

PAVERS BY IDEAL

**The
Ideal Way
to Build**

**Walls
with
Style™**

using
**Pisa2®
and
Roman Pisa®**



Ideal's Pisa2 and **Roman Pisa** are full component landscape retaining wall systems that are easy to assemble. A tongue and groove molded into the units locks them together and provides automatic step-back when stacked. They sit on a base of compacted gravel. Mortar or concrete are not required, so you can take your time building a strong, durable retaining wall that will provide years of lasting beauty.

This step by step guide will assist you from start to finish for beautiful do-it-yourself results. Using basic construction techniques, you can build classic style retaining walls, 90° corners, and stairs. We have even included some helpful hints that the professionals use!



Stretcher Unit

I *Planning*

First, determine the height, length, and configuration of the wall and make a drawing showing any adjoining fences, structures, stairs, and paved areas. Be sure to include an accurate sketch of the area to be retained, noting the slope and drainage patterns.

Once the plan is complete, check with your local building department to determine if a permit will be necessary. In some cases, a stamped drawing may be required, which means you will need the services of a professional engineer. The authorized **Ideal** dealer in your area may be able to help you obtain this type of service. Otherwise, they can help determine the quantity of **Pisa** units, gravel, crushed stone, and other materials you will need to complete your project. You can also refer to the handy charts we have included in the **Estimating Section**.

Most likely, you will need to have the materials delivered. Remember that delivery trucks are heavy, so select a convenient location where the materials can be placed. The **Pisa2** or **Roman Pisa** will arrive on pallets, while the gravel and crushed stone will be sent in separate trucks and dumped into piles. Plan to move the materials by wheelbarrow and to do some clean up afterwards.

Also, you will require the following tools, equipment, and materials:

- gloves
- rake
- string line
- carpenter's level
- caulking gun
- perforated pipe
- landscape filter fabric
- wheelbarrow
- tape measure
- torpedo level
- wood stakes
- hard rubber mallet
- mason's chisel or brick-set
- shovel
- pick
- line level
- brush
- 3 lb hammer

In addition, you may need a hand tamper or plate compactor and a power saw with a diamond blade. Check with your **Ideal** dealer or local equipment rental store for these items.

2

Preparing

Before beginning any excavation, contact your local utility companies such as *Dig Safe* or *Call Before You Dig* and request that they mark underground cables or pipes.

These services are usually free, but may require 72 hours notice.

The following instructions are typically suitable for walls under 4' high (measured from the first course of blocks placed on the base) with optimum site conditions. Walls 4' and higher, terraced walls, sites with poor drainage, weak soils, excessive groundwater, sloping embankments and surcharges such as parking behind the wall, will require special consideration and construction techniques, including the use of geogrid. See the section titled "**Engineered Walls**" for more information. We recommend you contact a qualified soils engineer for these conditions. Remember, safety is paramount, so you may need to use the services of a professional contractor. Ask your *Ideal* dealer to provide you with names. Some advice before you start. Follow the directions carefully as you proceed through each step. If you make a mistake, simply take the units apart to dismantle the section of the wall, correct the problem, and pick up where you left off.

3

Excavating

The key to building a good retaining wall is preparing a firm foundation for good structural support. Segmental retaining wall units are considered flexible structures, so the footing does not need to be placed below the frost line.

Begin by staking out the location of your wall. Be sure to allow for the automatic step-back of $\frac{3}{4}$ " with every course of wall units. If building your wall in front of an existing embankment, allow enough room to maintain 12" of space behind the wall for a drainage zone, which will be filled with $\frac{3}{4}$ " stone as you build the wall. The wall location is especially important on outside (convex) curves where the step-back of the units will decrease the radius of the curve as the wall height increases. See the section on **Curved Walls** for more information.

Once you have staked out the wall location, excavate a trench at least 12" deep by 24" wide. You will need to dig deep enough to allow for a 6" thick gravel base and the first row of units that will be embedded below finished grade. If the wall will step-up into a slope at different levels, start at the lowest point and excavate each rise in elevation in 6" increments. If the wall has multiple step-ups, be sure to allow for the $\frac{3}{4}$ " step-back that occurs in every course for each 6" increase in height.

