Pioneer Sleepers and Pioneer Panels

Installation & Technical Guide | November 2023

What’s inside

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Pioneer Concrete Sleepers Overview

1

Overview

The Austral Masonry concrete sleeper retaining wall system is an ideal choice for retaining walls in gardens, other residential applications and commercial projects. The simplicity of the systems designed and custom made components makes them easy to install for a range of applications. No matter what the project, the result is always an attractive and low maintenance retaining wall.

General Notes

1. Information contained in this installation guide is offered as general advice only.

2. The walls have been designed for the following surcharge loads (including construction loads):

- 5 kPa live loads for all walls up to 3m in height.

- No dead loads have been allowed for.

- Cohesion based on Table 1.1 Design Parameters:

  Where there are any variations to the materials, soil conditions, loadings, drainage, geometry of the site or retaining wall, a registered engineer should be engaged to design the wall.

3. Where a fence is required at the top of the wall, the fence shall be installed in accordance with the detail in this manual.

4. Structures such as building footings, swimming pools, other retaining walls, storage facilities or solid panel. fencing and loads such as those from heavy access vehicles must be kept clear such that the load is not placed within a line projected behind the wall from the founding level at 1V:1.5H. Where structures or driveways do intrude within this line a registered professional engineer should be engaged to design the wall.

5. Precautions must be taken where other building work or service trenches are excavated around the retaining wall, as it may be necessary to modify bored pier depths or other alternatives. No excavations shall be made below the ‘zone of influence’ line extending at 45° from the base of the retaining wall structure.

6. Precautions should be taken if cutting back the existing bank to ensure such excavation does not destabilize the footing of another structure.

7. Walls may be constructed to greater heights in specific applications with special engineering design.

8. Check with your local council whether building approval is required.

9. Where these walls impose loads on other structures those other structures must be checked for strength and stability.

10. External interface friction angle is calculated as being equal to 2/3 of the internal interface friction angle.

11. Sub-soil drains should be flushed at regular intervals to ensure continuous proper functioning of the retaining wall drainage system.

12. Sub-soil drains shall have outlet points at maximum 20m centres for dry application and maximum 5m centres for wet application.

13. Steel posts noted in design tables are from Austral Masonry fabricated post sections.

    Steel posts sections have been considered in the preparation of the design and are available direct from Austral Masonry.

14. Pier holes shall be located to allow posts to be installed centrally, provide sufficient post/panel contact (at least 35mm) and ensure at least **50mm cover to steel components.**

15. Pier holes shall be firm, dry, and free of loose material prior to placement of concete.

16. Any cutting needs to be referred back to Austral Masonry so that the warranty remains intact. When cutting concrete, the end-user needs to implement a combination of controls that include a continuous feed of water over the cutting area, or as compliant to the silica dust safety regulations. All cut sleepers to be treated with a high build epoxy or inorganic zinc silicate to AS2312.1:2014. Cut surface to be treated is to be dry,clean and free of dust, debris and slurry.”

Efflorescence

Efflorescence is a white powdery deposit that forms as a result of soluble salts migrating out of concrete and travelling to the surface, from excessive exposure to water onsite.

Efflorescence is a naturally occurring phenomenon that can occur with any concrete product exposed to wetting and drying. The potential for efflorescence to occur can be reduced by ensuring concrete products are installed in a dry or free draining environment.

Efflorescence will usually disappear over time and removal can be assisted by dry brushing off any surface salts before scrubbing with a brush and clean water.

Product Colour

Products are manufactured using natural raw materials which may vary over time and impact colour from batch to batch. It is recommended to see a physical product sample before purchase. Where large quantities of product are required, these will be manufactured across a range of batches and consistency of colour cannot be guaranteed.

Durability

Concrete sleepers are designed and manufactured to a B2 durability classification to AS 3600, with a minimum cover of 25mm and minimum concrete strength of 50MPa at 28d. Retaining walls in aggressive sulfate soils and saline soils have a different requirement, retaining wall engineer should design accordingly.

