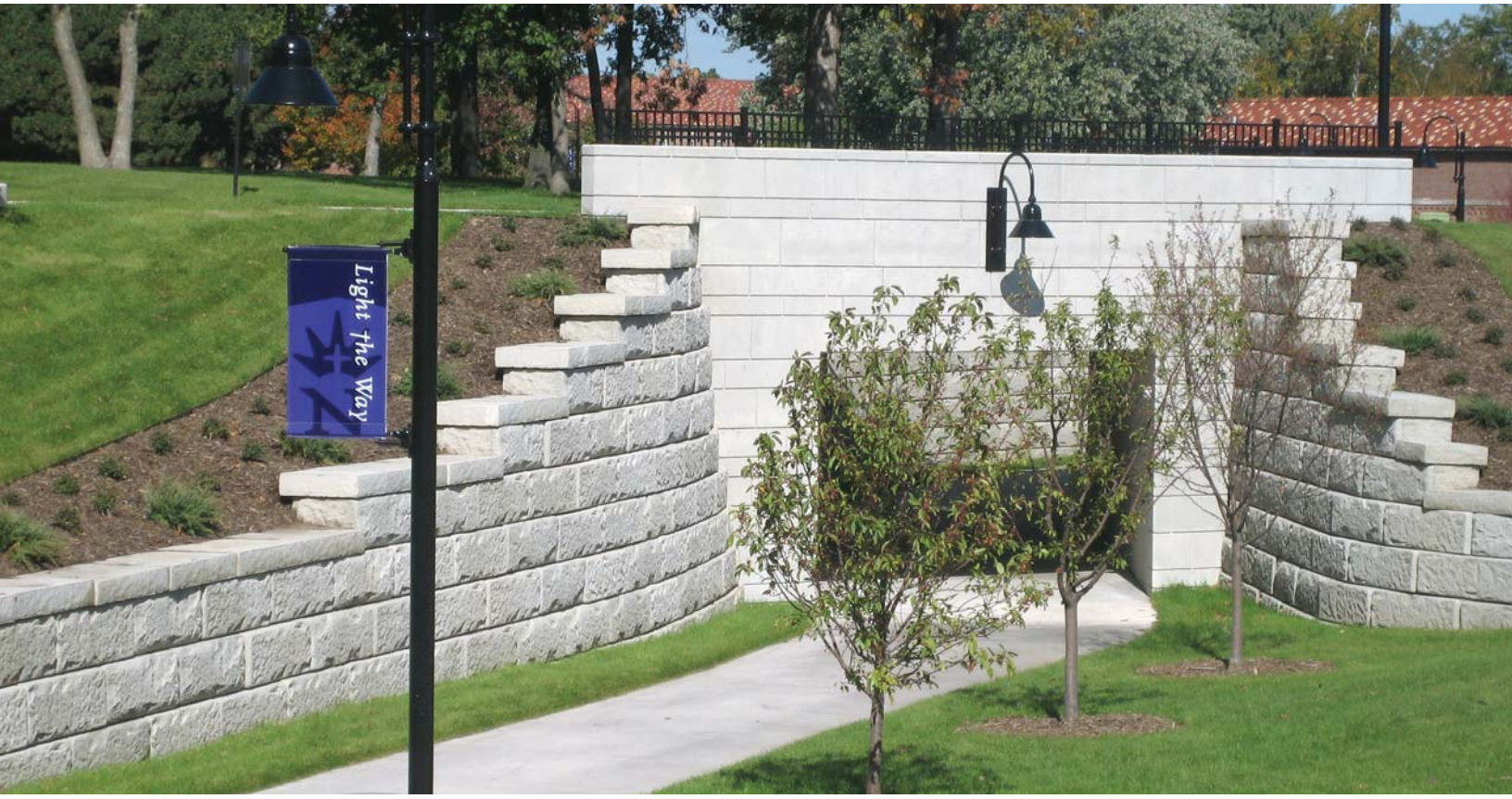
recon™
Retaining Wall Systems



Aesthetics and Performance

The look, size and durability of massive natural stone and the long-term performance of a fully engineered structural wall.

ReCon Retaining Wall Systems

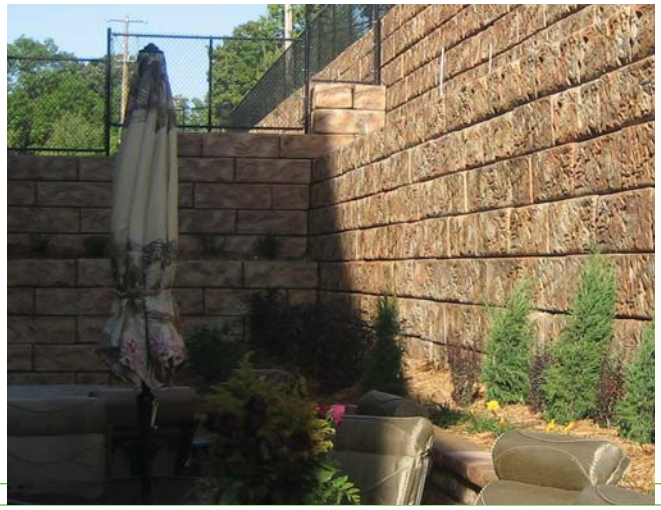
ReCon Retaining Wall Systems, Inc. is an industry leader in supplying aesthetically pleasing and structurally superior retaining wall solutions. ReCon focuses on providing value to its customers, including:

- Engineering and testing for tall gravity walls and taller geogrid walls.
- Solutions that accommodate wall needs rather than dictate them.
- Durability (wet-cast, air-entrained).
- Four texture options.
- Product shape and size choices that work.

Let us bring value to your project.

Features and Benefits:

- **Large Size and Mass**
- **Tall Gravity Walls**
  - Unique tongue-and-groove lock-and-placement design, combined with massive size and weight, permits wall heights up to 17 ft. 4 in. (5.28 m) without reinforcing geogrid. Eliminates the time and cost associated with excavation and soil replacement when reinforcing geogrid is required.
  - Significantly taller ReCon Walls can be built by incorporating geogrid, setback or tiers.
- **Durability**
  - Made of wet-cast, air-entrained concrete with a minimum psi of 4,000 (28 MPa). The durability required in environments prone to the challenges of freeze/thaw cycle, road salts or brackish water.
- **Faster Installation**
  - Walls can be constructed quickly using equipment generally available to contractors (skid steers or backhoes), maximizing productivity and minimizing manual labor. No mortar, no pins.
- **Engineered and Tested**
  - A ReCon Wall can be professionally engineered and designed (using shear and geogrid connection data unique to ReCon) for wall performance that is generally unavailable for natural stone walls.
- **Customized Design and Aesthetics**
  - The natural stone finish has several different textures, which prevents repetition in the overall wall pattern. Stains are readily available and easily applied in the field after installation to achieve a natural look that will last for years.
  - Block comes in multiple depths, to optimize design efficiency by providing the mass when required or eliminating it when not required to save material and freight cost.
  - Tapered block design allows both inside and outside 90-degree corners or curves.
  - Caps or special top units that allow greenscape within four inches of the finished wall's face are available for top-of-wall finishing options.



Block Specifications

- **Block Face:** 5.33 sq. ft. (0.5 m²), or 48 in. x 16 in. (120 cm x 40 cm)
- **Available Depths:** 24", 39", 45" or 60" (60, 100, 115 or 150 cm)
- **Mass:** 1,000 to 3,000 pounds (450 to 1,350 kg) per block.
- **Concrete:** Minimum of 4,000 psi (28 MPa)
- **Lifting Device:** Lifting insert loop
- **Turning Radius:** Approximately 15 feet (4.5 m) (varies with wall height)
- **Retaining Wall Batter:** 3.6 degrees automatically built into the system. Can be adjusted to 7.2 degrees with the use of field-installed spacers.

Full Block

Lifting inset loop

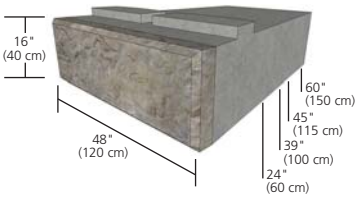
Taper of block and unique curved tongue permit turning radius of about 15 ft. (4.5 m)

Unique tongue-and-groove lock and placement for safe and secure walls

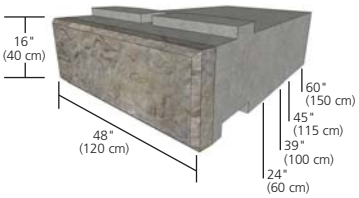
Natural-looking stone face available in multiple textures and stain colors

Block Shapes

FULL BASE BLOCK



FULL MIDDLE BLOCK

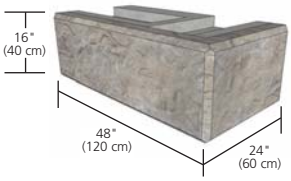


FULL TOP BLOCK

Top of block is recessed (starting behind the 4" (11 cm) texture on top of block at the face). Permits planting of sod to within 4" (11 cm) of front of the retaining wall.

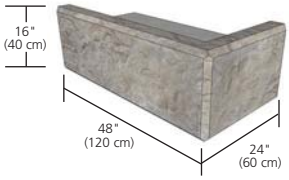
REVERSIBLE CORNER BLOCK

90° corners.

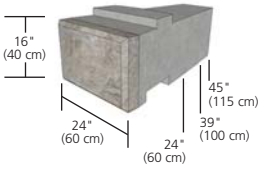


CORNER TOP BLOCK

Top of block is recessed.

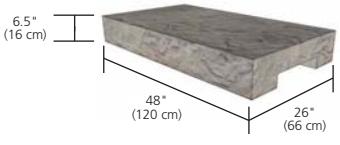


HALF BLOCK



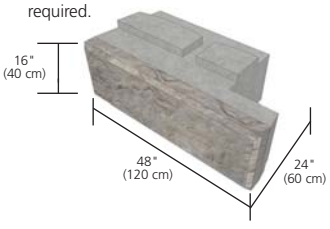
CAPSTONE

Alternate top-of-wall treatment used in lieu of full top block.



FITTING BLOCK

Used when occasional field cut is required.



Engineering and Installation Guidelines

Design and Specification

A ReCon Wall requires a site-specific design and analysis prepared by a registered professional engineer. ReCon has a comprehensive set of tools to aid architects and engineers in the specification and design of a ReCon Wall.

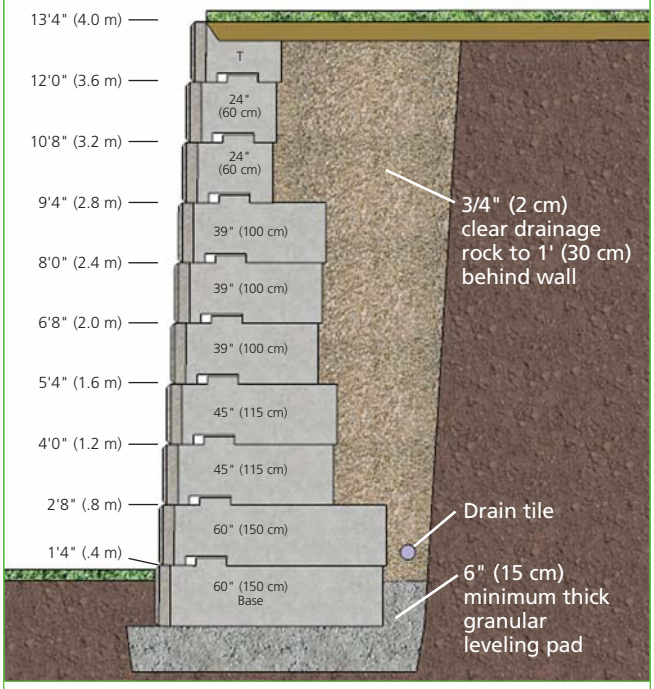
A block being set in place with a backhoe and chain.

A block being set in place with a skid steer.

Installation Steps

- Excavate and prepare soil foundation.
- Prepare leveling pad: A level and compacted base is essential for proper wall installation.
- Install and level base course: Individual blocks are then set in place using the lifting insert loop. The lifting insert loop is attached to a chain suspended from a backhoe or other lifting equipment.
- Drain tile
- Drainage aggregate.
- Install additional courses.
- Place geogrid (if required).
- Install additional courses.
- Backfill and compact.
- Check compaction regularly.

Typical Retaining Wall Section



Maximum height non-reinforced walls in sand (Soil Friction Angle Ø = 30°) is: 16'0", 12'0", 9'4" and 5'4" for 60", 45", 39" and 24" (4.8 m, 3.6 m, 2.8 m and 1.6 m for 150 cm, 115 cm, 100 cm and 60 cm) blocks respectively.

The installation steps represent a basic outline for a ReCon Wall installation and are not meant to serve as a complete construction or installation guide. Every ReCon Wall must be designed by a registered professional engineer. Design and other industry professionals can view online or download a complete ReCon design and construction reference manual at www.reconwalls.com.

ReCon Block is produced and marketed pursuant to a license agreement with ReCon Wall Systems, Inc., 7600 West 27th St., #229, St. Louis Park, MN 55426. Patents issued: US 6,620,364 B2, US 6,829,867 B2 and US 7,341,685 B2.

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sales@ctprecast.com
www.ctprecast.com

ReCon Retaining Wall Systems, Inc.

Architectural Engineering Overview

recon™
Retaining Wall Systems

ReCon Series 50 Installation Guidelines

Article 1: Background

1.1 Nature of Project

a. The work to be performed includes sourcing, providing, and installing concrete retaining wall blocks to the lines and grades as specified on the project construction drawings and as may be further specified herein.

1.2 Professional Engineer Standards

a. All walls are to be built pursuant to a site specific design and analysis prepared by a registered professional engineer who is familiar with the product (the "wall engineer").

Article 2: Wall Construction

2.1 Excavation

a. The contractor shall excavate to the lines and grades shown on the construction drawings. The contractor shall be careful not to disturb base beyond the lines shown.

2.2 Foundation Soil Preparation

a. Foundation soil shall be excavated as required for footing or base dimensions shown on the construction drawings, or as directed by the wall engineer.
b. Over-excavated areas shall be filled with compacted backfill material.

2.3 Base / Leveling Pad

a. Base shall be placed as shown on the construction drawings with a minimum thickness of 6 inches. Base materials are to be as specified by the wall engineer (generally crushed stone, ¾ inch minus, or Class Five). The width of the prepared base / leveling pad must extend a minimum of 6 inches in front and 6 inches in back of the Base Block. As a result, the typical width of the base / leveling pad will be 36 inches if the Base Block is 24" deep, 51 inches if the Base Block is 39" deep, and 57 inches if the Base Block is 45" deep.
b. Base materials shall be installed upon undisturbed native soils (unless a foundation soil correction is specified by the wall engineer).
c. Material shall be compacted so as to provide a smooth, hard surface on which to place the first course of units. ***The base row of blocks should be set so that the back of the block is ½ inch lower than the front of the block (see section 3.4.a below).*** Compaction will be with mechanical plate compactors to 95% of standard proctor.
d. Base shall be prepared to ensure contact of retaining wall unit with base. Spacing or gaps between blocks shall not be allowed.
e. Base materials shall be to the depths and widths shown. The contractor may opt for using reduced depth of the specified granular materials and adding a 1" to 2" concrete topping. Concrete shall be lean and unreinforced. Where a reinforced footing is required, place below frost line.

2.4 Unit Installation

a. First course of units shall be ***Base Block*** units and shall be placed on the prepared base. The first course is the most important to ensure accurate and acceptable results. ***The Base Block should be set such that the back edge of the Base Block is about ½" lower than the front edge of the Base Block (the "tip back"). By doing so, the wall can accommodate a minimal rotation forward, should this occur during backfill and compaction.*** (Note, however, on sections of the wall where there are sharp curves or a 90 degree corner, the blocks should be placed level from front to back with no "tip back".) When checking for level (or the recommended ½" tip back) from front to back of the block, do not place the level directly on the top of the tongue of the block. Rather, check for level from front to back by resting the level on a point elevated a uniform distance above the tongue at both the front and back of the block. Check with your Block supplier for a leveling device to assist in setting the Base Block. Refer to Drawing #101 for further details.
b. Ensure that units are in full contact with base.
c. Units are placed end to end for full length of wall alignment. Alignment shall be done by using a string line or offset from a base line.
d. After the Base Block has been placed and before proceeding to the placement of the next row of block, compaction to the specified embedment depth must be done ***in front*** of the Base Block before compaction is done behind the Base Block. This reduces the chance that compaction behind the Base Block will roll the Base Block forward.
e. Following site specific design completed by the wall engineer, (i) place drain tile and drain exits slightly above the finished grade elevation of the wall, (ii) fill to one foot behind the wall with ¾" clear drainage rock, and (iii) fill the voids between blocks caused by the trapezoid shape of the blocks with ¾" clear drainage rock. Compact remaining fill behind the clear drainage rock. Refer to Drawing #s 102 & 103 for typical wall cross sections.
f. Sweep all excess material from the top of the units and install next course. Fill all voids.
g. Lay up each course making sure that the backs of the locators are in contact. Pull unit forward as far as possible. Backfill and compact soil behind the units. Repeat procedure to the extent of wall height. Make sure to check for level on each row of block, both from side to side and from front to back. It is critical that level be maintained throughout the entire length and height of the wall. Adjust if necessary. Small corrections in level can be made with the use of a shim (such as an asphalt shingle).

2.5 Geogrid Installation (when required)

a. The geogrid soil reinforcement shall be laid on top of the block and horizontally on level compacted backfill. The geogrid must be extended forward on the block over the tongue and groove and up to the unexposed front edge of the block. The next course of units shall be placed such that the geogrid is deformed over the tongue and groove. This next course of block must be slid forward such that the back edge of the groove on this block is up against the back edge of the tongue on the lower unit with the geogrid pinched between the tongue and groove. ***Pull grid taut, removing any slack (a critical step). Anchor/stake geogrid to the compacted backfill prior to placing more backfill.***
b. ***Proper grid orientation is critical.*** The strength of the geogrid (the factory edge) must be perpendicular to face of wall. Consult the geogrid manufacturer's instructions to confirm proper geogrid orientation. Refer to Drawing #104 for further details.
c. Location and placement of the geogrid is as shown on the site specific engineered shop drawings. These shop drawings should specify both the spacing (number of rows of geogrid), the length of the geogrid at the various sections of the wall, and the type of geogrid required.
d. Refer to Drawing # 104 for installation of geogrid on curves.

2.6 Wall Fill Placement

a. Wall fill material shall be placed in lifts (maximum lift height of 8") and compacted to 95% of standard proctor.
b. Backfill shall be placed, spread, and compacted in such a manner that minimizes the development of wrinkles in and/or movement of the geogrid.
c. Only hand-operated compaction equipment shall be allowed within 3 feet of the back of the ReCon Units.
d. Backfill shall be placed from the face of the wall toward the embankment to ensure that the geogrid remains taut.
e. Tracked construction equipment shall not be operated directly on the geogrid. A minimum backfill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.
f. Rubber tired equipment may pass over the geogrid reinforcement at slow speeds, (less than 10 MPH). Sudden braking and sharp turning shall be avoided.

2.7 Curved Walls

a. Full Blocks concave / inside curves: The minimum turning radius is actually 13' 1 ¼". However, each row of blocks that is added to the wall requires a setback, and thus as the wall height increases, the radius of the concave curve gets larger. ***For ease of installation*** (thus requiring less precision in the placement of each block), ***it is highly recommended*** that the radius of the base row of a multiple row wall be no less than 15'. As each row of block is added, the radius will increase by 2 inches. Refer to Drawing # 105 for a table of Top Row minimum radius, given varying wall heights.
b. Full Blocks convex / outside curves: The minimum turning radius is 13' 1 ¼" for a one row wall. However, since each row of blocks that is added to a convex curve requires a tighter radius (due to the setback for each row), it is very important that the radius of the bottom row of blocks not be too tight, thus causing a problem on a subsequent row of blocks as the radius for each row becomes tighter. ***For ease of installation, it is highly recommended*** that 6" of radius be added for each row of block added. Thus, the radius for the first row of a convex wall must be no tighter than: (a) 14' for a 2 row wall; (b) 14.5' for a three row wall; (c) 15' for a four row wall; (e) 15.5' for a five row wall; (f) 16' for a six row wall; (g) 16.5' for a seven row wall; and (h) 17' for an eight row wall. Refer to Drawing # 106 for a table of suggested Base Row minimum radius suggestions, given varying wall heights.
c. The "loss of running bond" on curved walls: Because the radius of the curve on a wall changes with each row of block (it gets tighter on a convex / outside curve and it gets longer on a concave / inside curve), as the blocks progress along the curve, they will gradually work further away from the exact mid-point of the running bond. This can be minimized if the wall can be built such that each new row of block is begun in the middle of the row (if there are multiple curves in the wall) or in the middle of the curve (if there is just one curve in the wall) so that the shifting of the running bond is spread out in both directions of the wall. If as a result of the shift off of running bond the blocks do begin to bind at the tongue and groove, the binding can be eliminated or minimized if an inch or two of the block is cut from the face, thus restoring the row to the mid point of running bond. Also note that a wall that has both a concave and a convex curve will have a tendency to "self correct" some of the "loss of running bond" because on the convex portion of the curve the radius is getting tighter with each row added while on the concave portion of the curve the radius is getting larger with each row added. In summary, proper planning of the placement of each row can reduce the impact of "loss of running bond" in curved walls.

d. If a tighter turning radius is required, one can consider the use of the 90 degree corner block to "step a wall back" in square corners as opposed to curves. Also, using a combination of half and full block (alternating on each row between a half and a full block) will reduce the minimum radius. Also, the use of half blocks in a curve will soften the shape of the curve, given that the half block is only 24" long at the face.
e. Half Blocks have a minimum one row convex turning radius of 6' 6 11/16" and a minimum one row concave turning radius of 6' 4 5/8".