Note: If the height of your wall above finished grade is 2' or less, you may make the gravel base 4" thick and bury the first course of block just 3". On the other hand, if your wall is greater than 4' high, it will be necessary to excavate deeper. The first course must be buried an additional 1" for every course of block over 4'. For example, for a 6' high wall, you will need to dig the trench at least 16" deep in order to bury the entire first course and 4" of the second course of block.

The soil at the bottom of the trench must be firm and stable. Remove all loam, grass, roots and large rocks. If necessary, continue to excavate until you reach granular type soil. Compact with the plate compactor or hand tamper until the bottom of the trench is level and firmly packed

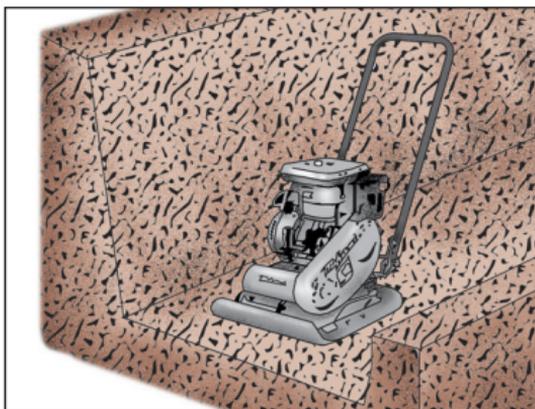


Figure 1

(Fig. 1). Next, cover the bottom and sides of the trench with landscape fabric. To prevent soil from washing into the crushed stone drainage zone that will be behind the wall, extend the fabric up the slope to completely cover the embankment. Overlap sections of fabric by at least 12".

4 **Installing & Compacting the Base**

The material for the base, or footing as it is sometimes called, should be well-draining, coarse granular material. We recommend **1½" processed gravel** or **crusher run**.

Fill the trench with about 3" of gravel, then level and compact it thoroughly with the plate compactor. If you are using a hand tamper, compact only 1" to 2" of gravel at a time. When you can walk on the base without leaving an indentation, add the next layer of gravel. Add and compact enough gravel until the base is 6" thick with the top 6" below grade (Fig. 2).

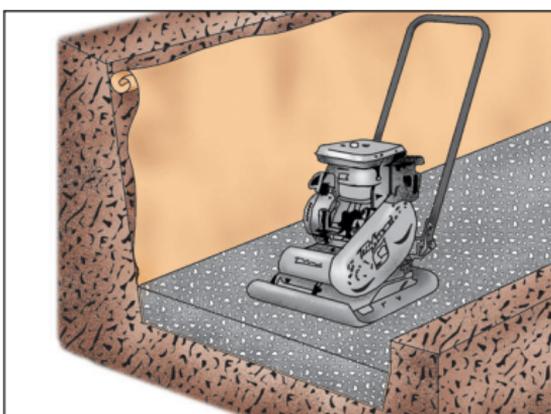


Figure 2

(As noted earlier, the elevation of the base will be deeper for walls over 4' high.)



Tip: To facilitate the compaction process, soak but do not saturate the gravel with water.

5 **Installing the First Course**

The first course of wall units is the most important and takes the longest time to install. Once you have positioned and leveled the units in this row, you will be able to place subsequent courses quickly and easily.



Tip: To make leveling easier, spread and compact up to $\frac{1}{2}$ " of coarse concrete sand on top of the compacted base.

Start by placing the *Stretcher* units directly on the base in the center of the trench. If your wall steps up, begin at the lowest elevation. Use a carpenter's level to align and level each unit from side to side and front to back (Fig. 3). Use a hard rubber mallet to tap them into position. Lay the units side by side along the length of the footing, following the desired alignment of the wall.

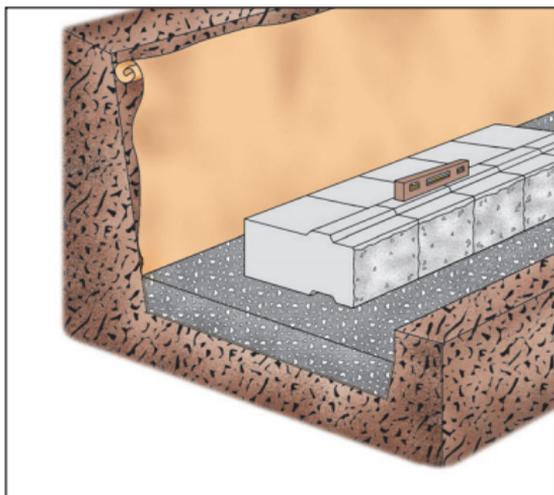


Figure 3

If your wall has 90° corners, it is best to start from a corner. See the **Details Section** for more information on building corners. You can also start next to a fixed structure such as a house foundation.



