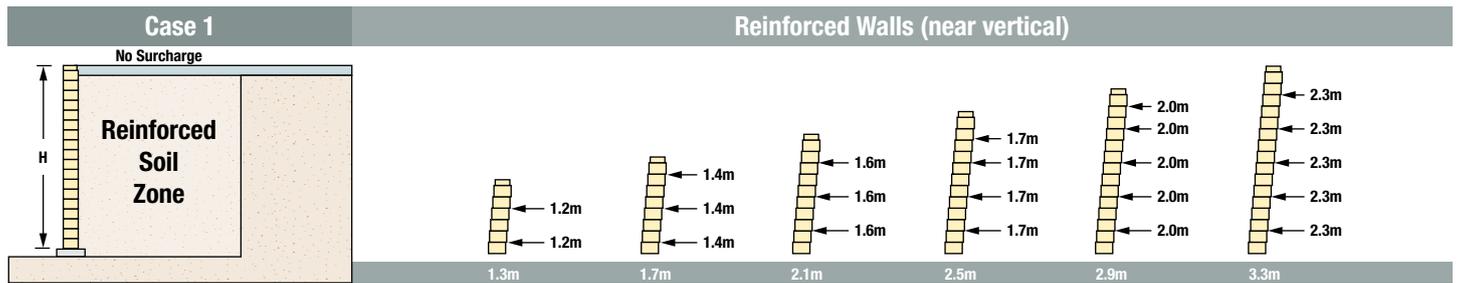
Near vertical is  $9\text{mm} + \text{setback per course}$ .

The Design Charts assume that the walls are constructed in accordance with Keystone specifications and good construction practice. All soils should be compacted in maximum 200mm lifts to 95% Standard Proctor density as determined by laboratory testing.