2.8 Base Row Step Up

a. As the base row of the wall steps up, proper placement and then compaction of the base material at the point of the step up is important. Refer to Drawing # 107 for a visual example of a base row step up.
b. With each row of base wall step up, the base leveling pad should be shifted back 1 inch to accommodate the 1 inch setback in each row of block.
c. If a measurement from the face of wall at the top of the wall is a critical measurement (for example, there is a sidewalk or curb at the top of the wall and that sidewalk or curb needs to be exactly 3 feet from face of wall), then care must be taken when staking the base leveling pad and when placing the base block. This can be somewhat tricky when the wall is long and when there are multiple step-ups in the base of the wall. Remember, plan and measure twice, build once!

2.9 Top of Wall Step Up and Step Down

a. As the top of a retaining wall steps up or steps down, the "top corner block" is used to make this transition.
b. If it is desired to have the long (4') face of the top corner block running along the face of the wall and the short (2') side of the top corner block running back from the face of the wall and into the slope (***Standard Placement***), then the top corner block will actually be resting on ½ of a full block (with the tongue protruding upward into the groove) and on ½ of a regular top block. A 7.5" thick concrete shim (or 4.5" thick concrete shim depending on the style of the top corner block delivered to the site) will need to be placed between the top block and the Left or Right corner top block at each point in the wall where the top of the wall steps up. Use a standard concrete masonry unit (CMU) for the shim. These are generally available at a lumberyard, ready mix plant or masonry block plant. To achieve the required thickness of the shim (7.5 or 4.5 inches), it may require that the CMU be trimmed from 8" of thickness to 7.5" of thickness. ***The shim should be glued in place with a concrete adhesive (recommended PL Premium Adhesive).*** Refer to Drawing # 108 for more details.
c. If it is desired to have the short (2') side of the top corner block running along the face of the wall and the long (4') side of the top corner block running back from the face of the wall and into the slope (***Alternative Placement***), then the top corner block will actually be resting on just ½ of a full block. About 7 inches of the end of the tongue of the full block will need to be removed with a concrete saw to accept the groove on the bottom of the top corner block. In this application, no shim is required. Refer to Drawing # 109 for more details.

2.10 Outside 90 Degree Corner

a. When building a wall with an outside 90-degree corner, it is recommended that construction start at the corner and work away from this point in both directions. This will allow for placement of the corner blocks so that 1" of batter can be maintained in the wall in both directions. Assuming that both ends of the wall running away from the 90 degree corner run out into grade, no block will need to be cut in order to maintain the 1" of batter per row of block.
b. One standard corner block will be used at the corner on each row of the wall. The corner blocks will overlap each other at the corner, coming together in a "zipper fashion". ***The***

corner blocks should be glued at the corner where they overlap with a concrete adhesive. Refer to Drawing # 110 for block placement details.

c. If, however, one end of the wall must end vertically because it abuts to an existing vertical structure, or if the wall has two outside 90-degree corners, then blocks will need to be cut to maintain the 1" batter. Refer to Drawing # 112 for details on the Single Outside 90 Degree Corner Abutting to an Existing Vertical Structure and for details on a Double Outside 90 Degree Corner.

d. In lieu of maintaining the 1" of batter after turning a 90-degree corner, you can build one side of the corner (say Side B) vertically without the 1" batter per row of block. This will require you to cut 1" off the back of the tongue of the first regular block adjacent to the corner block in each row on Side B of the wall. You can re-establish the 1" batter on Side B gradually as you move out from the corner. However, the wall engineer must take the elimination of the batter into account in the design of the wall.

2.11 Inside 90 Degree Corner

a. When building a wall with an Inside 90 Degree Corner, it is recommended that once the contractor gets to the base row of the inside corner, the contractor should then start each subsequent row at the corner and lay block out from the corner. Remember, the block has a 1" setback built into it for each row of block. This will have two different effects on the finished wall. First, at the point of the 90 degree corner, the wall will not be vertical, but rather the actual line at the corner will be laying back at the same 3.6 degrees of batter as the face of each of the sides of the wall that come together at the corner. Second, as each new row of block is place at the corner, the block will be set back not only 1" along the vertical axis but also will be placed 1" inside toward the corner along the horizontal axis. If you were to follow the second row of block out from the corner, you would see that the end of this row of block in the wall is 1" shorter in the horizontal /lineal direction than the base row. The third row of block will be 2" shorter in the horizontal / lineal direction than the base row, and so on. For taller walls, you may notice that the "running bond joint" is sliding off center by 2" for every other row. This is an aesthetic matter, not a structural issue.

b. One standard corner block will be used at the corner on each row of the wall. The corner blocks will overlap each other at the corner, coming together in a "zipper fashion". ***The corner blocks should be glued at the corner where they overlap with a concrete adhesive.*** Refer to Drawing # 111 for block placement details.

2.12 Railings / Guard Rails

a. It is possible to install a railing at the top of the retaining wall by core drilling into the top block. Follow the instructions of the railing manufacturer and wall engineer. It is, however, recommended that if a railing is to be installed at the top of the wall, then the top row of blocks should be glued to the row of blocks beneath it with a concrete adhesive.

b. In addition, guardrails can be installed behind the block. Refer to Drawing # 113 for typical details.

Article 3: Staining and Sealing

3.1 Staining

a. Before staining, the wall should be power washed and allowed to dry. This removes any dirt and / or form oil from the face of the block. This is very important.

b. Recommended stains include Sherwin Williams H & C Shield Plus Concrete Stain or TK Products Stain #5272. Both are latex / water based and can be applied with either an electric airless sprayer or a compressed air sprayer. Sherwin Williams is available at retail outlets across the country. For a distributor of the TK Products near you, contact

TK Products at 11400 West 47th Street, Minnetonka, MN 55343, 1-800-441-2129. It is suggested that you have your customer provide to you a sample of the color they want to replicate. That color can then be taken to the stain distributor and used to mix the base coat and the highlights. Some staining contractors may have samples that they can provide to you to choose from. The concrete should be at least 28 day cured before staining.

c. The wall can be stained a one coat one color stain, or it can be stained with a base color and then highlighted with several different shades to more closely approximate a weathered natural stone look. Generally, the "highlights" are applied to several blocks in a random fashion, and then before the highlights dry, they are wiped out with a wet sponge. This helps to blend the highlights into the block, making them look more natural. For the Northshore Granite texture, you may want to apply flecks of black, silver or white to create a natural granite look.
d. The stain should not be applied if it is going to be below 45 degrees prior to the stain having a chance to dry. Consult the manufacturer's instructions for proper application of the stains.

3.2 Sealing

a. Some customers ask that their wall be sealed. This may be particularly relevant if the wall is in a road splash zone where winter road salts might get on the face of the wall.
b. If you are using the TK Products stain, then TK Products also sells a number of sealers that are compatible with their stains, including TK-290-12. This is a solvent-based 12% Siloxane sealer. The manufacturer indicates that it must be 32 degrees or above before this should be applied. In addition, the blocks must be completely and thoroughly dry before sealing. This is more than just dry to the surface touch. The water and the mineral based sealer do not mix. Thus, after the power wash, you will need dry warm weather and the passage of time before the sealer can be applied. Yes, the sealer is applied ***before*** the stain is applied.

Article 4: Warranty

Each Block will have a 28 day compressive strength of at least 3000 PSI for 15 years after proper installation. If a Block does not meet this warranty standard, please notify the manufacturer in writing. If after it has been determined that the Block has not met the specifications, the manufacturer will have shipped to you, replacement Blocks which shall be the manufacturer's sole remedy for breach of this warranty. However, neither the manufacturer nor ReCon Wall Systems, Inc. shall have any obligation to install such replacement Blocks.

This warranty shall not apply to any Block which is damaged, defective or fails to meet the warranty standard due to improper installation of the Block, chemical contact, structural design of the wall, or excessive and unforeseen site conditions beyond the manufacturer's or ReCon Wall Systems, Inc.'s control.

The above warranty is the exclusive limited product warranty. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE DISCLAIMED

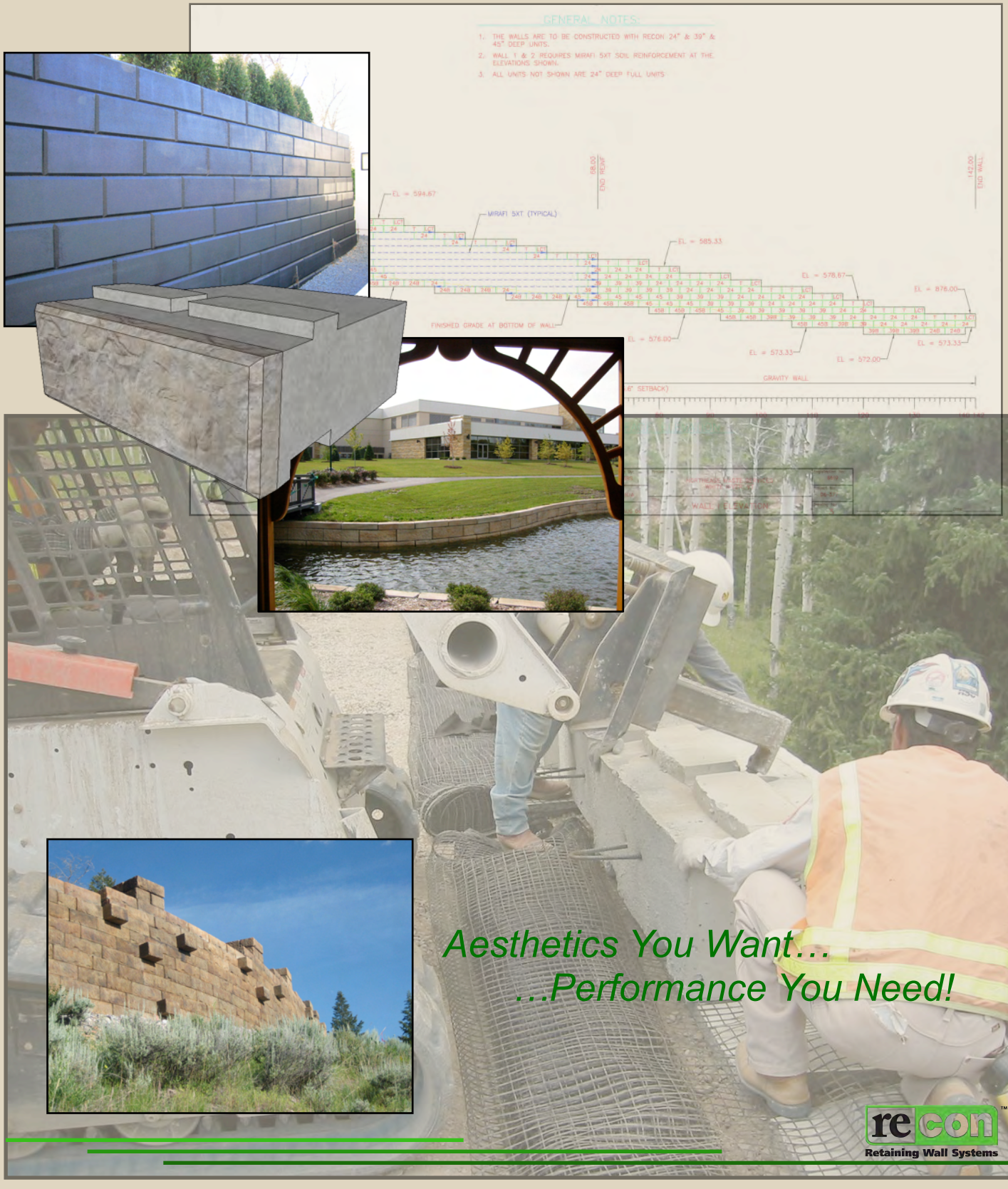
Note: Also available for review prior to the construction of a wall is a Power Point presentation that covers a number of topics discussed above. This presentation contains a number of useful on-site construction photos.

Index of Important Construction Detail Drawings:

- #100 Block Types
- #101 Typical Base Block Placement
- #102 Typical Maximum Gravity Wall Heights
- #103 Typical Geo-Grid Wall Cross Section
- #104 Typical Geo-Grid Orientation & Curved Walls
- #105 Typical Inside Radius – Full Block
- #106 Typical Outside Radius – Full Block
- #107 Typical Base Row Step Up
- #108 Typical Top of Wall Step Up
- #109 Typical Top of Wall Step Up – Alternative Placement
- #110 Typical Outside Corner Detail
- #111 Typical Inside Corner Detail
- #112 Outside Corner Details – Double & Single 90 Degree Corners Abutting to Vertical Structures
- #113 Typical Guard Rail Detail

Design and Construction Reference Manual

ReCon Series 50



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Retaining Wall Systems

Aesthetics You Want...
...Performance You Need!

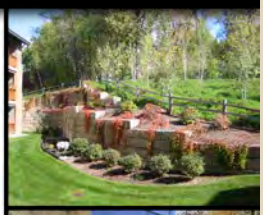
Scale...
Each block really is a block

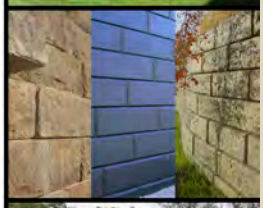
Texture...
Not one choice, but three

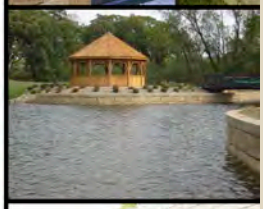
Shapes...
Flexibility and choices that work

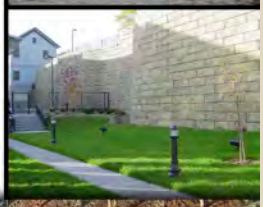
Durability...
Wet-Cast, Air-Entrained Concrete

Solutions...
A product that doesn't dictate wall needs: **It accommodates them!**









www.reconwalls.com

Introduction

At ReCon, we are proud of our tradition of offering a product line that adds value for our customers, and for our wall design and wall contractor partners. Whether the ReCon application focuses on the scale and aesthetics of the ReCon Block, the durability of the wet-cast, air-entrained concrete, the considerable gravity wall heights that can be achieved, or the construction efficiencies associated with our product, it is our intention to solve site specific challenges and add value.

The design of a ReCon segmental retaining wall may be fairly straightforward or it may be quite complex and involve a high degree of geotechnical and/or civil engineering expertise. At first glance, the steps involved in construction of a ReCon retaining wall appear relatively simple. In fact, they are; however, it is critical that these procedures are done properly if the wall is to last and perform as designed. This is due to the fact that the ReCon units themselves are often just a key component in what is a more complex and inter-dependent composite earthen structure. A number of important variables must be analyzed before a proper wall design can be finalized.

This manual is intended to provide wall designers, wall installers and others with the information useful in the design, the construction and cost estimation of a ReCon retaining wall that will remain attractive and structurally stable for the duration of its intended design life.

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ReCon Series 50 Shapes Data

Shapes

ReCon Series 50 units are available in a large variety of shapes. These shapes are designed to enhance the aesthetic appearance of a finished retaining wall. In addition, the large selection provides for ease and simplicity in the installation process without adding undue complexity for designers, installers and manufacturers alike.

The shapes shown are representative of the most common ReCon Series 50 block shapes.

Actual block shapes and texture options vary by region. Check with your local supplier to determine availability.

Name Half Middle Block - 24”

Unit ID	Dimensions	
HM24	16 in. x 24 in. x 24 in.	
Weight	**Volume**	**Coverage**
662	4.57	2.67

Batter 3.6°

Name Half Middle Block - 39”

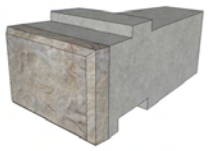
Unit ID	Dimensions	
HM39	16 in. x 24 in. x 39 in.	
Weight	**Volume**	**Coverage**
967	6.67	2.67

Batter 3.6°

Name Half Middle Block - 45”

Unit ID	Dimensions	
HM45	16 in. x 24 in. x 45 in.	
Weight	**Volume**	**Coverage**
1067	7.36	2.67

Batter 3.6°



Name Half Top Block - 24”

Unit ID	Dimensions	
HT24	16 in. x 24 in. x 24 in.	
Weight	**Volume**	**Coverage**
458	3.16	2.67

Batter 3.6°

Name Half Base Block - 24”

Unit ID	Dimensions	
HB24	16 in. x 24 in. x 24 in.	
Weight	**Volume**	**Coverage**
710	4.90	2.67

Batter 3.6°

Name Full Base Block - 24”

Unit ID	Dimensions	
FB24	16 in. x 48 in. x 24 in.	
Weight	**Volume**	**Coverage**
1457	10.04	5.33

Batter 3.6°

Name Full Middle Block - 24”

Unit ID	Dimensions	
FM24	16 in. x 48 in. x 24 in.	
Weight	**Volume**	**Coverage**
1411	9.73	5.33

Batter 3.6°

Name Full Base Block - 39”

Unit ID	Dimensions	
FB39	16 in. x 48 in. x 39 in.	
Weight	**Volume**	**Coverage**
2276	15.7	5.33

Batter 3.6°

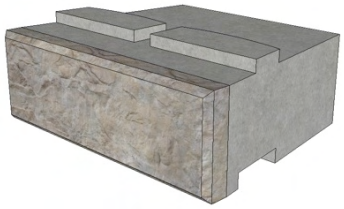
Because ReCon Series 50 units are manufactured from wet-cast, air-entrained concrete, they lend themselves to a varying degree of customization. Many existing shapes and face textures were originally developed to accommodate the needs of an owner, designer or installer. If some unique shape or texture is required it may be possible to develop products not already available. Given a reasonable amount of time, ReCon manufacturers should be able to determine the viability and cost estimate of such a request.

Name Full Middle Block - 39”

Unit ID	Dimensions
FM39	16 in. x 48 in. x 39 in.

Weight	Volume	Coverage
2201	15.18	5.33

Batter
3.6°

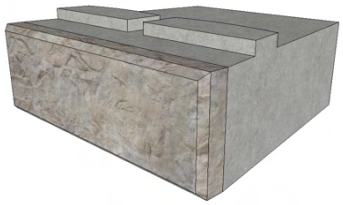


Name Full Base Block - 45”

Unit ID	Dimensions
FB45	16 in. x 48 in. x 45 in.

Weight	Volume	Coverage
2550	17.58	5.33

Batter
3.6°

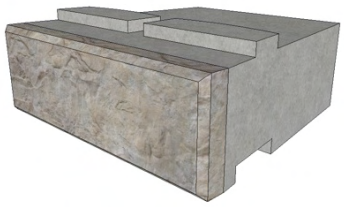


Name Full Middle Block - 45”

Unit ID	Dimensions
FM45	16 in. x 48 in. x 45 in.

Weight	Volume	Coverage
2491	17.18	5.33

Batter
3.6°



Name Reversible Corner Block

Unit ID	Dimensions
C	16 in. x 48 in. x 24 in.

Weight	Volume	Coverage
1401	9.66	8

Batter
3.6°

Name Full Top Block - 24”

Unit ID	Dimensions
T24	16 in. x 48 in. x 24 in.

Weight	Volume	Coverage
971	6.7	5.33

Batter
3.6°

Name Left Corner Top Block

Unit ID	Dimensions
LCT	16 in. x 48 in. x 24 in.

Weight	Volume	Coverage
1103	7.61	8

Batter
3.6°

Name Right Corner Top Block

Unit ID	Dimensions
RCT	16 in. x 48 in. x 24 in.

Weight	Volume	Coverage
1103	7.61	8

Batter
3.6°

Name Capstone

Unit ID	Dimensions
CAP	6.5 in. x 48 in. x 26 in.

Weight	Volume	Coverage
549	3.78	2.17

Batter
N/A

Name End Capstone

Unit ID	Dimensions
ECAP	6.5 in. x 48 in. x 26 in.

Weight	Volume	Coverage
558	3.85	2.17

Batter
N/A

Name Full-High Cap End Block

Unit ID	Dimensions
FHCAPE	16 in. x 48 in. x 24 in.

Weight	Volume	Coverage
1446	9.97	13.33

Batter
0°

Name Full-High Cap Middle Block

Unit ID	Dimensions
FHCAPM	16 in. x 48 in. x 24 in.

Weight	Volume	Coverage
1436	9.90	13.33

Batter
0°

Name Step Unit

Unit ID	Dimensions
STEP	6.5 in. x 48 in. x 26 in.

Weight	Volume	Coverage
680	4.69	N/A

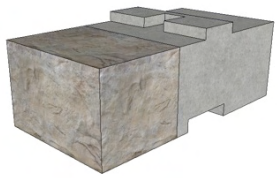
Batter
N/A

Name Plinth Block

Unit ID	Dimensions
PLB	16 in. x 24 in. x 47 in.

Weight	Volume	Coverage
1486	10.25	2.67

Batter
3.6°

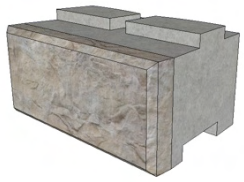


Name Three Quarter Block - 24”

Unit ID	Dimensions
TQM24	16 in. x 36 in. x 24 in.

Weight	Volume	Coverage
1037	7.15	4

Batter
3.6°

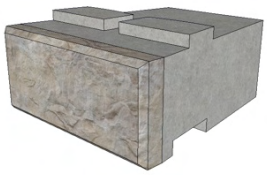


Name Three Quarter Block - 39”

Unit ID	Dimensions
TQM39	16 in. x 36 in. x 39 in.

Weight	Volume	Coverage
1586	10.94	4

Batter
3.6°



Name Fitting Block - 24”

Unit ID	Dimensions
FF24	16 in. x 48 in. x 24 in.