Overview of Explorer Panel Lifting System

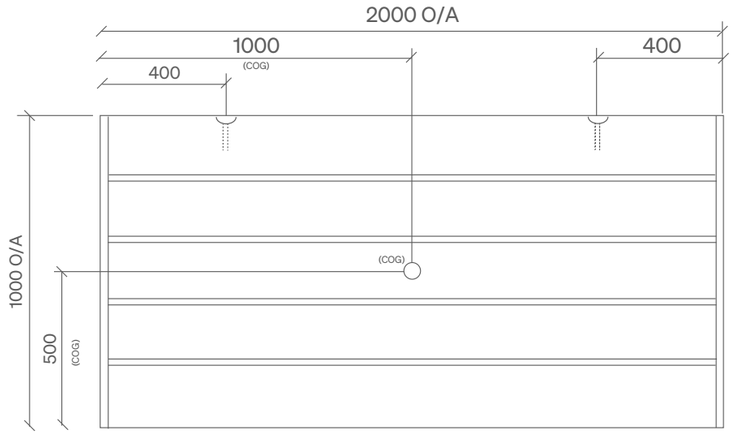
Pioneer panels are manufactured with two Ancon CA01120 1.3Tx120 Cone Anchors. The anchors are used in conjunction with Ancon 01LK Unilift Locking Klaw clutches.

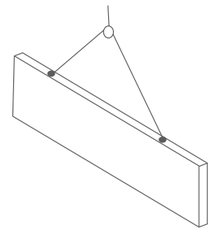
The following design notes must be adhered to when moving and installing the panels.

Notes:

1. Concrete strength at the initial time of lifting to be min 45MPa (at 20 days old).
2. Dynamic impact factor used is Kd=1.2 for On-Ground erection to vertical and Kd=5.0 (Mobile equipment travelling with the load).
3. Sling angle shall not exceed 60 degrees at any time.
4. Suction factor is taken at 1.2.
5. Min factor of safety FOS=2.25.
6. Load is to be equalised between the lifting points at all times.
7. Anchors of greater length and/or greater WLL may be used in place of the specified, so long as reasonable cover is maintained at the base of the anchor.
8. Lifting design in accordance with AS3850-2015.
9. Lifting design is based on the hardware as specified in the schedule & notes.

Lifting System

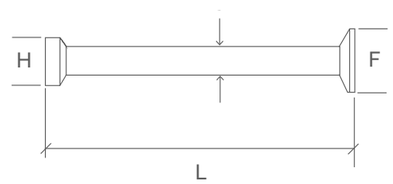




45MPa Concrete Strength
Rigging Angle 60˚

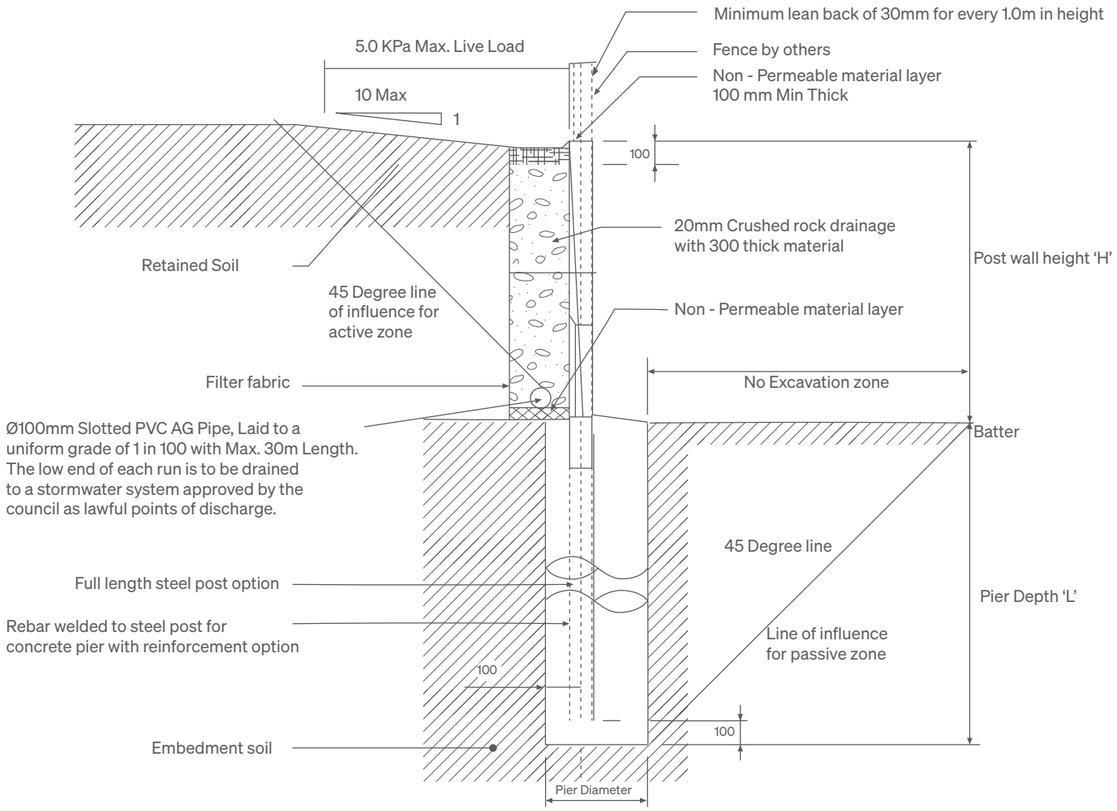
Dimensions (mm)