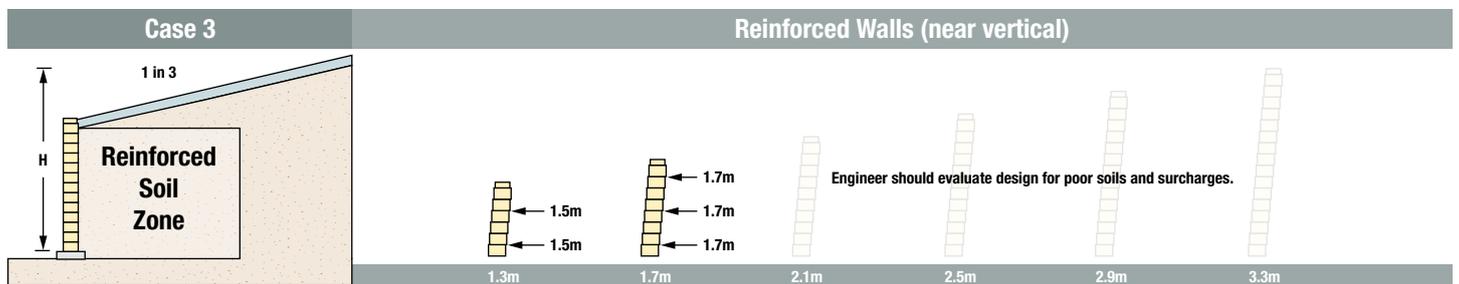
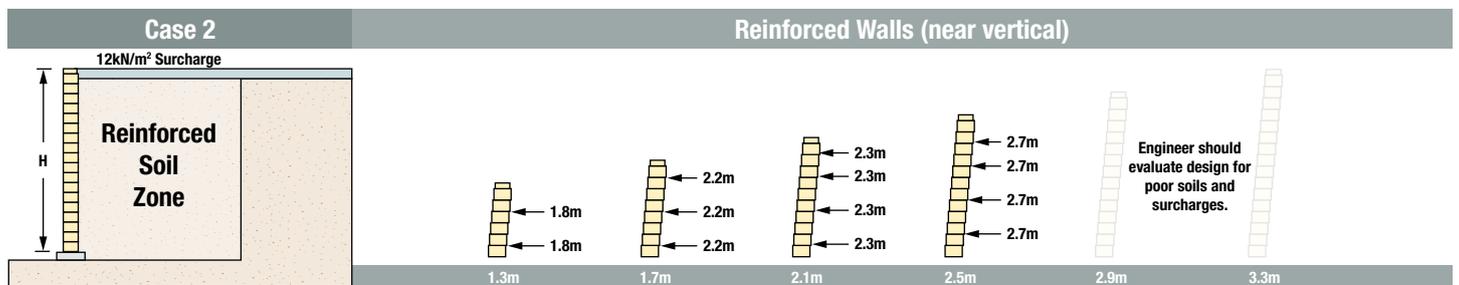
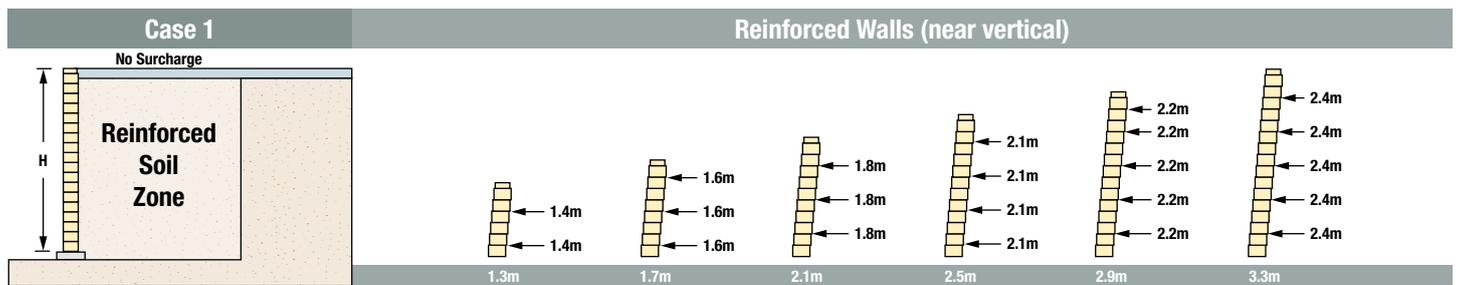
The information contained in the Design Charts is for preliminary design use only. A qualified engineer should be consulted for final design assistance. Keystone Retaining Wall Systems, Inc. accepts no liability for the improper use of these charts.



Silty Sand:  $\phi=30^\circ$ ,  $\gamma=19\text{kN/m}^3$



Silt/Lean Clay:  $\phi=26^\circ$ ,  $\gamma=19\text{kN/m}^3$





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**South Queensland**

62 Industrial Avenue,  
Wacol  
Brisbane QLD 4076  
Phone: (07) 3271 9292  
Fax: (07) 3271 1815

[brisbane.sales@nationalmasonry.com.au](mailto:brisbane.sales@nationalmasonry.com.au)

**Gold Coast**

663 Pine Ridge Road,  
Biggera Waters  
Gold Coast QLD 4216  
Phone: (07) 5552 3300  
Fax: (07) 5552 3399

[labrador.sales@nationalmasonry.com.au](mailto:labrador.sales@nationalmasonry.com.au)

**North Queensland**

6 David Muir Street,  
Slade Point  
Mackay QLD 4740  
Phone: (07) 4955 1155  
Fax: (07) 4955 4130

[mackay@nationalmasonry.com.au](mailto:mackay@nationalmasonry.com.au)

**New South Wales**

65 Burleigh Street,  
Toronto  
Lake Macquarie NSW 2283  
Phone: (02) 4088 1888  
Fax: (02) 4088 1899

[toronto.sales@nationalmasonry.com.au](mailto:toronto.sales@nationalmasonry.com.au)

**Victoria**

Riding Boundary Road,  
Deer Park  
Melbourne VIC 3023  
Phone: (03) 9361 6400  
Fax: (03) 9363 6008

[melbourne.sales@nationalmasonry.com.au](mailto:melbourne.sales@nationalmasonry.com.au)