Weight	Volume	Coverage
1215	8.38	5.33

Batter
3.6°

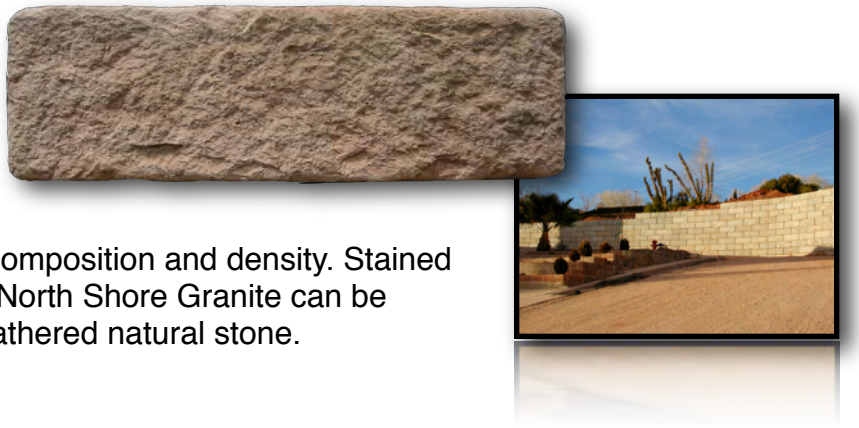
Textures

ReCon currently offers its licensed manufacturers a choice of three types of face textures. Most producers choose one of these textures as their standard and elect to maintain a working inventory of that texture. Other textures may still be available as a special order. As with most special orders, additional costs may be involved and sufficient time should be allowed for setup and production. Check with the ReCon licensed manufacturer in your market to determine what textures are available.

1) Le Sueur County Limestone

This texture offers the look of a broken and weathered limestone. This texture lends itself well to accent staining. When certain stain colors are used, Le Sueur County Limestone can also take on the appearance of a weathered sandstone material.

2) North Shore Granite



Granite may be the most universally recognized natural stone on earth. While its coloration varies widely, the texture of an unprocessed granite is somewhat consistent in the way it fractures due to its composition and density. Stained or unstained, the appearance of North Shore Granite can be nearly indistinguishable from weathered natural stone.

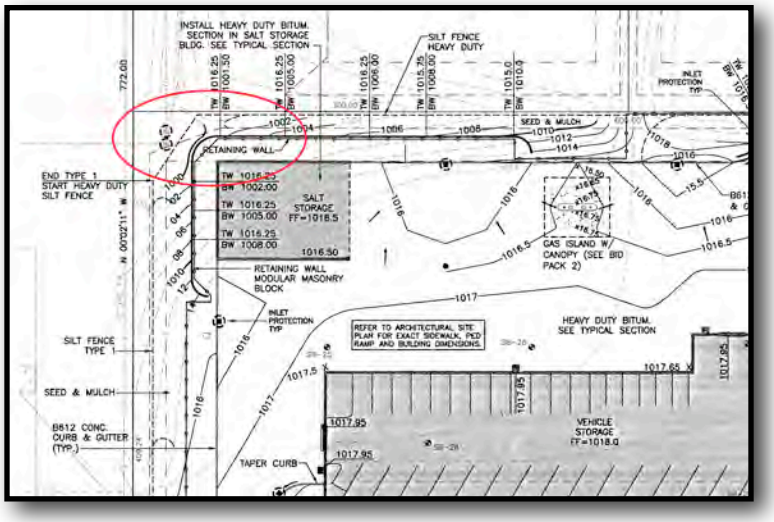
3) Old World

ReCon's Old World texture was originally developed as a "special order" to match the appearance of the popular cut stone building materials used in the late 1800's and early 1900's. Many different types of stone were used in this manner and the Old World texture can emulate most of them depending on the stains that are used. The face also lends itself to further processing, such as sandblasting or using a retarder to expose aggregates.

Design Parameters

Wall Geometry

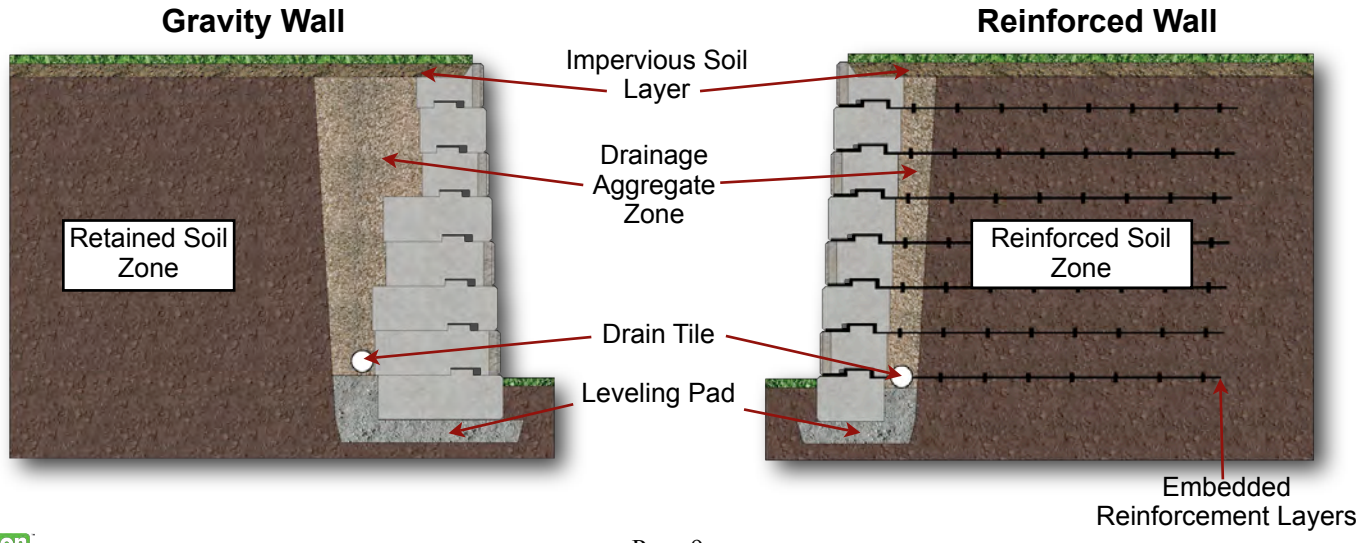
When planning a ReCon retaining wall, the most logical place to start is the wall location and where it resides with reference to the project site and topography. For most commercial projects this information is usually found on the site-grading plan. A great deal of the information necessary to properly design a ReCon retaining wall can be found there. In addition to the calculation of wall heights and lengths, designers study this plan in order to gather information about adjacent structures, surcharges, site access, property lines, utility locations and site drainage. All of these factors influence the final design and construction of a ReCon retaining wall.



For projects that don't have a formal site-grading plan, wall designers still need this information to be gathered, even if perhaps in a less formal way. Regardless of the source, access to this information is critical to proper design; determination of unit types; and the formulation of accurate unit quantities and cost estimates.

Soils Information

Segmental retaining walls (SRWs) are by definition a soil structure with a modular and mortarless aesthetic facing. In some cases, the facing itself can provide sufficient resistance to natural soil forces and potential wall movement. When this is true, the wall is commonly referred to as a "gravity wall". **The ability to construct taller gravity walls is one of the key advantages of the ReCon Series 50 retaining wall system.** How and why ReCon can achieve these heights will be addressed in the appropriate sections of this manual. When the mass, footprint and other properties of the facing units are insufficient to restrain movement of a given segmental retaining wall structure, soil reinforcement is introduced to the soil mass behind the wall to increase stability. These composite structures are commonly referred to as reinforced segmental retaining walls or "MSE walls", which is an acronym for "mechanically stabilized earth".



If soil is a main component of an SRW structure, then it is necessary for wall designers to know and understand the properties of these soils. Soils come in a “near infinite” number of types and compositions. In commercial projects, SRW wall designers often learn about the properties of the soils on a project site from a Soil Boring Log. Knowledgeable civil or geotechnical engineers evaluate this information in order to predict a completed SRW’s performance. In the absence of detailed soils information, wall designers must make some assumptions about the soil properties in order to proceed. When assumptions about soils must be made, they are usually, and should be, conservative in order to preserve the necessary safety factors for wall integrity. There are some soils that should never be used in a SRW. A detailed discussion of all soil types and properties is beyond the scope of this manual. The determination of particular soil suitability for use in a SRW rightfully belongs within the realm of a trained and experienced civil or geotechnical engineer.

The soils that are of critical interest to a wall designer are categorized into five basic “zones” with respect to their location in and around the finished wall.

1) The *leveling pad* is not really a zone, per se, but is an integral and necessary part of a well-designed, well-built SRW. It consists of a material similar to that of road gravel that allows for drainage, but also contains enough fines to allow it to compact well and “hold its shape”. Class 5, ¾” minus, crush & run and road base are some of the regional names given to this type of material. The dimensions for the leveling pad vary and are discussed elsewhere in this manual.
2) The *drainage zone* is typically an imported, well-draining crushed rock material that fills the voids in and around the facing units to a minimum depth of one foot behind the back of the facing. This zone functions as a “French drain” to transport water otherwise trapped behind the finished wall to a drainage collection or dispersal area. This material should be relatively free of fine-grained materials and also should be “self-compacting”. This eliminates the need to operate compaction equipment in close proximity to the back of the wall facing.
3) The *foundation soil zone* comprises the area immediately beneath the facing components and drainage zone and is responsible for providing adequate support for the weight of the retained wall above. If the wall is a reinforced SRW, the foundation zone also extends beneath and behind the wall to a distance roughly equal to the depth of the embedded soil reinforcement.
4) The *reinforced soil zone* only exists in MSE walls and extends from the back of the drainage zone to an embedded depth equal to the back of the geosynthetic soil reinforcement. This soil may have its origin on-site or it can be a “select fill” material brought on-site from elsewhere. The properties of this material strongly influence the performance characteristics of the reinforced soil mass and, as such, have a significant effect on the strength, length and quantity of soil reinforcement in the finished wall. Ultimately, the design of a finished soil-reinforced wall is greatly affected by the material confined within this soil zone.
5) The *retained soil zone* is the material either behind the reinforced soil zone, in the case of a soil-reinforced SRW, or behind the drainage zone in a gravity retaining wall. Soil characteristics within this zone also have a significant effect on the design of the finished wall in the same way that the reinforced soil zone does.

Unit Characteristics

There are a number of characteristics of the wall facing units themselves that contribute to the final SRW wall design.

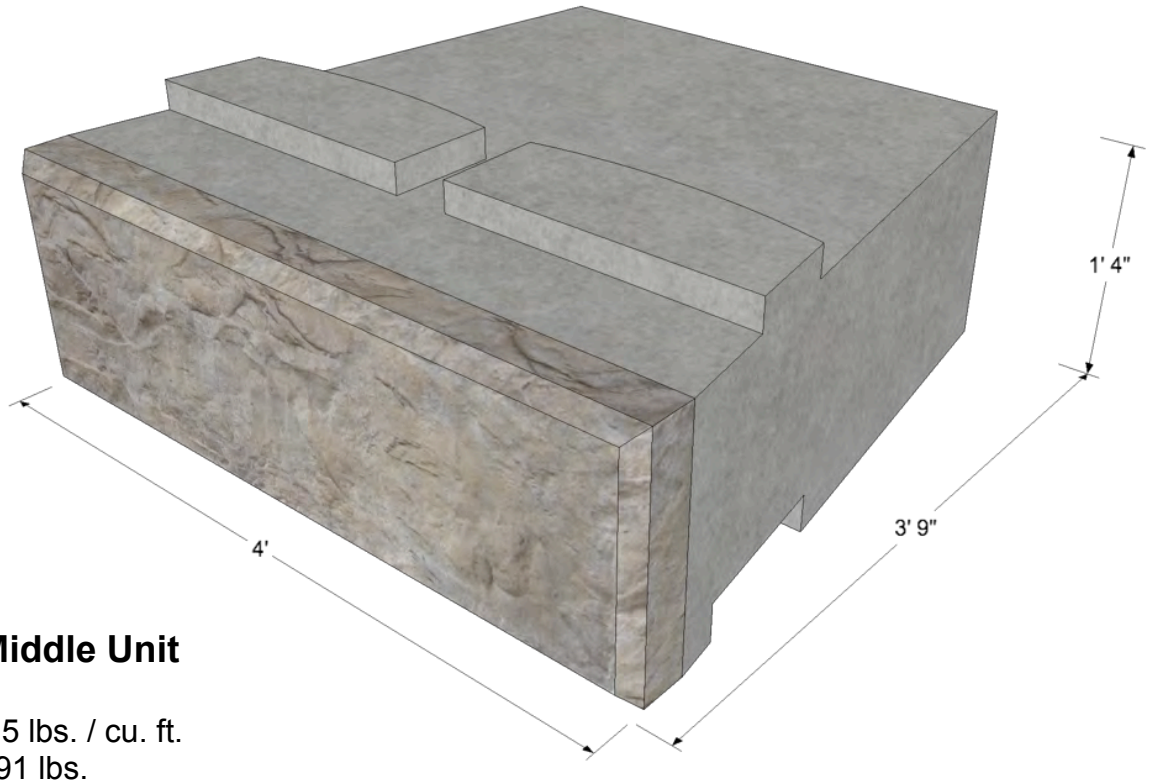
1.Dimensions
- A.Height
- B.Width
- C.Depth

2.Weight
- A.Volume
- B.Density
- C.Center of Gravity
- D.Infill Weight

3.Unit Setback / Wall Batter

4.Durability

These key characteristics are listed in the ReCon shapes chapter.



45” Full Middle Unit

Density - 145 lbs. / cu. ft.
Weight - 2491 lbs.
Volume - 17.18 cu. ft.
Batter - 3.6°

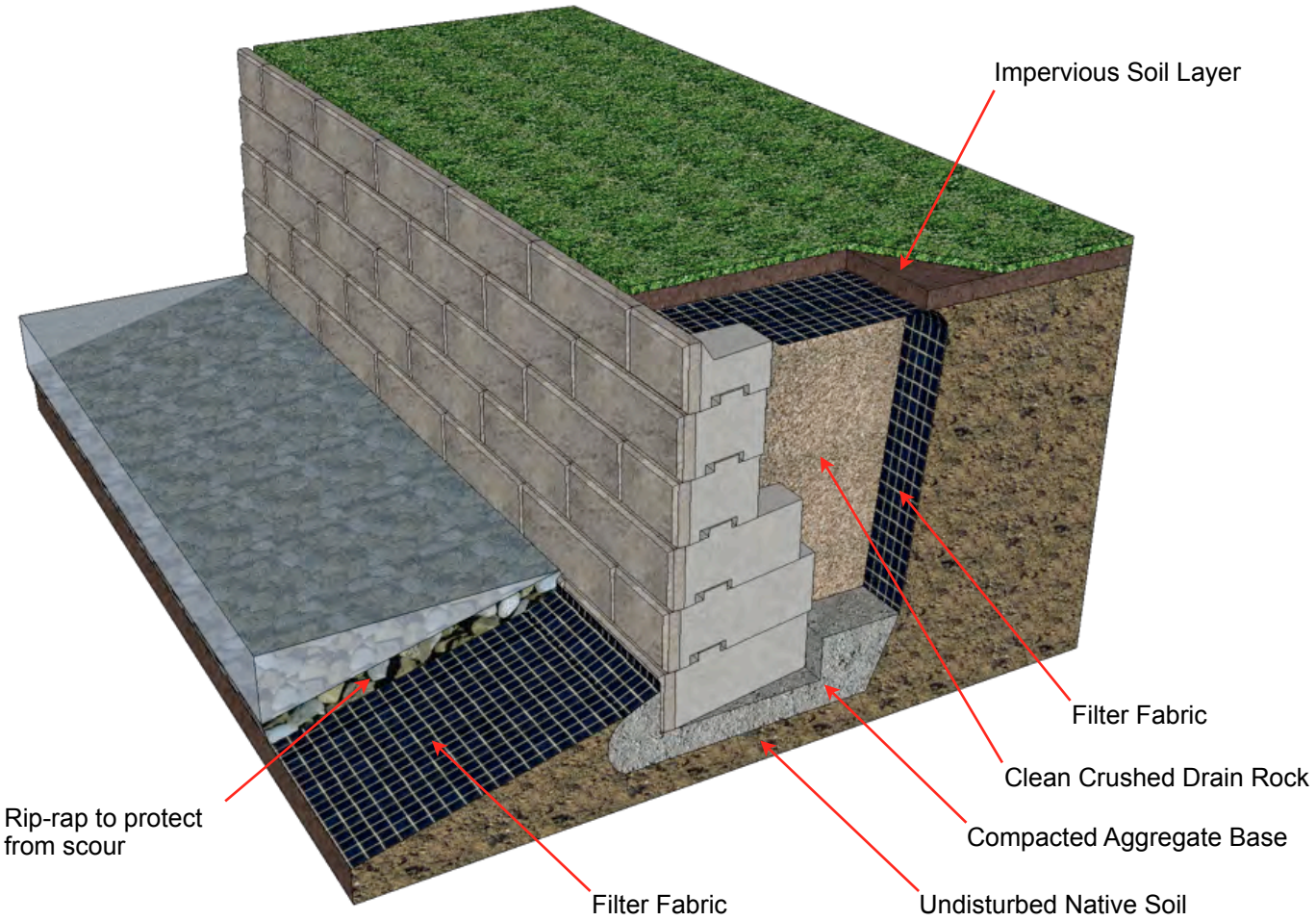
Water / Drainage

Most problems associated with SRWs can be traced back, directly or indirectly, to water. The presence of water, whether or not anticipated, affects soil mechanics and places extra strain on a finished wall. Water trapped behind a wall greatly increases retained pressures. A high water table can weaken foundation soils to the point where they are unable to continue to support the wall. Moving water over the top or along the bottom of a finished wall can erode away the soil to the point where the wall becomes unstable and must be rebuilt. Finally, drainage must be considered during the construction period as well as when the wall and final grading is completed. Water “traffic” on an unfinished project site can be entirely different than what is designed for and intended on the completed project. In short, the presence of water accentuates weaknesses in wall design and/or construction. As such, care must be taken to avoid these water issues when designing and installing a ReCon “Series 50” retaining wall.

By the same token, ReCon “Series 50” units are an excellent choice for the unique challenges that water applications present. The durability, mass, footprint and specific gravity of a “Series 50” wall enables designers to comfortably tackle these applications.

Shoreline or seawall retaining wall applications are unique and should be treated as such. The design for these applications can vary significantly. Consult a qualified wall design engineer for these situations and make sure to check all governing code requirements.

The following diagram illustrates some of the special construction and design elements of a typical water application.



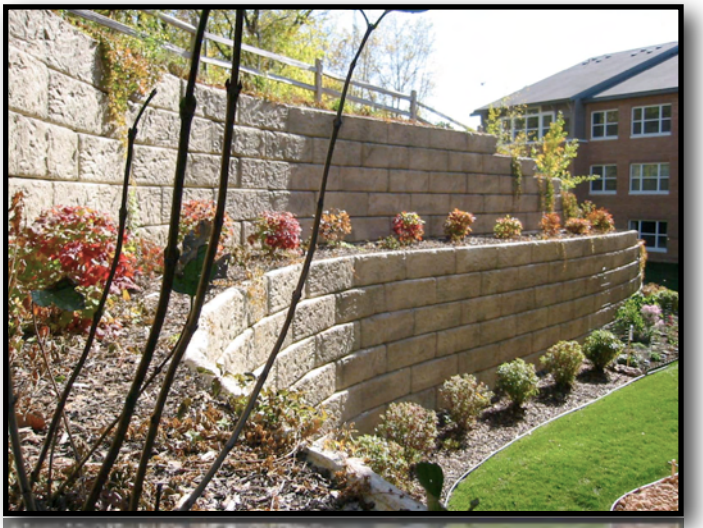
Surcharges

When a SRW is exposed to additional loads, whether permanent or temporary, the overall wall design is affected. Usually, when a structure, building, roadway or top slope is within twice the height of the SRW wall face, its impact on the stability of the wall must be evaluated. This is only a general rule based on the most common soil types. Wall design engineers must consider many other factors which may adjust this proximity formula.

Surcharges may stabilize or destabilize a ReCon wall, depending on their type and / or relative proximity to the wall.

By definition, surcharges are usually classified as a “live load” or “dead load”. A live load is generally temporary in nature. An example might be a fully loaded semi truck traveling along a roadway within close proximity to the finished SRW. Because it is by definition temporary, any stabilizing contribution of a live-load surcharge is usually ignored. Ultimately, this results in a more conservative design with an improvement in the overall safety factors for certain aspects of the wall design.

A dead load, by contrast, is intended to be permanent. Although it will increase stresses on the wall depending on its type and proximity to the wall, it can also contribute to certain aspects of wall stability. Examples of a dead load could be a slope above the wall that adds the extra weight of the soil mass and must be accounted for in the wall design; or it may be a building exerting additional weight through its foundation or footing. Another common type of dead load found on SRW sites results from wall terracing. When a second (or third, etc.) SRW is built above another it needs to be evaluated to see if it is imposing additional stresses on the wall (or walls) beneath it.



Terraced Walls

Terraced walls are a common feature in retaining wall applications. From an engineering standpoint, these walls must be treated as a single composite structure if their proximity, in conjunction with other site and soil parameters, is such that an upper wall places additional load or stress on the wall (or walls) below.

