



PERMACON

THE HARMONY OF SPACE

**INSTALLATION GUIDE
LANDSCAPE PRODUCTS**

2018

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PAVERS

INSTALLATION GUIDE

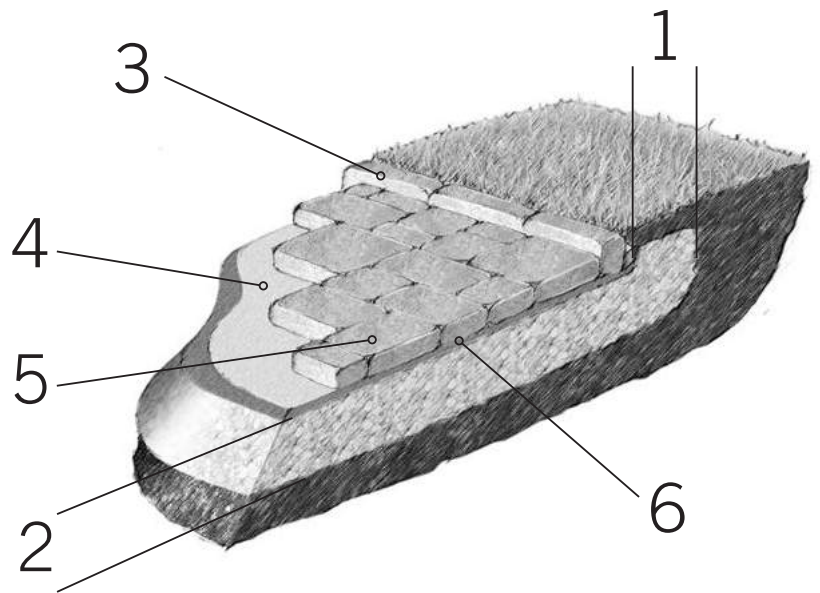
TOOLS REQUIRED

- 1 wheelbarrow
- A few pegs
- 2 rigid pipes with a diameter of 25 mm (1 in) x 3 m (10 ft)
- 1 25 mm x 150 mm x 2,4 m (1 in x 6 in x 8 ft) plank
- 1 plumb line
- 1 level
- 1 15 m long (50 ft) bricklayer's line
- 1 shovel
- 1 chalk line
- 1 measuring tape
- 1 broom
- 1 rake
- 1 guillotine or concrete saw (available from rental stores)
- 1 vibrating plate (compacting tool available from tool rental stores)

OPTIONAL

- Jumping jack
- Vibrating roller

The jumping jack and vibrating roller should not be used for compacting paving stones. They should only be used for the foundation.



EXCAVATION

- 1.1 If pipes or wires are located in the area to be excavated, contact the representatives of the company concerned before the work is started.
- 1.2 To ensure adequate drainage, excavate the soil to obtain a minimum 2% slope (20 mm per metre or 1/4 inch per foot). The slope can be reduced to 1% if the drainage of all the landscaping is well controlled. In case of doubt, obtain an expert's assistance for a detailed analysis of everything concerning drainage (slopes of the ground, soil type, landscaping, etc.).
- 1.3 The excavation contour should extend beyond the surface to be paved by at least 300 mm (12"). Ideally, this distance should be 1 to 1 1/2 times the thickness of the foundation. The stability of the project depends on this measurement, which ensures that the paving stones at the edge will be as well supported as those in the centre.
- 1.4 Level the bottom of the excavation with a rake and if the soil is sandy, compact it with a vibrating plate or roller. It is preferable not to pack clay soil at this stage. In this case, the use of a geotextile membrane placed between the natural soil and the foundation is recommended to prevent foundation contamination by clay and ensure greater stability. Refer to the chart "Excavation depth and minimum foundation" to get the minimum excavation required (Ref: photo #1).

FOUNDATION

- 2.1 Spread and compact the 20-0 mm (0-3/4") stone in 100 mm (4") layers. Lightly water the 20-0 mm (0-3/4") stone to make tamping easier. To ensure an adequate foundation, compact the stone several times with a vibrating plate, roller, or a jumping jack (Ref: photo #2). Once this stage is completed, you will be able to see what the final result will look like. You can verify the final level of the pavers by placing a paver on a guide. (Ref: photo #3) Refer to the typical installation drawings (see page 6).

CURB

- 3.1 If you install a curb of the Universal Curb, Anglia or Celtik Mega Curb type, proceed with installation of the curbs immediately before completing the foundation. Start by laying the first side of the curb. Before installing the other side of the curb, temporarily place a row of pavers on the ground to determine the ideal distance and the position of the other curb, and thus minimize the size of the pavers. If you install a Celtik curb, a Melville curb, a Segment curb or even a plastic curb, refer to step 5.7 "Laying pavers".

INSTALLATION BED

- 4.1 Spread between 15 mm (5/8") and 25 mm (1") of concrete sand or screening (Ref: photo #4). Bear in mind that a 25 mm (1") bed will be reduced down to 15 mm (5/8") in thickness once compacting is completed and after the paving stones are installed.
- 4.2 Level the concrete sand using two (2) 25 mm (1") diameter pipes and a straight plank (Ref: photo #5). Any significant variation in bed thickness may cause irregularities in the paved surface.
- 4.3 Make sure you do not compact the screenings or the sand before laying the pavers on the installation bed. Fill the holes left by the pipes.

LAYING THE PAVING STONES

- 5.1 Arrange the paving stones according to the pattern chosen with a 90° angle if possible. Proceed by walking on the paving stones (Ref: photo #6).
- 5.2 Paving stones are manufactured with side spacers that will set a space of 3 mm (1/8") between each paver. A space of 2 mm must be allowed for paving stones without spacers.
- 5.3 To obtain an even distribution of colour and texture, it is recommended that you choose paving stones from more than one cube at a time. Moreover, working across each cube always gives the best results.
- 5.4 Check the alignment of the pavers (after every five rows installed) and adjust them, if necessary, using a screwdriver.
- 5.5 Install paving stones up to the last row. To avoid having to cut paving stones later, determine the position of the curbs to finish with a complete paving stone.
- 5.6 If necessary, you can cut the paving stones using a cold chisel or specialized tools such as guillotine or a concrete saw (Ref: photo #7). It is recommended that you use a chalk line to mark the paving stones to be cut. If you have to use a guillotine to cut the stones, make sure that the cut is at a slight angle as pavers cut this way are much easier to install. If you use a concrete saw, keep away from the paving stones already installed, since the dust and dirt from the sawing will permanently stain them. Wear safety glasses when cutting concrete products.
- 5.7 Proceed immediately with installation of Celtik curbs, Segment curbs, Melville curbs or plastic curbs on the perimeter of the paved surface (ref. Photo No. 8). The curbs are laid directly on the densified granular foundation. .

FILLING THE JOINTS

- 6.1 Once you have finished laying the paving stones, stabilize them using a vibrating plate (Ref: photo #9). This operation will settle the stones into the bed while levelling the surface. Begin by brushing a thin uniform layer of joint-filling sand over the paving stones and into the joints (Ref: photo #10), and then use a vibrating plate. For best results, run the plate two or three times in each direction. This operation will allow the sand to penetrate suitably into the joints and the paving stones to settle approximately 10 mm (3/8") into the bed. (For improved performance, use Techniseal polymeric sand in accordance with the instructions provided on the bag).

The installation of a detachable neoprene sole (or layer) has been proven to be an additional protection against the risk of concrete spalls when filling the joints of paving stones.
- 6.2 Repeat the sand-spreading and vibrating procedures until all of the paving-stone joints have been filled. Remove the excess sand with a brush. The final level of the sand in the joints should be about 3 mm (1/8") lower than the level of the paving stones.
- 6.3 If, after a few days, some joints are not properly filled, repeat the procedure. It is recommended to perform an annual maintenance of the joints between the paving stones.
- 6.4 We suggest setting aside a number of paving stones for replacement.



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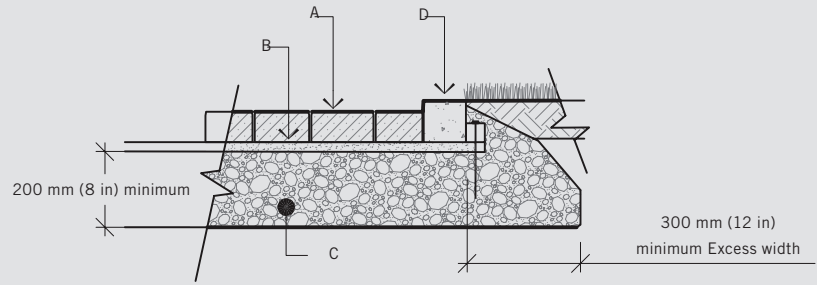


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TYPICAL CROSS-SECTION – PAVERS

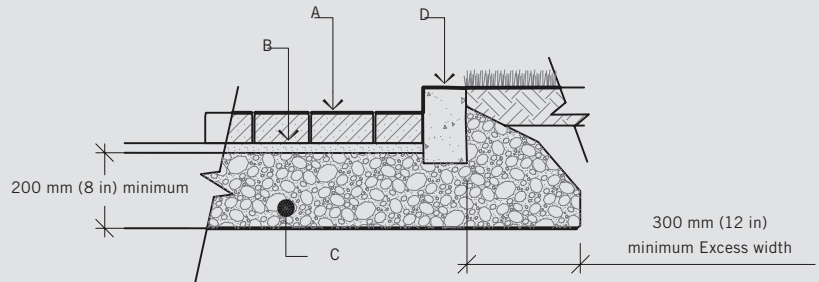
TYPICAL PAVER INSTALLATION WITH CELTIK CURB OR MELVILLE CURB

- A Paving stones
- B Laying bed 25 mm (1 in) (concrete sand)
- C Compacted granular foundation 0–20 mm (0–3/4 in)
- D Celtik Curb



TYPICAL PAVER INSTALLATION WITH CELTIK MEGA CURB OR ANGLIA CURB

- A Paving stones
- B Laying bed 25 mm (1 in) (concrete sand)
- C Compacted granular foundation 0–20 mm (0–3/4 in)
- D Celtik Mega Curb or Anglia curb



EXCAVATION DEPTH AND MINIMUM FOUNDATION⁽³⁾

NATURE OF PROJECT	GARAGE ENTRANCE		PATIO OR SIDEWALK	
	Clay ⁽²⁾	Sandy	Clay	Sandy
Minimum excavation required	400 mm (16 in)	300 mm (12 in)	350 mm (14 in)	250 mm (10 in)
Minimum foundation thickness (0–20 mm (0–3/4") crushed stone)	300 mm (12 in)	200 mm (8 in)	250 mm (10 in)	150 mm (6 in)
Minimum/maximum uncompacted installation ⁽¹⁾ bed	15 to 25 mm (5/8 in to 1 in)	15 to 25 mm (5/8 in to 1 in)	15 to 25 mm (5/8 in to 1 in)	15 to 25 mm (5/8 in to 1 in)
Thickness of the paving stone	60 mm or 80 mm (2 3/8 in or 3 1/8 in)	60 mm or 80 mm (2 3/8 in or 3 1/8 in)	60 mm or 80 mm (2 3/8 in or 3 1/8 in)	60 mm or 80 mm (2 3/8 in or 3 1/8 in)

The information in this table shows the minimum required for a job well done. Anything above this level means improved stability for the whole.

(1) Once compacted, a 25 mm (1") bed will be reduced down to 15 mm (5/8").

(2) For certain areas where clay soil is unstable, the minimum excavation required is 600 mm (24") and the minimum foundation is 525 mm (21").

(3) Conforms to the recommended ICPI standards (Interlocking Concrete Pavement Institute).

PAVER INDEX

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PACKAGING

For product packaging information, please refer to our Landscape product price list, or product data sheets.

LAYING PATTERNS AND LAYING IDEAS

You will find on page 21 a reference chart gathering the ideas to use for each type of pavers.

The laying idea details are shown at the section "Laying idea" page 188.

CASSARA® VERDE PAVER

SPECIFIC DETAILS

MODULE

100 mm x 300 mm x 450 mm
4" x 11 13/16" x 17 3/4"



RESIDENTIAL VEHICULAR VEGETATED PAVEMENTS INCORPORATING PAVERS WITH MULTI-CAVITY

Advantages

- Significantly reduces heat island effects
- Better management of rainwater: slow-down of runoff water
- Improves air quality
- Create more natural and soothing spaces for the population

Applications

Residential parking, driveways, picnic areas and pedestrian walkways.

Implementation

Filling paver cells: Soil mix for grassing, sodding and tree planting. Professional blend composed of mineral soil, sand, fibrous black earth and compost. Available at bulk landscape suppliers, specialized garden centres and soil mix manufacturers.
Fill the cells. Pass vibrating plate. Water the surface. Spread the grass seeds.

Grass seed Here are two recommended blends:

Minimum maintenance blend (2-week germination):

63% Fescue, 20% Perennial Ryegrass, 17% Kentucky Bluegrass

Sports field blend: High traffic resistance (Germination: 3 weeks):

65% Kentucky Bluegrass, 20% Fescue, 15% Perennial Ryegrass

Seed bed

Cover the grass seeds with a maximum of 10 mm of soil mix for grassing, sodding and tree planting, then water slightly.

Fertilizers: Nitrogen (N), Phosphorus (P), Potassium (K)

Application of fertilizers is recommended for the first year. An organic-based fertilizer is adequate. The following ratios (N-P-K) may be used: 4-1-2, 3-1-1, 2-1-1 (Formulation example: 19-6-4)

Germination cover for seed bed protection

A woven fabric designed to protect the seed bed allows moisture retention and prevents soil erosion during heavy rains. .

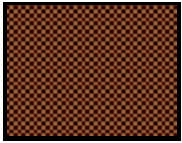
Irrigation

During the first year of implementation, you must provide an irrigation system for 7 to 8 weeks.
Then irrigate as needed in the morning such that the soil throughout the depth of the cells is moistened.

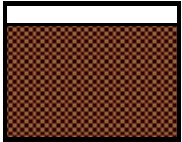
CASSARA® VERDE PAVER

FIGURE 1: PLANTING DIAGRAM OF LAWN GRASSES IN CASSARA VERDE PAVERS

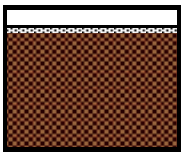
WATER



- Fill the cells with soil mix for grassing, sodding and tree planting
- Spread without compacting
- Level with the paver surface
- Apply (vibrating plate with rubberized protection)
- Compact the pavers (vibrating plate with rubberized protection)



- Water to obtain soil packing enabling the addition of the seed bed

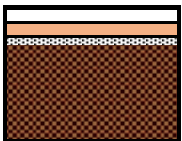


- **Ensure 5-10 mm of clearance under the paver surface and adjust (if required)**

- Spread out fertilizers and seeds



- Spread the seed bed and level



- Water lightly to moisten the seed bed

Main interventions to maintain the initial vegetation in place

Extensive approach with minimal maintenance required:

A traditional vegetation planting approach: selection of undemanding plants.

One fertilization per year: From irrigation process to planting.

Minimal interventions for natural growth of the vegetation in the cells.

Intensive approach with multiple interventions (greater chance of success):

A traditional approach of planting vegetation (grass).

Regular irrigations in season (mandatory in drought period)

Periodic manual weeding (preferred)

Replacement of vegetation as needed (reseeding)

Addition of soil mix annually. Regular fertilization in season.

N.B. : The seed bed is the soil mix for grassing, sodding and tree planting.

Figure 1 presents the grass filling and planting steps. The succession of steps should prevent the seeds from being more than 10 mm below the seed bed so that they do not rot.

CASSARA® VERDE PAVER

Maintenance recommendation

Seasonal irrigation

Irrigation is necessary during the first year of planting

Mowing

Mowing to 8-10 cm (3" and 4") is recommended for the entire growing season. Avoid mowing during drought periods. Leave the cut grass in place.

Weeding control

Extensive approach: Leave what nature provides.

Intensive approach: Manual weeding can be performed in season.

Fertilization program (N-P-K)

Proceed with at least one fertilization per year (extensive approach). For optimal results, three fertilizations per year are required.

Adding soil mix

Addition of soil mix is performed from the end of August to mid-September as well as in the spring. It maintains fertility and restores the filling level (if packing is observed) for optimum clearance (6 to 10 mm) below the paver surface.

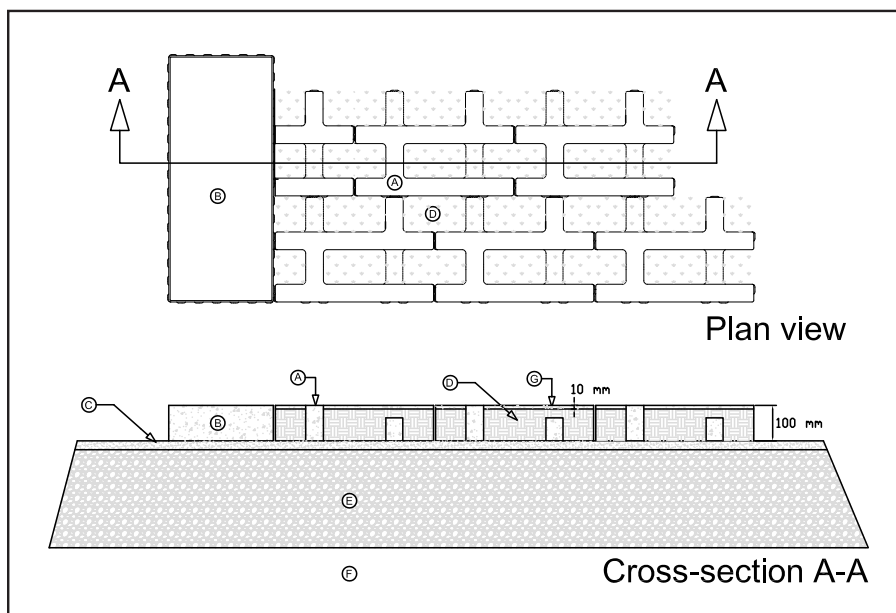
Reseeding

Increases grass density. The dense presence of vegetation associated with a strong root system avoids compaction. Reseeding is performed at the same time as the addition of soil mix, between mid-August and mid-September and in the spring.

Winter conditions

De-icing salts application is prohibited. Ice clumps under vehicles are also a threat to the plants. Snow removal height must be adapted to leave a tamped snow cover of 2 to 4 cm, which will protect the plants from cold spells and prevent their uprooting during snow removal.

CASSARA VERDE PAVERS CROSS-SECTION, RESIDENTIAL DRIVEWAY



- A. Cassara Verde Pavers (100 x 300 x 450 mm)
- B. Cassara Pavers (Mix 3 sizes and Large Rectangle)
- C. Bedding sand 12 to 25 mm: Concrete sand (0-5 mm)
- D. Soil Mix for grassing, sodding and tree planting (inside the multi-cavity). The soil mix is also used as seed bed (for grass)
- E. Crushed stone, 200 to 300 mm (0-20 mm) compacted to 95% Modified Proctor
- F. Existing soil with adequate bearing capacity (Minimum of 150 kN/m²)
- G. Maximal clearance of 10 mm under the paver surface

NOTES:

The Cassara Verde Pavers is used in combination with the Cassara Pavers (for walkway).

CASSARA® VERDE PAVER

Use of herbaceous perennials to replace lawn grasses

It is important to note that the turf installed in the Cassara Verde pavers is demanding in terms of water and fertilizer and is not very resistant to dryness. Intensive maintenance interventions approach increase the chances of success. In addition, hardy ground cover crops that are very drought-resistant and low in fertilizer may provide a better alternative.

In this sense, several plants were selected and tested to establish their drought resistance and their demand for water and fertilizer. Overall, the plants that we propose here exceed the potential of the more demanding lawn. The use of these plants should be considered when an extensive approach (minimal maintenance interventions) is recommended.

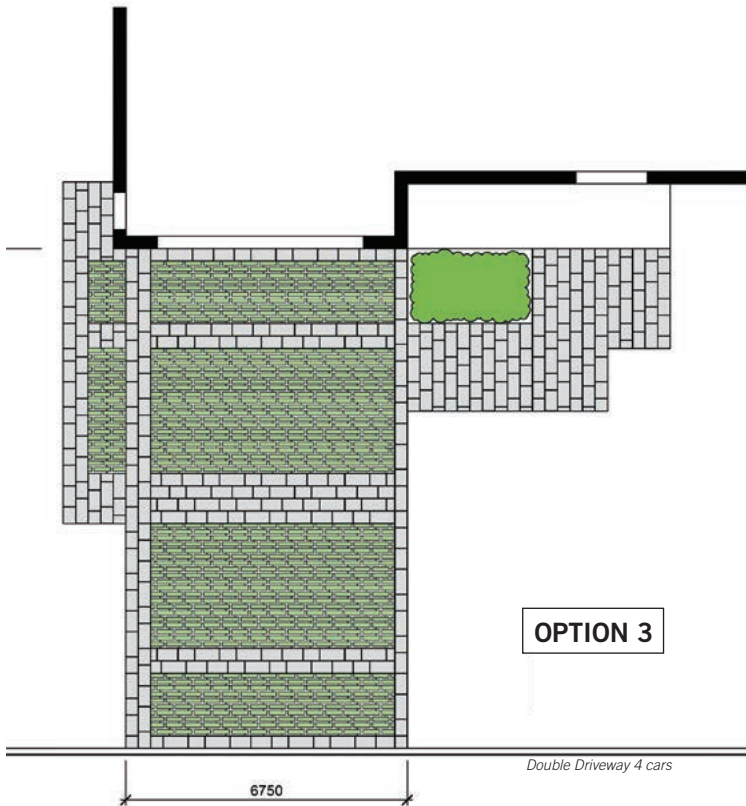
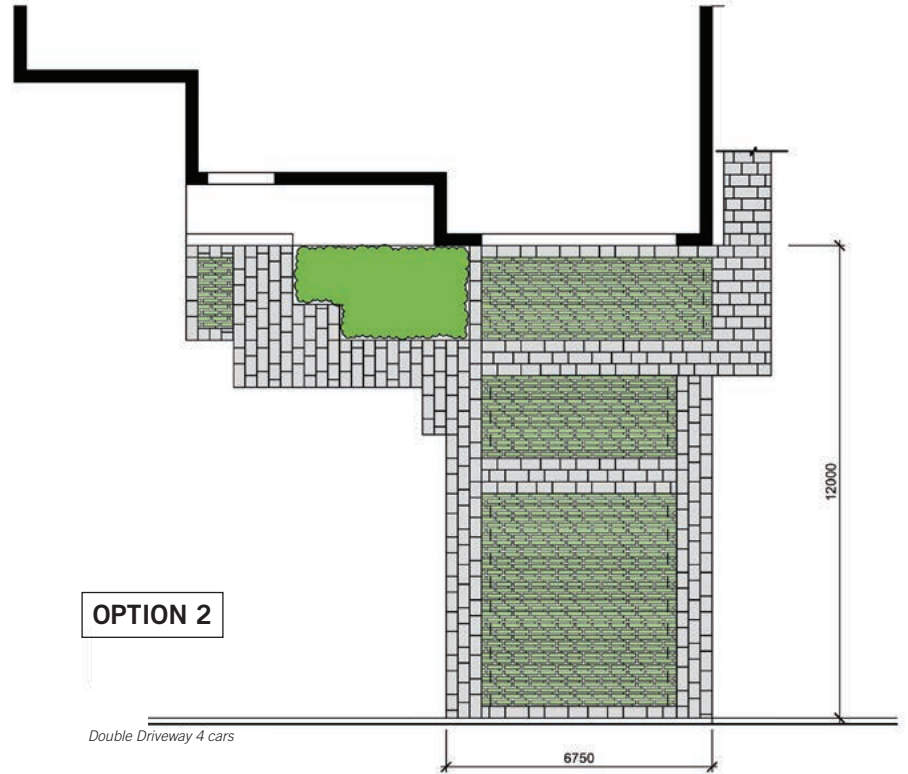
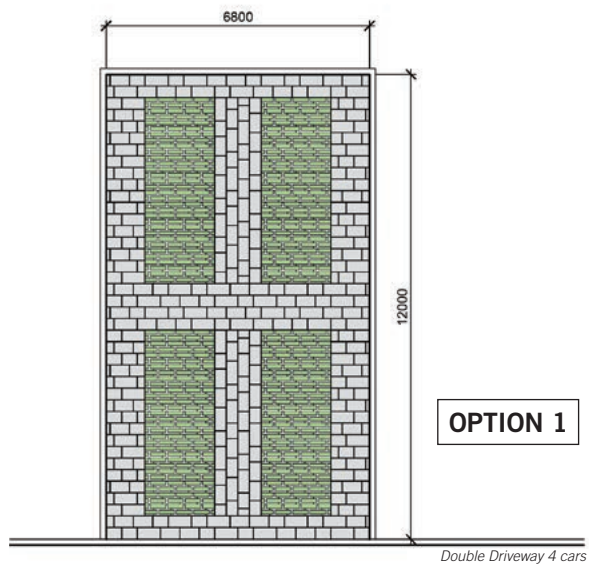
- Veronica Repens
- Pilosella aurantiacum (hawkweed)
- Sedum album 'Coral Carpet'
- Thymus serpyllium 'Magic Carpet'
- Sedum acre.

Notes:

- Use plants produced in multi-cell at the rate of 2 per single alveolus.
- Cutting implantation (for SEDUM) is possible and takes root more quickly.
- Plants exposed to full sun will have smaller leaves than normal because they adapt.
- Plants are available in specialized horticultural centers (Aux Aubepines for example).
- The substrate (potting soil) to be considered must not contain an excessive mineral component.

CASSARA® VERDE PAVER

Example of installation: Residential Driveway. Cassara Verde Pavers and Cassara Pavers.



CASSARA® PLANK PAVERS

UNIT

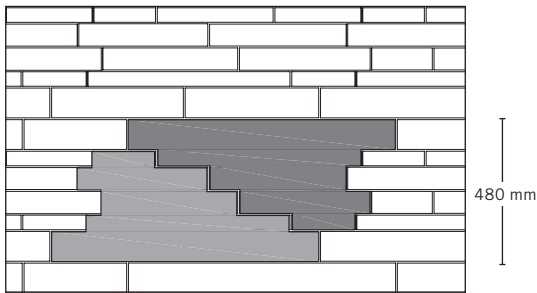


100 mm x 374 mm x 900 mm
3 15/16" x 14 3/4" x 35 7/16"

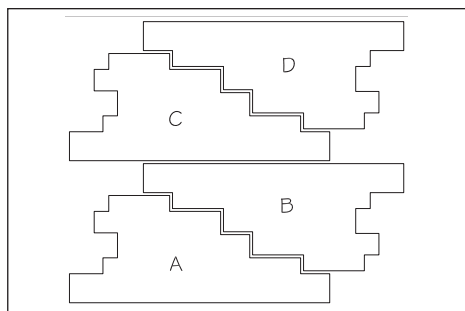


Cassara Plank Paver is composed of a single module with four different patterns that allows on a aleatory setup.

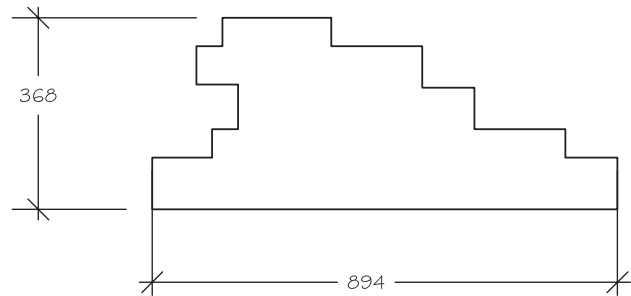
LAYING PATTERNS



LINEAR PATTERN (IN STRIPS)



TYPICAL ROW



PAVER DIMENSION

Note: The module nominal dimension (including joints between pavers) is 374 mm x 900 mm (14 3/4" x 35 7/16").

One piece covers 0.21 m² (2.26 ft²)

NOTES :

Winter conditions: It is recommended that the snow removal equipment is well covered (Teflon blade or other), in order to avoid damaging the paving stones against scratches, spalls or concrete glares. It is recommended to discuss this with your snow removal contractor before signing the contract.

Special protection when using a vibrating plate on the pavers See the generic installation guide on pavers, article 6.1

CASSARA® PLANK PAVERS

PAVER INSTALLATION STEPS

First strip (480 mm)

A1 (Cut A2 first, see cutting detail)

B1 (Cut B2 first, see cutting detail)

C

D (and finish the strip: A, B, C, D, etc.)

Second strip (480 mm)

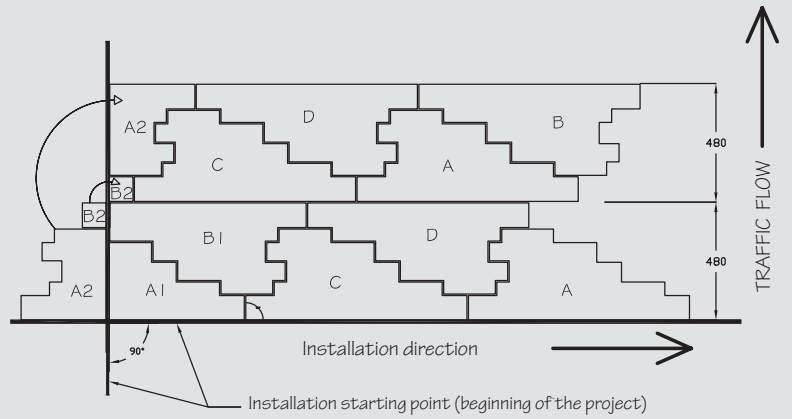
B2 (Part cut of B1)

A2 (Part cut of A1)

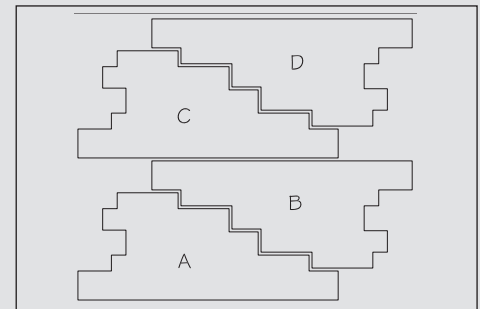
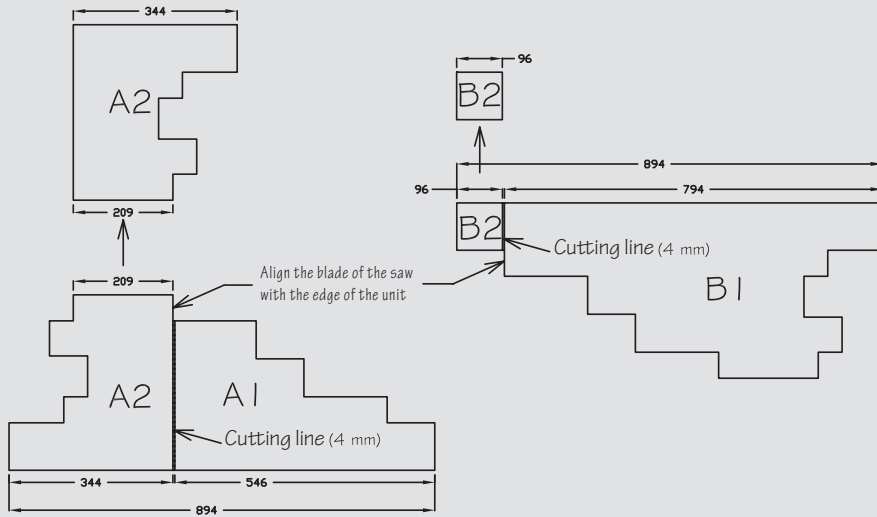
C

D (and finish the strip: A, B, C, D, etc.)

Repeat the two first strips according to the dimension of the project.



Cutting details to start the installation (from left to right)



CUBE LAYOUT

CASSARA® PLANK PAVERS

HANDLING CASSARA PLANK PAVERS

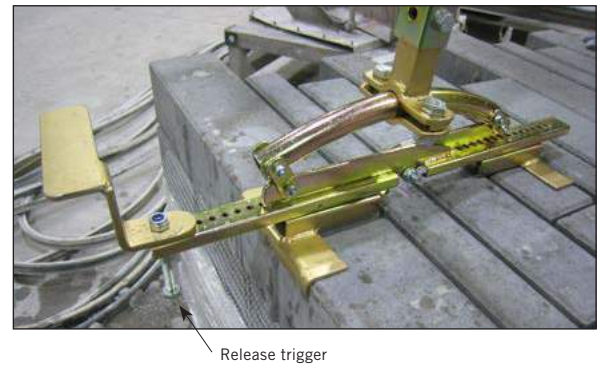
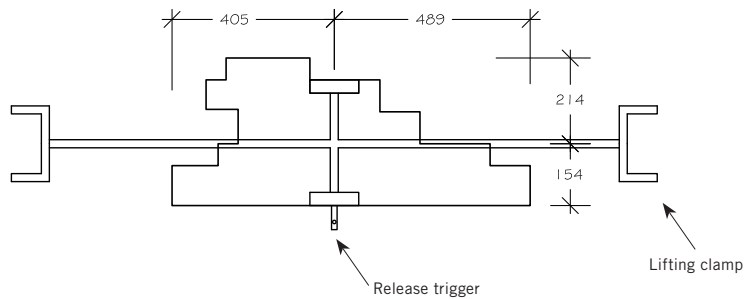
The weight and irregular shape of the Cassara Plank pavers, require the use of a clamp to ease the installation.

To pick up a Cassara Plank module, the clamp must be positioned so that when the paver is in place the release trigger is not in contact with another paver. The trigger must be in the open to work properly.

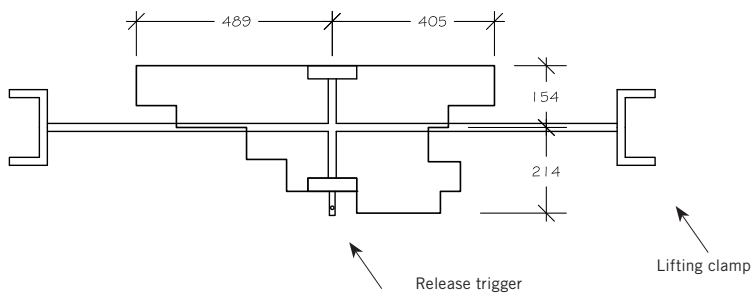
The clamp should always be positioned in the same way (with the release trigger underneath, see positioning sketch) when handling and installing pavers (installers should not turn around the pallet).

During installation, we suggest placing the pallets in order to facilitate the positioning of pavers in the order shown in the following diagram (1 :A, 2 :B, 3 :C, 4 :D). It is very important to install paver A first and then pavers B, C and D, in that order.

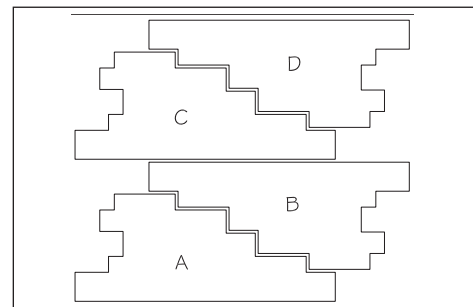
LIFTING CLAMP POSITIONING FOR INSTALLATION OF THE PAVERS A AND C



LIFTING CLAMP POSITIONING FOR INSTALLATION OF THE PAVERS B AND D



PAVER INSTALLATION STEPS ON A CUBE WITH THE LIFTING CLAMP:
1:A, 2:B, 3:C, 4:D



MEGA-ARBEL® PAVERS

SPECIFIC DETAILS

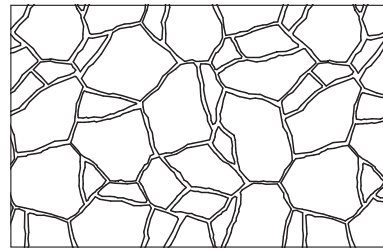
UNITS



80 mm x 390 mm x 532 mm
3 1/8" x 15 3/8" x 20 15/16"



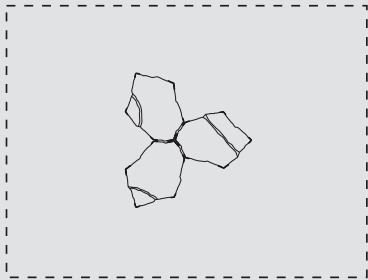
LAYING PATTERN



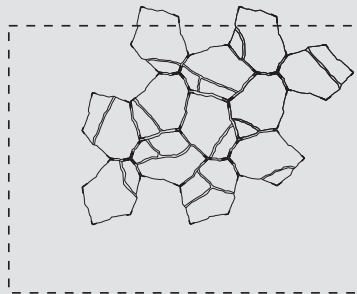
RANDOM PATTERN

SPECIFICS DETAILS

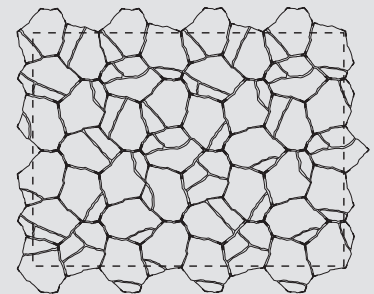
INSTALLATION OF AN IRREGULAR PATIO OR SIDEWALK—WITHOUT CUTTING



STEP 1
Place 3 pavers together in order to form a cloverleaf.



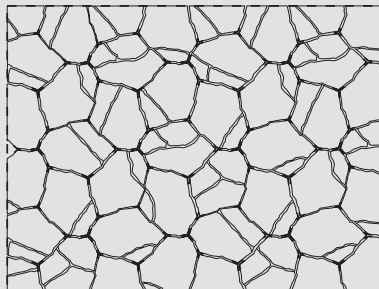
STEP 2
Add more sets in multiples of 3 pavers (cloverleaf) to fill in the surface to be covered.



STEP 3
Complete the balance of the surface to be covered with a single paver for the final result.

STRAIGHT BORDERS

In order to achieve a straight border for a patio and/or sidewalk, you must install the pavers in such a way that it surpasses the surface completely. Saw cut the excess pieces. Tighten the pavers together using a few rows of Mega-Trafalgar or Vendome pavers sealing them with Permapro Plastic Edge.



RESIDENTIAL PERMEABLE PAVEMENT

ROLE OF PERMEABLE PAVEMENT

The objective, when building a permeable pavement system, is to allow rainwater to infiltrate the underlying soil. The stormwater will be stored in the subbase of the paved area instead of running off to the sewer system. The open graded subbase material will provide storage for the runwater that is collected and will be held for a period of time. Subsequently, the natural permeability of the soil beneath the subgrade will allow the accumulated water to gradually return to the ground table, thus pursuing its natural cycle.

CONCRETE PAVERS USED IN THE CONSTRUCTION OF PERMEABLE PAVEMENT

Specifically designed concrete pavers can be used for the construction of a permeable pavement. The joints between the pavers, which are filled with a permeable granular material, have the required porosity to channel water into the system.

DESIGN AND CONSTRUCTION

Before undertaking any construction work, an engineer experienced in the field of hydrology should be consulted, in order to obtain an accurate history of local precipitation and the amount of rainwater or drainage from neighbouring surfaces that will run through the permeable paved area.

UNITS

TRAFALGAR 60 PAVERS

- A. 60 mm x 100 mm 200 mm
2 3/8" x 3 15/16" x 7 7/8"
- B. 60 mm x 200 mm 200 mm
2 3/8" x 3/8" x 7 7/8"
- C. 80 mm x 390 mm 532 mm
2 3/8" x 3/8" x 11 13/16"

A



B



C



Permeability: 484 in/hre

MEGA-ARBEL PAVERS

- 80 mm x 390 mm 532 mm
3 1/8" x 15 3/8" x 20 15/16"



Permeability: 338 in/hre

VENDOME PAVERS

- A. 80 mm x 130 mm 197 mm
3 1/8" x 5 1/8" x 7 3/4"
- B. 80 mm x 130 mm 262 mm
3 1/8" x 5 1/8" x 10 5/16"
- C. 80 mm x 130 mm 327 mm
3 1/8" x 5 1/8" x 12 7/8"

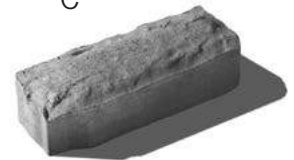
A



B



C



Permeability: 890 in/hre

MONDRIAN PLUS 80 PAVERS

- A. 80 mm x 165 mm 330 mm
3 1/8" x 6 1/2" x 13"
- B. 80 mm x 330 mm 330 mm
3 1/8" x 13" x 13"
- C. 80 mm x 330 mm 495 mm
3 1/8" x 13" x 19 1/2"

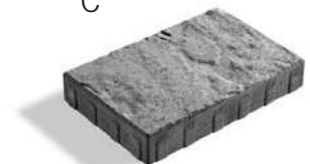
A



B



C



Permeability: 126 in/hre

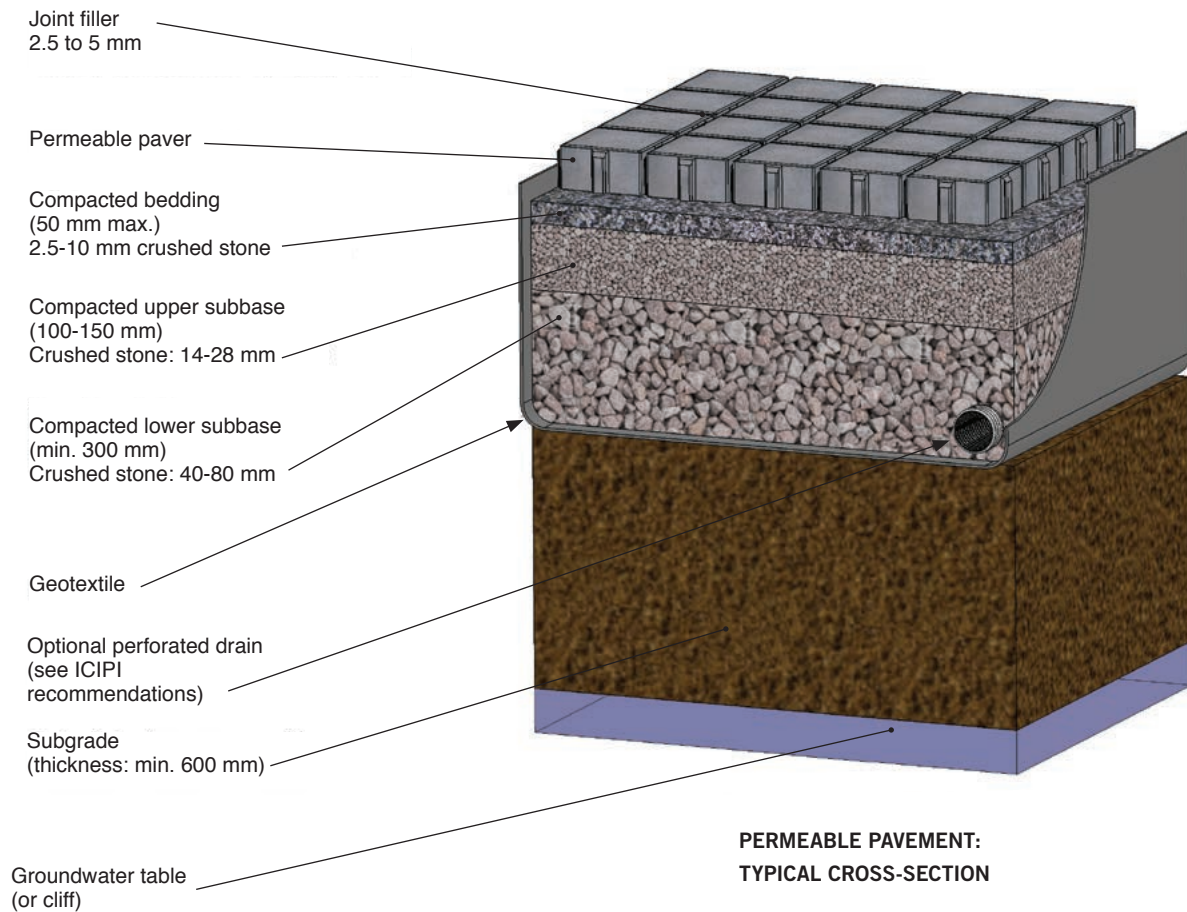
RESIDENTIAL PERMEABLE PAVERS

TECHNIC

DESIGN AND CONSTRUCTION

A detailed study is also required to determine the permeability of the undisturbed soil present beneath the permeable materials, as well as proximity to the groundwater table, rock bed, etc. The technical data gathered will make it possible to design effective permeable pavement**, i. e., pavement where the volume of the subgrade's intergranular basin is sufficient to collect the projected amount of rainwater, and where the permeability of the soil is adequate (permeability coefficient exceeding $2 \times 10^{-6} \text{ m/sec}$. or 0.27 inches/hour) to allow the water to return naturally to the groundwater table before another major rainfall. Failing this, it will be necessary to build a drainage system into the subbase, perhaps even on the surface of the pavement (which should always have a minimum 1% slope) as a complementary measure to evacuate residual rainwater and avoid any overflow or flooding of the structure in service. Melting snow and winter rains must also be taken into account.

Construction must be carried out by a competent contractor in strict compliance with plans and specifications. Moreover, materials must be selected with considerable care to obtain the required permeability. (The minimum requirement for the permeability of the pavers is 100 in/hre).



* Permacon strongly recommends that you go to the website of the ICPI (Interlocking Concrete Pavement Institute) at the following address www.icpi.org (items: permeable pavers) before undertaking any studies or work on permeable pavement using concrete pavers.

** Application software has been developed for this purpose. See the ICPI

RESIDENTIAL PERMEABLE PAVERS

ADVANTAGES & BENEFITS

These can be summarized as follows:

- Excellent way of avoiding the construction of new impermeable surfaces
- Significantly reduces the volume of rainwater channelled to a storm sewer
- Eliminates the need to dig catch basins for surface water
- Reduces the quantity of toxic and suspended matter in the storm system
- Improves the comfort and safety of users during rainfalls (survival of the natural environment, plants, trees, etc.)
- Actively contributes to reloading the groundwater table
- Reduces occasional risk of flooding paved areas
- Reduces the risk of soil erosion by reducing the runoff speed of surface water
- Reduces development costs in new sectors, by avoiding oversized rainwater management works
- Provides a durable concrete paver structure capable of withstanding freeze-thaw cycles and deicing salts
- Favours sustainable development [possibility of earning 2 LEED points (Leadership in Energy and Environmental Design) from the Canada Green Building Council]] in the area of ecological site development, paragraph 6. 1 Flow and Quantity and paragraph 6. 2, Water Treatment

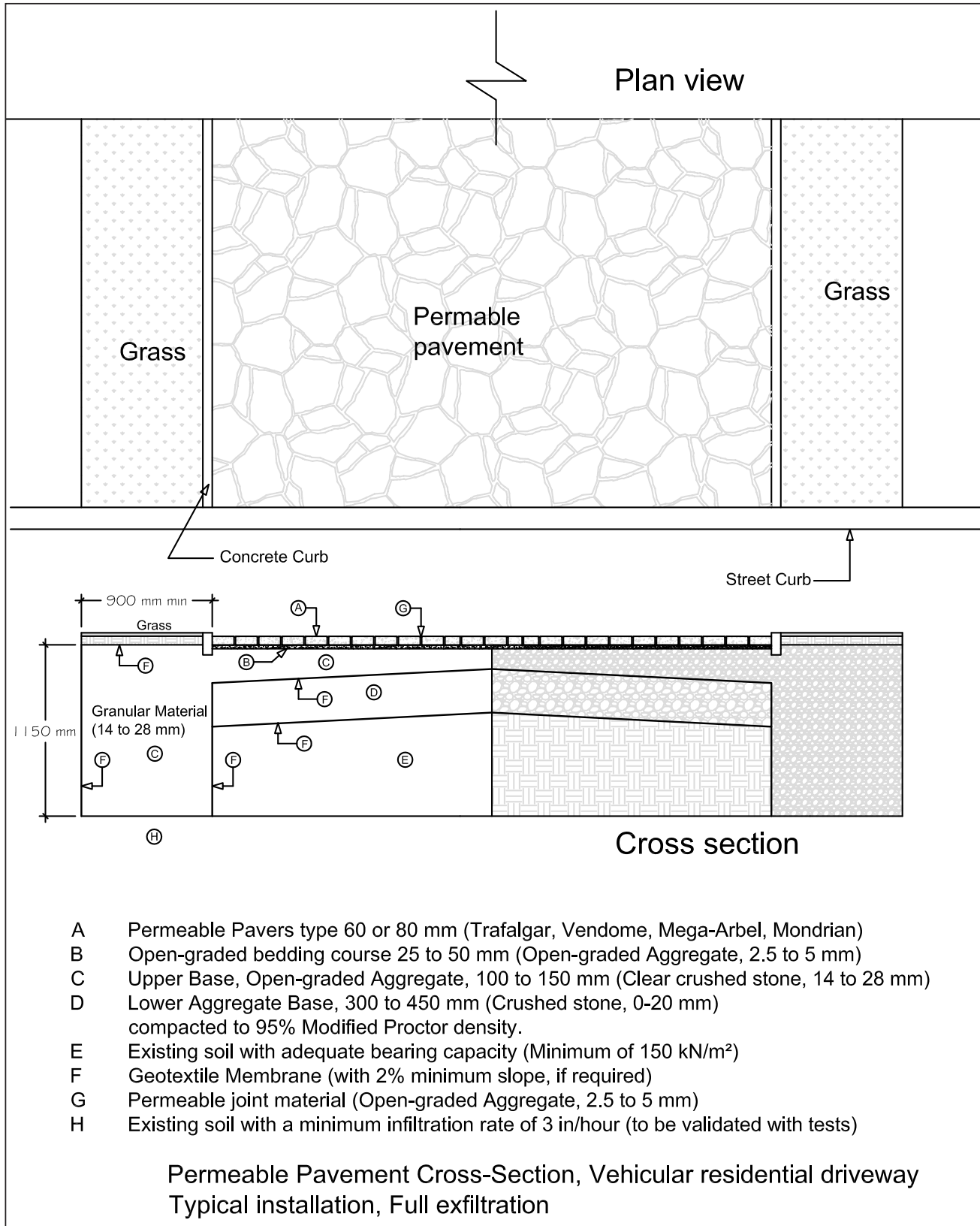
PERMEABLE PAVEMENT LIMITATIONS

While permeable pavement provides many advantages, it should be recalled that it is not the solution for every project that comes up. It does have its shortcomings, as shown below:

- Requires greater design and construction expertise
- A solution that should be avoided in the presence of rock or a groundwater table too close to the surface [distance of less than 600 mm (24 in.)]
- A solution that should be avoided where there are steep slopes near the permeable pavement (slopes exceeding 20%)
- A solution that should be avoided when the permeable pavement's slope exceeds 5%
- High risk of contaminating the groundwater reservoir near the draining subgrade (minimum 30-metre protective strip required, in keeping with prevailing regulations)
- High risk of progressive clogging of the drainage layers over the long term, because of the significant quantity of fine particles in suspension. These result in particular from the application of road abrasives rich in fine particles, and which could, over time, reduce the structure's permeability. With a minimum of seasonal maintenance, the structure could perform effectively for more than 25 years.
- A solution that should be avoided when a road's standard base course is too close to the drainage layer (minimum 6 m protective zone required)

PERMEABLE PAVERS

PERMEABLE PAVEMENT CROSS-SECTION (RESIDENTIAL)



LAYING IDEAS TABLE - PAVERS

PRODUCTS	LAYING IDEA				
	Edging A	Pathway B	Banding C	Insertion D	Stepping stone E
MELVILLE PLANK 80	X	X			
MELVILLE 60 SMALL RECTANGLE	X			X	
MELVILLE 80		X			
MELVILLE 80 SMALL RECTANGLE	X				
MONDRIAN PLUS 60 SMALL RECTANGLE	X			X	
MONDRIAN PLUS 80		X			
MONDRIAN PLUS 80 SMALL RECTANGLE	X				
LEXA A 165 X 380	X				
LEXA B 330 X 330			X		
LEXA C 330 X 495	X				
LEXA MIX A + B + C		X			
TRAFALGAR 60		X			
TRAFALGAR 60 LARGE SQUARE	X		X		
TRAFALGAR 60 (MIX)		X			
MEGA-TRAFALGAR	X	X			
AMALFI		X			
AMALFI LARGE SQUARE			X		
AMALFI (MIX)		X			
PERI-AMALFI	X		X		
VENDOME	X		X	X	
DOMINO 60		X			
MEGA-ARBEL		X			X
BERGERAC PLUS		X			
PALEO PLUS		X			
CASSARA VERDE			X	X	
CASSARA PLANK		X			
MELVILLE CLASSIC		X			

See details of laying ideas, page 188.

SLABS

GENERIC INSTALLATION GUIDE

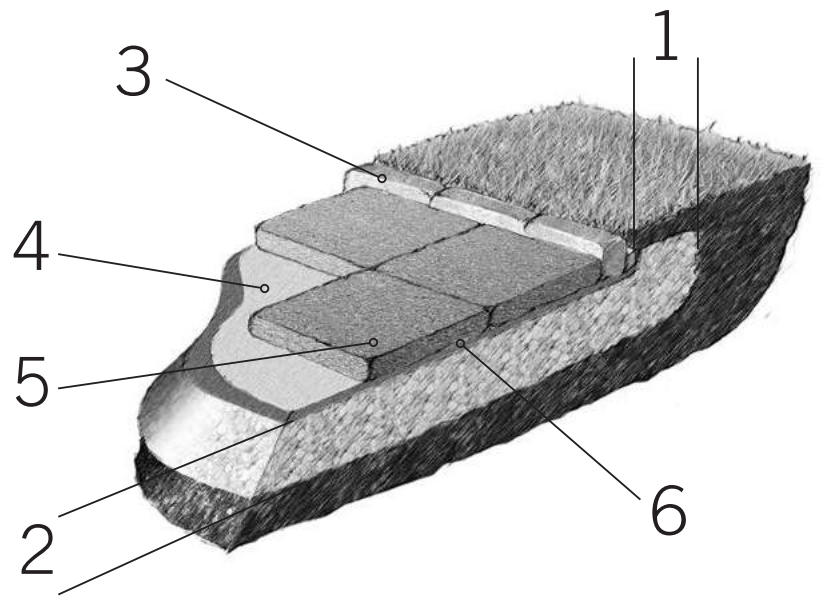
TOOLS REQUIRED

- 1 wheelbarrow
- A few pegs
- 2 rigid pipes with a diameter of 25 mm (1 in.) x 3 m (10 ft.)
- 1 25 mm x 150 mm x 2,4 m (1 in. x 6 in. x 8 ft.) plank
- 1 plumb line
- 1 level
- 1 15 m long (50 ft.) bricklayer's line
- 1 shovel
- 1 chalk line
- 1 measuring tape
- 1 broom
- 1 rake
- 1 guillotine or concrete saw (available from rental stores)
- 1 vibrating plate (compacting tool available from tool rental stores)

OPTIONAL

- Jumping jack
- Vibrating roller

The jumping jack and vibrating roller should not be used for compacting paving stones. They should only be used for the foundation.



EXCAVATION

- 1.1 If pipes or wires are located in the area to be excavated, contact the company representative concerned before the work is started.
- 1.2 To ensure sufficient drainage, excavate the soil to obtain a minimum incline of 2% (20 mm/m or 1/4 inch per foot). The slope may be further reduced to as little as 1% if there is good overall drainage on the site. When in doubt, obtain a detailed analysis of the site drainage (slopes, soil type, layout, etc.) from an expert.
- 1.3 The excavation contour should extend beyond the surface to be paved by at least 300 mm (12"). Ideally, this distance should be 1 to 1 1/2 times the thickness of the foundation. The stability of the project depends on this measurement, which ensures that the slabs at the edge will be as well supported as those in the centre.
- 1.4 Level the bottom of the excavation area with a rake and if the soil is sandy, compact it with a vibrating plate or roller. It is preferable not to pack clay soil at this stage. In this case, the use of a geotextile membrane placed between the natural soil and the foundation is recommended to prevent foundation contamination by clay and ensure greater stability. Refer to the chart to get the minimum excavation required (Ref: Photo #1)

FOUNDATION

- 2.1 Spread and compact the 0–20 mm (0-3/4") stone in 100 mm (4") layers. Lightly water the 0–20 mm (0-3/4") stone to make tamping easier. To ensure an adequate foundation, compact the stone several times with a vibrating plate or a jumping jack (Ref: photo #2). Once this stage has been completed, you will be able to see what the final result will look like; the surface should be uniform, with no bumps or depressions greater than 13 mm (1/2") in 3 m (10 ft). You can verify the final level for the slab installation by placing a slab on a guide (Ref: photo #3). Adjust the surface, if necessary, with compacted 0-20 mm (0-3/4") stone.

CURB

- 3.1 Installing Universal curb, Anglia curb or Mega Celtik curb type: Before you finish the foundation, proceed immediately with the installation of the curb. Begin by installing the curb on one side. Before installing the curb on the other side, temporarily place a row of slabs in order to determine the ideal distance and thus to determine the position of the other curbs and avoid having to cut slabs later. Installing Celtik curb, Melville curb, Segment curb or even a plastic curb: to install these types of curbs, see step 5.7 of laying the slabs.

INSTALLATION BED

- 4.1 Spread the first layer of concrete sand between two 25 mm-(1"-) diameter steel pipes placed parallel to each other on the granular foundation (Ref: photo #4). Level the material by sliding a straight plank across the two pipes (Ref: photo #5). Compact the layer between the two pipes using a vibrating plate, without moving the pipes. Spread a second layer of uncompacted sand between the pipes to fill the space left by the compaction (approximate depth of 6 mm or 1/4") and level once again using the straight plank. This method will facilitate the subsequent installation of the slabs. Fill the spaces left by the pipes which were used as levelling guides.

Repeat the same steps for the entire surface of the work. Any significant variation in the bed thickness may cause irregularities in the paved surface. Never use installation-bed material to make important corrections to the compacted granular foundation.

LAYING THE SLABS

- 5.1 Arrange the slabs according to the pattern chosen with a 90° angle if possible. Proceed by walking on the slabs (Ref: photo #6).
- 5.2 Slabs are manufactured with side spacers that will set a space of 3 mm (1/8") between each slab. A space of 2 mm must be allowed for slabs without spacers. The use of a bricklayer's line, a level, a square, and a specialized handling tool (possibly including vacuum lifting equipment) will be required.
- 5.3 To obtain an even distribution of colour and texture, it is recommended that you choose slabs from more than one cube at a time. Moreover, working across each cube always gives the best results.
- 5.4 Check the alignment of the slabs after every five rows installed and adjust them, if necessary, using a screwdriver. Also, check the uniformity of the surface regularly, and use a soft-head mallet to correct any units which do not meet the required degree of uniformity.
- 5.5 Install slabs up to the last row. To avoid having to cut slabs later, determine the position of the curbs to finish with a complete slab.
- 5.6 If necessary, you can cut the slabs using specialized tools such as guillotine or a concrete saw. It is recommended that you use a chalk line to mark the slabs to be cut. If you have to use a guillotine to cut the slabs, make sure that the cut is at a slight angle as slabs cut this way are much easier to install. If you use a concrete saw, keep away from the slabs already installed, since the dust and dirt from sawing will permanently stain them. Wear safety glasses when cutting concrete products.
- 5.7 At the perimeter of the slab-covered surface, proceed with installing the Celtik curb, Segment curb, Melville curb or a plastic curb (Ref: photo #7). The curbs should be installed directly on the compacted granular foundation.

FILLING THE JOINTS

- 6.1 Spread Techniseal polymeric sand on the slabs, then make it penetrate the joints by sweeping it in all directions (ref. Photo No. 8). (Follow the instructions indicated on the sand bags). Pass a small vibrating plate (see Note 1), protected by a rubber or neoprene membrane, over the entire surface to pack the sand solidly. Pass the vibrating plate a second time over the entire surface. Remove the surplus sand from the surface with a push broom. Level the surface of the joint with a leaf blower, then wet the surface to stabilize the polymer sand.
- 6.2 If, after a few days, some joints are not properly filled, repeat the procedure.
- 6.3 We suggest setting aside a number of slabs for replacement.

Note 1: For slabs with sensitive surfaces, like Provence slabs, pass a vibrating plate, using a flat-jointed snow fence membrane on top of the slabbing surface. For large slabs, it may be possible to use a small vibrating plate protected by plywood boards. However, this method must be used with caution to avoid eventual breakage of elements. For very large slabs and in places where a vibrating plate cannot be used, proceed with manual compaction of the sand by means of a rubber mallet, hammering vigorously on the four corners and the contour of each slab. Shearing the sand joints (manual compaction with an appropriate tool, such as a pointing trowel) may be necessary to ensure better densification.



01



02



03



04



05



06



07

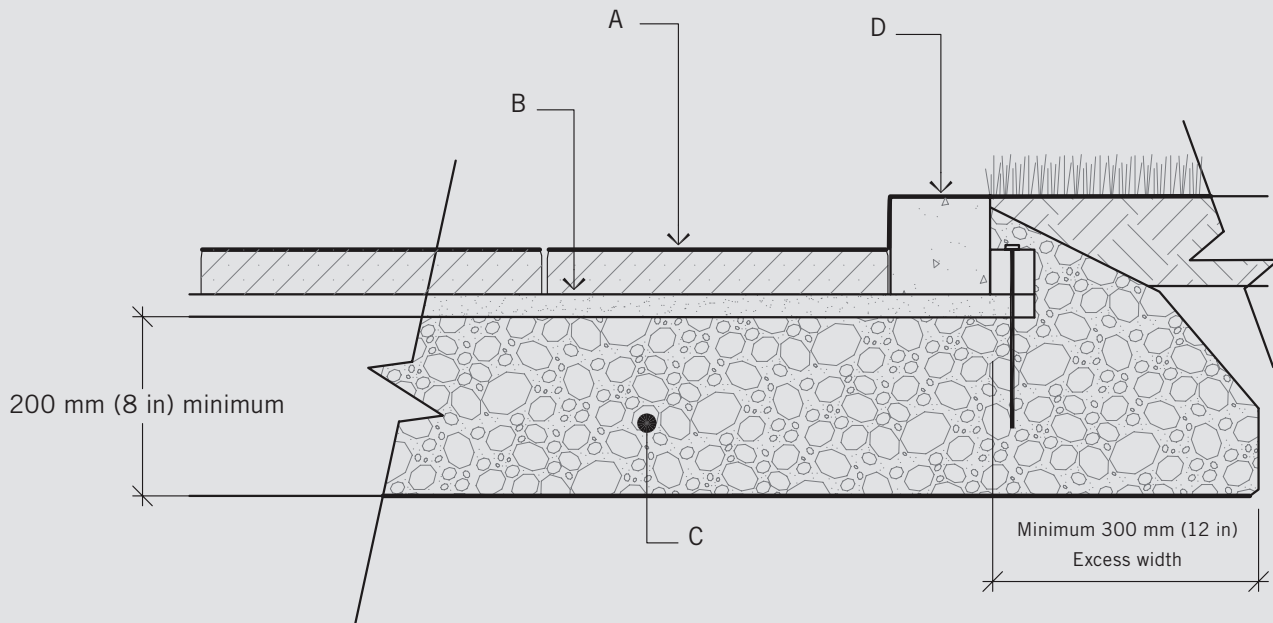


08

TYPICAL CROSS SECTION

SLABS TYPICAL CROSS SECTION

- A Slabs
- B Laying bed 25 mm (1 in.) (concrete sand)
- C 0-20 mm (0-3/4 in.) compacted granular foundation
- D Celtik curb, Anglia curb or other



EXCAVATION DEPTH AND MINIMUM FOUNDATION⁽³⁾

NATURE OF PROJECT	PATIO OR SIDEWALK	
	Clay	Sandy
Nature of soil		
Minimum excavation required	350 mm (14 in)	250 mm (10 in)
Minimum foundation thickness (20-0 mm (0-3/4 in.) crushed stone)	250 mm (10 in)	150 mm (6 in)
Minimum/maximum uncompacted installation ⁽¹⁾ bed	15 to 25 mm (5/8 in to 1 in)	15 to 25 mm (5/8 in to 1 in)
Thickness of the paving stone	will vary depending on the selected slab	

The information in this table shows the minimum required for a job well done. Anything above this level will mean improved stability for the whole.

- (1) Once compacted, a 25 mm (1") bed will be reduced down to 15 mm (5/8").
- (2) For certain areas where clay soil is unstable, the minimum excavation required is 600 mm (24") and the minimum foundation is 525 mm (21").
- (3) Conforms to the recommended ICPI standards (Interlocking Concrete Pavement Institute).

SLAB INDEX

PROVENCE SLABS	27
MADRIA SLABS	28
MELVILLE PLANK SLABS	30
ROSEBEL SLABS	32
PORTAGE SLABS	34

PACKAGING

For product packaging information, please refer to our Landscape product price list, or product data sheets.

LAYING PATTERNS AND LAYING IDEAS

You will find on page 35 a reference chart gathering and ideas to use for each type of slabs.

The laying idea details are shown at the section "Laying idea" page 188.

PROVENCE® SLAB

Enhanced by Satura, a colour technology.

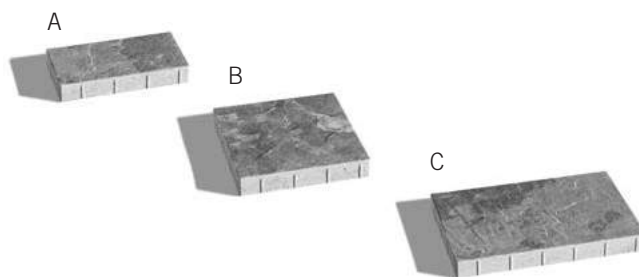
SPECIFIC DETAILS

PROVENCE SLABS UNITS

A. 60 mm x 190 mm x 380 mm
2 3/8" x 7 1/2" x 15"

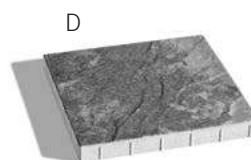
B. 60 mm x 380 mm x 380 mm
2 3/8" x 15" x 15"

C. 80 mm x 390 mm x 570 mm
2 3/8" x 15" x 22 1/2"



PROVENCE SQUARE SLABS UNITS

D. 60 mm x 570 mm x 570 mm
2 3/8" x 22 1/2" x 22 1/2"



PROVENCE RECTANGLE SLABS UNITS

E. 60 mm x 380 mm x 760 mm
2 3/8" x 15" x 30"



MADRIA™ SLABS

Enhanced by Satura, a colour technology.

NEW

SPECIFIC DETAILS

MADRIA SLABS LARGE SQUARE UNITS

60 mm x 570 mm x 570 mm
2 3/8" x 22 1/2" x 22 1/2"



MADRIA SLABS LARGE RECTANGLE UNITS

60 mm x 380 mm x 760 mm
2 3/8" x 15" x 30"



1- GENERAL

The surface finish of Satura (Provence and Madria) Slabs is specially designed to enhance the brilliance of the colours. Special surface treatment of Satura Slabs enhances their colour and offers additional stain protection.

For the excavation, foundation, laying bed, slab placement and joint filling stages, installation of Satura Slabs is based on the same principles as for regular slabs. See the generic installation guide for slabs.

Notes:

- Satura Slabs are reserved exclusively for residential applications.
- Satura Slabs are not designed for installation on pedestals.

2- SPECIALS INSTALLATION CONDITIONS

Handling

You must be vigilant to prevent the risks of scratches and spalls on Satura Slabs, particularly when handling slabs during placement. You must avoid rubbing the slabs against each other.

You must ensure the elimination of any presence of granular material on the slabs after they are placed, to avoid the risk of scratches when circulating on the slabs. In this sense, we recommend you clean the surface frequently, using a leaf blower, during laying of the slabs and placement of the joint filler.

Levelling the laying bed



It is important to pay special attention to the finish of the laying bed, to ensure perfect levelling so that the slabs are laid at their final elevation during placement. This will reduce the slab levelling step after installation.

Joint filler

When passing the vibrating plate, it is important to protect the slab paving surface, using a flat-jointed plastic snow fence-type membrane, after passing a leaf blower beforehand to eliminate any traces of sand on the slabs. The vibrating plate to be used must have a maximum centrifugal force of 2500 lbs.



3- CLEANING

As needed, for current maintenance and cleaning of small stains, simply use clear water and a soft cloth. For slightly bigger stains other than oil or grease, use a colourless natural soap or linseed oil, taking care to moisten the surfaces with water before applying any detergent. Then wash abundantly in clear water. Oil or grease stains can be cleaned with a product specifically designed for that purpose. This cleaning product will be available shortly (Details to come).