Tip: Snap a chalk line directly on the gravel footing as a guide to align the wall.

After the first course has been installed, place perforated pipe behind the wall to help collect water and drain it away. Lay the pipe, with the holes facing **down**, on the base behind the units along the entire length of the wall and several feet beyond. Some types of pipe are available with a geotextile sock, otherwise, wrap the pipe in filter fabric. Slope the pipe at each end to allow gravity to drain water beyond the wall. Next, backfill the trench behind the first course with $\frac{3}{4}$ " **crushed stone**, and tamp level to the top of the wall units, being careful not to move them in any way. Now, fill and compact the trench on the front side of the units by using the same $1\frac{1}{2}$ " processed gravel you used for the base (Fig. 4). Sweep the top of the wall units clean.

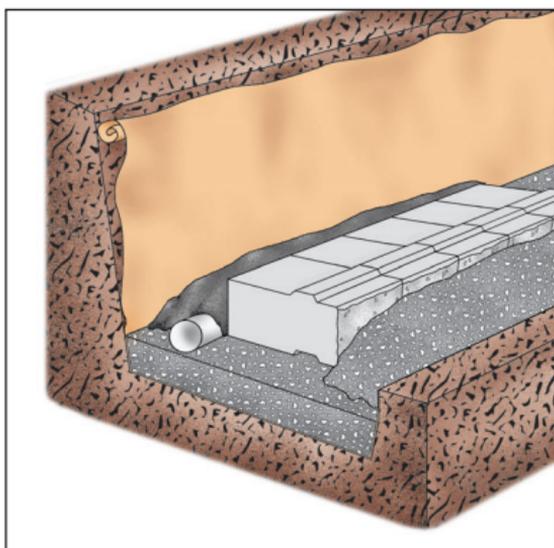


Figure 4

6

Laying the Wall

Install the second course of units by fitting the groove onto the tongue of the unit below. Align the units with the tongue to achieve a uniform appearance - the tongue and groove allows some play for adjustment. Position the units in a "running bond" pattern, staggering the joints over the middle of the wall unit below. You may need to use *Half* units to maintain the bond and it may even be necessary to cut some units. While a perfect running bond is not necessary, always maintain some stagger to the joints. Use a mason's chisel or cut-off saw if cutting is necessary.

Always exercise caution, wear safety glasses and a NIOSH approved respirator! Occasionally, it may be necessary to shim units to maintain level coursing.



Tip: Level wall and corner units using plastic shims or asphalt shingles.

Roman Pisa - Ashlar Patterns - So far, we have described the steps involved with the construction of a **Pisa2** or **Roman Pisa** wall using regular 6"h x 8"l x 12"d *Stretcher* units. If building a **Roman Pisa** wall in an ashlar pattern, you will be combining *Half* and 12" *Jumbo* units with regular *Stretcher* units. Although they may look complicated, the ashlar patterns are easy to assemble and simply repeat throughout the wall. See our **Roman Pisa** Installation Pattern sheet for the configuration of the pattern you have chosen. You can even create your own custom pattern by interchanging *Stretcher* and *Half* units with *Jumbo* units. Grooves molded into the 12" length and 8" side of the *Jumbo* unit allow it to be placed either horizontally or vertically in the wall. Always place several $\frac{3}{8}$ " beads of **SRW Adhesive** on the top surface of *Jumbo* units immediately prior to placing the next course of units onto it. One 10 oz tube will be required for about every 10 sq ft of wall area for ashlar patterns.



Tip: Always select block from several pallets as you are installing to distribute the color uniformly.

When you have laid the second course, fill the area behind the units to about 12" back with $\frac{3}{4}$ " crushed stone for a drainage zone. Then you'll backfill behind the crushed stone. Pull the filter fabric over the front of the wall and place a 3"-4" layer of $1\frac{1}{2}$ " processed gravel (or soil that was excavated from the site) and compact thoroughly. Add enough gravel or soil until it is even with the top of the wall units. If necessary, add more $\frac{3}{4}$ " drainage stone and tamp level. The key is to consolidate the stone and backfill material as much as possible to avoid future settlement.