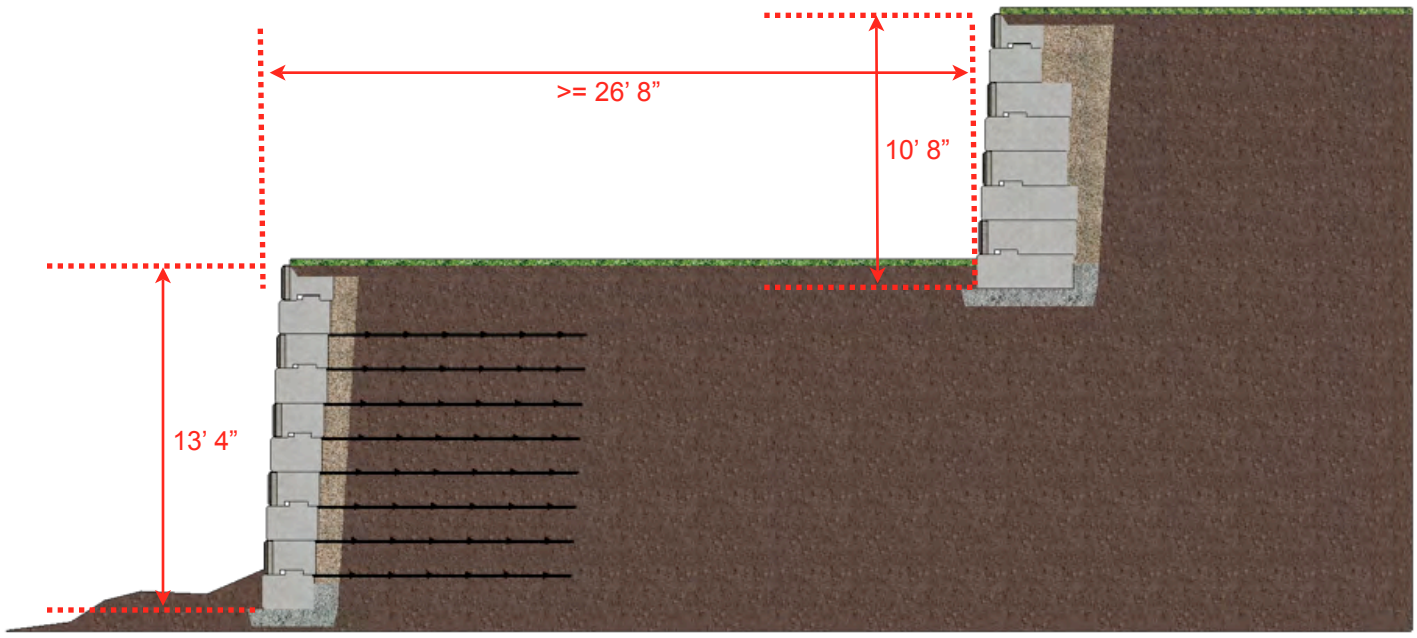
Most terraced walls may be considered independent of each other if they meet the requirements of the following rule of thumb.

Terraced Wall "2:1" General Rule

"Terraced walls may generally be considered independent of each other if… 1) the height of the upper wall is less than or equal to the height of the lower wall and… 2) the distance between the two walls is at least twice the height of the lower wall."

This general rule may not apply if soils are very poor, if toe or crest slopes are involved, or if there are additional surcharges present.

Terraced walls that do not meet the "2:1" rule usually require additional mass and / or soil reinforcement incorporated into the lower wall design in order to resist the additional stress incurred from the upper wall or walls.



Terraced Wall Example

Wall Construction

The following procedures comply with the generally accepted industry standards for the installation of segmental retaining walls with special attention given to the unique features of the ReCon “Series 50” product line. Every attempt should be made to follow these procedures as closely as possible unless the project specifications, drawings or the final engineered wall design directs otherwise.

Site Preparation

Before beginning work, contractors should make sure that they have thoroughly studied the project specifications, the final engineered drawings for the wall and complied with all the requirements for product submittals. Contractors should also have a clear understanding of their scope of work and their responsibilities that may be covered elsewhere in the project specifications and are not in the actual wall construction section.

For projects that do not have a formal set of plans and specifications but do have a “signed and stamped” final engineered wall plan, the contractor should refer to these procedures whenever a topic is not specifically covered in the final engineered plan.

Excavation

The contractor should carefully excavate the wall construction area to the lines and grades shown on the construction drawings. Exercise caution to keep the soil undisturbed in areas that will not need modification during wall construction. Be sure to identify above and below ground utilities including power lines, communication lines, sewer and drainage structures, etc.

Preparing the Leveling Pad

Excavate a trench to a minimum thickness of 6 inches and to a width that extends a minimum of 6 inches in front and behind the actual location of the base units along their designated placement. If the wall layout requires either inside or outside radius curves, it is a good idea to increase the width of the leveling pad to accommodate adjustment during wall alignment. For all but straight walls where the bottom elevation doesn’t

change along the entire length of the wall, stakes should be driven to the proper height as determined by a transit to indicate the proper bottom elevation of the wall. These stakes should also show where base step-ups are located. Bear in mind that each step-up causes the leveling pad location to step back by one inch due to the integral setback of ReCon “Series 50” units.

Fill the trench and any over-excavated areas with the specified base material. Unless specified otherwise, this material should generally consist of a well-draining material that also contains enough fines that the leveling pad will hold its shape after compaction. Depending on the region, this material may be referred to as road base, ¾” minus, crush and run or Class 5. Fully compact the base material and add or remove material as necessary to keep the leveling pad as close to the final level grade as possible. Where step-ups are located, base material should taper up at roughly a 45° angle.

At times a concrete leveling pad may be required or desirable in lieu of a compacted granular base material. Unless the leveling pad is designed as a true “footing” and extends below frost depth, the concrete should not contain steel reinforcing and should consist of a relatively weak mix capable of breaking up under frost pressures. This allows for resettlement as the frost dissipates. Also, when using a concrete leveling pad take extra care to keep the pad level and any step-ups at their proper height to avoid difficulty in maintaining height tolerances.

Base Course Installation

The first (base) course of a ReCon wall requires the use of a *Base Block.* This unit does not have the special groove on the bottom. This makes for easier leveling of the base course and also provides greater shear resistance at the interface between the leveling pad and ReCon base block.

Walls should generally be built starting at the lowest point in the wall. Make sure to properly place the edge of the first unit at an even 2 foot increment from any fixed wall features such as a 90° corner, a control joint or building structure. This helps to avoid unnecessary cutting or trimming of the ReCon units and improves wall aesthetics.

Depending on the type of material used for the leveling pad and how level the pad is to start with, base course leveling may be easier if the leveling pad is topped and screed with up to ½” of clean sand. On long straight sections of wall, it may be helpful to set units with a canter or tip-back of up to ½”. This increases the ability to maintain a positive wall batter and minimize rotation during soil compaction when robust compaction equipment is used.

As base units are laid, ensure that the units are in full contact with the leveling pad and check to ascertain that the units are level both front-to-back and left-to-right. Use a jig if necessary to maintain a consistent leveling plane from unit-to-unit. Lay units end-to-end and avoid gaps between units. The use of a string line will help ensure proper wall alignment along straight sections of wall. After the base units have been placed and before compacting the backfill material behind the wall, compaction to the specified embedment depth should be done in front of the wall.

Backfilling and Compaction

When all the units comprising a section of wall at a single elevation have been placed, aligned and leveled, fill the gaps between the units with a clean crushed rock material at least ½" – ¾" in size. Use this same material behind the back of the block to a depth of at least 1' or as otherwise indicated in the final engineered drawings. This material serves as a "French drain" to relieve water build-up and also, because it is self-compacting, it relieves installers from having to operate compaction equipment close to the back of the units.

At times, a **filter fabric** may be specified behind the drainage aggregate material. This helps keep the drainage zone clean and free from sedimentation. If present, wrap the fabric forward over the drainage aggregate as the other backfill material is placed.

When **drain tile** is used, it should be located as shown in the plans or drawings. Generally, the drain tile runs along the back of the wall and is at the bottom of the drainage aggregate zone at an elevation at or above the bottom finished grade level. Drain tile should "daylight" at least every 50' along the length as well as at every low point in the wall.

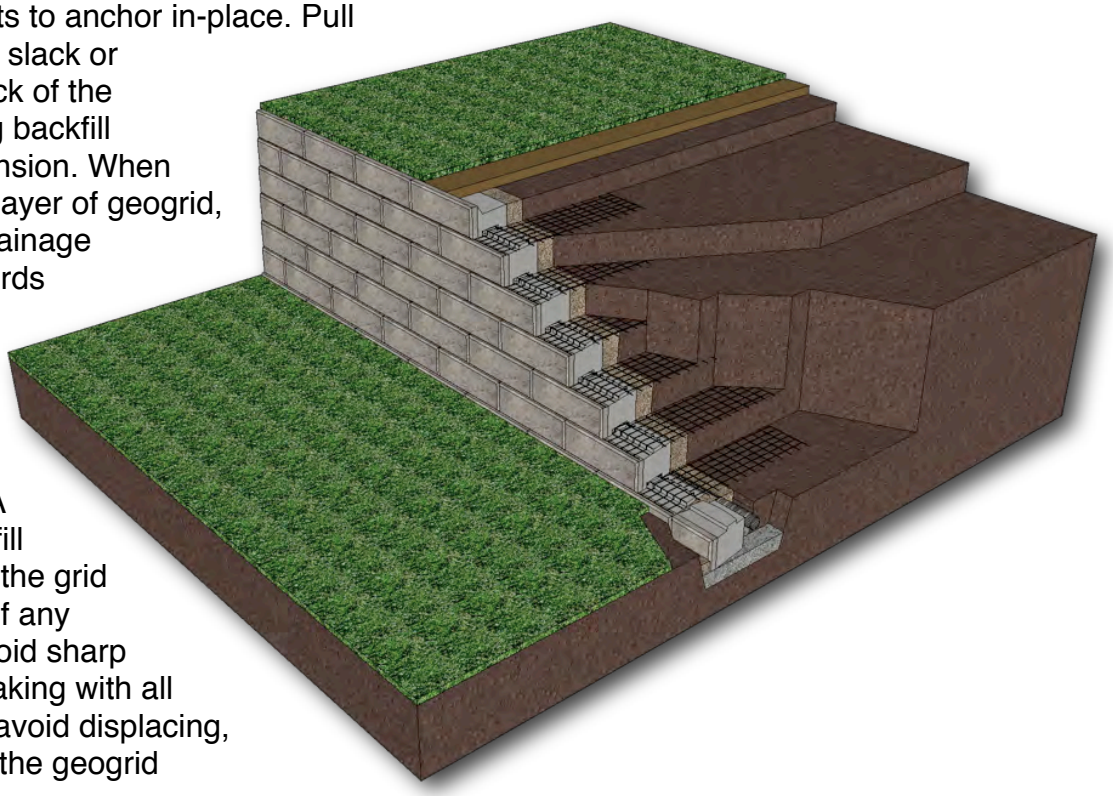
Place the specified backfill material and thoroughly compact material in 8" lifts. Backfill material should be compacted to 95% of standard proctor. **Improper or inadequate compaction is a primary source of contractor-caused wall failures.** Close attention should be paid to changes in consistency and moisture content of all backfill material. Use the proper type of compaction equipment. Sandy or gravelly materials respond best to plate compaction equipment and clayey materials usually should be "kneaded" by using a hand-operated "jumping jack" or "sheep's foot ". Heavy-duty compaction equipment should be kept a minimum of 5' from the back of the ReCon Wall to avoid wall rotation.

Placing Additional Courses

Prior to placing successive courses, sweep and keep clean any backfill material from the top of the ReCon units and make sure that all voids are filled with the proper drainage material. Place the next course in a running bond pattern or as otherwise shown on the engineer's detailed wall elevation plan. Set the upper unit and slide it forward until its bottom "groove" is in full contact with the bottom unit's "tongue". Check and adjust level at every course elevation. If shimming is required, use a material such as an asphalt shingle and cover as much of the "low" surface area as possible to achieve the desired result.

Geogrid Placement

When a geosynthetic reinforcement (geogrid) is required, use only the type (or types) specified. Also, make sure the reinforcement is cut to the proper lengths as indicated on the final engineered plan. Most geogrid types are “uni-axial” and must be laid perpendicular to the wall face. Check the manufacturer’s data to insure proper orientation. The geogrid should be laid on the top of the block as near to the front face as possible and extend back over a compacted, level backfill to the length required. Sandwich the reinforcement under the next course of ReCon “Series 50” units to anchor in-place. Pull the grid taut to remove slack or wrinkles. Stake the back of the geogrid prior to placing backfill material to maintain tension. When placing backfill over a layer of geogrid, start just behind the drainage aggregate and fill towards the back of the geogrid. Avoid operating backfill equipment directly on the tensioned geogrid as much as possible. A minimum of 6” of backfill should be placed over the grid prior to the operation of any tracked equipment. Avoid sharp turning and sudden braking with all types of equipment to avoid displacing, wrinkling or damaging the geogrid reinforcement.



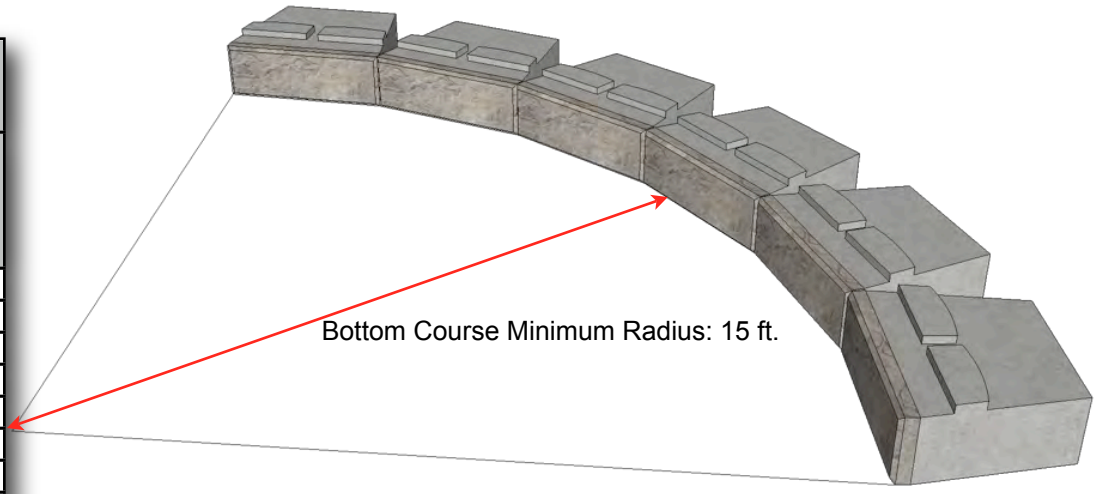
Curved Walls

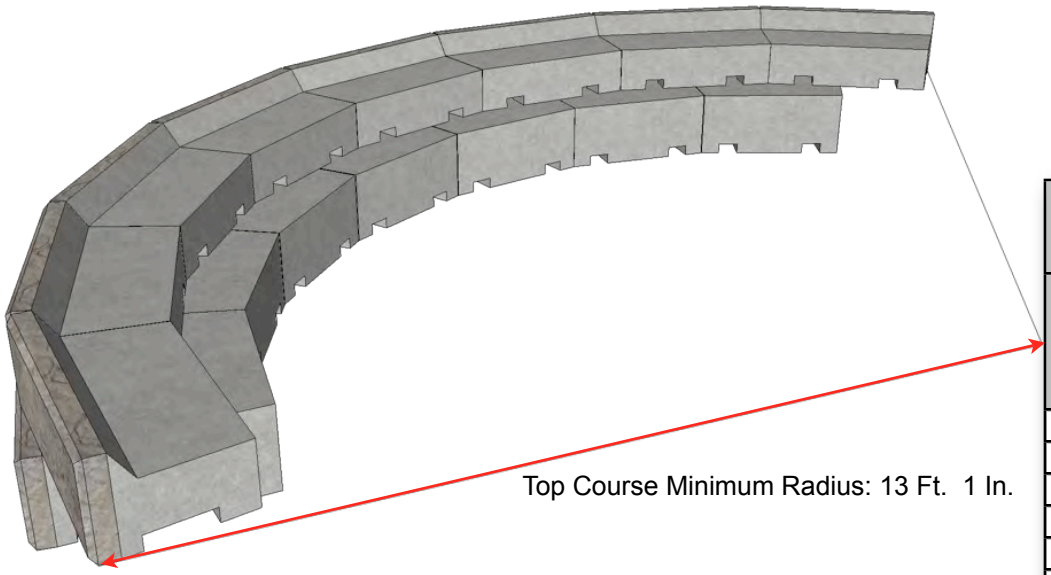
The absolute minimum turning radius for ReCon “Series 50” units is a little over 13’. Due to the integral setback of the units, the actual minimum radius grows or shrinks by 2” or so for each additional course… depending on whether it is an “inside” or “outside” curve in the wall. For ease of installation, it is recommended that the radius at the base row of a multiple row wall be no less than about 15’ at the bottom of an inside radius or top of an outside radius wall. From this starting point, you should add about 2” for each additional course as you plan for your radius wall.

Because ReCon “Series 50” units have a fixed length and a built-in setback, ReCon walls that travel along radiuses will tend to run “off-bond” over long curves and as the height of the wall increases. For wall integrity, it is recommended that whenever a point is reached where there is less than 1/3 of one of the upper units bearing on a unit beneath, a partial unit should be inserted into the wall to return the bond to normal. For aesthetic purposes, try to stagger any partial units placed in the wall so they don’t all occur in the same section along the length of the wall face.

Inside Curve Minimum Radius

Wall Ht.	Number of Courses	Top Row Min. Radius
2’ 8”	2	15’ 2”
4’	3	15’ 4”
5’ 4”	4	15’ 6”
6’ 8”	5	15’ 8”
8’	6	15’ 10”
9’ 4”	7	16’
10’ 8”	8	16’ 2”
12’	9	16’ 4”





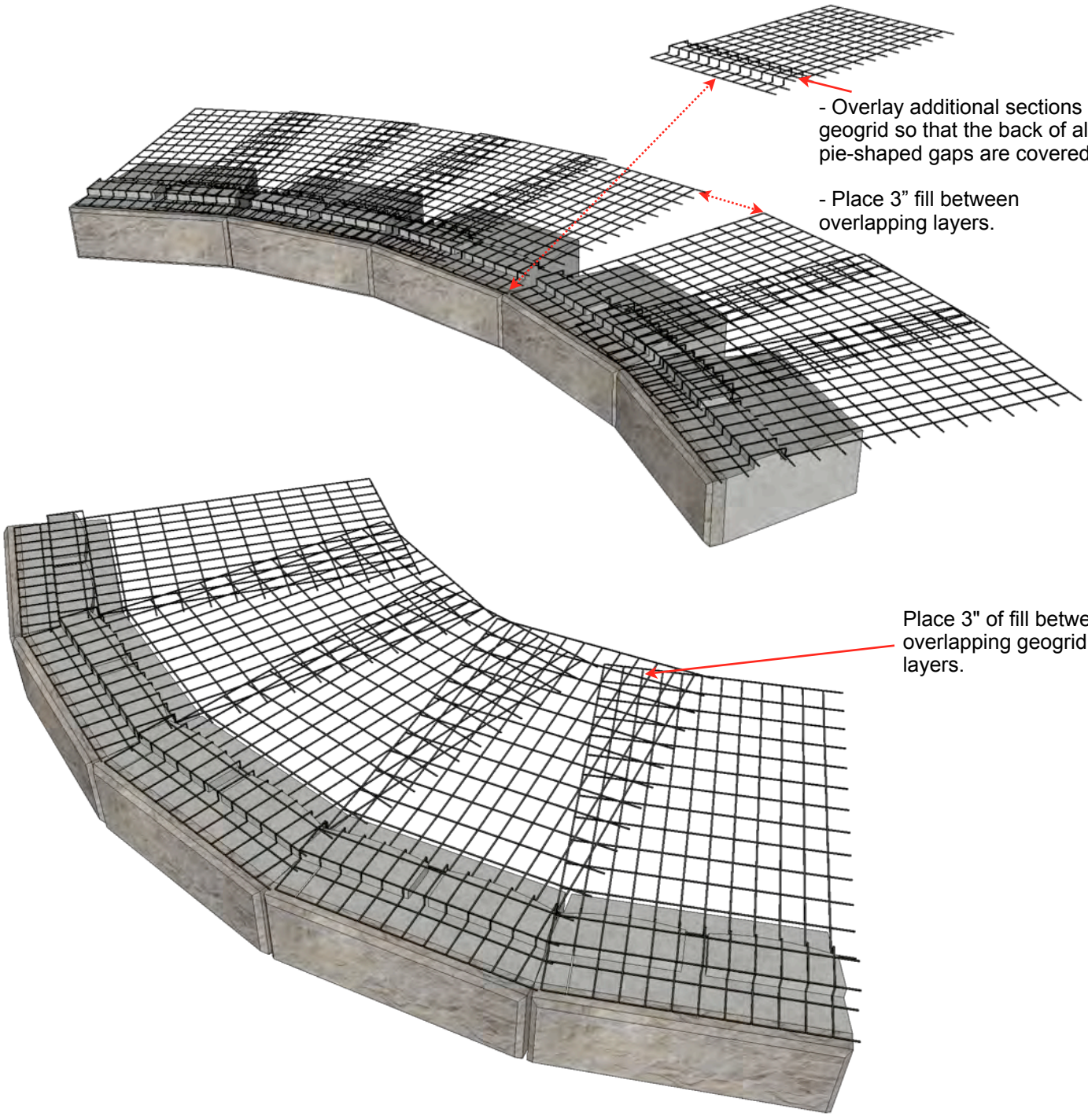
Outside Curve Minimum Radius

Wall Ht.	Number of Courses	Base Row Min. Radius
2’ 8”	2	14’
4’	3	14’ 6”
5’ 4”	4	15’
6’ 8”	5	15’ 6”
8’	6	16’
9’ 4”	7	16’ 6”
10’ 8”	8	17’
12’	9	17’ 6”

Reinforcement Placement on Curved Walls

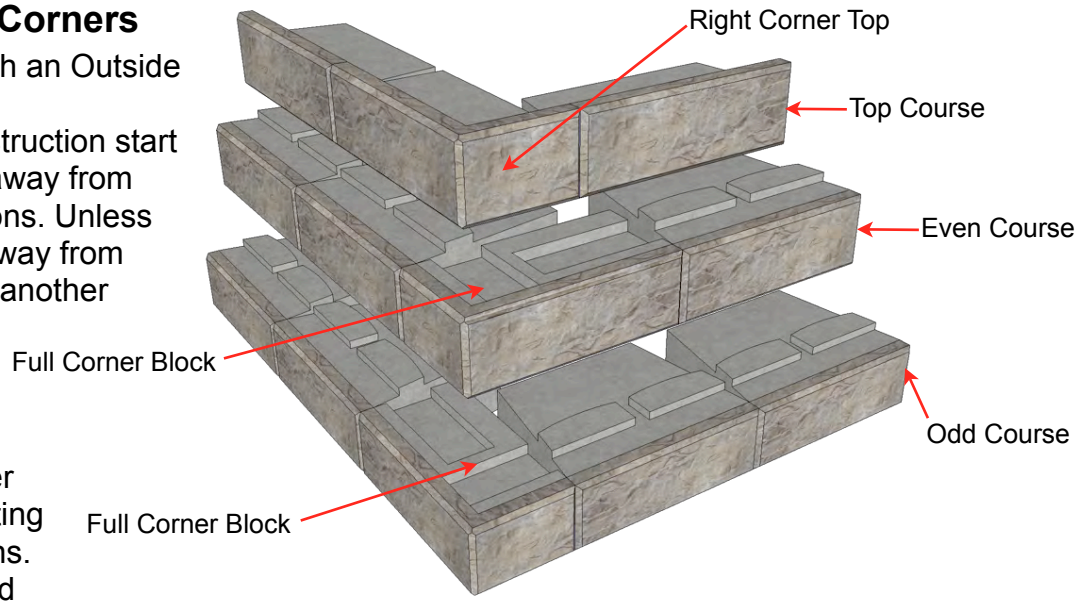
Most accepted design methodologies stipulate that the reinforcement shall be continuous along the length of the wall at both the front and rear of the reinforced soil zone. Geogrid layers should not overlap unless there is compacted soil separating the individual layers. In addition, the natural rectangular sections of geogrid should ***never*** be cut to form a wedge shape.