IMPORTANT PRECAUTIONS:

- Avoid maintenance products containing acids and solvents.
- do not use deicing products containing calcium or abrasives.
- never use a high-pressure water cleaner.
- do not apply sealant.
- to avoid scratches on Satura slabs, we recommend that you use felt pads or rubber protection on your furniture legs.

4- SURFACE COATING

Small scratches may appear unexpectedly on the surface of the slabs during normal use. The scratches usually fade away over time (under the combined effect of passing pedestrians, rain, snow and maintenance).

Under normal conditions of use, including appropriate maintenance, the projected lifespan of the industrial coating of Satura Slabs is ten (10) years. You must simply reapply a surface coating after ten (10) years to maintain its stain resistance, the brightness of the colours and protection against general wear. The coating specifications and the application procedures must follow the manufacturer's requirements. (The coating specifications and application procedures are coming soon).

(Peak Products mark, model #3407, 2.5" x 1.75", roll of 50' x 48", thickness de 0.5 mm).

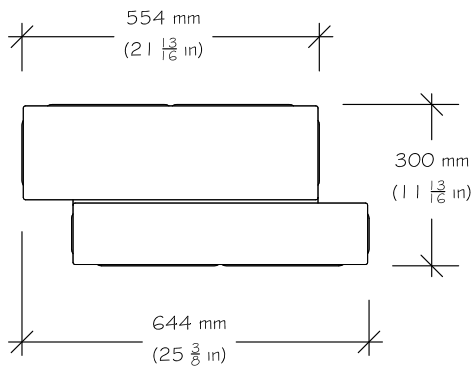
MELVILLE® PLANK SLAB

UNITS

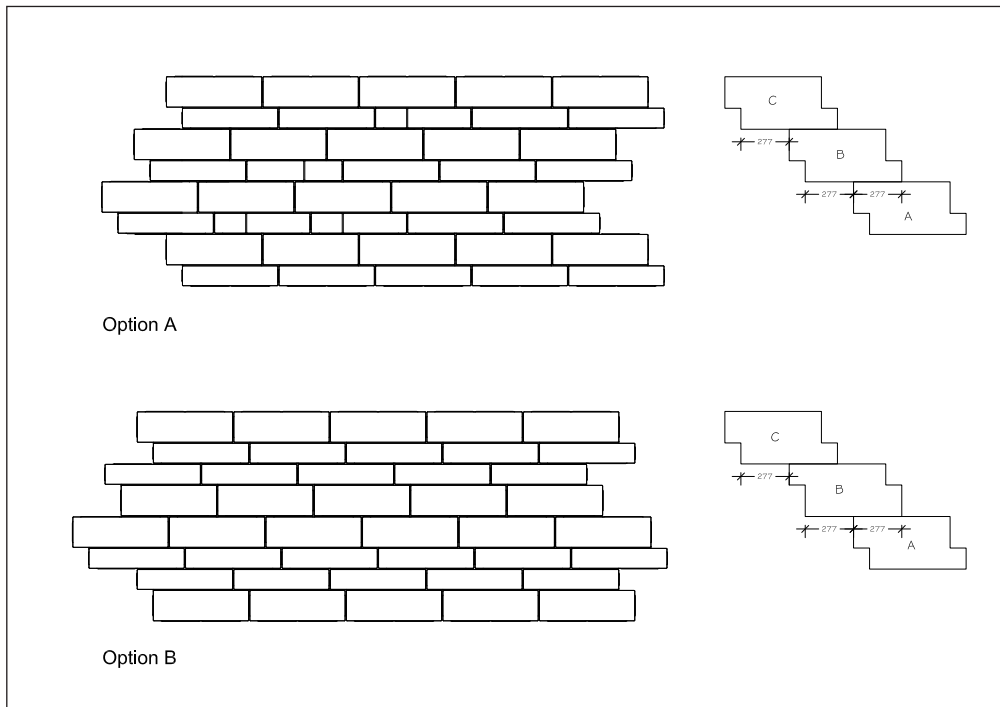
80 mm x 300 mm x 552 mm
2 3/8" x 11 13/16" x 21"



SLAB DIMENSIONS



LAYING PATTERNS AND DETAILS



MELVILLE® PLANK SLAB

Implementation sequence

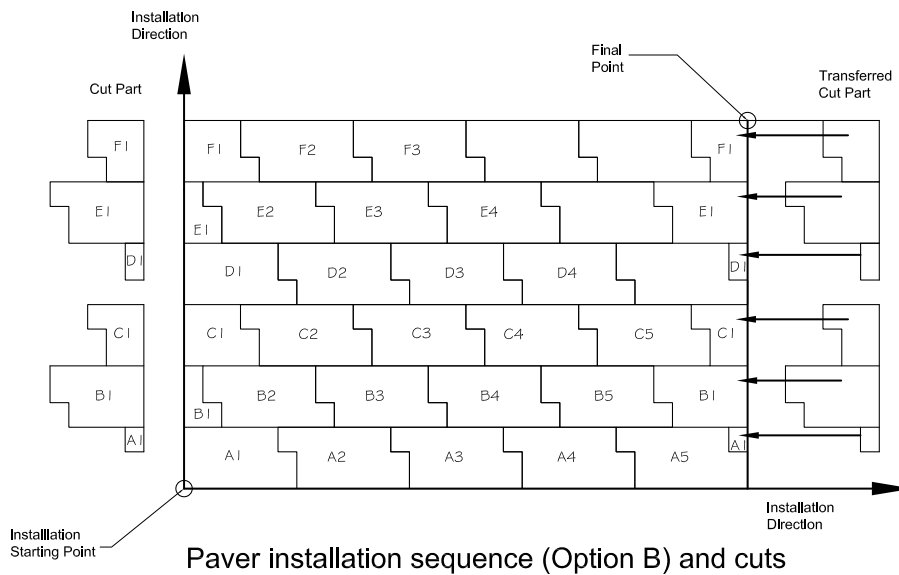
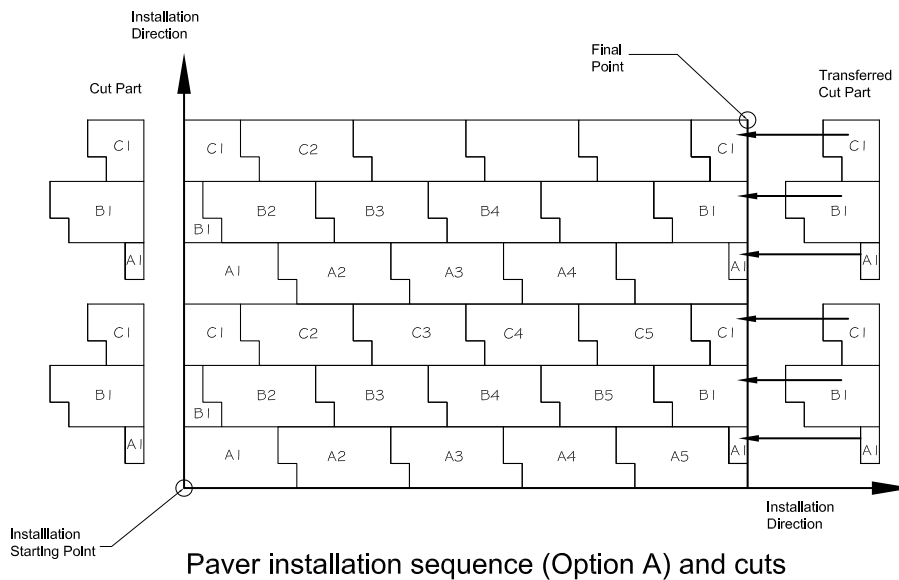
Slab placement order (option A and B)

- First edge A1, A2, A3, etc.
- Second edge B1, B2, B3, etc.
- Third edge C1, C2, C3, etc.

Note:

Each edge is installed symmetrically in relation to the previous edge (see typical placement detail).

- Saw the modules along the starting line (on the left).
- Reuse the sawn modules at the end of the project (on the right) (see the sketch of the placement sequence).
- Repeat the edges according to the project's dimensions.



ROSEBEL® SLAB

SPECIFIC DETAILS

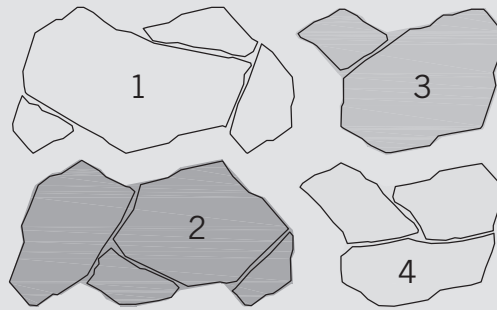
UNITS



SPECIFIC DETAIL

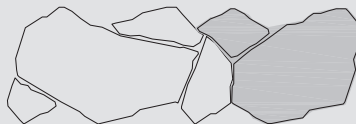
INSTALLATION INSTRUCTION:

- Two sizes of slabs
- Each with two different textures

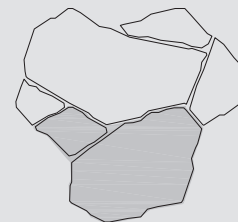


ROSEBEL SLAB'S INSTALLATION:

Basically, build a duo (pair) using both available slabs to reproduce a paving surface more accurately.



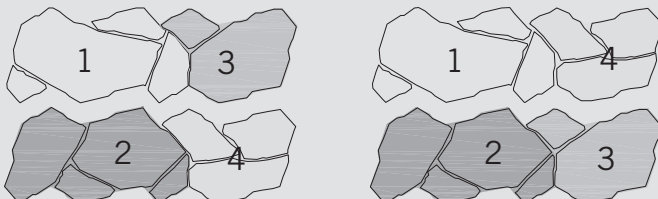
DUO A: Horizontal linear (one after each other)



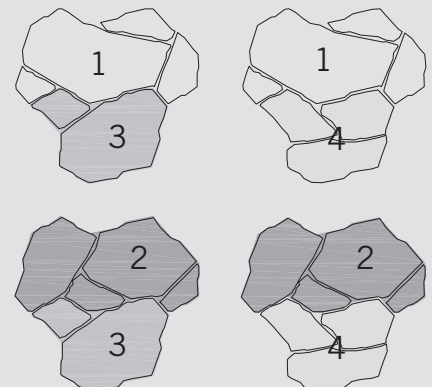
DUO B: Vertical linear (one under each other)

You can create 4 different duos (pairs) for each type using four different formats: 1-3, 1-4, 2-3, 2-4.

DUO A:



DUO B:



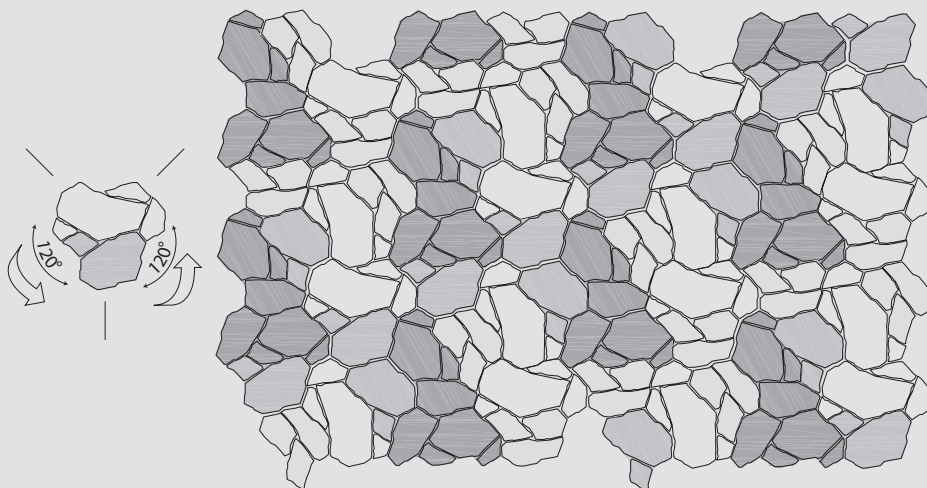
ROSEBEL® SLAB

IF YOU PLACE THEM RANDOMLY, YOU WILL CREATE THREE DIFFERENT TYPES OF PATTERNS:

1ST PATTERN:

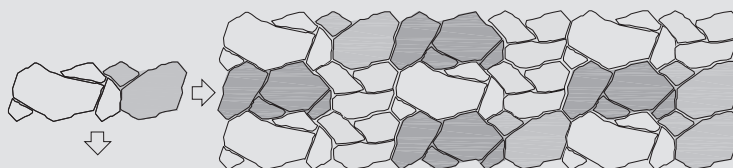
Duos B turned on themselves with a 120° angle (1/3 turn) in one way or the other, then put in place at 30° one from the other. This will give less linear repetition of the joints.

Permacon recommends this installation method.



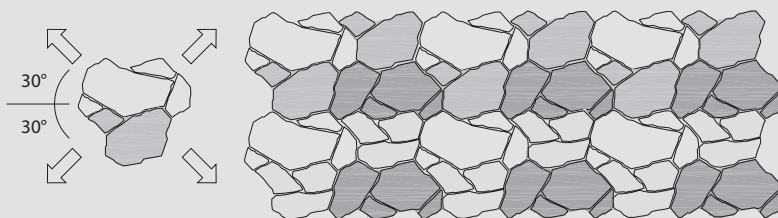
2ND PATTERN:

Install Duos A horizontally an vertically.



3RD PATTERN:

Duos B installed at 30° from each other.



PORTAGE® SLABS

SPECIFIC DETAILS

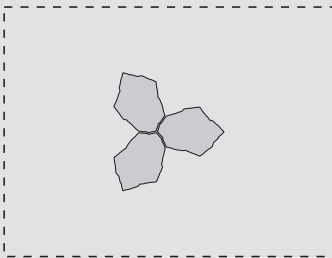
UNITS



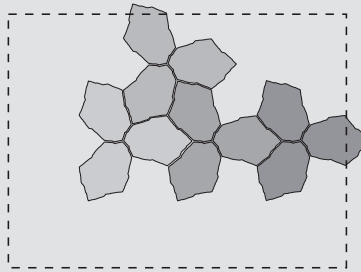
43 mm x 391 mm x 534 mm
1 11/16" x 15 1/2" x 21"



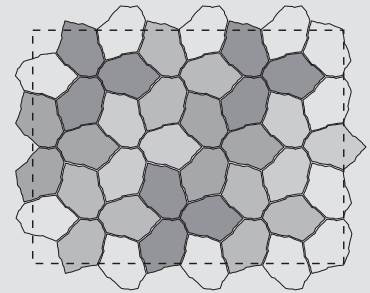
INSTALLATION OF AN IRREGULAR PATIO OR SIDEWALK — WITHOUT CUTTING



STEP 1
Begin by laying 3 slabs at the centre of the surface to be covered. Place 3 slabs together to form a cloverleaf.

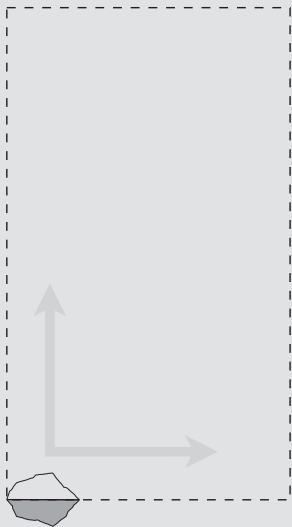


STEP 2
Add more sets of 3 slabs (cloverleaf) to fill in the surface to be covered.

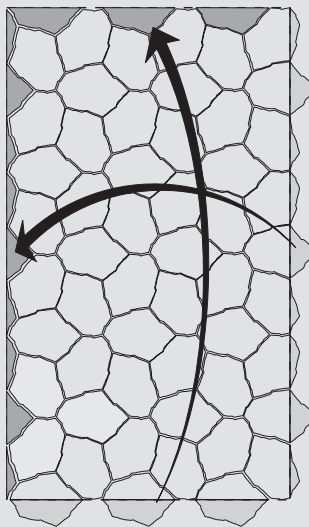


STEP 3
Complete the balance of the surface to be covered with single slabs for the final result.

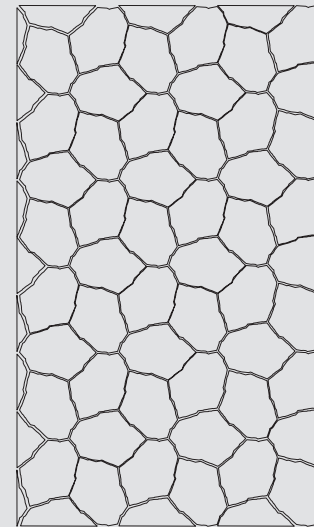
INSTALLATION OF A PATIO OR A SIDEWALK—WITH CUTTING



STEP 1
Begin by laying half a slab at the left-hand side.



STEP 2
Continue by fitting more sets of 3 slabs (cloverleafs) against the others. The cutting will be done when the entire surface has been covered.



STEP 3
Keep the cut-off pieces of slab to fill in the empty spaces. For some width increments of 40" the loss can be limited.

It is also possible to create patios, pathways, sidewalks or stepping stones with wider joints. Use the same technique described above by leaving an average 50 mm (2 inches) space between stones.

LAYING IDEAS TABLE - SLABS

PRODUCTS	LAYING IDEA				
	Edging A	Pathway B	Banding C	Insertion D	Stepping stone E
INFINITI 16 X 16			X		
INFINITI 16 X 24	X		X		X
INFINITI 24 X 24			X		
MELVILLE 60		X			
MEGA-MELVILLE 60			X	X	X
MONDRIAN 50		X			
MONDRIAN 60		X			
MEGA-MONDRIAN 60			X	X	X
LEXA A, B OR C	X		X		X
LEXA MIX A + B + C		X			
PROVENCE		X			
MELVILLE PLANK				X	
PORTAGE		X			X
QUADRAL				X	
VERSAILLES			X		
ROSEBEL					X
CITY A, B OR C	X				X
CITY MIX A+B+C		X			
CASSARA		X			

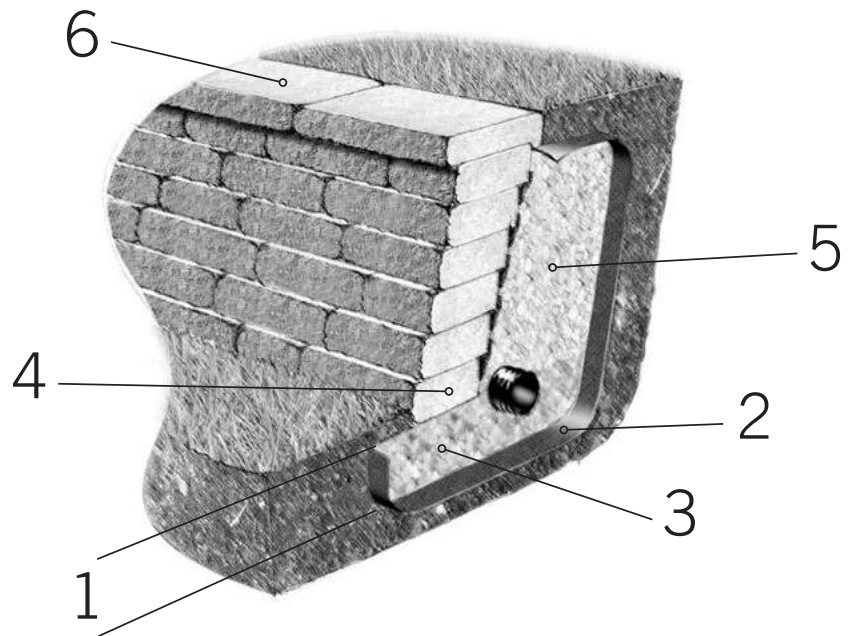
See details of laying ideas, page 188.

WALLS

RETAINING WALLS INSTALLATION GUIDE

TOOLS REQUIRED

- 1 wheelbarrow
- A few pegs
- 1 plumb line
- 1 level
- 1 15 m long (50 ft) bricklayer's line
- 1 shovel
- 1 chalk line
- 1 measuring tape
- 1 broom
- 1 rake
- 1 guillotine or concrete saw
(available from rental stores)
- 1 vibrating plate or jumping jack
(compacting tool available from tool rental stores)



EXCAVATION

- 1.1 Dig a trench. The excavation depth must allow for a granular foundation of a minimum thickness of 150 mm (6"), as well as the buried depth of the first rows of modules of the wall being built. Also calculate that 10% of the total height of the wall (150 mm or 6" minimum) should be buried in the ground. The width of the trench will depend on the type of block selected. You should also leave a space of at least 30 cm (12") at the back of the wall to build a drainage system. (See photo #1).

PREPARATION OF THE BASE

- 2.1 Cover the rear and bottom of the trench with a geotextile membrane to prevent soil from blocking the drainage system (see illustration section). The membrane should project about 300 mm (12") beyond the top of the slope so it can be folded back on the drainage system when in place. The geotextile membrane can sometimes be placed right behind the wall (to be undertaken following step 4).

FOUNDATION

- 3.1 Prepare a 150 mm (6") foundation of 0-20 mm (0-3/4") stone (see photo #2). In the case of clay soils, we strongly recommend increasing the excavation depth. Compact with a jumping jack or vibrating plate (see photo #3). Level the surface.

FIRST ROW

- 4.1 Lay the first row of blocks, level them on the compacted foundation according to your layout (see photo #4). On this foundation, at the back of the wall, install a 100 mm (4") diameter perforated drain and connect it to the existing drainage system. The drain can be wrapped in a geotextile membrane. (See photo #5). The drain should be covered with 20 mm (3/4") clean stone or sand during step 5.

BACKFILLING THE WALL

- 5.1 Fill in the space behind the wall. The backfill can be composed of 20 mm (3/4") clean stone as shown in the illustration section, or of draining sand (see photo #6). The geotextile membrane must be installed at this stage (behind the wall as shown in photo #6 or at the rear of the trench as in the illustration section).

CONSTRUCTION AND COMPLETION OF THE WALL

- 6.1 Lay the next rows and backfill the space at the back (step 5) approximately every 200 mm (8"). (See photos #7 and #8). Use capping modules to top off the wall if available for your selected type of wall (see photos #9 and #10). We recommend using Techniseal concrete adhesive to secure them.

*NOTE : Note: This guide describes the installation of a standard gravity wall of a given maximum height. (Consult the table of wall specifications on page 39 to check the approved height of wall selected). Some walls can be made higher with geogrid reinforcement. Consult a specialized engineer or Permacon's engineering department to find out more on the design specifications for your wall.



01



02



03



04



05



06



07



08



09

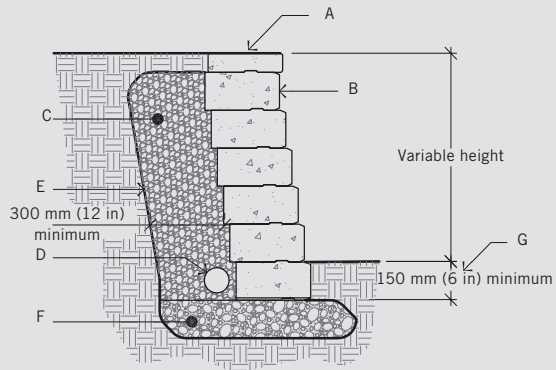


10

TYPICAL CROSS SECTION

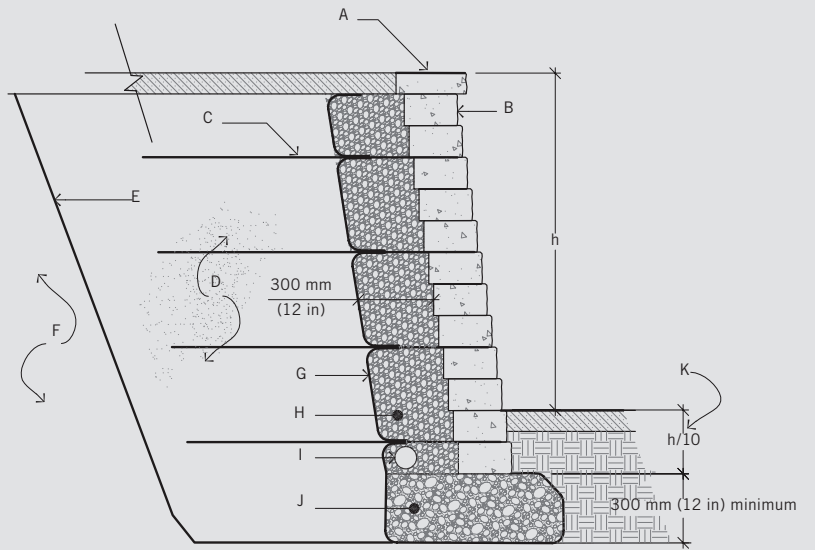
GRAVITY WALL

- A Capping module
- B Block
- C 20 mm (3/4 in.) clean stone
- D Perforated drain 100 mm (4 in.) Ø connected to services
- E Geotextile
- F 0-20 mm (0-3/4 in.) compacted foundation minimum 300 mm (12 in.)
- G Buried depth 150 mm (6 in.)



REINFORCED WALL

- A Capping module
- B Block
- C Typical geogrid (see Permacon technical support department)
- D Compacted reinforced zone, Class A sand
- E Excavation slope
- F Existing soil
- G Geotextile
- H 20 mm (3/4 in.) clean stone
- I Perforated drain 100 mm (4 in.) Ø connected to services
- J 0-20 mm (0-3/4 in.) compacted foundation
- K Minimum buried largest: 200 mm (8 in.) or $h/10$



WALL CHARACTERISTICS

TYPE OF BLOCK	INSTALLATION METHOD	MAXIMUM HEIGHT AT THE TOP OF WALL INCLUDING BURIED MODULE WITHOUT OVERLOAD		MINIMUM POSSIBLE RADIUS		WALL ANGLE	AMOUNT OF BLOCKS REQUIRED	
		Feet	Metres	Feet	Metres	degree	per sq. metre	per sq. foot
Universal* Slope block	Without joints	4.00	1.20	5.0	1.5	15	35	3.2
	50 mm (2 in) joints	3.25	1.00	5.0	1.5	15	28	2.6
	100 mm (4 in) joints	2.75	0.80	5.0	1.5	15	24	2.2
Split-face Universal* Slope block	Without joints	5.0	1.5	5.0	1.5	10	35	3.2
	50 mm (2 in) joints	4.25	1.3	5.0	1.5	10	28	2.6
	100 mm (4 in) joints	3.7	1.1	5.0	1.5	10	24	2.2
Pisa* System	200 mm (8 in) blocks	2.0	0.6	–	–	5	17	1.6
	200 mm (8 in), 300 mm (12 in) and 380 mm (15 in) blocks	5.0	1.5	–	–	5	variable	variable
	200 mm (8 in) and 400 mm (16 in) blocks	5.0	1.5	–	–	5	variable	variable
Grande Wall <small>(see notes 1 and 2)</small>	Units 375, 750 & 1125	8.5	2.6	65	20	0	5	0.46
	Units 375, 750 & 1125	10.5	3.2	65	20	9	5	0.46
	Units 375, 750 & 1125	13.1	4.0	65	20	17	5	0.46
Keystone System <small>(see note 2)</small>	Compact	3.0	0.9	4.0	1.2	0 or 9	22 and/or 11	2 and/or 1
Celtik® wall	Angled wall	3.5	1.1	3.0	0.9	9	variable	variable
	Vertical wall	2.2	0.67	3.0	0.9	0	variable	variable
Tandem system (Lafitt, Melville, Lexa)	Angled wall	3.5	1.1	4.0	1.2	9	variable	variable
	Vertical wall	2.2	0.67	4.0	1.2	0	variable	variable
FS ² System <small>(see note 1)</small>	Angled wall	10.5	3.2	16.0	5.0	7	9	0.83
	Vertical wall	9.2	2.8	16.0	5.0	0	9	0.83
Tandem Next Wall(Lamina)	Angled wall	3.5	1.1	8.0	2.4	3	14	1.3
	Vertical wall	2.2	0.67	8.0	2.4	0	14	1.3

NOTES:

Note 1: The walls can be installed with other height and overload specifications than those above. Specific designs for special project conditions are available from Permacon's technical department. Consult our technical department for details.

Note 2: These products offer you the possibility of building higher walls when combined with a geogrid reinforcement. Contact our technical support department for more details.

Permacon offers technical design services for non-standard walls. Please complete the form and return it to your sales representative.

1 Permacon Group

Date: _____ Region : _____
 Sales person: _____ Project #: _____

2 Information

Company name: _____ Project : _____ Prov. City Com Res.
 Representative: _____
 Telephone #: _____ Metric units Imperial
 Prepared by: _____ Cross-section drawings:
 Signature: _____ Estimates Stamped drawing
 Project title: _____
 Address: _____
 Date information required: _____

3 Basic informations on the wall

Height above ground level: _____
 Length of wall: _____
 Space between blocks: _____
 Soil conditions (refer to #7)
 Reinforced soil: _____
 Retained soil: _____
 Water application? _____
 Design according to MTO/MTQ? _____
 Seismic design? _____

Wall batter (Please check the appropriate blank box)

Blocks 0° 2° 5° 7° 9° 17°
 Grande
 Keystone
 FS² System
 Others

4 Bottom wall conditions

Flat: _____
 or
 Slope: _____
 (Angle or ratio)

Top of wall conditions

Flat: _____ or _____ Slope: _____
 Surcharges: _____ Distance: _____
 Road _____
 Parking _____
 Cycle path _____
 Pool _____
 Other _____

5 Tiered wall

	Height	Distance
Bottom wall	_____	_____
2 nd wall	_____	_____
3 rd wall	_____	_____

6 Geogrid selection

Miragrid of Mirafi
 Stratagrid of Strata
 Tensar of Solmax

7 Type of soil

<input type="checkbox"/> MG-56 (0-2 1/2)	<input type="checkbox"/> Silt
<input type="checkbox"/> MG-20 (0-3/4)	<input type="checkbox"/> Silt & clay
<input type="checkbox"/> Grade A sand	<input type="checkbox"/> Clay
<input type="checkbox"/> Silty sand	<input type="checkbox"/> Clay sand
<input type="checkbox"/> Mix of sand, silt and clay	



WALL INDEX

TANDEM NEXT SYSTEM 43
TANDEM SYSTEM 64
CELTIK SYSTEM. 127
FS² SYSTEM. 142
GRANDE WALL 166
KEYSTONE SYSTEM. 167
PISA SYSTEM 168
SPLIT-FACE UNIVERSAL* SLOPE BLOCK 169

PACKAGING

For product packaging information, please refer to our Landscape product data sheet.

SYSTEM ELEMENTS

180 mm STRUCTURAL TANDEM NEXT UNITS



A. 180 mm x 201 mm x 201 mm
7 1/8" x 7 7/8" x 7 7/8"

180 mm LAMINA TANDEM NEXT VENEER UNITS



A. 180 mm Veneer unit
180 mm x 67 mm x 402 mm
7 1/16" x 2 5/8" x 15 13/16"



C. 180 mm Veneer unit
180 mm x 67 mm x 536 mm
7 1/16" x 2 5/8" x 21 1/8"



B. 180 mm Veneer unit
180 mm x 67 mm x 469 mm
7 1/16" x 2 5/8" x 18 1/2"

CASCADE TANDEM NEXT VENEER UNITS



A. 180 mm Veneer unit
180 mm x 67 mm x 603 mm
7 1/16" x 2 5/8" x 23 3/4"

SYSTEM ELEMENTS



**MELVILLE TANDEM
STRAIGHT CAPPING UNIT**
60 mm × 305 mm × 600 mm
2 3/8" × 12" × 23 5/8"



MELVILLE TANDEM STEP UNIT
60 mm × 400 mm × 600 mm
2 3/8" × 15 3/4" × 23 5/8"



STARTER UNIT
90 mm × 200 mm × 400 mm
3 9/16" × 7 7/8" × 15 3/4"



LAFITT PILLAR CAPPING UNIT 24" X 24"
83 mm × 610 mm × 610 mm
3 1/4" × 24" × 24"

UNIVERSAL CONNECTOR TANDEM NEXT



180 mm LAFITT TANDEM VENEER UNITS



E – 180 mm VENEER UNIT
180 mm × 67 mm × 335 mm
7 1/16" × 2 5/8" × 13 3/16"



F – 180 mm VENEER UNIT
180 mm × 67 mm × 402 mm
7 1/16" × 2 5/8" × 15 13/16"



G – 180 mm VENEER UNIT
180 mm × 67 mm × 469 mm
7 1/16" × 2 5/8" × 18 1/2"

180 mm MELVILLE TANDEM VENEER UNITS



E – 180 mm VENEER UNIT
180 mm × 67 mm × 335 mm
7 1/16" × 2 5/8" × 13 3/16"



F – 180 mm VENEER UNIT
180 mm × 67 mm × 402 mm
7 1/16" × 2 5/8" × 15 13/16"



G – 180 mm VENEER UNIT
180 mm × 67 mm × 469 mm
7 1/16" × 2 5/8" × 18 1/2"

180 mm LEXA TANDEM VENEER UNITS



E – 180 mm Veneer UNIT
180 mm × 67 mm × 335 mm
7 1/16" × 2 5/8" × 13 3/16"



F – 180 mm Veneer UNIT
180 mm × 67 mm × 402 mm
7 1/16" × 2 5/8" × 15 13/16"



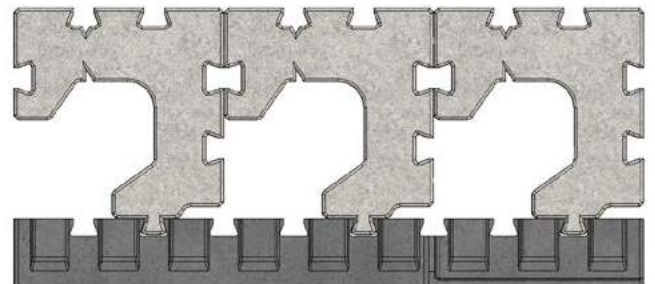
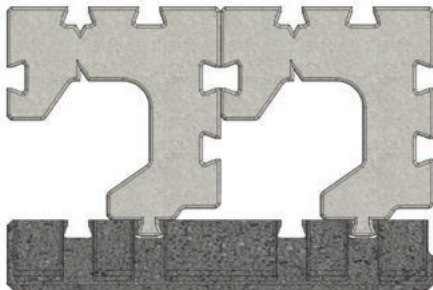
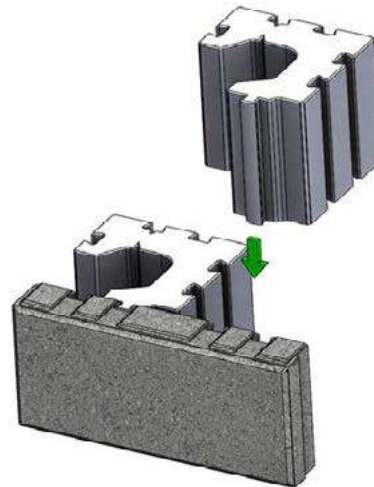
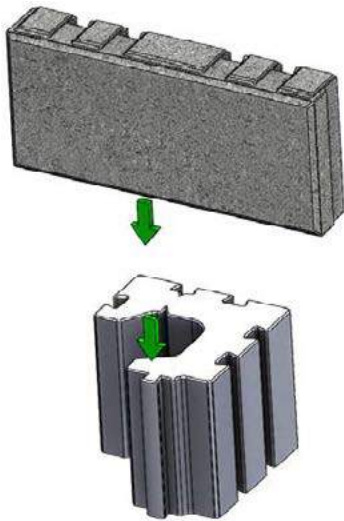
G – 180 mm Veneer UNIT
180 mm × 67 mm × 469 mm
7 1/16" × 2 5/8" × 18 1/2"

TANDEM® NEXT SYSTEM

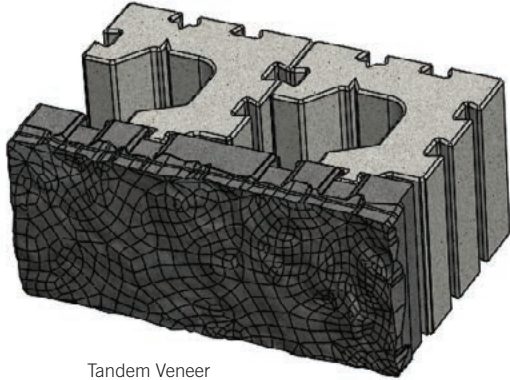
DESCRIPTION

The new Tandem Next 180 mm wall system allows the creation of retaining walls, double-sided walls, columns and stairs.

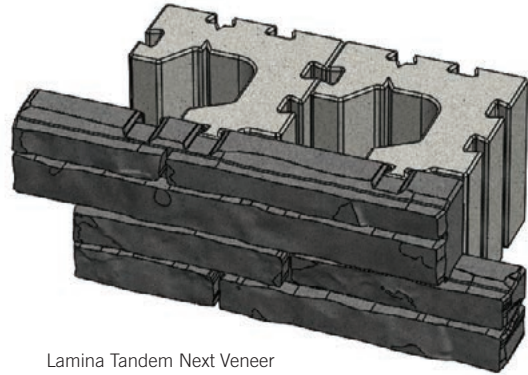
It applies the principle of interlocking a veneer unit into a structural unit with a dovetail joint (tenon and mortise or interlocking male/female system). Each structural unit has a vertical tenon (male side) and each veneer unit has at least two mortises (female side). The veneer units are joined to the structural units by simply sliding their tenon into the mortises to form the Tandem Next units.



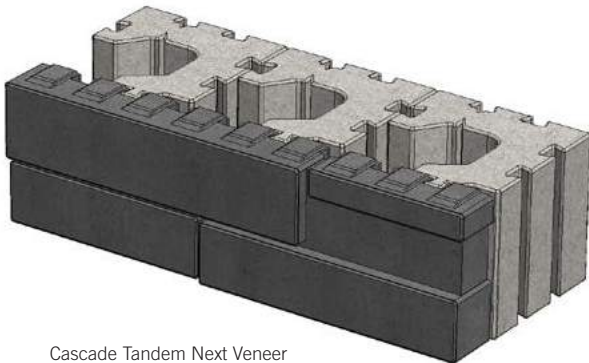
Several types of 180 mm veneers can be used with this system: The 180 mm veneers of the Tandem system (Lafitt, Melville & Lexa) and the Lamina and Cascade Tandem Next 180 Veneer (new in 2018) .



Tandem Veneer
(Lafitt, Melville, Lexa)



Lamina Tandem Next Veneer



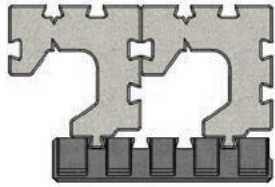
Cascade Tandem Next Veneer

ASSEMBLY

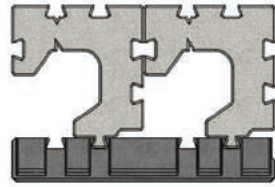
Assembly of Tandem Next elements always requires the use of two structural units for one veneer unit, when using Melville, Lafitt, Lexa Tandem and Lamina Tandem Next products. The use of three structural

units for one Cascade Tandem Next Veneer module. The structural units obviously must be positioned so that the tenons are always located behind a veneer unit.

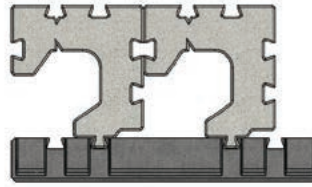
Tandem Next wall with Tandem system Veneer (Lafitt, Melville, Lexa)



With Veneer E

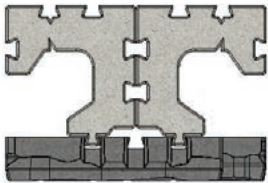


With Veneer F

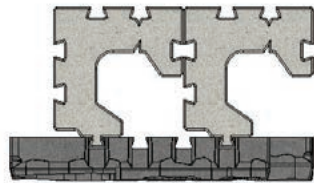


With Veneer G

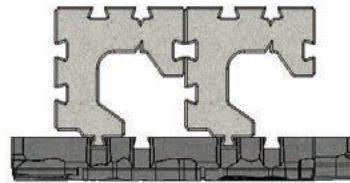
Lamina Tandem Next wall



Veneer A



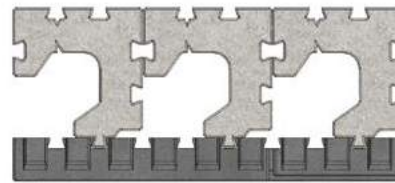
Veneer B



Veneer C

The structural units are reversible and the back can be oriented to the left or right depending on the veneer format used. It is recommended to place the structural units in the mortises farthest from a veneer whenever possible.

Cascade Tandem Next wall



Cascade Veneer

Lamina Tandem Next units assembly

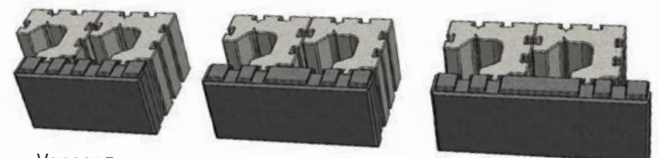


Veneer A

Veneer B

Veneer C

Tandem Next units assembly with Tandem Veneer (Lafitt, Melville, Lexa)



Veneer E

Veneer F

Veneer G

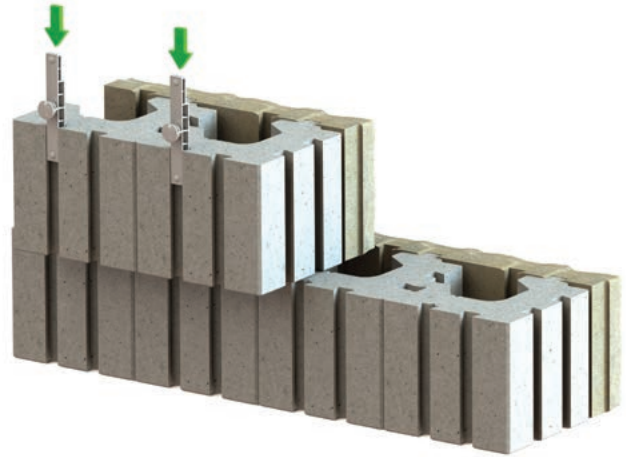
Cascade Tandem Next units assembly



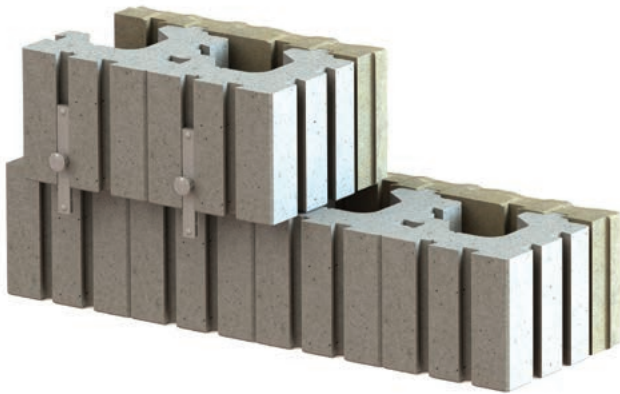
SLOPE OF THE WALL

The Tandem Next wall system allows construction of vertical or sloped walls using the universal connector specially designed for this purpose. This connector is inserted in one of the two grooves located on the back of the structural units. The connectors are slid from the top of the grooves until they overlap the structure unit located below by a few centimetres. In general, one universal anchor is required for each structural unit.

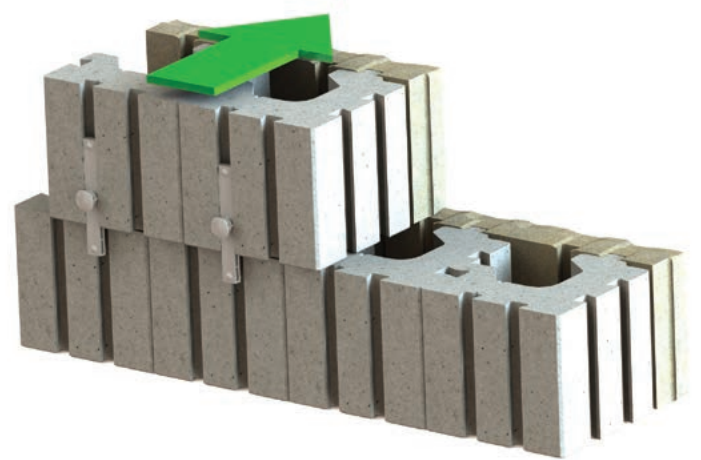
To build a sloped wall, the connector must be placed as shown in the drawing. Simply push the Tandem Next unit forward until the connector locks it. This will form a setback of about 9 mm relative to the lower unit.



1. Slide the universal connector as follow (one connector per unit)

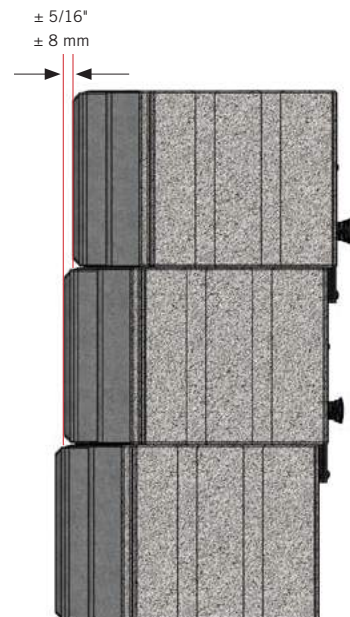


2. Exceed the lower part of the connector with the unit underneath



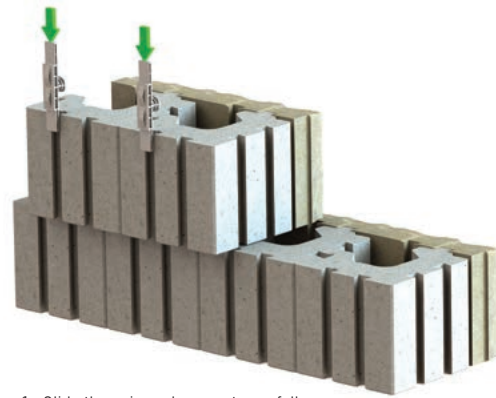
3. Push the unit forward until it locks

UNIVERSAL CONNECTOR

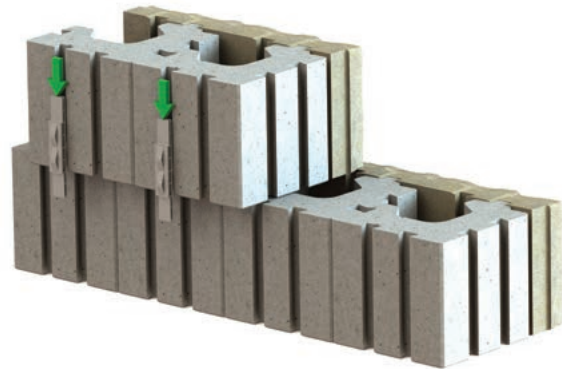


VERTICAL WALL

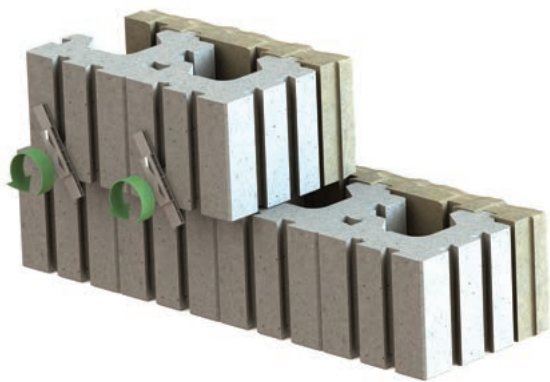
A vertical wall applies the same principle as a sloped wall, with the difference that the universal connector is simply turned 180 degrees (See the drawing). After insertion in a groove as far as the overlap with the unit underneath, the connector slopes slightly relative to the vertical. The Tandem Next unit then is pushed forward until it locks, to create a vertical wall.



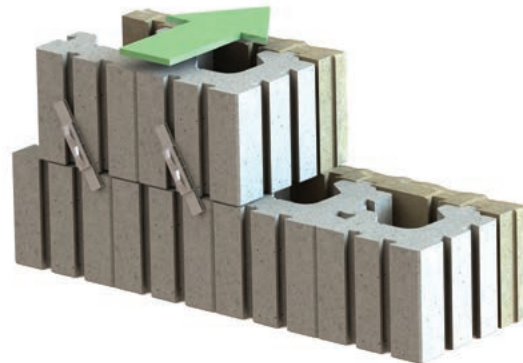
1. Slide the universal connector as follow (one connector per unit)



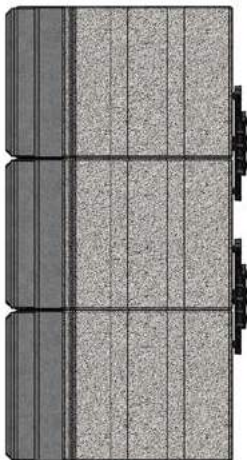
2. Exceed the lower part of the connector with the unit underneath



3. Rotate slightly the universal connector



4. Push the unit forward until it locks

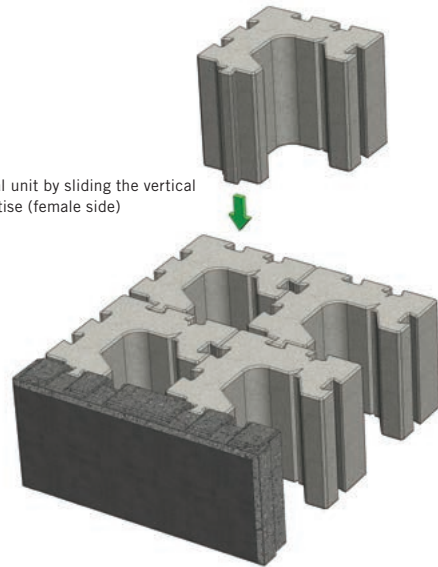


REINFORCING WALLS

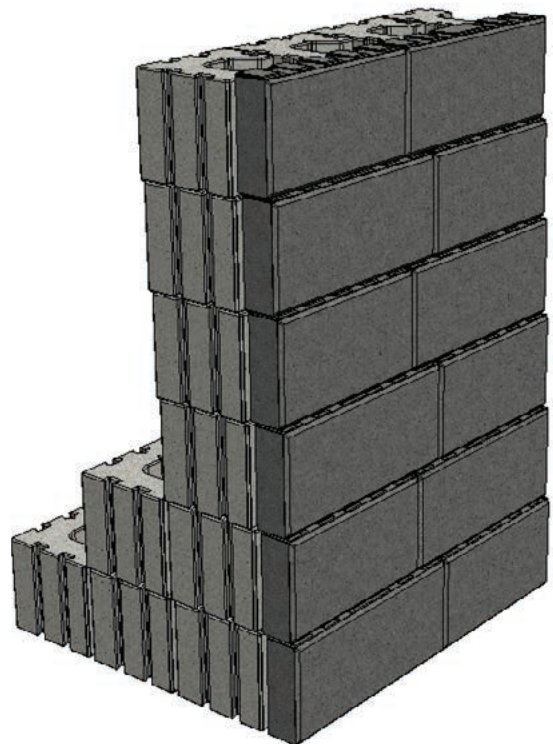
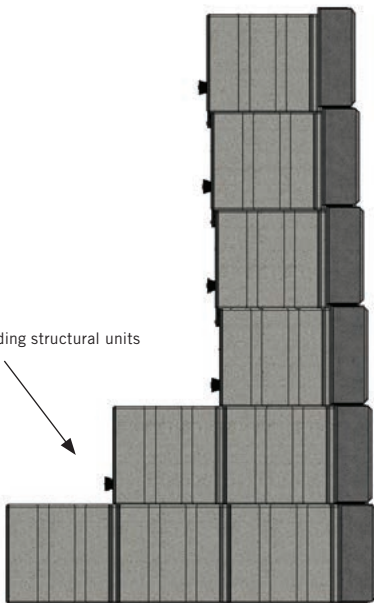
The maximum above-ground height of a Tandem Next retaining wall is 900 mm (36 in.) for a sloped wall and 560 mm (22 in.) for a vertical wall. A portion of the wall at least 150 mm (6 in.) high must be buried in the ground to ensure its stability.

The flexibility of the Tandem Next system allows interconnection of structural units by using Tandem Next universal connectors. This has the advantage of being able to build stronger walls by adding units in the back.

1. Install an additional structural unit by sliding the vertical tenon (male side) in the mortise (female side)

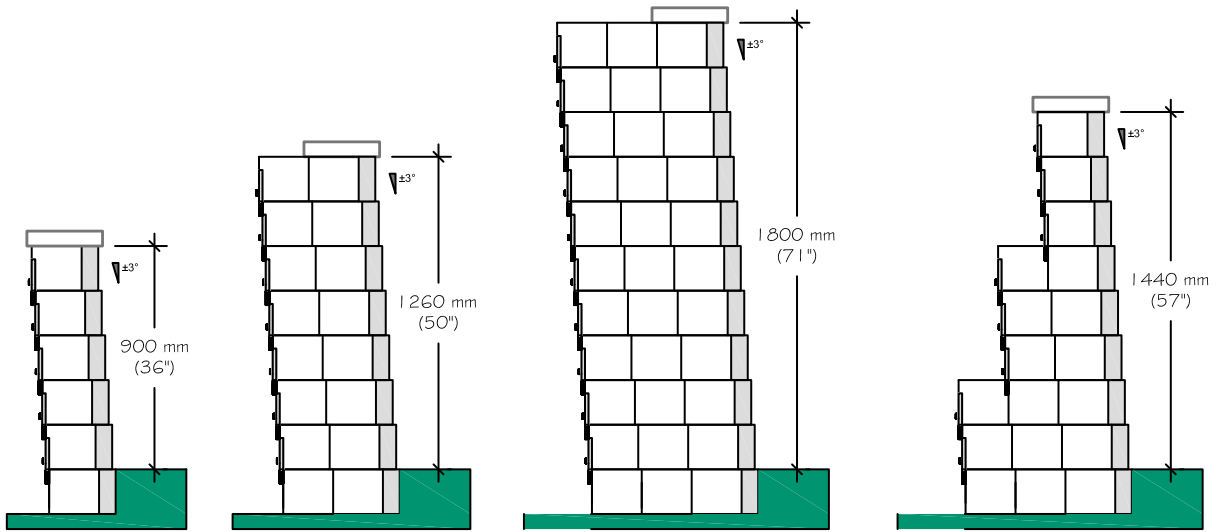


2. Stronger wall by adding structural units

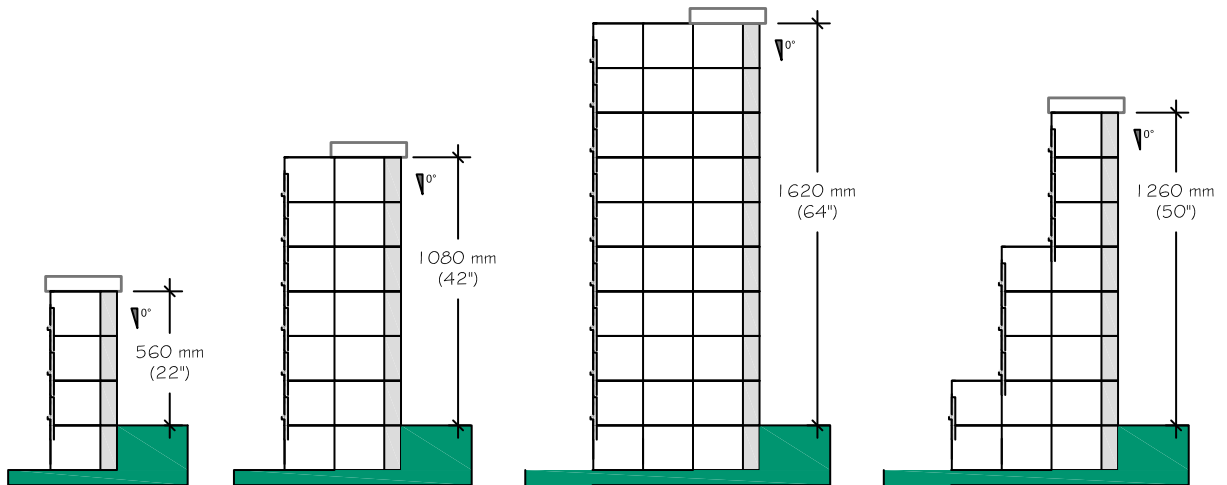


TANDEM NEXT WALL MAXIMUM HEIGHT

SLOPED TANDEM NEXT WALL



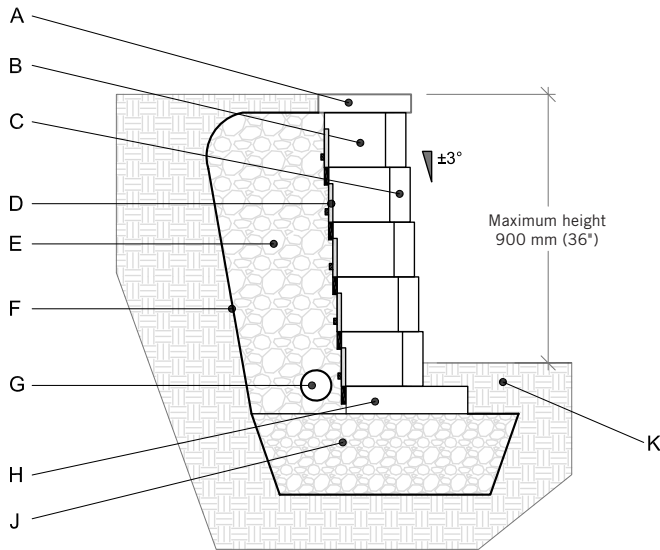
VERTICAL TANDEM NEXT WALL



CROSS-SECTION

Here we present the general typical construction cross-section of a Tandem Next wall. The width of a Tandem Next retaining wall is 268 mm (10 1/2 in.).

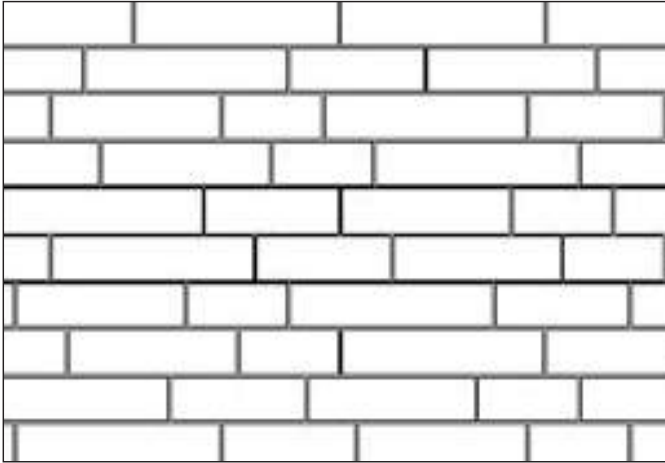
Tandem Next Retaining Wall Typical Cross-section with inclination



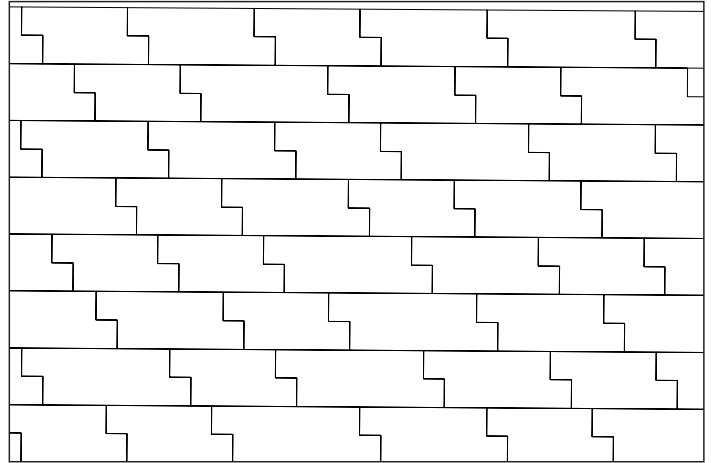
- A Melville Tandem capping unit
60 mm x 305 mm x 600 mm (2 3/8" x 12" x 23 5/8")
- B Tandem Next Wall, structural unit (180 mm x 201 mm x 201 mm)
with clear crushed stone 20 mm (3/4")
- C 180 mm Veneer unit
(Lamina or cascade Tandem Next or Tandem system)
- D Universal connectors Tandem Next
- E Clear stone 20 mm (3/4") 300 mm minimum
- F Geotextile membrane
- G Minimum 100 mm Ø (4") perforated drain pipe connected to sewer services
- H Starter unit 90 mm x 200 mm x 400 mm (3.5" x 7.88" x 15.75")
(the widest sides side by side)
- J Compacted granular foundation 0-20 mm (0-3/4") 300 mm (12") minimum
- K Buried depth of 150 mm (6")

LAYING PATTERNS

Linear Pattern
100% Tandem 180 units (Lafitt, Melville, Lexa)

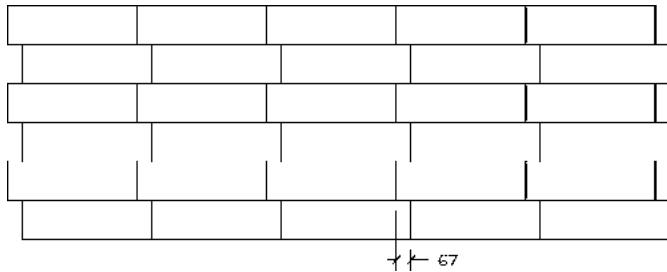
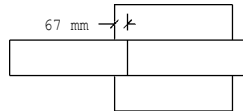


Linear Pattern
100% Lamina Tandem Next units



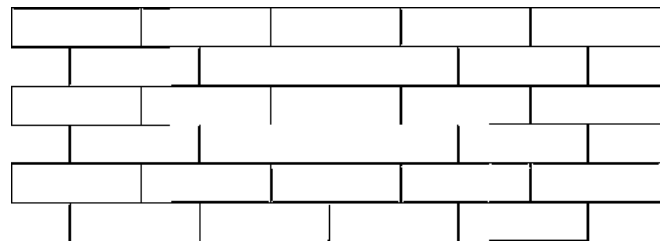
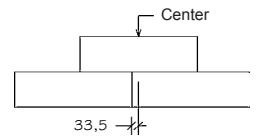
Linear Pattern
100% Cascade Tandem Next units

Stack bond with 67 mm offset
(every second row)



Linear Pattern
100% Cascade Tandem Next units

Running bond with 33.5 mm offset



CONSTRUCTION OF A TANDEM NEXT RETAINING WALL

STRAIGHT WALL

The construction of a Tandem Next wall begins with the placement of the starter units installed side by side (the longest side).

Install a first row of structural units at random on the starter units, using all the formats in equal proportions and following the indications for the typical cross-section. Then insert the veneer units in the structural units as described previously, and provide for the placement of the universal

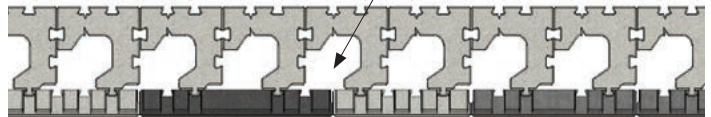
connectors depending on the chosen slope of the wall. The next rows are installed in the same way, avoiding alignment of the vertical joints of one row to another.

Clean stone must be installed behind the structural units. It is also recommended to install clean stone in the empty spaces of the structural units.

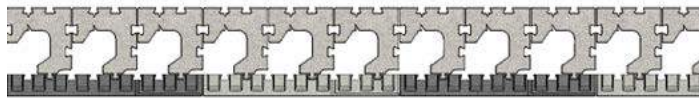


With Lamina Tandem Next

Fill the empty space with 20 mm (¾") clean stone



With Melville / Lexa / Lafitt Tandem

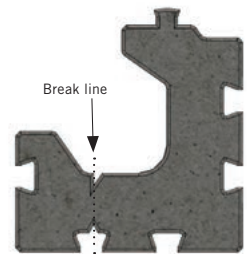


With Cascade Tandem Next

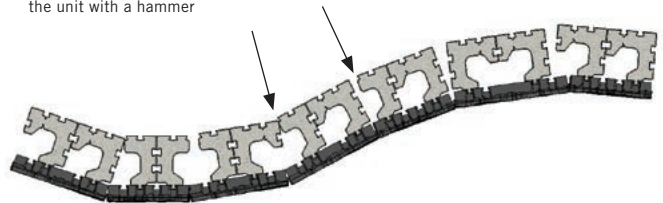
CURVED WALL

The construction of a Tandem Next curved wall begins with the placement of the starter units installed side by side (the longest side), bevelling the units to form the required curve.

Building a concave or convex curved walls is possible with the Tandem Next system. The use of smaller veneer units allows reduction of the bending radius. The back part of the structural units sometimes must be cut as illustrated to create the bevelled elements necessary for the construction of curved walls. The minimum bending radius of a Tandem Next wall is 2.4 m (8 feet).

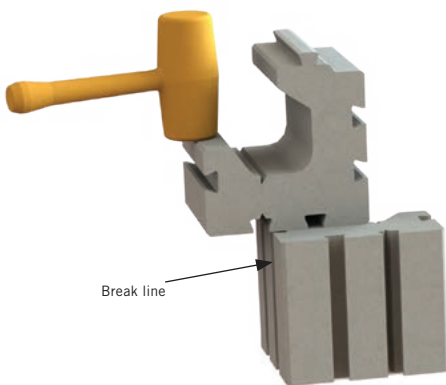


To close a concave curve, break the end of the unit with a hammer



Note

To create a curved wall, only Tandem and Lamina Tandem Next Veneers can be used.



Break line

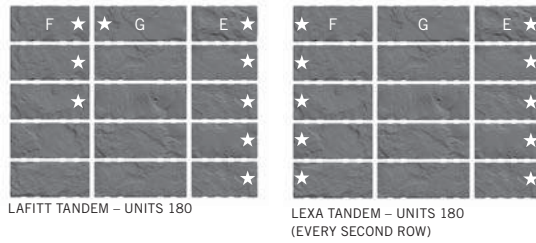


BUILDING A 90° OUTER CORNER

It is recommended to always begin a wall with a corner. A 90° outer corner is produced by using the veneers specially designed for this purpose, depending on the chosen type of veneer. The veneer units all contain integrated corners, but in different proportions depending on the chosen type of veneer.

A Lafitt Tandem 180 veneer cube contains 8 units with one 90° corner side per row. The Lexa Tandem 180 corner Veneers are limited to units E and F only. All the Melville Tandem 180 veneer units, the Lamina Tandem Next Veneer units and the Cascade Tandem Next Veneer units contain one corner side.

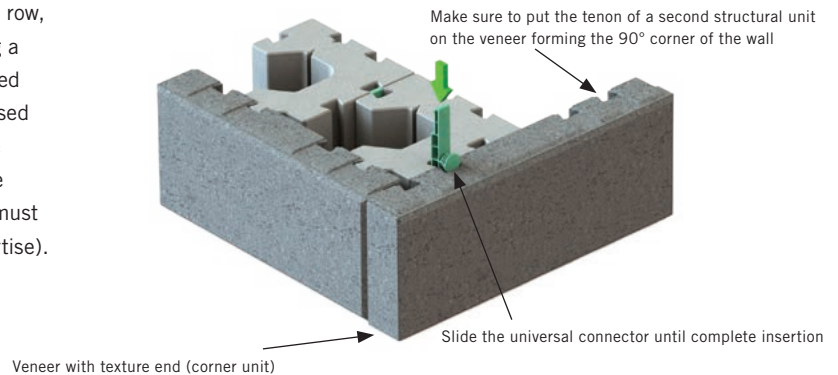
Stacking position on pallets (with a textured end)



90° CORNER WALL PRINCIPLE

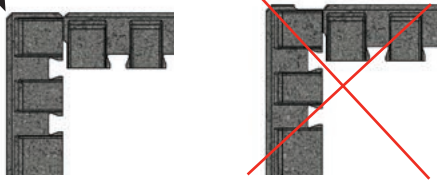
The veneer units are reversible to form left or right corners. For each row, the veneer that forms the corner is affixed to the structural unit using a Tandem Next universal anchor. The position of the veneer is alternated 90° from one row to the next. We recommend gluing the elements used to make the corner of each row, using concrete adhesive. Spread the adhesive on the veneer units or the structural units or both. Only one universal anchor per row is required to form a corner. Long veneers must be affixed to the structural unit following the corner (tenons and mortise).