	Working Load Limit	L	H	S	F
CA01120	1.3	120	19	10	25



Overview
Detail

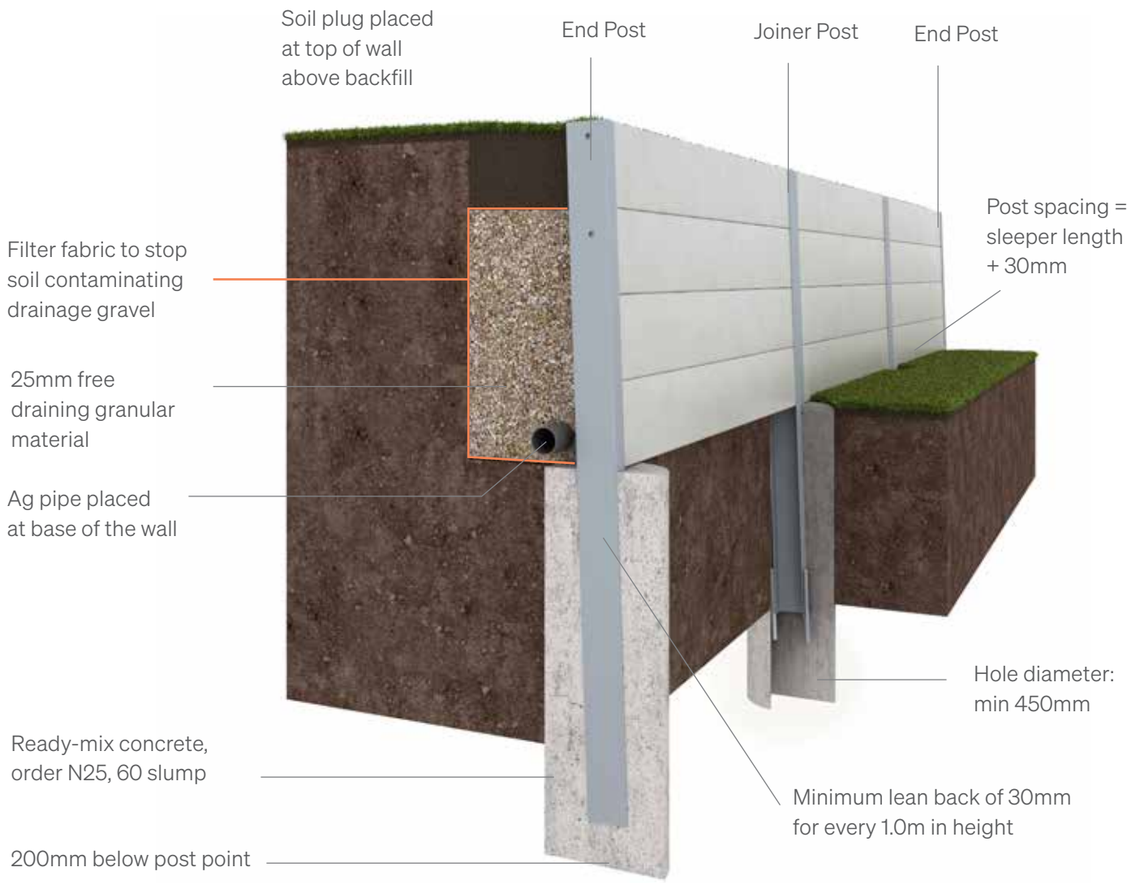
Typical Concrete Sleeper & Panel Retaining Wall Detail