Rectangular reinforcement sections will naturally overlap in a pie-shaped fashion at either the front or the back of the reinforced zone depending on whether the curve is “inside” or “outside”. The figures show how reinforcement is laid out in this situation. All of the pie-shaped overlap areas should be separated by at least 3” of backfill.



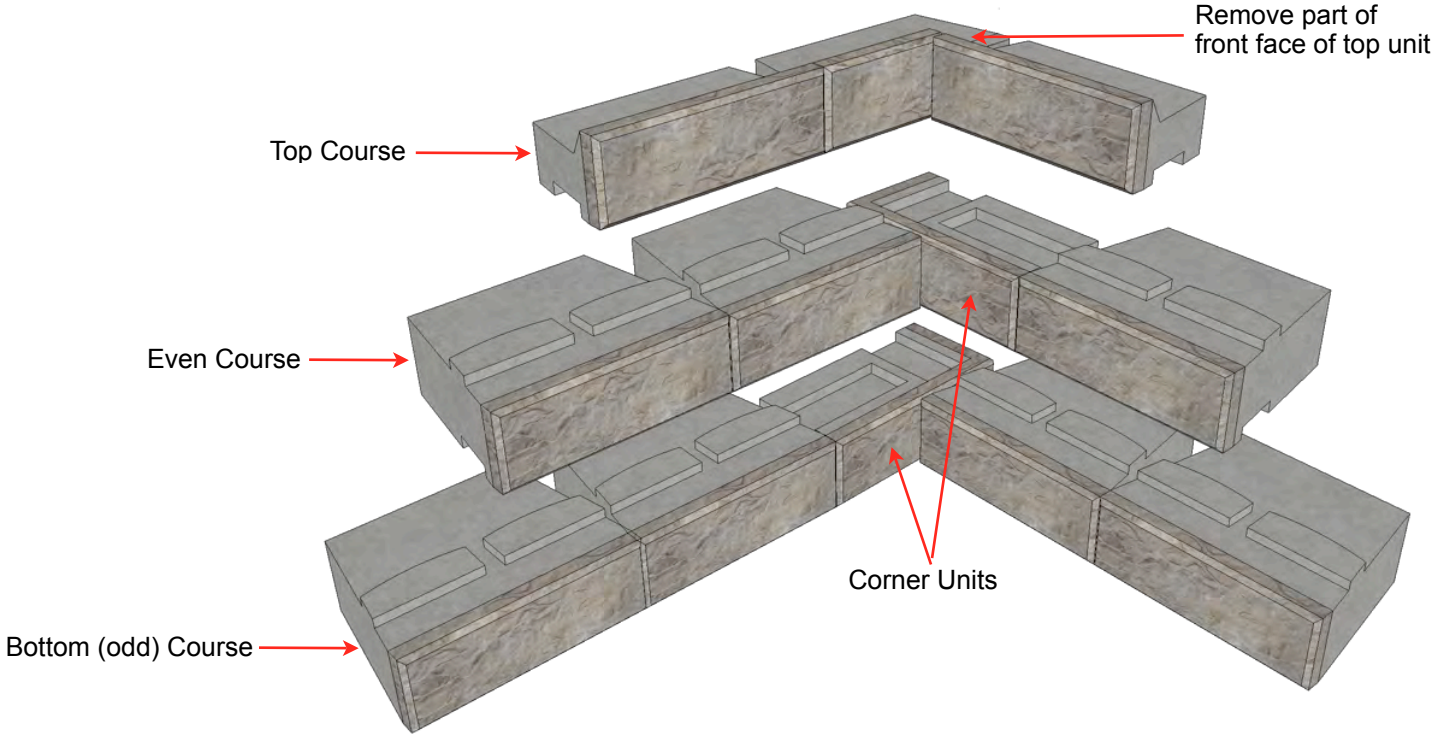
Outside 90 Degree Corners

When building a wall with an Outside 90 Degree Corner, it is recommended that construction start at the corner and work away from this point in both directions. Unless one of the walls going away from the 90° corner runs into another corner or abutment, no block should need to be cut. One standard corner block will be used at the corner on each course, alternating the long and short returns. The corner blocks should be glued at the corner where they overlap with a high-quality, exterior-grade concrete adhesive.



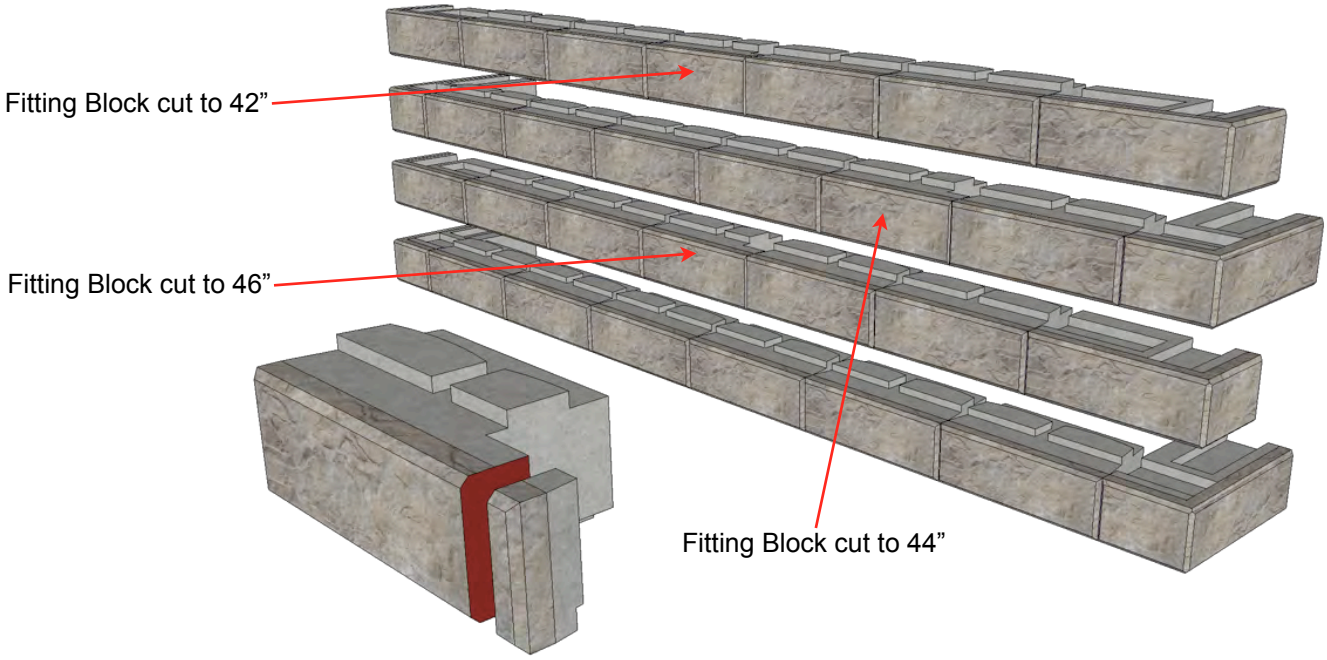
Inside 90 Degree Corners

When building a wall with an Inside 90 Degree Corner, it is recommended that once the base row is laid to the location of the inside corner, subsequent courses should begin at the corner and be laid outward from there. This avoids unnecessary trimming due to the built-in 1" setback. On taller walls, the "running bond joint" will slide off center by 2" for every other row. This does not affect the structural integrity of the wall. One standard corner block will be used at the corner on each row of the wall. The corner blocks will overlap each other at the corner, coming together in an alternating long/short fashion. The corner blocks should be glued at the corner where they overlap with a concrete adhesive.



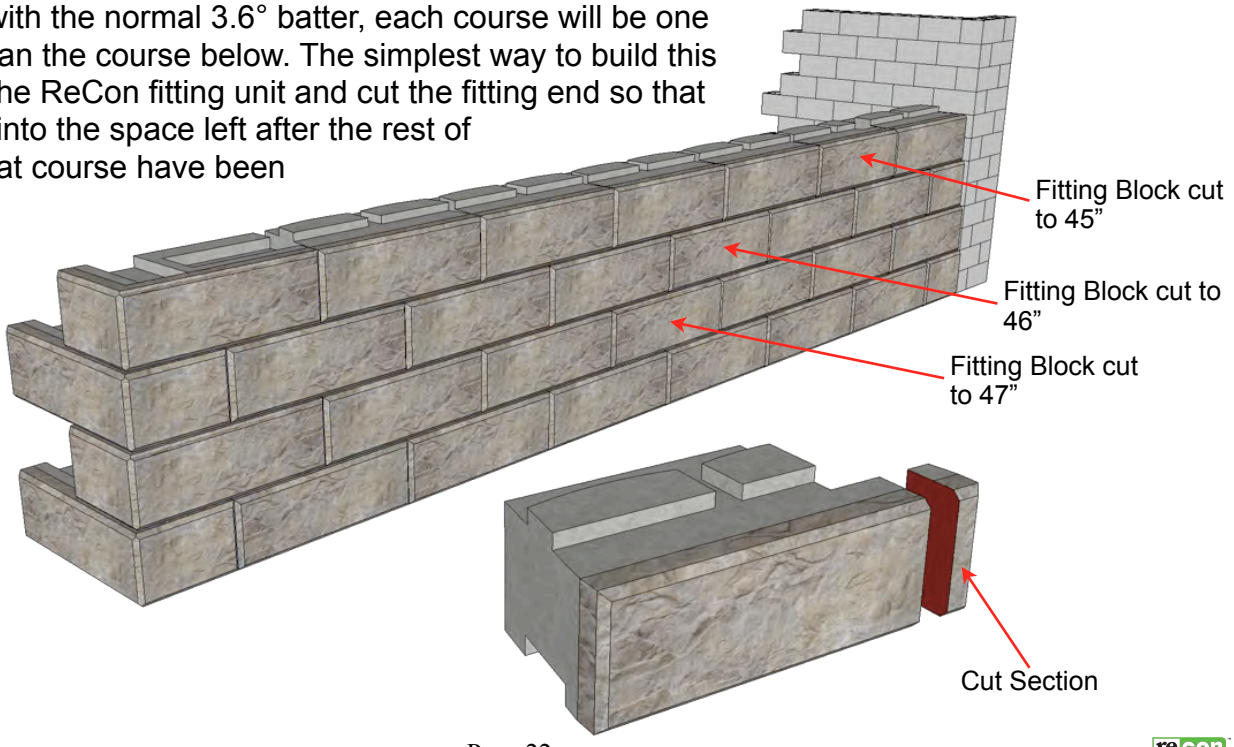
Double Outside 90 Degree Corners

When building a wall with a wall section that is terminated on each end with an Outside 90 Degree Corner, start by placing the corners in their proper location and elevation. Because the wall will narrow by two inches (on a 3.6° battered wall) for each successive course, a partial unit must be cut to fit somewhere along the length of the wall. Use a ReCon fitting unit to create this partial unit, thus making the cutting procedure easier. For aesthetic purposes it is recommended that you locate these partial units at varying locations along the length of the wall.



Outside 90 Degree Corner to Abutment

A ReCon “Series 50” wall may start against an abutment, perhaps a garage or walk-out basement. Often the other end of the wall will turn with a 90° corner. When such a wall is built with the normal 3.6° batter, each course will be one inch shorter than the course below. The simplest way to build this wall is to use the ReCon fitting unit and cut the fitting end so that the unit will fit into the space left after the rest of the units on that course have been laid.



Top of Wall Treatments

ReCon Top Units

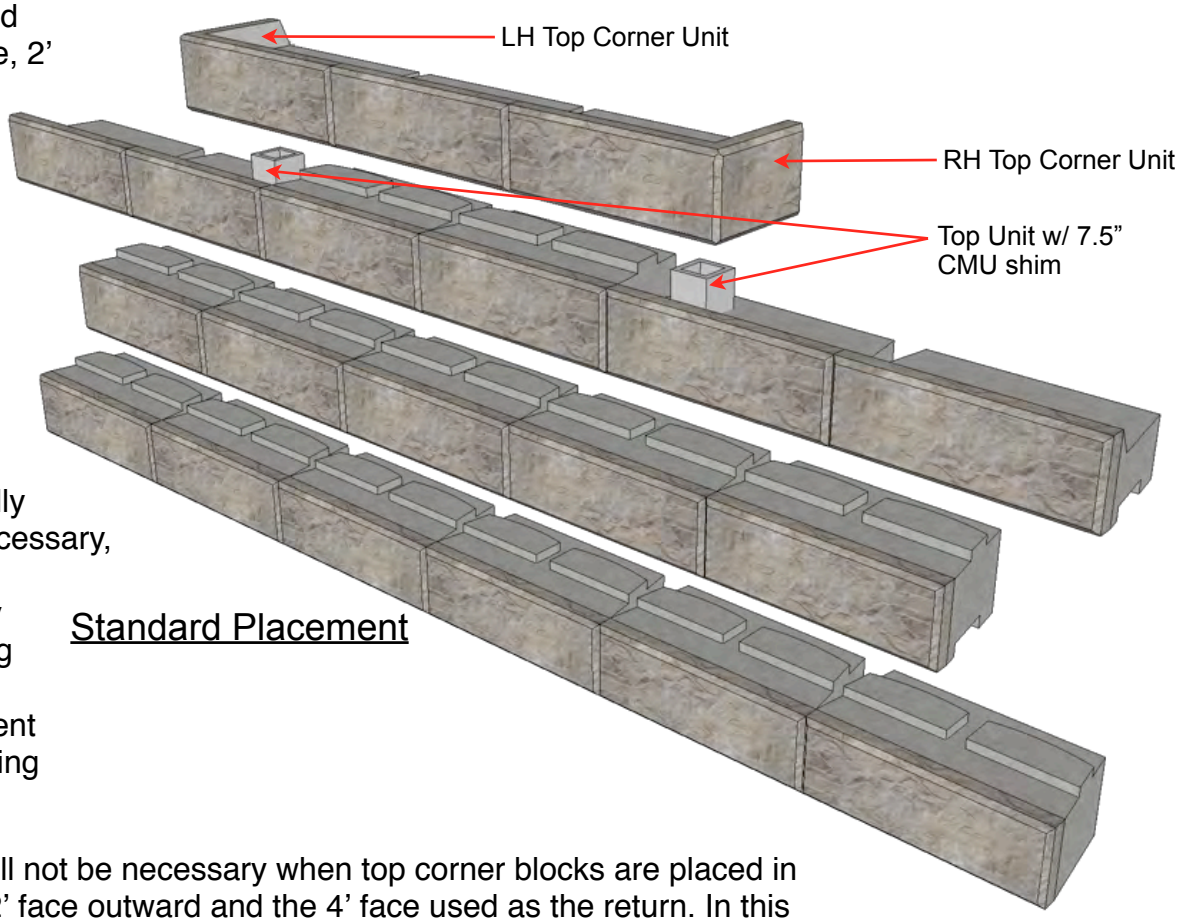
The tops of ReCon walls are usually either capped using ReCon “Series 50” cap units or finished with top block units. Other treatments typically involve special construction, such as forming and pouring a concrete parapet or attaching specialty, precast components.

Capping a wall is a fairly straightforward process. However, radius walls require cutting of the cap units to avoid creating triangular wedges at the front or back of the wall, depending on whether it is an “inside” or “outside” radius.

Using the ReCon “Series 50” top blocks to finish off a wall provides the ability to fill units with a landscape rock or plant material to within 4” of the wall face. When stepping up or down at the top of a wall using top blocks, the “top corner block” is used to make this transition. A top corner block can be laid with either the 2’ or the 4’ face as the return side. Usually the wall layout elevation plan prepared by the design engineer will indicate the proper unit location or type. In the absence of such a plan, the left and right top corner units designate which side the 2’ return dimension is located as you face the finished wall. This is referred to as “standard” placement.

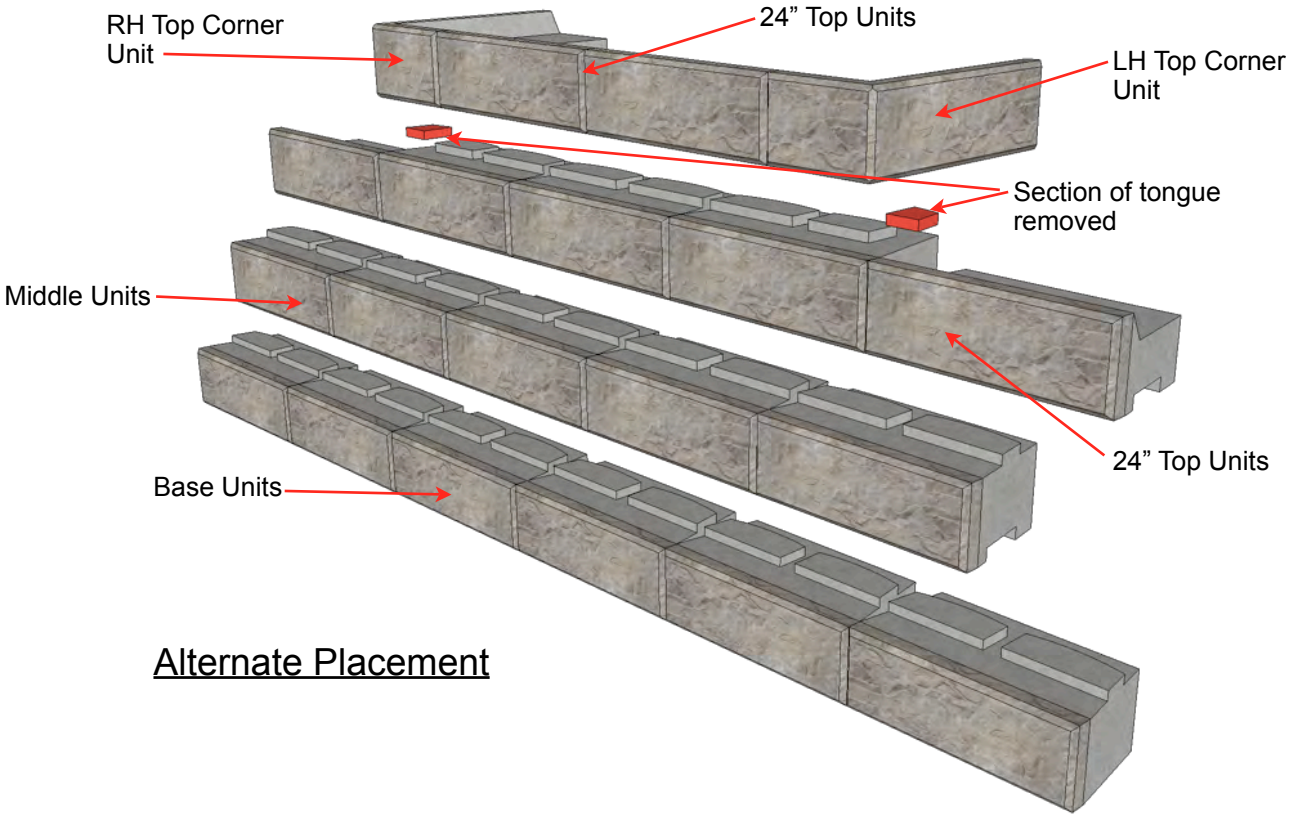
If it is desired that the 4’ face returns back into the retained soil, then a left corner top block will actually return (with respect to the wall face) on its right side and visa-versa for a right corner top block. This is referred to as “alternate” placement.