It is possible to add other structural units in the corners of a wall to strengthen it, if required.

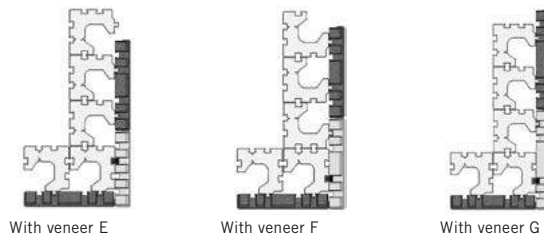


BUILDING AN OUTER 90° CORNER WITH TANDEM VENEER (MELVILLE, LAFITT, LEXA)

Always use veneers with texture end (corner unit) to build a corner

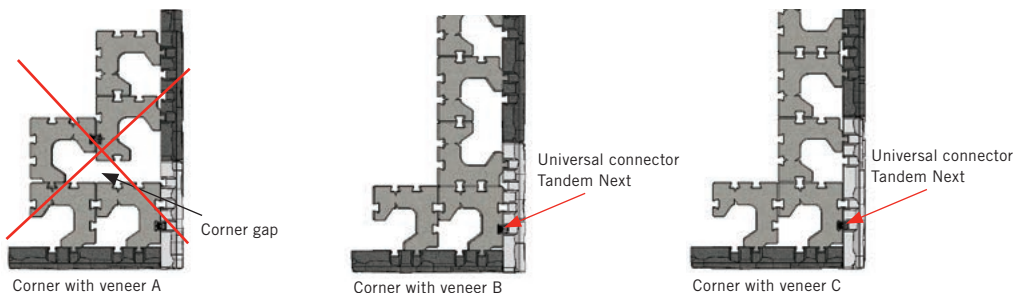


Make sure to put the tenon of a second structural unit on the veneer forming the 90° corner of the wall

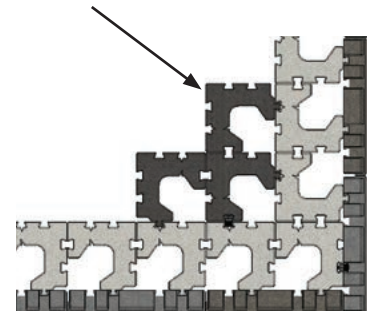


BUILDING AN OUTER 90° CORNER WITH LAMINA TANDEM NEXT VENEER

Do not use the small Lamina Veneer (A) to build a corner



You can install additional structural units to reinforced the corner



CONSTRUCTION OF 90° OUTER CORNER WITH CASCADE TANDEM NEXT VENEER



CONSTRUCTION OF 90° CORNER WITH CASCADE TANDEM NEXT VENEER

A 90° outer corner with Cascade Tandem Next Veneers can be made in two installation options:

- Installation with 67 mm offset, every second rows (cut-off method)
- Running bond installation with 33.5 mm offset. This method will require a 10 ½ " (268 mm) cut veneer every second row

CASCADE TANDEM NEXT WALL, 90° OUTER CORNER, OPTION A (CUT-OFF METHOD)

Stack bond pattern with 67 mm offset, every second row



90° outer Corner

CASCADE TANDEM NEXT WALL, 90° OUTER CORNER, OPTION B (CUT METHOD)

Running bond laying pattern with 33.5 mm offset

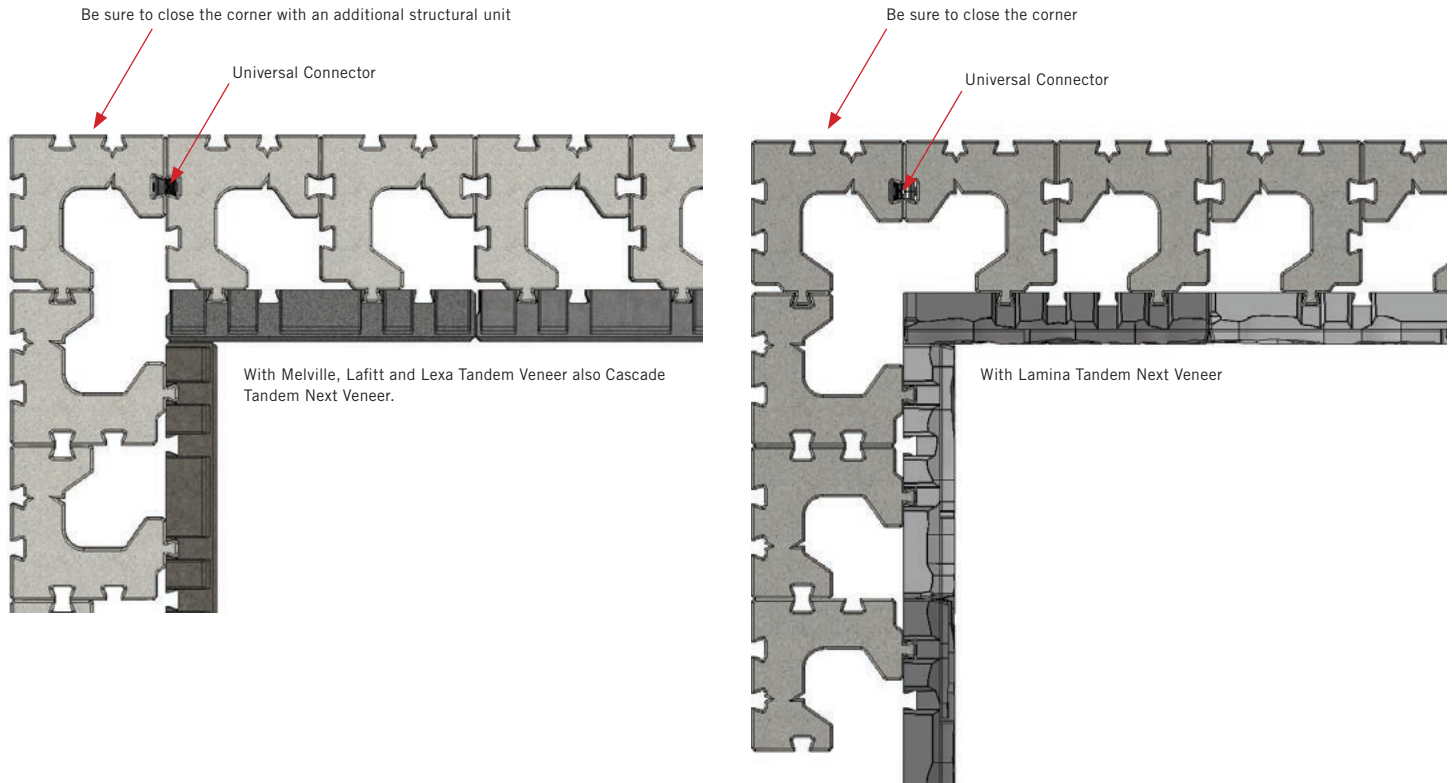


268 mm
(10 ½")
Cut unit every
second Row

90° outer Corner

BUILDING A 90° INNER CORNER

Building an inner corner is based on the principle illustrated opposite. The solidity of an inner corner is assured by the placement of a structural unit forming the back corner of the wall. This additional unit is anchored to the others with a Tandem Next universal connector.



TANDEM NEXT RETAINING WALL CAPPING

Tandem Next retaining walls can be capped with different types of products:

- Melville Tandem 60 capping module
- Lafitt Tandem 90 capping module
- Celtik Plus Straight 90 capping module and Celtik Bevelled 90 capping module
- City Buffed capping module

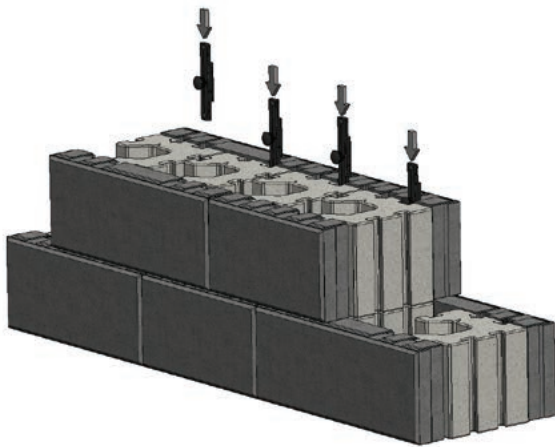
The capping modules must be glued to the last row of units, using an appropriate concrete adhesive. For the curved parts, certain elements must be bevelled to follow the curve of the wall.

TANDEM NEXT DOUBLE-SIDED WALL

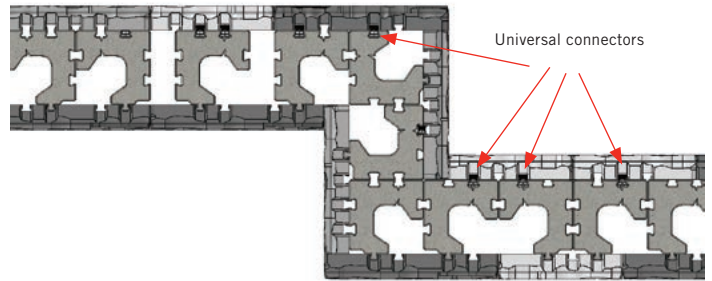
A double-sided wall is built without a slope and thus is vertical.

Installation of a Tandem Next double-sided wall requires the use of veneer units, which are affixed to each side of the Tandem Next structural units. The basic principle is to build a Tandem Next wall and add veneer units in the back, affixing them with Tandem Next universal connectors in the vertical position. The outer corners of a double-sided wall must be built by using corner veneer units. The flexibility of the Tandem Next system is based on the fact that the structural units can be positioned in several ways, ensuring that each veneer can be affixed to them by tenons or by universal connectors.

TANDEM NEXT DOUBLE FACE WALL WITH TANDEM VENEER (MELVILLE, LAFITT, LEXA) AND CASCADE TANDEM NEXT VENEER



Slide the universal connector with complete insertion (always have two connectors per veneer)

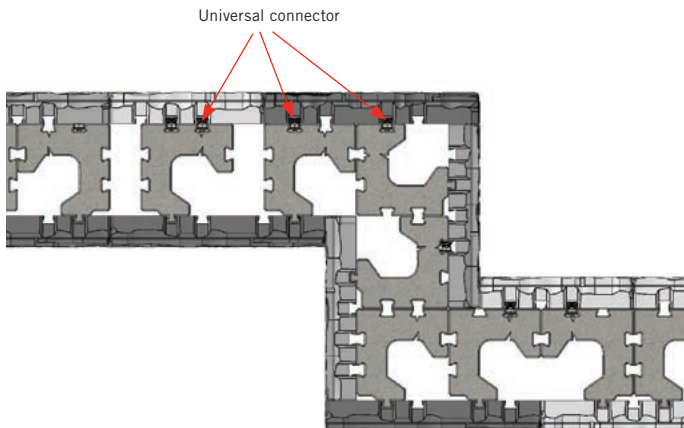


Universal connectors

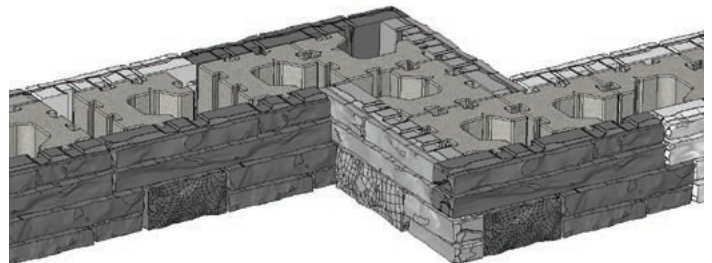
Note

Some Cascade Tandem Next Veneer units will have to be cut with a pitch of 67 mm for perfect insertion.

TANDEM NEXT DOUBLE FACE WALL WITH LAMINA TANDEM NEXT VENEER

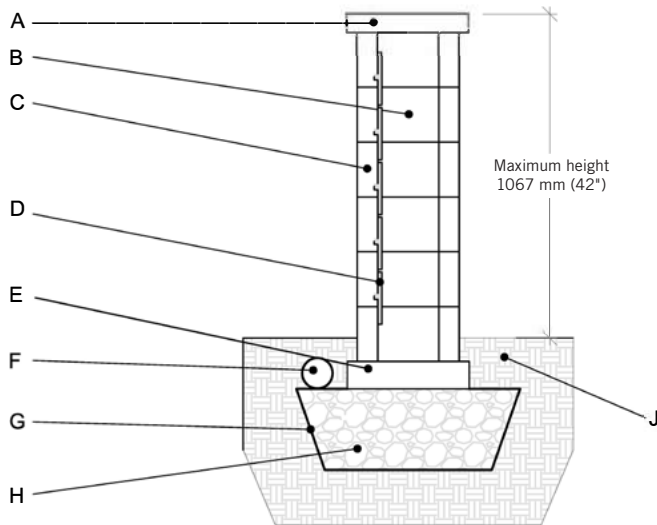


Universal connector



DOUBLE-SIDED TANDEM NEXT WALL – CROSS-SECTION

A typical cross-section of a double-sided wall is shown here. A Tandem Next double-sided wall rests on a first base course made with starter units installed side by side (the longest side). The units are placed at random, avoiding alignment of the vertical joints of one row to another. It is essential to glue each row together (including the base course), using concrete adhesive. Spread the adhesive on the veneer units or the structural units or both.



- A Melville Tandem Wall Step Unit
60 mm x 400 mm x 600 mm (2 3/8" x 15 3/4" x 23 5/8")
- B Tandem Next Wall structural unit 180 mm x 201 mm x 201 mm
with clear crushed stone 20 mm (3/4")
- C 180 mm veneer unit
(Lamina or Cascade Tandem Next or Tandem system)
- D Universal Connectors Tandem Next
- E Starter unit 90 mm x 200 mm x 400 mm (3.5" x 7.88" x 15.75")
- F 100 mm Ø (4") perforated drain pipe connected to sewer services
- G Geotextile membrane
- H Compacted granular foundation 0-20 mm (0-3/4"), min 300 mm (12")
- J Minimum buried depth of 150 mm (6")

TANDEM NEXT DOUBLE-SIDED WALL END

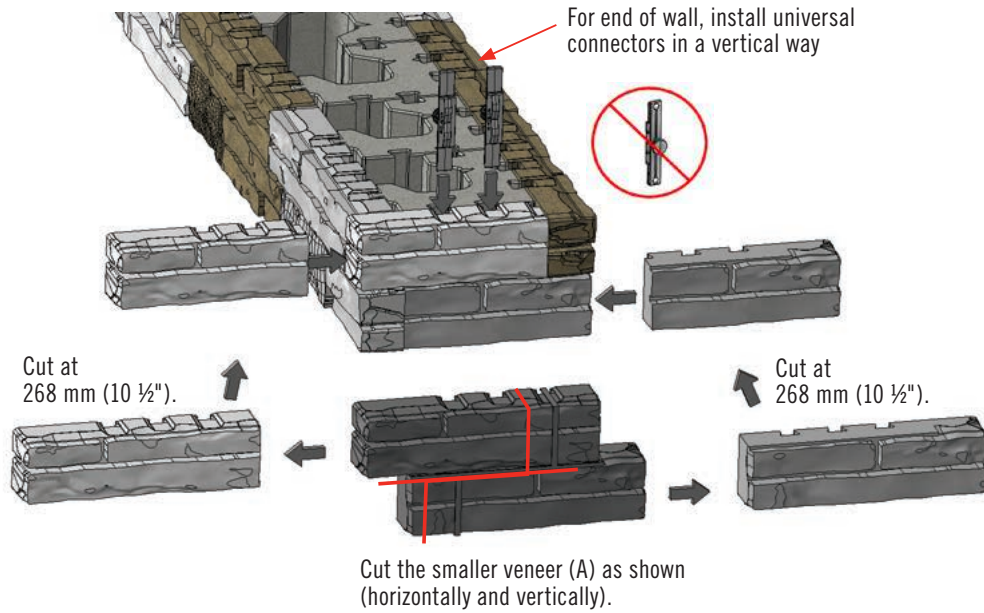
The construction details of a double-sided wall end are shown here. The veneer units must be cut to 268 mm (10 1/2 in.) to allow their installation. Only the smallest veneer unit must be used to finish a double-sided wall (unit A for Lamina Tandem Next and unit E for Tandem Veneers). It will be necessary to use two universal anchors to affix these elements. It is suggested to use concrete adhesive to glue together the elements forming the end of a wall, at each row.

The width of a Tandem Next double-sided wall is 335 mm (13 3/16 in.) and its maximum above-ground height is 1067 mm (42 in.).

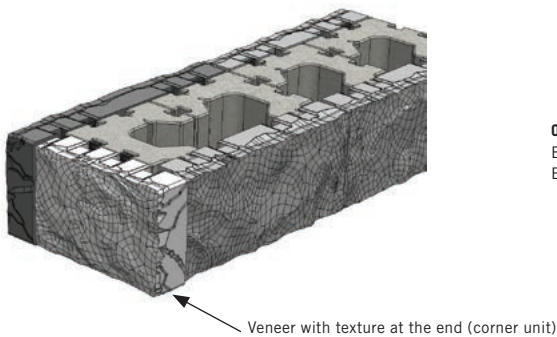
Tandem Next double-sided wall capping

Tandem Next double-sided walls can be capped with different types of products: the Melville Tandem 60 step, the Melville Tandem 90 step and the City 60 or 80 step (buffed).

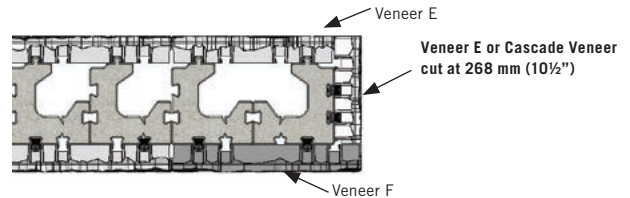
END OF WALL WITH LAMINA TANDEM NEXT:



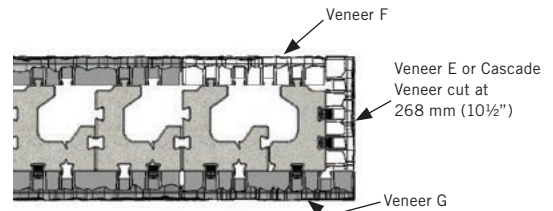
END OF WALL WITH TANDEM SYSTEM (LAFITT, MELVILLE, LEXA, OR CASCADE TANDEM NEXT):



Option 1
End of wall with veneers E and F



Option 2
End of wall with Veneers F and G



TANDEM NEXT COLUMN

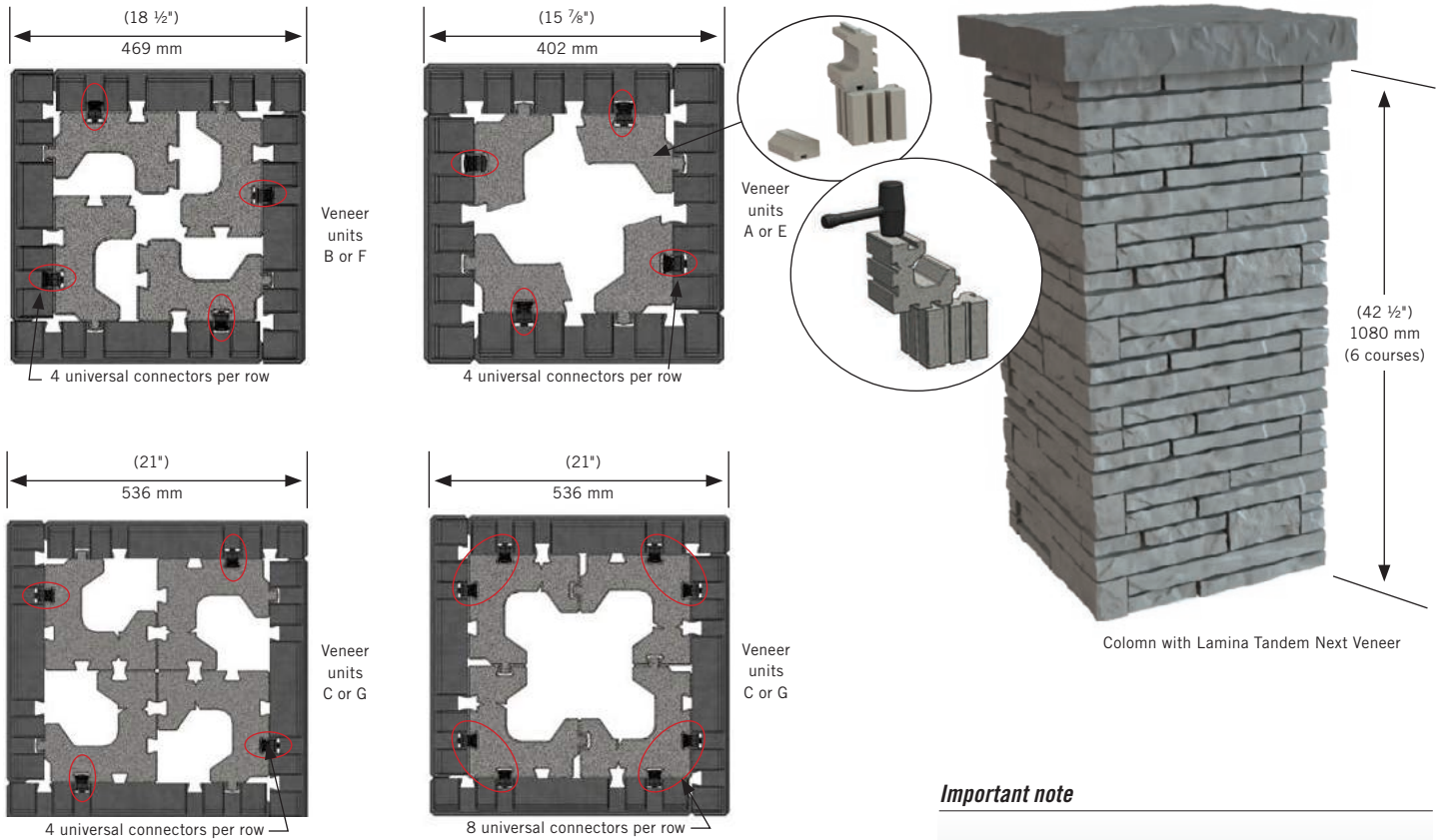
Columns can be built with the Tandem Next system. The veneer units are secured to the structural units with their tenon and with universal connectors. It is possible to create a space in the centre of the column so that a post can be inserted. However, this post must not be structural (for example, the post can serve as a lamppost). Four column formats are possible:

- 402 mm x 402 mm (15 $\frac{7}{8}$ in x 15 $\frac{7}{8}$ in)
- 469 mm x 469 mm (18 $\frac{1}{2}$ in x 18 $\frac{1}{2}$ in)
- 536 mm x 536 mm (21 in x 21 $\frac{3}{8}$ in)
- 670 mm x 670 mm (26 $\frac{3}{8}$ in x 26 $\frac{3}{8}$ in)

A Tandem Next doubled-sided wall rests on a first base course made with starter units. We here propose five types of construction of columns in different formats. This type of construction requires the creation of 90° corners. The position of the veneer is alternated by 90° from one row to another. It is essential to glue each row together (including the base course), using concrete adhesive. Spread the adhesive on the veneer units or the structural units or both. **The construction of Tandem Next columns will require that only units with the same format be used. This will leave surpluses in the other formats on the same pallet.**

The smallest column formats require cutting of the structural units (see drawings). To increase the overall solidity of a column, it is possible to install universal connectors at the centre of a column 536 mm x 536 mm (21 in. x 21 in.) that joins the four structural units. The empty spaces at the centre of the column must be filled with clean stone. The maximum height of a column is limited to 1080 mm (42 $\frac{1}{2}$ in.), which includes a portion buried in the ground of at least 150 mm (6 in.). The capping of 469 mm x 469 mm (18 $\frac{1}{2}$ " x 18 $\frac{1}{2}$ ") and 536 mm x 536 mm (21" x 21") columns can be achieved by using the Lafitt 24" x 24" column capping, by gluing it over the last row with a Techniseal concrete adhesive. The other column formats are provided by a natural stone where an assembled element has dimensions that are adapted to the format of the column.

MELVILLE TANDEM AND LAMINA TANDEM NEXT COLUMN

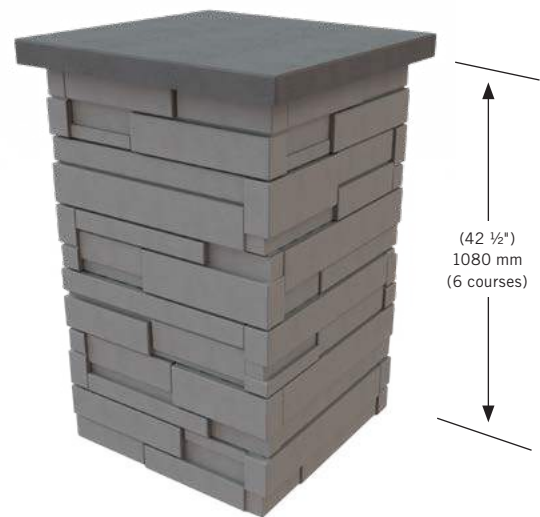
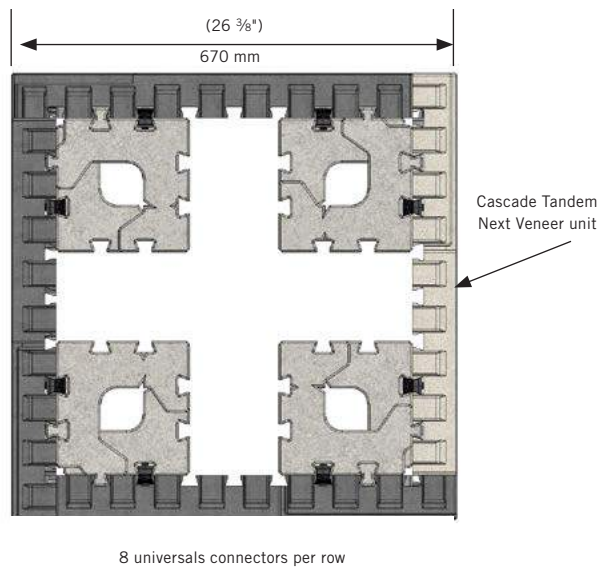


Note: Structural units can be linked together with universal connectors at the center to increase the strength of the column.

Important note

We recommend using only Melville Tandem, Lamina Tandem Next and Cascade Tandem Next Veneers to build columns.

CASCADE TANDEM NEXT COLUMN

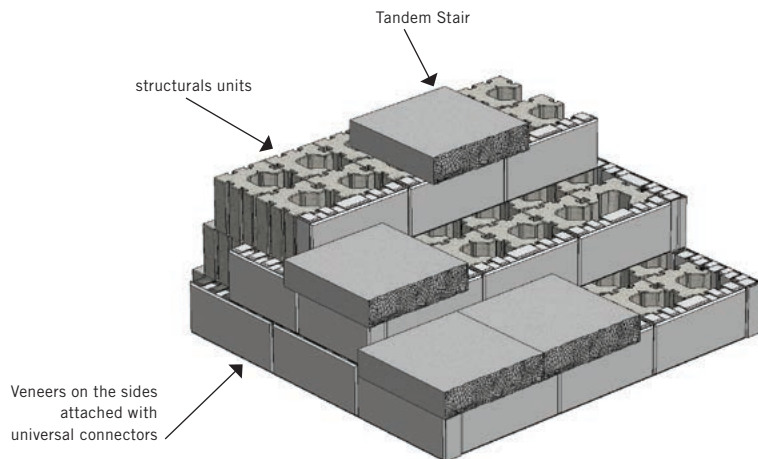
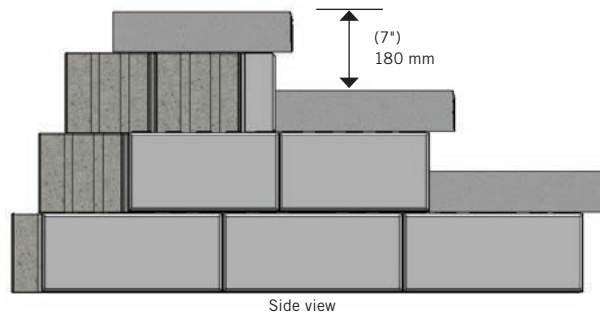
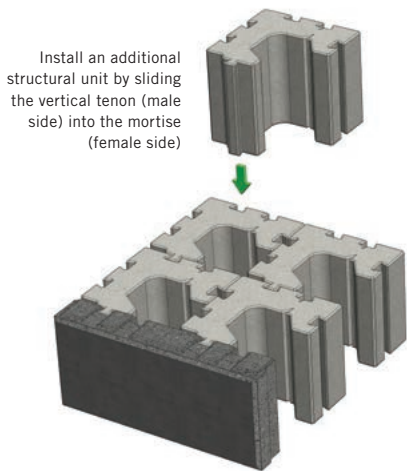


Column with Cascade Tandem Next Veneer

BUILDING OF STAIRS

BUILDING OF TANDEM NEXT STAIRS

The Tandem Next system allows the building of stairs. The construction of Tandem Next landings at each level of the stairs ensure maximum stability of the entire structure. We show the basic principle here.



Note

Melville, Lafitt and Lexa Tandem Veneers and also Lamina and Cascade Tandem Next Veneers can be use.

A first landing is installed with the structural units attached together with universal connectors. The size of this landing varies with the number of stairs to be constructed. The veneer units are then placed all around and secured with universal anchors. A second landing is constructed above according to the same procedure by installing a series of stairs in front, secured with concrete adhesive. Construction continues until the last stair. The stairs of the Tandem Next system can be produced with different types of products: the Melville Tandem 60 step, the Melville Tandem 90 step, the Lafitt Tandem 90 step and the City 60 or 80 (buffed) step.

TANDEM® SYSTEM

SYSTEM ELEMENTS

90 mm STRUCTURAL UNITS



A – 90 mm STRUCTURAL UNIT
90 mm × 155 mm × 201 mm
3 9/16" × 6 1/8" × 7 7/8"



B – 90 mm STRUCTURAL UNIT
90 mm × 155 mm × 268 mm
3 9/16" × 6 1/8" × 10 1/2"



C – 90 mm STRUCTURAL UNIT
90 mm × 155 mm × 335 mm
3 9/16" × 6 1/8" × 13 3/16"



D – 90 mm STRUCTURAL UNIT
90 mm × 155 mm × 402 mm
3 9/16" × 6 1/8" × 15 13/16"

180 mm STRUCTURAL UNITS



E – 180 mm STRUCTURAL UNIT
180 mm × 155 mm × 335 mm
7 1/16" × 6 1/8" × 13 3/16"



F – 180 mm STRUCTURAL UNIT
180 mm × 155 mm × 402 mm
7 1/16" × 6 1/8" × 15 13/16"



G – 180 mm STRUCTURAL UNIT
180 mm × 155 mm × 469 mm
7 1/16" × 6 1/8" × 18 1/2"

90 mm LAFITT VENEER UNITS



A – 90 mm VENEER UNIT
90 mm × 67 mm × 201 mm
3 9/16" × 2 5/8" × 7 7/8"



B – 90 mm VENEER UNIT
90 mm × 67 mm × 268 mm
3 9/16" × 2 5/8" × 10 1/2"



C – 90 mm VENEER UNIT
90 mm × 67 mm × 335 mm
3 9/16" × 2 5/8" × 13 3/16"



D – 90 mm VENEER UNIT
90 mm × 67 mm × 402 mm
3 9/16" × 2 5/8" × 15 13/16"

180 mm LAFITT VENEER UNITS



E – 180 mm VENEER UNIT
180 mm × 67 mm × 335 mm
7 1/16" × 2 5/8" × 13 3/16"



F – 180 mm VENEER UNIT
180 mm × 67 mm × 402 mm
7 1/16" × 2 5/8" × 15 13/16"



G – 180 mm VENEER UNIT
180 mm × 67 mm × 469 mm
7 1/16" × 2 5/8" × 18 1/2"

90 mm MELVILLE VENEER UNITS



A – 90 mm VENEER UNIT
90 mm × 67 mm × 201 mm
3 9/16" × 2 5/8" × 7 7/8"



B – 90 mm VENEER UNIT
90 mm × 67 mm × 268 mm
3 9/16" × 2 5/8" × 10 1/2"



C – 90 mm VENEER UNIT
90 mm × 67 mm × 335 mm
3 9/16" × 2 5/8" × 13 3/16"



D – 90 mm VENEER UNIT
90 mm × 67 mm × 402 mm
3 9/16" × 2 5/8" × 15 13/16"

180 mm MELVILLE VENEER UNITS



E – 180 mm VENEER UNIT
180 mm × 67 mm × 335 mm
7 1/16" × 2 5/8" × 13 3/16"



F – 180 mm VENEER UNIT
180 mm × 67 mm × 402 mm
7 1/16" × 2 5/8" × 15 13/16"



G – 180 mm VENEER UNIT
180 mm × 67 mm × 469 mm
7 1/16" × 2 5/8" × 18 1/2"

90 mm LEXA VENEER UNITS



A – 90 mm VENEER UNIT
90 mm × 67 mm × 201 mm
3 9/16" × 2 5/8" × 7 7/8"



B – 90 mm VENEER UNIT
90 mm × 67 mm × 268 mm
3 9/16" × 2 5/8" × 10 1/2"



C – 90 mm VENEER UNIT
90 mm × 67 mm × 335 mm
3 9/16" × 2 5/8" × 13 3/16"



D – 90 mm VENEER UNIT
90 mm × 67 mm × 402 mm
3 9/16" × 2 5/8" × 15 13/16"

180 mm LEXA VENEER UNITS



E – 180 mm VENEER UNIT
180 mm × 67 mm × 335 mm
7 1/16" × 2 5/8" × 13 3/16"



F – 180 mm VENEER UNIT
180 mm × 67 mm × 402 mm
7 1/16" × 2 5/8" × 15 13/16"



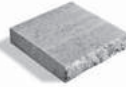
G – 180 mm VENEER UNIT
180 mm × 67 mm × 469 mm
7 1/16" × 2 5/8" × 18 1/2"

SYSTEM ELEMENTS

OTHERS UNITS (SOLD SEPARATELY)



LAFITT TANDEM STRAIGHT CAPPING UNIT
90 mm × 305 mm × 400 mm
3 9/16" × 12" × 15 3/4"



LAFITT TANDEM STEP UNIT
90 mm × 400 mm × 400 mm
3 9/16" × 15 3/4" × 15 3/4"



MELVILLE TANDEM STRAIGHT CAPPING UNIT
60 mm × 305 mm × 600 mm
2 3/8" × 12" × 23 5/8"



MELVILLE TANDEM 60 STEP UNIT
60 mm × 400 mm × 600 mm
2 3/8" × 15 3/4" × 23 5/8"



STARTER UNIT
90 mm × 200 mm × 400 mm
3 9/16" × 7 7/8" × 15 3/4"



MELVILLE TANDEM 90 STEP UNIT
90 mm × 400 mm × 600 mm
3 9/16" × 15 3/4" × 23 5/8"

60 mm CITY STEPS



60 mm × 360 mm × 610 mm
2 3/8" × 14 3/16" × 24"

80 mm CITY STEPS



80 mm × 360 mm × 610 mm
3 1/8" × 14 3/16" × 24"

OTHERS UNITS (SOLD SEPARATELY)



CITY CAPPING MODULE
60 mm × 305 mm × 600 mm
2 3/8" × 12" × 23 5/8"
(only the front face is buffed)



CITY DOUBLE FACE CAPPING MODULE
60 mm × 300 mm × 600 mm
2 3/8" × 11 13/16" × 23 5/8"
(three front and rear faces are buffed)



CITY PRIVACY CAPPING MODULE
60 mm × 360 mm × 605 mm
2 3/8" × 14 3/16" × 23 13/16"
(both ends are buffed)

ANCHORS AND CONNECTORS



SETBACK ANCHOR



DOUBLE SIDED CONNECTOR



CORNER CONNECTOR

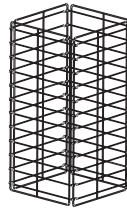


TANDEM GRID CONNECTOR

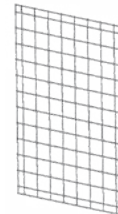


DOUBLE-SIDED CONCRETE CONNECTOR

OTHERS



TANDEM GRID PILLAR KIT



TANDEM MODULAR GRID
720 mm × 1080 mm
28 3/8" × 42 1/2"



SCREW
#10 × 1 1/4"



BRACKETS (LOOP CLAMPS)



TANDEM SHELF ANGLE 8"
64 mm × 64 mm × 2439 mm
2 1/2" × 2 1/2" × 8"



SCREW
#10 × 3 1/2"

Note: Each Tandem Grid Pillar Kit comes with 1 bag of 200 Tandem Grid Connectors.

Each Tandem Modular Grid comes with 1 bag of 60 Tandem Grid Connectors, 10 screws #10 × 1 1/4" and 10 loop clamps.

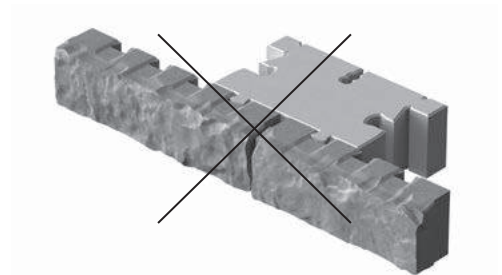
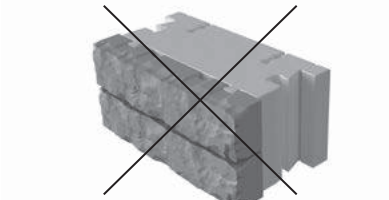
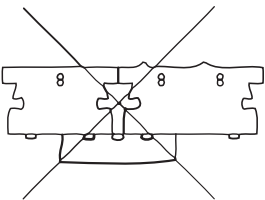
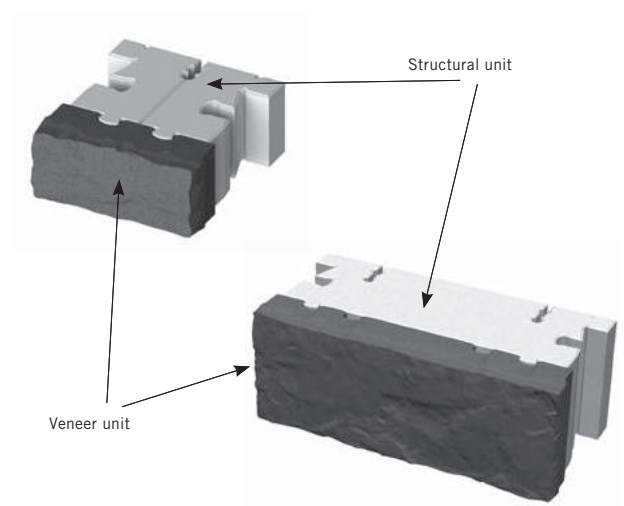


TANDEM UNIT ASSEMBLY

Tandem units come in 2 heights: 90 and 180 mm (3 5/16" and 7 1/16"). For each structural unit, there is a veneer unit of the same length and height. The unit can be assembled using the dovetail joint (an interlocking male/female system). Each structural unit has two vertical tenons (male side) and each veneer unit has at least two mortises (female side). The veneer units are joined to the structural units by simply sliding the mortises into the tenons to create the Tandem unit. Today, there are three types of veneer units; Lafitt, Melville and Lexa Tandem units. The total depth of the Lafitt, Melville and Lexa Tandem unit is 222 mm (8 3/4").

Attention: in general, do not overlap two veneer units on a single structural unit of the same height, and do not overlap two structural units on a single veneer unit. Do not install two 90 mm veneer units on a 180 mm structural unit.

TANDEM UNIT

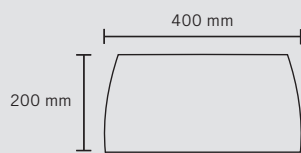


BUILDING A RETAINING WALL

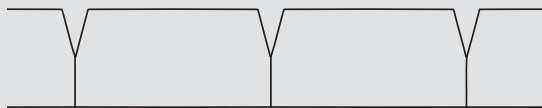
STARTER UNIT

The first course of the Tandem wall is built using the Tandem wall starter unit. This is to be installed directly on the granular base foundation and levelled. The unit is bevelled to make it easy to install curved walls.

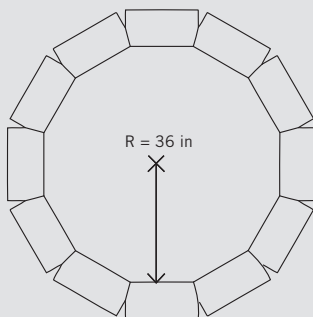
The use of starter units is strongly recommended given that the Tandem units (structural and veneer units) can then be placed on a uniform base ensuring overall wall stability.



STARTER UNIT



STRAIGHT INSTALLATION
(PLAN VIEW)

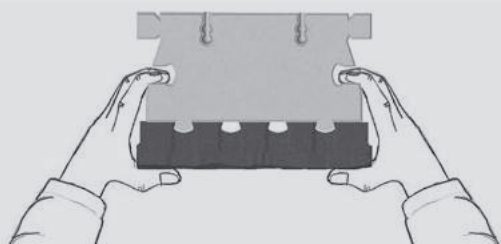


CURVED INSTALLATION
(PLAN VIEW)

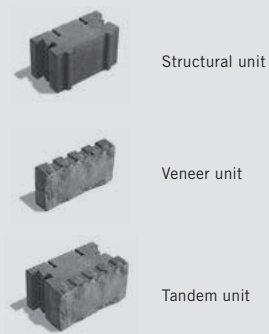
PRE-ASSEMBLY OF 90 UNITS

It is best to pre-assemble veneer and structural units before beginning to stack them in building the wall.

Once pre-assembled, Tandem units are randomly installed on starter units, using the four different sizes.



Recommended handling for the Tandem 90 unit



PRE-ASSEMBLY OF 180 UNITS

Because the Tandem System 180 components are heavier, we recommend that you install the structural units first, then attach their veneer units.

ANCHOR SYSTEM

The way in which the setback anchor is positioned in the Tandem wall system determines the slope of the wall. This positioning is what allows for either vertical or sloped walls.

Generally, at least one setback anchor must be installed per Tandem 90 unit, with two setback anchors for the Tandem 180 unit, to make sure the wall is stable. Setback anchors come with or without blades. No-blade setback anchors are used in curved walls. Both types of anchor can be used in straight walls.

Allowable heights⁽¹⁾: 650 mm (26 in) without a slope (0°, vertical);
1.050 mm (42 in) with a slope of 9°

Note: For a 9° of slope, the setback per row of 90 mm is 14 mm (9/16") and the setback per row of 180 mm is 28 mm (1 1/8")

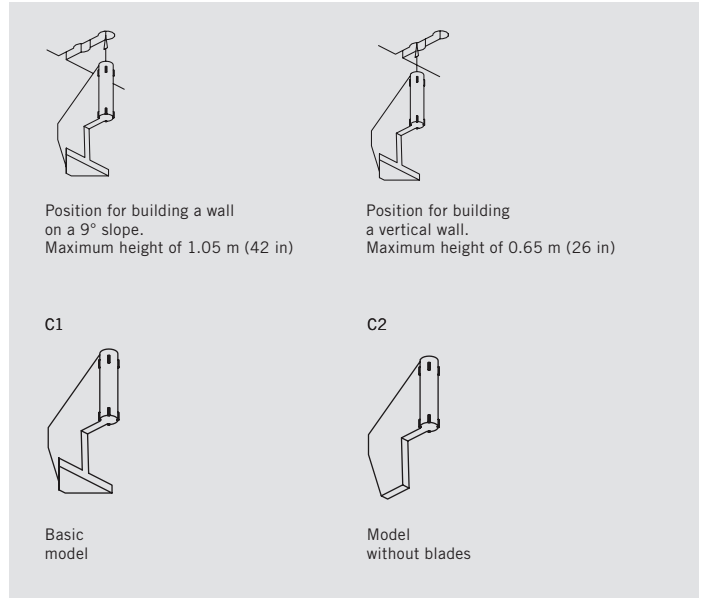
⁽¹⁾ Maximum height of the wall including the buried portion of 150 mm (6 in) without additional load or embankment above the wall.

There are several ways to build a Tandem retaining wall:

- Using only Lafitt, Melville or Lexa Tandem 90 units
- Using only Lafitt, Melville or Lexa Tandem 180 units
- Combining Lafitt, Melville or Lexa Tandem 90 and 180 units in a single wall

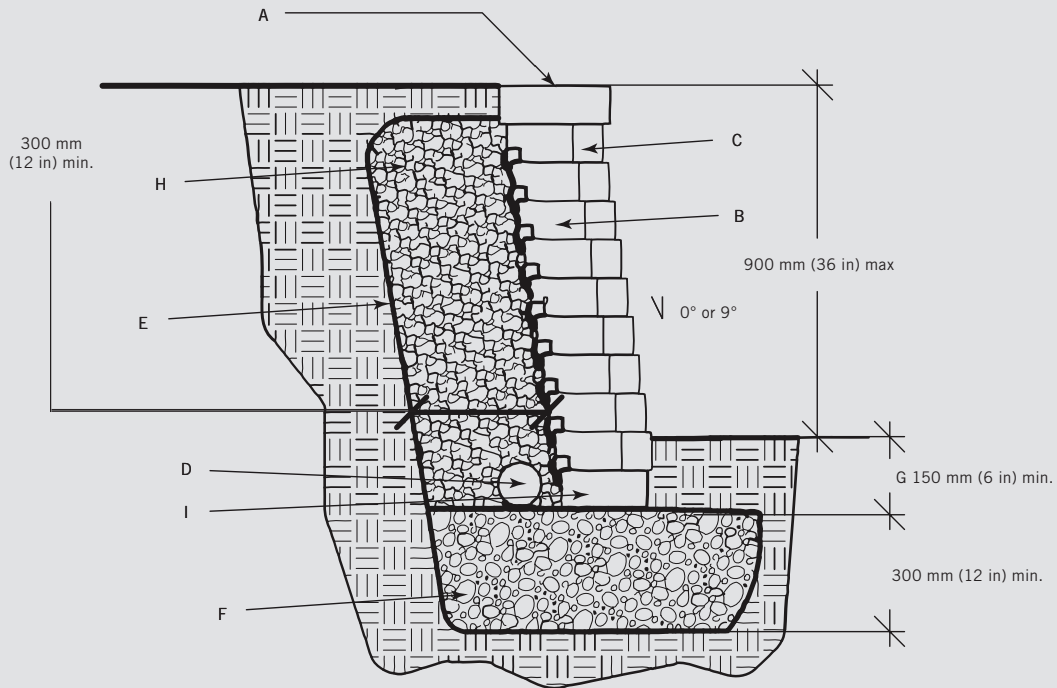
A typical cross-section and installation pattern are shown for each type of wall.

Note: It is possible to use Lafitt, Melville and Lexa Tandem Veneer units in the same wall.

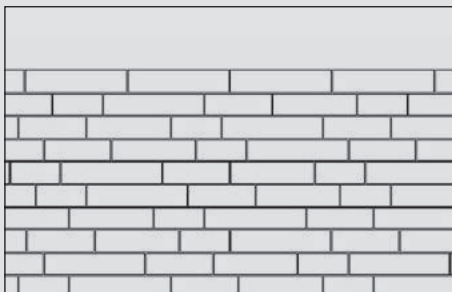


TYPICAL CROSS SECTION AND INSTALLATION PATTERN
 90 mm LAFITT, MELVILLE OR LEXA TANDEM WALL

- A Straight capping unit
 90 mm × 305 mm × 400 mm
 (3 9/16" × 12" × 15 3/4")
 or
 City capping unit
 60 mm × 305 mm × 600 mm
 (2 3/8" × 12" × 23 5/8")
- B Structural units
 90 mm × 155 mm × variable (201, 268, 335 or 402 mm)
 3 9/16" × 6 1/8" × var (7 7/8", 10 1/2", 13 3/16", 15 13/16")
- C Veneer units
 90 mm × 67 mm × variable (201, 268, 335 or 402 mm)
 3 9/16" × 2 5/8" × var (7 7/8", 10 1/2", 13 3/16", 15 13/16")
- D Perforated drain 100 mm Ø (4 in) connected
- E Geotextile membrane
- F Granular base 0-20 mm (0-3/4")
 compacted 300 mm (12") min.
- G Buried depth 150 mm (6") min.
- H Clean stone 20 mm (3/4")
- I Starter unit
 90 mm × 200 mm × 400 mm
 (3 9/16" × 7 7/8" × 15 3/4")



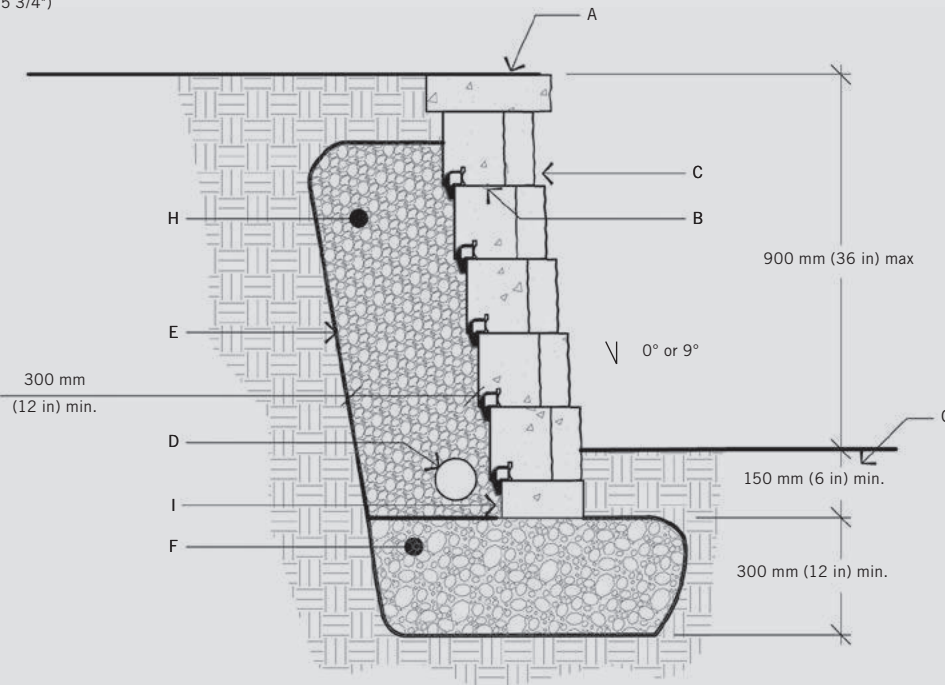
INSTALLATION PATTERN



LINEAR PATTERN WITH 100% 90mm TANDEM UNITS.

TYPICAL CROSS-SECTION AND INSTALLATION PATTERN –
LAFITT, MELVILLE OR LEXA TANDEM 180 WALL

- A Straight capping unit
90 mm × 305 mm × 400 mm
(3 9/16" × 12" × 15 3/4")
or
City capping unit
60 mm × 305 mm × 600 mm
(2 3/8" × 12" × 23 5/8")
- B Structural units
180 mm × 155 mm × variable (335, 402, or 469 mm)
7 1/16" × 6 1/8" × var (13 3/16", 15 13/16" or 18 1/2")
- C Veneer units
180 mm × 67 mm × variable (335, 402, or 469 mm)
7 1/16" × 2 5/8" × var (13 3/16", 15 13/16" or 18 1/2")
- D 100-mm perforated drain (4") connected to drains
- E Geotextile membrane
- F 0-20 mm (0-3/4") compacted aggregate base,
min. 300 mm (12")
- G Min. buried depth of 150 mm (6")
- H 20 mm (3/4") clean stone
- I Starter unit
90 mm × 200 mm × 400 mm
(3 9/16" × 7 7/8" × 15 3/4")



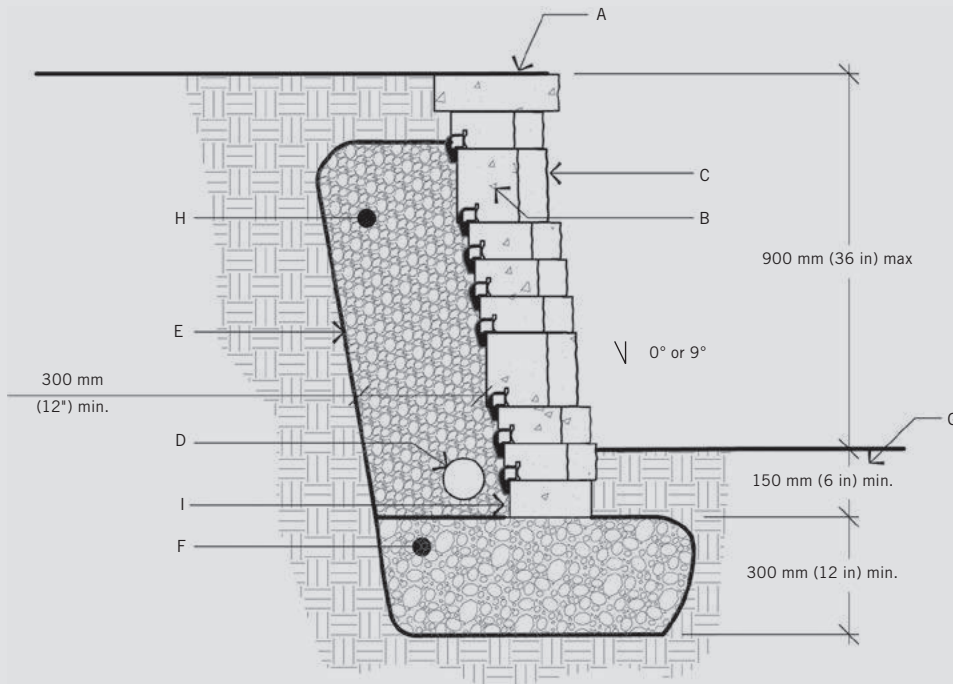
INSTALLATION PATTERN



LINEAR PATTERN WITH 100% 180mm TANDEM UNITS.

TYPICAL CROSS-SECTION AND INSTALLATION PATTERN –
WALL WITH MIX OF LAFITT, MELVILLE AND LEXA TANDEM 90 AND 180 UNITS

- A Straight capping unit (connected to drains)
90 mm × 305 mm × 400 mm
(3 9/16" × 12" × 15 3/4")
or
City capping Unit
60 mm × 305 mm × 600 mm
(2 3/8" × 12" × 23 5/8")
- B Structural units
90 mm or 180 mm × 155 mm × variable
(3 9/16" or 7 1/16" × 6 1/8" × variable)
- C Veneer units
90 mm or 180 mm × 67 mm × variable
(3 9/16" or 7 1/16" × 2 5/8" × variable)
- D 100-mm perforated drain (4") connected to drains
- E Geotextile membrane
- F 0-20 mm (0-3/4") compacted aggregate base
- G Min. buried depth of 150 mm (6")
- H 20 mm (3/4") clean stone
- I Starter unit
90 mm × 200 mm × 400 mm
(3 9/16" × 7 7/8" × 15 3/4")



INSTALLATION PATTERN



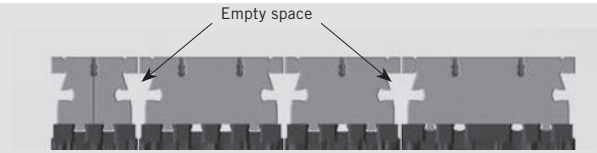
MODULAR PATTERN: 75% TANDEM 90 UNITS
25% TANDEM 180 UNITS

STRAIGHT WALLS

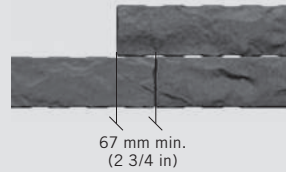
To build straight Tandem walls, install the units randomly, using equal numbers of all unit sizes according to the typical cross-section and installation pattern associated with each type of walls.

To combine the Tandem 90 and 180 units in a single wall, just use units of each height randomly, in a proportion that creates an aesthetically pleasing result. We recommend the following proportions: 75% Tandem 90 and 25% Tandem 180 (in terms of wall surface).

When building a Tandem wall, avoid aligning vertical joints between rows as much as possible. Allow a minimum overlap of about 67 mm (2 3/4") between modules to make sure the vertical joints do not line up.



LAFITT TANDEM WALL (PLAN VIEW)



CURVED WALLS

Using some Tandem units yields the minimum following curves:

	LAFITT TANDEM 90	LAFITT TANDEM 180	MELVILLE TANDEM 90	MELVILLE TANDEM 180	LEXA TANDEM 90	LEXA TANDEM 180
Convex curves (outside)	1.5 m (5 ft)	1.5 m (5 ft)	1.8 m (6 ft)	2.4 m (8 ft)	1,8 m (6 ft)	2,4 m (8 ft)
Concave curves (inside)	1.2 m (4 ft)	1.5 m (5 ft)	1.8 m (6 ft)	2.4 m (8 ft)	1,8 m (6 ft)	2,4 m (8 ft)

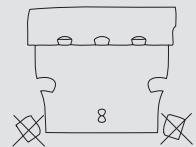
Curved sections of walls must generally be built using the smallest units.

For a curved Tandem 90 wall, use units A, B and C.
For Tandem 180 walls, units E and F must be used.
Their ends are bevelled to make it easier to install the curved wall.

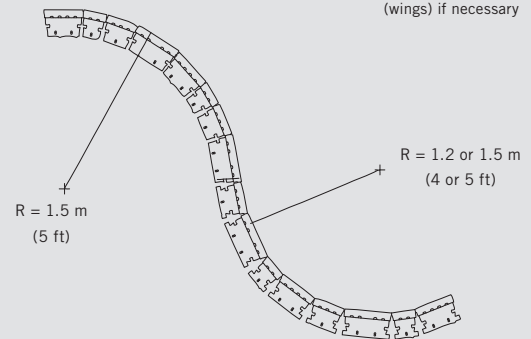
Since Melville Tandem Veneers all have a textured side, the minimum bend radius is greater.

Remember that there will be a surplus of longer units for the remainder of the wall.

In building convex curves (outer curve), the wings of structural units may have to be cut off.



Cut off the extremities (wings) if necessary



90° CORNER WALL

When building a retaining wall, it is best to start with a corner to avoid breaks and alignment of vertical joints. Specially designed veneer units are needed to build a 90° corner. These units are called textured end units or corner veneer units.

LAFITT TANDEM

A Lafitt Tandem 90 cube contains 18 textured end veneer units per row.
To form the corner, use B, C or D veneer units.
A Lafitt Tandem 180 cube contains 8 textured end veneer units per row.
All of the veneer units (E, F and G) can be used to build the corner.

MELVILLE TANDEM

All of Melville Tandem Veneers have one textured side.

LEXA TANDEM

Lexa Tandem 90 corner veneer units are limited to B and D modules only, every second row. A cube of Lexa Tandem 90 contains 18 corner veneer units per row (every other row).
Lexa Tandem 180 corner veneer units are limited to E and F modules only, every second row. A cube of Lexa Tandem 180 contains 10 corner veneer units per row (every other row).

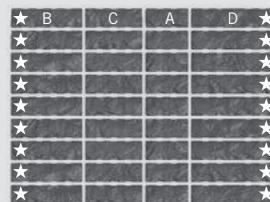
STACKING POSITION ON PALLETS (WITH A TEXTURED END)



LAFITT TANDEM - 90 mm UNITS



LAFITT TANDEM - 180 mm UNITS



LEXA TANDEM - 90 mm UNITS (EVERY SECOND ROW)



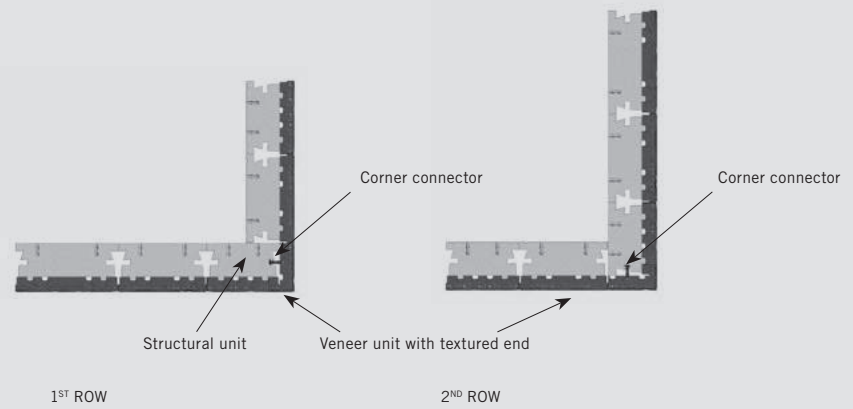
LEXA TANDEM - 180 mm UNITS (EVERY SECOND ROW)

**90° OUTER CORNER –
LAFITT, MELVILLE AND LEXA TANDEM WALL
PRINCIPLES**

An outer corner is created using veneer units with the textured end out.

These units are reversible to form both left and right corners. For each course, the veneer that forms the corner is affixed to the structural unit using corner connectors designed specifically for this purpose. It is simply a question of alternating the placement of units from one course to the next. We recommend adhering the elements used to make the corner of each row using Permapro concrete adhesive.

(spread the adhesive on the veneer units, or the structural units or on both)

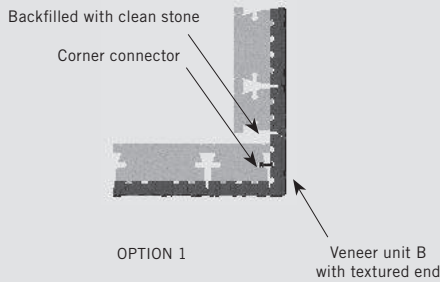


**90° OUTER CORNER DETAIL –
90 mm LAFITT, MELVILLE AND LEXA
TANDEM WALL**

There are three ways of building a corner with Tandem units:

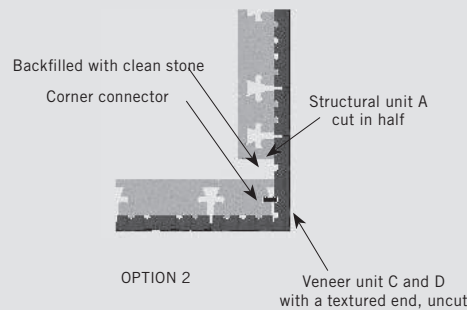
Option 1

Use corner veneer unit with a textured end B uncut, and begin the wall perpendicularly leaving an empty space that will be backfilled with clean stone



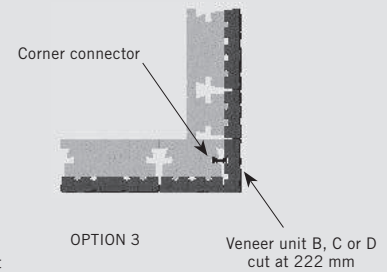
Option 2

Use corner veneer unit with a textured end C or D, uncut, attached to structural unit A cut in half.



Option 3

Use corner veneer unit with a textured end B, C or D, cut at 222 mm (8 3/4") and begin the wall perpendicularly, pressing it up against the existing wall. Gently hammer the freshly cut side to obtain a similar finish as the other sides.



90° OUTER CORNER DETAIL
180 mm LAFITT, MELVILLE AND LEXA TANDEM

There are three ways to build an outer corner using Tandem 180 units:

Option 1

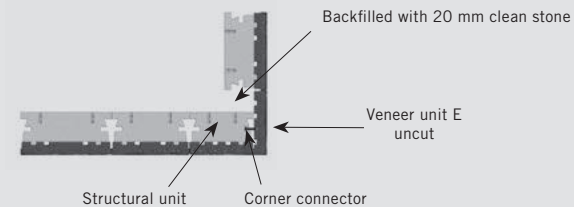
Use an uncut **textured end veneer unit E** and start the wall perpendicularly, leaving an empty space that will be backfilled with clean stone.

Option 2

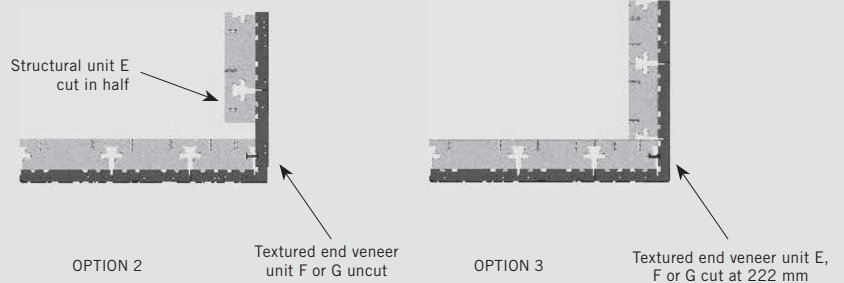
Use an uncut **textured end veneer unit F or G** attached to a **structural unit E**, cut in half. The empty space is backfilled with clean stone.

Option 3

Use a **textured end veneer unit E, F or G** cut at 222 mm, and start the wall perpendicularly, simply pressing it up against the existing wall. Gently hammer the freshly cut side to make the finish similar to the other sides.



OPTION 1



90° OUTER CORNER DETAIL OF LAFITT, MELVILLE AND LEXA TANDEM 90mm AND 180mm

To build a corner for a wall featuring a mix of Tandem 90 and 180 units, for each given row height, use corner units of the same height (Tandem unit with associated corner veneer).

Corners are built using the options available for that height (90 or 180), as illustrated and explained earlier in this document. This principle applies to both outer and inner corners.

The choice of corner unit heights is a matter of aesthetics. The 90 and 180 units must be inserted in a similar proportion to the remainder of the wall.

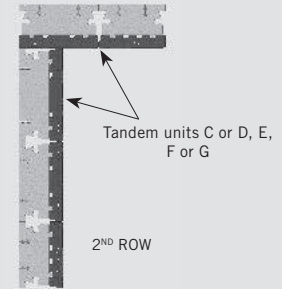
INNER CORNER

Build a Lafitt, Melville and Lexa Tandem inner corner according to the principle shown here, using Tandem 90 units C or D and 180 units E, F or G.

INNER CORNER, PRINCIPLES



1ST ROW

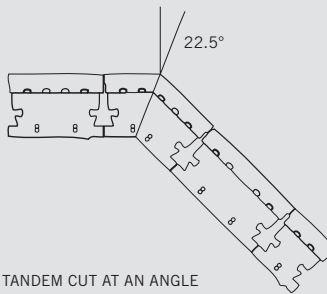


Tandem units C or D, E, F or G

2ND ROW

45° CORNER

It is also possible to build corners on a 45° angle. Simply cut each Tandem unit used to make the corner on a 22.5° angle. These Tandem units must be adhered together using Permapro concrete adhesive on the horizontal and vertical sides.



TANDEM CUT AT AN ANGLE

RETAINING WALL CAPPING

LAFITT, MELVILLE AND LEXA TANDEM WALLS

The Lafitt Tandem retaining wall is completed using **Lafitt Tandem capping units** (90 × 305 × 400 mm).

The Melville Tandem wall is finished with the use of the Melville Tandem Capping units (60 mm × 305 mm × 600 mm).

The Lexa Tandem wall is finished with the use of the City capping units (60 mm × 305 mm × 600 mm).

To cap a wall with a 90° corner, capping units must be cut at a 45° angle (see illustration).

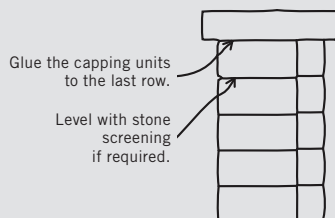
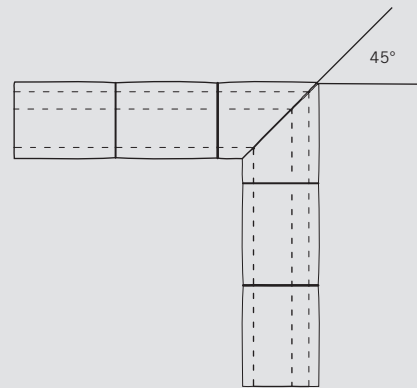
Lafitt or Melville Tandem capping units are also used to cap curved walls. The units must be bevelled on site to match the final shape of the wall.