Tip: Place a piece of plywood between the crushed stone and the slope to keep the $\frac{3}{4}$ " stone and backfill material as separated as possible. Slide the plywood up as you backfill.

Repeat this procedure for the remaining courses until you have reached the desired height of your wall. Be sure to backfill after each course, taking care not to move the units out of alignment. Do not backfill the last course at this point. Fold the filter fabric over the $\frac{3}{4}$ " stone drainage zone.

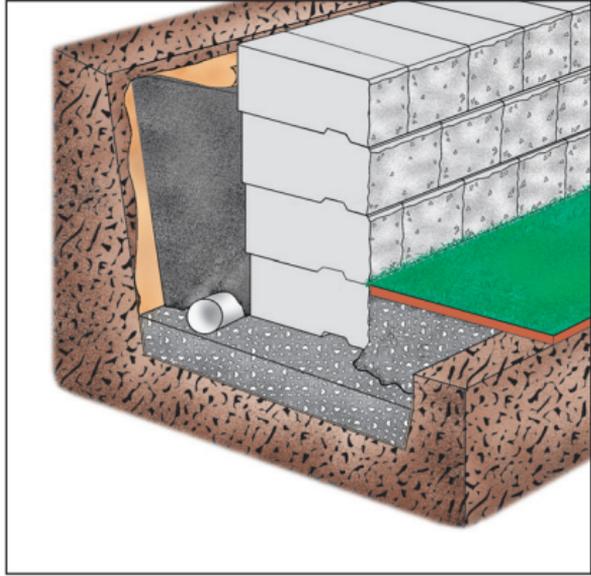


Figure 5



Capping the Wall

To finish the wall, use one of our coping units for the last course. We offer four styles to choose from:

Universal Coping Stone™, Roman Pisa® Coping, Ancestral™ Coping and ReversaCap®.

Universal Coping Stone and Roman Pisa Coping are both $3\frac{5}{8}$ " h x 16" w x 13" d. *Universal Coping Stone* features one edge that is split-face, while the opposite edge is smooth. Either edge may be positioned at the front of the wall. *Roman Pisa Coping* offers this same feature in a tumbled unit that matches the appearance of **Roman Pisa**. Both can be used to create corners by splitting them into either 13" x 13" or 9" x 13" pieces.

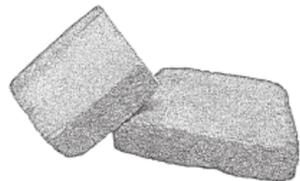


Universal Coping



Roman Pisa Coping

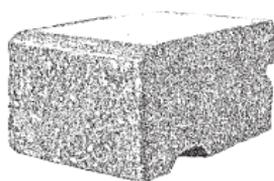
Ancestral Coping is a paired set of tumbled, tapered units. Sold as a set, one unit is 16/13" long on opposite faces; the second unit is 13/10" long on opposite faces. Both are $3\frac{5}{8}$ " h x 13" d. Alternate the units for straight walls or orient them to follow the curve of serpentine walls.



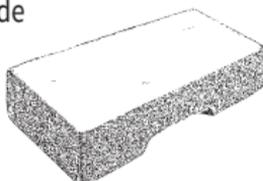
Ancestral Coping

A white deposit known as efflorescence may appear naturally on any concrete or masonry product. It does not affect the structural integrity and will dissipate over time. Efflorescence is not indicative of a flawed product. For more information, ask for our **Efflorescence Advisory**.

When finishing the wall with our *Universal, Ancestral or Roman Pisa Coping* units, you must use *Full Cap* units for the last course of wall units. *Full Caps* are the same size as the standard **Pisa 2** and **Roman Pisa** units, but are flat on top to allow the coping units to be attached.



ReversaCap is tapered, with one face 8" wide and the opposite 7" wide. It is ideal for eliminating gaps between units without cutting. For straight walls, reverse every other unit, and for curves, reverse them as needed to eliminate gaps. *ReversaCap* comes with a smooth face, or it can be field-split to match the textured face of **Pisa 2**. You will need to miter *ReversaCap* if your wall includes 90° corners.



Secure your coping unit to the wall with a construction-grade adhesive that's been formulated for use with concrete. Simply apply several $\frac{3}{8}$ " beads to the top surface of the last course of wall units (Fig. 6). It's best to do only 3 or 4 units at a time to prevent the adhesive from skinning over. Follow the directions for use on the label. When setting the coping units, apply firm pressure to secure them in place. Allow 24 hours or so for complete curing.