When the standard placement (4’ face, 2’ return) is used, it will be necessary for block stability to add a concrete shim beneath the portion of the top corner block that bears on part of another top block located beneath. This shim is usually made or cut, if necessary, from a standard concrete masonry unit (CMU). Gluing this shim in place will resist movement during the backfilling process.



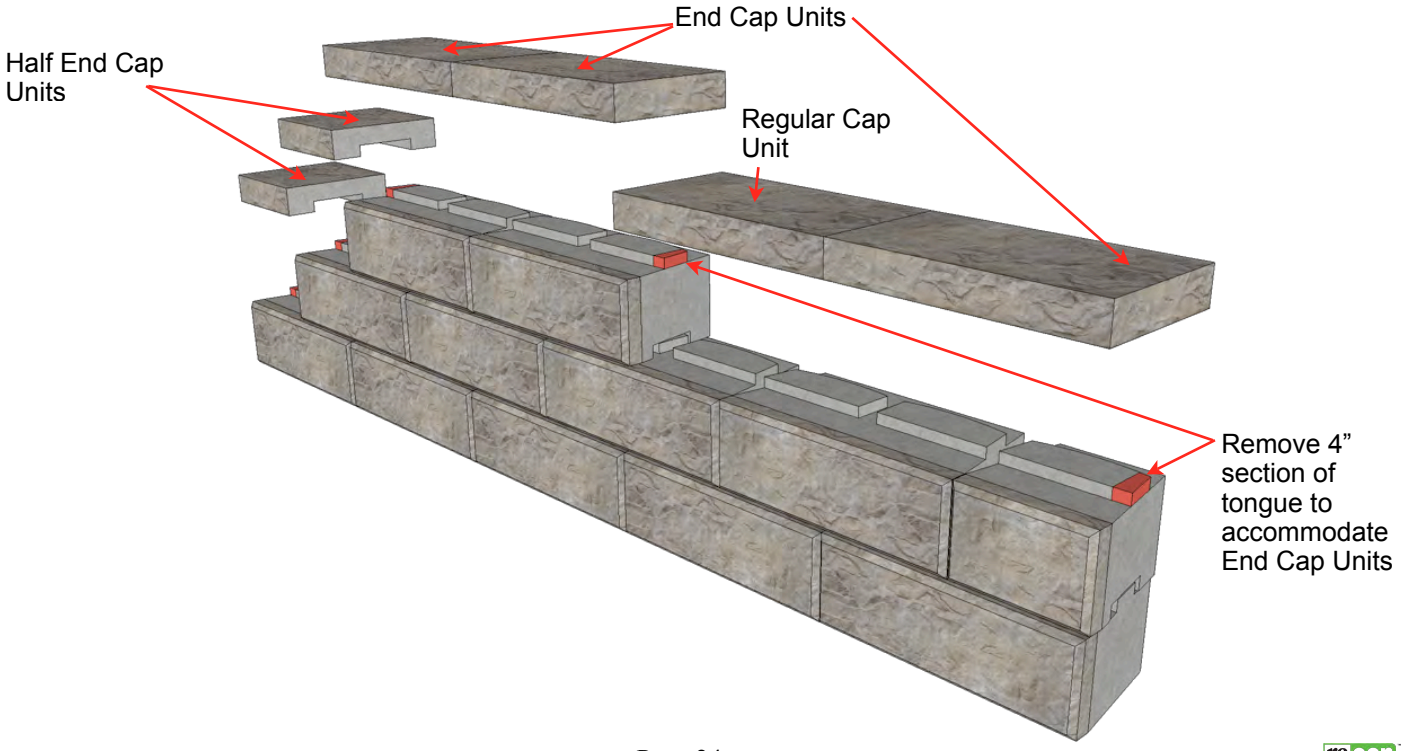
Standard Placement

This procedure will not be necessary when top corner blocks are placed in the wall with the 2’ face outward and the 4’ face used as the return. In this scenario, the block should be resting entirely on ½ of a full unit. In order for the unit to lay flat and level, a section (approx. 7”) of the tongue on the lower unit must be removed.



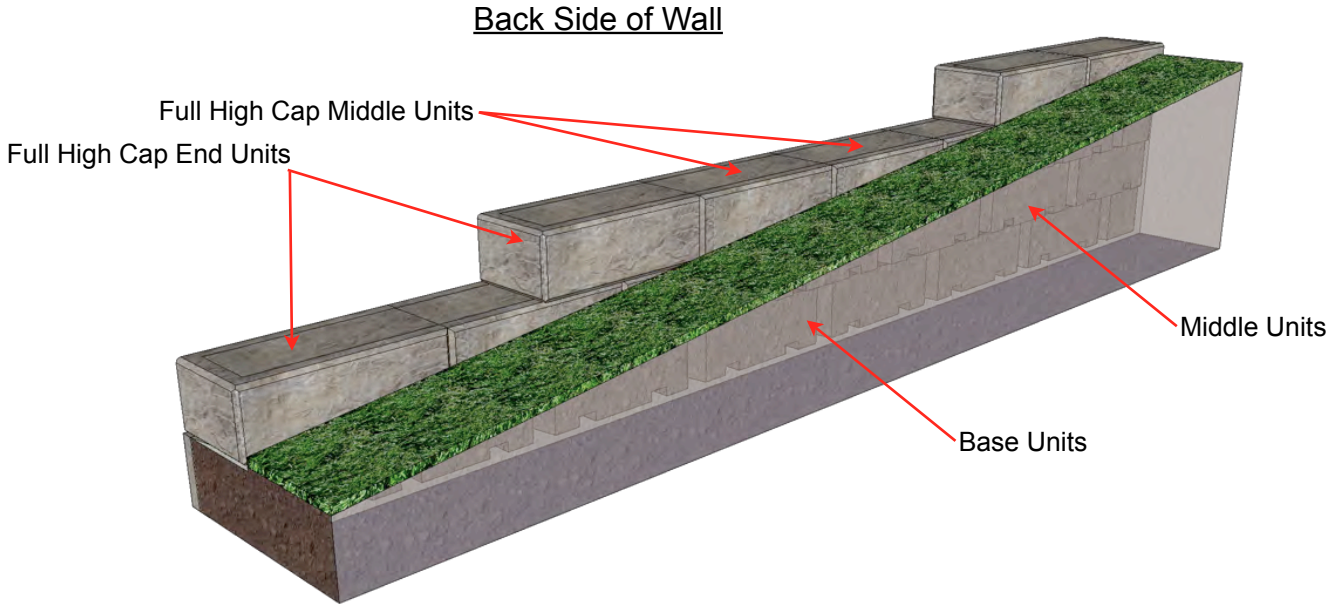
Cap Units

ReCon Cap Units are rectangular in shape and are available in two shapes, a regular cap that has a groove along the entire bottom of the unit and an end cap where the groove terminates 4” from one end to provide a finished appearance on one end. These caps are placed with a scissors clamp and are intended primarily for straight walls. If cap units are to be used atop curved wall sections they will need to be cut to provide a continuous finished appearance.



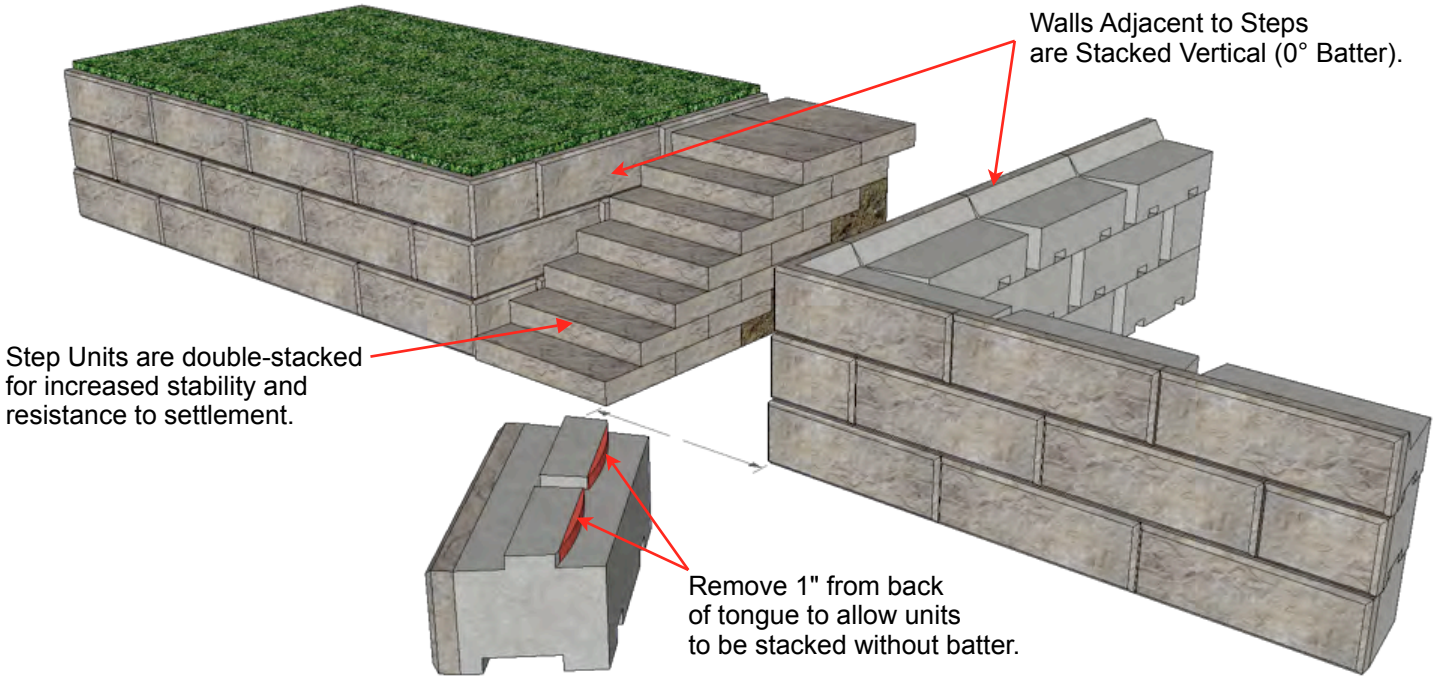
Full-High Cap Units

ReCon Full-High Cap Units can be used when some freeboard above top grade is expected at the top of a wall. This solution can be useful when the wall involves numerous step-ups at the top of the finished wall and a finished appearance is desired for all exposed block above grade.



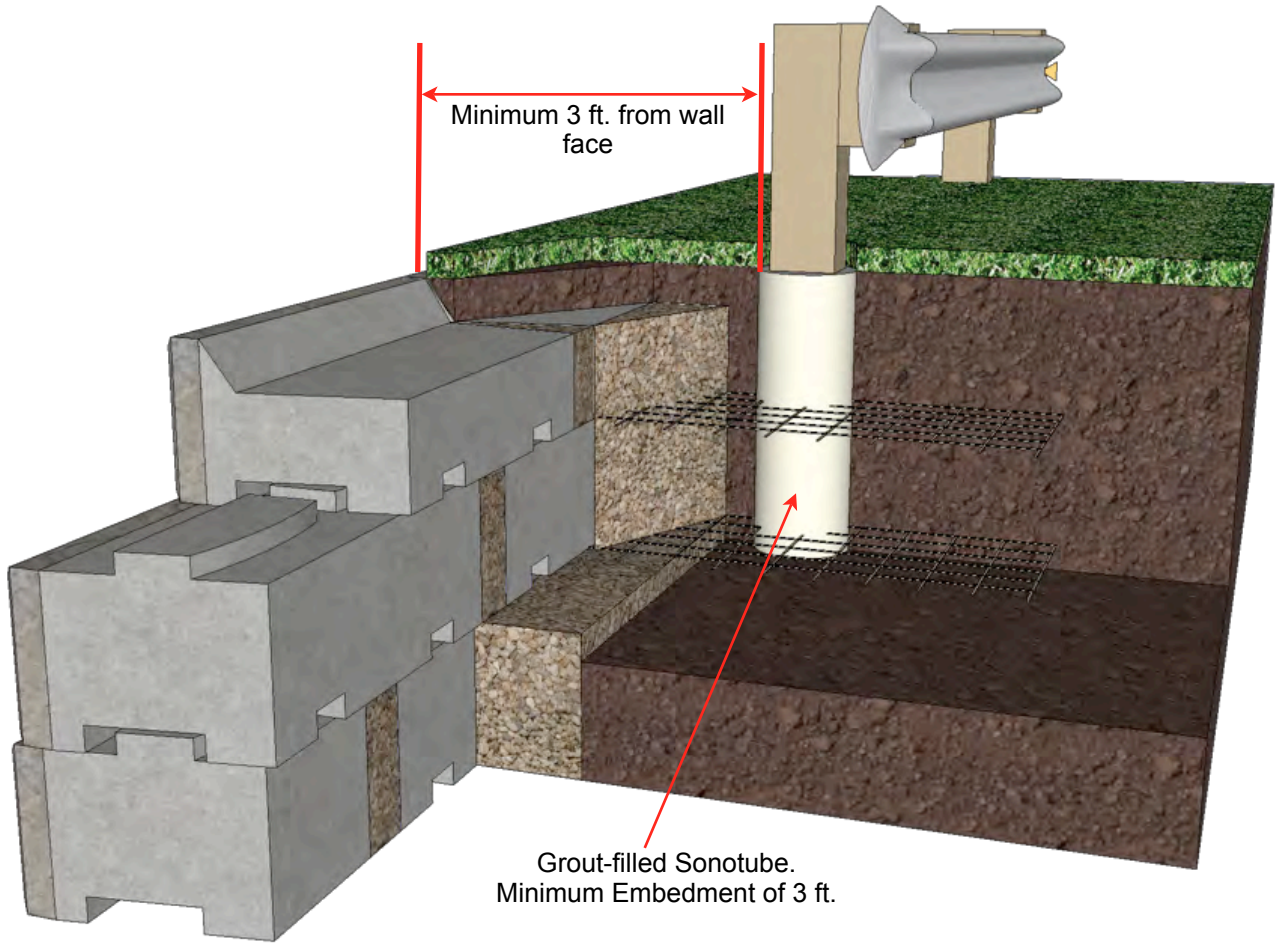
Steps

There are numerous configurations that incorporate steps into a retaining wall. The most common is where the steps begin at the base of the wall and go up through the wall to the top grade. Other step configurations, such as steps protruding from a wall or running parallel up along the wall face can also be designed and would be built using the same general procedures.



Railings and Guardrails

ReCon “Series 50” units can be manufactured to accommodate certain types of fence uprights. It is recommended that a qualified design engineer be consulted to prepare the proper detailing and design of guardrails and / or special critical fencing situations. Local building codes and wind-loading conditions can have a significant effect on the proper and safe design of these features.



Staining and Sealing

The ability to stain and seal a ReCon “Series 50” wall is an attractive benefit to owners and specifiers. When applied by experienced professionals, modern day concrete stains and the realistic stone appearance of the ReCon “Series 50” textures can render a finished ReCon wall nearly indistinguishable from natural stone. Most modern concrete stains have excellent life expectancies. Depending on the environment, walls may not need a reapplication of stain for many years, if at all. An acid-etch stain is, for all practical purposes, permanent. In some situations, weathering may even enhance the appearance of a stained ReCon wall.

Sealing is also an option where it may be necessary to minimize moisture absorption or protect against graffiti. Certain types of stain also provide a degree of sealant protection in addition to adding color and depth.

ReCon recommends that you consult directly with a staining or sealer manufacturer to determine suitability and proper installation procedures for staining and sealing.

ReCon “Series 50” Guide Specification

Note: This guide specification should not be included entirely “as-is”. Specification writers must edit areas in red which may or may not be relevant to a specific project or where mutually exclusive choices are referenced.

SECTION 323223
SEGMENTAL RETAINING WALL

PART 1 GENERAL

1.1. SUMMARY

A. Section Includes: Furnishing materials and labor required for the design and construction of a ReCon “Series 50” concrete segmental retaining wall.

B. Related Sections:
1. Section 312000 Earth Moving
2. Section 099313.13 Exterior Staining
3. Section 099723 Concrete and Masonry Coatings
4. Section 099623 Graffiti-Resistant Coatings

1.2. REFERENCES

A. Concrete Segmental Retaining Wall Units - American Society for Testing and Materials (ASTM)
1. ASTM C-1372 Specification for Segmental Retaining Wall Units (Sections 7, 8 & 9)

B. Drain Pipe - American Society for Testing and Materials (ASTM):
1. ASTM D-3034 Specifications for Polyvinyl Chloride Pipe (PVC)
2. ASTM D-1248 Specifications for Corrugated Plastic Pipe

C. Geo-grid Reinforcements - Geosynthetic Research Institute (GRI) and American Society for Testing and Materials (ASTM):
1. GG1 Geogrid Rib Tensile Strength
2. GG2 Individual Geogrid Junction Strength
3. GG4a Determination of the Long-Term Design Strength of Stiff Geogrids
4. GG4b Determination of the Long-Term Design Strength of Flexible Geogrids
5. ASTM D-4595 Tensile Properties of Geotextiles - Wide Width Strip
6. ASTM D-5262 Unconfined Tension Creep Behavior of Geosynthetics
7. ASTM D-5970 Deterioration of Geotextiles from Outdoor Exposure
8. ASTM D-6706 Measuring Geosynthetic Pullout Resistance in Soil

D. Engineering Design - National Concrete Masonry Association (NCMA):
1. NCMA Design Manual for Segmental Retaining Walls
2. NCMA SRWU-1 Test Method for Determining Connection Strength of SRW
3. NCMA SRWU-2 Test Method for Determining Shear Strength of SRW

E. Soils - American Society for Testing and Materials (ASTM):
1. ASTM D-698 Laboratory Compaction Characteristics of Soil - Standard Effort
2. ASTM D-4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
3. ASTM D-422 Gradation of Soils
4. ASTM D-424 Atterberg Limits of Soils
5. ASTM D-G51 Soil pH

F. ReCon Construction Detail Drawings: www.reconwalls.com
1. #100 Block Types
2. #101 Typical Base Block Placement
3. #102 Typical Maximum Gravity Wall Heights
4. #103 Typical Geo-Grid Wall Cross Section
5. #104 Typical Geo-Grid Orientation & Curved Walls
6. #105 Typical Inside Radius – Full Block
7. #106 Typical Outside Radius – Full Block
8. #107 Typical Base Row Step Up
9. #108 Typical Top of Wall Step Up
10. #109 Typical Top of Wall Step Up – Alternative Placement
11. #110 Typical Outside Corner Detail
12. #111 Typical Inside Corner Detail
13. #112 Outside Corner Details – Double & Single 90° Corners Abutting to Vertical Structures
14. #113 Typical Guard Rail Detail
15. #200 Capstone Unit Details
16. #201 Step Block
17. #300 Fence Block
18. #301 Full-High Cap Block

1.3. DEFINITIONS

A. ReCon Retaining Wall Unit: Concrete, segmental facing block provided by an authorized manufacturer under license to ReCon Retaining Wall Systems, Inc.

B. Geogrid: A geosynthetic material manufactured of high tensile materials specifically for the purpose of reinforcing and creating a structural soil mass.

C. Drainage Aggregate: Clean, crushed rock located within and immediately behind ReCon units to facilitate drainage and avoid compaction in close proximity to ReCon wall units.

D. Reinforced Backfill: Soil zone extending from the Drainage aggregate zone to the back of the embedded geogrid.

E. Foundation Soil: Soil zone immediately beneath the retaining wall facing units, the wall leveling pad and the reinforced soil zone.

F. Retained Soil: Soil immediately behind retaining wall facing and drainage aggregate or reinforced backfill if present.

G. Construction Drawings: Approved final plan for construction prepared and stamped by the wall design engineer licensed to practice in the state where the retaining wall is located.

1.4. SUBMITTALS

A. Contractor shall submit Manufacturer's product data and installation instructions for approval.

B. Contractor shall submit Manufacturer's test reports certifying that the ReCon units manufactured at their production facility meet the requirements of this specification and the requirements of the Construction Drawings.

C. Unless provided within these project documents and/or the project drawings, contractor shall submit two sets of the Construction Drawings for all ReCon retaining walls on the project.
   1. The design must be prepared by a Professional Engineer licensed to practice in the state where the retaining wall is located.
   2. The design shall be per NCMA Design Guidelines for Segmental Retaining Walls, or the AASHTO Standard Specifications for Highway Bridges, whichever is applicable as determined by the retaining wall design engineer.
   3. Construction Drawings shall include:
      a. The retaining wall layout and retaining wall heights.
      b. Proper placement, lengths and types of geogrid reinforcement where necessary.
      c. Typical wall sections.
      d. Types, locations and properties of all drainage materials, appurtenances and special installation requirements not covered in this specification.
      e. Retaining wall elevation views.
      f. Any soils reports or testing conducted in addition to that included within the project drawings and specifications.
      g. Design assumptions.

D. If geogrid reinforcement is required in the final engineered construction drawings, submit manufacturer's product literature, product testing reports and a twelve by twelve inch or larger sample of each type to be used in wall construction.
   1. Testing reports shall include:
      a. Connection strength data for each combination of ReCon segmental unit and geogrid used as determined by NCMA SRWU-1.
      b. Long-term design strength as determined by GG4-91.
      c. Geogrid soil pullout as determined by ASTM D-6706.

E. Submit gradation reports for aggregates used for the wall leveling pad, unit / drainage fill and for select reinforced fill if required in the final engineered wall design.

F. All submittals must be provided and reviewed prior to the start of retaining wall construction.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Contractor shall inspect all products at delivery to determine that the proper materials have been delivered and are useable. Damaged material shall not be incorporated into the work.