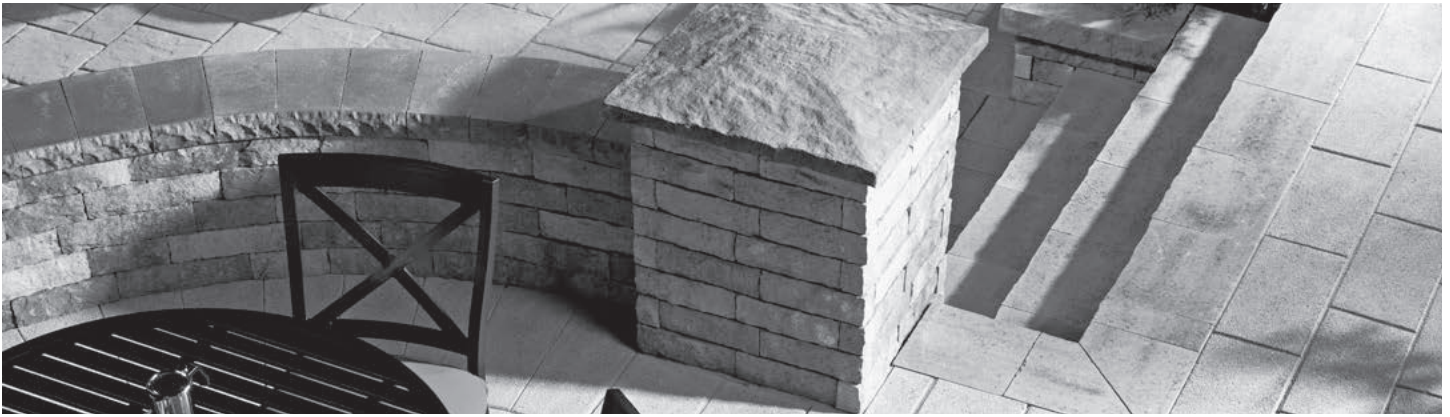
Options: Straight and bevelled capping units from the Celtik wall system units can also be used to highlight the wall's finish (different colours and textures).

Note that all capping units must be glued to the last row of Tandem units using Permapro concrete adhesive.

GENERAL NOTE

If necessary, level the second last course with stone screening. Make sure the surface is clean, so that the capping can be glued to the top course with Permapro concrete adhesive.





BUILDING A DOUBLE-SIDED WALL

DOUBLE-SIDED TANDEM UNIT ASSEMBLY

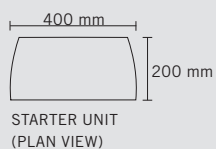
Installing a double-sided wall requires the use of two veneer units held together using connectors. Connectors are inserted into the mortises on the veneer units thus connecting them two by two in order to create the double-sided Tandem unit. The work is complete once 20 mm (3/4 in) clean stone is placed between the veneers of every other course, and the capping unit is installed. Lafitt, Melville and Lexa Tandem 90 and 180 veneer units, can be used to build straight or curved double-sided walls, as well as 90° corners.

Allowable heights

The Tandem wall system can be used to build a double-sided wall with a maximum above-ground height of 711 mm (28 in). The wall is built completely vertical without a slope.

STARTER UNITS

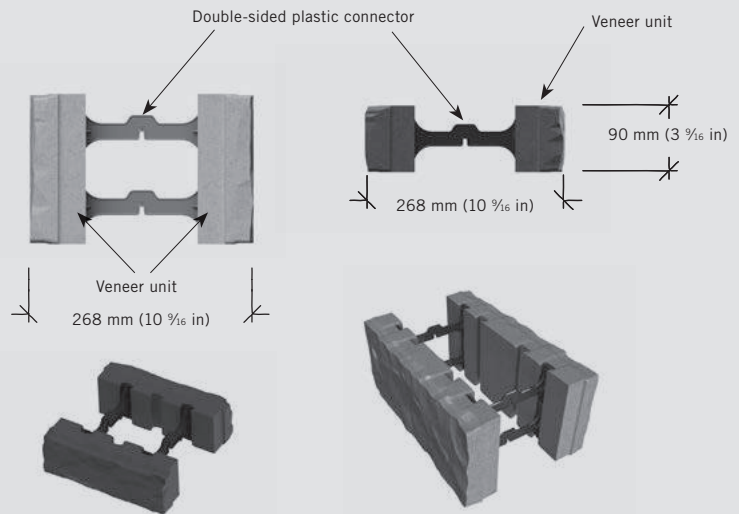
To build the double sided Tandem wall, begin by placing the starter unit directly on the granular base perpendicular to the wall and levelling it.



STARTER UNIT INSTALLATION (PLAN VIEW)

TANDEM WALL: DOUBLE-SIDED PLASTIC CONNECTORS

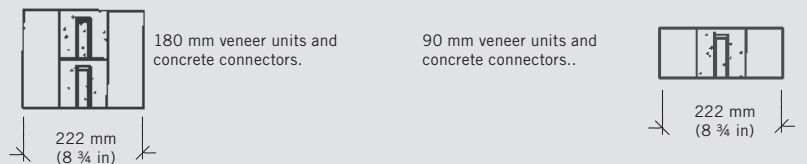
DOUBLE-SIDED LAFITT TANDEM MODULES



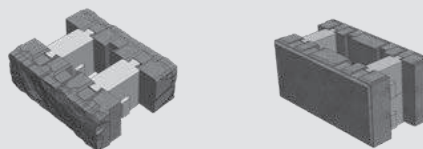
DOUBLE-SIDED TANDEM UNIT ASSEMBLY

Note: Lafitt, Melville and Lexa Tandem 180 wall modules must be assembled using pairs of double-sided connectors installed one on top of the other for greater stability.

TANDEM WALL WITH DOUBLE-SIDED CONCRETE CONNECTORS



90 AND 180 mm DOUBLE-SIDED TANDEM WALL: 3D VIEW



Note: Lafitt, Melville and Lexa 180 mm Tandem walls module must be assembled using pairs of double-sided concrete connectors one on top of the other for greater stability.

BUILDING A DOUBLE-SIDED WALL

There are four ways to build a double-sided wall:
 Using only Lafitt, Melville or Lexa Tandem 90 units
 Using only Lafitt, Melville or Lexa Tandem 180 units
 Using a mix of Lafitt, Melville or Lexa Tandem 90 and 180 units in the same wall.

To build a solid structure, the empty space inside the double-sided Tandem unit with plastic connectors must be filled with 20 mm (3/4") clean stone on every second row. Before installing the capping, tap lightly on each side of the wall with a rubber hammer to help compact the aggregate between the veneer units. If you use concrete connectors instead, it is not necessary to fill the void with clean stone.

Double-sided Tandem units are randomly installed on starter units, using an equal number of all units. The same installation patterns as for retaining walls are used here (see the installation patterns in the "Retaining Wall" section). Each veneer unit of the first row must be glued to the starter units with the Permapro concrete adhesive.

Note: Quantity of connectors required:

Lafitt, Melville and Lexa Tandem 90 wall

7 connectors per sq. ft. of double-sided wall (74 connectors per m²) based on one of the sides of the wall

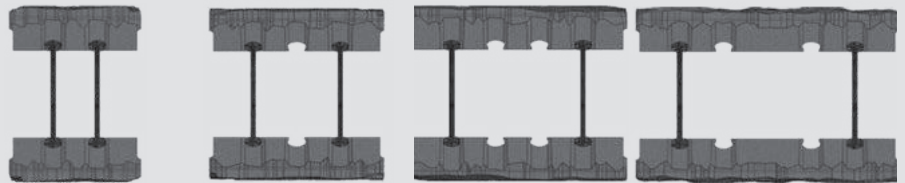
Lafitt, Melville and Lexa Tandem 180 wall

5.5 connectors per sq. ft. of double-sided wall (57 connectors per m²) based on one of the sides of the wall

For a double-sided Lafitt, Melville and Lexa TANDEM wall, we recommend gluing all of the rows together.

STRAIGHT DOUBLE-SIDED WALL

When building a straight wall, assemble veneer units of the same size using the double-sided connector. Because the veneer units come in different lengths, several layouts are possible.



UNITS A-A

90 mm × 67 mm × 201 mm
(3 5/16" × 2 5/8" × 7 7/8")

UNITS B-B

90 mm × 67 mm × 268 mm
(3 5/16" × 2 5/8" × 10 1/2")

UNITS C-C

90 mm × 67 mm × 335 mm
(3 5/16" × 2 5/8" × 13 3/16")

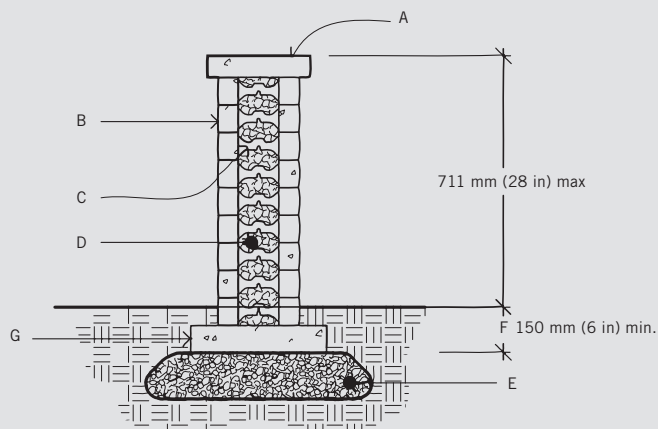
UNITS D-D

90 mm × 67 mm × 402 mm
(3 5/16" × 2 5/8" × 15 13/16")

DOUBLE-SIDED LAFITT, MELVILLE AND LEXA TANDEM WALL WITH 90 mm VENEER UNITS AND PLASTIC CONNECTORS

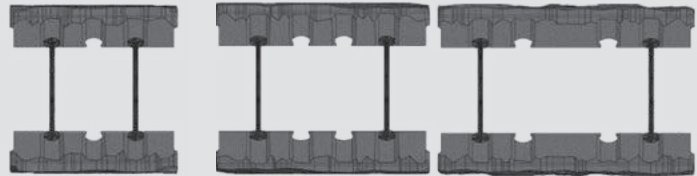
TYPICAL CROSS SECTION

- A City double face capping module (for double-sided wall)
- B Veneer units
90 mm × 67 mm × variable
(3 5/16" × 2 5/8" × var)
- C Double-sided connector
- D 20 mm (3/4") clean stone
- E Granular base 0-20 mm (0-3/4") compacted 300 mm (12") min.
- F Minimum buried depth 150 mm (6")
- G Starter unit
90 mm × 200 mm × 400 mm
(3 5/16" × 7 7/8" × 15 3/4")



DOUBLE-SIDED LAFITT, MELVILLE AND LEXA TANDEM WALL WITH 180 mm VENEER UNITS AND PLASTIC CONNECTORS

Note: Tandem 180 wall modules must be assembled using pairs of double-sided connectors installed one on top of the other for greater stability.



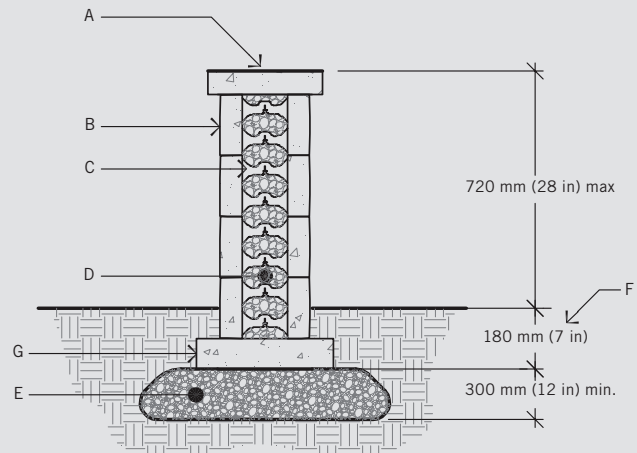
UNITS E-E
180 mm × 67 mm × 335 mm
(7 1/16" × 2 5/8" × 13 3/16")

UNITS F-F
180 mm × 67 mm × 402 mm
(7 1/16" × 2 5/8" × 15 3/16")

UNITS G-G
180 mm × 67 mm × 469 mm
(7 1/16" × 2 5/8" × 18 1/2")

TYPICAL CROSS SECTION

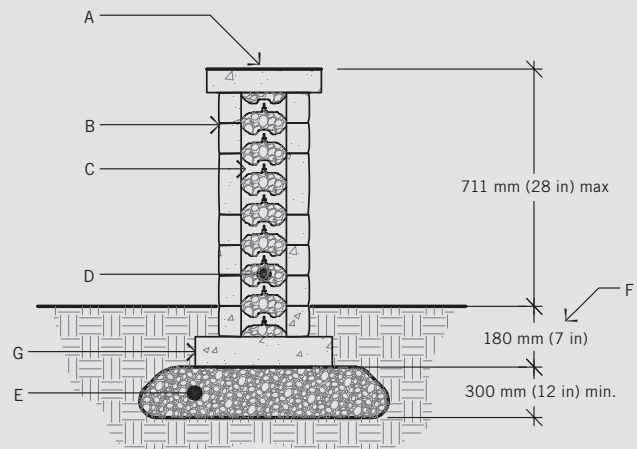
- A City double face capping module (for double-sided wall)
- B Veneer units
180 mm × 67 mm × variable
(7 1/16" × 2 5/8" × variable)
- C Double-sided plastic connector
- D 20 mm (3/4") clean stone
- E Granular base 0-20 mm (0-3/4") compacted 300 mm (12") min.
- F Min. buried depth of 150 mm (6")
- G Starter unit
90 mm × 200 mm × 400 mm
(3 3/16" × 7 7/8" × 15 3/4")



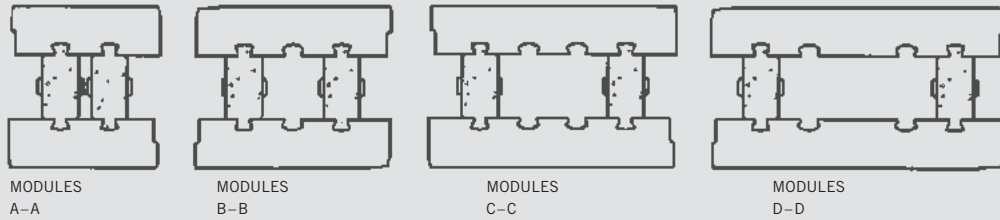
DOUBLE-SIDED LAFITT MELVILLE AND LEXA TANDEM WALL WITH 90 AND 180 VENEER UNITS

TYPICAL CROSS SECTION

- A City double face capping module (for double-sided wall)
- B Veneer units
90 mm or 180 mm × 67 mm × variable
(3 3/16" or 7 1/16" × 2 5/8" × variable)
- C Double-sided plastic connector
- D 20 mm (3/4") clean stone
- E Granular base 0-20 mm (0-3/4") compacted 300 mm (12") min.
- F Min. buried depth of 150 mm (6")
- G Starter unit
90 mm × 200 mm × 400 mm
(3 3/16" × 7 7/8" × 15 3/4")

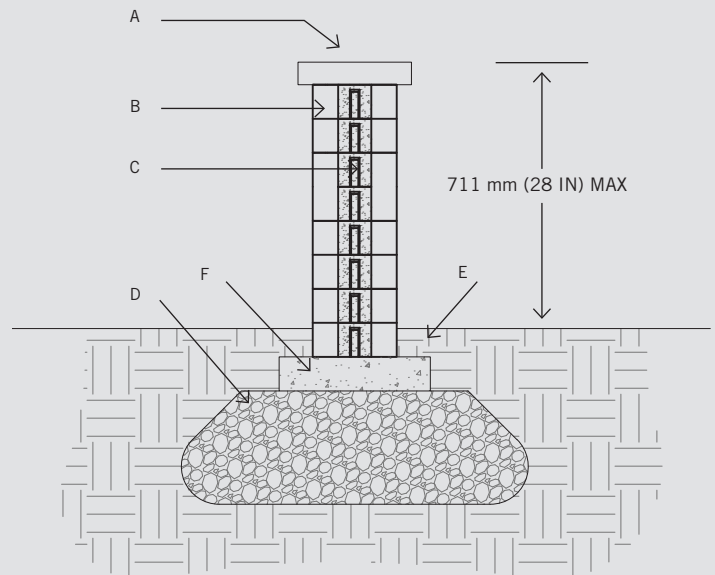


90 mm DOUBLE-SIDED TANDEM WALL (LAFITT, MELVILLE, LEXA)
WITH CONCRETE CONNECTORS



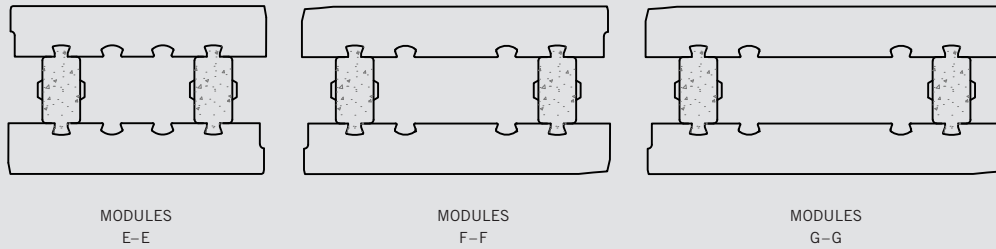
TYPICAL CROSS SECTION

- A City double face capping module (for double-sided wall)
- B Veneer units
90 mm × 67 mm × variable
(3 7/16" × 2 5/8" × variable)
- C Double-sided concrete connector
- D Granular base 0-20 mm (0-3/4")
compacted 300 mm (12") min.
- E Min. buried depth of 150 mm (6")
- F Starter unit
90 mm × 200 mm × 400 mm
(3 7/16" × 7 7/8" × 15 3/4")



Note:
A double-sided Tandem wall
with concrete connectors doesn't
need the use of clean stone.

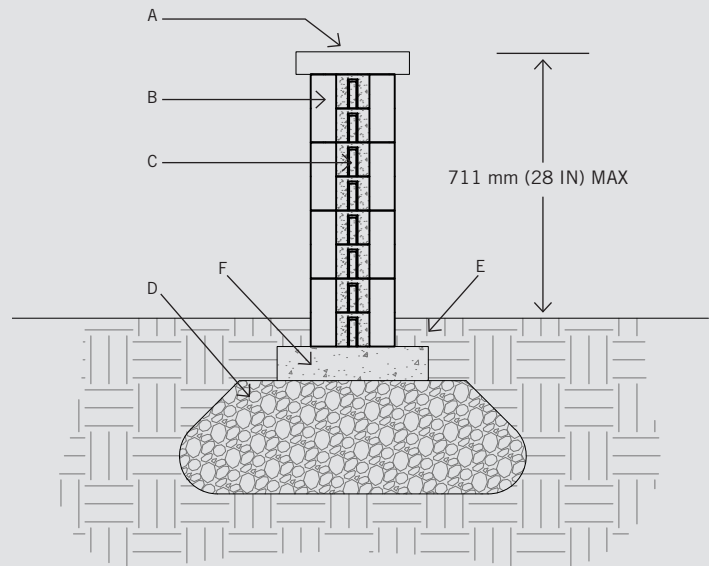
180 mm DOUBLE-SIDED TANDEM WALL (LAFITT, MELVILLE, LEXA)
WITH CONCRETE CONNECTORS



Note: Tandem 180 mm wall modules must be assembled using pairs of double-sided connectors installed one on top of the other for great stability.

TYPICAL CROSS SECTION

- A City double face capping module (for double-sided wall)
- B Veneer units
180 mm x 67 mm x variable
(7 1/16" x 2 5/8" x variable)
- C Double-sided concrete connector
- D Granular base 0-20 mm (0-3/4")
compacted 300 mm (12") min.
- E Min. buried depth of 150 mm (6")
- F Starter unit
90 mm x 200 mm x 400 mm
(3 5/16" x 7 7/8" x 15 3/4")

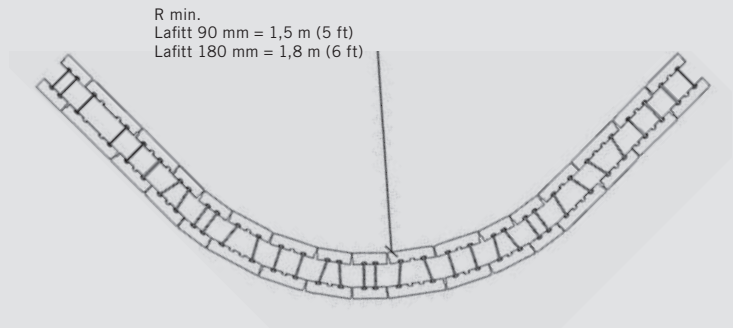
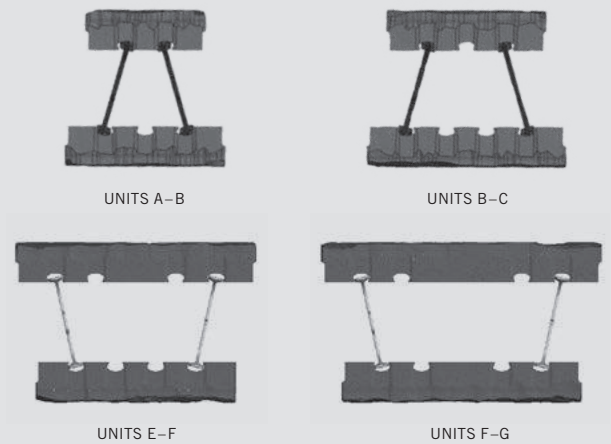


Note:
A double-sided Tandem wall with concrete connectors doesn't need the use of clean stone.

CURVED LAFITT, MELVILLE AND LEXA TANDEM WALL WITH PLASTIC CONNECTORS

To build a curved double-sided wall, while maximizing results and minimizing sizes, only the following pairs of veneer units are recommended for use: A-A, A-B, B-B and B-C for 90 mm units and E-E, E-F, F-F and F-G for 180 mm units. Consequently, there will be more D veneer units for the remainder of the wall. Some units may have to be cut to fit perfectly into the selected curve. The design flexibility of double-sided units means that connectors can be inserted in all unit mortises, providing for better adjustment in creating curves with different radiuses.

Note: Lafitt, Melville and Lexa Tandem 180 wall modules must be assembled using pairs of double-sided connectors installed one on top of the other for greater stability.

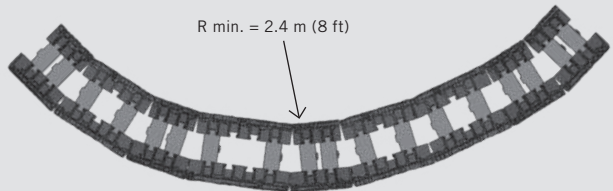


The minimum curves possible for the Lafitt Tandem wall:

- Lafitt 90 mm = 1.5 m (5.0 ft);
- Lafitt 180 mm = 1.8 m (6.0 ft).

The minimum bend radius of Melville and Lexa Tandem walls is 2,4 m (8 ft)

CURVED TANDEM WALL WITH CONCRETE CONNECTOR



END OF DOUBLE-SIDED LAFITT, MELVILLE AND LEXA TANDEM WALL WITH PLASTIC CONNECTORS

The end of a double-sided Tandem 90 wall is built using a textured end veneer unit A installed on the end of the wall.

To ensure solid corner assembly, two double-sided connectors are overlapped in a cross shape and inserted into the mortises on the veneer units. The first connector connects the two double-sided wall veneer units, while the perpendicular connector connects the textured end veneer unit that forms the end of the wall. Glue every course forming the end of the wall using Perma-pro adhesive.

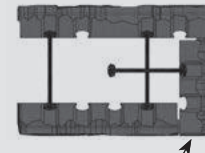
The end of a double-sided Tandem 180 wall is built using a textured end veneer unit E cut at 201 mm and installed on the end of the wall.

ASSEMBLY FOR DOUBLE-SIDED 90 WALL: END OF WALL

Connectors in a cross shape



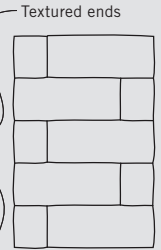
Isometric view



Plan view

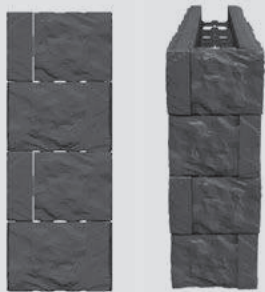
Textured ends

Veneer A



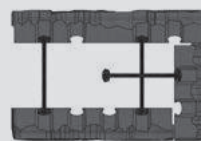
End of double-sided wall - side view

ASSEMBLY FOR DOUBLE-SIDED 180 WALL: END OF WALL



Elevation view

Connectors installed in a cross shape



Plan view

Veneer F (or G)
Textured ends

Textured end Veneer E cut at 201 mm

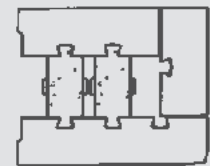
Veneer E (or F)

END OF A DOUBLE-SIDED LAFITT, MELVILLE AND LEXA TANDEM 90 AND 180 WALL

The end of a double-sided 90 and 180 wall is built by smoothly combining the two kinds of construction (90 and 180) for a wall end, described previously in this document. To build an end for a wall that mixes Tandem 90 and 180 units in the same wall, for each given row height, use units of the same height.

END OF DOUBLE-SIDED TANDEM WALL AND CONCRETE CONNECTORS

The end of a double-sided tandem wall is produced by using a veneer module with a textured side, cut at 155 mm (6 1/8 in.) Make sure to glue each row.



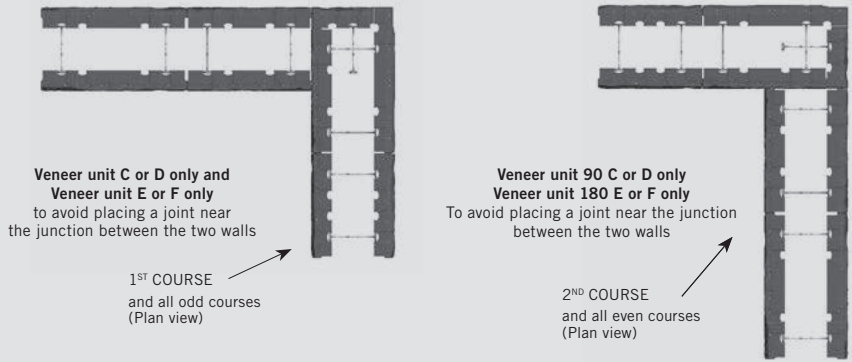
Corner veneer cut at 155 mm and glue.

DOUBLE-SIDED WALL: 90° CORNERS WITH PLASTIC CONNECTORS

Building a 90° corner on a Lafitt, Melville and Lexa Tandem wall requires installing a wall end (described earlier), then juxtaposing a second wall perpendicular to it.

Glue every course in the wall corner using Permapro adhesive.

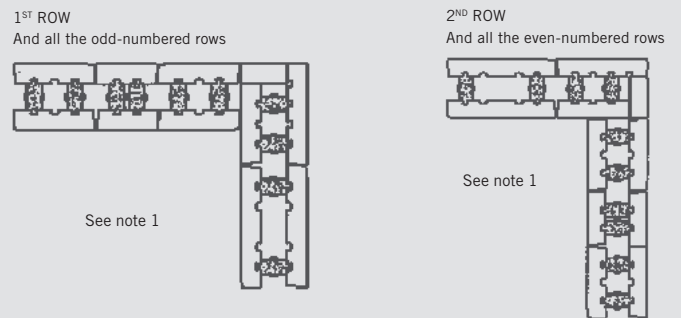
Once again, for a natural look, avoid aligning vertical joints from one row to the next on all visible surfaces.



90° CORNER OF A DOUBLE-SIDED TANDEM WALL WITH CONCRETE CONNECTORS

The construction of a double-sided tandem wall corner with a concrete connector is possible by starting a second wall perpendicular to the first and ending with a wall end, as described previously. Glue all the modules forming the corners, on each row, with Permapro adhesive.

Note 1 : Use the 90 mm veneer modules C and D and the 180 mm veneer modules F and G to avoid placing a joint near the junction of two walls.



90° CORNER IN A DOUBLE-SIDED 90 AND 180 WALL

Building a 90° corner on a wall requires installing a wall end (described earlier), then juxtaposing a second wall perpendicular to it. The second wall can be built starting with double-sided Tandem 90 or 180 units. Adhere every course in the wall corner using Permapro adhesive.

Corners are built using the options available for that height (90 or 180). These options were illustrated and explained earlier in this document. The selection of corner module heights and their positioning in the wall is a matter of aesthetics. The 90 and 180 units must be inserted in a similar proportion to the remainder of the wall so that they harmonize.

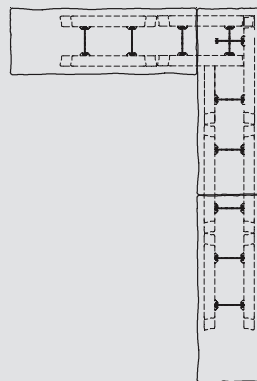
CAPPING A DOUBLE-SIDED WALL

Double-sided Tandem walls are completed using **city double face capping module** (60 mm x 300 mm x 600 mm), laid side by side.

To cap a 90° corner, simply install two capping units at a 90° angle. For curved walls, capping units must be bevelled on site to match the final shape of the wall.

Options: Straight and bevelled Celtik wall system capping units and Melville Tandem capping modules can also be used.

Note that all capping units must be attached to the last row of **Tandem units** using **Permapro** concrete adhesive.





BUILDING STAIRS

MELVILLE TANDEM STEP UNITS 60

To build Melville Tandem 60 stairs, we suggest using Melville Tandem 60 step unit combined with the Melville Tandem 180 units used as risers.

A Melville Tandem step 60 step unit

60 mm × 400 mm × 600 mm
(2 3/8" × 15 3/4" × 23 5/8")

B Structural and veneer Melville Tandem 180

180 mm × 222 mm × variable
(3 9/16" × 8 3/4" × variable)

C Concrete paver 60 mm (2 3/8")

D 25 mm (1") bedding sand

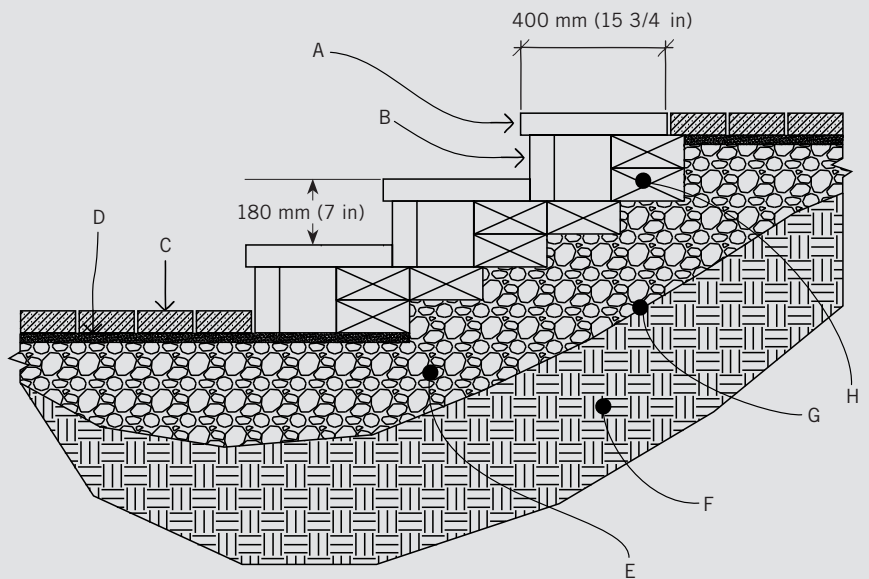
E 0-20 mm (0-3/4") compacted aggregate base

F Existing soil

G Geotextile membrane

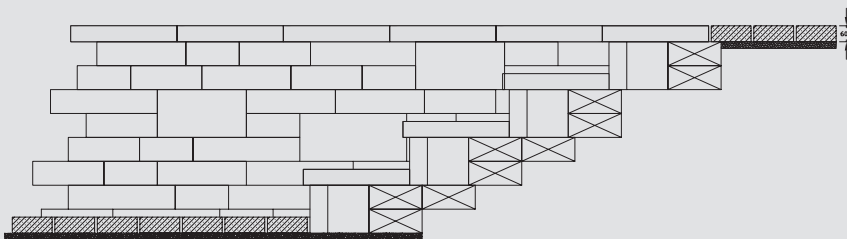
H Starter unit 90 mm × 200 mm × 400 mm

(3 9/16" × 7 7/8" × 15 3/4")



All step and riser units must be glued together .

MELVILLE TANDEM STEP UNITS STAIR INTEGRATION / TANDEM WALL





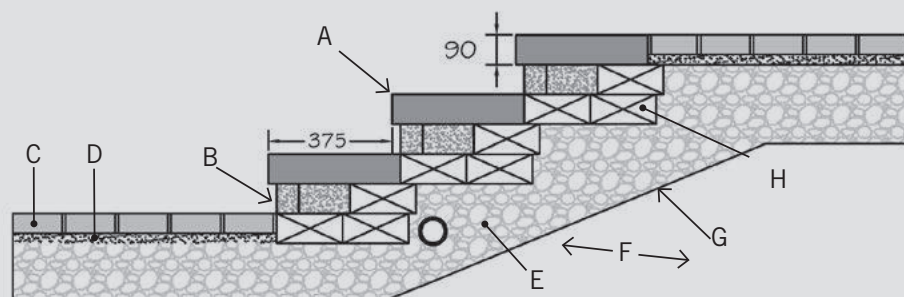
BUILDING STAIRS

MELVILLE TANDEM STEP UNITS 90

to build Melville Tandem 90 stairs, we suggest using Melville Tandem 90 step unit combined with the Melville Tandem 90 units used as risers.

- A Melville Tandem step 90 steps unit
90 mm × 400 mm × 600 mm
(3 1/16" × 15 3/4" × 23 5/8")
- B Structural and veneer Melville Tandem 90
90 mm × 222 mm × variable
(3 1/16" × 8 3/4" × variable)
- C Concrete paver 60 mm (2 3/8")
- D 25 mm (1") bedding sand
- E 0-20 mm (0-3/4") compacted aggregate base
- F Existing soil
- G Geotextile membrane
- H Starter unit 90 mm × 200 mm × 400 mm
(3 1/16" × 7 7/8" × 15 3/4")

All step and riser units must be glued together.



Melville Tandem 90 step (90 x 400 x 600)
and Melville Tandem 90 unit as riser



LEXA TANDEM STEP UNITS

To build Lexa stairs, we suggest using City 60 or 80 step unit combined with the Lexa Tandem 180 units used as risers.

OPTION 1

A City 60 step unit

60 mm × 360 mm × 610 mm
(2 3/8" × 14 3/16" × 24")

OPTION 2

A City 80 step unit

80 mm × 360 mm × 610 mm
(3 1/8" × 14 3/16" × 24")

B Structural and veneer Lexa Tandem unit

180 mm × 222 mm × variable
(3 9/16" × 8 3/4" × variable)

C Concrete paver 60 mm (2 3/8")
or 80 mm (3 1/8")

D 25 mm (1") bedding sand

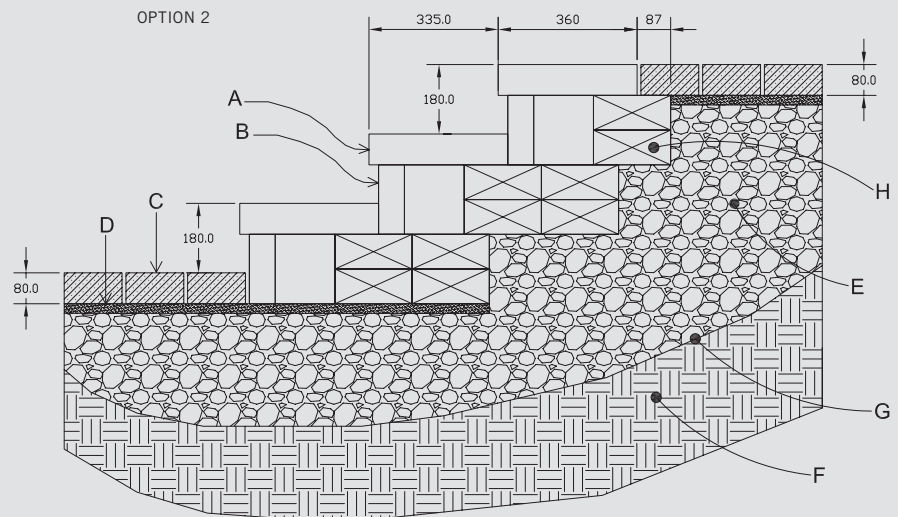
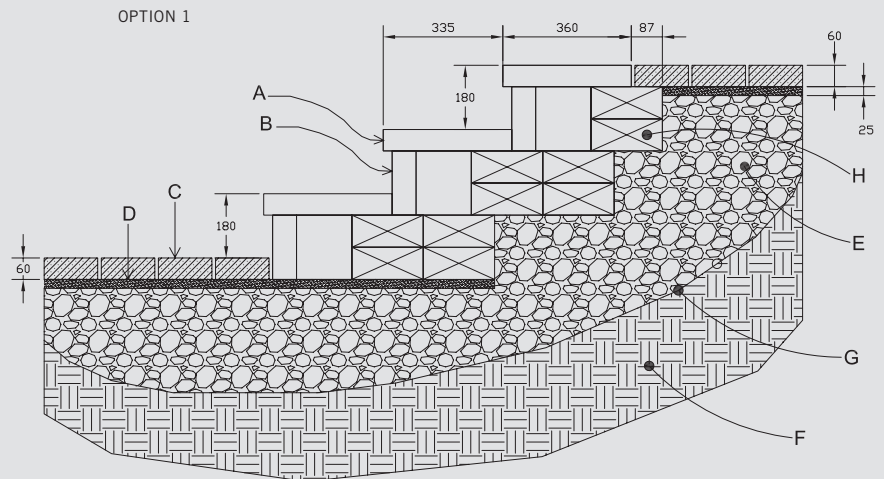
E 0-20 mm (0-3/4") compacted aggregate base

F Existing soil

G Geotextile membrane

H Starter unit 90 mm × 200 mm × 400 mm
(3 9/16" × 7 7/8" × 15 3/4")

All step and riser units must be glued together using Techniseal adhesive.



LAFITT TANDEM STEP UNITS

To build stairs, it is recommended that the step unit be used in combination with one of the following options for the riser:

A Lafitt Tandem step unit
 90 mm × 400 mm × 400 mm
 (3 9/16" × 15 3/4" × 15 3/4")

B Option 1
 Structural unit and Lafitt Tandem Veneer
 90 mm × 222 mm × variable
 (3 9/16" × 8 3/4" × variable)

Option 2
 Lafitt Tandem straight capping unit
 90 mm × 305 mm × 400 mm
 (3 9/16" × 12" × 15 3/4")

C Concrete paver
 60 mm (2 3/8") or 80 mm (3 1/8")

D 25 mm (1") bedding sand

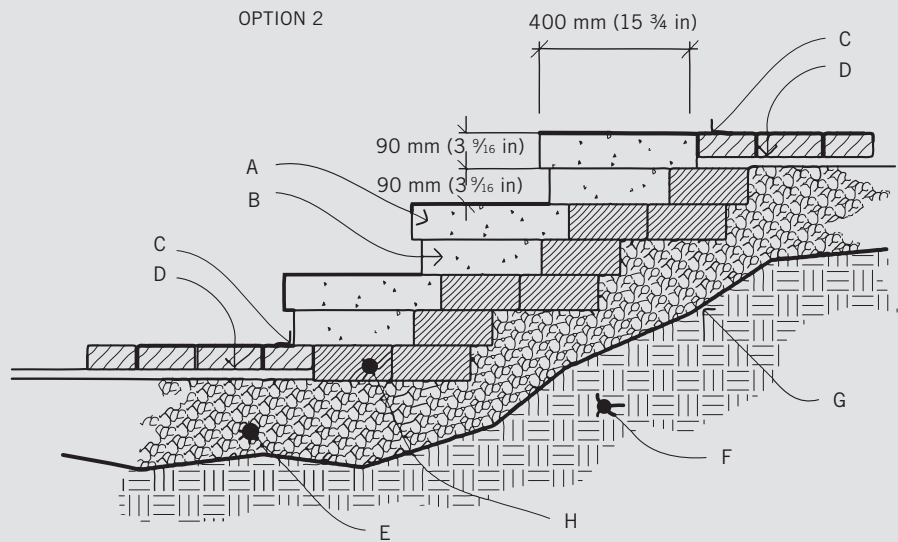
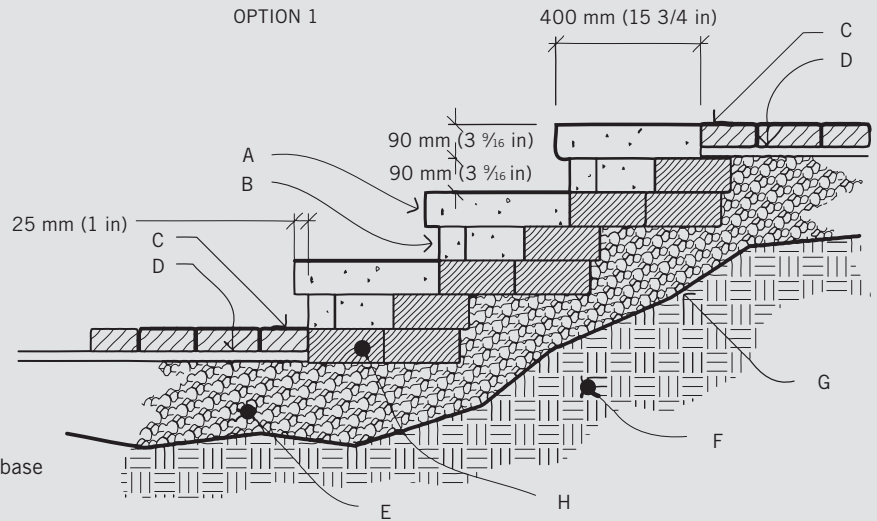
E 0-20 mm (0-3 3/4") compacted aggregate base

F Existing soil

G Geotextile membrane

H Starter unit 90 mm × 200 mm × 400 mm
 (3 9/16" × 7 7/8" × 15 3/4")

All step and riser units must be glued together using Techniseal adhesive.





BUILDING PILLARS

This section discusses the different types of pillars which can be built using the Tandem system, namely:

- Tandem pillars with steel pillar grids
- Tandem pillars with structural modules

Tandem Veneer units are used for the exterior facing of the pillar. The interior core of the column serves a structural function and can be built in accordance with one of the following two methods: using structural units (regular Tandem system) or using a steel pillar grid instead of structural units (Tandem pillar grid).

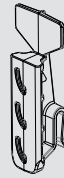
TANDEM PILLARS WITH PILLAR GRIDS

That type of pillar is built with Lafitt and Melville Tandem Veneer units only. *Do not use Lexa Tandem with Pillar grid.* The building of this type of column begins with the use of a steel pillar grid which provides structural support for the veneer units. The units are fastened to the pillar grid using specially-designed connectors.

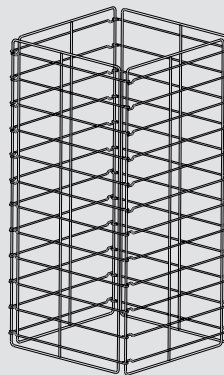
The essential details for building this type of pillar are described below.

90 mm LAFITT AND MELVILLE TANDEM COLUMN WITH PILLAR GRID ASSEMBLY

MATERIAL NEEDED:



GRID CONNECTORS
200 UNITS PER BAG



TANDEM PILLAR GRID

90 mm LAFITT OR MELVILLE
TANDEM VENEER UNITS:

48 REGULAR UNITS
(12A, 12B, 12C, 12D)

48 TEXTURED END CORNER UNITS
(12A, 12B, 12C, 12D)

With this material, you can construct one Pillar:
670 mm × 670 mm (26 3/8" × 26 3/8") of 1080 mm in height (42 1/2").

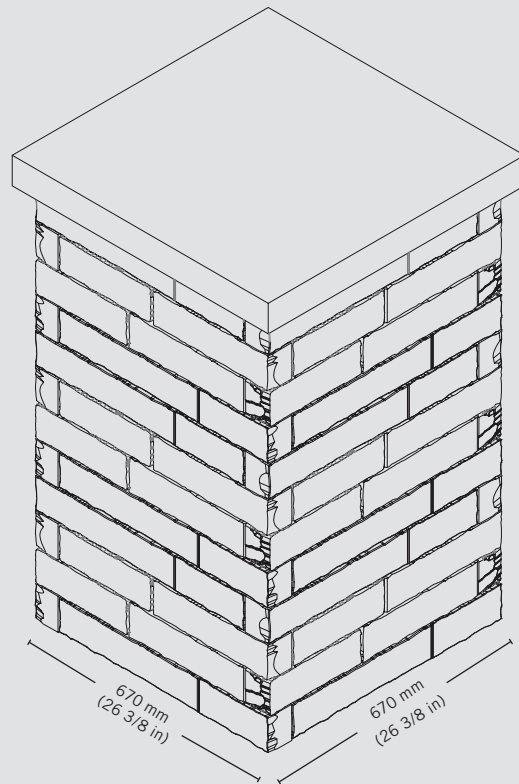
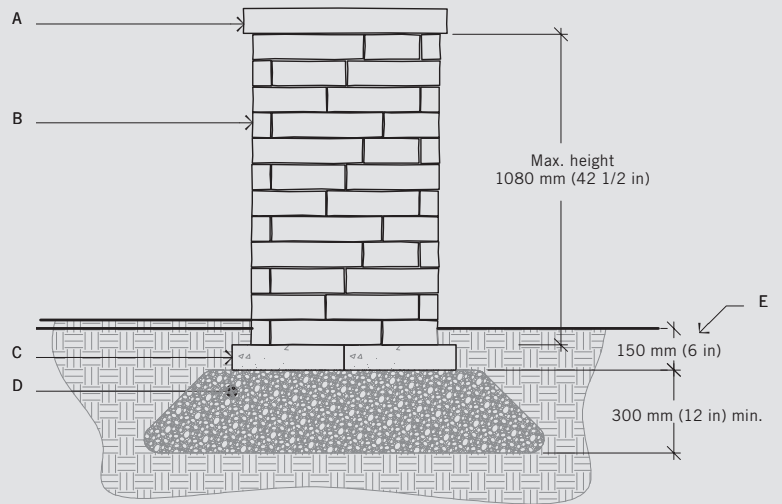
One Pillar requires the use of 2.6 m² (28 ft²) of veneer units.

One cube contains 10 Pillar grids and 10 bags of 200 grid connectors.

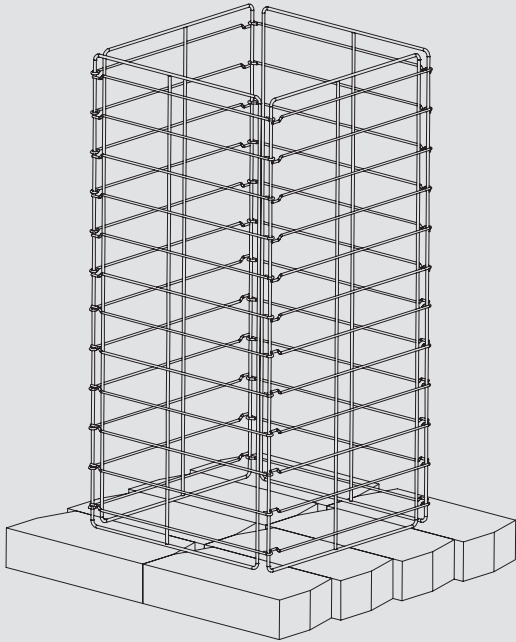
Note: All Melville Veneer units come with one textured end (corner units)

LAFITT OR MELVILLE TANDEM PILLAR GRID –
CROSS SECTION

- A Natural stone Capping Pillar Module (29" × 29")
- B 90 mm Lafitt or Melville Tandem Veneer unit
- C Starter unit
- D 0-20 mm compacted granular Foundation, 300 mm (12")
- E Minimum Embedded Soil, 150 mm (6")

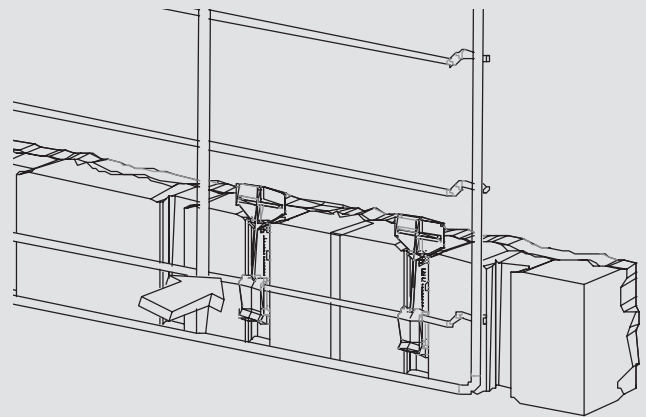
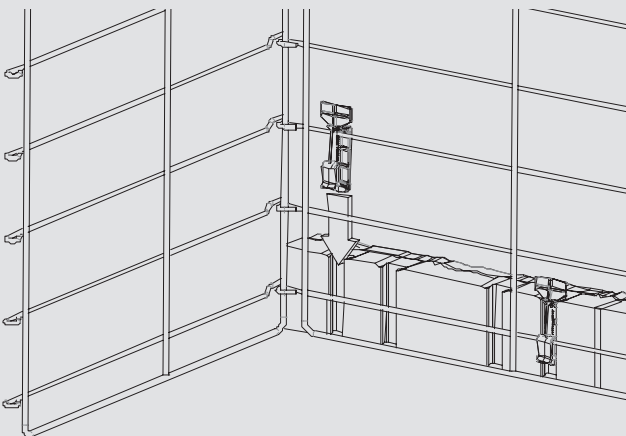


Begin by placing a row (8 units) of starter units on a base of compacted crushed stone. Unfold the steel pillar grid and place it on the prepared surface.

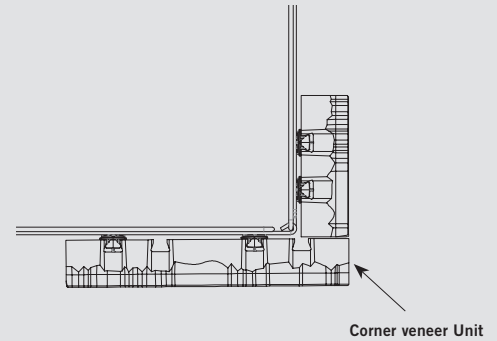
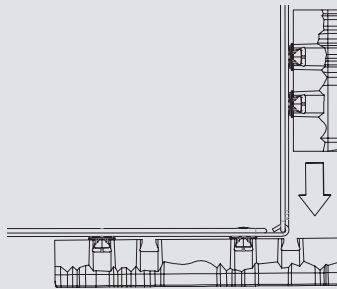
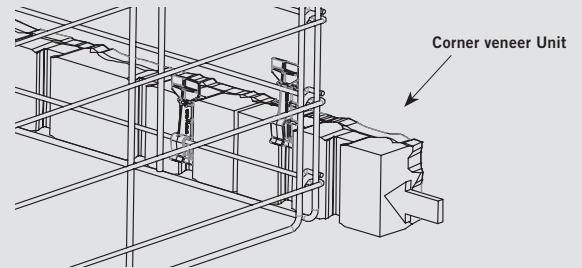
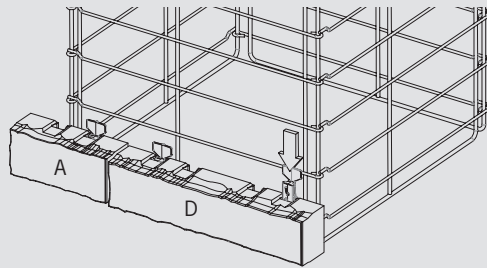


1ST ROW OF STARTER UNITS

Insert the pillar connectors (using 2 connectors for each unit) into the veneer units which form the first row of the pillar. Place the veneer units for the first row around the steel pillar grid, making sure to “click” the connectors onto the horizontal wires (refer to the recommended installation pattern for the veneer units which have been selected).



The corners of the pillar can be built easily by sliding the units along the wire until they line up with the corner unit which was installed previously.



LAYING PATTERN

Suggested installation pattern for the optimal use of the Tandem Veneer units.

TANDEM PILLAR WITH 90 mm UNITS

FIRST 4 ROWS
(OVER THE STARTER UNITS)
360 mm (14 in)

D	A	D	4 TH ROW
C	B	C	3 RD ROW
B	C	B	2 ND ROW
A	D	A	1 ST ROW

INSTALLATION PATTERN TO REPEAT
UP TO DESIRED HEIGHT (FRONT VIEW)

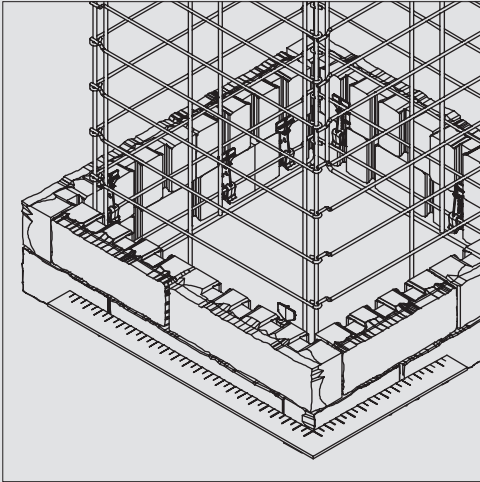
90 mm TANDEM PILLAR
WITH 180 mm UNITS

FIRST 5 ROWS
(OVER THE STARTER UNITS)
(FOR REFERENCE ONLY)

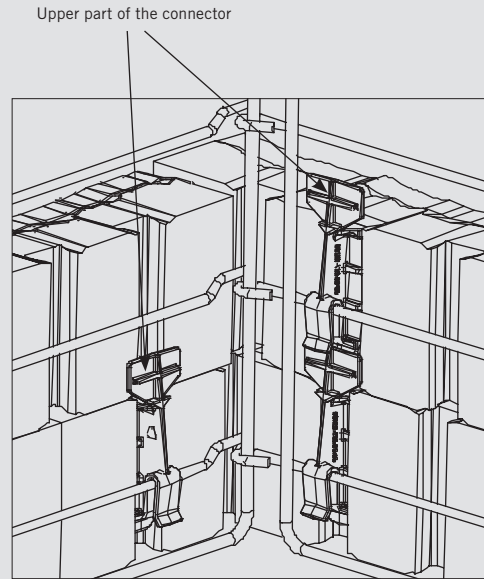
B	B		5 TH ROW	
F		A	E	4 TH ROW
F		B		3 RD ROW
B	C	B	2 ND ROW	
A	D	A	1 ST ROW	

INSTALLATION PATTERN TO REPEAT
UP TO DESIRED HEIGHT (FRONT VIEW)

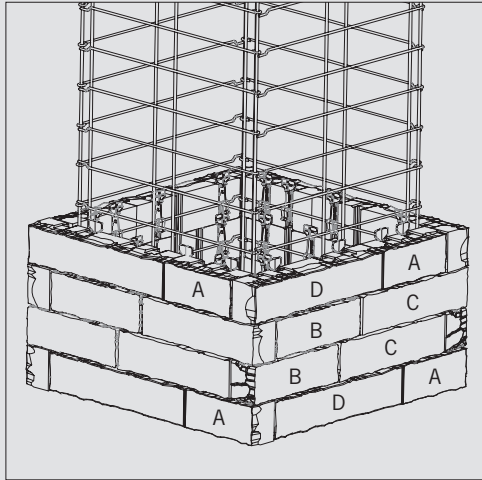
90 mm TANDEM PILLAR



Once the first row has been completed, fill the interior space with clean 20 mm aggregate, and then use a square to ensure that the corner units are perpendicular to each other. Repeat this step after every second row has been completed. Install subsequent rows in the same manner, up to the desired height.

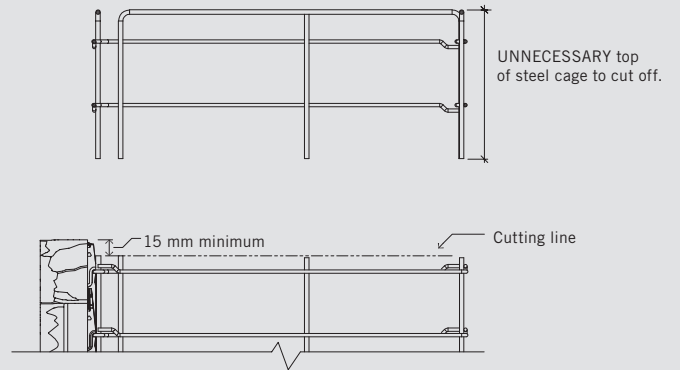


Ensure that the upper part of each connector is firmly in place behind the veneer unit, since it will serve as a support for the unit which will be installed above it.



This is the recommended installation procedure for building the first four rows of a pillar; it makes optimal use of the veneer formats within a pallet: 16 regular veneers and 16 veneers with a texture end.

Repeating this pattern two more times will build a pillar with 12 rows and a height of 42 1/2 inches.



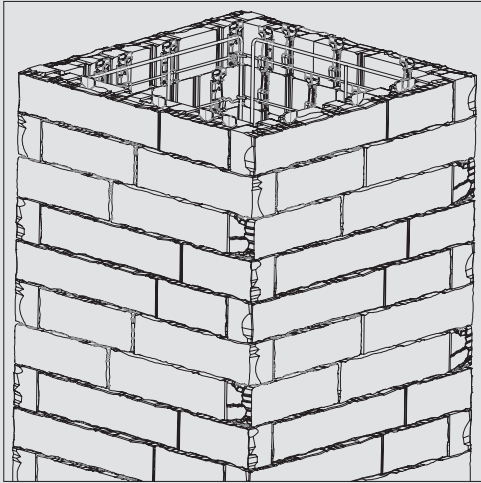
CUTTING INSTRUCTION OF PILLAR GRID (front view)

To build a pillar which is shorter than 1067 mm (42"), simply cut away the excess portion of the steel pillar grid with a grinder.

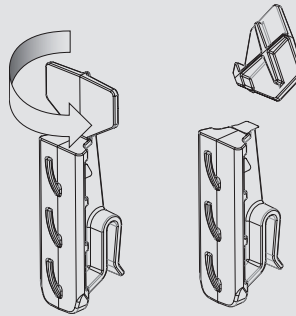
A full steel pillar grid can be used to build a pillar with an overall height above ground, including the capping unit, of 1067 mm (42").

When the last row is reached, cut off the tops of the connectors with sheet-metal shears or twist them off by hand. Then install the capping unit on the pillar, adhering it in place with glue.

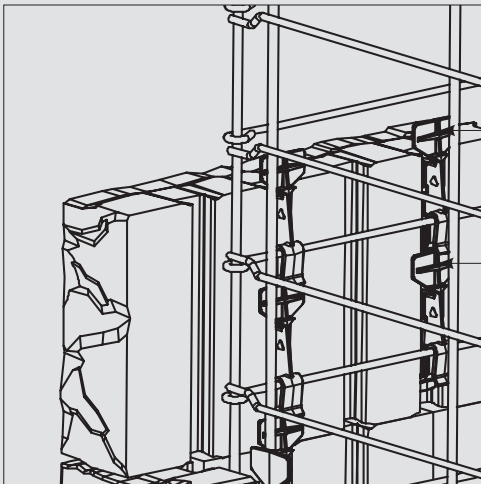
Important note: the capping unit must rest on the veneer units and not on the steel pillar grid.



*** Important note: the capping unit must rest on the veneer units and not on the steel pillar grid**



TANDEM PILLAR 90 and 180 mm Veneer UNITS

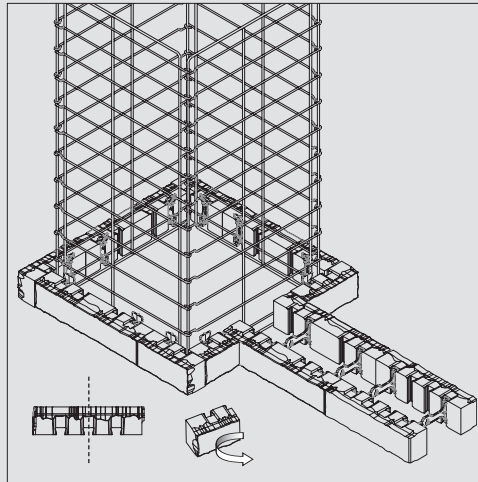


When using 180 mm high veneer units, use four connectors as shown below, beginning with the two lower ones and ending with the two upper ones.

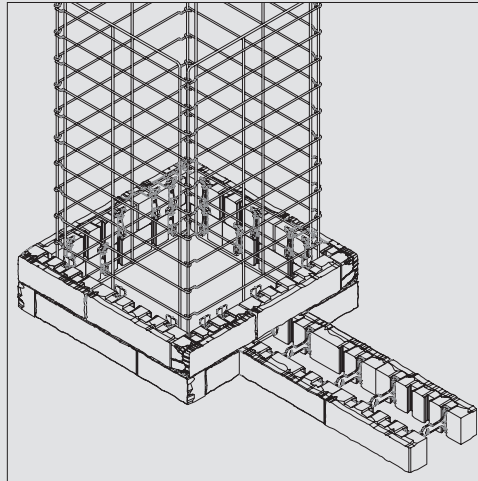
To integrate 180 mm units into a pillar, use only 180 mm E and F units with textured corners. Carefully place the veneer units so that the joints are staggered, and ensure that you place at least one 180 mm unit on each side of the pillar, and not more than two.

JOINING A DOUBLE-SIDED WALL TO A PILLAR

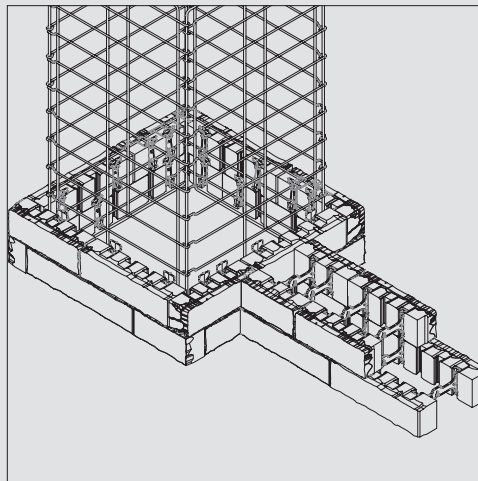
To join a double-sided wall to a pillar, you must cut the veneer unit for the pillar at every second row. Cut it at the centre of the dovetail recess.



For the second row, run the unit across the double-sided wall.



Begin the second row of the double-sided wall from the face of the pillar.



TANDEM PILLAR WITH STRUCTURAL UNITS

Four types of pillar can be built:

- Lafitt Tandem
- Melville Tandem
- Lexa Tandem

LAFITT AND MELVILLE TANDEM PILLARS

Pillars are built by placing Tandem units at 90° angles to create a square. Corners can then be completed by adding the appropriate textured veneer units. These veneers are attached using a corner connector as mentioned in the section on building a corner. It is advisable to glue each module together for every course.

Two different sizes of pillar can be built by using 90 mm units. The 180 mm Tandem units could be also used in combination with the 90 mm Tandem units. When building a pillar, it is suggested to use a maximum of 15 to 20% of 180 mm units (modules E or F).

Maximum pillar height ranges from 1200 mm to 1500 mm (4 to 5 ft) above ground level with a minimum buried depth of 150 mm (6"). Capping is completed using a natural stone glue on last row.

PILLAR 90 UNIT	MAXIMUM HEIGHT
670 mm x 670 mm (26 3/8 in x 26 3/8 in)	1200 mm (4 ft)
737 mm x 737 mm (29 in x 29 in)	1500 mm (5 ft)

LEXA TANDEM PILLAR

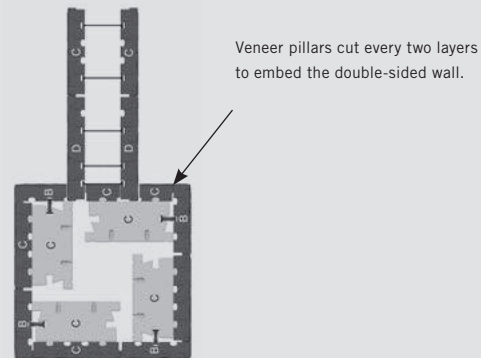
It is not recommended to build a pillar with the use of Lexa Tandem units for aesthetic and design purposes. Building a Lexa Tandem pillar requires the use of two units out of the four units available, leaving a large quantity of left over. In addition, the urban and modern style of Lexa Veneers is less suitable for the completion of a column.

The predetermined installation patterns which are provided are intended to facilitate the building of each type of pillar. They also permit the optimal use of the different Tandem modules and the textured veneer units.

In all cases, it is important to avoid aligning vertical joints from one row to the next on all visible façades. For these reasons, some combinations should be avoid from row to another.

Note that for some combinations, you need to use a structural unit A cut in two and fitted together with the veneer units.

When a double-sided wall ends at a pillar, the pillar must be modified to ensure it is solidly embedded, as in the following illustration:

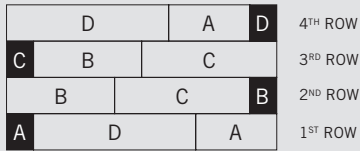


EXAMPLE OF EMBEDDING

LAFITT AND MELVILLE TANDEM PILLARS
WITH 90 mm UNITS

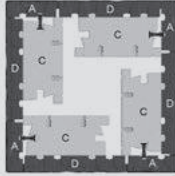
PILLAR
670 mm × 670 mm
(26 3/8 in × 26 3/8 in)

FIRST 4 ROWS
360 mm (14 3/16 in)



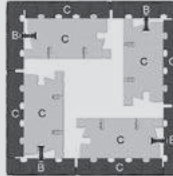
INSTALLATION PATTERN TO REPEAT
UP TO DESIRED HEIGHT
(FRONT VIEW)

1ST ROW



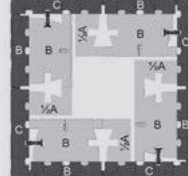
VENEER A WITH
TEXTURED END

2ND ROW



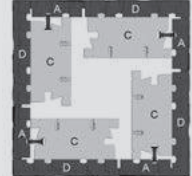
VENEER B WITH
TEXTURED END

3RD ROW



VENEER C WITH
TEXTURED END

4TH ROW



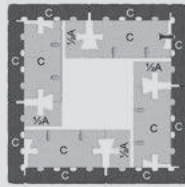
VENEER D WITH
TEXTURED END

LEGEND

- D** VENEER D WITH TEXTURED END
- C** VENEER C WITH TEXTURED END
- B** VENEER B WITH TEXTURED END
- A** VENEER A WITH TEXTURED END

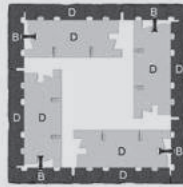
PILLAR
737 mm x 737 mm
(29 in x 29 in)

1ST ROW



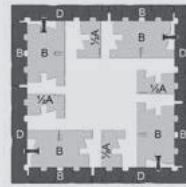
VENEER C WITH TEXTURED END

2ND ROW



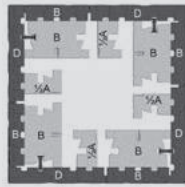
VENEER B WITH TEXTURED END

3RD ROW



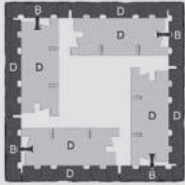
VENEER D WITH TEXTURED END

4TH ROW



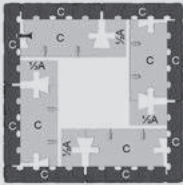
VENEER D WITH TEXTURED END

5TH ROW



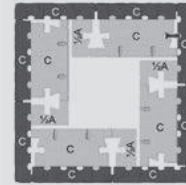
VENEER B WITH TEXTURED END

6TH ROW



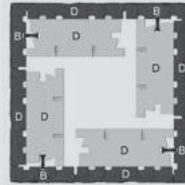
VENEER C WITH TEXTURED END

7TH ROW



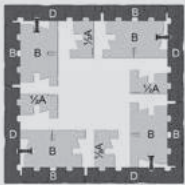
VENEER C WITH TEXTURED END

8TH ROW



VENEER B WITH TEXTURED END

9TH ROW



VENEER D WITH TEXTURED END

FIRST 9 ROWS
810 mm (31 7/8 in)

D	B	D	
B		D	B
C	C		C
	C	C	
B	D		B
	D	B	D
D	B	D	
	B	D	B
C	C		C

9TH ROW
8TH ROW
7TH ROW
6TH ROW
5TH ROW
4TH ROW
3RD ROW
2ND ROW
1ST ROW

INSTALLATION PATTERN TO REPEAT
UP TO DESIRED HEIGHT
(FRONT VIEW)

LEGEND

- D** VENEER D WITH TEXTURED END
- C** VENEER C WITH TEXTURED END
- B** VENEER B WITH TEXTURED END
- A** VENEER A WITH TEXTURED END



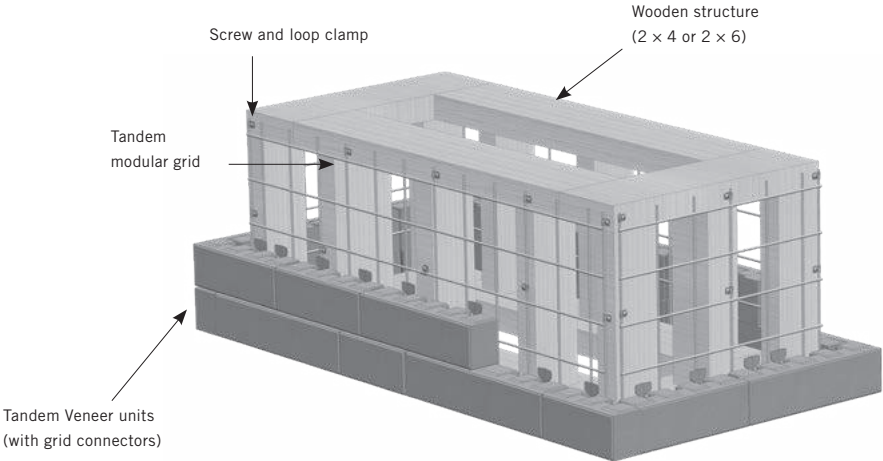
CONSTRUCTION OF OUTDOOR LIVING COMPONENTS WITH THE TANDEM MODULAR GRID (GENERALITY)

The Tandem system allows you to install different outdoor living components such as outdoor kitchens (barbecue, fridge, bar), patio furniture (bench and table), flower box, outdoor gas fireplace, privacy wall, fencing and deck skirting.