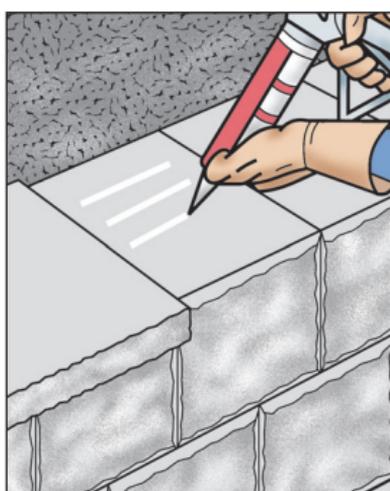


Figure 6

8

Completing the Project

To complete the project, add topsoil behind the wall to bring the embankment to the desired height. Finish the grading so that water will not pond behind the wall. If necessary, construct a small swale to collect and channel the water away, or grade the surface to direct water over the top and down the face of the wall. Complete your new landscape wall by installing sod, flowers, and plants. And don't forget, **Pisa 2** and **Roman Pisa** walls look great with **Ideal** interlocking concrete pavers. You can integrate a walkway, patio, or terrace into your wall design to maximize your outdoor living area!

Congratulations! You have built a beautiful landscape retaining wall that will provide years of enjoyment and maintenance-free service.

Details

Step-ups

When building into the direction of a slope, the wall must be stepped in 6" increments. Do not attempt to slant the wall to the angle of the slope (Fig. 7).

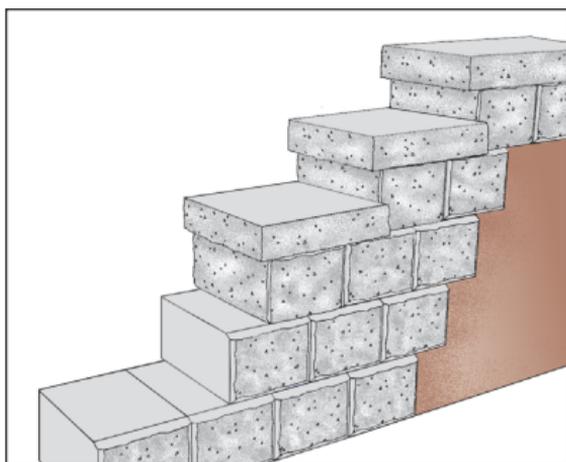


Figure 7

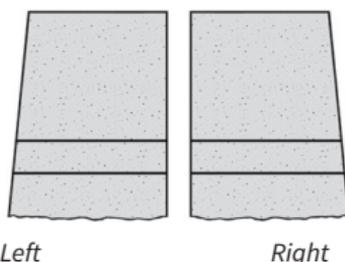
Ending the Wall

When the wall ends as a step-down, use a *Full Cap* and a *Corner* unit as the last two units in the course. For **Pisa 2** walls, split a *Universal Coping Stone* into the appropriate corner and place it onto the *Full Cap* and *Corner* blocks. Position it to overhang the exposed faces by about 1". Be sure to secure them with construction adhesive (Fig. 6). For **Roman Pisa** use the *Roman Pisa Coping Stone*.

Curved Walls

Pisa 2 and Roman Pisa

Stretcher units are tapered 1" in width from front to back, so building curved walls is easy. They lay out to a minimum radius of $7\frac{1}{2}'$ for convex



Left

Right

(outside) curves. Note that the units are only tapered on either the right or left side. Typically, a shipment includes about half of each type. When laying convex curves, only use units with the same taper in a row. It does not matter whether they are "rights or lefts" - just don't mix them together. Alternate them every course as you build the wall to get a $7\frac{1}{2}'$ radius. Concave (inside) curves can be built with a radius as tight as 6' by laying the faces tight and opening the back as much as possible. Fill the space between the units with $\frac{3}{4}"$ crushed stone as you backfill. If building a curved wall in a **Roman Pisa** ashlar pattern, plan on laying out a radius of 15' to minimize cutting.

Corners

Outside Corners: Building outside corners is easy with **Pisa 2** and **Roman Pisa**. They are constructed using *Full Caps* and *Right* and *Left Hand Corner* units. When ordering, be sure to specify the height in order to get the right amount of each type of unit. It is best to start the wall in the corner and build out. Follow these simple steps to construct 90° corners (Fig. 8).