B. ReCon retaining wall units shall be stored in a location and manner that protects against excessive weathering and damage.

C. Contractor shall prevent ReCon units from excessive soiling and coming in contact with substances which may stain or adhere to the finished visual surfaces of the unit.

D. Faces of the ReCon shall be free of excessive chipping, cracking and stains.

1.6. QUALITY ASSURANCE

A. Installer Qualifications: Contractor shall have successfully installed at least three projects similar to that of this project within the last two years. Contractor shall maintain at least one mechanic on site at all times that worked on one or more of these previous installations.

B. Owner shall employ the services of an independent geotechnical or materials engineering firm to provide soil testing and quality assurance inspection for wall construction and soils work. Contractor shall provide any quality control testing or inspection not provided by the Owner.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Only licensed and authorized manufacturers of:

ReCon Retaining Wall Systems, Inc.
2311 Wayzata Blvd.
Minneapolis, MN 55405
(612) 374-1113 Phone
(612) 374-1118 Fax
www.reconwalls.com

2.2. MATERIALS

A. ReCon “Series 50” retaining wall units.
   1. The block unit shall consist of concrete with average 28-day compressive strength of no less than 4000 PSI.
   2. Concrete shall have 4.5 - 7.5 percent air entrainment by volume.
   3. Weight of concrete shall be a minimum of 145 pounds per cubic foot.
   4. Exterior dimension at the face shall be 48” by 16” for full and corner unit, and 24” by 16” for half unit.
   5. Depth of unit should be as per Construction Drawings and is available in 24”, 39” or 45” depths.
   6. ReCon units used shall maintain tolerances of:
      a. Height: +/- 3/16”
      b. Width: +/- 1/2” unless field cut for fitting purposes.
      c. Depth: No less than the unit design depth (i.e. 24”, 39” or 45”)
   7. Special shape units should be obtained and used where indicated on the final engineered construction drawings. Reference ReCon Drawing # 100 for overview of standard unit types.
   8. ReCon Unit Face Texture: [Specify choice (or choices) as required. Check local availability]
      a. Shall be “LeSueur County Limestone”.

      <or>

      b. Shall be “North Shore Granite”.

      <or>

      c. Shall be “Old World”.

B. Geogrid Reinforcement: Geosynthetic reinforcement shall be high tensile geogrid or geotextile manufactured specifically for soil reinforcement applications.
   1. Construction Drawings shall indicate type, strength, locations and lengths of reinforcement used.
   2. The geosynthetic manufacturer shall provide all relevant testing to the wall design engineer for incorporation in the wall design and shall be included in the submittal for the Construction Drawings.
   3. No substitution of geosynthetic shall be allowed that was not evaluated in the Construction Drawings.

C. Base Leveling Pad: The wall base leveling pad material shall consist of a compacted crushed stone base or non-reinforced concrete as indicated in the Construction Drawings.

D. Drainage Aggregate: Drainage aggregate shall consist of clean 1” minus crushed stone or gravel meeting the requirements of the Construction Drawings.

E. Backfill material: All backfill material, borrow or imported, shall meet all requirements of the Construction Drawings.

F. Drainage Pipe: If required in Construction Drawings, drainage pipe shall be perforated or slotted PVC pipe manufactured in accordance with ASTM D-3034 or corrugated HDPE pipe manufactured in accordance with ASTM D-1248. Drainage pipe may also be covered with a geotextile filter fabric.

G. Unit adhesive: Adhesive shall be a premium, construction grade suitable for concrete and exterior applications.

2.3. FINISHES

A. ReCon retaining wall color [Specify choice (or choices) as required]
   1. Finished wall shall be left in natural (as-cast) color.

   <or>

   2. Finished retaining wall shall be stained in accordance with Section 099313.13 “Exterior Staining”.
      a. Acceptable product stains:
         1. Sherwin Williams H & C SHIELD PLUS CONCRETE STAIN
         2. TK Products TRI-SHEEN PIGMENTED STAIN TK-5272
      b. Color shall match [Define reference or sample to match].

         <or>

      c. Color shall be [Designate existing color]

B. Sealing [Optional, list here and specify in Section 099723 Concrete and Masonry Coatings or 099623 Graffiti-Resistant Coatings]
   1. Acceptable sealers
      a. TK Products TK-290 WDOT TRI-SILOXANE

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify locations of utilities and existing structures prior to excavation.

B. Examine the Project site and evaluate conditions where the ReCon retaining wall will be constructed. Notify the proper supervising authority in writing of any conditions that may interfere with the proper construction of the ReCon wall or delay completion.

C. Promptly notify the wall design engineer of site conditions which may affect wall performance, soil conditions observed other than those assumed, or other conditions that may require a reevaluation of the wall design.

3.2. EXCAVATION

A. Contractor shall excavate to the lines and grades shown on the construction drawings. The contractor shall be careful not to disturb base beyond the lines indicated.

B. Foundation soil shall be excavated as required for footing or base / leveling pad dimensions shown on the construction drawings, or as directed by the wall engineer.

C. Over-excavated areas shall be filled with suitable base or backfill material and compacted to 95% standard proctor.

3.3. FOUNDATION SOILS PREPARATION

A. Foundation soil shall be evaluated by a Geotechnical Engineer or Owner's Representative to ensure that the bearing soils meet or exceed the design conditions or assumptions.

B. Compact foundation soil zone to 95% standard proctor prior to installing base / leveling pad.

3.4. BASE / LEVELING PAD

A. Base shall be located as indicated on the construction drawings and shall have a minimum thickness of 6 inches.

B. Width of the base pad must extend a minimum of 6 inches in front and 6 inches in back of the ReCon base unit footprint.

C. Base material shall be compacted so as to provide a smooth, hard surface on which to place the first course of units. NOTE: (reference 3.5 UNIT INSTALLATION)

D. Compact base / leveling pad material with mechanical plate compactors to 95% of standard proctor.

E. Prepared base to ensure full contact of the wall unit with base material and there will be no voids beneath or between units.

F. Contractor may elect to substitute a portion of the specified granular base materials with a lean, unreinforced concrete topping.

G. When a reinforced footing is required by the construction drawings, it shall be located below the frost line.

3.5. UNIT INSTALLATION

A. Units shall be placed in full contact with base / leveling pad material.

B. Check units for level from side-to-side and maintain unit batter front-to-back.

C. Place unit faces in contact end to end and avoid any gaps one-half inch or greater.

D. Fill and compact fill to grade in front of embedded units prior to compaction behind the wall units.

E. Fill voids between ReCon units with 3/4" clean crushed rock to a distance of one foot behind the unit depth unless otherwise instructed in the Construction Drawings.

F. Sweep and clean the top of each course before setting additional courses.

G. Lay each successive course making sure that the bottom recess is in full contact with the unit locators of the course below. Pull unit forward as far as possible.

H. Check and maintain level and wall batter by use of shims when necessary.

I. Follow ReCon recommended procedures to maintain acceptable running bond when constructing curved walls and / or corners. Build in accordance with Construction Drawings or ReCon Construction Drawing Details.

3.6. GEOGRID INSTALLATION

A. Install geosynthetic reinforcement in accordance with manufacturer's recommendations and the Construction Drawings.

B. Locate geosynthetic reinforcement at elevations and to the lengths shown on the Construction Drawings.

C. Prior to installation of geosynthetic reinforcement, level and compact backfill material to the level of the reinforcement layer.

D. Reinforcement design strength direction must be oriented perpendicular to wall face.

E. Position reinforcement on ReCon units to within 2" of the front exposed face. Hold in place by installing the next course of units.

F. Remove all wrinkles or folds in reinforcement by pulling taut prior to backfill placement. Secure using soil staples, stakes or hand tension until reinforcement is covered with sufficient fill to maintain tensioned position.

G. Reinforcements shall be continuous throughout the embedment length. Splicing along reinforcement strength direction is not allowed.

H. Position reinforcement sections side-by-side to provide 100% coverage along wall face.

I. Where curved wall sections cause overlap areas in reinforcement, maintain at least 3" of soil between layers where overlap occurs.

3.7. REINFORCED BACKFILL PLACEMENT

A. Wall fill material shall be placed in lifts no greater than 8” in depth and shall be less if necessary to achieve necessary compaction.

B. Compact backfill material to 95% of standard proctor.

C. Only hand-operated compaction equipment shall be used within 3 feet of the back of the ReCon Units.

D. Wherever possible, backfill should be placed beginning the face of the wall. Backfill shall be placed, spread, and compacted in a manner that minimizes the development of wrinkles, folds or movement of the geogrid.

E. Tracked construction equipment shall not be operated directly on the geogrid. A minimum backfill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.

F. Rubber tired equipment may pass over the geogrid reinforcement at slow speeds, (less than 10 MPH). Avoid sudden braking and sharp turning.

G. At the conclusion of each days work, slope backfill at both the crest and bottom of wall away from wall face to prevent surface drainage from scouring or ponding.

H. During wall construction, the General Contractor shall be responsible for coordination of other project site operations so as to avoid adjacent construction site drainage from affecting wall construction area.

I. Upon completion of wall construction work, the General Contractor shall:
   1. Ensure finished grading directs normal drainage away from the finished wall.
   2. Ensure other trades do not operate heavy equipment or excavate near the wall and reinforced soil zone.

3.8. CAP UNIT INSTALLATION

A. Clean and apply exterior concrete cap adhesive to top course of ReCon wall unit prior to placement of ReCon cap unit.

B. Trim sides of interior cap units to insure proper fit of wall cap. Do not leave cut surfaces exposed to view in the finished wall.

C. Fill and compact soil to top of ReCon cap unit.

3.9. SITE TOLERANCES

A. Straight walls
   1. Vertical alignment: +/- 1.5” over any 12 ft. distance and no more than +/- 3” over entire length of wall.

B. Horizontal Alignment Control:
   1. Corners and radius location: +/- 1 foot to theoretical location indicated on the Grading Plan.
   2. Radii: +/- 2 ft. from theoretical lines indicated on the Grading Plan

C. Wall Batter At Completion Of Work: +/- 2 degrees from the design batter and no batter less than 2 degrees.

3.10. FIELD QUALITY CONTROL

A. Contractor shall be responsible for proper installation and quality control of all ReCon wall components and appurtenant materials.

B. Owner shall, at their expense, retain a qualified professional to monitor and perform quality assurance checks of the installer's work.

C. Quality Assurance should include foundation soil inspection, frequent backfill compaction testing, verification of geotechnical design parameters and compliance with Construction Drawings and Project Specifications.

3.11. CLEANING

A. After completion of wall installation, remove construction debris and restore any adjacent finished areas affected by wall construction to their pre-construction state.

B. Wash wall face to remove soiling and stains. Do not use acid or detergents that may “burn” or discolor face.

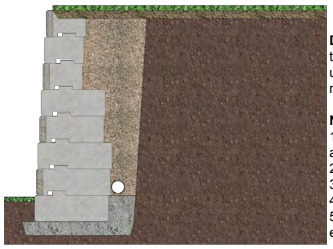
3.12 STAINING / SEALING (Optional)

A. Provide samples of stained / sealed faces for approval prior to commencing application to ReCon retaining wall units. Samples shall be large enough to demonstrate scope of color variation.

B. Install stain / sealer in accordance with manufacturers recommended procedures.

ReCon Series 50 Standard Design Charts

Gravity Walls



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2. The information in the above chart assumes that the soil phi angle is the same for both the foundation and the retained soils.
3. Design as per NCMA standards / Design Manual for Segmental Retaining Walls (2nd Ed).
4. The information in the above chart assumes that the retained soil has a weight of 120 pcf.
5. Installation shall follow ReCon Installation Instructions and any additional instruction or guidance provided as a part of the final engineered stamped and site specific plans.

- **3.6° Batter**
- **No Slope**
- **No Surcharge**

Gravity Walls			Wall Elevation									
Soil Phi Angle	Wall Height (ft.)		1.33’	2.67’	4.00’	5.33’	6.67’	8.00’	9.33’	10.67’	12.00’	13.33’
26°	2.67	Block Depth	24	24								
	4.00		24	24	24							
	5.33		24	24	24	24						
	6.67		39	39	24	24	24					
	8.00		39	39	39	24	24	24				
	9.33		45	45	39	39	24	24	24			
28°	2.67	Block Depth	24	24								
	4.00		24	24	24							
	5.33		24	24	24	24						
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	8.00		39	39	39	24	24	24				
	9.33		39	39	39	39	24	24	24			
	10.67		45	45	39	39	39	24	24	24		
30°	2.67	Block Depth	24	24								
	4.00		24	24	24							
	5.33		24	24	24	24						
	6.67		39	39	24	24	24					
	8.00		39	39	39	24	24	24				
	9.33		39	39	39	39	24	24	24			
	10.67		45	45	39	39	39	24	24	24		
	12.00		45	45	45	39	39	39	24	24	24	
32°	2.67	Block Depth	24	24								
	4.00		24	24	24							
	5.33		24	24	24	24						
	6.67		24	24	24	24	24					
	8.00		39	39	24	24	24	24				
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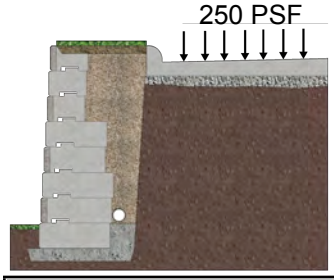
	12.00		45	45	39	39	39	24	24	24	24	
34°	2.67	Block Depth	24	24								
	4.00		24	24	24							
	5.33		24	24	24	24						
	6.67		24	24	24	24	24					
	8.00		39	39	24	24	24	24				
	9.33		39	39	39	24	24	24	24			
	10.67		39	39	39	39	24	24	24	24		
	12.00		45	45	39	39	39	24	24	24	24	
	13.33		45	45	45	39	39	39	24	24	24	24

ReCon Series 50 Standard Design Charts

Gravity Walls



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- **3.6° Batter**
- **250 PSF Surcharge (3' behind wall face)**

Gravity Walls			Wall Elevation							
Soil Phi Angle	Wall Height (ft.)		1.33'	2.67'	4.00'	5.33'	6.67'	8.00'	9.33'	10.67'
26°	2.67	Block Depth	24	24						
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	9.33									
28°	2.67	Block Depth	24	24						
	4.00		39	39	24					
	5.33		39	39	39	24				
	6.67		39	39	39	39	24			
	8.00		45	45	39	39	39	24		
	9.33									
	10.67									
30°	2.67	Block Depth	24	24						
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	5.33		39	39	39	24				
	6.67		39	39	39	39	24			
	8.00		45	45	39	39	39	24		
	9.33		45	45	45	45	45	45	24	
	10.67									
	12.00									
32°	2.67	Block Depth	24	24						
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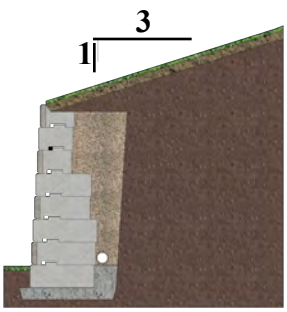
	6.67		39	39	39	24	24			
	8.00		39	39	39	39	24	24		
	9.33		45	45	39	39	39	24	24	
	10.67									
	12.00									
34°	2.67	Block Depth	24	24						
	4.00		24	24	24					
	5.33		39	39	24	24				
	6.67		39	39	39	24	24			
	8.00		39	39	39	39	24	24		
	9.33		45	45	39	39	39	24	24	
	10.67									
	12.00									
	13.33									



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Gravity Walls

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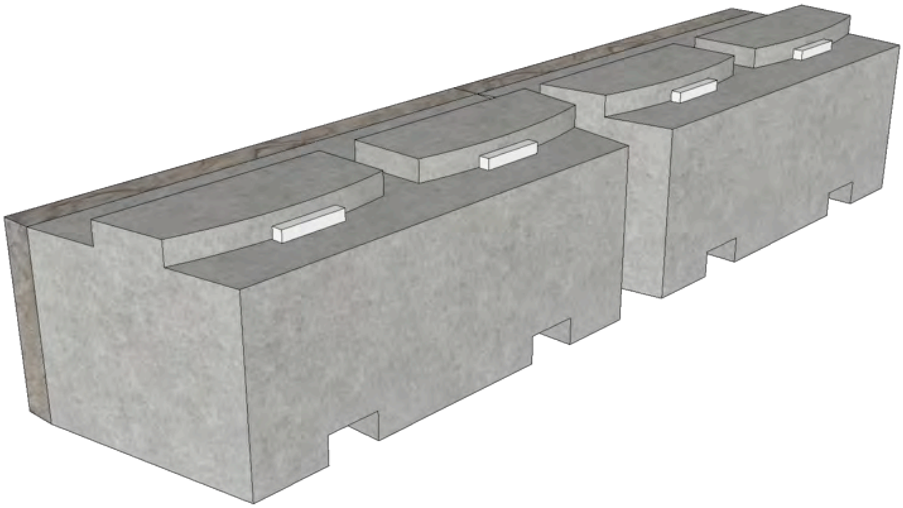
4. The information in the above chart assumes that the retained soil has a weight of 120 pcf.
5. Installation shall follow ReCon Installation Instructions and any additional instruction or guidance provided as a part of the final engineered stamped and site specific plans.

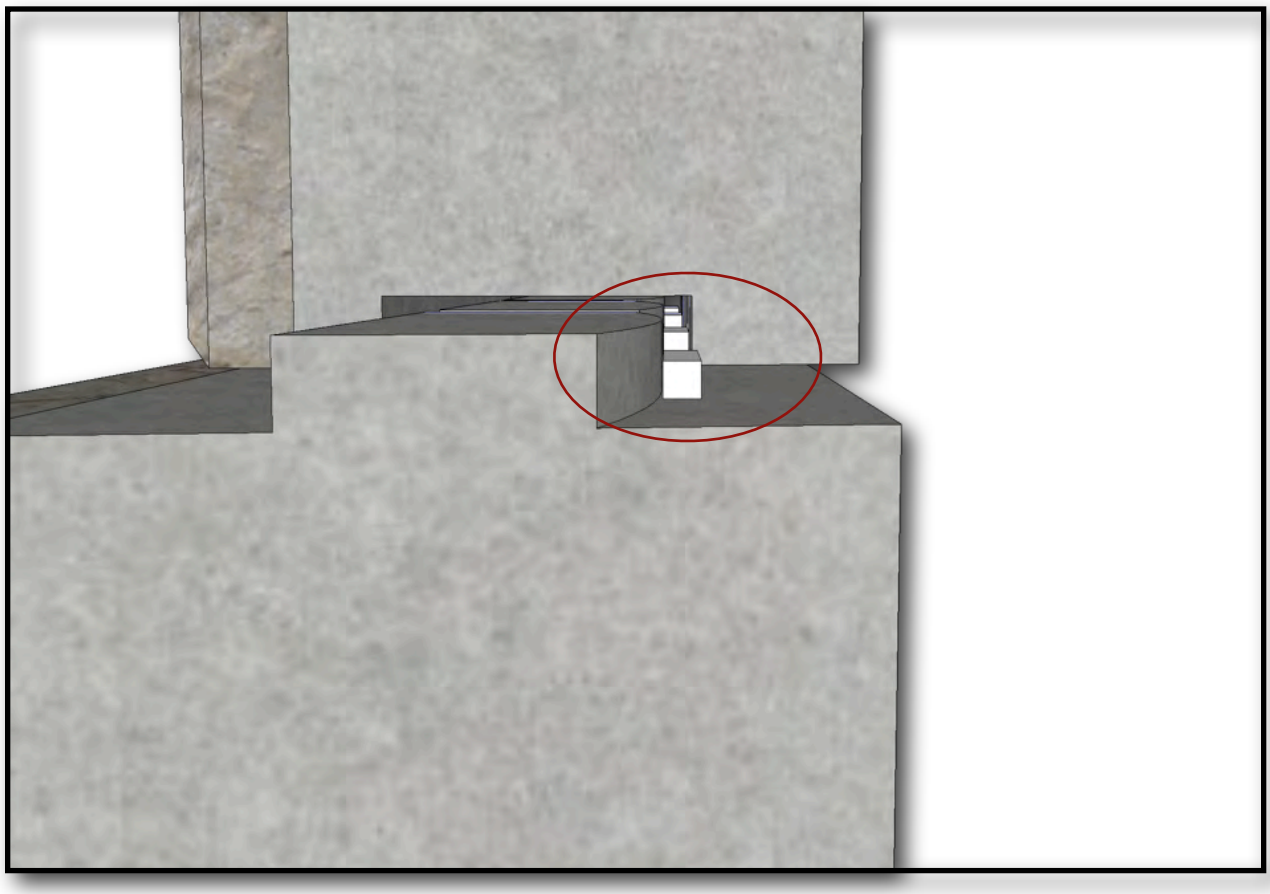
- 3.6° Batter
- 3:1 Slope
- No Surcharge

Gravity Walls			Wall Elevation						
Soil Phi Angle	Wall Height (ft.)		1.33’	2.67’	4.00’	5.33’	6.67’	8.00’	9.33’
26°	2.67	Block Depth	24	24					
	4.00		39	39	24				
	5.33		39	39	39	24			
	6.67		45	45	39	39	24		
	8.00								
	9.33								
28°	2.67	Block Depth	24	24					
	4.00		39	39	24				
	5.33		39	39	39	24			
	6.67		39	39	39	39	24		
	8.00		45	45	45	45	45	24	
	9.33								
	10.67								
30°	2.67	Block Depth	24	24					
	4.00		24	24	24				
	5.33		39	39	24	24			
	6.67		39	39	39	24	24		
	8.00		45	45	39	39	24	24	
	9.33								
	10.67								
	12.00								
32°	2.67	Block Depth	24	24					
	4.00		24	24	24				
	5.33		39	39	24	24			
	6.67		39	39	39	24	24		
	8.00		39	39	39	39	24	24	
	9.33		45	45	39	39	39	24	24
	10.67								
	12.00								
34°	2.67	Block Depth	24	24					
	4.00		24	24	24				
	5.33		24	24	24	24			
	6.67		39	39	24	24	24		
	8.00		39	39	39	24	24	24	
	9.33		45	45	39	39	24	24	24
	10.67								
	12.00								
	13.33								

Increasing Gravity Wall Heights

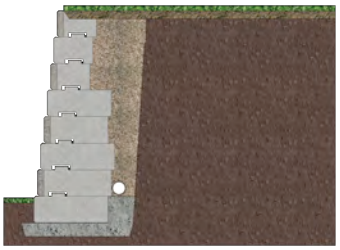
At times a gravity wall may need to be slightly taller than the maximum allowed for the given site conditions. One way to increase the maximum allowed height of a gravity wall is to increase the wall batter, thereby reducing the stresses placed on the wall. ReCon has developed a one-inch fiberglass spacer bar that increases the effective batter of a Series 50 wall to 7.2°. These spacers are placed behind the tongue of a Series 50 unit while the wall is being built. When the next course is laid the spacer bar limits (by one inch) how far forward the unit can be slid forward to make positive contact. The following gravity wall height charts demonstrate the effect of building a wall, or section of wall, using the spacer bars.