Indeed, you can easily build all these features by using the Tandem modular grid.

Our system has multiple benefits:

- Provides a unified look for all the features of the landscaping design.
- Provides a durable, economical and maintenance-free solution.
- Offers great flexibility and unrestricted creativity regarding the configuration and size of components to be constructed.
- Offers a solution to difficult issues (e.g. deck skirting).
- Eliminates the use of cementitious products (mortar).



Basic Principles

A set of Tandem modular grids is attached to a structure of treated wood to which are attached Tandem Veneer units (Lafitt, Melville or Lexa). Since veneer units are manufactured in multiples of 67 mm, the overall dimensions of outdoor units should always be a multiple of 67 mm in order to avoid cuts. The wooden structure should be built taking into account the modular design of Tandem Veneers. The same applies to the height, which must be a multiple of 90 mm. The item is finished off with an appropriate capping module. You can construct a range of outdoor units of various dimensions.

Main components of the system

- Tandem modular grid, 720 mm × 1080 mm (28" × 42 ½"), including stainless steel screws and Loop clamps for fastening. A modular grid covers a facing surface of 0.78 m² (8.40 sqft). Each modular grid includes a kit of 60 connectors, 10 × 1 ¼" screws and 10 loop clamps.
- Tandem Veneer units (Lafitt, Melville or Lexa).
- Galvanized shelf angle (for deck skirting, privacy walls and fences) 2 ½" × 2 ½" × 8' (min 10 gauge, Z275 G90 galvanized steel, ASTM A653 Grade 33).
- Permacon concrete capping module (Lafitt, Melville and Esplanade Tandem, Mondrian as well as the City and Privacy Capping).

Other components not supplied by Permacon

- Treated Wood: 2 x 4, 2 x 6 and 2 x 8 boards, 4 x 4 or 6 x 6 posts, 4 x 8 plywood sheets (all wood should be treated against rot and must be category S-P-F #1 or better). Refer to the various suppliers' specific application sheets for details.
- Fiber cement panels 1220 mm × 2240 mm × 12 mm (48" × 96" × ½").
- #10 screws of varying lengths, nuts, bolts and washers where required, all in stainless steel. It is not recommended to use treated wood screws (green ceramic) or metal plated screws (zinc, copper or other).
- Hilti Kwik Bolt-type anchors (for concrete deck skirting)
- Simpson Strong-Tie-type hardware for construction of wood frame for deck.
- Custom countertops made of granite, quartz, marble and natural stone as alternatives to concrete tops.

WOOD FRAMING

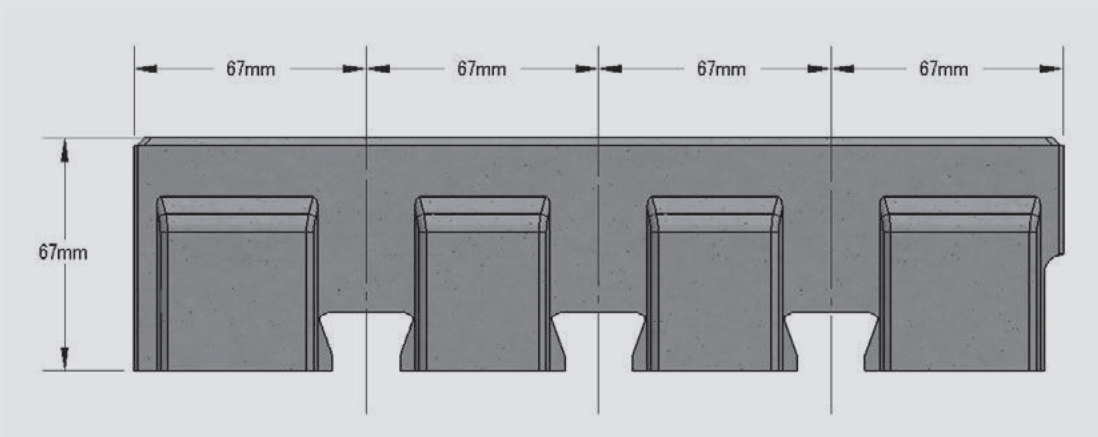
You must always take the modular design of Tandem Veneers into account when constructing wood framing. The overall dimensions of outdoor units must always be a multiple of 67 mm in length and width and 90 mm in height. When installing the framing, remember that grids need a 16 mm ($\frac{5}{8}$ ") space between the veneer and the frame.

Bearing this in mind, the following tables show detailed measurements for the framing of units. These tables are very useful for quickly calculating the actual dimensions of the wood framing and the unit to be constructed to build the component without any veneers cut.

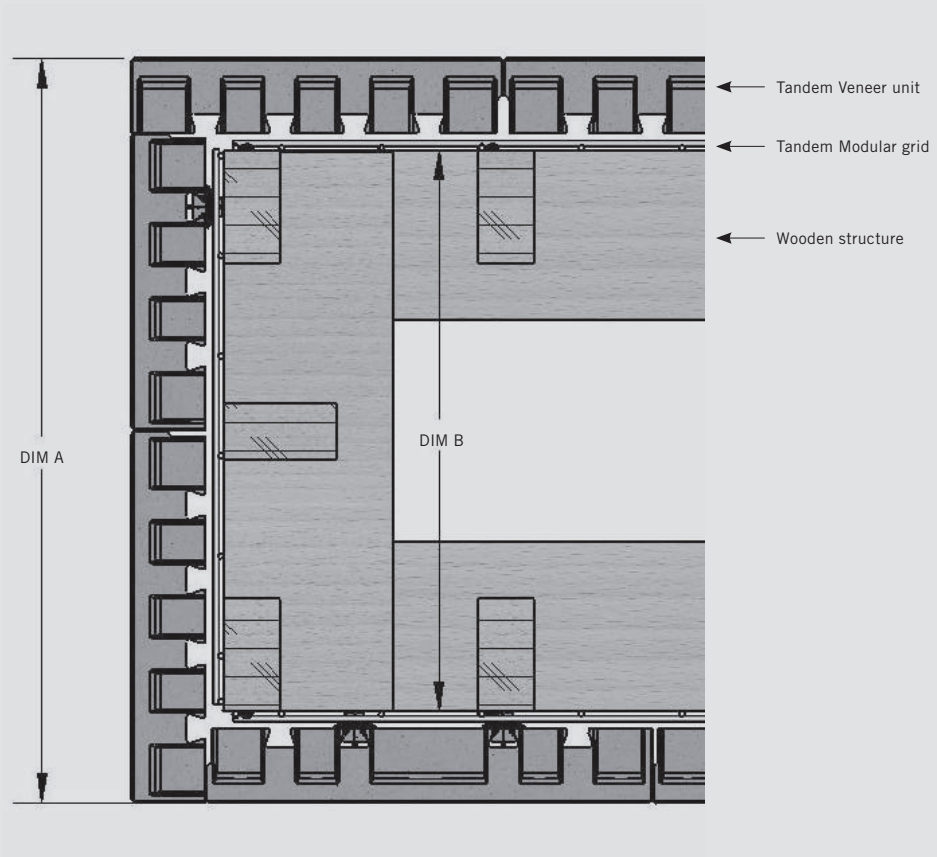
Table of component and its wood frame dimensions based on the modular format of veneers

DIM A (mm)	DIM A (in)	DIM B (mm)	DIM B (in)
201	7 15/16	35	1 3/8
268	10 9/16	102	4
335	13 3/16	169	6 5/8
402	15 13/16	236	9 5/16
469	18 7/16	303	11 15/16
536	21 1/8	370	14 9/16
603	23 3/4	437	17 3/16
670	26 3/8	504	19 13/16
737	29	571	22 1/2
804	31 5/8	638	25 1/8
871	34 5/16	705	27 3/4
938	36 15/16	772	30 3/8
1005	39 9/16	839	33 1/16
1072	42 3/16	906	35 11/16
1139	44 13/16	973	38 1/4
1206	47 1/2	1040	40 15/16
1273	50 1/8	1107	43 9/16
1340	52 3/4	1174	46 1/4
1407	55 3/8	1241	48 7/8
1474	58 1/16	1308	51 1/2
1541	60 11/16	1375	54 1/8
1608	63 5/16	1442	56 3/4
1675	65 15/16	1509	59 3/8
1742	68 9/16	1576	62 1/16
1809	71 1/4	1643	64 5/8
1876	73 7/8	1710	67 5/16
1943	76 1/2	1777	69 15/16
2010	79 1/8	1844	72 5/8
2077	81 3/4	1911	75 1/4
2144	84 7/16	1978	77 7/8
2211	87 1/16	2045	80 1/2
2278	89 11/16	2112	83 1/8
2345	92 5/16	2179	85 3/4
2412	94 15/16	2246	88 7/16
2479	97 5/8	2313	91 1/16
2546	100 1/4	2380	93 11/16
2613	102 7/8	2447	96 5/16
2680	105 1/2	2514	99

TANDEM VENEER UNITS –
MODULAR DESIGN



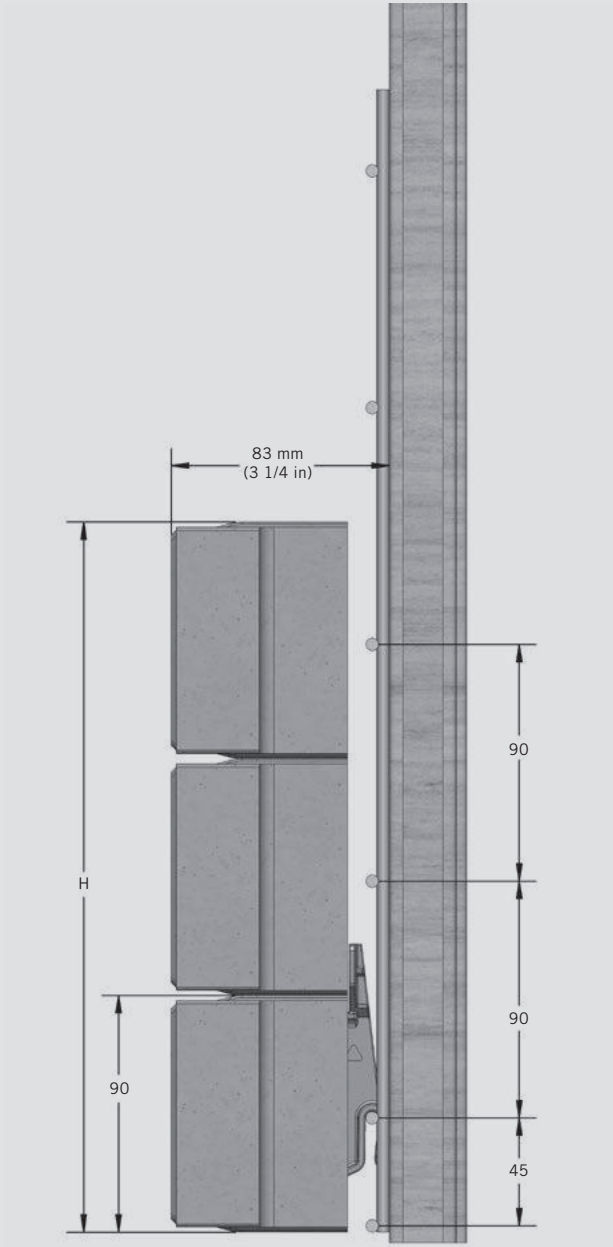
TYPICAL COMPONENT –
PLAN VIEW



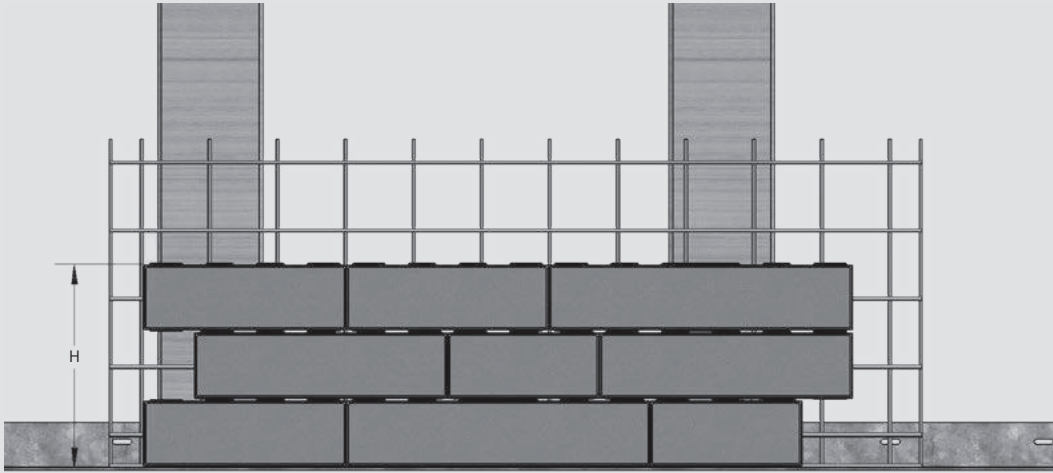
TYPICAL COMPONENT –
SIDE VIEW

Table – Height of components and its wood frame according to the modular design of veneer units (90 mm)

# OF ROWS	HEIGHT (mm)	HEIGHT (in)
2	180 mm	7 1/16
3	270 mm	10 5/8
4	360 mm	14 3/16
5	450 mm	17 11/16
6	540 mm	21 1/4
7	630 mm	24 13/16
8	720 mm	28 1/3
9	810 mm	31 1/8
10	900 mm	34 5/8
11	990 mm	39
12	1080 mm	42 1/2



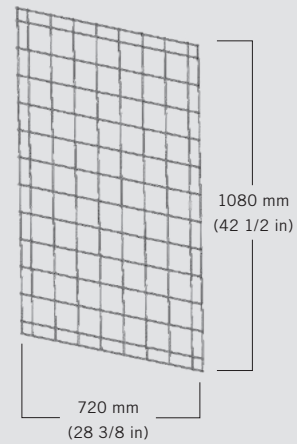
TYPICAL COMPONENT –
FRONT VIEW



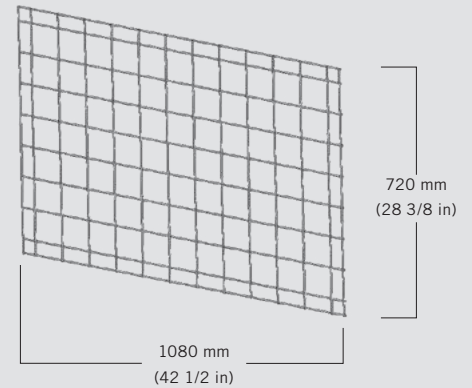
TANDEM MODULAR GRID

It is important to note that the units to be constructed must always be straight and have corners (inner and outer) forming a 90° angle. Therefore, making a corner is a common element in all construction plans. You can also refer to the plan view detail (page 44) to see how to make a 90° corner, taking into account the modular design of Tandem Veneers and grids. When building the wood frame, keep in mind that you have to install Tandem grids. The flexibility of the grid means that you can install it in either direction, horizontally or vertically.

DETAIL 1
VERTICAL
INSTALLATION

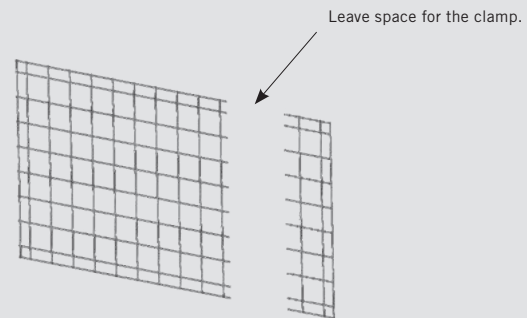


HORIZONTAL
INSTALLATION



You have to cut the grids when the unit you're building is smaller in size (height or length) than a complete grid of 28" or 42 1/2". It may be helpful to decide the direction of the grid so as to minimize cuts. To cut a grid, use any suitable tool like a grinder or bolt cutters.

To avoid making cuts in the veneers, simply follow the dimensions based on the modular design of the veneers shown in the previous tables.



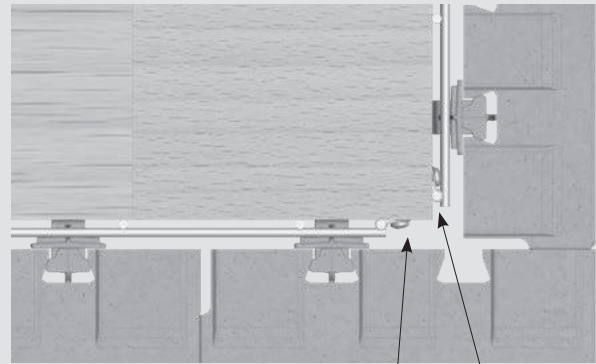
The grid is attached with the loop clamps and screws supplied. Simply place the loop clamps around the vertical rods of the grid and then insert a screw into the wood frame. There are 10 loop clamps per Tandem grid.

To secure a grid, the loop clamps should be evenly positioned, starting with the edge of the grid and moving towards the center. To ensure the solidity of the grid, use approximately one fastener (screw and loop clamps) per square foot of grid or 10 fasteners per square meter. To attach a grid to the wood frame, the vertical rods must be placed directly against the structure.

Since the metal rods of the grids are spaced every 90 mm, it's helpful if the intermediate posts of the wood framing are multiples of 90 mm. This will increase the available attachment area for the grid. A continuous attachment area like plywood sheeting can also be used to provide a larger surface for attaching the Tandem grid.

When a unit requires more than one grid either horizontally or vertically, they should be installed one after the other in both directions.

DETAIL 2



CUTTING INSTRUCTION OF MODULAR GRID (PLAN VIEW)

Keep the last vertical rod intact for better fixation

Leave free space to attach the loop clamps



3D VIEW

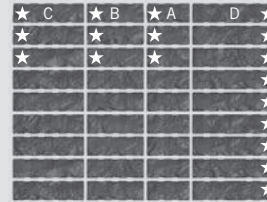
TANDEM VENEERS

When the grids have been installed, just insert the veneers for the unit using the connectors specially designed for the purpose. We recommend using 2 connectors per veneer for a solid job, but sometimes it can happen that a connector can't be inserted because of the grid's geometry. You can then secure the veneer by gluing it around other veneers with a concrete adhesive such as Permapro adhesive.

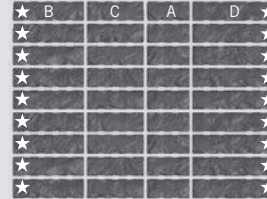
Normally, for a standard project, all formats of the veneer units are used randomly. As for retaining walls, always keep in mind the principle of staggering the vertical joints from one row to another. For the corners, you need corner units just like constructing a pillar with steel grids (see "Building Pillars" section). But it should be noted that sometimes the construction of a short unit requires a larger quantity of the same format veneers, especially corner units (for Lafitt Tandem, the amount of veneer corner units is in a proportion of about $\frac{1}{3}$ of a pallet. For Melville Tandem, all veneer units have a textured corner. For Lexa Tandem, the amount of veneer units are limited to B and D units, every second row only). It is important to check this when calculating the quantity so as to have enough of the appropriate veneers on hand.

It is also possible to use 180 mm veneers when constructing a unit, the same as for a retaining wall or a column.

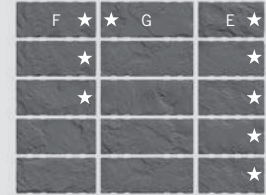
STACKING POSITION ON PALLETS (WITH A TEXTURED END)



LAFITT TANDEM – 90 mm UNITS



LEXA TANDEM – 90 mm UNITS
(EVERY SECOND ROW)



LAFITT TANDEM – 180 mm UNITS



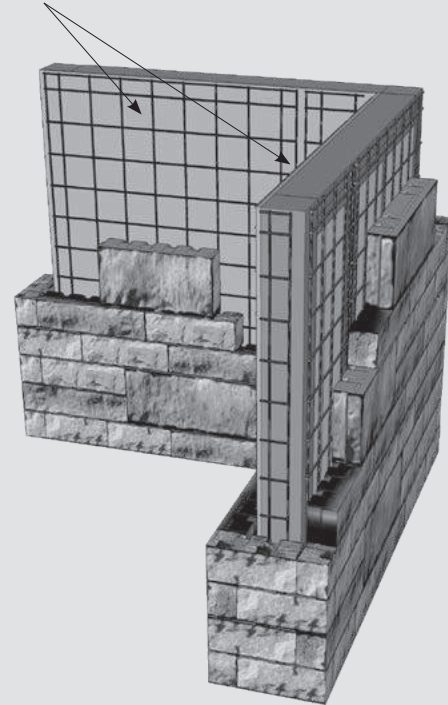
LEXA TANDEM – 180 mm UNITS
(EVERY SECOND ROW)

BRACING

Some items require bracing panels like plywood sheeting, especially for privacy walls, fencing and deck skirting. These panels are needed to strengthen the unit to withstand stress such as wind and to limit distortion under regular loads.

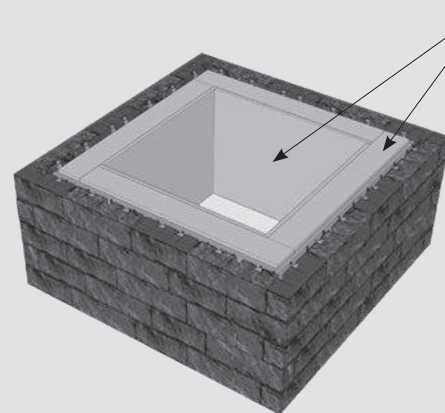
EXAMPLE OF BRACING
(PRIVACY WALL)

Plywood sheeting
for bracing



EXAMPLE OF A HEAT PROTECTION SET-UP

Fiber cement panel for
protection against heat

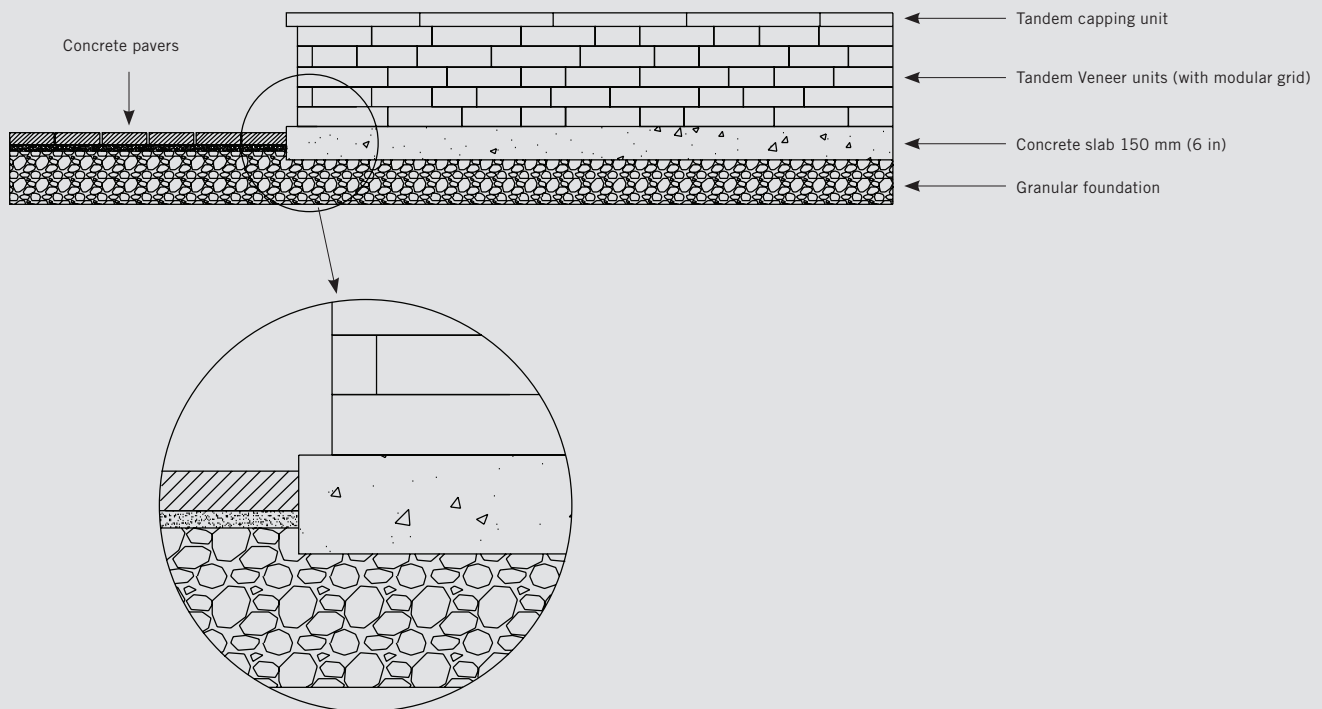


Other units require the installation of fiber cement panels for heat insulation (barbecues and outdoor gas fireplaces) or as protection against moisture (flower boxes). In these situations, we recommend fiber cement panels of a minimum thickness of 12 mm (1/2").

BASE SUPPORT FOR OUTDOOR UNITS

Outdoor units like a bench, flower box or outdoor fireplace can usually be built on a base of concrete foundation (starter modules) or placed directly onto concrete pavers. A granular base of compacted crushed stone should be laid before the foundation. However, we recommend that long or heavy units be supported on a concrete slab (minimum thickness of 150 mm or 6"). We also recommend that units like barbecues or tables with a single granite, quartz or marble top over their entire surface be supported on a reinforced concrete slab to prevent the top from breaking if the ground shifts. In each case, a compacted granular base should underlie the concrete slab.

COMPONENTS SUPPORTED ON A CONCRETE SLABS – CROSS SECTION



Note: When a section of a unit has veneers that are not directly supported on the ground (foundation modules, pavers or concrete slabs), for example for installing doors, the veneers must be supported on shelf angle sections attached to the wood frame.

CONSTRUCTION LUMBER

Building the different units in this guide requires construction lumber for the framing: 2 × 4, 2 × 6 and 2 × 8 boards, 4 × 4 and 6 × 6 posts and plywood sheets. We recommend that all wood used outdoors be treated against rot according to established procedures approved by Health Canada. You should use S-P-F #1 or #2 wood, or better. This type of wood usually has a minimum life of 15 years without maintenance in normal outdoor conditions.

Note: Wooden components that have been cut or sawed should be treated with an anti-rot product.

COMPLIANCE WITH CONSTRUCTION STANDARDS

In all circumstances, units to be constructed must always comply with the requirements of the National Building Code (version specific to your region) and local municipal bylaws and regulations.



CONSTRUCTION OF OUTDOOR LIVING COMPONENTS WITH THE TANDEM MODULAR GRID

BUILDING AN OUTDOOR GAS FIREPLACE

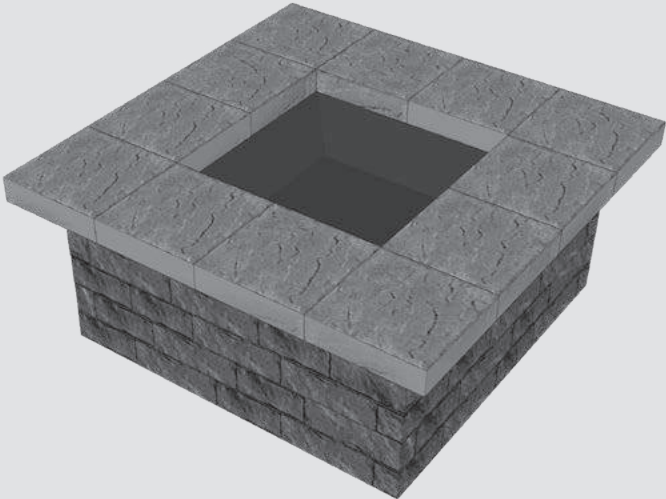
Note that the only type of fireplace recommended for this type of construction is a propane gas or natural gas fireplace. A wood fireplace is not permitted.

Construction should begin with laying a solid foundation that is leveled, compacted and well drained.

The wood framing must be built according to the type of fireplace chosen. Dimensions are calculated using the data on shop drawings provided by the fireplace manufacturer. It may be necessary to add some extra parts like plywood shims for adjusting to the exact modular dimensions of the fireplace (Tandem modular veneers according to the wood frame design).

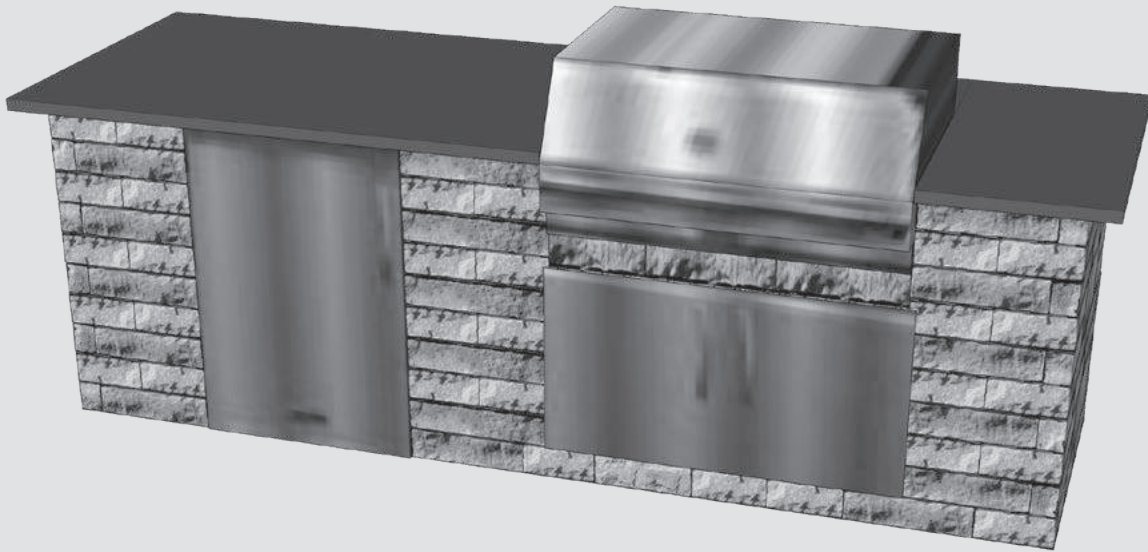
It is essential to install heat insulation. A fiber cement panel of a minimum thickness of 12 mm (1/2") is recommended for adequate protection. The panels must be installed all around the heating element (burner).

You must also plan to install conduits in the ground for gas pipes and for electric cables if required.



BUILDING AN OUTDOOR KITCHEN (BARBECUE, REFRIGERATOR, BAR)

The wood frame must be constructed according to the type of barbecue chosen. Dimensions are calculated using data on the shop drawings provided by the barbecue manufacturer. Additional accessories such as a fridge or integrated cabinet doors are also possible. Naturally, you have to plan on adding pieces of wood to attach accessories to the wooden structure, like a frame in the case of doors. When purchasing supplies, you will usually find moldings to finish the edges of the various units.



It is essential to install protection from heat and sparks. A fiber cement panel of a minimum thickness of 12 mm (1/2") or a double-skinned steel section if provided by the BBQ manufacturer is recommended for adequate protection. The panels must be installed all around the heating element (burner).

Finish off with concrete coping or panels of granite, quartz, marble or natural stone. The panels must be made to measure by specialized companies. You must make special provisions for handling and installation to avoid possible breakage. The panels are attached on top of the plywood with silicone adhesive to prevent movement.

Provide adequate means for venting gases when constructing the barbecue. (Refer to the barbecue manufacturer's recommendations for the position and size of the ventilation grid required).

You should also plan to install conduits for gas pipes and electric cables. The conduits may in certain cases be installed in the ground.

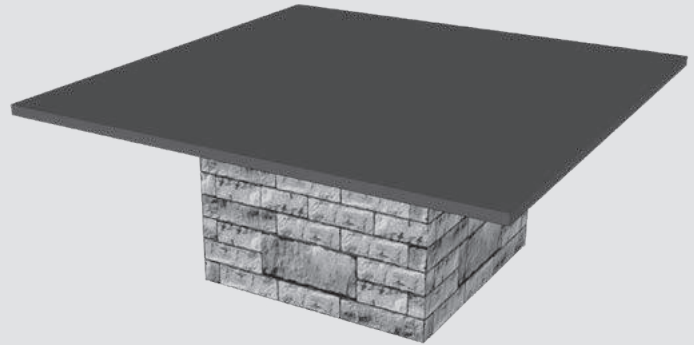
BUILDING PATIO FURNITURE (TABLE AND BENCH) AND FLOWER BOX

TABLE

You can make a table by building a Tandem unit (grid and veneers) to form the base and then adding a tabletop. The tabletop can be wood, granite, quartz, marble or natural stone.

Dimensions may vary. It is essential to leave a minimum space between the table edge and the base. At least 460 mm (18") is needed for leg room.

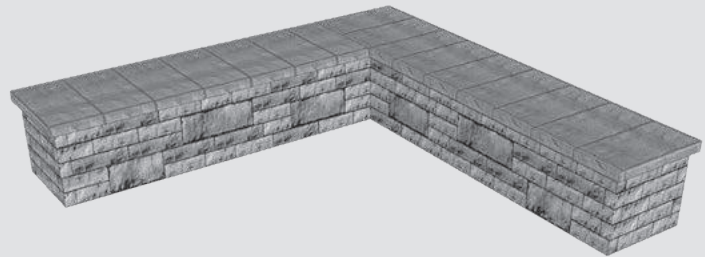
Granite, quartz or marble tabletop: the tabletop must be attached to the veneers with a silicone adhesive. We recommend that a tabletop resting on a Tandem unit be made from a single piece to increase rigidity and stability. This allows you to avoid adding a metal fastener to secure the tabletop to the structure for increased stability and extra protection where necessary. For very large tabletops, it is recommended to install steel supports (angles) to better stabilize the whole unit. You should enquire from the tabletop supplier what are the optimal sizes and thicknesses for stability and security and to avoid possible breakage.



BENCH

You can make a bench by building a structure for the base and simply adding a concrete coping unit for the seat. Bench dimensions can vary, but it may be helpful to make your decision based on available coping units in order to avoid cuts. For a typical bench, the coping will be of the Melville Tandem type.

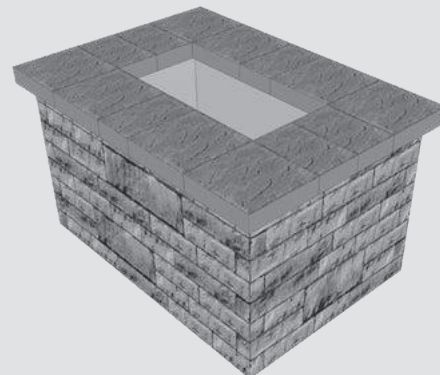
Bench minimum width is 21 in.



FLOWER BOX

It is recommended to install a fiber cement panel and a geotextile membrane to protect the wood against deterioration caused by vegetable and mineral materials (plants and soil). You should provide water drainage when building the structure.

For the coping, use the following Permacon capping products for retaining walls: Mondrian capping module 50 mm, Lafitt, Melville and Esplanade capping modules.



BUILDING PRIVACY WALLS AND FENCES

When you're building a fence or when you want to hide or conceal various pieces of equipment (e.g. pool filter, heat pump) or utility items (e.g. trash-cans or storage bins), the Tandem modular grid system is just what you need.

Fencing is mostly built with treated wood posts (structural, select quality) supported by cast-in-place concrete foundations (Sonotubes) for the main structure. An intermediate structure in treated wood boards is then installed between the posts to attach the fence components of Tandem modular grids and veneers. A shelf angle is fixed to the base of the structure to provide continuous support for the weight of the veneers. The shelf angle (2 1/2" x 2 1/2" x 8') is attached to the base of the structure (wood poles and boards forming the stringer) with suitable screws (#10 x 3 1/2") every 200 mm (8"). This shelf angle can be cut to the size of the unit under construction.

The wooden structure between the posts, combined with the shelf angle, supports the weight of the walls and transfers it to the foundations. Fences and privacy walls must rest on pillars (Sonotubes) and concrete foundations to transfer the weight of the walls to the ground. The foundations are also necessary to prevent the walls from collapsing due to the force of the wind.

The dimensions of the foundations in this guide were calculated to respect the weight-bearing capacity of the soil and to limit irregular subsidence that could lead to distortions in the wall. Calculations were made for soil conditions of low weight-bearing capacity. For different soil conditions, we recommend consulting a qualified engineer. The foundation must be built to withstand local frost conditions. The depth of frost in this guide is 1.8 m (6'). The use of screw piles is not recommended for this type of application.

Privacy walls are made with the same main structure to which a perpendicular section is added to obscure non-aesthetic items.

The maximum height of a fence or a privacy wall is limited to 1.8 m (6 ft).

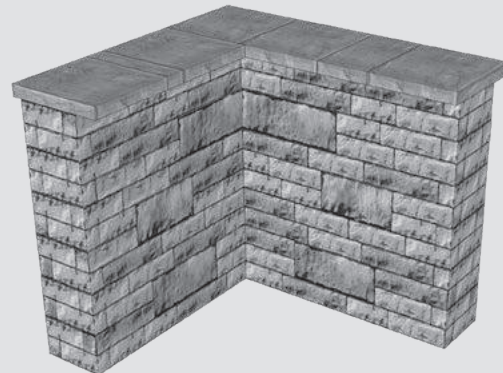
The maximum length of a wall facade between posts is 2.4 m (8 ft).

The unit can be built to display its aesthetic appearance on one side or both sides simultaneously.

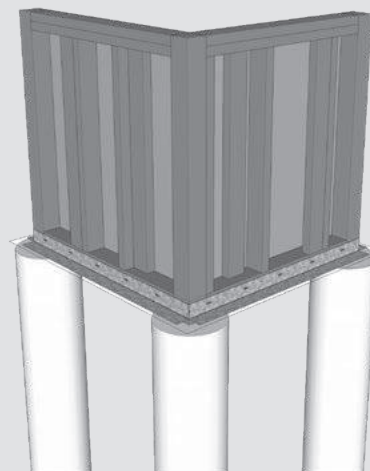
The wood frame must integrate a bracing panel such as a sheet of 12 mm (1/2") treated plywood to provide a continuous attachment area and stabilize the structure to withstand loads. To finish the walls, attach a cap on top of the wood frame, either in concrete (sizes to be decided on site) or metal (custom bent by a specialized company). Esplanade coping and Tandem Melville steps can be used to finish the top of a fence or privacy wall.

The capping unit is fixed with a suitable concrete adhesive spread on the wooden structure and the top of veneers. It may be useful to fix the wooden structure to the concrete cap with a metal attachment to provide additional wind protection.

PRIVACY WALL



PRIVACY WALL ON CONCRETE PILLAR (SONOTUBE) – CONSTRUCTION DETAILS OF WOODEN STRUCTURE



Since unit components will vary according to height from zero to 1.8 m (6'), we present the main minimum requirements in table form.

DESIGN DATA FOR FENCES

Fence with veneer on one side

HEIGHT	Ø PILASTER	FOOTING	EMBEDDING POST	POST	STRUCTURE
0 to 4 ft – Option 1	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	4 x 4*	2 x 4
Option 2	12 in / 300 mm	16 in x 16 in / 400 mm x 400 mm	24 in / 600 mm	4 x 4*	2 x 4
Option 3	24 in / 600 mm	N/A	24 in / 600 mm	4 x 4*	2 x 4
4 to 5 ft – Option 1	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	6 x 6**	2 x 6
Option 2	12 in / 300 mm	16 in x 16 in / 400 mm x 400 mm	24 in / 600 mm	6 x 6**	2 x 6
5 to 6 ft – Option 1	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	6 x 6**	2 x 6
Option 2	12 in / 300 mm	20 in x 20 in / 500 mm x 500 mm	24 in / 600 mm	6 x 6**	2 x 6

Fence with veneer on both sides

HEIGHT	Ø PILASTER	FOOTING	EMBEDDING POST	POST	STRUCTURE
0 to 4 ft – Option 1	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	4 x 4*	2 x 4
Option 2	12 in / 300 mm	20 in x 20 in / 500 mm x 500 mm	24 in / 600 mm	4 x 4*	2 x 4
4 to 5 ft – Option 1	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	6 x 6**	2 x 6
Option 2	12 in / 300 mm	20 in x 20 in / 500 mm x 500 mm	24 in / 600 mm	6 x 6**	2 x 6
5 to 6 ft – Option 1	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	6 x 6**	2 x 6
Option 2	12 in / 300 mm	22 in x 22 in / 550 mm x 550 mm	24 in / 600 mm	6 x 6**	2 x 6

DESIGN DATA FOR PRIVACY WALLS

Wall with veneer on one side

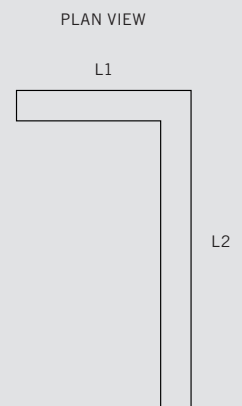
HEIGHT	Ø PILASTER	FOOTING	EMBEDDING POST	POST	STRUCTURE
L1 and L2 Configuration = 1.2 m (4 ft)					
0 to 3 ft	16 in / 400 mm	N/A	24 in / 600 mm	4 x 4*	2 x 4
3 to 6 ft – Option 1	24 in / 600 mm	N/A	24 in / 600 mm	6 x 6	2 x 6
Option 2	12 in / 300 mm	16 in x 16 in / 400 mm x 400 mm	24 in / 600 mm	6 x 6	2 x 6
Option 3	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	6 x 6	2 x 6
L1 Configuration = 2.4 m (8 ft) and L2 = 1.2 m (4 ft)					
0 to 4 ft – Option 1	24 in / 600 mm	N/A	24 in / 600 mm	4 x 4*	2 x 4
Option 2	12 in / 300 mm	16 in x 16 in / 400 mm x 400 mm	24 in / 600 mm	4 x 4*	2 x 4
4 to 5 ft – Option 1	24 in / 600 mm	N/A	24 in / 600 mm	6 x 6**	2 x 6
Option 2	12 in / 300 mm	16 in x 16 in / 400 mm x 400 mm	24 in / 600 mm	6 x 6**	2 x 6
Option 3	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	6 x 6**	2 x 6
5 to 6 ft – Option 1	12 in / 300 mm	16 in x 16 in / 400 mm x 400 mm	24 in / 600 mm	6 x 6**	2 x 6
Option 2	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	6 x 6**	2 x 6

Wall with veneer on both sides

HEIGHT	Ø PILASTER	FOOTING	EMBEDDING POST	POST	STRUCTURE
L1 and L2 Configuration = 1.2 m (4 ft)					
0 to 4 ft	16 in / 400 mm	N/A	24 in / 600 mm	4 x 4*	2 x 4
4 to 6 ft – Option 1	12 in / 300 mm	16 in x 16 in / 400 mm x 400 mm	24 in / 600 mm	6 x 6**	2 x 6
	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	6 x 6**	2 x 6
L1 Configuration = 2.4 m (8 ft) and L2 = 1.2 m (4 ft)					
0 to 3 ft	24 in / 600 mm	N/A	24 in / 600 mm	4 x 4*	2 x 4
3 to 4 ft – Option 1	12 in / 300 mm	16 in x 16 in / 400 mm x 400 mm	24 in / 600 mm	4 x 4*	2 x 4
Option 2	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	4 x 4*	2 x 4
4 to 6 ft – Option 1	12 in / 300 mm	20 in x 20 in / 500 mm x 500 mm	24 in / 600 mm	6 x 6**	2 x 6
Option 2	12 in / 300 mm	Ø 24 in / 600 mm	24 in / 600 mm	6 x 6**	2 x 6

N/A: Not Applicable * 4 x 4 SFP Wood Select Structural ** 6 x 6 #1 SFP Wood

It should be noted that the base of concrete pillars should normally have a wider section in the ground for a footing. The footing can take two shapes, square or round. There are round footings on the market, sold as Bigfoot, which can be used for the construction of pillars. Square footings must be made on site with wooden formwork.



DESIGN ASSUMPTIONS

The construction of privacy walls or fences must take into account the following assumptions:

Wall weight (grid and veneers): 28 lbs/sq ft (1.35 kN/m²)

Wind: 20 lbs/sq ft (1 kPa)

Minimum allowable bearing capacity of soil: 1,575 lbs/sq ft (75 kPa)

Density of soil around pillars and foundations (γ): 112 lbs/cu ft (18 kN/m³)

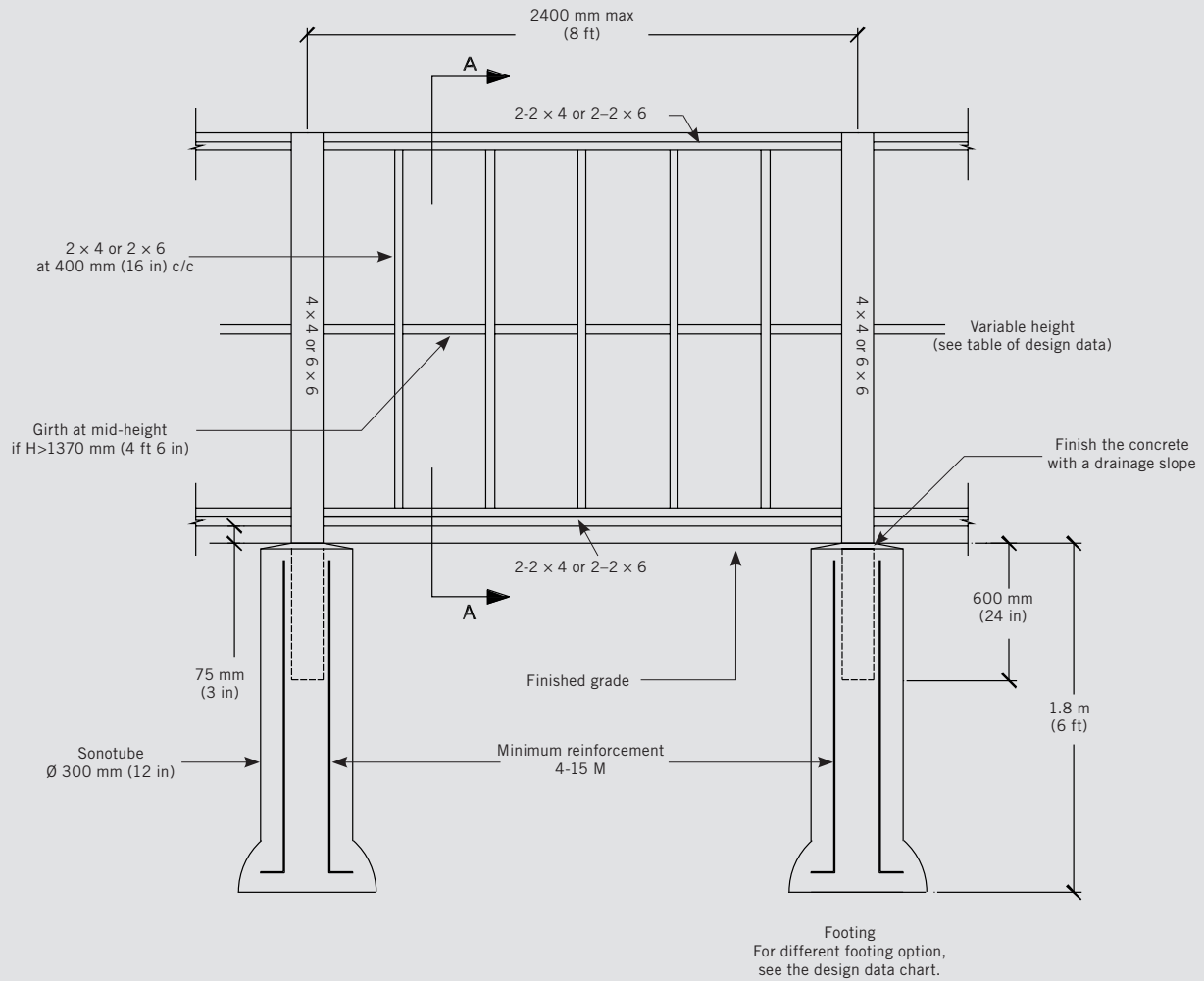
Backfill must be compacted around Sonotubes and spread footings

Minimum depth of foundations: 6 ft (1.8 m) away from frost
(consult an engineer to check the typical depth of frost for your area)

Note: Design assumptions do not take into account earthquake effects.
It may be necessary to consult an engineer.

Leave a free space under the Tandem wall of at least 75 mm (3")
to ensure proper ventilation and adequate room for the potential effects
of freezing and thawing.

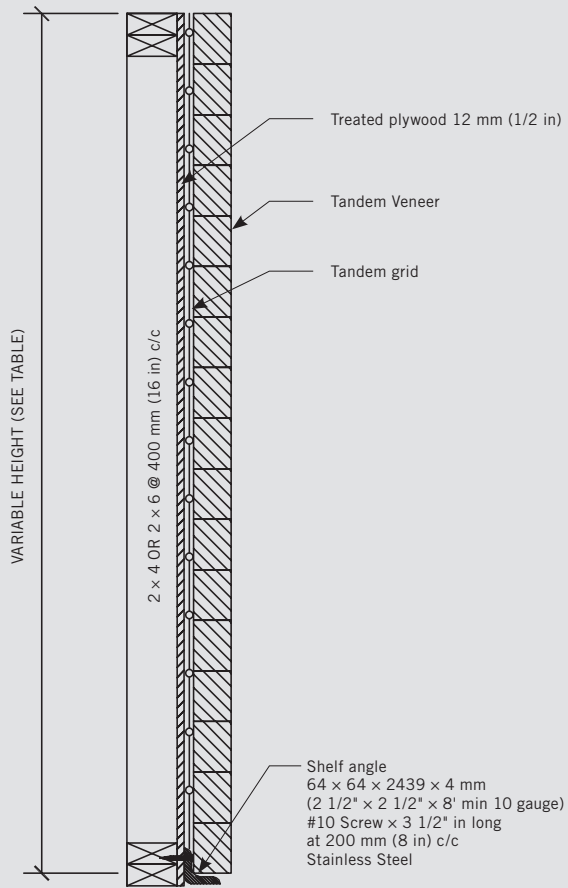
PRIVACY WALLS AND FENCES –
TYPICAL FRONT VIEW



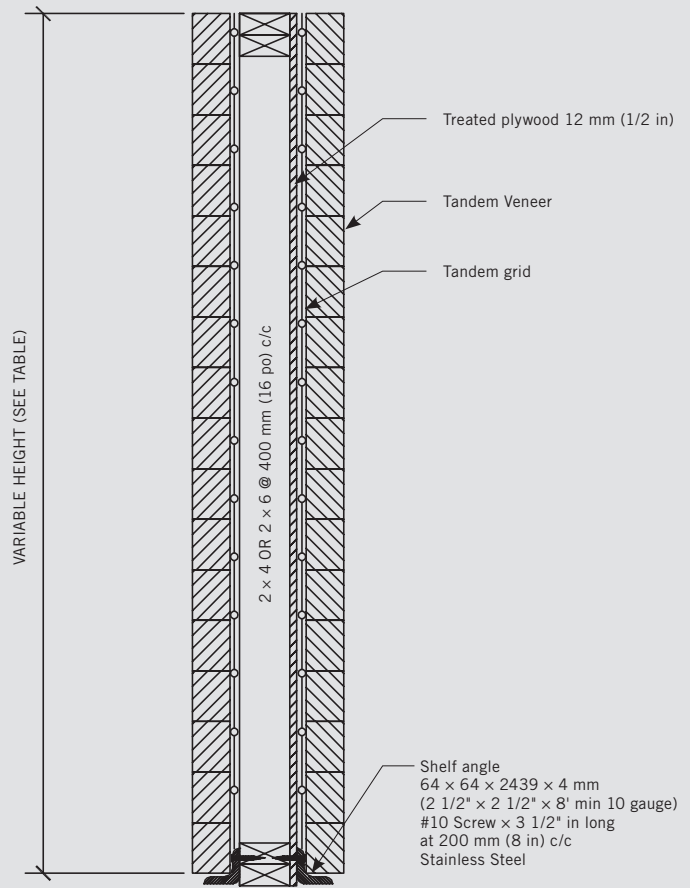
Note: The details shown here are only valid for the application suggested in this guide, taking into account the prescribed limitations. You are strongly recommended to engage a structural engineer or specialist in the field to validate structural design details for other configurations or for different soil conditions (lower or higher load capacity, presence of blocks, support on rock, etc.).

PRIVACY WALLS AND FENCES –
CROSS-SECTION A-A

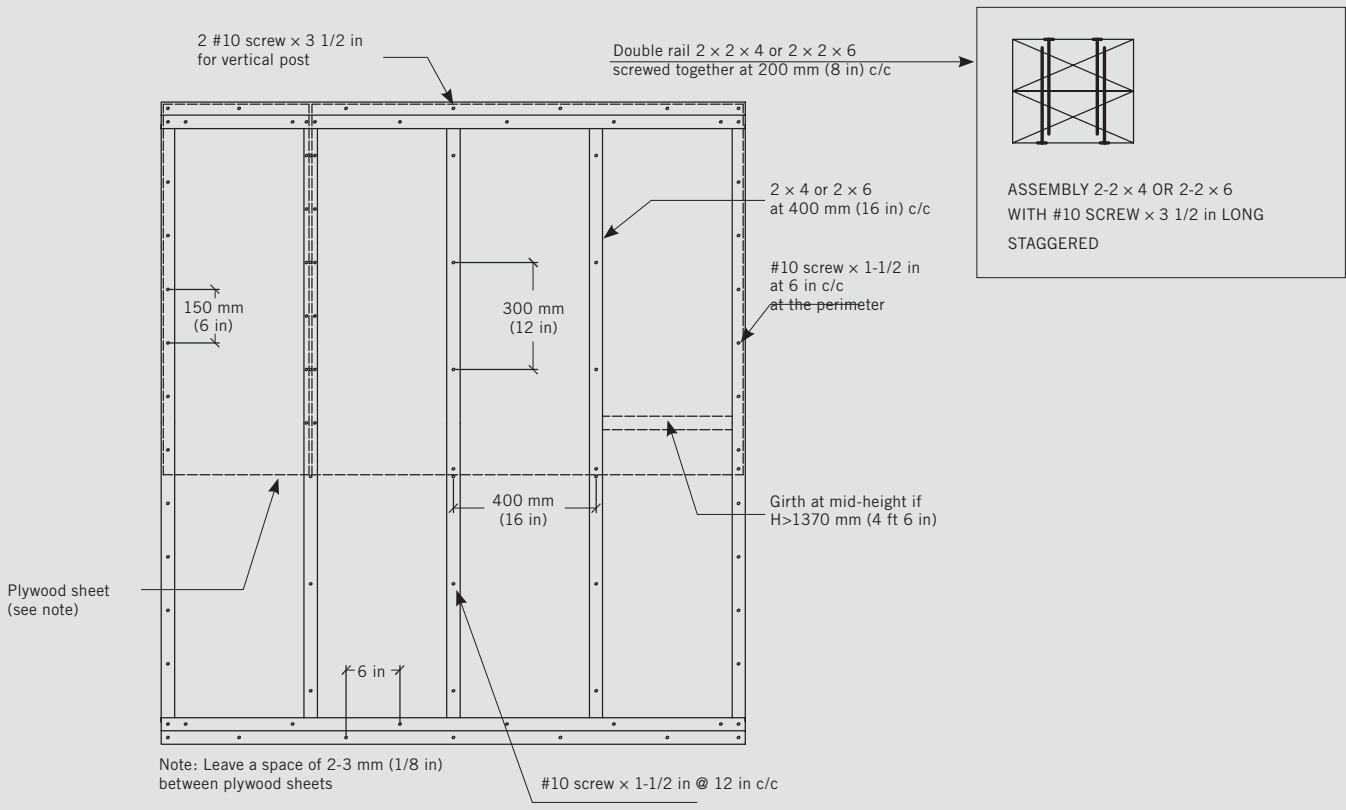
ONE-SIDED



DOUBLE-SIDED



SCREW DIAGRAM OF COMPONENTS OF WOODEN STRUCTURE



BUILDING DECK SKIRTING

Applications: new wood or concrete decks, or existing concrete decks

Another application of the Tandem grid consists of covering the free space under a deck by building a Tandem wall around it. Tandem Veneers are supported by a galvanized shelf angle and a wood frame fixed to the deck (wood or concrete). The wood frame consists of treated plywood to provide a continuous attachment area for the grid, and vertical bracing to stabilize the structure and withstand lateral loads such as the wind. The whole structure is supported by appropriate foundations (screw piles for wooden decks and concrete foundations for concrete decks).

Maximum height of Tandem wall: 1.5 m (5 ft)

To install deck skirting on existing concrete structures, you must first ensure that the initial structure (the deck itself) can bear the additional weight of new covering components: wooden structure, shelf angle and Tandem Veneers. For this kind of project, it is strongly recommended to engage a structural engineer or specialist in the field to validate the structural design details for adequate load bearing.

In all cases, it is necessary to minimally comply with the design criteria shown below:

Wall weight (grid and veneers): 1.35 kN/m² (28 lbs/sq ft)

Wind: 1 kPa (21 lbs/sq ft)

Overload: 1.9 kPa (40 lbs/sq ft)

Note: Design assumptions do not take into account earthquake effects. It may be necessary to consult an engineer.

Minimum allowable bearing capacity of soil: 75 kPa (1575 lbs/sqft).

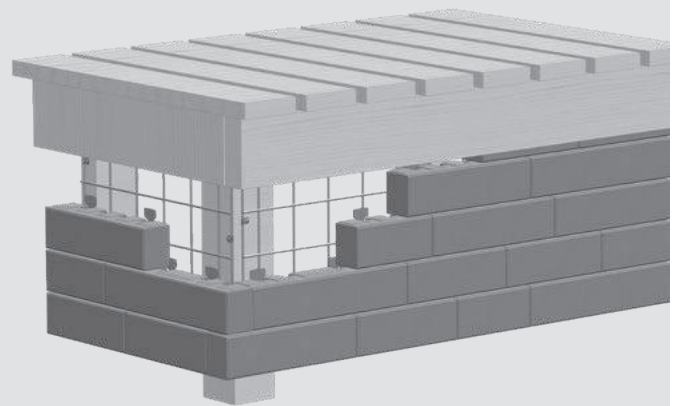
Minimum depth of foundations in soil: 1.8 m (6 ft) away from frost (consult an engineer to check the typical depth of frost for your area).

Leave a free space under the Tandem wall of at least 75 mm (3").

Note: As there is no direct access from the top of a unit (since the Tandem wall is built under the deck), it will be impossible to attach the last row of veneers to the Tandem grid with connectors. Simply glue the last row of veneers to the second-to-last row with a concrete adhesive like Permapro adhesive.

The sketches shown here have been designed to withstand the additional loads of Tandem walls. The details shown are valid for applications suggested in this guide. It is strongly recommended to engage a structural engineer or specialist in the field to validate structural design details for other configurations.

DECK SKIRTING –
3D VIEW



CONCRETE DECK

To cover a concrete deck, you must comply with additional minimum design criteria detailed below:

The minimum thickness of the slab should be 140 mm (5 1/2")

The slab should be reinforced with a minimum 10M reinforcement at 300 mm (12") c / c in both directions and positioned at the center of the slab.

The concrete deck should be supported by pillars of reinforced concrete (Sonotubes), 200 mm (8") in diameter with a minimum footing of 600 mm (24") or larger in diameter.

The compressive strength of the concrete (slab and pillars) must be at least 30 MPa with 5% to 8% entrained air.

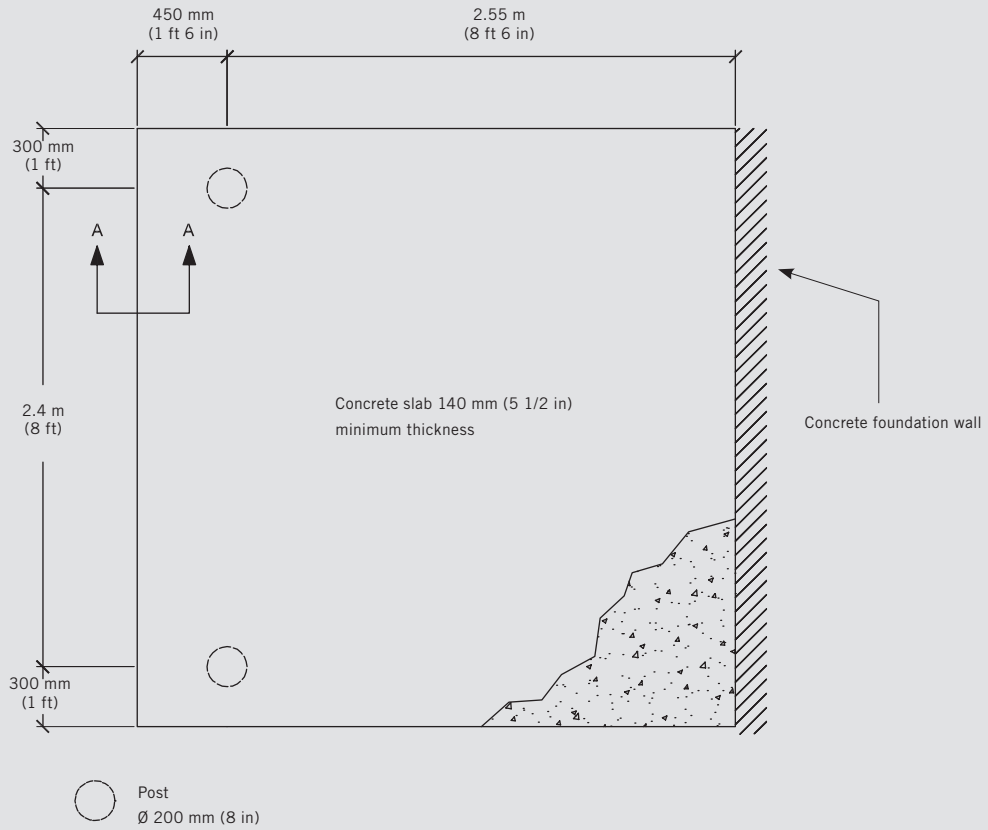
Maximum distance between pillars: 2400 mm (8 ft)

Maximum overhang of concrete slab: 600 mm (2 ft)

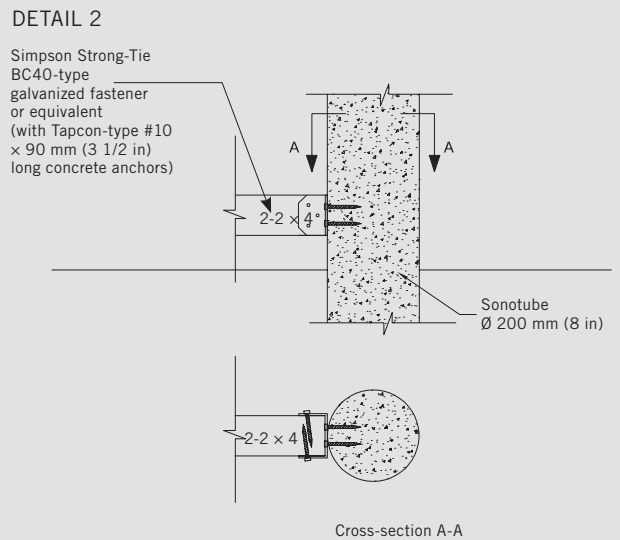
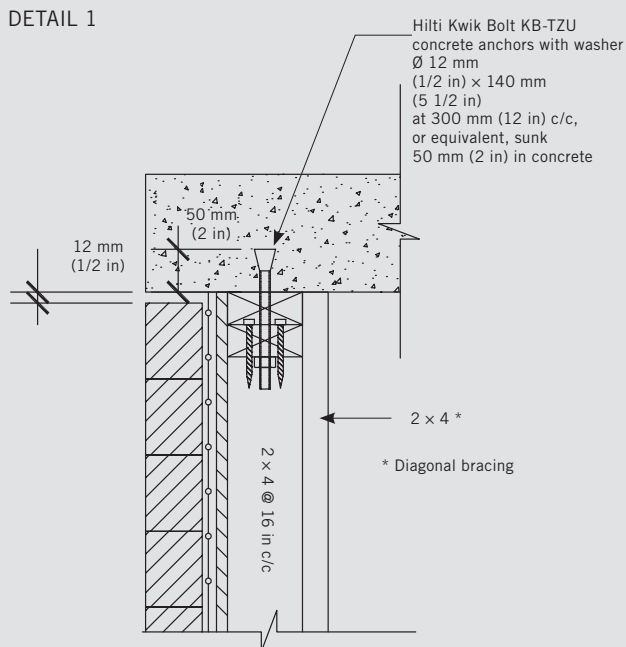
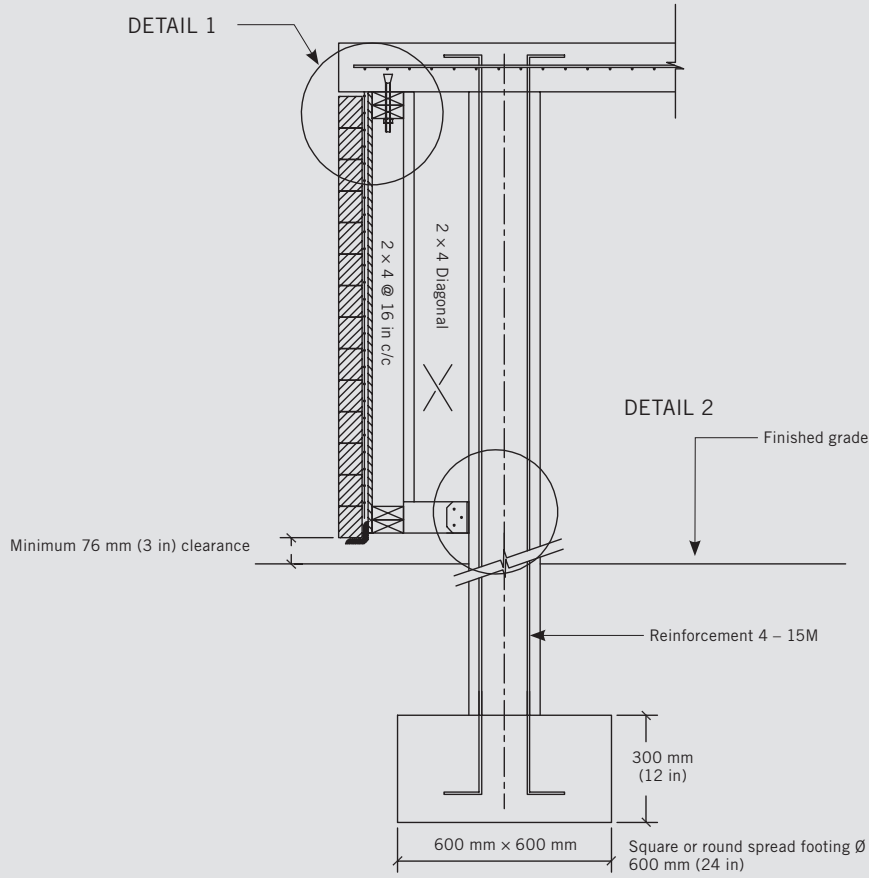
To attach the components of the wooden structure to the concrete slab, you should use mechanical anchors like Hilti Kwik Bolt TZ (12 mm diameter by 140 mm long) or equivalent (not supplied by Permacon).