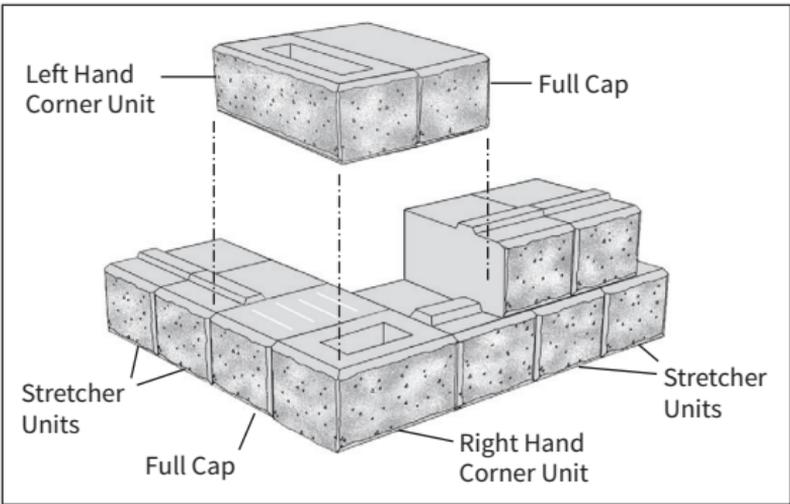
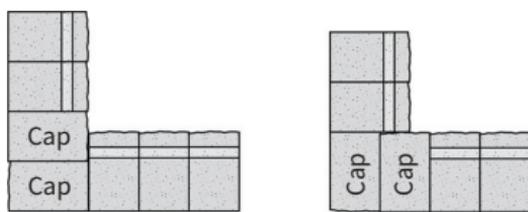


Figure 8

- 1) As you lay out the location of the wall, mark the position of the corner with a stake and use string lines to indicate the line of the intersecting walls. When digging the trench, allow for additional space at the corner location.
- 2) Once the gravel base has been placed and compacted to the desired elevation, mark the exact location of the corner. Use a builder's square to ensure an accurate 90° angle, or lay it out using the 3-4-5 triangle method.
- 3) Carefully position a *Right Hand Corner* unit first. Place a *Full Cap* unit beside it to the left. Using a level, align and plumb the units. Continue the wall on each side using **Pisa 2** or **Roman Pisa Stretchers** as described in **Section 5**.
- 4) For the second course, select a *Left Hand Corner* unit and position it onto the *Right Hand Corner* and *Full Cap*. Next place a *Full Cap* beside it to the right and continue the second course using *Stretcher* units.
- 5) Continue this procedure for each course remembering to alternate the *Right* and *Left Hand Corner* units every course to maintain the running bond pattern. When the wall reaches the height you desire, use a *Universal Coping Stone* or *Roman Pisa Coping* as a cap to finish the corner.

Note: Apply several $\frac{3}{8}$ " beads of *construction adhesive* to the top of each corner unit immediately prior to placing the successive corner unit. If your wall has 90° corners on each end, it will be necessary to cut units within the wall to accommodate the wall batter and to maintain the pattern.

Inside Corners: Inside corners are easy to build. Use 2 *Full Caps* for every course at the intersecting corners, alternating the courses as shown in Fig. 9. Apply construction adhesive to the corner cap units for added strength.



Alternating Courses

Figure 9

Fences

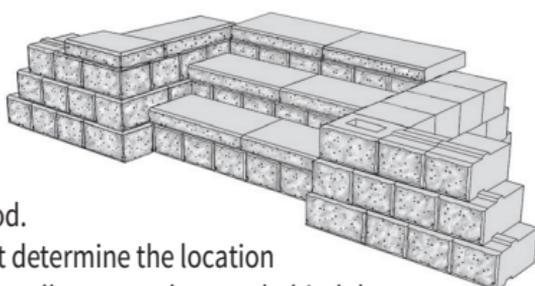
If your project requires a fence, the posts must be placed at least 3' behind the back of the wall. Do not anchor into the coping units.

Stairs

Stairs serve a functional purpose and add a beautiful dimension to any landscape design. Building stairs with **Pisa 2** or **Roman Pisa** is relatively simple. Most stairs are 48" wide; otherwise lay them out in multiples of 8".

There are two methods for building stairs. They are known as the "cut" method and "fill" method.