ReCon Series 50 Standard Design Charts

Gravity Walls



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4. The information in the above chart assumes that the retained soil has a weight of 120 pcf.
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- **7.2° Batter**
- **No Slope**
- **No Surcharge**

Gravity Walls			Wall Elevation										
Soil Phi Angle	Wall Height (ft.)		1.33'	2.67'	4.00'	5.33'	6.67'	8.00'	9.33'	10.67'	12.00'	13.33'	14.67'
26°	2.67	Block Depth	24	24									
	4.00		24	24	24								
	5.33		24	24	24	24							
	6.67		39	39	24	24	24						
	8.00		39	39	39	24	24	24					
	9.33		39	39	39	39	24	24	24				
	10.67		45	45	39	39	39	24	24	24			
28°	2.67	Block Depth	24	24									
	4.00		24	24	24								
	5.33		24	24	24	24							
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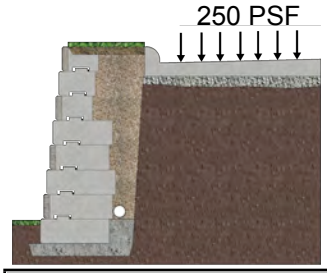
	8.00		39	39	39	24	24	24					
	9.33		39	39	39	39	24	24	24				
	10.67		39	39	39	39	39	24	24	24			
	12.00		45	45	39	39	39	39	24	24	24		
30°	2.67	Block Depth	24	24									
	4.00		24	24	24								
	5.33		24	24	24	24							
	6.67		24	24	24	24	24						
	8.00		39	39	24	24	24	24					
	9.33		39	39	39	24	24	24	24				
	10.67		39	39	39	39	24	24	24	24			
	12.00		39	39	39	39	39	39	39	24	24		
	13.33		45	45	39	39	39	39	39	39	24	24	
32°	2.67	Block Depth	24	24									
	4.00		24	24	24								
	5.33		24	24	24	24							
	6.67		24	24	24	24	24						
	8.00		39	39	24	24	24	24					
	9.33		39	39	39	24	24	24	24				
	10.67		39	39	39	39	24	24	24	24			
	12.00		39	39	39	39	39	24	24	24	24		
	13.33		45	45	45	39	39	39	24	24	24	24	
34°	2.67	Block Depth	24	24									
	4.00		24	24	24								
	5.33		24	24	24	24							
	6.67		24	24	24	24	24						
	8.00		24	24	24	24	24	24					
	9.33		39	39	39	24	24	24	24				
	10.67		39	39	39	39	24	24	24	24			
	12.00		39	39	39	39	39	24	24	24	24		
	13.33		39	39	39	39	39	39	24	24	24	24	
	14.67		45	45	45	39	39	39	39	24	24	24	24

ReCon Series 50 Standard Design Charts

Gravity Walls



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- **7.2° Batter**
- **250 PSF Surcharge (3' behind wall face)**

Gravity Walls			Wall Elevation								
Soil Phi Angle	Wall Height (ft.)		1.33'	2.67'	4.00'	5.33'	6.67'	8.00'	9.33'	10.67'	12.00'
26°	2.67	Block Depth	24	24							
	4.00		39	39	24						
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	8.00		45	45	39	39	39	24			
	9.33										
28°	2.67	Block Depth	24	24							
	4.00		39	39	24						
	5.33		39	39	39	24					
	6.67		39	39	39	39	24				
	8.00		39	39	39	39	39	24			
	9.33		45	45	39	39	39	39	24		
	10.67										
30°	2.67	Block Depth	24	24							
	4.00		24	24	24						
	5.33		39	39	24	24					
	6.67		39	39	39	24	24				
	8.00		39	39	39	39	24	24			
	9.33		45	45	39	39	39	24	24		
	10.67		45	45	45	45	45	45	45	24	
	12.00										
32°	2.67	Block Depth	24	24							
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	8.00		39	39	39	39	24	24			
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	10.67		45	45	39	39	39	39	24	24	
	12.00										
34°	2.67	Block Depth	24	24							
	4.00		24	24	24						
	5.33		24	24	24	24					
	6.67		39	39	24	24	24				
	8.00		39	39	39	24	24	24			
	9.33		39	39	39	39	24	24	24		
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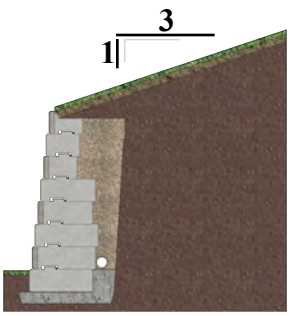
	12.00		45	45	45	39	39	39	24	24	24
	13.33										



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Gravity Walls

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- **7.2° Batter**
- **3:1 Slope**
- **No Surcharge**

Gravity Walls			Wall Elevation								
Soil Phi Angle	Wall Height (ft.)		1.33’	2.67’	4.00’	5.33’	6.67’	8.00’	9.33’	10.67’	12.00’
26°	2.67	Block Depth	24	24							
	4.00		39	39	24						
	5.33		39	39	39	24					
	6.67		39	39	39	39	24				
	8.00										
	9.33										
28°	2.67	Block Depth	24	24							
	4.00		39	39	24						
	5.33		39	39	39	24					
	6.67		39	39	39	39	24				
	8.00		45	45	39	39	39	24			
	9.33										
	10.67										
30°	2.67	Block Depth	24	24							
	4.00		24	24	24						
	5.33		39	39	24	24					
	6.67		39	39	39	24	24				
	8.00		39	39	39	39	24	24			
	9.33		45	45	39	39	39	24	24		
	10.67										
	12.00										
32°	2.67	Block Depth	24	24							
	4.00		24	24	24						
	5.33		39	39	24	24					
	6.67		39	39	39	24	24				
	8.00		39	39	39	39	24	24			
	9.33		39	39	39	39	39	24	24		
	10.67		45	45	45	39	39	39	24	24	
	12.00										
34°	2.67	Block Depth	24	24							
	4.00		24	24	24						
	5.33		24	24	24	24					
	6.67		39	39	24	24	24				
	8.00		39	39	39	24	24	24			
	9.33		39	39	39	39	24	24	24		
	10.67		45	45	39	39	39	24	24	24	
	12.00		45	45	45	45	45	45	45	39	24
	13.33										

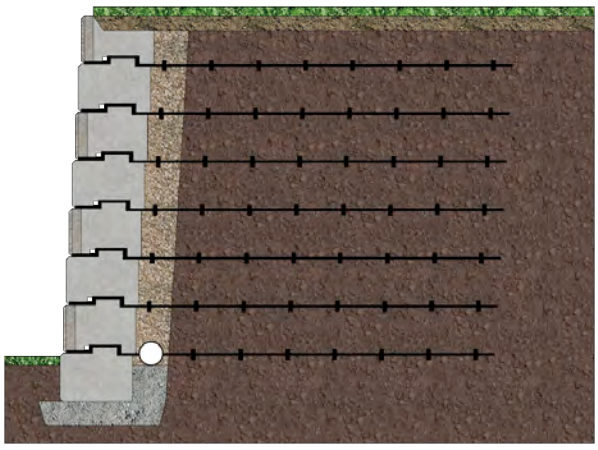
ReCon Series 50 Standard Design Charts

Geogrid Reinforced Walls

- **Assumes an allowable geogrid reinforcement design strength of 1550 lbs. / ft. Check with ReCon for Grid types that have been tested for pull-out connection.**

- **3.6° Batter**
- **No Slope**
- **No Surcharge**

Geogrid Walls			Wall Elevation												
Soil Phi Angle	Wall Height (ft.)		1.33’	2.67’	4.00’	5.33’	6.67’	8.00’	9.33’	10.67’	12.00’	13.33’	14.67’	16.00’	17.33’	18.66’
26°	8.00	Grid Length	8'	n/a	8'	n/a	8'									
	9.33		n/a	9'	n/a	9'	n/a	9'								
	10.66		10'	n/a	10'	n/a	10'	n/a	10'							
	12.00		10'	10'	n/a	10'	n/a	10'	n/a	10'						
	13.33		11'	11'	11'	n/a	11'	n/a	11'	n/a	11'					
	14.66		12'	12'	12'	12'	n/a	12'	n/a	12'	n/a	12'				
	16.00		13'	13'	13'	13'	13'	n/a	13'	n/a	13'	n/a	13'			
	17.33		13'	13'	13'	13'	13'	13'	n/a	13'	n/a	13'	n/a	13'		
	18.66		14'	14'	14'	14'	14'	14'	14'	n/a	14'	n/a	14'	n/a	14'	
	20.00		15’	15’	15’	15’	15’	15’	15’	15’	n/a	15’	n/a	15’	n/a	15’
30°	8.00	Grid Length	7'	n/a	7'	n/a	7'									
	9.33		n/a	8'	n/a	8'	n/a	8'								
	10.66		8'	n/a	8'	n/a	8'	n/a	8'							
	12.00		n/a	9'	n/a	9'	n/a	9'	n/a	9'						
	13.33		10'	n/a	10'	n/a	10'	n/a	10'	n/a	10'					
	14.66		10'	10'	n/a	10'	n/a	10'	n/a	10'	n/a	10'				
	16.00		11'	11'	11'	n/a	11'	n/a	11'	n/a	11'	n/a	11'			
	17.33		12'	12'	12'	12'	n/a	12'	n/a	12'	n/a	12'	n/a	12'		
	18.66		13’	13’	13’	13’	13’	n/a	13’	n/a	13’	n/a	13’	n/a	13’	
	20.00		13'	13'	13'	13'	13'	13'	n/a	13'	n/a	13'	n/a	13'	n/a	13'
34°	8.00	Grid Length	6'	n/a	6'	n/a	6'									
	9.33		n/a	7'	n/a	7'	n/a	7'								
	10.66		8'	n/a	8'	n/a	8'	n/a	8'							
	12.00		n/a	8'	n/a	8'	n/a	8'	n/a	8'						
	13.33		9'	n/a	9'	n/a	9'	n/a	9'	n/a	9'					
	14.66		n/a	9'	n/a	9'	n/a	9'	n/a	9'	n/a	9'				
	16.00		10'	n/a	10'	n/a	10'	n/a	10'	n/a	10'	n/a	10'			
	17.33		n/a	11'	n/a	11'	n/a	11'	n/a	11'	n/a	11'	n/a	11'		
	18.66		12’	n/a	12’	n/a	12’	n/a	12’	n/a	12’	n/a	12’	n/a	12’	
	20.00		12'	12'	n/a	12'	n/a	12'	n/a	12'	n/a	12'	n/a	12'	n/a	12'



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Notes:

1. Minimum factors of safety for overturning, sliding and bearing are 1.5, 1.5 and 2.0 respectively. Global stability has not been addressed in this chart.
2. The information in the above chart assumes that the soil phi angle is the same for both the foundation and the retained soils.
3. Design as per NCMA standards / Design Manual for Segmental Retaining Walls (2nd Ed) with the exception that the soil pressure is derived using a Rankine Analysis.
4. The information in the above chart assumes that the retained soil has a weight of 120 pcf.
5. Installation shall follow ReCon Installation Instructions and any additional instruction or guidance provided as a part of the final engineered stamped and site specific plans.

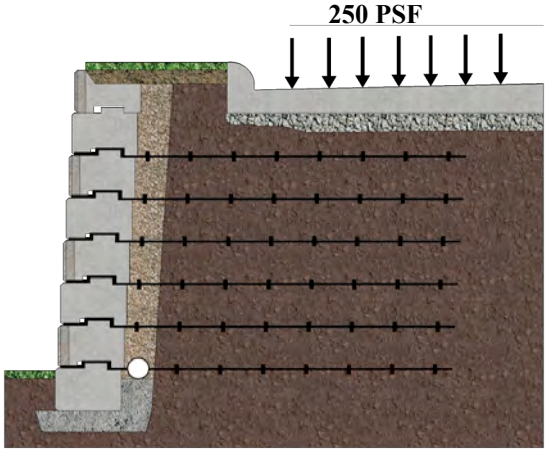
ReCon Series 50 Standard Design Charts

Geogrid Reinforced Walls

- **Assumes an allowable geogrid reinforcement design strength of 1550 lbs. / ft. Check with ReCon for Grid types that have been tested for pull-out connection.**

- **3.6° Batter**
- **250 PSF Surcharge (3' behind wall face)**

Geogrid Walls			Wall Elevation												
Soil Phi Angle	Wall Height (ft.)		1.33'	2.67'	4.00'	5.33'	6.67'	8.00'	9.33'	10.67'	12.00'	13.33'	14.67'	16.00'	17.33'	18.66'
26°	8.00	Grid Length	10'	n/a	10'	n/a	10'									
	9.33		10'	10'	n/a	10'	n/a	10'								
	10.66		11'	11'	11'	n/a	11'	n/a	11'							
	12.00		12'	12'	12'	12'	n/a	12'	n/a	12'						
	13.33		13'	13'	13'	13'	13'	n/a	13'	n/a	13'					
	14.66		13'	13'	13'	13'	13'	13'	n/a	13'	n/a	13'				
	16.00		14'	14'	14'	14'	14'	14'	14'	n/a	14'	n/a	14'			
	17.33		15'	15'	15'	15'	15'	15'	15'	15'	n/a	15'	n/a	15'		
	18.66		16'	16'	16'	16'	16'	16'	16'	16'	16'	n/a	16'	n/a	16'	
	20.00		17'	17'	17'	17'	17'	17'	17'	17'	17'	17'	n/a	17'	n/a	17'
30°	8.00	Grid Length	8'	n/a	8'	n/a	8'									
	9.33		n/a	8'	n/a	8'	n/a	8'								
	10.66		9'	n/a	9'	n/a	9'	n/a	9'							
	12.00		10'	10'	n/a	10'	n/a	10'	n/a	10'						
	13.33		11'	11'	11'	n/a	11'	n/a	11'	n/a	11'					
	14.66		11'	11'	11'	11'	n/a	11'	n/a	11'	n/a	11'				
	16.00		12'	12'	12'	12'	12'	n/a	12'	n/a	12'	n/a	12'			
	17.33		13'	13'	13'	13'	13'	13'	n/a	13'	n/a	13'	n/a	13'		
	18.66		13'	13'	13'	13'	13'	13'	13'	n/a	13'	n/a	13'	n/a	13'	
	20.00		14'	14'	14'	14'	14'	14'	14'	14'	n/a	14'	n/a	14'	n/a	14'
34°	8.00	Grid Length	7'	n/a	7'	n/a	7'									
	9.33		n/a	7'	n/a	7'	n/a	7'								
	10.66		8'	n/a	8'	n/a	8'	n/a	8'							
	12.00		n/a	9'	n/a	9'	n/a	9'	n/a	9'						
	13.33		9'	n/a	9'	n/a	9'	n/a	9'	n/a	9'					
	14.66		n/a	10'	n/a	10'	n/a	10'	n/a	10'	n/a	10'				
	16.00		10'	n/a	10'	n/a	10'	n/a	10'	n/a	10'	n/a	10'			
	17.33		11'	11'	n/a	11'	n/a	11'	n/a	11'	n/a	11'	n/a	11'		
	18.66		12'	12'	12'	n/a	12'	n/a	12'	n/a	12'	n/a	12'	n/a	12'	
	20.00		12'	12'	12'	12'	n/a	12'	n/a	12'	n/a	12'	n/a	12'	n/a	12'



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Notes:

1. Minimum factors of safety for overturning, sliding and bearing are 1.5, 1.5 and 2.0 respectively. Global stability has not been addressed in this chart.
2. The information in the above chart assumes that the soil phi angle is the same for both the foundation and the retained soils.
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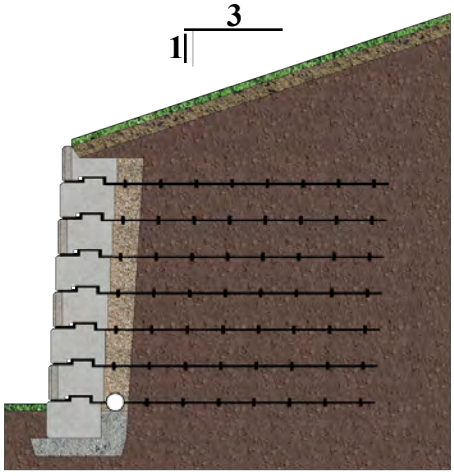
ReCon Series 50 Standard Design Charts

Geogrid Reinforced Walls

- **Assumes an allowable geogrid reinforcement design strength of 1550 lbs. / ft. Check with ReCon for Grid types that have been tested for pull-out connection.**

- **3.6° Batter**
- **3:1 Slope**
- **No Surcharge**

Geogrid Walls			Wall Elevation												
Soil Phi Angle	Wall Height (ft.)		1.33’	2.67’	4.00’	5.33’	6.67’	8.00’	9.33’	10.67’	12.00’	13.33’	14.67’	16.00’	17.33’	18.66’
26°	8.00	Grid Length	7’	n/a	7’	n/a	7’									
	9.33		8'	8'	n/a	8'	n/a	8'								
	10.66		9’	9’	9’	n/a	9’	n/a	9’							
	12.00		11’	11’	11’	11’	n/a	11’	n/a	11’						
	13.33		14’	14’	14’	14’	14’	n/a	14’	n/a	14’					
	14.66		17’	17’	17’	17’	17’	17’	n/a	17’	n/a	17’				
	16.00		20’	20’	20’	20’	20’	20’	20’	n/a	20’	n/a	20’			
	17.33		22'	22'	22'	22'	22'	22'	22'	22'	n/a	22'	n/a	22'		
	18.66		25’	25’	25’	25’	25’	25’	25’	25’	25’	n/a	25’	n/a	25’	
	20.00		27’	27’	27’	27’	27’	27’	27’	27’	27’	27’	n/a	27’	n/a	27’
30°	8.00	Grid Length	6'	n/a	6'	n/a	6'									
	9.33		n/a	7'	n/a	7'	n/a	7'								
	10.66		8'	n/a	8'	n/a	8'	n/a	8'							
	12.00		8'	8'	n/a	8'	n/a	8'	n/a	8'						
	13.33		9'	9'	9'	n/a	9'	n/a	9'	n/a	9'					
	14.66		10’	10’	10’	10’	n/a	10’	n/a	10’	n/a	10’				
	16.00		10’	10’	10’	10’	10’	n/a	10’	n/a	10’	n/a	10’			
	17.33		11’	11’	11’	11’	11’	11’	n/a	11’	n/a	11’	n/a	11’		
	18.66		12’	12’	12’	12’	12’	12’	12’	n/a	12’	n/a	12’	n/a	12’	
	20.00		12’	12’	12’	12’	12’	12’	12’	12’	n/a	12’	n/a	12’	n/a	12’
34°	8.00	Grid Length	6'	n/a	6'	n/a	6'									
	9.33		n/a	6'	n/a	6'	n/a	6'								
	10.66		7'	n/a	7'	n/a	7'	n/a	7'							
	12.00		n/a	8'	n/a	8'	n/a	8'	n/a	8'						
	13.33		8'	n/a	8'	n/a	8'	n/a	8'	n/a	8'					
	14.66		n/a	9'	n/a	9'	n/a	9'	n/a	9'	n/a	9'				
	16.00		10'	n/a	10'	n/a	10'	n/a	10'	n/a	10'	n/a	10'			
	17.33		11'	11'	n/a	11'	n/a	11'	n/a	11'	n/a	11'	n/a	11'		
	18.66		12'	12'	12'	n/a	12’	n/a	12’	n/a	12'	n/a	12’	n/a	12’	
	20.00		12'	12'	12'	12'	n/a	12’	n/a	12’	n/a	12'	n/a	12’	n/a	12’



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Warranty

Each Block will have a 28 day compressive strength of at least 3000 PSI for 15 years after proper installation. If a Block does not meet this warranty standard, please notify the manufacturer in writing. If after it has been determined that the Block has not met the specifications, the manufacturer will have shipped to you, replacement Blocks which shall be the manufacturer's sole remedy for breach of this warranty. However, neither the manufacturer nor ReCon Wall Systems, Inc. shall have any obligation to install such replacement Blocks.

This warranty shall not apply to any Block which is damaged, defective or fails to meet the warranty standard due to improper installation of the Block, chemical contact, structural design of the wall, or excessive and unforeseen site conditions beyond the manufacturer's or ReCon Wall Systems, Inc.'s control.

The above warranty is the exclusive limited product warranty. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE DISCLAIMED.

recon™
Retaining Wall Systems

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