Leave a space of at least 12 mm (1/2") between the top of the Tandem wall and the underside of the concrete slab.

CONCRETE DECK SKIRTING – PLAN VIEW



CONCRETE DECK SKIRTING –
CROSS-SECTION A-A



WOODEN DECK

Warning: We recommend installing a Tandem wall only for new wooden decks to be built according to the minimum specifications and data detailed below.

The wooden deck should be built with a structure composed of 2 x 8 joists spaced every 16" (400 mm) or less. The deck beams must be made of at least two 2 x 8 boards.

The beams are supported on 4 x 4 (89 x 89 mm) wooden posts. The posts themselves are supported on screw piles designed for this purpose (helical piles).

Maximum length of wood joists in both directions: 2400 mm (8 ft).

Minimum overhang of 300 mm (12") and maximum overhang of 600 mm (2 ft).

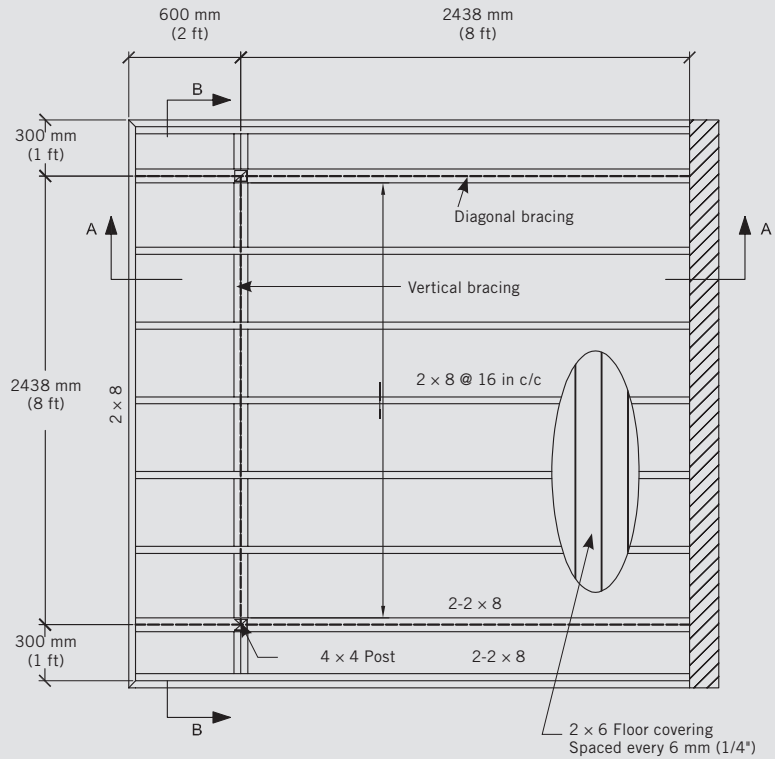
To attach the components of the wooden structure to the deck joists, you should use #10 stainless steel wood screws.

Simpson Strong-Tie hardware (or equivalent) should be used.

A waterproofing membrane must be installed on top of the wood frame to protect the wood from water saturation and rot (in the case of wood board flooring with free space). The membrane can be omitted for waterproof deck flooring such as fiberglass.

It is recommended to leave a space of 1/8" to 1/4" between the wooden boards of the deck for ventilation under the deck so as not to trap moisture.

FLOOR STRUCTURE – PLAN VIEW



WOODEN DECK SKIRTING – CROSS-SECTION A-A

A Simpson Strong-Tie LUS 26 and LUS 26-2 (GA 18) galvanized steel joist hangers, or equivalent

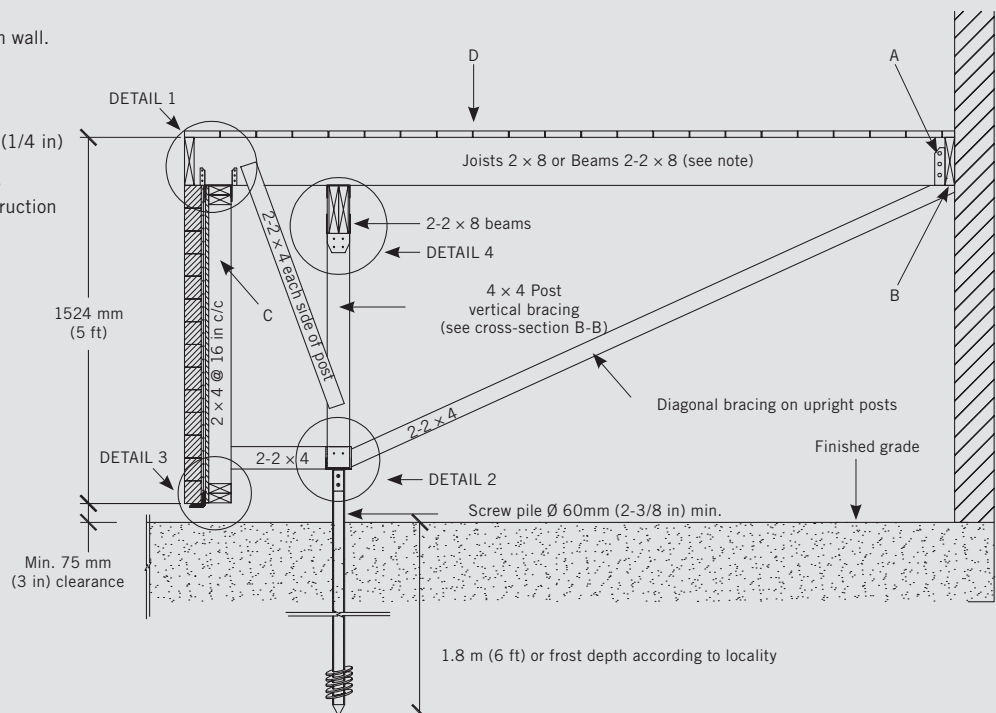
B 2x8 continuous rail attached to foundation wall with Hilti KB-TZU 12 x 140 mm (1/2 in x 5 1/2 in) anchors, or equivalent

Alternative: joists resting on foundation wall.

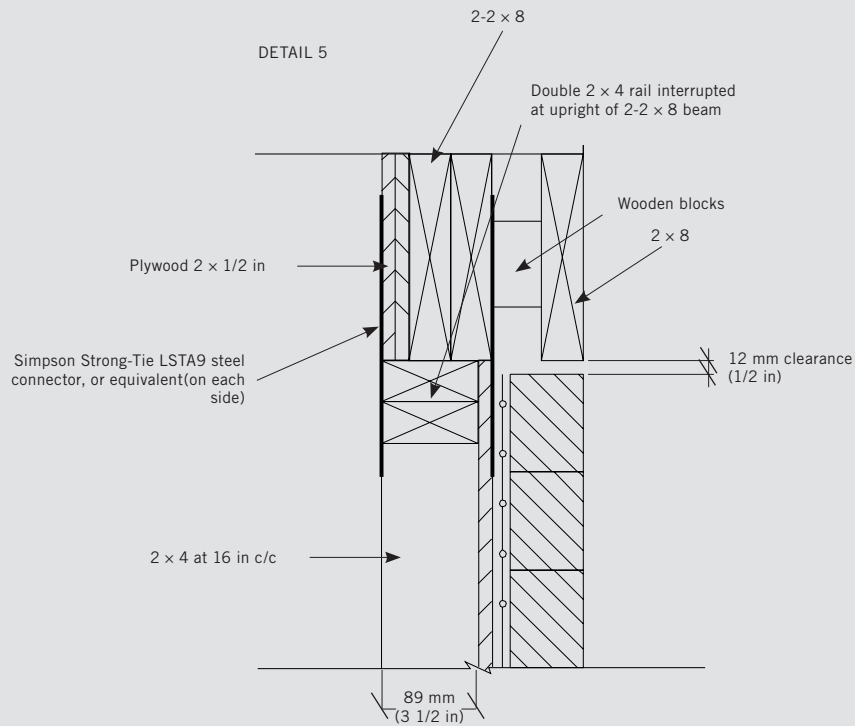
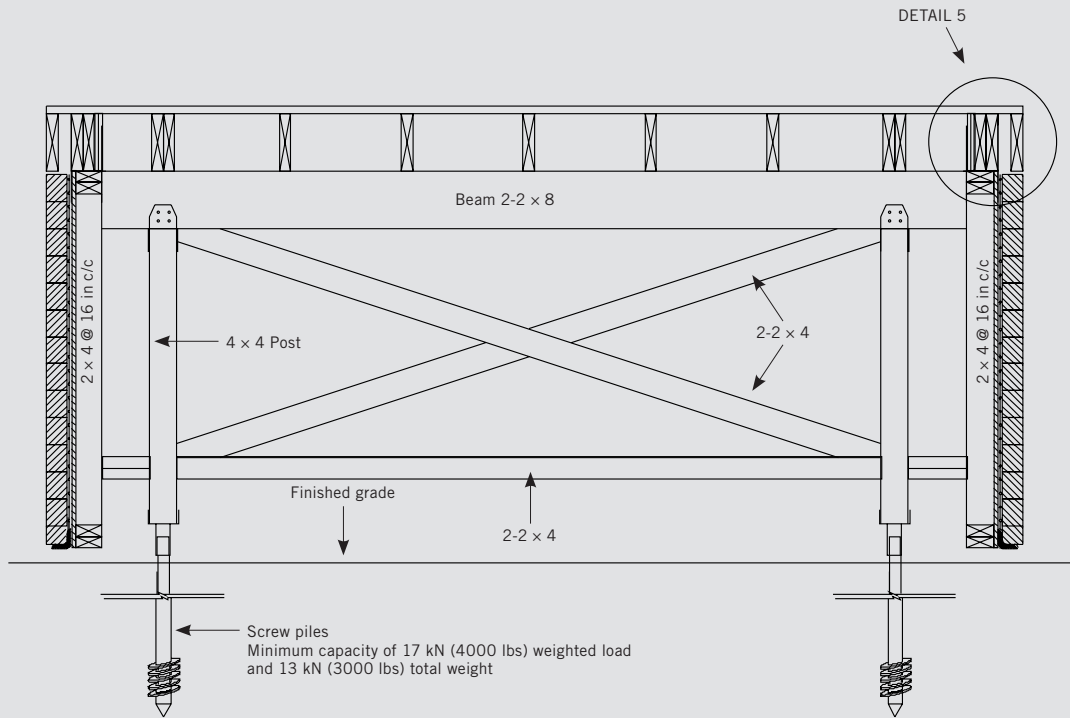
C Diagonal brace at mid-height for wall over 1200 mm (4 in) tall

D Floor coverings 2 x 6 spaced at 6 mm (1/4 in)

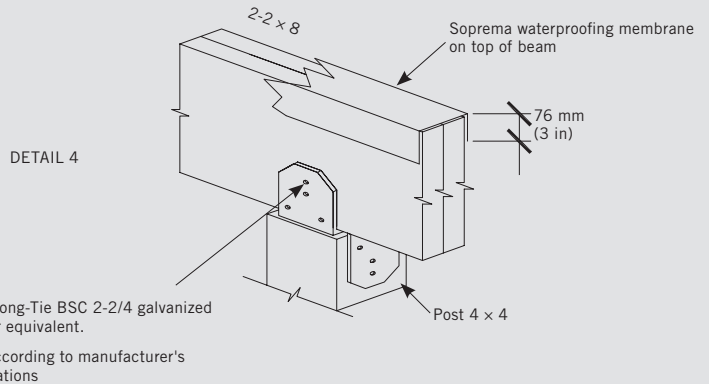
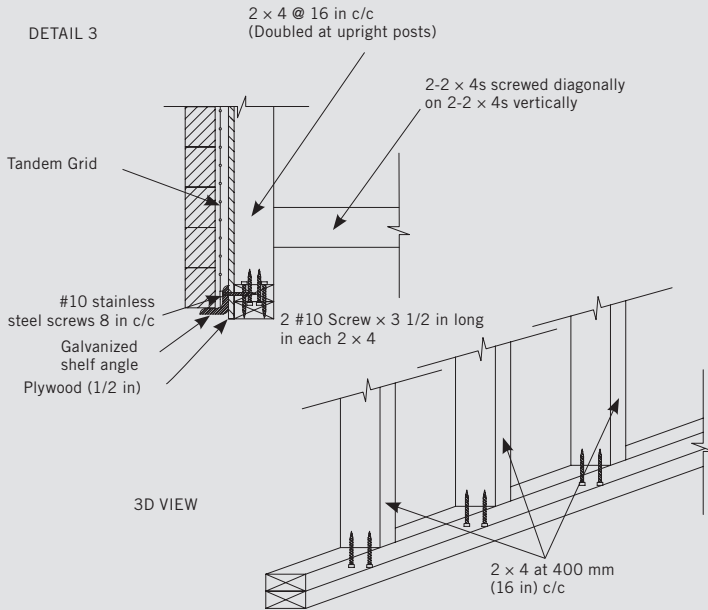
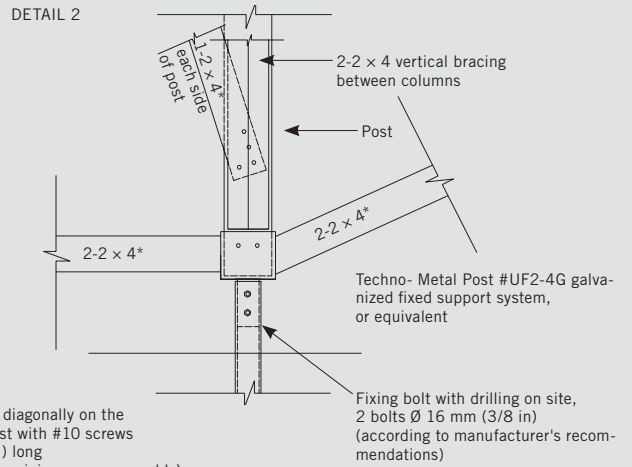
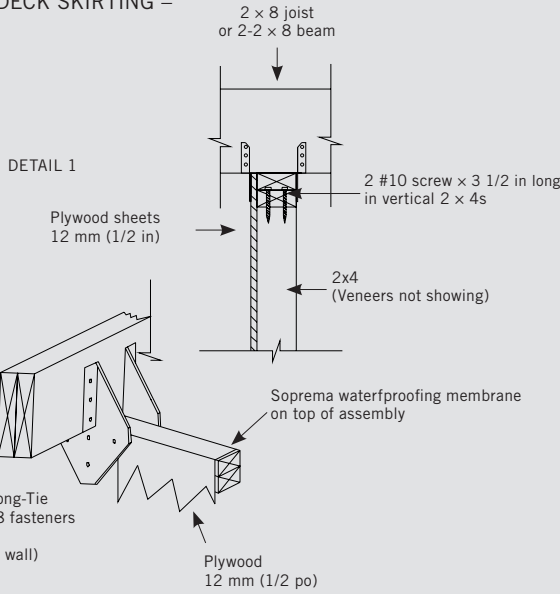
Note: During construction, 2 x 4 posts should face floor joists to enable construction of assemblies



WOODEN DECK SKIRTING –
CROSS-SECTION B-B



WOODEN DECK SKIRTING –
DETAILS



CELTIK® WALL

DESCRIPTION





With a maximum height of 42 inches, the Celtik wall is considered the standard in the landscaping market. Celtik is reminiscent of old stone structures typical of the Irish and Scottish countryside. Its rich texture and variety of modules gives you a choice between the uneven look of cut stone and the more linear look of a brick.

Benefits

- Patented anchor pin system located at the back of the block makes it possible to:
 - Build sloped or vertical walls with minimum cutting, chiselling or using a guillotine
 - Easily create a radius or curves



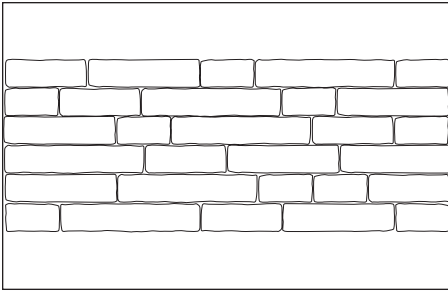
90 UNITS

 A – 90 mm UNIT 90 mm x 225 mm x 175 mm 3 9/16" x 8 7/8" x 6 7/8"	 B – 90 mm UNIT 90 mm x 225 mm x 265 mm 3 9/16" x 8 7/8" x 10 7/16"
 C – 90 mm UNIT 90 mm x 225 mm x 345 mm 3 9/16" x 8 7/8" x 13 9/16"	 D – 90 mm UNIT 90 mm x 225 mm x 435 mm 3 9/16" x 8 7/8" x 17 1/8"

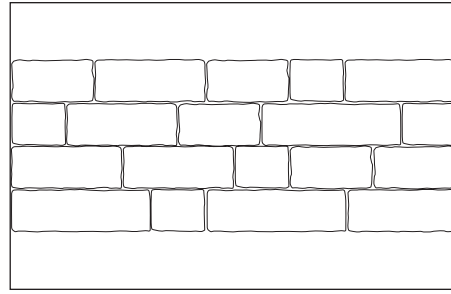
135 UNITS

 E – 135 mm UNIT 135 mm x 225 mm x 175 mm 5 5/16" x 8 7/8" x 6 7/8"	 F – 135 mm UNIT 135 mm x 225 mm x 265 mm 5 5/16" x 8 7/8" x 10 7/16"
 G – 135 mm UNIT 135 mm x 225 mm x 345 mm 5 5/16" x 8 7/8" x 13 9/16"	 H – 135 mm UNIT 135 mm x 225 mm x 435 mm 5 5/16" x 8 7/8" x 17 1/8"

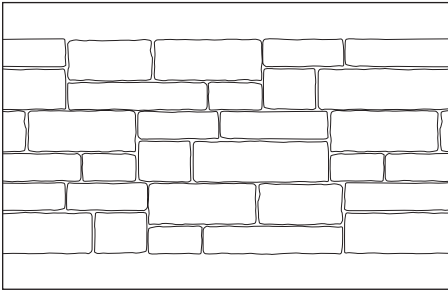
LAYING PATTERNS



LINEAR PATTERN
90 mm modules



LINEAR PATTERN
135 mm modules



MODULAR PATTERN – 2 HEIGHTS
90 mm and 135 mm modules

ANCHOR PIN SYSTEM

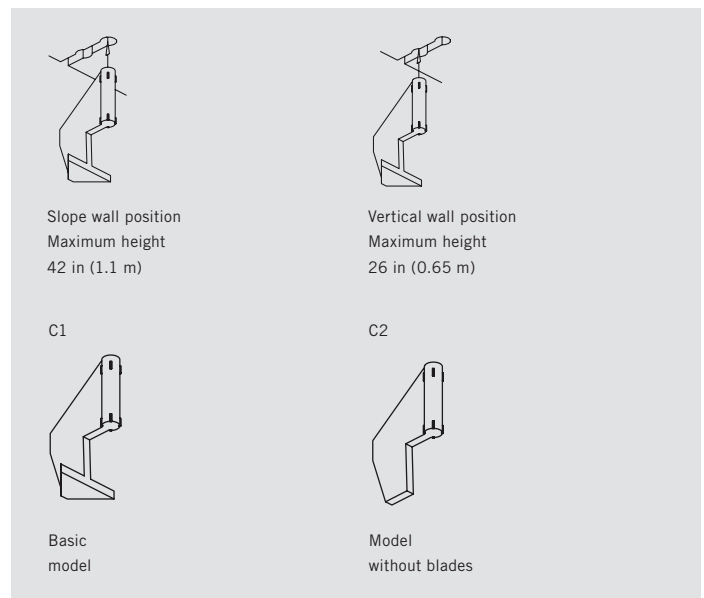
The Celtik Wall anchor pin system is designed to facilitate the construction of walls with a maximum height of 42 in (1.1 m). The special pin system is designed to stabilize the overall structure and guide the installation of modules. The dual-position system allows for the construction of vertical or 9° sloped walls. Modules are delivered with two different anchor pins: a regular pin with blades (C1) and a second pin without blades (C2), designed for the construction of corners.

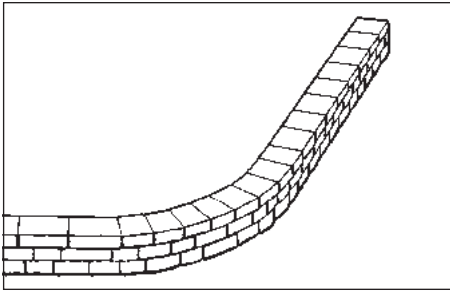
Setback per block for a 9° of slope:

90 mm unit: 14 mm ($\frac{9}{16}$ "")

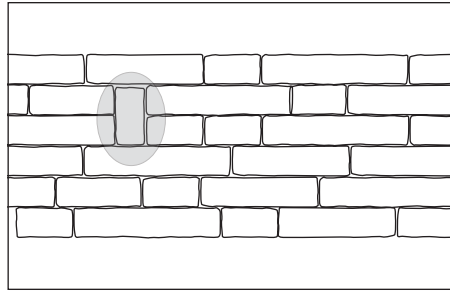
135 mm unit: 21 mm ($\frac{13}{16}$ "")

Note: Pins for the different Celtik modules are inserted from underneath, as shown in the opposite illustration. This is why modules are placed bottom up on the pallet.

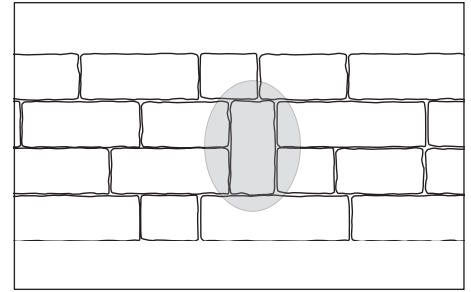




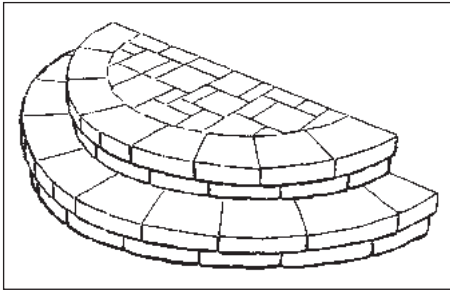
CURVED AND STRAIGHT WALL



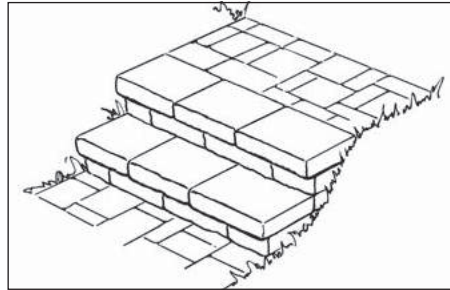
90 mm MODULE WITH JUMPER (VERTICAL ELEMENT)



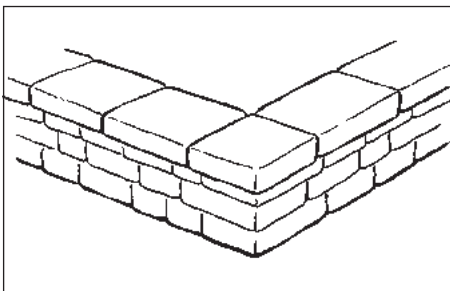
135 mm MODULE WITH JUMPER (VERTICAL ELEMENT)



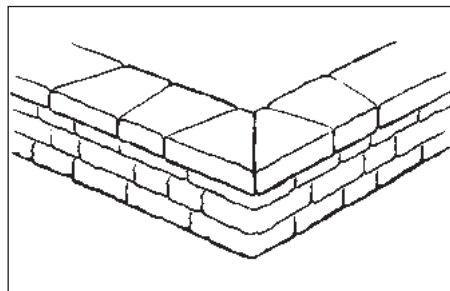
CURVED STEPS
Curved steps using 90 mm module and bevelled capping module



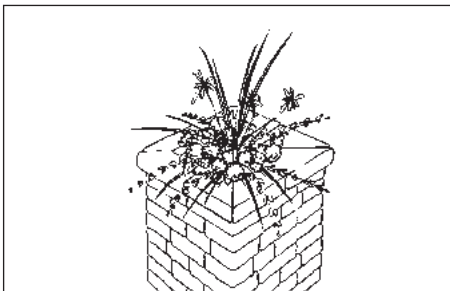
STRAIGHT STEPS



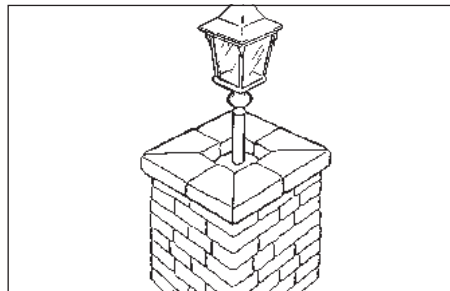
CORNER WITH STRAIGHT CUT



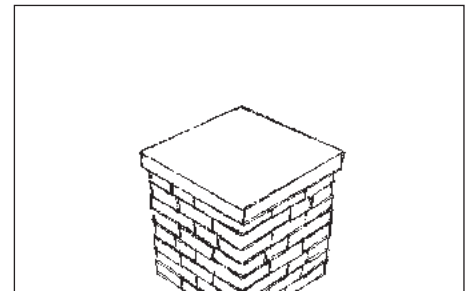
CORNER WITH 45° ANGLE CUT



PILLAR
with flowers



PILLAR
Light pillar



PILLAR
with Esplanade Capping module

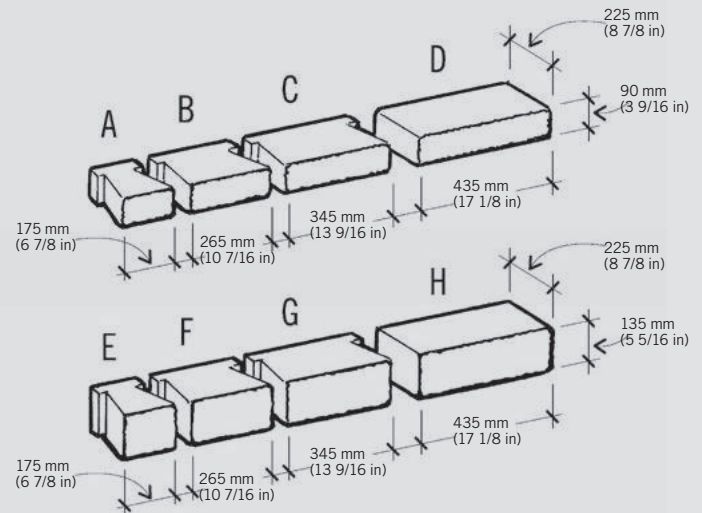
SELECT ONE OF THE FOLLOWING MODULES:

- 90 mm
- 135 mm
- Combination of 90 mm and 135 mm modules

STEP 1

Installation of the first row

Lay the modules of the same thickness on the compacted foundation. It is important to carefully align the first row of modules horizontally to ensure that the wall will be levelled. At this stage, no pins are used.



STEP 2

Installation for the following rows

Walls of 90 mm or 135 mm modules:

Carefully lay the modules of the following rows, remembering however, to insert a pin in each module before installation.

First insert pins in modules to be installed. Use appropriate grooves depending on whether the wall is vertical (maximum 26 in.) or 9° sloped (maximum 42 in.).

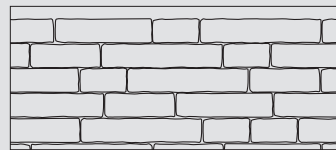
Lay each row by overlapping joints of the last row installed.

Supplied radiuses may be used vertically to give a natural and original look to the layout. Two of the radiuses measures two rows high. Use module A (6 7/8 in.) to match two 90 mm rows (see illustration A) and module F (10 7/16 in.) to cover two 135 mm rows (see illustration B).

Combination of 90 mm and 135 mm modules.

Carefully distribute different sizes of the modules to give a well balanced, natural look to the layout (see illustration C).

To integrate vertical elements into the arrangement, split 17 1/8 in. (435 mm) long modules (90 or 135 mm high) in halves. A split half covers the total height of a 90 mm module plus a 135 mm module. (see illustration D)



90 mm MODULES



135 mm MODULES

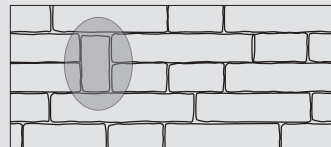


ILLUSTRATION A
90 mm module with jumpers (vertical elements)

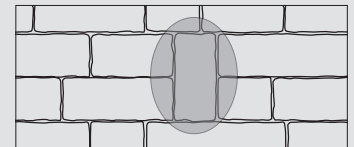


ILLUSTRATION B
135 mm module with jumpers (vertical elements)

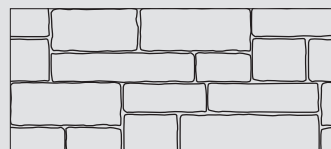


ILLUSTRATION C
40% 90 mm module and 60% 135 mm module in square feet

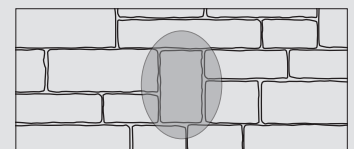


ILLUSTRATION D
40% 90 mm module and 60% 135 mm module in square feet with jumper

STEP 3

Back filling

Every two rows, fill the space behind modules only with 3/4 in. (20 mm) clean stone.

Repeat steps 2 and 3 up to the desired height.

Notes:

The dimensions of the Imperial system are approximate.

It's easy to give your Celtik wall a more natural look by combining two different module sizes that break up the horizontal lines as much as possible.

UNITS

The Celtik wall is made up of blocks, namely modules. The Celtik module is available in two thicknesses: 90 mm (3 9/16 in.) and 135 mm (5 5/16 in.).

90 mm MODULES (3 9/16 in)

The 90 mm modules are available in four lengths: 175 mm (6 7/8 in.), 265 mm (10 7/16 in.), 345 mm (13 9/16 in.) and 435 mm (17 1/8 in.)

135 mm MODULES (5 5/16 in)

The 135 mm modules are available in four lengths: 175 mm (6 7/8 in.), 265 mm (10 7/16 in.), 345 mm (13 9/16 in.) and 435 mm (17 1/8 in.)

DIFFERENT COMBINATIONS

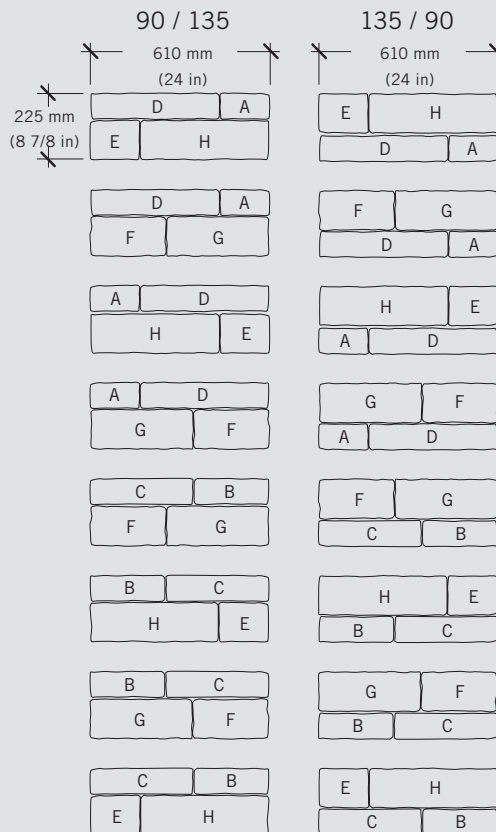
One basic formula

The entire Celtik wall system is based on a simple formula. By choosing different modules, you can obtain various combinations.

Each combination is 610 mm (24 in.) long and 225 mm (8 7/8 in.) tall. Throughout this technical guide, we will refer to these combinations with the following names: 90/135 combination and 135/90 combination

(see illustration). It is important to have a good understanding of the combination principle before going on to the next step.

The Celtik wall may look complicated, but it is based on a very simple system. When the system's instructions are properly followed, the result will be a unique and natural-looking wall.



Notes:
The dimensions of the Imperial system are approximate.

A SIMPLE AND LOGICAL BUILDING SYSTEM

The whole Celtik wall system is based on a grid 225 mm (8 7/8 in) high and 610 mm (24 in) long.

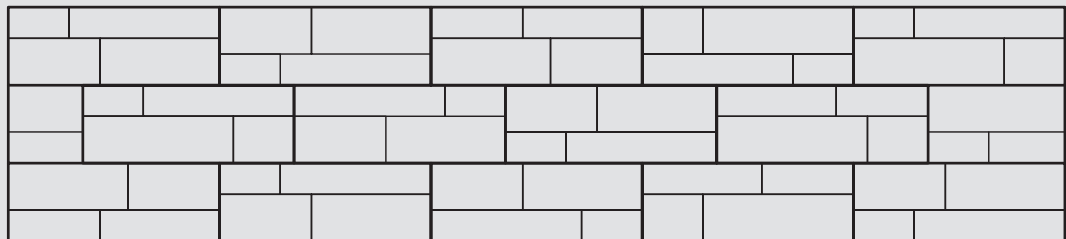
Before you start to install your Celtik wall, you must calculate its entire length and height. It is important to calculate the height of the Celtik wall in multiples of 225 mm (8 7/8 in). As for the length, multiples of 610 mm (24 in) are suggested to save you from having to cut the blocks.



VISUALIZING THE CELTIK MODULE COMBINATIONS

On the basic grid, it is easy to see the combinations of the 225 mm (8 7/8 in) high and 610 mm (24 in) long modules.

When you see all of the installation options, you will get exceptional results.



Notes:

The dimensions of the Imperial system are approximate.

**CELTIK WALL CAPPING - OPTION A
WITH REGULAR MODULES**

Walls can also be capped using Celtik standard modules, in one of two styles:

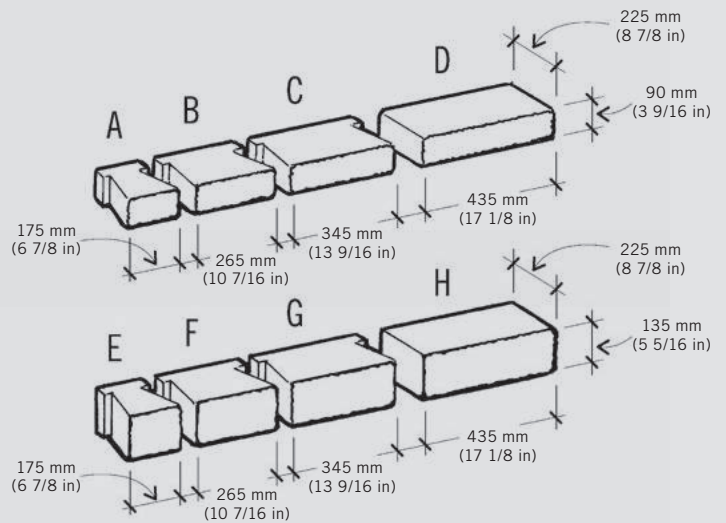
- Flush
- Overhanging

In either case, the modules must be properly secured with adhesive to ensure wall stability. Save straight modules (D or H) for capping the straight portions of the wall.

Use bevelled modules for the curved portions; less cutting will be required.

Note: Several small modules will give a shorter bend radius, while larger modules will give a larger radius.

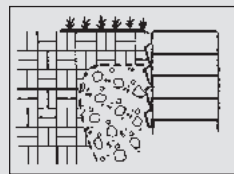
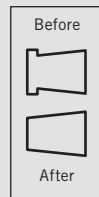
Advantage: A Celtik retaining wall with standard modules as capping modules is economical, easy to install and versatile, offering a number of possibilities.



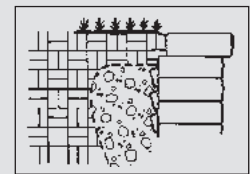
to create curves in a Celtik wall, the minimum radius is 0.9 m (3 ft).

Convex curve:
Strike the extremities of the module at the back.

Concave curve:
Modules will have to be cut.



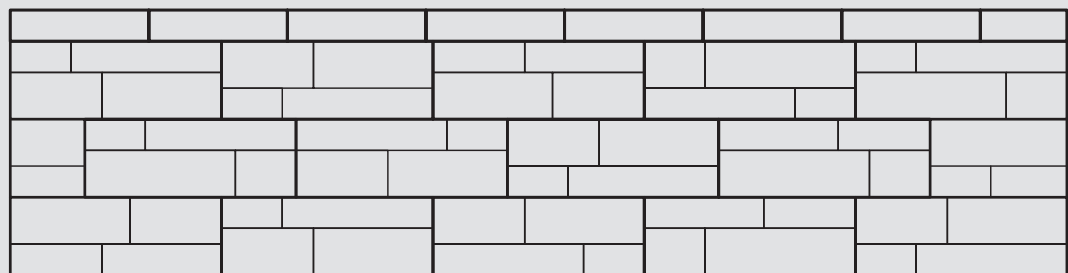
FLUSH CAPPING



OVER HANGING CAPPING

**CELTIK WALL CAPPING - OPTION B
WITH CELTIK CAPPING MODULES (STRAIGHT AND BEVELLED)**

Use Celtik capping modules to complete your wall. Refer to pages 83 to 85 to order the selected Celtik capping modules. It is important to cement the Celtik caps with a concrete adhesive.



OPTION 1

CELTIK COLUMNS (600 X 600 mm / 23 5/8 X 23 5/8 in)
WITH THE NEW CELTIK PILLAR MODULE.

Discover the new Celtik Pillar kit. It is now possible to build an easier and faster column, without any cutting or splitting on site.

1) First course installation

Using left pillar modules, install the first course as shown.

2) Second course installation

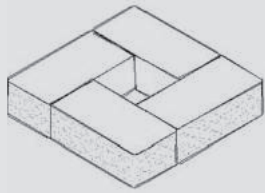
Using right pillar modules, install the second course avoiding aligning the joints as shown.

3) Installation of other course

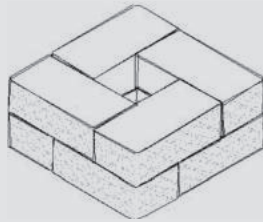
To build the column, repeat the first and second course instructions. Each course must be glued onto the last one using Permapro concrete adhesive.

4) The finish is ensured using the Lafitt pillar capping 24 x 24

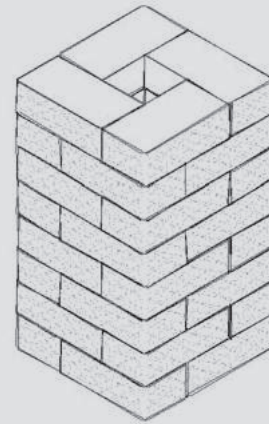
1 CELTIK PILLAR KIT 135



1st course and all odd course



2nd course and all even course



MODULE

135 x 200 x 400 mm
(5-5/16 x 7-7/8 x 15 3/4 in)

PACKAGING

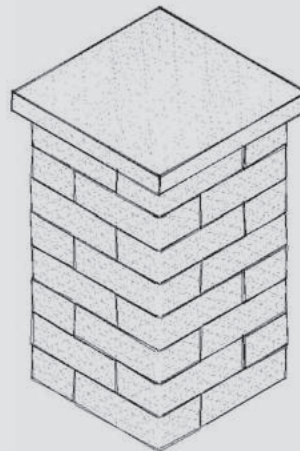
Celtik pillar kit 135 mm

Weight per unit	24.30 kg	53,76 lbs	
Quantity per cube	32 pcs	32 pcs	*16 left units + 16 right units
Weight per cube	823 kg	1814 lbs	

1 cube allows to build a 945 mm (37 1/4 in) high column above grade, excluding the capping (provide for a buried part of 135 mm)

The modules are manufactured with two adjustment lines on the top surface to ensure height is consistent from one module to the next. The modules are not reversible; they must be placed with the adjustment lines facing up.

The modules are placed in pairs on a pallet, for a total of 16 left-side modules and 16 right-side modules.



OPTION 2

CELTIK PILLAR 734 mm X 734 mm (29" X 29")
WITH ALL CELTIK MODULES.

To build a pillar minimizing joint alignment and better stability, be sure to follow the laying order for each step and row, as illustrated. Measure the site for the pillar(s). Each pillar measures of 734 mm x 734 mm (29 in x 29 in). Always secure each row with adhesive to ensure stability.

For the corners, cut C and D module as illustrated:

- Trim the C module in the middle
- Trim the D module along one of the two grooves (left or right)

1) Installing the first row

Lay the first four modules as illustrated (A, B, C and D), followed by the next four.

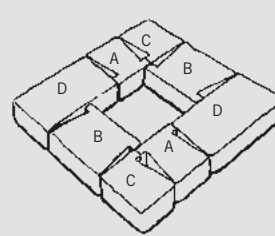
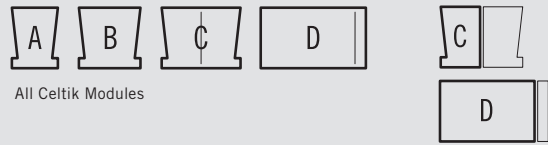
2) Installing the second, third and fourth rows

For each row, proceed as illustrated. Starting from the fifth row, repeat instruction no. 1 and no. 2, followed by the next ones until the desired height is reached (see illustration).

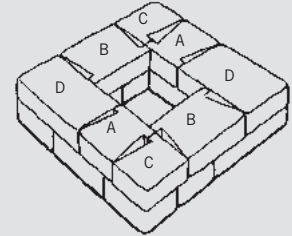
3) Capping

Use Celtik straight capping modules or Esplanade Pillar Capping Module 31 x 31

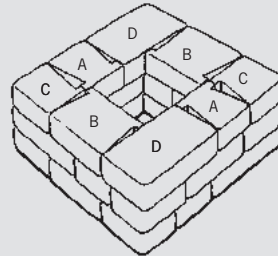
Note: It is recommended that only 90 mm or 135 mm modules be used. Pillar with 90 mm Modules shown here.



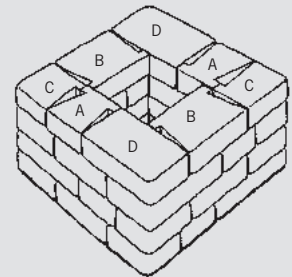
Step 1 (rows 1 and 5)



Step 2 (rows 2 and 6)



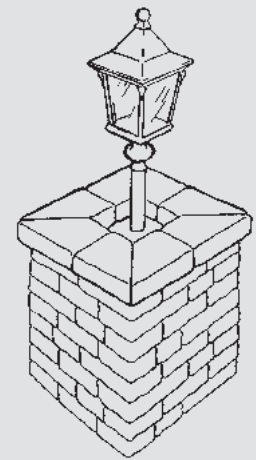
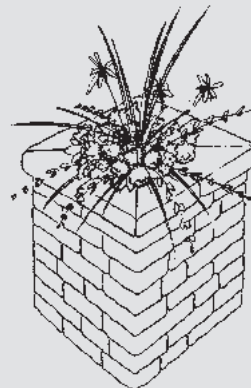
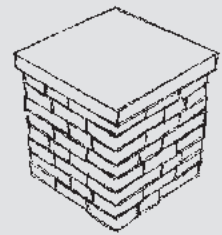
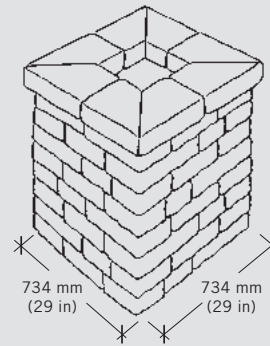
Step 3 (rows 3 and 7)



Step 4 (rows 4 and 8)

CAPPING A PILLAR

Cap the pillar using Celtik straight capping modules or the Natural Stone capping



WARNING

If a lit pillar is desired, make sure all electrical wiring is completed before the modules are laid.

If flowers are to be planted above the pillar, install a geotextile membrane inside the pillar before filling with garden soil.

CELTIK® PLUS STRAIGHT CAPPING MODULE

DESCRIPTION

The Celtik straight capping module can be used in most cases. If the wall design is curved, we recommend using the Celtik bevelled capping module.

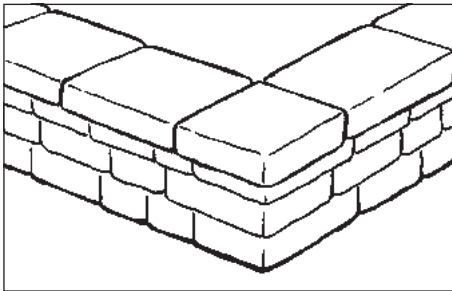
UNIT



90 mm x 305 mm x 400 mm
3 9/16" x 12" x 15 3/4"



LAYING IDEA



PACKAGING

CELTIK® STRAIGHT CAPPING MODULE		
Weight per unit	26.70 kg	59.00 lbs
Units per length	2.50 units/ lin. m	0.76 units/lin. ft
Quantity per cube	72 units	72 units
Length per layer	3.60 lin. m	11.80 lin. ft
Length per cube	28.80 lin. m	94.50 lin. ft
Weight per cube	1921 kg	4264 lbs

HOW TO ORDER

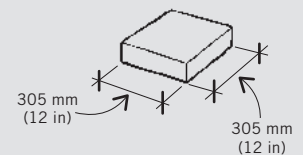
Celtik straight capping modules are purchased individually. Each module is 400 mm (15 3/4 in) in length.

- Calculate the length in linear feet that you require for capping your Celtik wall.
- Divide the number of linear feet by 1.333 (the result will give you the number of modules you need to cap your wall).
- Order the required number of modules.

CAPPING A CORNER

Prepare a Celtik straight capping module as follows.

- Cut using a cold chisel or a guillotine, 100 mm (4 in) from one of the ends of the capping module.
- Flip the module over and cut off the retaining lip.
- Hit the newly cut face with a sledge hammer to achieve the same finish as for the other sides.
- Install this corner cap first before proceeding with the installation of the other capping modules.
- Always spread a layer of concrete adhesive along the top row of Celtik wall before laying the capping modules.



CELTIK® SPLIT BEVELED CAPPING MODULE




DESCRIPTION

Celtik bevelled capping modules are designed to offer greater flexibility for straight walls, S-curves and regular curves, while keeping cutting to a minimum. Our system includes three modules of various dimensions (A-B-C). Each module is reversible and treated on both sides, which means more possibilities in terms of bent radius. Always lay the curved portions of the wall first and keep the remaining modules for straight wall portions. We recommend properly securing the modules with adhesive to ensure wall stability.

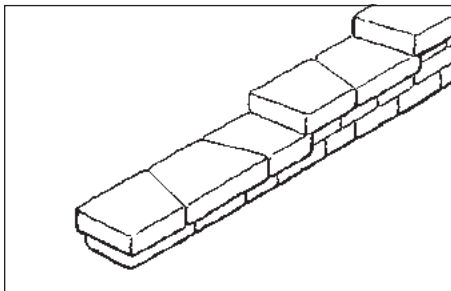
A straight wall visible on both sides.

The Celtik bevelled capping module can be used to construct a wall visible on both sides such as bench, small balustrade, etc. Stack the Celtik bevelled capping modules and spread concrete adhesive between each row.

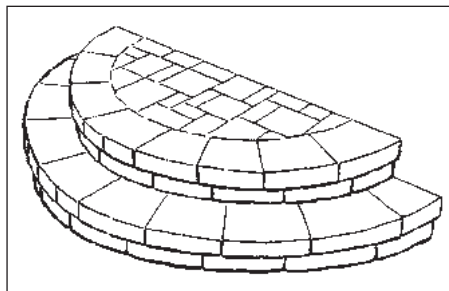
UNIT

	A 90 mm x 316 mm x 225 / 165 mm 3 9/16" x 12 7/16" x 8 7/8" / 6 1/2"		B 90 mm x 316 mm x 300 / 240 mm 3 9/16" x 12 7/16" x 11 3/4" / 9 1/2"
	C 90 mm x 316 mm x 375 / 315 mm 3 9/16" x 12 7/16" x 14 3/4" / 12 1/2"		

LAYING IDEAS



STEPPED WALL CAPPING WITH 90° CUT



CURVED STEPS
Curved steps using 90 mm module and bevelled capping module
See other details on page 136

PACKAGING

CELTIK® SPLIT BEVELED CAPPING MODULE		
Weight per unit	variable	variable
Length per layer (average)	2.46 lin. m	8.07 lin. ft
Length per cube (average)	19.44 lin. m	64.56 lin. ft
Units per layer	3 sets of 3 units	
1 set	0.82 lin. m	2.69 lin. ft
Weight per cube	1257 kg	2565 lbs

HOW TO ORDER

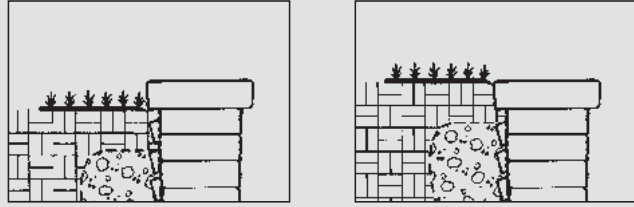
Celtik bevelled capping modules are purchased per linear foot, per set of three modules (A, B, C).

- A) Calculate the number of linear feet you require for capping your Celtik wall (length in feet).
- B) Divide the number of linear feet by 2.65 (the result will give you the number of modules you need to cap your wall).
- C) Order the required number of modules.

CELTIK CAPPING MODULE IS TREATED ON BOTH SIDES.

Benefit

Celtik bevelled capping modules are treated on both sides. This finish enables excavation or laying of sod inside the wall, beneath the top of the wall. The finish is equally attractive on each side.



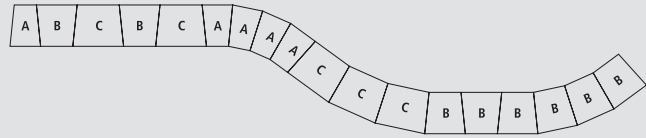
DIFFERENT COMBINATIONS

Different combinations of capping elements can be used to create uniform bends of varying lengths, making them ideal for creating semi-circular walls.

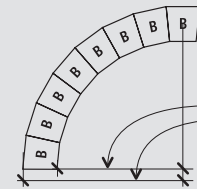
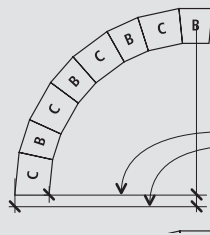
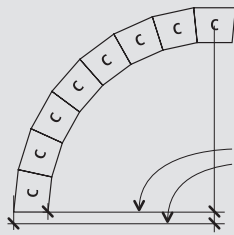
STRAIGHT LINE



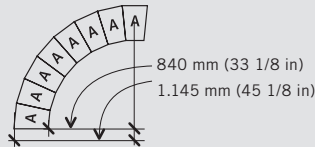
SINUOUS CURVE



REGULAR CURVE



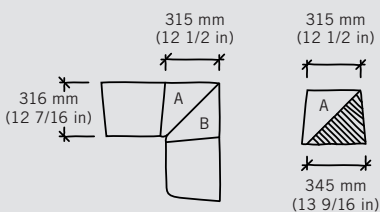
1.030 mm (40 1/2 in)
1.335 mm (52 1/2 in)



CREATING CORNERS

Use 375 mm (14 3/4 in) Celtik bevelled capping modules to finish 90° corners.

Use a concrete saw to cut the modules at 45° angles. Always start with the corner modules when capping a wall.



Notes:

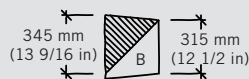
The dimensions of the Imperial system are approximate.

CREATING STEPPED WALLS

Use 375 mm (14 3/4 in) Celtik bevelled capping modules to finish 90° stepped walls.

Split the 90° module along one of the two grooves. Tap the newly cut face with a sledge hammer to achieve the same finish as on the other sides. Always start from one end when capping a stepped wall.

In either case, always spread a layer of concrete adhesive along the top row of Celtik modules before laying the capping modules.



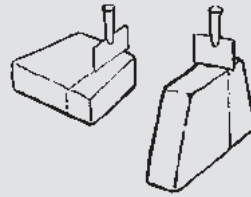
CUTTING

Cutting a module using a cold chisel

- 1) Strike the module along the cut line.
- 2) Strike along an imaginary line running all the way around the module.
- 3) Finish cutting by firmly striking one of the visible faces of the module.
- 4) Tap the newly cut face with a sledge hammer to achieve the same finish as the other sides.

Use a guillotine if several cuts are required.

Strike along an imaginary line running all the way around the module.



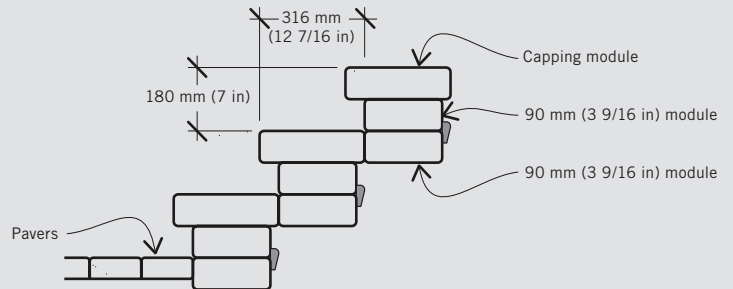
Firmly strike one of the visible faces of the module.

CREATING STRAIGHT STEPS OR CURVED LANDINGS

Steps or landings can be laid using Celtik standard wall modules and bevelled capping modules. Semi-circular landings can also be created using the Celtik beveled capping modules.

Notes:

The dimensions of the Imperial system are approximate.



CELTIK® 15 INCH MODULAR STEP SYSTEM

UNITS

STEP

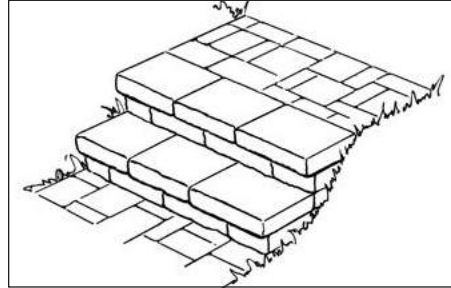
90 mm x 385 mm x 400 mm
3 9/16" x 15" x 15 3/4"



RISER

90 mm x 225 mm x 400 mm
3 9/16" x 8 7/8" x 15 3/4"

LAYING IDEAS



STRAIGHT STEPS

PACKAGING

STEP		
Weight per unit	34.65 kg	81.50 lbs
RISER		
Weight per unit	19.75 kg	38.50 lbs
Quantity per cube	20 sets	20 sets
Weight per cube	1070 kg	2354 lbs

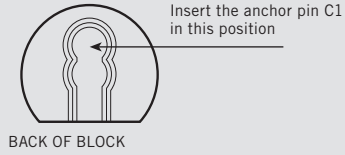
Note - Each set includes 1 step and 1 riser.
4 anchor pins are included per set: 2 X C1 and 2 X C3.

1. Installing the first row.

Lay a 10 cm x 20 cm x 40 cm (4 in x 8 in x 16 in) solid block or universal curb so that it will be flush with the interlocking paving stone. The solid block will support the concrete riser.

2. Installing the second row

Lay a Celtik riser 225 mm (8 7/8 in) on top of the 10 cm x 20 cm x 40 cm block. Make sure that the anchor pin C1 is inserted in the right position (see illustration). Fill in the space behind the riser with 20-0 mm (0-3/4 in) crushed stone and compact.



3. Fastening the step

Lay a 385 mm (15 in) Celtik step module on top of the Celtik riser. Make sure to insert the square anchor pin C3 (see sketch and cross section).

4. Installing additional rows

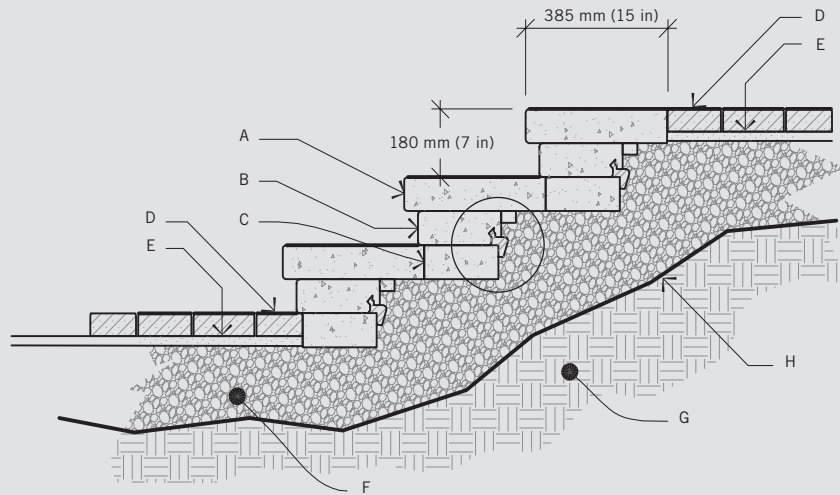
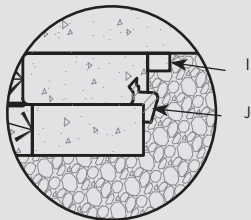
Repeat steps 1, 2 and 3 until desired height is reached.



Note: We recommend the use of Permacon Permapro concrete adhesive to secure the Celtik concrete riser and the Celtik step module.

Note: Celtik steps and risers give a step height of 180 mm (7 in). If the height of the wall and the step must be the same, you must ensure that the height of the wall containing the steps is in multiples of 180 mm (7 in).

- A 385 mm (15 in) Celtik step module
- B 225 mm (8 7/8 in) Celtik riser
- C Starter unit
90 mm x 200 mm x 400 mm (3 9/16 in x 7 7/8 in x 15 3/4 in)
- D 60 mm (2 3/8 in) paver or 80 mm (3 1/8 in) paver
- E Laying bed 25 mm (1 in) (concrete sand)
- F 0-20 mm (0-3/4 in) compacted foundation 300 mm (12 in) minimum depth
- G Existing soil
- H Geotextile
- I Anchor pin C3
- J Anchor pin C1



FS² RETAINING WALLS SYSTEM

DESIGNING AND BUILDING SAFELY

A retaining wall is considered to be a structure. The design and construction must be carried out by the book, in compliance with prevailing construction codes and best industry practices.

PERFORMANCE IN SERVICE

All retaining walls must be designed to resist lateral soil pressure and other stresses to which they are subjected in service. The engineer designing a retaining wall must ensure that the structure will perform well, propose safe plans and specifications for typical cross-sections of the wall to be built, in order to avoid any buckling, toppling, settling or shifting at the base of the structure.

DESIGN

At the design stage, before any work is undertaken, it is necessary to conduct a detailed analysis of the conditions to which the retaining wall will be subjected in service (type of surrounding soil, surcharges above the wall, presence and depth of the groundwater table, types of materials in the subgrade, presence of an abutment downstream from the base of the wall, etc.). All other stresses to which the structure is likely to be subjected (seismic loads, pressure from the frozen soil, soil's loss of load-bearing capacity during thaw periods or fluctuations in the height of the groundwater table, pool, parking lots, vehicular traffic areas, fences, garden sheds, etc.) must also be taken into account by the engineer in designing the structure. This design approach is essential for ensuring that the wall will hold up safely and retain its long-term structural integrity.

CONSTRUCTION

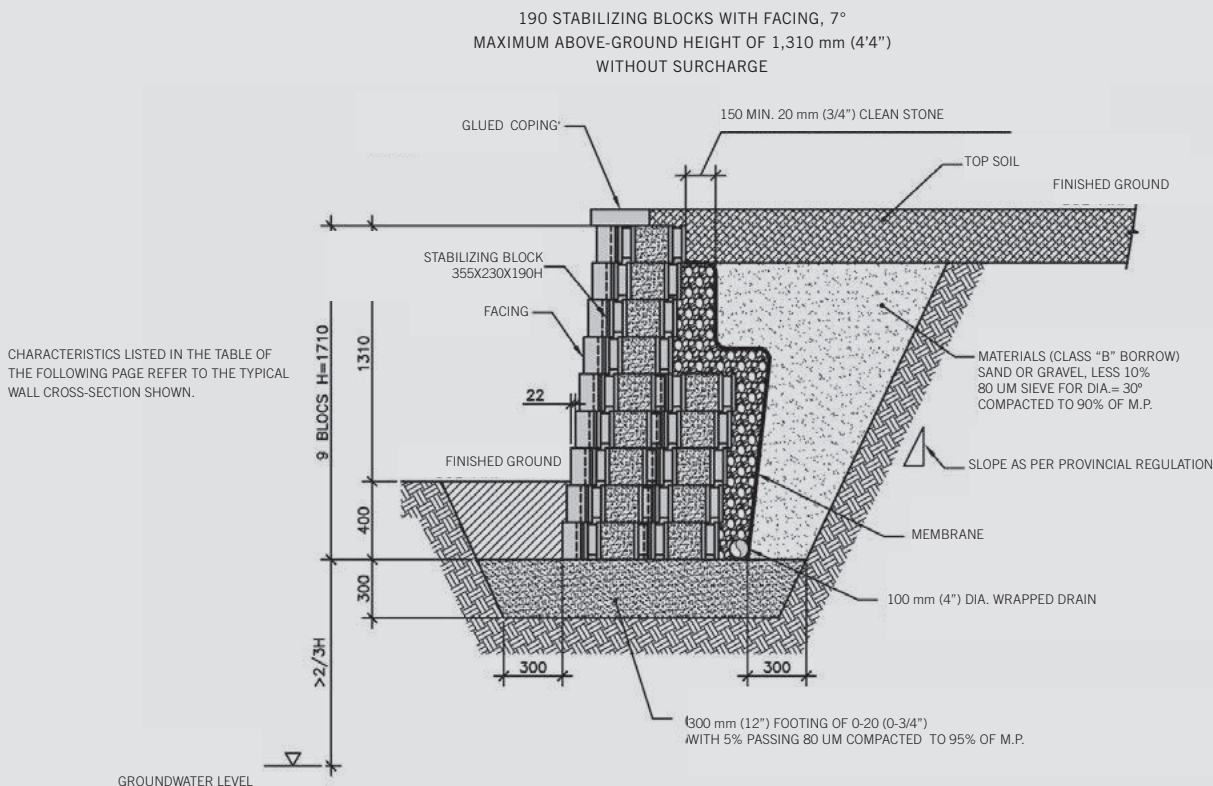
All structures must be built in accordance the industry's best practices. Complying with the designer's plans and specifications, construction codes, prevailing laws and Permacon's recommendations is imperative.

RETAINING WALLS

CONSTRUCTION – REMINDER OF BEST PRACTICES

Retaining walls incorporating FS² blocks have several points in common. When designing a structure and planning its construction phases, the characteristics and parameters listed in the following typical cross-section must be analyzed with care to produce a structure that meets your highest expectations in terms of performance, and complies with prevailing codes.

EXAMPLE OF A TYPICAL FS² CROSS-SECTION



NOTE 1:
MINIMUM GROUND LOAD-BEARING CAPACITY: 100 kPa
BLOCK/BLOCK CONNECTION – 670 DAN/M (450 LBS./FT.)

PERMACON'S MAIN RECOMMENDATIONS

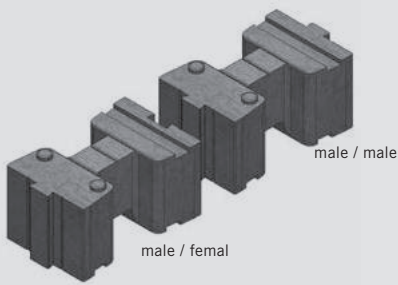
IDENTIFICATION	RECOGNIZED PRACTICES	PERMACON RECOMMENDATION
A	Minimum load-bearing capacity of the excavated soil beneath the 0-20 mm compacted granular base	<ul style="list-style-type: none"> • 100 kPa
B	Adequate depth of the groundwater table	<ul style="list-style-type: none"> • 2/3 of the total height of the wall
C	Excavation sufficiently deep and wide	<ul style="list-style-type: none"> • minimum excess of 300 mm
D	Adequate protection of the granular base against contamination in clayey environments	<ul style="list-style-type: none"> • use of a geotextile
E	Adequate load-bearing capacity of the granular base	<ul style="list-style-type: none"> • minimum thickness of 200 mm to 300 mm compacting to a minimum of 95% of modified Proctor
F	Minimum height of the wall's buried section (minimum requirement sheet) ensuring additional protection against the wall's sliding	<ul style="list-style-type: none"> • minimum 10% of the total height of the wall built and • 200 mm to 400 mm depending on the above-ground height of the wall
G	Adequate drainage behind the wall	<ul style="list-style-type: none"> • 100 mm-diameter wrapped drain placed on the granular base and • minimum 150-mm layer of clean stone behind the wall, placed along the entire height of the wall
H	Wall's adequate resistance to toppling	<ul style="list-style-type: none"> • respecting the maximum above-ground height based on the typical wall cross-section proposed and • taking into consideration all possible loads and stresses encountered in service (one-off extra loads, wall inclination, ground slope, etc.)
I	Complementary integrity of the structure in service	<ul style="list-style-type: none"> • gluing the coping

The FS2 retaining wall system combines two elements: a stabilizing block and a facing attached to it. The facing contributes to the aesthetic appeal of the outer wall. The stabilizing block ensures the stability of the wall subjected to soil stresses. In fact, the greater the pressure exerted by the soil, the greater the number of stabilizing blocks that must be fitted behind each other. Designed for optimal construction ease and speed, the FS2 system allows the construction of walls of varying heights and forms.

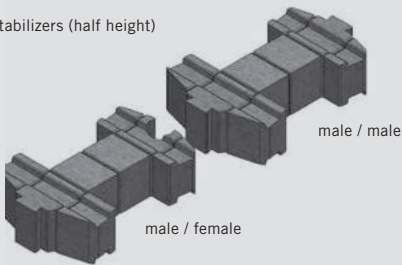
- Retaining wall
- Privacy wall
- Column
- Step

STABILIZERS

Stabilizers (2 blocks)
(full height)



Stabilizers (half height)



FACINGS
CASSARA



City



Metropol



TWO-COMPONENT MODULAR SYSTEM

(facing and stabilizing block)

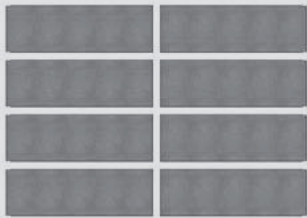
- The Cassara facing is a single-size module distinguished by a smooth face finish.

A 90° corner is integrated in each module.

Dimensions: 190 mm x 100 mm x 590 mm (7 1/2" x 4" x 23 1/4").

- The 190-mm stabilizing block comes in 2 models
 - Male-female model for most retaining walls and male-male for most freestanding walls (finished on both sides).
 - Male-female model for retaining walls with significant limitations.

TYPICAL ROW (FACING)



Corner is included

Cassara
(corner is included)



PALLET
48 elements per pallet
8 elements per row



DIMENSIONS

Nominal dimensions:
190 mm x 230 mm x 355 mm
(7 1/2" x 9" x 14")

FACING INSTALLATION SEQUENCE

The objective is to distribute elements from the left and right sides of each pallet in order to produce uniform shades. Work from more than one pallet at a time.

TWO-COMPONENT MODULAR SYSTEM

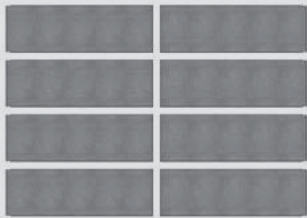
(facing and stabilizing block)

- The City block facing is a single-size module distinguished by a buffed visible face and a deep joint around the perimeter. A corner block is needed to complete the installation (sold separately).

Dimensions: 190 mm x 100 mm x 590 mm (7 1/2" x 4" x 23 1/4").

- The 190-mm stabilizing block comes in 2 models
 - Male-female model for most retaining walls and male-male for most freestanding walls (finished on both sides).
 - Male-female model for retaining walls with significant limitations.

TYPICAL ROW (FACING)



Corner not included and sold separately

City



PALLET
48 elements per pallet
8 elements per row



DIMENSIONS

Nominal dimensions:
190 mm x 230 mm x 355 mm
(7 1/2" x 9" x 14")

FACING INSTALLATION SEQUENCE

The objective is to distribute elements from the left and right sides of each pallet in order to produce uniform shades. Work from more than one pallet at a time.