With either method, first determine the location of the stairway. Be sure to allow enough space behind the wall, as each stair will step back 12".



It is better to construct the corners and side walls independent of the risers. Start by building corners, as shown in the **Corner Section**, on each side of the stairs. To construct the side walls, we recommend using *Full Caps* to avoid the automatic step-back created by the tongue and groove molded into the *Stretcher* units. Lay all the courses of block in the side walls **vertically with no setback**. Be sure to bond the units together with construction adhesive. Backfill with $\frac{3}{4}$ " stone as you go up, using filter fabric to keep the soil from infiltrating the drainage stone.

Stair Construction using the "Cut" Method

With the "cut" method, a separate gravel base is used under each stair. The risers will consist of a *Stretcher*, a *Full Cap* and a coping unit for the tread, although you can have the *Full Caps* as the tread. Depending on the style you choose, you must then determine the height of the rise. Generally, 6" to 8" is acceptable, although building codes may dictate specific heights.

You can start the stairs at the front of the wall or set them back from the corners. The depth of the excavation will depend on the height required for the risers and style coping unit used. The height of the first riser should measure from the top of the tread to the finished grade. Install and compact a 6" gravel base as the footing. See Fig. 10. Place a row of **Pisa Stretchers** onto the base and level them. Next, place the second course using *Full Caps*.

Construct the next riser assembly by placing and compacting another 6" thick gravel footing behind the first course of units. Place another row of *Stretchers* onto the base, directly behind the *Full Caps*.

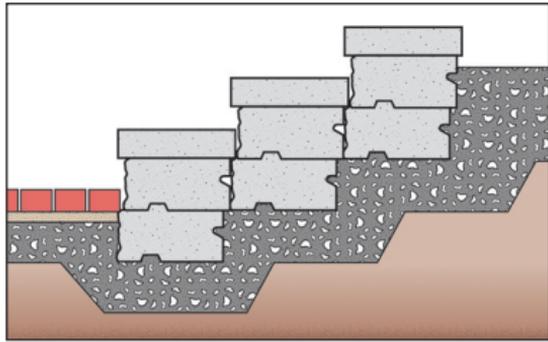


Figure 10

Complete the riser with *Full Caps* as the second course. Install successive risers in the same manner for the number of stairs needed.

Stair Construction using the “Fill” Method

Although more units are required using the “fill” method, it may prove faster and easier, especially if there are a small number of steps. Simply excavate the entire stairway area straight back then place and compact a 6" thick gravel base as a level foundation. Use multiple courses of wall units to build up the risers for the number of steps you want. Use *Full Caps* as the last course for each stair and finish the treads as noted below.

Stair Treads

We recommend using stone treads, such as limestone, bluestone or granite, to complement the wall with an attractive seamless look. Set with an acrylic-based mortar or with **SRW Adhesive** as instructed in **Section 7 - Capping the Wall**. Position the treads to provide a 1" overhang. Allow the adhesive to cure at least 24 hours before opening the stairs to traffic.

Important:

When coping units are used for treads they must be treated with a penetrating-type sealer. Promptly remove snow and ice and use sand for traction control. Avoid use of magnesium and potassium deicers, which can be harmful to concrete products.

Engineered Walls

Pisa 2 and **Roman Pisa**, as well as all other types of segmental retaining walls, or SRWs as they are known, function as gravity structures where the weight of the wall resists the weight of the earth it retains. When the wall is 4' and higher, or if the site involves conditions as noted in **Section 2**, additional construction techniques, such as tiered construction or the use of geogrid, and the services of a qualified engineer are required.

As a “rule of thumb”, a terraced wall should be set back a distance equal to, but not less than, twice the height of the lower wall in front. For example, if the lower wall in front is 3¹/₂' high, the tiered wall behind it should be built at least 7' back.

Geogrid is a PVC-coated polyester mesh that reinforces the earth behind the wall when embedded between layers of soil. The grid is placed on the wall units, then extended back over the compacted gravel. Additional gravel is placed on top of the grid and compacted. As courses of units are added and back-filled, additional layers of grid are placed at appropriate heights. The number of layers and length of geogrid depend on several conditions, including the type of soil being retained. Poor draining soils such as clay require more geogrid than granular soils, which drain well.