TWO-COMPONENT MODULAR SYSTEM

(facing and stabilizing block)

- The Metropol block facing is a single-size module with a finely textured slate surface and deep joints around the perimeter.

Dimensions: 190 mm x 100 mm x 590 mm (7 1/2" x 4" x 23 1/4").

All blocks can serve as corners.

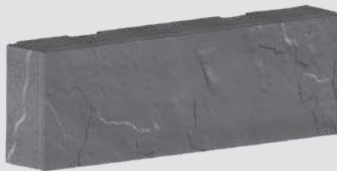
- The 190-mm stabilizing block comes in 2 models

TYPICAL ROW (FACING)



1 integrated corner per facing included.

METROPOL



PALLET
48 elements per pallet
8 elements per row

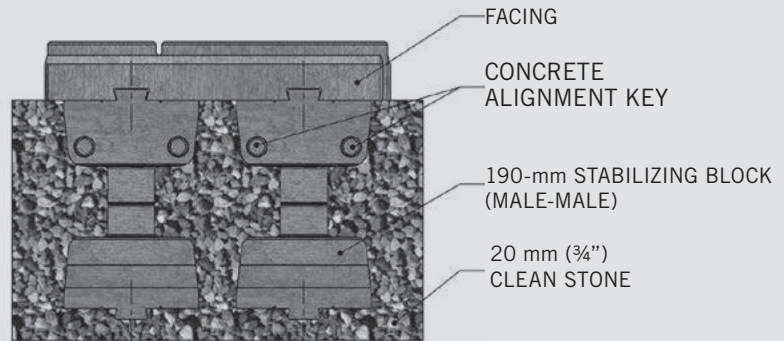


DIMENSIONS
Nominals dimensions:
190 mm x 230 mm x 355 mm
(7 1/2" x 9" x 14")

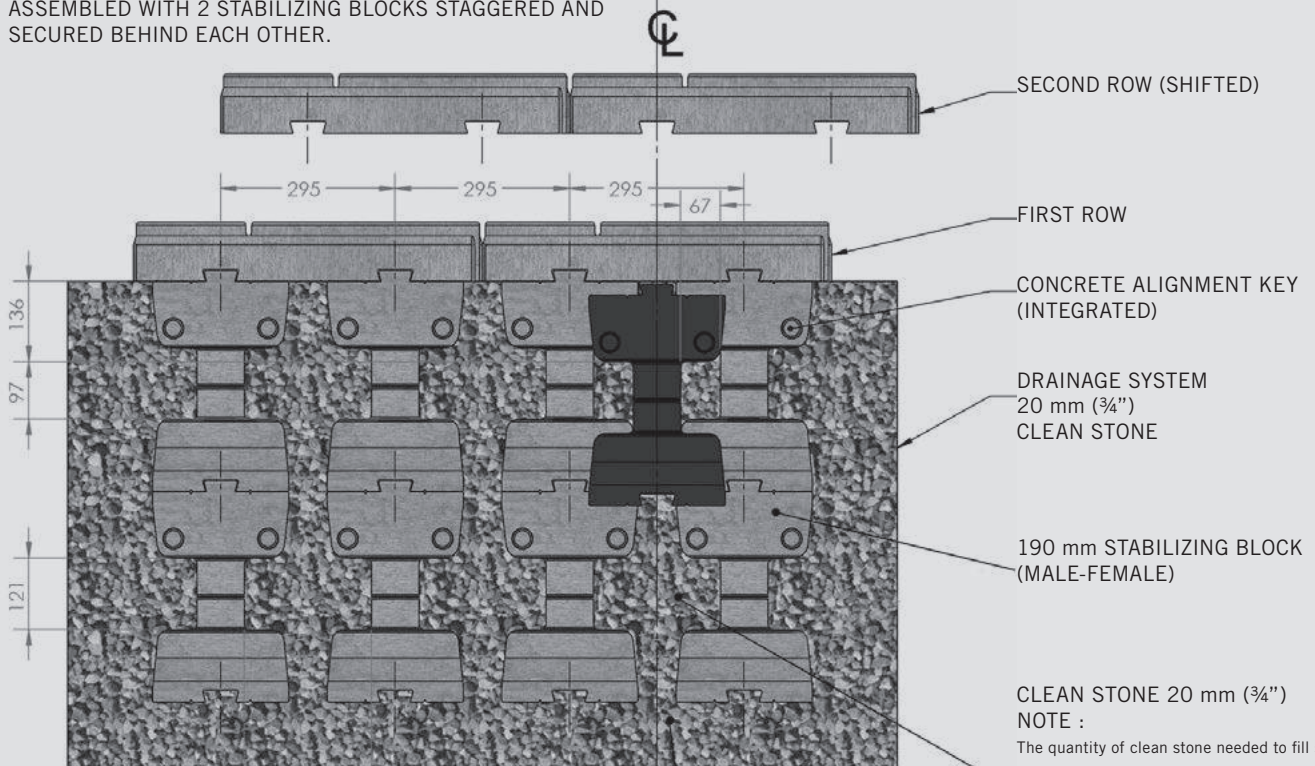
FACING INSTALLATION SEQUENCE

The objective is to distribute elements from the left and right sides of the pallet in order to produce uniform shades and slate textures. Work from more than one pallet at a time.

CONSTRUCTION SKETCH OF A FS² RETAINING WALL ASSEMBLED WITH 1 STABILIZING BLOCK



CONSTRUCTION SKETCH OF A HIGH INCLINED RETAINING WALL ASSEMBLED WITH 2 STABILIZING BLOCKS STAGGERED AND SECURED BEHIND EACH OTHER.



A minimum layer of 150 mm of 20 mm clean stone is required as a drainage material behind the last stabilizer.

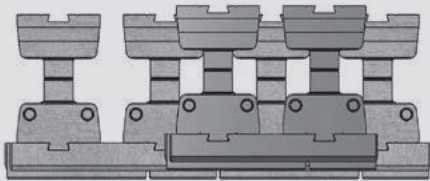
CLEAN STONE 20 mm (3/4")
NOTE :
The quantity of clean stone needed to fill spaces between the stabilizers, excluding the 150-mm layer of clean stone placed behind the last stabilizing block, equals 50% of the total weight of the stabilizing blocks installed. (the weight of one stabilizer is 26.3 kg).

Generally speaking, full-height 190-mm male/female stabilizers are used to build most FS² retaining walls, (except for non-inclined and privacy walls, which may occasionally require male/male stabilizers).

When using the FS² system to build the second row of a retaining wall, stabilizing blocks can be assembled by either staggering or overlaying them on the bottom row. Opting to stagger the stabilizers will result in the construction of a wall whose facings will have vertical joints offset 25% lengthwise. On the other hand, overlaying stabilizers on the bottom row will yield vertical stabilizer joints representing 50% of their length.

STAGGERED STABILIZING BLOCKS
(wall with 7° slope)

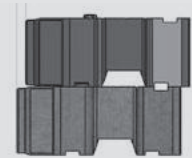
PLAN



ELEVATION

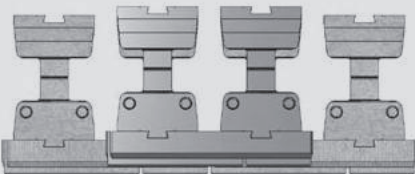


PROFILE

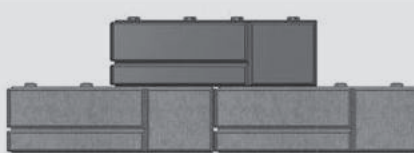


OVERLAID STABILIZING BLOCKS
(wall with 7° slope)

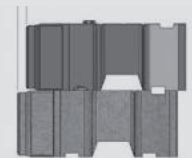
PLAN



ELEVATION



PROFILE

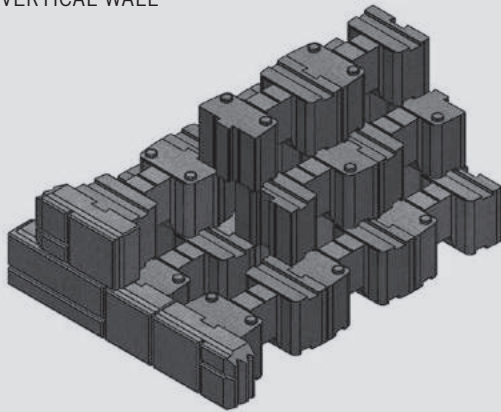


Stabilizing blocks allow the construction of retaining walls whose visible face is vertical or inclined by 7 degrees (i.e. 22 mm setback per row built).

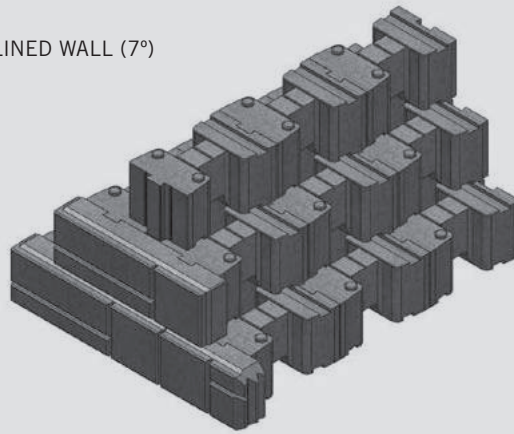
To build the façade of an inclined wall, stabilizers must be positioned in such a way that the alignment keys of the male-female stabilizing blocks are directly behind the facing. They retain this position throughout the wall's construction.

To build the façade of a vertical wall, all odd-numbered rows from the base course up will be built like those of an inclined wall. However, all even-numbered rows will have male-female stabilizers positioned at 180 degrees from the previous row, and the first stabilizer attached to the facing of even-numbered rows will be male-male type, also positioned at 180 degrees.

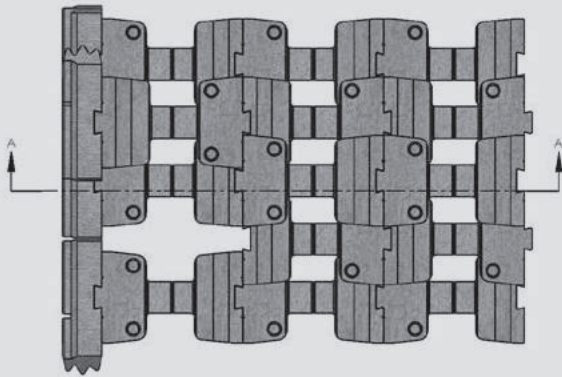
VERTICAL WALL



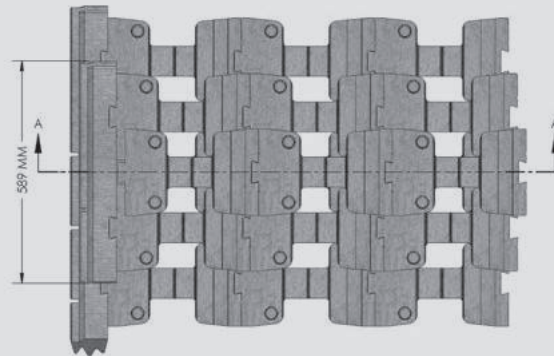
INCLINED WALL (7°)



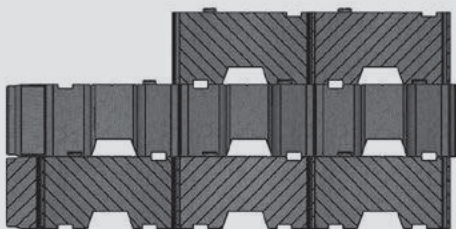
PLAN VIEW



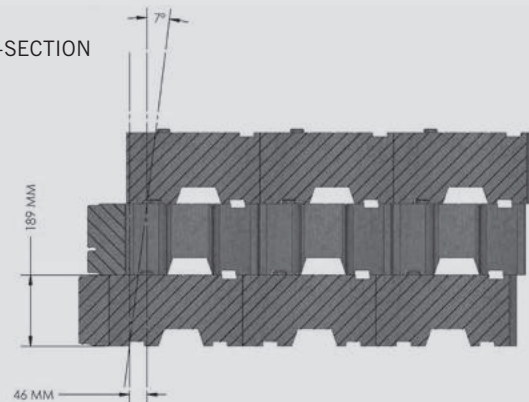
PLAN VIEW



CROSS-SECTION



CROSS-SECTION





Carefully level and compact the 0-20 mm granular base course.



Spread loose granular bedding with a maximum thickness of 20 mm



Place the first stabilizers and facings, perfectly aligned using a mason's line



Check the horizontality of the stabilizing blocks installed

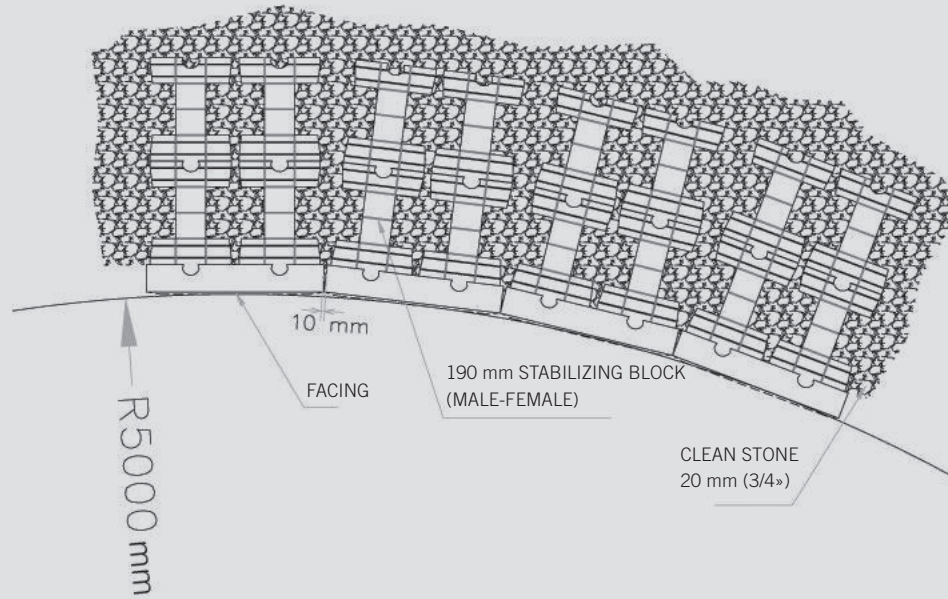


Continue the installation of stabilizing blocks. A level base course and well-aligned blocks allow rapid installation of subsequent rows with no significant repositioning of elements already in place

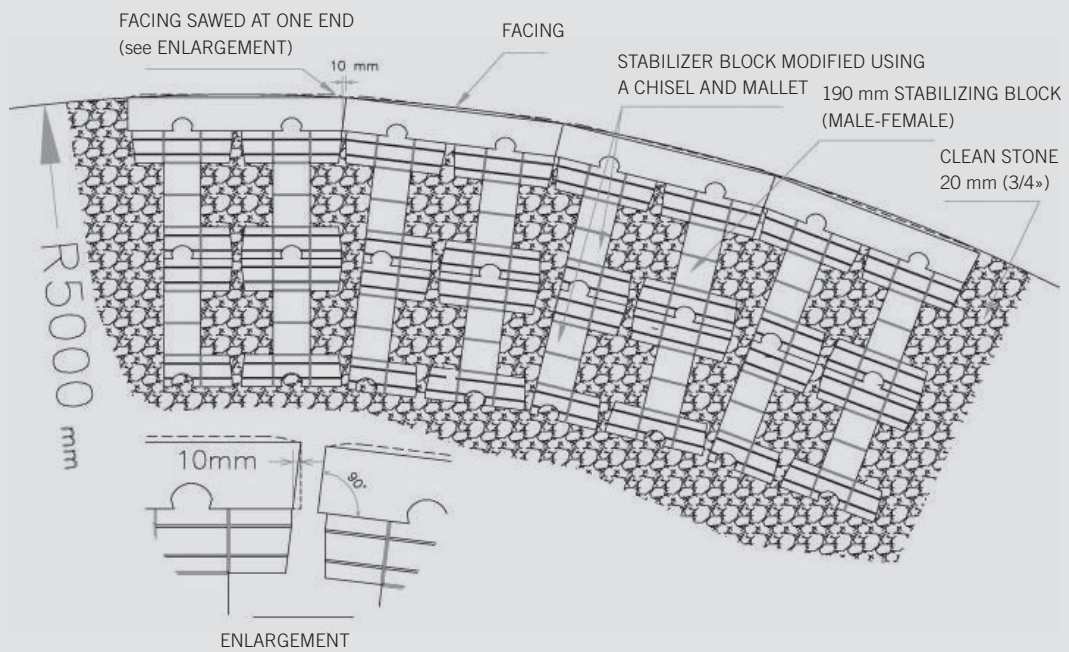


End rows with cascading finished returns to confer excellent stability to the backfill

CONCAVE CURVED RETAINING WALL WITH 2 STABILIZERS

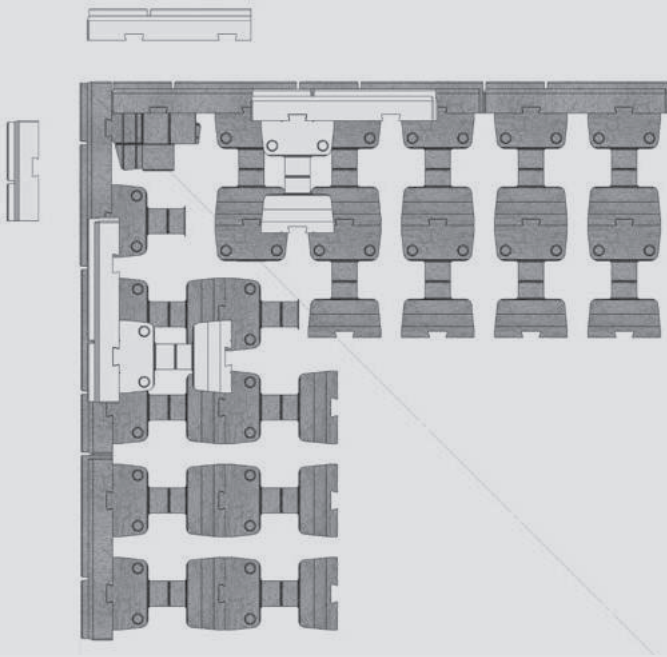


CONVEX CURVED RETAINING WALL WITH 2 STABILIZERS

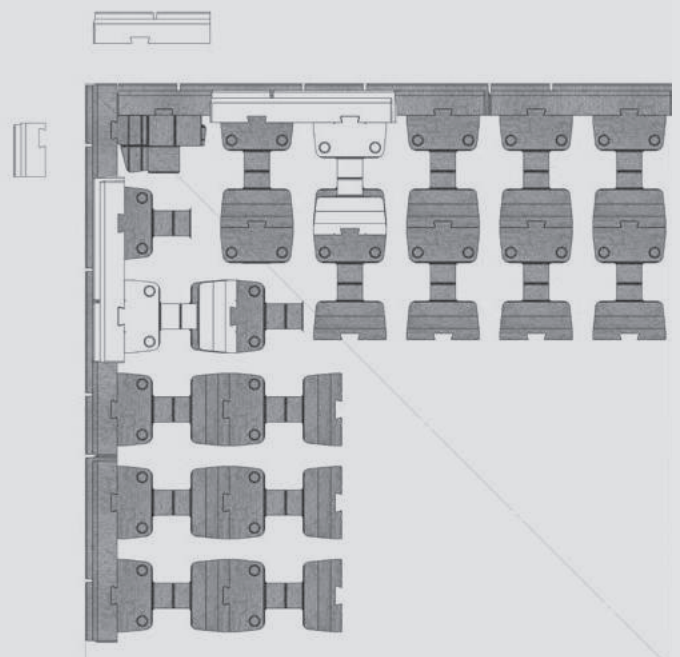


During the course of the work, stabilizing blocks must be positioned to create the required aesthetic effect (staggered vertical joint and inclination or lack of inclination of the wall's façade). To start the construction of the first row of a 90° outside corner over the bedding, install two mason's lines, as shown on the plan, to form a 90-degree angle. From the corner created by the two lines, install two full-length facings. Then continue the installation of facings in both directions along the lines, and complete by installing stabilizers in keeping with the wall cross-section shown on the plan. To start the construction of a second row and subsequent rows from a 90-degree outside corner, the first stabilizer must be properly positioned very close to the corner (staggered or overlaid), before installing the first full-length facing. This will then make it possible to deduce the required cut to the corner stabilizer.

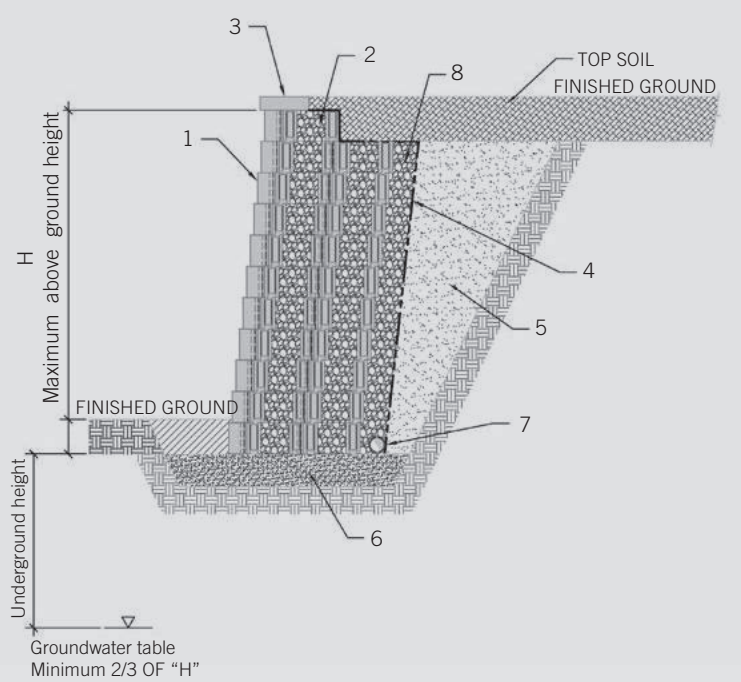
STAGGERED
STABILIZER BLOCKS



OVERLAID
STABILIZER BLOCKS



FS² SYSTEM – TYPICAL CROSS-SECTION (non-optimized)



COMPONENTS

- 1) Facing
- 2) Stabilizing block (filled with 20 mm clean stone)
- 3) Glued coping
- 4) Geotextile membrane
- 5) Compacted backfill
- 6) Well-compacted footing (0-20 mm)
- 7) Wrapped drain
- 8) 20 mm of packed clean stone backfill (minimum thickness of 150 mm)

FS² SYSTEM - DESIGN

NOTE

Before designing and building a retaining wall, it is imperative that you read the introduction to design and construction presented at the start of the section.

TYPICAL DESIGN VIEWS

The FS² system consists of 4 typical design cross-sections presented as a reference for the design of the final section of each of the retaining walls to be built, in keeping with site conditions.

FS2 SYSTEM – 0° SLOPE

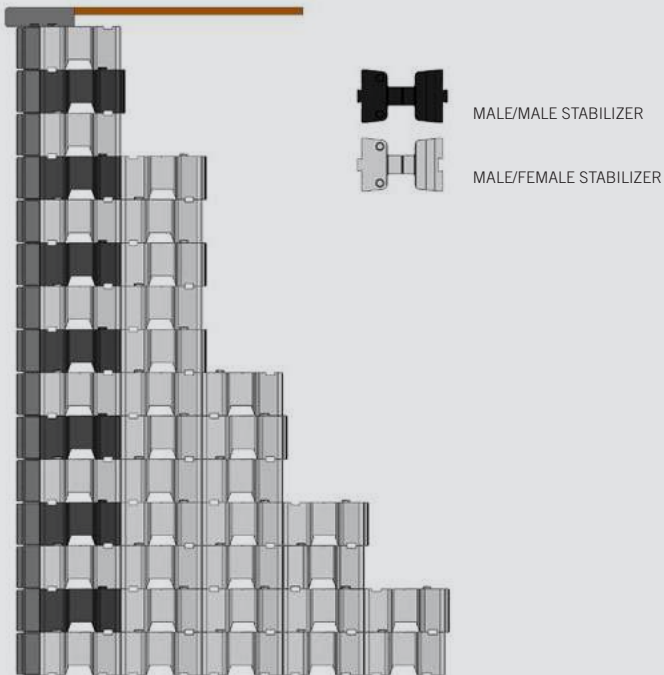
CHOICE OF STABILIZERS

For the first stabilizers connected directly to the facings, from one row to the next, alternate male/female and male/male stabilizers starting with the wall's bottom row. For stabilizers in all other rows, use male/female stabilizers.

N.B.:

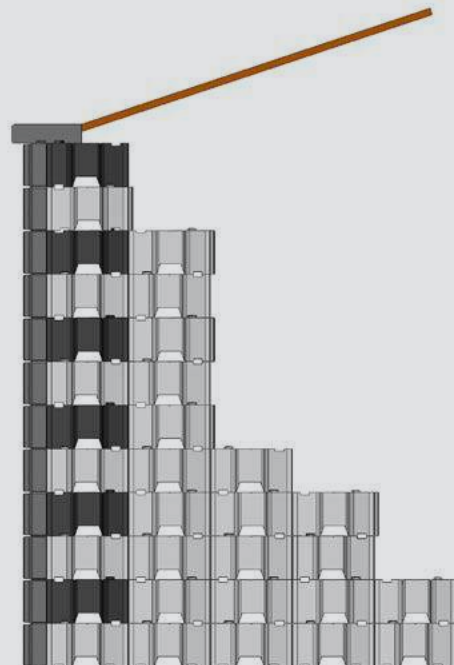
Stabilizers must be used along the full depth of the wall for each of the rows before starting work on the next row up.

WALL WITH NO SURCHARGE



* Stabilizers: see note and indication

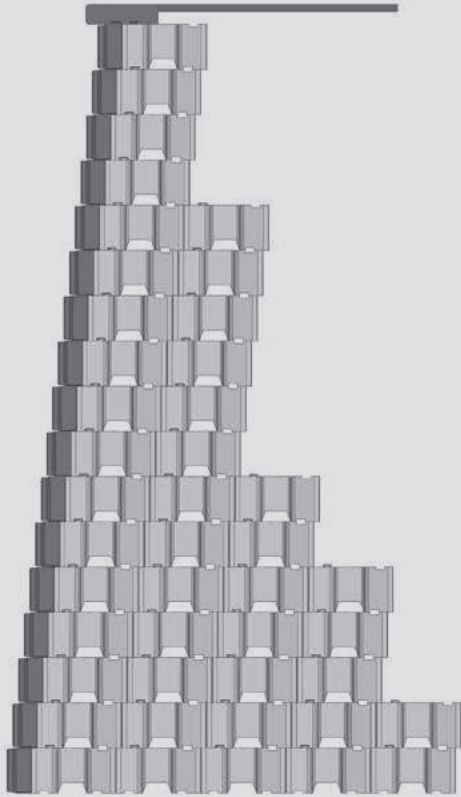
WALL WITH SLOPE (1V : 3H)



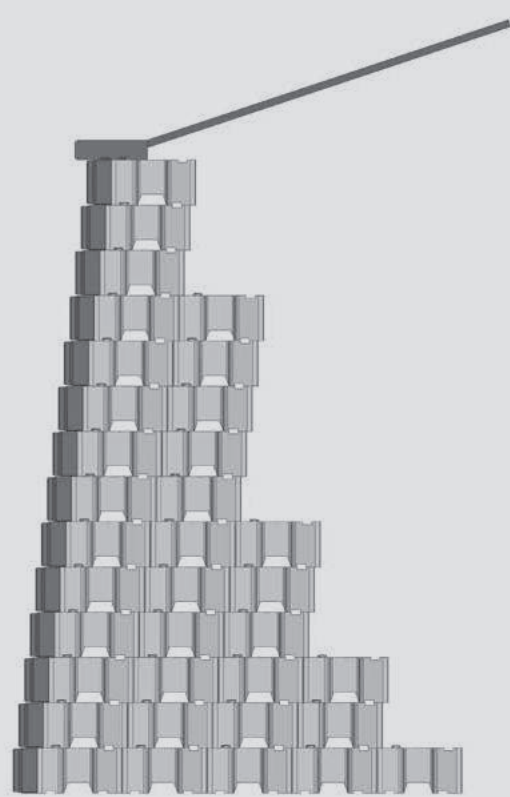
* Stabilizers: see note and indication

FS2 SYSTEM – 7° SLOPE

WALL WITH NO SURCHARGE



WALL WITH SLOPE (1V : 3H)



* For inclined walls, use male/female stabilizers

NOTE: For residential applications, if the above-ground height of the FS² wall to be built is less than 800 mm, the 400 mm penetration height (footing) shown on the drawing can be reduced to at least 200 mm without compromising the stability of the structure. For above-ground heights exceeding 800 mm but below 1,000 mm, a minimum penetration of 300 mm is required. In all other instances, a minimum penetration of 400 mm is required to prevent sliding of the wall in service.

NOTE:

TYPICAL CROSS-SECTIONS OF VARIOUS WALLS PROPOSED BY PERMACON

These typical wall cross-sections are presented for illustrative purposes and integrate hypotheses and specific calculation parameters, which were used to produce these designs. Furthermore, all structures require final design verification based on the environment where they are to be used.

PRIVACY WALL FS² SYSTEM - DESIGN

SAFE DESIGN AND CONSTRUCTION

A privacy wall is considered a structure. This type of freestanding structure is held upright by its own weight. Design and construction must be carried out in compliance with prevailing construction codes and best industry practices.

IMPORTANT

Strict compliance with specifications relating to the typical wall cross-sections proposed by Permacon is required in the execution of the work.

PERFORMANCE IN SERVICE

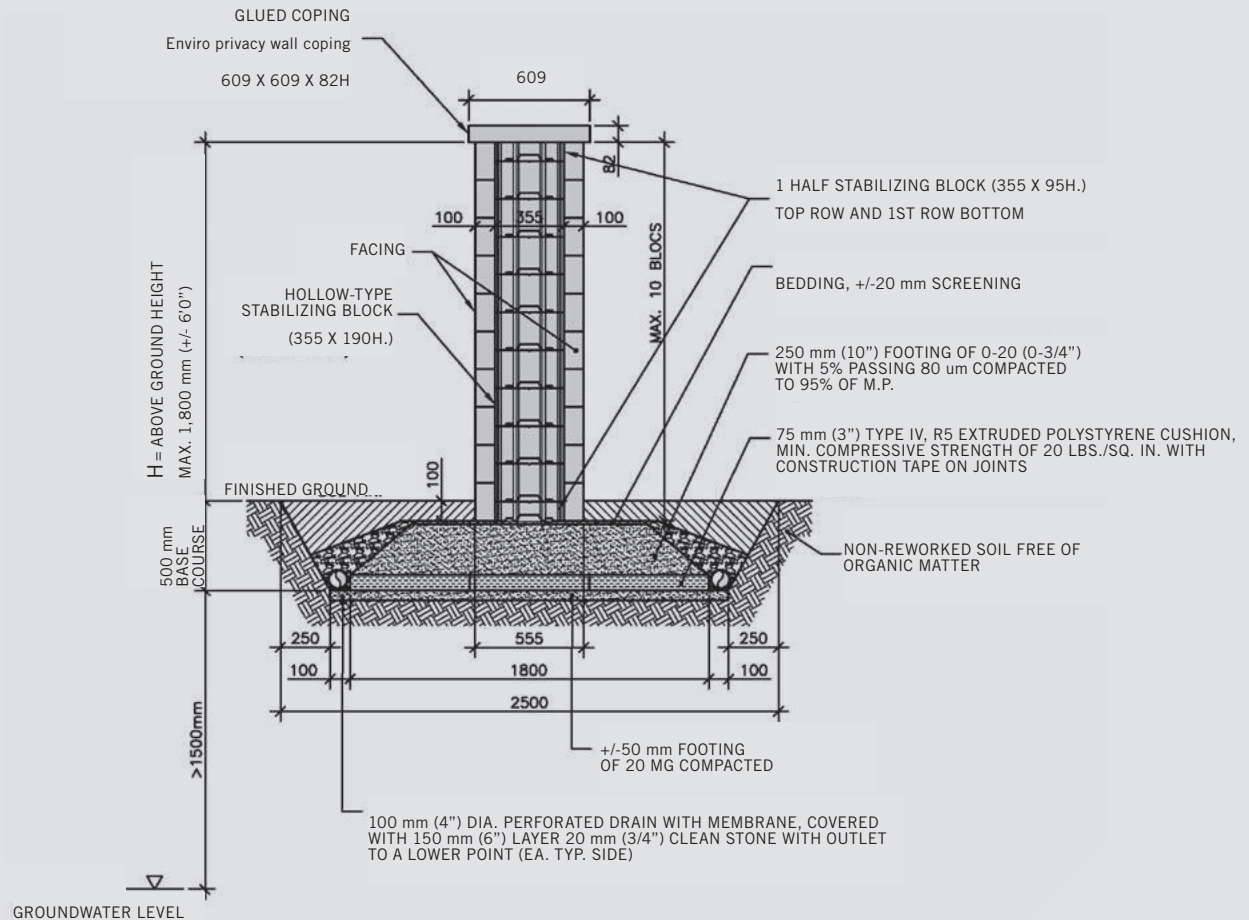
A privacy wall must withstand strong winds, earthquakes and other strong impacts in service (to be specified). The engineer designing a privacy wall must ensure that the structure will perform in service, proposing safe plans and specifications for the wall to be built, in order to avoid any buckling, toppling or settling. Furthermore, to avoid the collapse of a privacy wall, it is imperative to design acute angles (90° singles or doubles) limiting the maximum length of a straight wall section without lateral support to a given above-ground height.

DESIGN

At the design stage and before any work is undertaken, the construction of a privacy wall requires detailed planning to determine its optimal configuration (the maximum length of the straight wall based on its projected above-ground height). Furthermore, any structure to be built must be protected from service impacts (vehicles, snow-clearing, various stresses, etc.) It is also imperative to protect the subgrade against freezing using a rigid insulating material, since any ground movement could upset the structure's balance and ultimately lead to its collapse. This design approach is essential for ensuring that the wall will hold up safely and retain its structural integrity over the long term.

One 190 mm STABILIZING BLOCK without clean stone
 WITH FACING Maximum above-ground height of 1,800 mm (6'0")
 NOISE BARRIER, PRIVACY WALL, FENCE

PRIVACY WALL DETAIL



NOTES:

- 100 mm (4") FOR DAY-INDEX UNDER 18° >5,000 (COLDER REGIONS)
- EXCAVATE THE BOTTOM TO PROVIDE AN EVEN SURFACE AND NON-REWORKED SOIL FREE OF ORGANIC MATTER
- MINIMUM GROUND LOAD-BEARING CAPACITY: 100 kPa
- NO LATERAL STRESS ALLOWED ON THE WALL OTHER THAN WIND AND SEISMIC LOADS.

MISE EN GARDE:

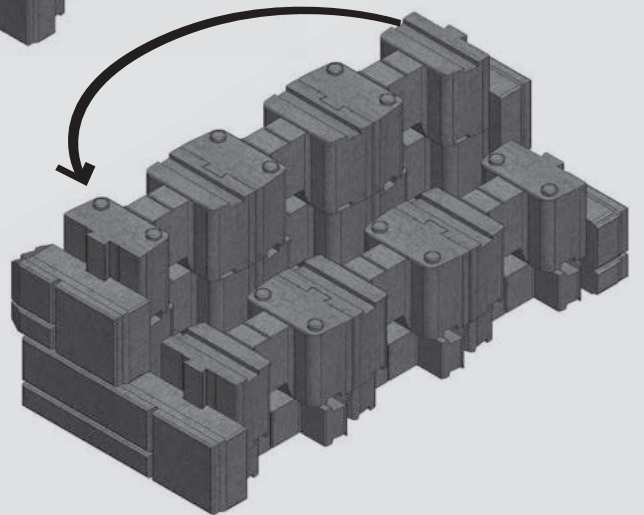
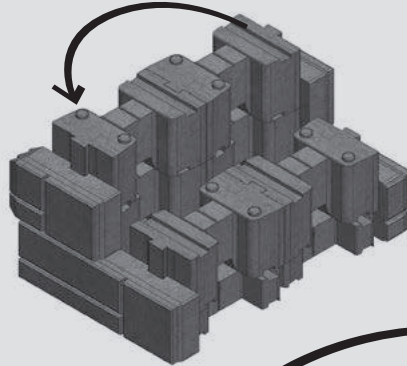
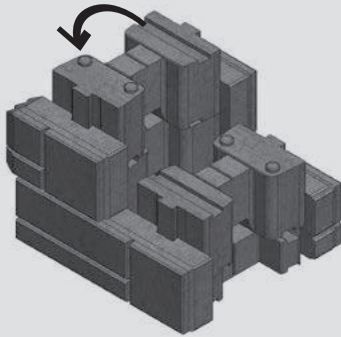
These typical wall cross-sections are presented for illustrative purposes and integrate hypotheses and specific calculation parameters, which were used to produce these designs. Furthermore, all structures require final design verification based on the environment where they are to be used.

For different heights or special conditions, please contact Permacon technical service.

ASSEMBLY OF FS² STABILIZING BLOCKS

Stabilizing blocks incorporate a concrete alignment key at one of their extremities. Inserted in the groove of a stabilizing block above, this key serves to lock the blocks between rows, and keep them from sliding off the wall in service. It also makes it possible to stagger rows during construction. To keep the privacy wall vertical, simply turn the stabilizing block or set of several stabilizing blocks connected to each other) horizontally by 180 degrees (see following assemblies).

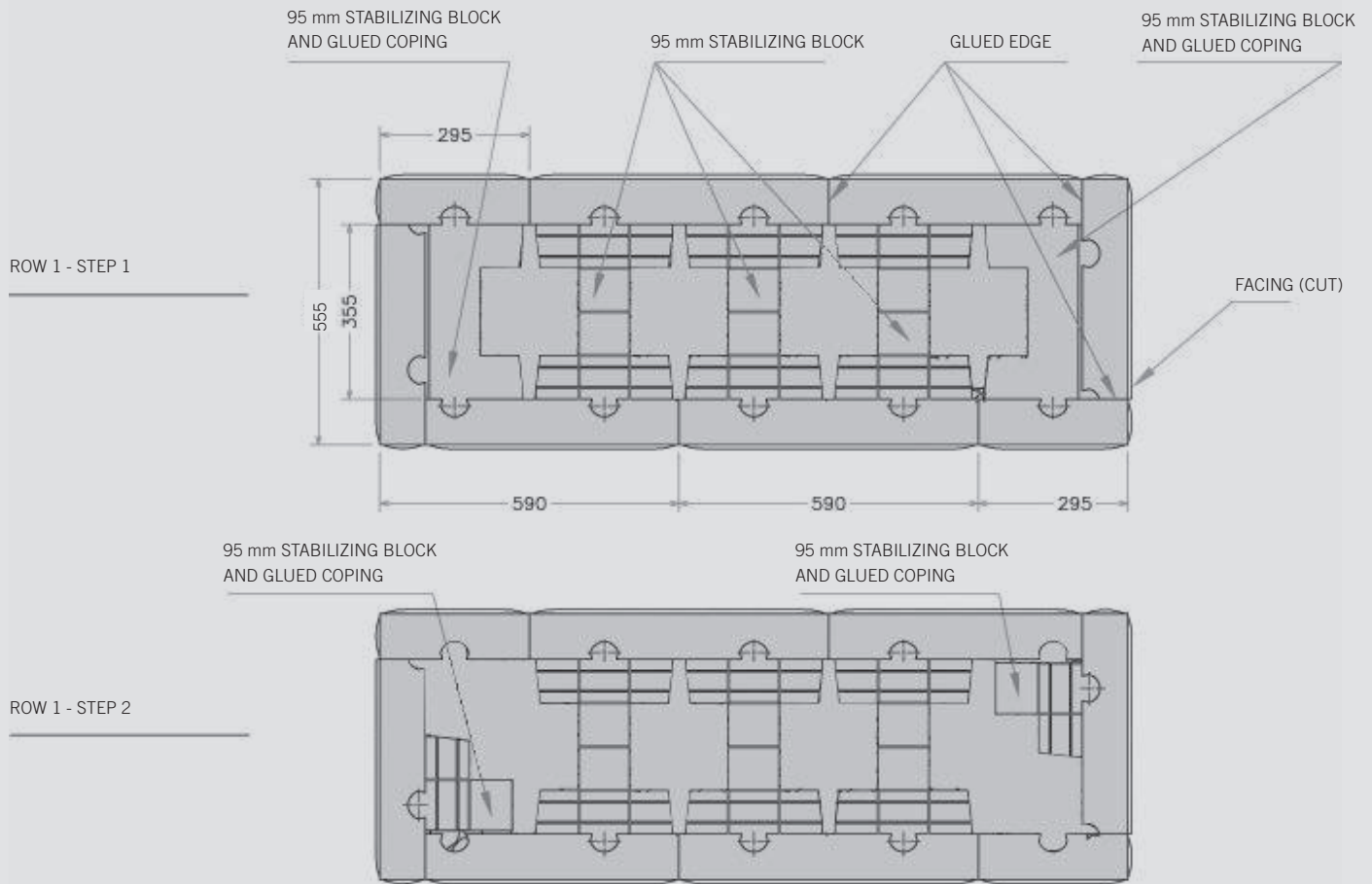
Stabilizing blocks must be assembled by overlaying them one over the other when building each of the rows of a privacy wall. Finally, building a curved concave or convex privacy wall requires the use of mid-height 95 mm male/female stabilizing blocks glued to each other.



NOTE: When starting construction, build the first row using mid-height 95 mm stabilizers, then continue building using full height 190 mm stabilizers and complete the last row beneath the coping by placing mid-height stabilizing blocks to fill the remaining space. This will enable the stabilizers to lock the facings to each other, increasing the structure's overall stability.

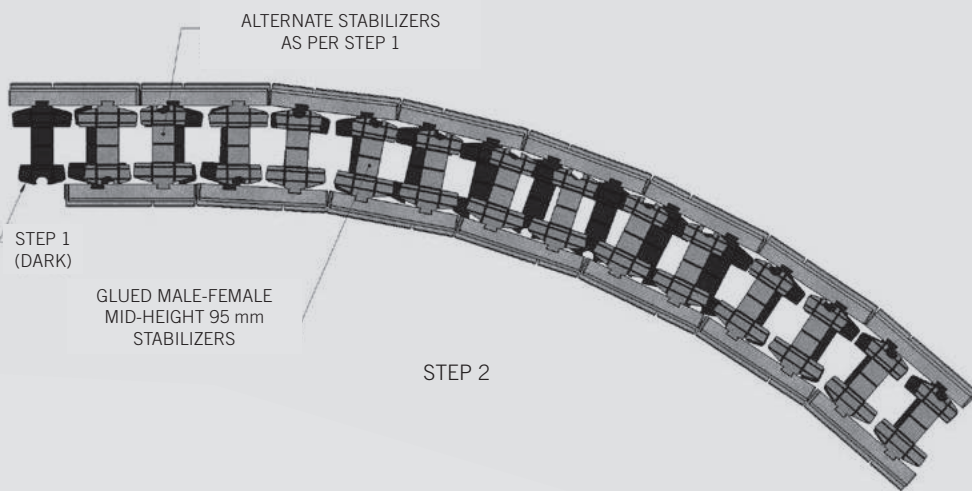
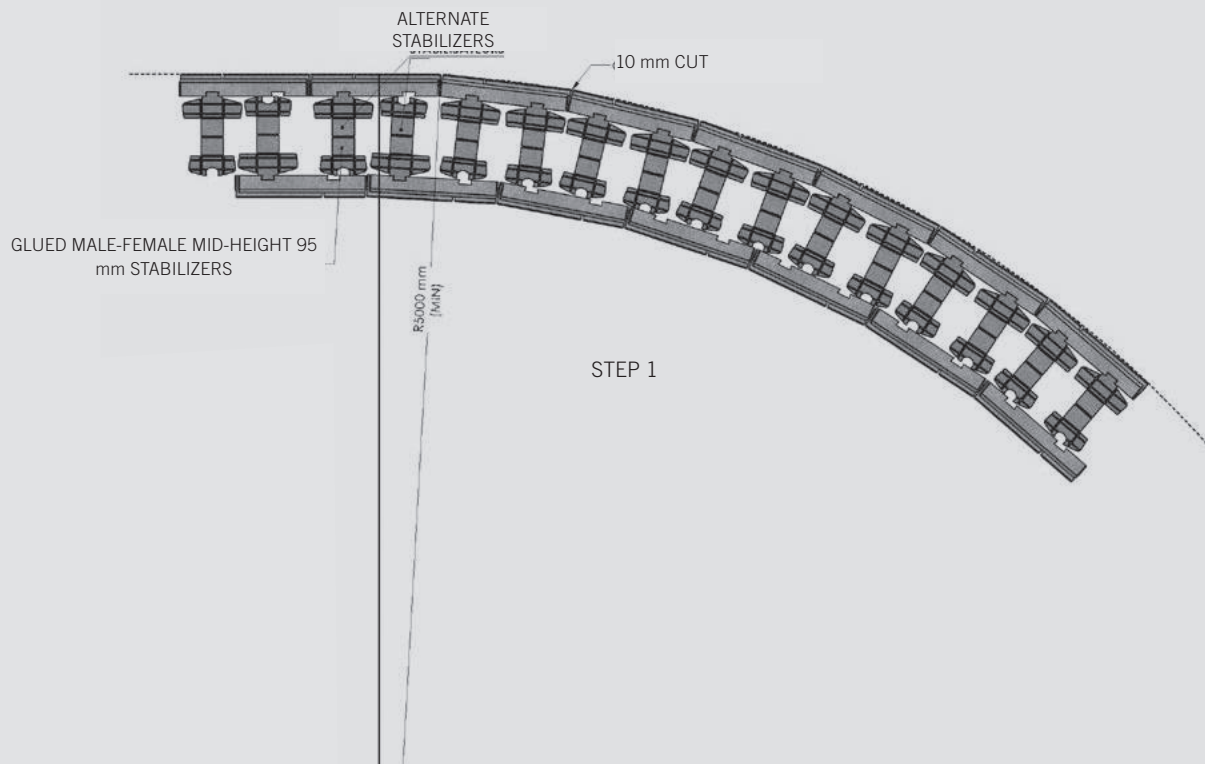
FREESTANDING PRIVACY WALL FINISHED ON TWO SIDES

EXAMPLE:
CORNER ASSEMBLED WITH CORNER MODULES

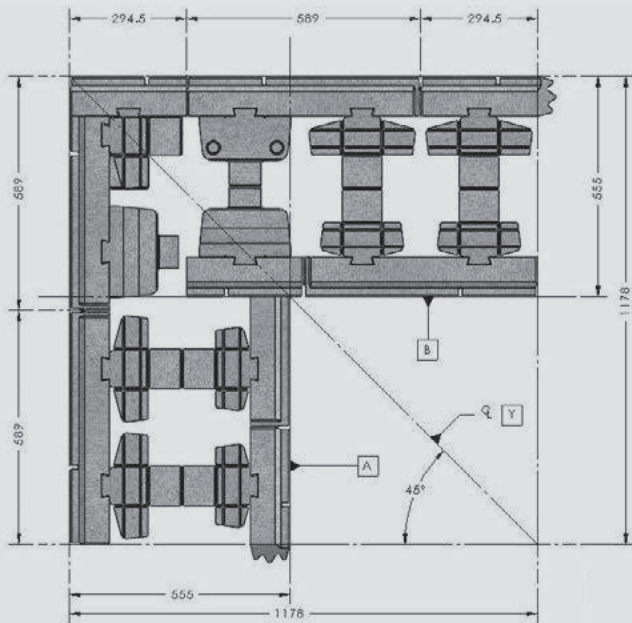


NOTE: To increase the seismic resistance of a freestanding wall, 20 mm clean stone must not be used to fill spaces between the stabilizing blocks after the structure's construction.

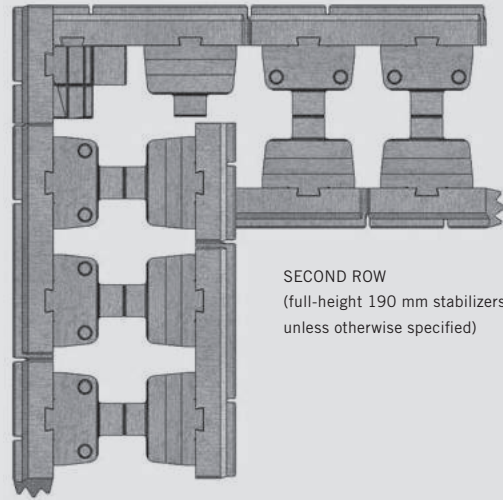
The construction of curved privacy walls requires the use of mid-height FS2 stabilizers, which lend themselves to the production of a wall finished on both sides and of different lengths. As shown in the 2 proposed steps for the construction of a row, the specific orientation of the stabilizers makes it possible to give the structure a curve. Finally, all stabilizers and copings must be glued to ensure the integrity of the overall structure.



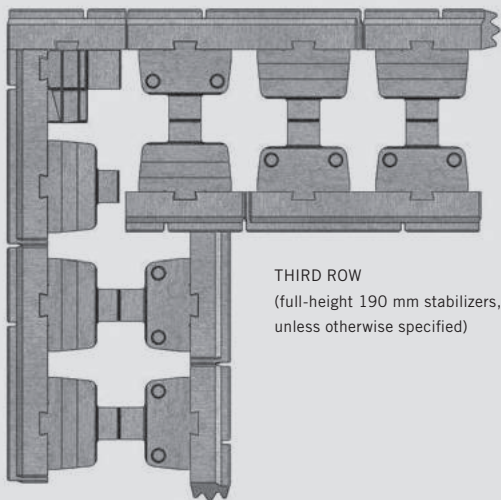
PRIVACY WALL WITH 90-DEGREE CORNER
(construction details for 1 stabilizing block)



FIRST ROW
(mid-height 95 mm stabilizers,
unless otherwise specified)



SECOND ROW
(full-height 190 mm stabilizers,
unless otherwise specified)



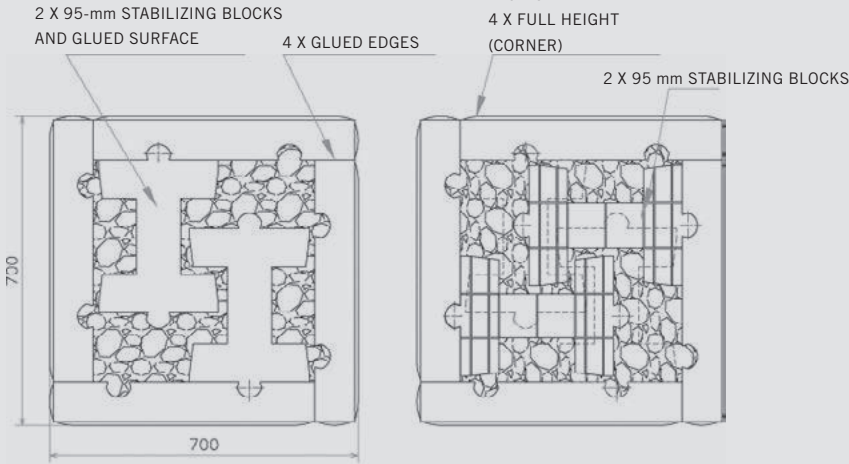
THIRD ROW
(full-height 190 mm stabilizers,
unless otherwise specified)

CONTINUE
CONSTRUCTION

FOURTH ROW
(construction similar to second row)

FIFTH ROW
(construction similar to third row)

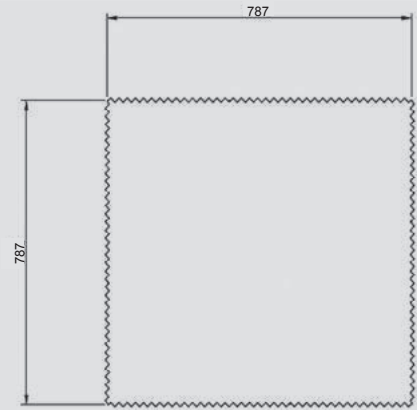
BUILDING A COLUMN
 MAXIMUM HEIGHT 1800 mm. (6 FT)



ROW 1 - STEP 1

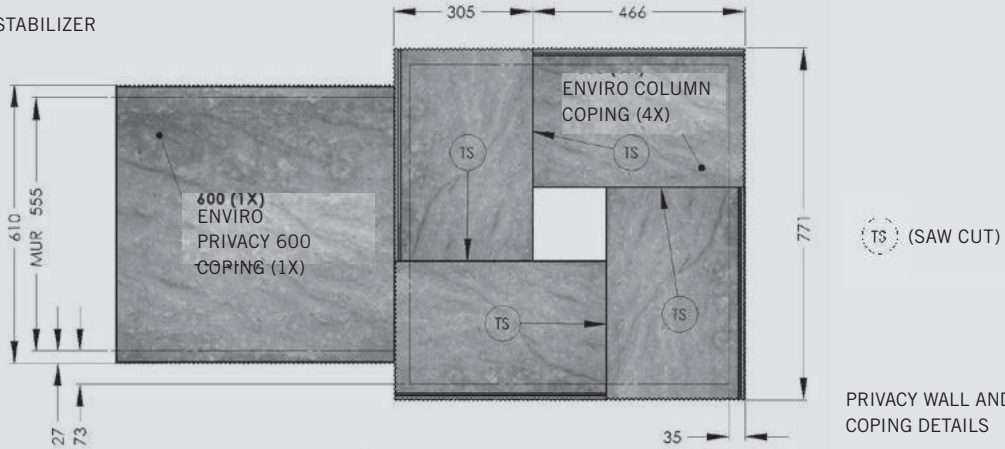
ROW 1 - STEP 2

COLUMN COPING (OPTION 1)



Esplanade column coping
 3 " x 31" x 31 "
 (75 mm x 787 mm x 787 mm)

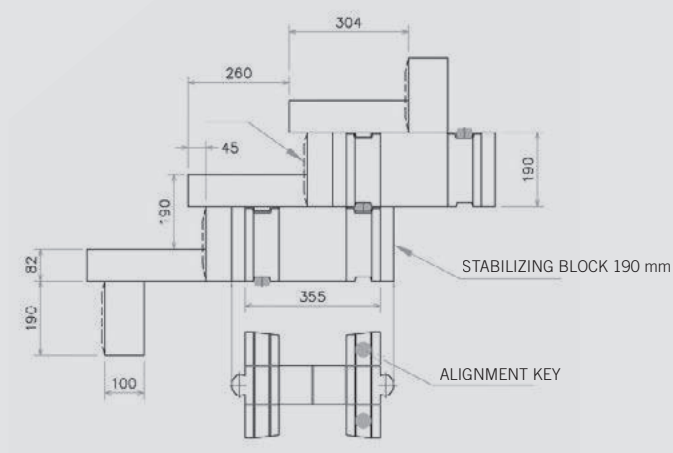
COLUMN 1 STABILIZER



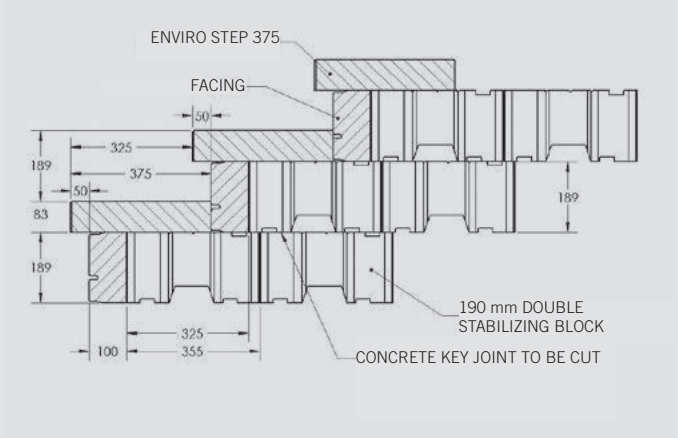
PRIVACY WALL AND COLUMN CONSTRUCTION COPING DETAILS

PRIVACY WALL ← → COLUMN : ENVIRO 300 COPING (OPTION 2)

STEPS
COPINGS (304 mm depth)



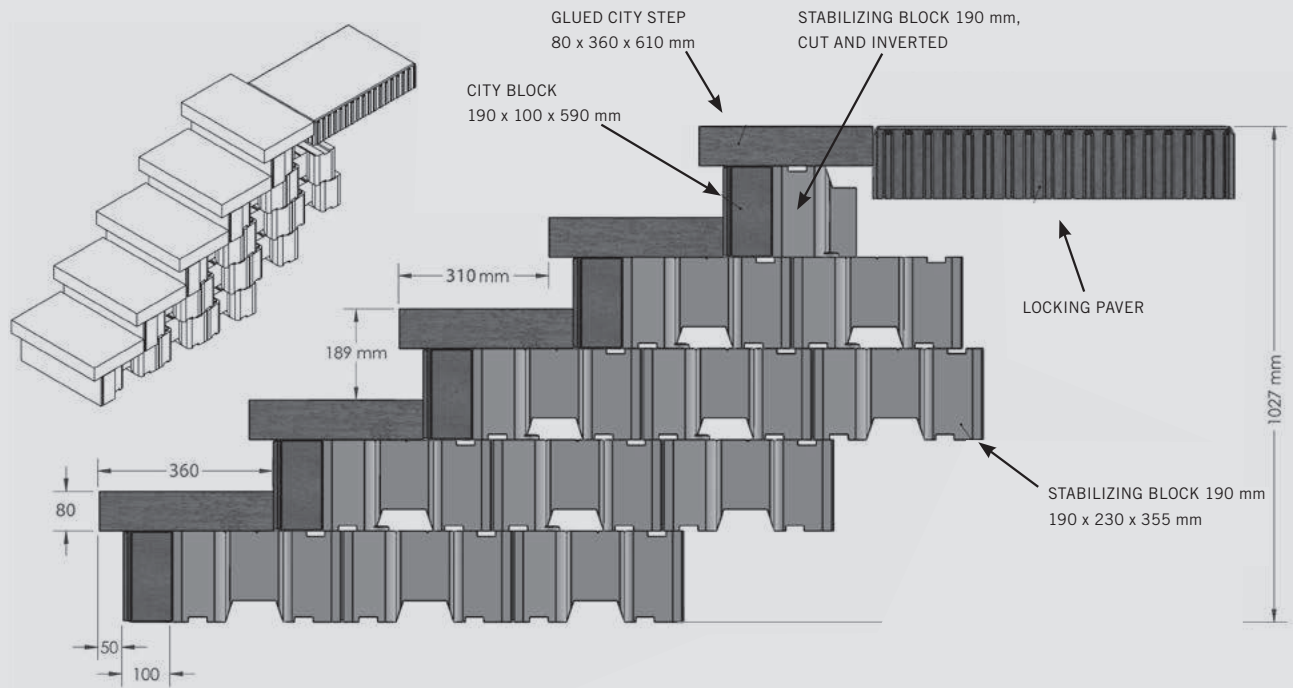
STEPS (375 mm depth)



*NOTE : Increasing the number of stabilizers installed behind the risers is highly recommended to increase the stability of steps built using the FS² system. The presence of triple stabilizers lends greater support to the risers, the step's stabilizers, and the top riser to be built. See the following application example on the next page.

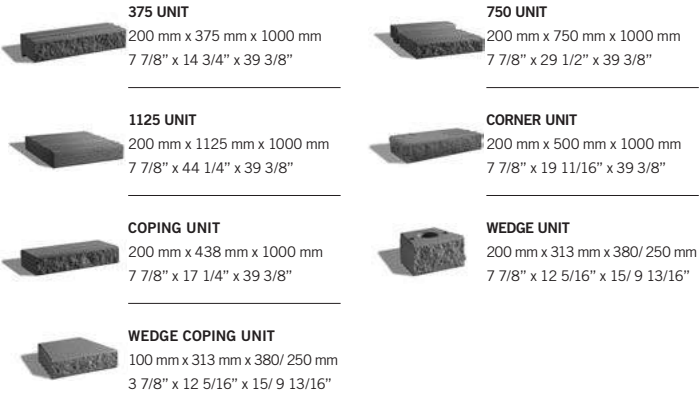
USE OF TRIPLE STABILIZERS FOR INCREASED STABILITY

Increasing the number of stabilizers installed behind the risers is highly recommended to increase the stability of steps built using the FS2 system. The presence of triple stabilizers lends greater support to the risers, the step's stabilizers, and the top riser to be built. See the following application example using 150-mm thick pavers.

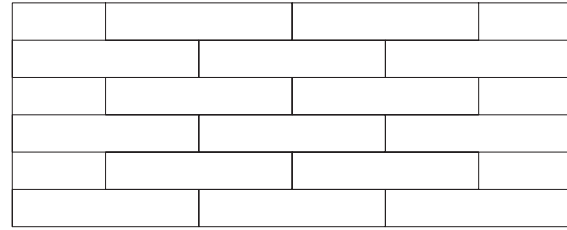


GRANDE WALL®

UNITS (SOLD SEPARATELY)

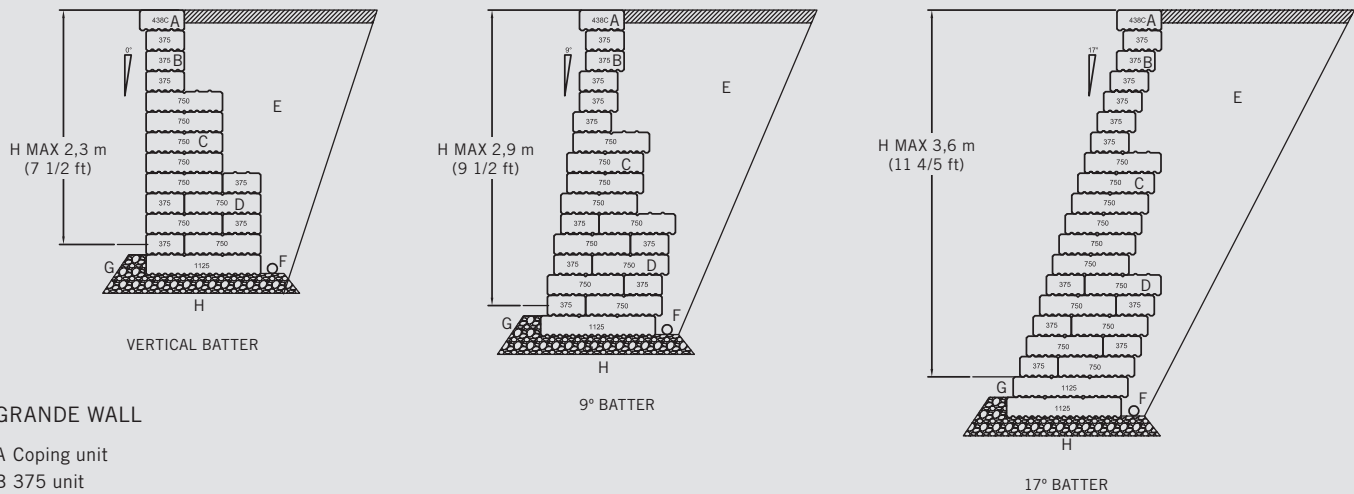


LAYING PATTERN



LINEAR PATTERN

CROSS-SECTION



GRANDE WALL

- A Coping unit
- B 375 unit
- C 750 unit
- D 1125 unit
- E Free-draining sand and gravel material
- F Perforated drain 100 mm (4 in.) Ø connected to services
- G Embedment, minimum 200mm (8 in)
- H 0-20 mm (0-3/4 po) compacted foundation

The Grande system is designed to be installed with three possible pitches: 0°, 9° and 17°.

Note 1

The design charts presented here reflect the following assumptions:

The backfill material behind the wall and the existing soil to be retained must have an internal friction angle of 30° or more. The bearing capacity of the soil under the granular base must be at least 150 kPa (3150 lb/ft²). These charts were developed using 1125 mm modules as the basic depth, thereby limiting the maximum aboveground height to 3.6 m (11.81 ft). However, the height of the walls can be extended by adding modules to build broader bases. Grande Walls can reach heights of up to 6.0 m (19.7 ft) by gravity. The walls can be installed with other height and overload specifications than those above. Specific designs for special project conditions are available from Permacon's technical department. Consult our technical department for details.

Note 2

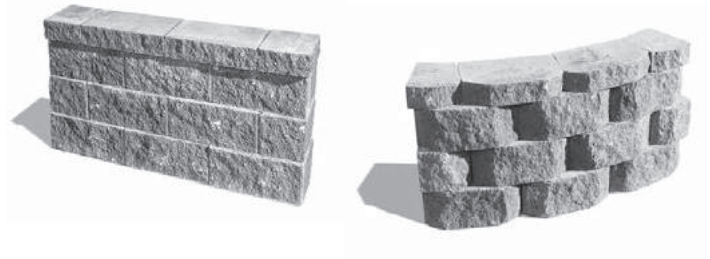
These products have the potential for constructing higher walls using geogrid-type reinforcement. Consult our technical engineering department for details.

KEYSTONE* SYSTEM




DESCRIPTION

- Product certified by the Quebec Transport Department
- For designing walls with a geogrid reinforcement, consult our engineering department

* This system allows for the construction of the wall to be up to 10 metres high. Consult with our Engineers in order to obtain the design details of your wall, by filling out the form on page 40.



UNITS – KEYSTONE* SYSTEM ROUNDED FACE

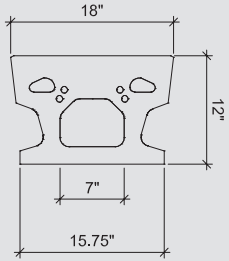
	COMPACT MODULE 204 mm x 305 mm x 457 mm 8" x 12" x 18"		BEVELLED CAPPING MODULE 102 mm x 267 mm x 457 mm 4" x 10 1/2" x 18"
	STRAIGHT CAPPING MODULE 102 mm x 267 mm x 457 mm 4" x 10 1/2" x 18"		

All units are sold separately.

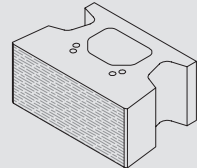
UNITS – KEYSTONE* SYSTEM STRAIGHT FACE

	CORNER MODULE 204 mm x 230 mm x 457 mm 8" x 9" x 18"		COMPACT MODULE 204 mm x 305 mm x 457 mm 8" x 12" x 18"
	BEVELLED CAPPING MODULE 102 mm x 267 mm x 457 mm 4" x 10 1/2" x 18"		STRAIGHT CAPPING MODULE 102 mm x 267 mm x 457 mm 4" x 10 1/2" x 18"

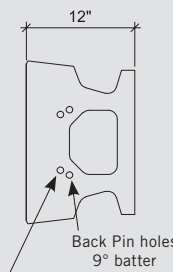
ANCHOR PIN SYSTEM



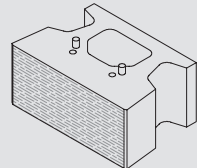
Keystone
Straight face compact module
underneath



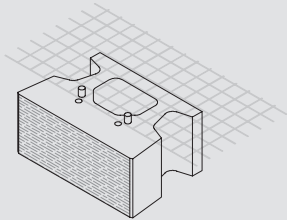
Keystone
Straight face compact module
Isometric view



Front Pin holes
near vertical wall (2°)
Back Pin holes
9° batter



Insert connecting Pin
into Pin holes

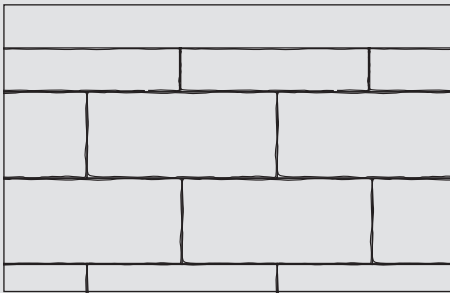


Geogrid installation

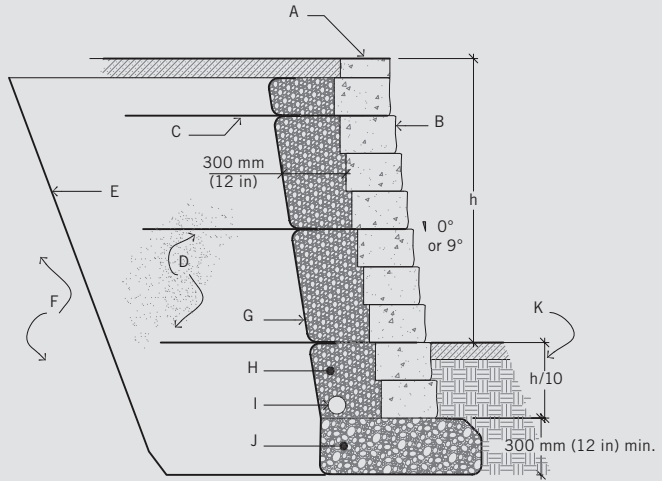
TYPICAL CROSS SECTION

- A 102 mm (4 in.) capping module
- B Keystone system module 200 mm
- C Typical geogrid (For conception see Permacon technical services)
- D Compacted reinforced zone, Class A sand
- E Excavation slope
- F Existing soil
- G Geotextile
- H 20 mm (3/4 in.) clean stone
- I Perforated drain 100 mm (4 in.) Ø connected to services
- J Compacted fondation 0-20 mm (0-3/4 in.)
- K Minimum buried largest: 200 mm (8 in.) or h/10

LAYING PATTERN



LINEAR PATTERN



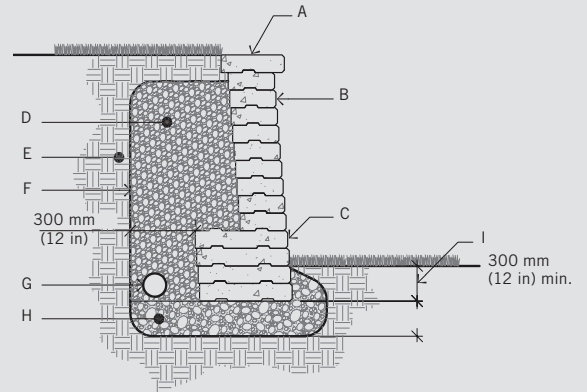
PISA* SYSTEM

TYPICAL CROSS SECTION – OPTION A

- A Capping module
- B Regular 200 mm (8 in.) module
- C Regular 400 mm (16 in.) module
- D 20 mm (3/4 in.) clean stone
- E Existing soil
- F Geotextile
- G Perforated drain 100 mm (4 in.) Ø connected to services
- H 0-20 mm (0-3/4 in.) compacted foundation
- I 150 mm (6 in.) minimum buried depth

Amount of Pisa block required:

TOTAL HEIGHT OF WALL	200 MM (8 IN)	400 MM (16 IN)	FINISHING BLOCK
450 mm (18 in)	5	-	1
600 mm (24 in)	7	-	1
750 mm (30 in)	9	-	1
900 mm (36 in)	9	2	1
1050 mm (42 in)	9	4	1
1200 mm (48 in)	9	6	1
1350 mm (54 in)	9	8	1
1500 mm (60 in)	9	10	1
1650 mm (66 in)	9	12	1

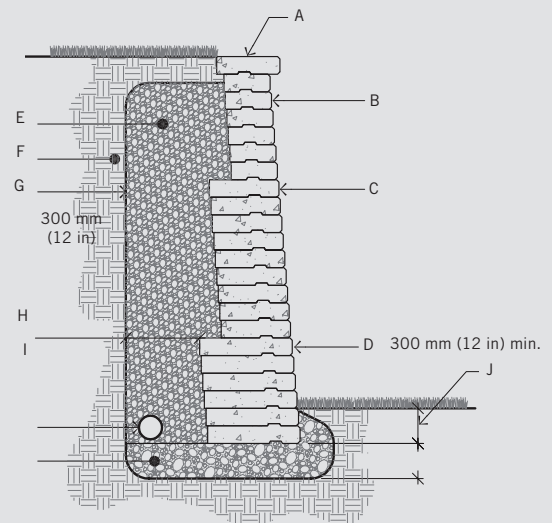


TYPICAL CROSS SECTION – OPTION B

- A Capping module
- B Regular 200 mm (8 in.) module
- C Regular 300 mm (12 in.) module
- D Regular 380 mm (15 in.) module
- E 20 mm (3/4 in.) clean stone
- F Existing soil
- G Geotextile
- H Perforated drain 100 mm (4 in.) Ø connected to services
- I 0-20 mm (0-3/4 in.) compacted foundation
- J 150 mm (6 in.) minimum buried depth

Amount of Pisa block required:

TOTAL HEIGHT OF WALL	200 MM (8 IN)	300 MM (12 IN)	380 MM (15 IN)	FINISHING BLOCK
450 mm (18 in)	5	-	-	1
600 mm (24 in)	5	2	-	1
750 mm (30 in)	5	4	-	1
900 mm (36 in)	5	6	-	1
1050 mm (42 in)	5	8	-	1
1200 mm (48 in)	5	8	2	1
1350 mm (54 in)	5	8	4	1
1500 mm (60 in)	5	9	5	1
1650 mm (66 in)	6	9	6	1



UNIVERSAL* SLOPE BLOCK



UNITS



UNIVERSAL SLOPE BLOCK
135 mm x 280 mm x 215 mm
5 5/16" x 11" x 8 1/2"

SPLIT-FACE UNIVERSAL* SLOPE BLOCK



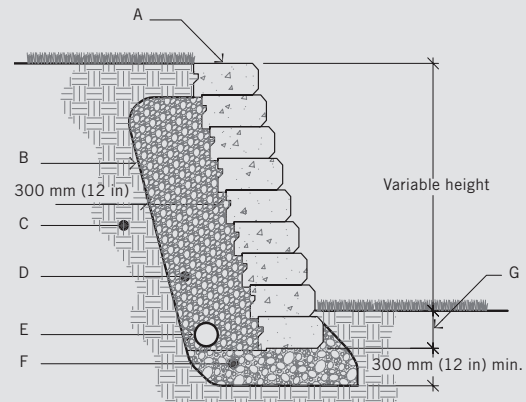
MODULES



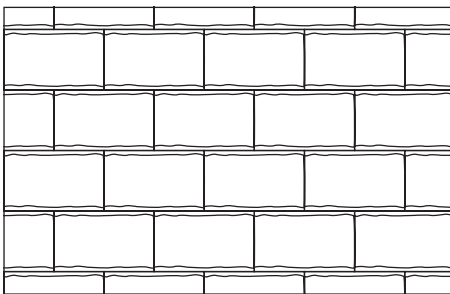
SPLIT-FACE UNIVERSAL* SLOPE BLOCK
134 mm x 305 mm x 215 mm
5 5/16" x 12" x 8 1/2"

TYPICAL CROSS SECTION

- A Universal slope block wall module
- B Geotextile
- C Existing soil
- D 20 mm (3/4 in.) clean stone
- E Perforated drain 100 mm (4 in.) Ø connected to services
- F 0-20 mm (0-3/4 in.) compacted foundation
- G 150 mm (6 in.) minimum buried depth



LAYING PATTERN



LINEAR PATTERN

CURBS AND ACCESSORIES INDEX

CURB	STEPS
<hr/>	
TYPICAL CROSS SECTION	STEPS INSTALLATION - TYPICAL DETAILS 176
CELTIK CURB	MEGA-LAFITT STEP.
ANGLIA CURB	VERSAILLES STEP.
	MEGA-MELVILLE PLUS STEP 177
COPING	GRANIKA STEP 178
<hr/>	
POOL COPING - CROSS SECTION	MARINA 60 CURB (STEP OPTION) 180
RECOVERY OF EXISTING CONCRETE STEP	The curb installation guide is included in the paver installation guide (Page 3).
171	
172	
173	
174	
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PACKAGING

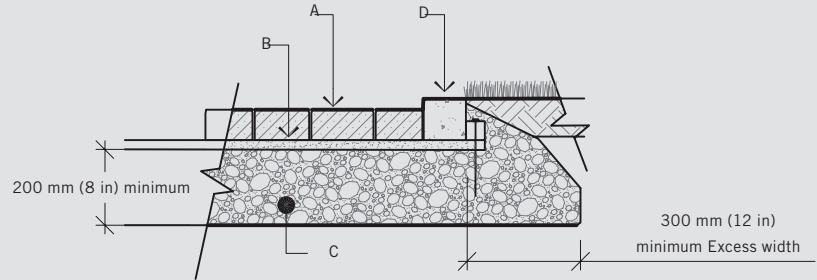
For product packaging information, please refer to the Permacon landscape product price list.

CURBS

TYPICAL CROSS-SECTION – CURBS

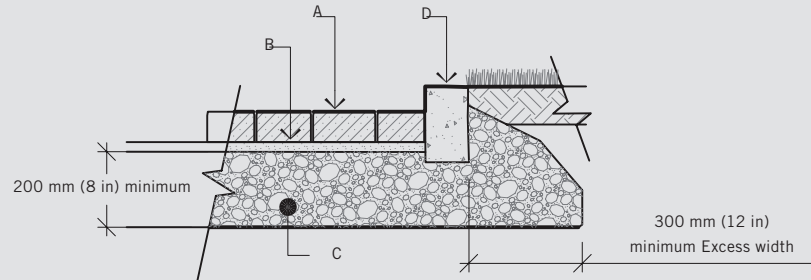
TYPICAL PAVER INSTALLATION WITH CELTIK CURB OR MELVILLE CURB

- A Paving stones
- B Laying bed 25 mm (1 in) (concrete sand)
- C Compacted granular foundation 0–20 mm (0–3/4 in)
- D Curb



TYPICAL PAVER INSTALLATION WITH CELTIK MEGA CURB, ANGLIA CURB OR UNIVERSAL CURB

- A Paving stones
- B Laying bed 25 mm (1 in) (concrete sand)
- C Compacted granular foundation 0–20 mm (0–3/4 in)
- D Curb



CELTIK® CURB

SPECIFIC DETAILS

UNITS



110 mm x 90 mm x 200 mm
4 5/16" x 3 9/16" x 7 7/8"



110 mm x 90 mm x 250 mm
4 5/16" x 3 9/16" x 9 7/8"



110 mm X 90 mm X 275 mm
4 5/16" x 3 9/16" x 10 7/8"

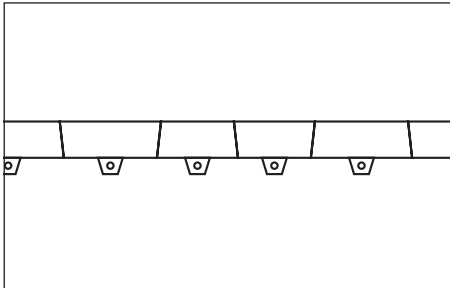


C3-ANCHORS

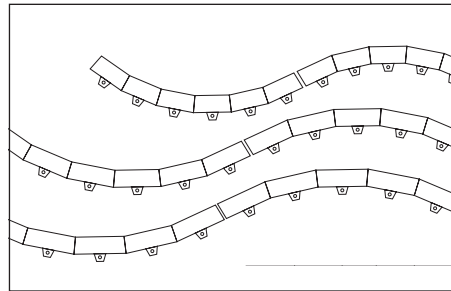
Note: in order to facilitate orders by half layer (13 lin. ft) each row must include 2 boxes of anchors. Each box contains 16 C3-anchors & 16 nails.



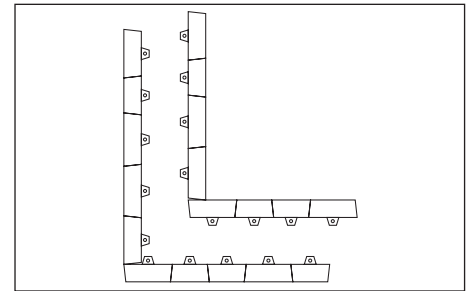
LAYING IDEAS



For a straight line curb, use alternating angled curb modules.



For a concave or convex curve, lay curb modules in the same direction.



For a 90° corner, simply align curb modules at this angle

ANGLIA® CURB

SPECIFIC DETAILS

UNIT



203 mm x 133 mm x 267 mm
8" x 5 1/4" x 10 1/2"



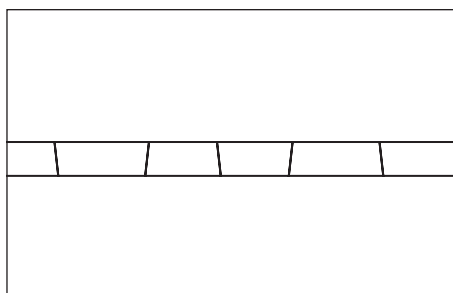
203 mm x 133 mm x 457 mm
8" x 5 1/4" x 18"



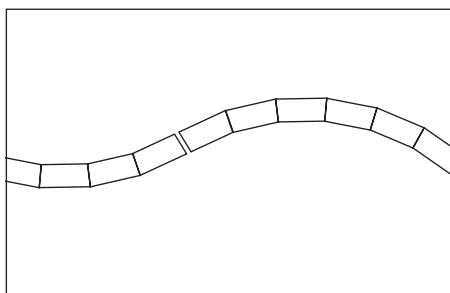
203 mm X 133 mm X 591 mm
8" x 5 1/4" x 23 1/4"



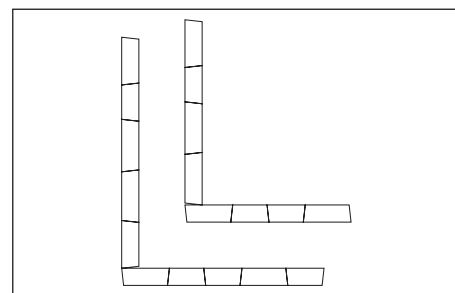
LAYING IDEAS



For a straight line curb, use alternating angled curb modules.



For a concave or convex curve, lay curb modules in the same direction.

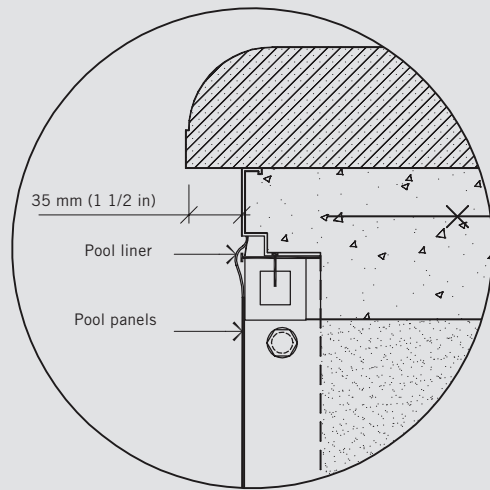
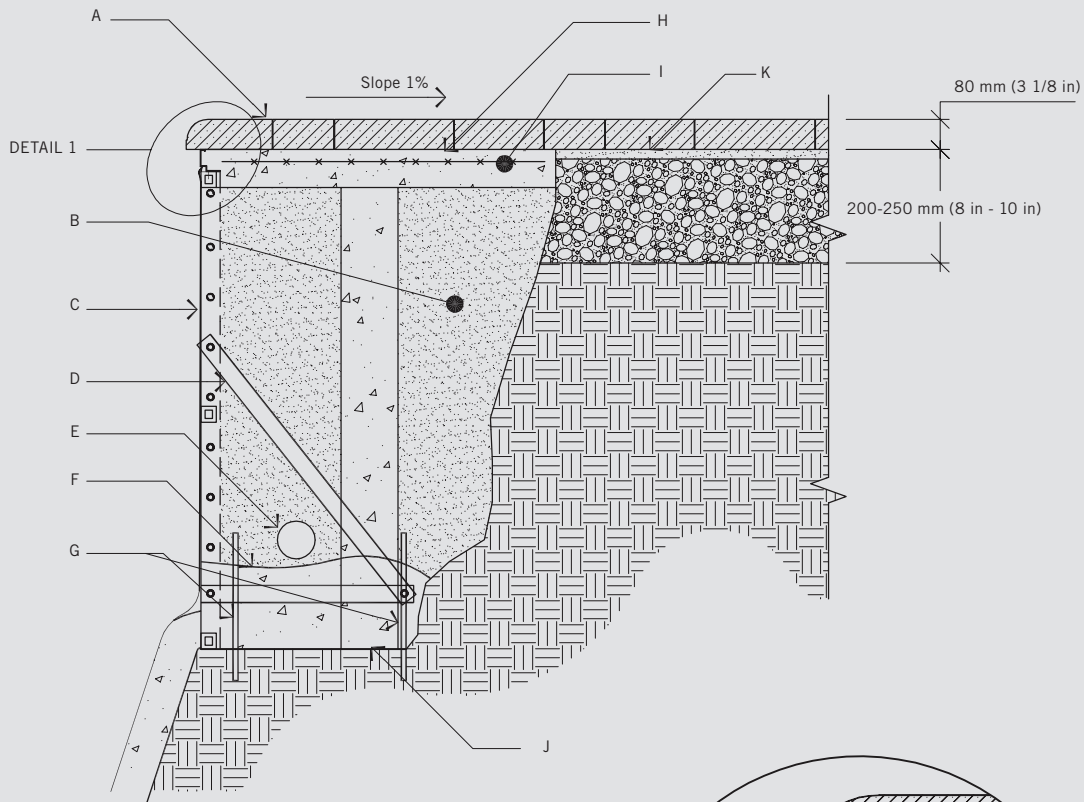


For a 90° corner, simply align curb modules at this angle

POOL COPING - GENERIC DETAIL

TYPICAL INSTALLATION – POOL COPING

LAGUNA 60 AND 80 POOL COPING AND MARINA 60 COPING



DETAIL 1

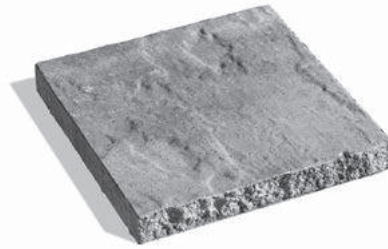
- A Pool coping and pavers glued with Permapro concrete adhesive or mortar
- B Sand
- C Pool panels
- D Reinforcement bars
- E Perforated drain 100 mm (4 in)
- F Concrete footing 200 mm X 200 mm (8 in X 8 in)
- G Metal rod 10 mm (3/8 in)
- H Concrete deck 1 m (± 39 in) wide x 100 mm (4 in) thick
- I Wire mesh 150 mm (6 in) X 150 mm (6 in) X 9 ml (G)
- J Concrete Sonotube 150 mm (6 in) Ø
- K Bedding course 25 mm (1 in)

RECOVERY OF EXISTING CONCRETE STEP MONDRIAN® PLUS CAPPING MODULE

UNITS



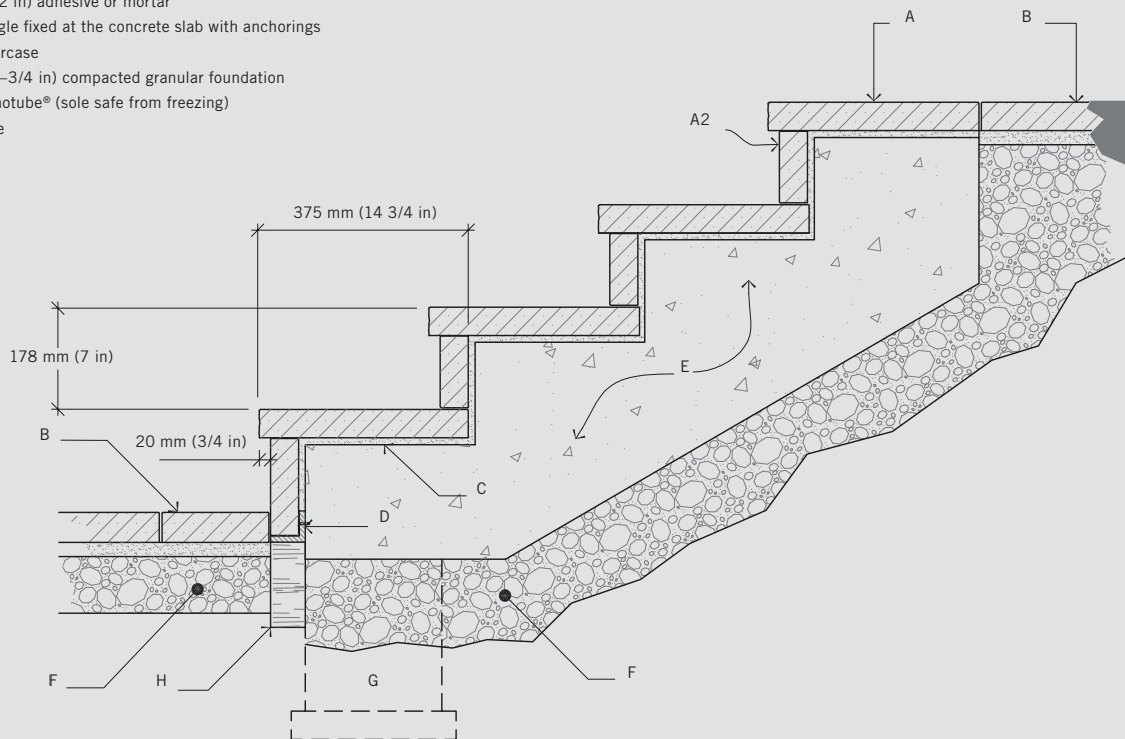
50 mm x 406 mm x 375 mm
2" x 16" x 14 3/4"



SPECIFIC DETAIL

RECOVERY OF EXISTING CONCRETE STEPS MONDRIAN CAPPING MODULE AND MONDRIAN SLABS

- A Split Mondrian capping module
- A2 Sawn Mondrian capping module
- B Mondrian Slabs (3 sizes) on 25 mm (1 in) laying bed
- C 12 mm (± 1/2 in) adhesive or mortar
- D Steel iron angle fixed at the concrete slab with anchorings
- E Concrete staircase
- F 0–20 mm (0–3/4 in) compacted granular foundation
- G Concrete Sonotube® (sole safe from freezing)
- H Rigid insulate



POLYMERIC SAND XP NEXTGEL

When overlaying a concrete landing, you can install Mondrian slabs on a 25 mm (1 in) thick bedding by using the new Techniseal XP NextGel polymeric sand to fill the joints between the slabs.

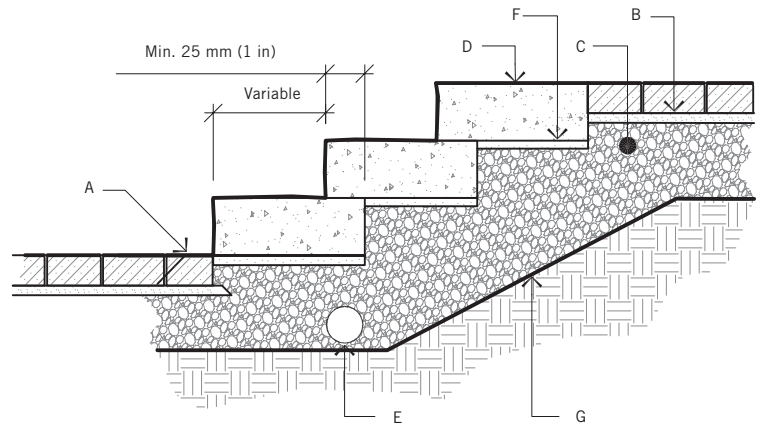


STEPS

STEPS INSTALLATION - TYPICAL DETAIL

TYPICAL CROSS SECTION – INSTALLATION FOR MEGA-LAFITT AND VERSAILLES

- A Concrete pavers
- B Laying bed 25 mm (1 in)
- C 0-20 mm (0-3/4 in) compacted foundation
 - 250 mm (10 in) sandy soil
 - 400 mm (16 in) clay soil
- D Concrete step
- E Perforated drain 100 mm (4 in) Ø connected to services
- F 12 mm (1/2 in) maximum laying bed must be compacted
- G Geotextile

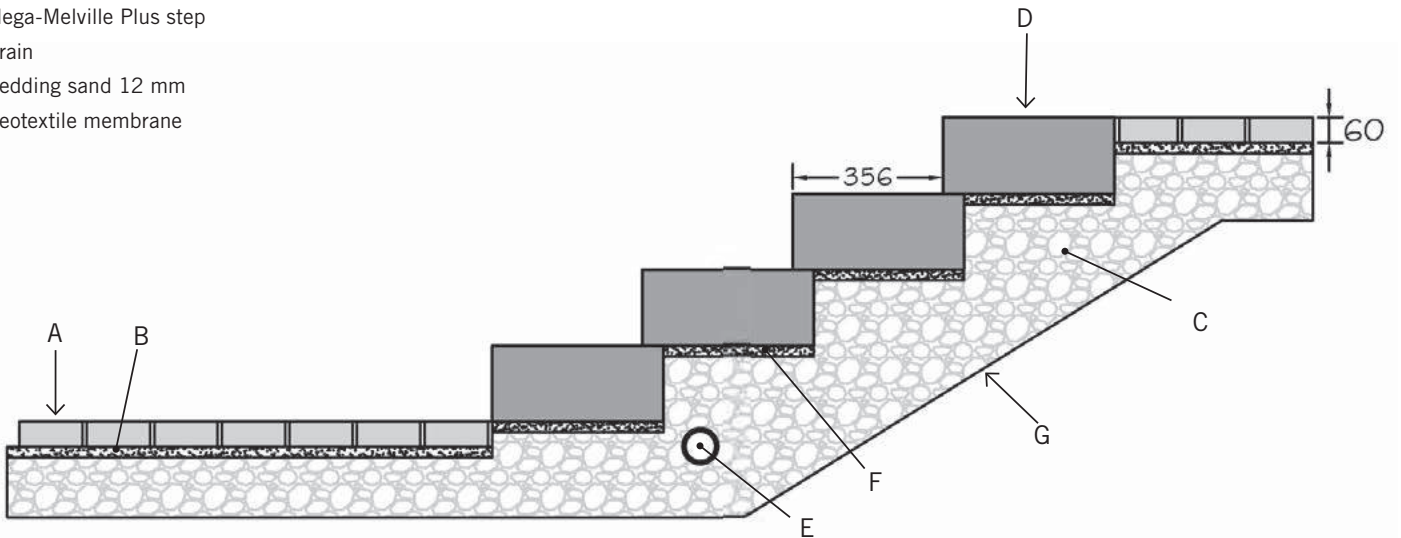


STAIRS WITH MEGA-MELVILLE PLUS STEP

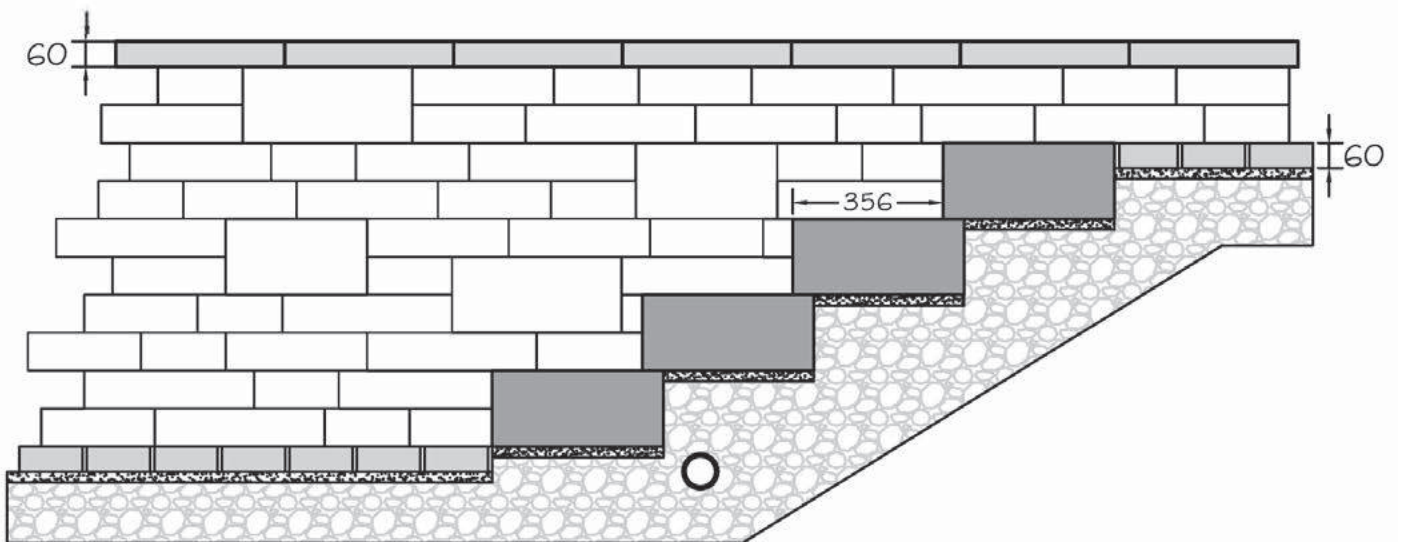
NEW

CONSTRUCTION DETAIL

- A Pavers
- B Bedding sand 25 mm
- C Granular foundation
- D Mega-Melville Plus step
- E Drain
- F Bedding sand 12 mm
- G Geotextile membrane



Stairs with Mega-Melville Plus step (7 x 16 x 48)



Mega-Melville Plus step with Tandem Wall

Dimensions are in mm.

GRANIKA STEPS

SPECIFIC DETAILS

MASSIVE ELEMENT, STRUCTURAL STABILITY

THE LOOK OF NATURAL GRANITE WITH
“FLAME-TREATED” FINISH.

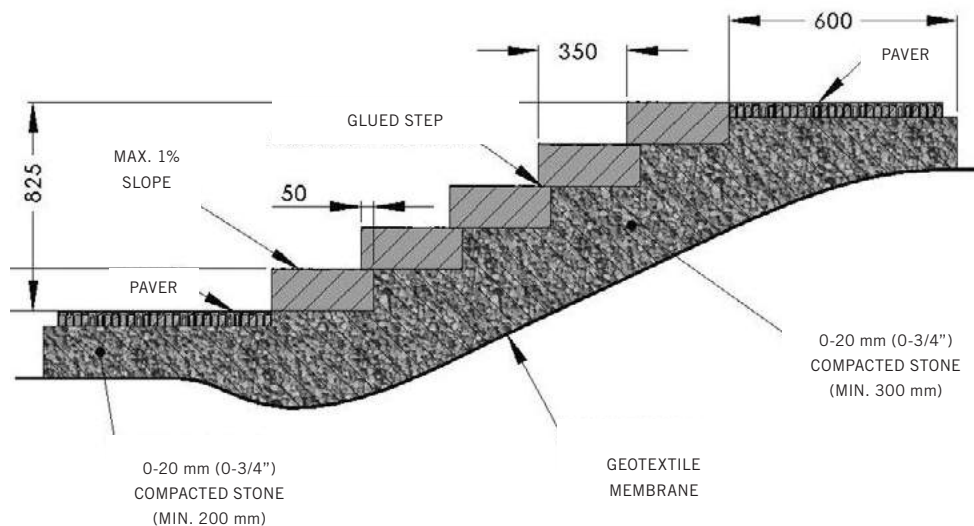
DESIGN

Granika steps were designed for the construction of straight and narrow stairs measuring 800 mm in width. Granika steps can also be combined to produce wider structures. Joints should be staggered to maximize the aesthetics of the finished structure. It is imperative to comply with construction details presented in the suggested drawings, in order to maximize the stability of the construction in service.

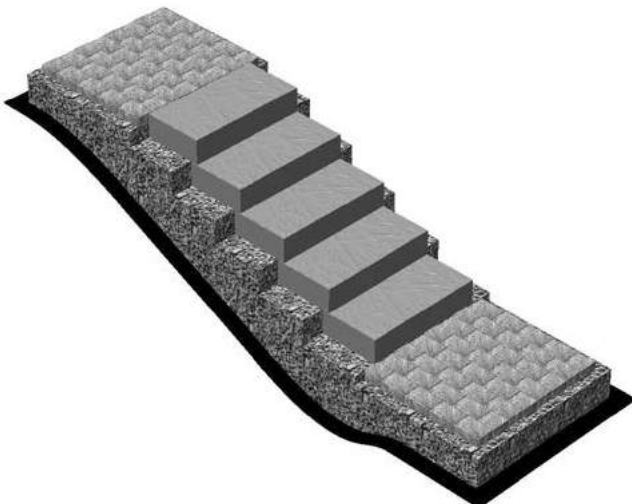
ADVANTAGES

- Large products, 164 mm (H) x 400 mm x 800 mm (6 1/2" X 15 3/4" x 31 1/2")
- Multipurpose for use in prestigious projects
- Beauty and design flexibility

TYPICAL SECTION OF PROPOSED ASSEMBLY

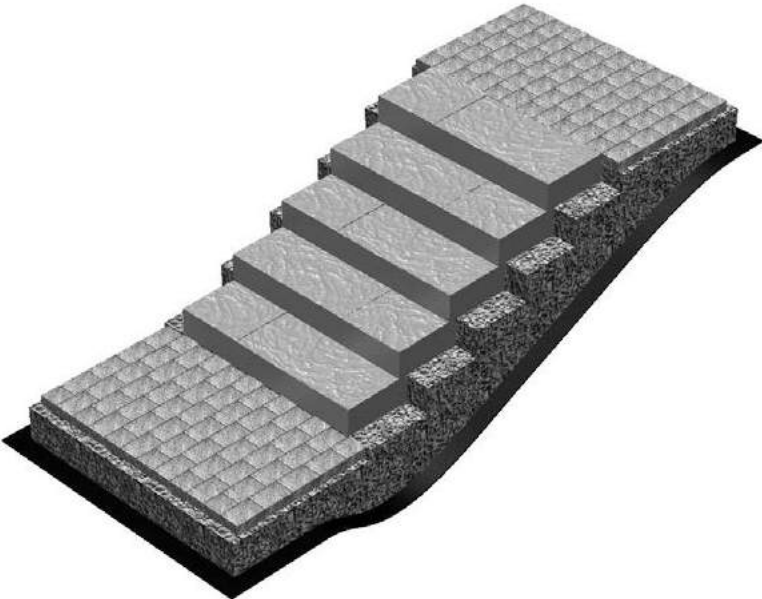


PROPOSED ASSEMBLY (SINGLE STEP, 800 mm WIDTH)

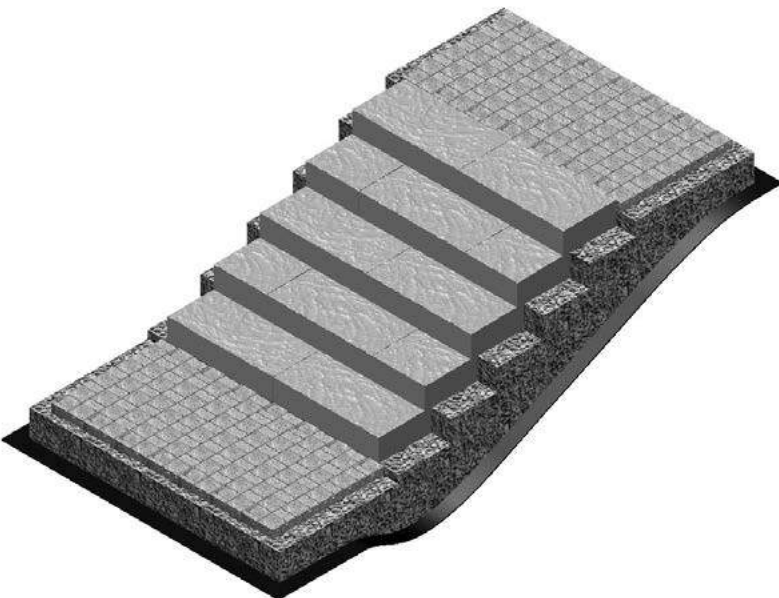


GRANIKA STEPS (cont'd)

1200-mm WIDE STAIRS



1600-mm WIDE STAIRS



Note:
The combination of several GRANIKA steps allows the construction of wider structures adapted to the designer's needs.

MARINA[®] 60 COPING

STEP OPTION

UNIT



60 mm x 150 mm x 300 mm
2 3/8" x 5 15/16" x 11 13/16"

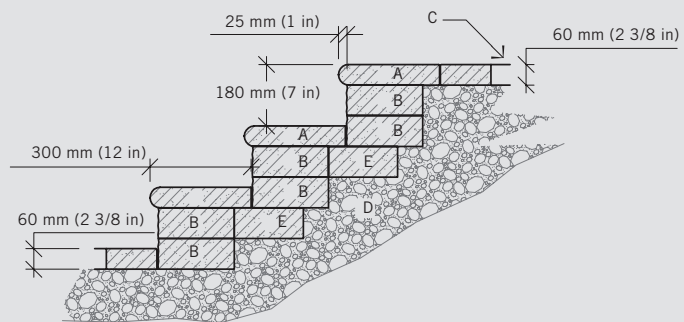


LAYING IDEAS

STAIRWAY OPTION 1

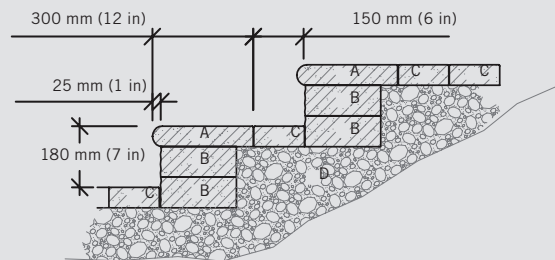
- A Marina coping 60 mm x 300 mm x 150 mm
(2 3/8 in x 11 13/16 in x 5 15/16 in)
- B Celtik 90 wall (4 formats)
90 mm x 225 mm x variable
(3 9/16 in x 8 7/8 in x variable)
- C Paver 60 mm
- D Granular base 0–20 mm compacted
- E Grey block 100 mm x 200 mm x 400 mm
(4 in x 8 in x 16 in)
or Celtik wall – 90 mm module

Note: All elements must be glued together with the Techniseal adhesive



STAIRWAY OPTION 2

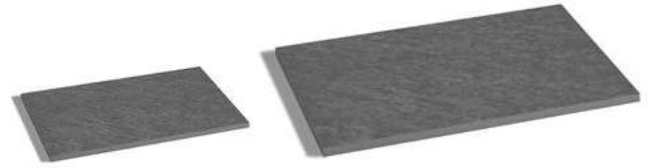
- A Marina coping 60 mm x 300 mm x 150 mm
(2 3/8" x 11 13/16" x 5 15/16")
- B Celtik wall – (4 sizes)
90 mm x 225 mm x variable
(3 9/16" x 8 7/8" x variable)
- Note: A and B elements must be glued together with the Techniseal adhesive
- C 60 mm pavers
- D Granular base 0–20 mm compacted



MIRAGE PORCELAIN TILES

SPECIFIC DETAILS

QUARZITI 2.0 MODULAR 300 X 600 AND 600 X 900



QUARZITI 2.0 LARGE RECTANGLE 600 X 1200



QUARZITI 2.0 LARGE SQUARE 600 X 600



QUARZITI 2.0 POOL COPING 330 X 600



NOON 300 X 1200



NA.ME 450 X 900



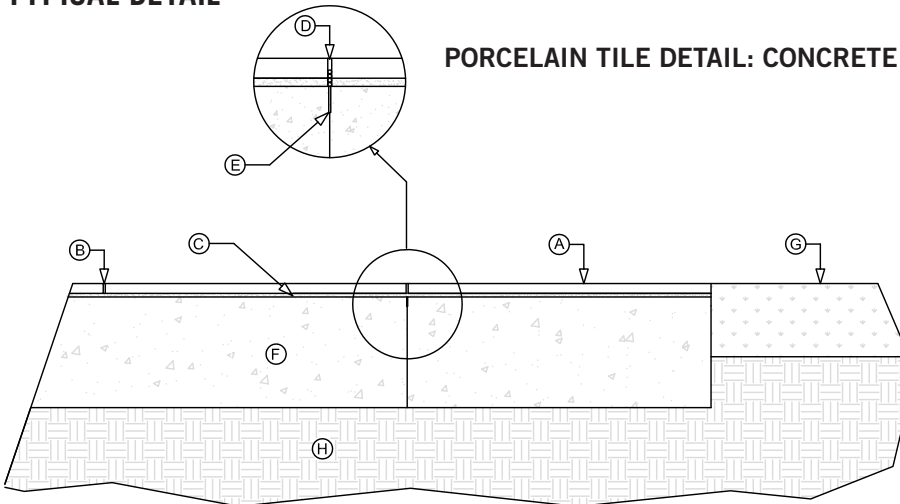
NA.ME 600 X 600



THICKNESS OF PORCELAIN TILES: 20 mm (3/4")

PORCELAIN TILE (APPLICATIONS)

TYPICAL DETAIL



PORCELAIN TILE DETAIL: CONCRETE BASE INSTALLATION

- A. Mirage Porcelain Tile (20 mm).
- B. Joint grout for Porcelain tile (8 to 10 mm width). (Ultracolor Plus or Keracolor S from Mapei or equivalent).
- C. Cementitious adhesive for porcelain tile (Kerabond T/Keralastic or Ultraflex LFT from Sika).
- D. Contraction/Control joint (Architectural urethane sealant and sealant backer rod).
- E. Saw cut contraction joint. The depth of the saw cut must be a minimum of 1/4 of the thickness of the concrete slab (to induce crack beneath saw cut contraction joint).
- F. Structural concrete base, 150 mm minimum thickness (Design by others).
- G. Grass
- H. Existing soil with adequate bearing capacity (Minimum of 100 kN/m²).

Notes:

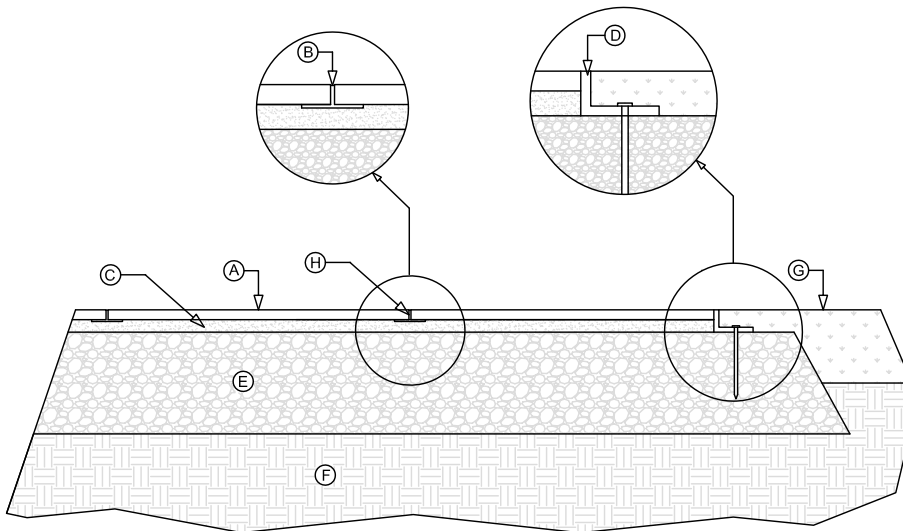
The concrete slab must have contraction/control joint (every 5 lin. m max). It is absolutely imperative that all contraction/control joints be located in the joint line of installed porcelain tile and not beneath a tile. The concrete slab must be cured at least 28 days before the installation of any porcelain tiles.

Never compact porcelain tile with a plate compactor.

Insure the pavement is constructed with a 2 degree slope and that it is pitched away from any building.

This installation is dedicated to a pedestrian application only. The actual structural design for light vehicular application must be performed by a qualified Professionnal Engineer.

PORCELAIN TILE DETAIL: GRANULAR BASE INSTALLATION



- A. Mirage Porcelain Tile (20 mm).
- B. Joint sand (Techniseal Polymeric sand).
- C. Bedding sand 25 mm max: concrete sand (0-5 mm). Pre-compact the sand bedding course and screed to a 12 mm thickness with smooth surface
- D. Peripheral restraint system spiked into 150 to 200 mm over base area. Base material is to be over based 150 to 200 mm beyond the edge of the pavement.
- E. Crushed stone, 200 to 300 mm (0-20 mm) compacted to 95% Modified Proctor.
- F. Existing soil with adequate bearing capacity (Minimum of 100 kN/m²)
- G. Grass.
- H. Plastic Spacers for Mirage porcelain tiles to insure 4 mm between tiles. 1 spacer is required at every corner.

Notes :

Level the bedding sand properly and than pre-compact. Never compact Porcelain Tiles with a palte compactor.

This construction is dedicated to a pedestrian application only.

Insure the pavement is constructed with a 1.5 to 2 degree slope that is pitched away from any building.

For a professionnall and chip free cut, porcelain tiles should only be cut with a tile saw equipped with a wet cut porcelain blade.

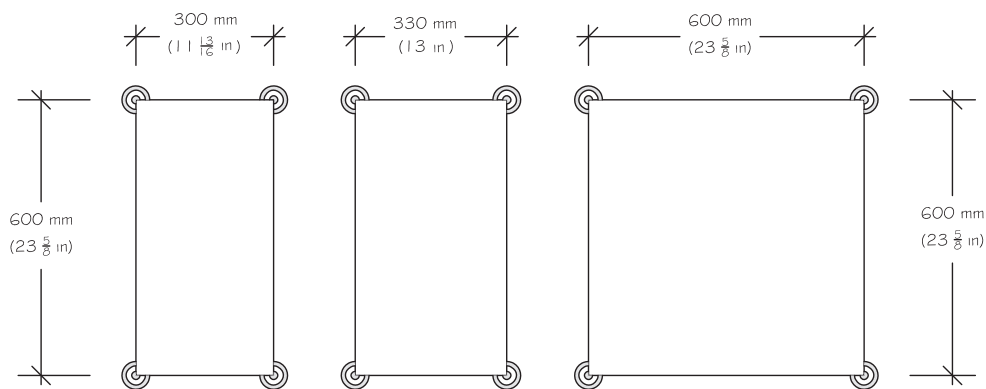
General note: The Mirage porcelain tiles can be cut by using a table water saw with a diamond blade specially designed for porcelain.

MIRAGE PORCELAIN TILES: INSTALLATION ON PEDESTALS

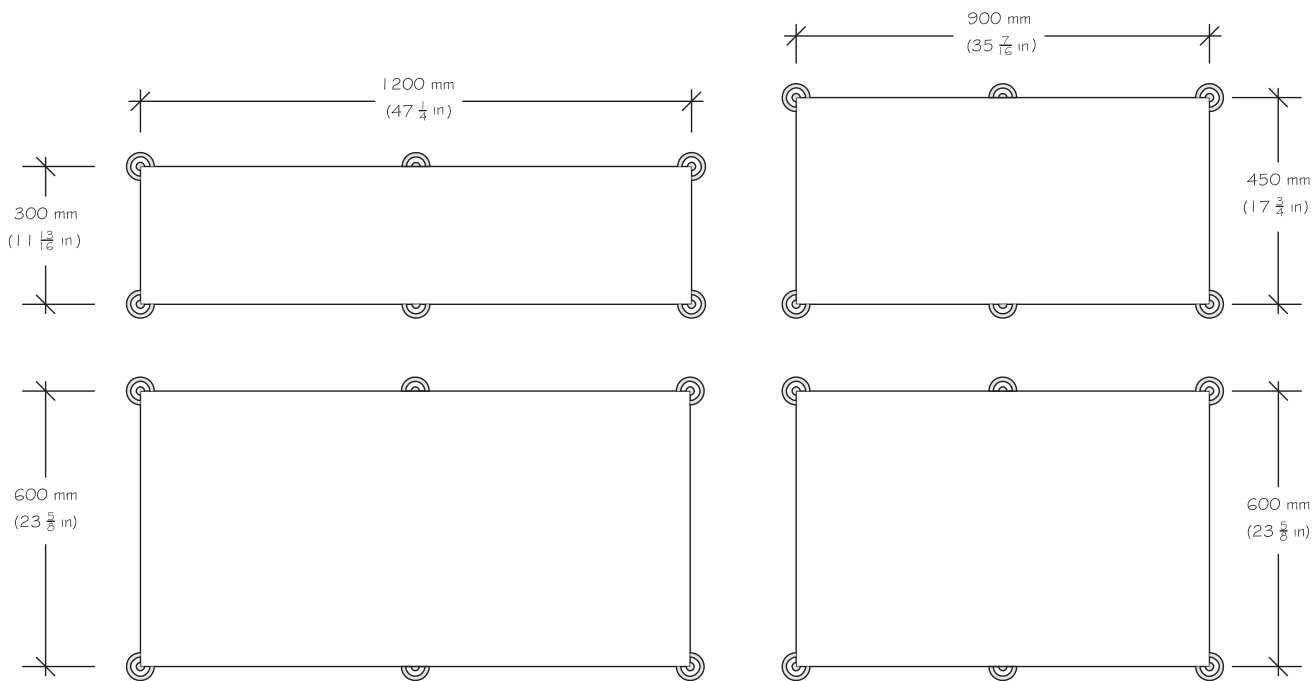
THE PORCELAIN TILES INSTALLED ON PEDESTAL MUST HAVE GALVANIZED STEEL SHEET ON THE BACK.

POSITION OF THE PEDESTALS ACCORDING TO THE SIZE OF THE PORCELAIN TILES

4 PEDESTALS PER UNIT



6 PEDESTALS PER UNIT



COMPLEMENTARY PRODUCTS INDEX

POLYMERIC SAND	185
ADHESIVE, EDGES AND NAILS, SEALANT	186

Note:
All the complementary products are produced by Techniseal, sister company.
The technical information is available on techniseal.com.

Quantity chart for filling joints

Surface per bag of 22.7 kg (50 lbs)

	Polymeric Sand RG+ et HP Nextgel		Polymeric Sand RG+ et HP Nextgel
Amalfi Pavers	53 ft ² (4.92 m ²)	Cassara Slabs	131 ft ² (12.16 m ²)
Azur Classic Pavers	120 ft ² (11.14 m ²)	Cité Slabs	210 ft ² (19.50 m ²)
Bergerac Plus Pavers	38 ft ² (3.53 m ²)	Lexa Slabs	210 ft ² (19.50 m ²)
Cassara Pavers	78 ft ² (7.24 m ²)	Mega-Melville Slabs	210 ft ² (19.50 m ²)
Cassara Plank Pavers	23 ft ² (2.14 m ²)	Mega-Mondrian Plus Slabs	180 ft ² (17.00 m ²)
Domino 50 Pavers	53 ft ² (4.92 m ²)	Melville 50 Slabs	169 ft ² (16.00 m ²)
Lexa Pavers	53 ft ² (4.92 m ²)	Melville 60 Slabs	105 ft ² (9.15 m ²)
Mega-Arbel Pavers	30 ft ² (2.79 m ²)	Melville Plank Slabs	105 ft ² (9.15 m ²)
Mega-Trafalgar Pavers	30 ft ² (2.79 m ²)	Mondrian Plus 50 Slabs	169 ft ² (15.63 m ²)
Melville 80 Pavers	53 ft ² (4.92 m ²)	Mondrian Plus 60 Slabs	66 ft ² (6.12 m ²)
Melville Plank (Étroit et Large) Pavers	53 ft ² (4.92 m ²)	Portage Slabs	113 ft ² (10.49 m ²)
Mondrian 80 Plus Pavers	53 ft ² (4.92 m ²)	Provence Slabs	105 ft ² (9.15 m ²)
Paleo Plus Pavers	64 ft ² (5.94 m ²)	Rosebel Slabs	75 ft ² (6.36 m ²)
Melville Classic Pavers	78 ft ² (7.24 m ²)	Saranak Slabs	169 ft ² (10.49 m ²)
Trafalgar 60 Pavers	38 ft ² (3.53 m ²)	Victoria Slabs	139 ft ² (12.90 m ²)
Vendome Pavers	23 ft ² (2.14 m ²)		



Techniseal Pro RG+ Polymeric Sand

40100594	Granite
40100230	Tan
40100595	Urban Grey
40100605	Cinder Grey
40105156	Grey

Bag of 22.7 kg (48.50 lbs), 56 bags / cube



Techniseal HP NextGel Polymeric Sand

40100597	Granite
40100596	Tan
40100598	Urban Grey
40105612	Grey
40100606	Cinder Grey
40105613	Ivory
40108003	Black

Bag of 22.7 kg (48.50 lbs), 56 bags / cube



Code	Product	Format	
Techniseal Accessories			
70975213	Permapro adhesive tube of 10 oz (296 ml)	12 units/box	90 boxes/cube
70975212	Permapro adhesive tube of 28 oz (828 ml)	12 units/box	60 boxes/cube
70975914	Techniseal adhesive Structure Bond 24 Oz	12 units/box	84 boxes/cube
60050802	Techniseal Structure bond Gun	12 units/box	
70975915	Techniseal Cleaner Structure Bond 16.9 oz	12 units/box	
70971147	Techniseal Ez Base Panel 20" X 36 " 10 Pcs	10 units/package 12 packages/cube	5.15 square feet
70975222	Techniseal Rigid Edging 8'	10 units/package	63 packages/cube
70971149	Techniseal Coil Edging 40'		72 rolls/cube
70975976	Techniseal Nail Box 10" 50lbs	22.7 kg (50 lbs)	48 boxes/cube
70975916	Techniseal Tile Spacers 4 mm 100 pcs	100 units/box	168 boxes/cube



Code	Product	Format	
Techniseal Pro Water Based Protector Sealant			
60301879	Protector Colour Boost for pavers wet look - 3.78L Gloss Finish (Wa)	2 units/box	90 boxes/cube
60301701	Protector Colour Boost for pavers wet look - 18.93L Gloss Finish (Wa)		48 units/cube
60102101	Protector for pavers clear look - 3.78L Semi-gloss Finish (Ev)	2 units/box	90 boxes/cube
60102099	Protector for pavers clear look - 18.93L Semi-gloss Finish (Ev)		48 units/cube
60102065	Protector Colour Boost for pavers - 3.78L Matt Finish (Cb)	2 units/box	90 boxes/cube
60301706	Protector Colour Boost for pavers - 18.93L Matt Finish (Cb)		48 units/cube
60301876	Protector for pavers, natural look - 3.78L Matt Finish	2 units/cube	90 boxes/cube
60301877	Protector for pavers, natural look - 18.93L Matt Finish		48 units/cube
60301784	Waterproofing sealant for Brick and Concrete Sealant - 3.78L Matt Finish (WR7)	2 units/box	90 boxes/cube
60301785	Waterproofing sealant for Brick and Concrete Sealant - 18.93L Natural look. Matt Finish (WR7)		48 units/cube
60102088	Surefoot - Anti-slip grit for water based protector - 114 gr	6 units/box	90 boxes/cube



Code	Product	Format	
Techniseal Pro Solvent Based Protector Sealant			
60102104	Protector for pavers, wet look - 3.78L Gloss Finish (WL4)	4 units/box	45 boxes/cube
60102102	Protector for pavers, wet look - 18.93L Gloss Finish (WL4)		48 units/cube
60102110	Protector for pavers, recoater, wet look - 3.78L Gloss Finish (WL5)	4 units/box	45 boxes/cube
60102108	Protector for pavers, recoater, wet look - 18.93L Gloss Finish (WL5)		48 units/cube
60102085	Surefoot anti-slip grit for solvent-based protectors - 160 gr	6 units/box	90 boxes/cube



Code	Product	Format	
Techniseal Pro Protectors for Wet Cast			
60301872	Wet cast pavers preparator - 4L	4 units/box	45 boxes/cube
60102098	Protector Wet Cast pavers, wet look - 3.78L Gloss Finish, solvent based	2 units/box	45 boxes/cube
60102096	Protector Wet Cast pavers, wet look - 18.93L Gloss Finish, solvent based		48 units/cube
60102095	Protector West Cast pavers, natural look - 3.78L Matt Finish, water based	2 units/box	90 boxes/cube
60102093	Protector West Cast pavers, natural look - 18.93L Matt Finish, water based		48 units/cube



Code	Product	Format	
Techniseal Pro Stabilizator Sealant for permable joints and sand joints without polymeric			
60301709	Joint Stabilizing Protector, Natural look - 3.78L Semi-gloss Finish (N1), water based	2 units/box	90 boxes/cube
60301708	Joint Stabilizing Protector, Natural look - 18.93L Semi-gloss Finish (N1), water based		48 units/cube
60102078	Joint Stabilizing Protector, Wet look - 3.78L Gloss Finish (W1), water based	2 units/box	90 boxes/cube
60301781	Joint Stabilizing Protector, Wet look - 18.93L Gloss Finish (W1), water based		48 units/cube
60301782	Joint Stabilizing Protector, Wet look - 3.78L Gloss Finish (W1), solvent based	2 units/box	90 boxes/cube
60301992	Joint Stabilizing Protector, Wet look - 18.93L Gloss Finish (W1), solvent based		48 units/cube



Code	Product	Format	
Techniseal Pro "NuLook" Tinted Protector			
60301878	Protector NuLook for pavers, cognac (NL-B) - 3.78L Semi-gloss Finish, water based	2 units/box	90 boxes/cube
60301702	Protector NuLook for pavers, charcoal (NL-G) - 3.78L Semi-gloss Finish, water based	2 units/box	90 boxes/cube
60102084	Protector NuLook for pavers, honey (NL-Y) - 3.78L Semi-gloss Finish, water based	2 units/box	90 boxes/cube
60301704	Protector NuLook for pavers, brick red (NL-R) - 3.78L Semi-gloss Finish, water based	2 units/box	90 boxes/cube



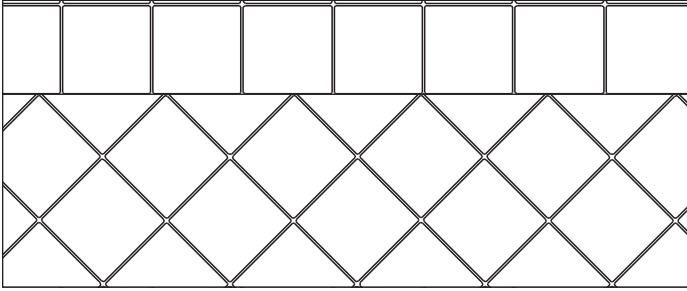
Code	Product	Format	
Techniseal Pro Cleaners			
70975913	Grade Oil and grease remover - 950 ml	6 units/box	100 boxes/cube
60200204	Dirt and grease cleaner - 1L	6 units/box	80 boxes/cube
60200205	Rust remover - 1L	6 units/box	80 boxes/cube
60200208	Paint, Tar and Rubber remover - 1L	6 units/box	120 boxes/cube
60105961	Organic stain remover - 700 gr	6 units/box	90 boxes/cube
60200206	Efflorescence cleaner for pavers - 4L	4 units/box	36 boxes/cube
60200207	Efflorescence cleaner for pavers - 18.93L		48 units/cube
60200243	Paver restorer for pavers - 3.78L	4 units/box	36 boxes/cube



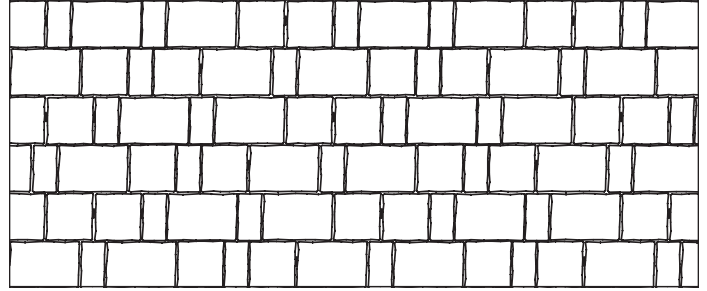
Code	Product	Format	
Techniseal Accessories			
70971143	Exact Sprayers for cleaners	12 units/box	60 boxes/cube
70971145	Slit Foam Roller - 19 x 240mm	20 units/box	30 boxes/cube
70971144	Stain Remover brush	12 units/box	90 boxes/cube

LAYING IDEAS

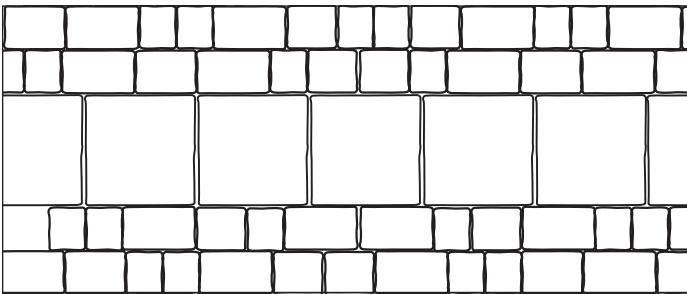
GENERAL



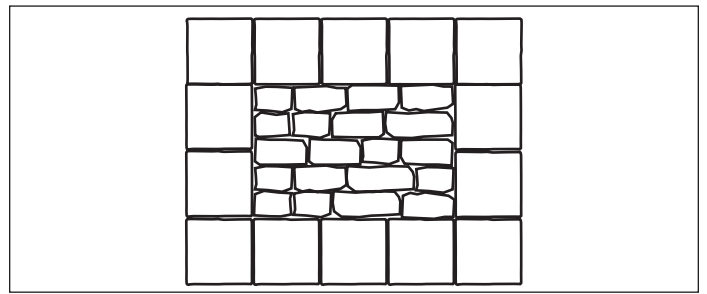
A - EDGING



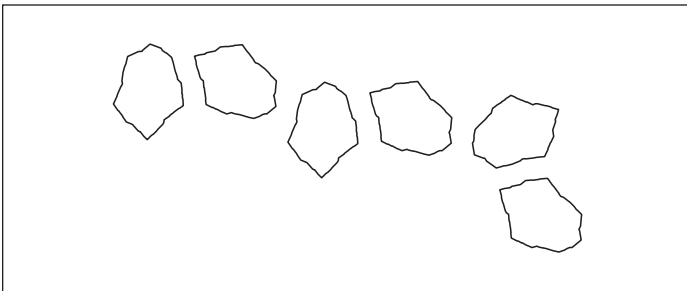
B - PATHWAY



C - BANDING



D - INSERTION



E - STEPPING STONE

Seamless textures and hatching patterns library

AVAILABILITY CHART

Download all the seamless textures and hatching patterns available from our website: www.permacon.ca, tab "support" of the "professional" section.

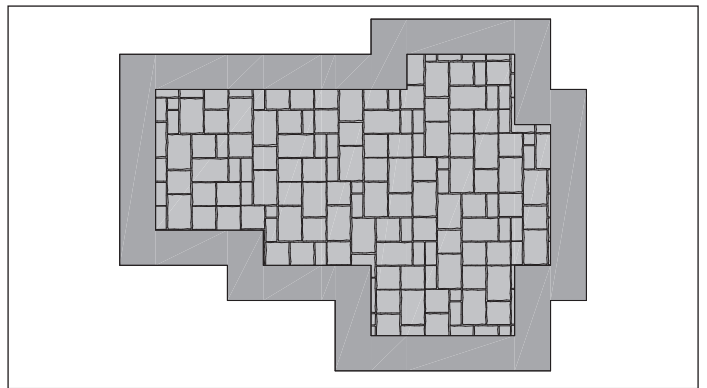
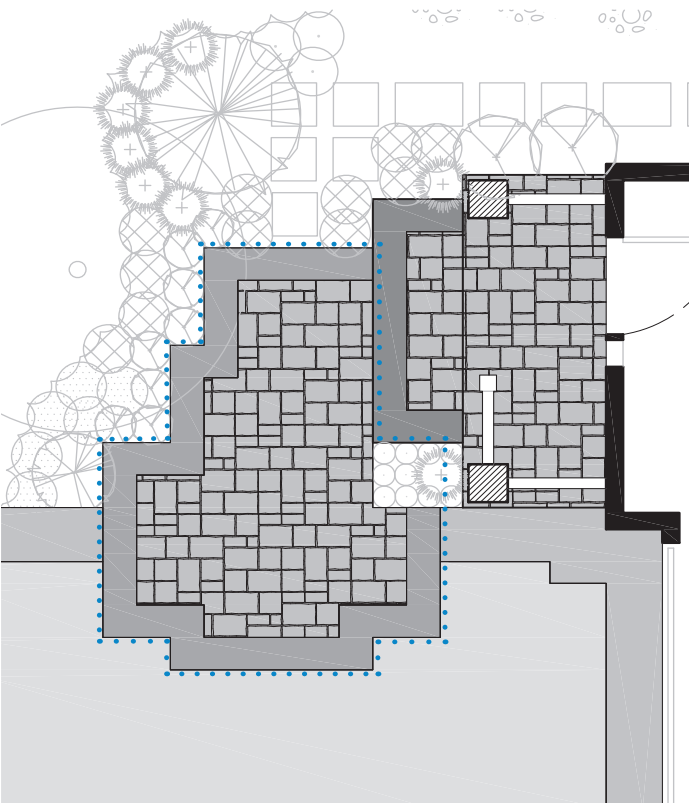
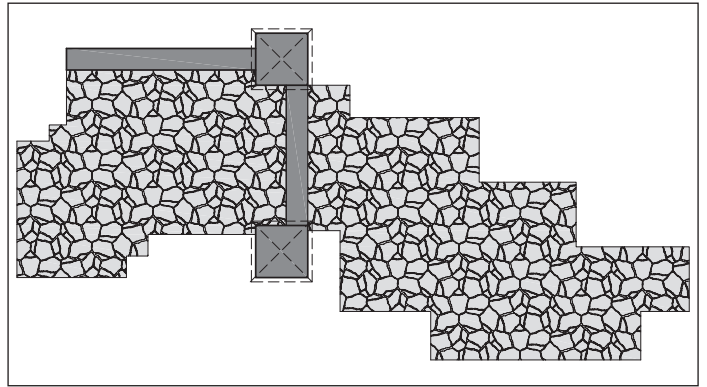
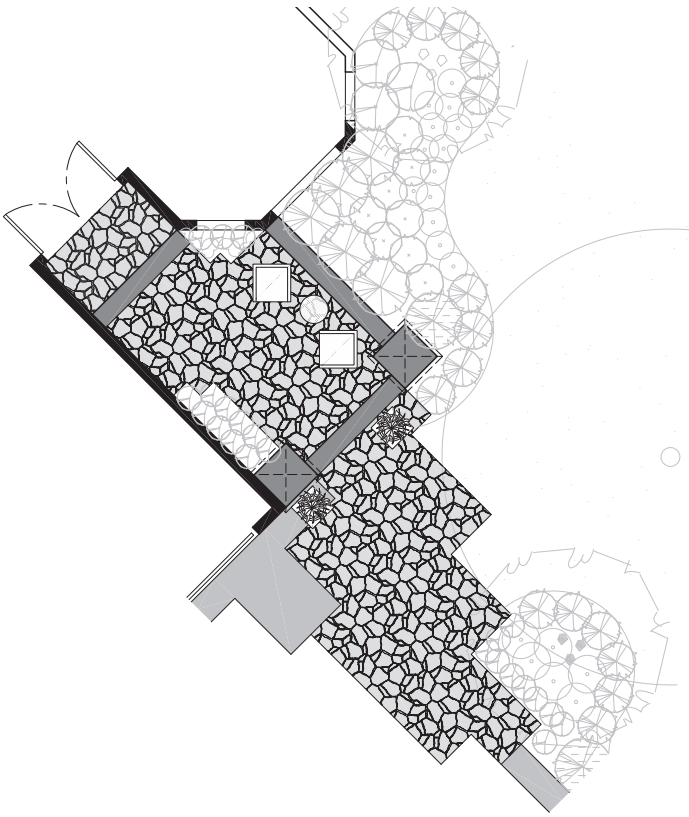
PAVERS	Seamless textures	Hatching patterns
Amalfi Pavers	●	●
Bergerac Plus Pavers	●	●
Canvas Pavers	●	●
Melville Classic Pavers	●	●
Mega-Arbel Pavers	●	●
Mega-Trafalgar Pavers	●	●
Mondrian 80 Pavers	●	●
Paleo Plus Pavers	●	●
Trafalgar 60 Pavers	●	●
Vendome Pavers	●	●
Lexa Pavers	●	●
Melville 80 Pavers	●	●
Cassara Pavers	●	●
Azur Pavers	●	●
Melville Plank Pavers	●	●
Cassara Plank Pavers	●	●

Download Permacon hatching patterns for the following types of software:
AutoCAD, Dynascape

Download Permacon seamless textures for the following types of software:
AutoCAD, Dynascape, Sketchup, Photoshop

SLABS	Seamless textures	Hatching patterns
Lattice Stone	N/A	●
Mondrian 50 & 60 Slabs	●	●
Lexa Slabs	●	●
Melville 50 Slabs	●	●
Rosebel Slabs	●	●
Portage stepping stone	●	●
Quadral Slabs	●	●
Versailles RocArt Slabs	●	●
Provence Slabs	●	●
Melville 60 Slabs	●	●
Cassara Slabs	●	●
City Slabs	●	●
Mega-Mondrian 60 Slabs	●	●
Mega-Melville 60	●	●

WALLS	Seamless textures	Hatching patterns
Celtik	●	N/A
Lafitt Tandem	●	N/A
Melville Tandem	●	N/A
Lexa Tandem	●	N/A





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