Typically, grid should be placed every 2 or 3 courses and should extend back a distance about equal to the height of the wall (Fig. 11). Your engineer will be able to specify the number of layers of grid that will be required for your wall and the distance the grid should extend back.

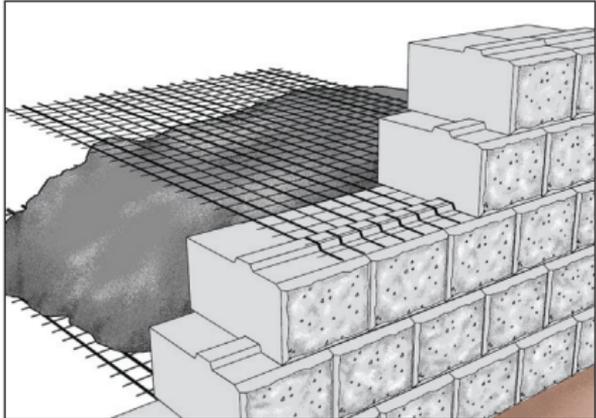


Figure 11

Estimating Charts

The following charts should be used as guides to estimate the number of units required to build a **Pisa 2** or **Roman Pisa** wall. Remember to allow a few extra units for cutting and waste. Walls exceeding the heights shown on the charts require additional construction techniques and engineering consideration. Contact **Ideal** for additional information.

PISA2® & ROMAN PISA®

Stretcher Unit - 6" h x 8" w x 12" d • 3 pcs/sf • 43lb ea.

HEIGHT & COURSE	LENGTH						
	5'	10'	15'	20'	30'	40'	50'
6" 1st	8	15	23	30	45	60	75
12" 2nd	15	30	45	60	90	120	150
18" 3rd	23	45	68	90	135	180	225
24" 4th	30	60	90	120	180	240	300
30" 5th	38	75	113	150	225	300	375
36" 6th	45	90	135	180	270	360	450
42" 7th	53	105	158	210	315	420	525
48" 8th	60	120	180	240	360	480	600

Shaded row is the buried course

Half Unit - 6" h x 4" w x 12" d • 6 pcs/sf • 23 lb ea.

Corner Unit - 6" h x 8" w x 12" l • 33 lb ea.

Jumbo* Unit - 6" h x 12" w x 8" d • 2 pcs/sf • 32lb ea.

** Jumbo Unit available only for Roman Pisa*

COPING UNITS

STYLE	LENGTH					
	10'	15'	20'	30'	40'	50'
Universal Coping 3 ⁵ / ₈ "h x 16"w x 13"d	8	12	15	23	30	38
ReversaCap 3"h x 8/7"w x 14"d	16	24	32	48	64	80
Pisa Full Cap 6"h x 8"w x 12"d	15	23	30	45	60	75
Roman Pisa Coping 3 ⁵ / ₈ "h x 16"w x 13"d	8	12	15	23	30	38
Ancestral Coping 3 ⁵ / ₈ "h x 16/13"w x 13"d 3 ⁵ / ₈ "h x 13/10"w x 13"d	5	7	10	14	19	24
<i>Ancestral is sold as a pair set.</i>						

ROMAN PISA PATTERNS (Also see Pattern Card)

NO. OF UNITS IN ROMAN PISA PATTERNS per 100 sf			
STYLE	Stretcher	Half	Jumbo
Ashlar Pattern 1	164*	110	56
Ashlar Pattern 2	164*	110	56
Ashlar Pattern 3	160**	42	80
Ashlar Pattern 4	168***	30	60
Stretcher & Half - 2:1 Ratio	240	120	-
Stretcher & Half - 4:1 Ratio	265	66	-

*Includes 9 Full Cap units for every 10' of closure row.

**Includes 8 Full Cap units for every 10' of closure row.

***Includes 11 Full Cap units for every 10' of closure row.

Here are some "rules of thumb" that you might find handy for estimating the amount of gravel needed for the base and the quantity of ³/₄" crushed stone used for drainage.

Base material*: Approx. 5-6 tons of 1¹/₂" processed gravel or crusher run are required to construct a base 6" thick by 24" wide by 100' long.

Drainage stone*: For every 100 sf of wall, approx. 5-6 tons of ³/₄" crushed stone will be required to fill the 12" drainage zone behind the wall.

*Based on the approx. weights of: 115 lb/cuft for 1¹/₂" processed gravel or crusher run
100 lb/cuft for ³/₄" crushed stone

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