Overview

Austral Masonry's Pioneer concrete sleeper retaining wall system utilizes posts embedded in the ground and the strength of the concrete panel units to resist the lateral earth pressures. When built to engineering specifications and taking into account site conditions, these walls can be built to substantial heights, without costly structural reinforcement.

Typical Cross Section



See table 1.1 for Design Parameters

- Maximum wall heights table is based on a 5kPa surcharge load acting on top of the wall as per AS4678: 2002. This table is supplied as a guide only and must be referred to a qualified professional engineer. If imposed surcharge loads above 5kPa are applied, these designs are not appropriate.
- Design details shown assume the foundation material has a minimum bearing capacity of 150kPa.
- Designs assume no hydrostatic loading.
- Designs assume flat slopes on top of the wall.
- Global Stability may govern design criterias for steep slopes. A qualified geotechnical engineer should be consulted for such cases.

Table 1.1 Design Parameters Adopted

Design Parameter	Value	Description	Unit
q, Surcharge	5.0	Surcharge (Live Load)	kPa
Effective Internal Friction Angle, Φ'	26	Effective Internal Friction Angle of Soil as per AS 4678	Degrees
Reduction Factor for tan (Φ')	0.85	Soil Reduction Factor as per AS 4678	Unitless
Effective Cohesion of Retained Soil, c'	8	Characteristic Effective Cohesion of Soil as per AS 4678	kPa
Effective Cohesion of Foundation Soil, c'	10	Characteristic Effective Cohesion of Soil as per AS 4678	kPa
Reduction Factor for c'	0.7	Apparent Cohesion Reduction Factor for In-Situ Material	Unitless
Retained Soil Unit Weight	19	Bulk Unit Weight of the Fill Behind the Wall	kN/m^3
Foundation Soil Unit Weight	20	Bulk Unit Weight of Foundation Soil	kN/m^3
Load Factor for Surcharge	1.5	Ultimate Limit State	Unitless
Height of Water Table	N/A	Hydrostatic Pressure Head	m
Hf, Fence Height	1.8	Fence	m
Pw, Wind Pressure	0.75	Design Service Wind Pressure	kPa

Overview
Posts + Accessories

Austral Masonry's Pioneer concrete sleeper retaining wall system utilizes posts embedded in the ground and the strength of the concrete sleeper units to resist the lateral earth pressures. When built to engineering specifications and taking into accounts site conditions, these walls can be built to substantial heights, without costly structural reinforcement.

Joiner Post with Deformed Bar

Length	Description
1.35m	Post Steel 100UC Galvanised for wall 0.4m
1.55m	Post Steel 100UC Galvanised for wall 0.6m
1.75m	Post Steel 100UC Galvanised for wall 0.8m
1.95m	Post Steel 100UC Galvanised for wall 1.0m
2.35m	Post Steel 100UC Galvanised for wall 1.2m
2.75m	Post Steel 100UC Galvanised for wall 1.4m
3.15m	Post Steel 100UC Galvanised for wall 1.6m
3.55m	Post Steel 100UC Galvanised for wall 1.8m
3.95m	Post Steel 150UC 23.4* Galvanised for wall 2.0m
4.35m	Post Steel 150UC 23.4* Galvanised for wall 2.2m
4.75m	Post Steel 150UC 23.4* Galvanised for wall 2.4m
5.15m	Post Steel 150UC 30* Galvanised for wall 2.6m
5.55m	Post Steel 150UC 30* Galvanised for wall 2.8m
5.95m	Post Steel 150UC 30* Galvanised for wall 3.0m

*150UC posts have N10-225 ties

End Post

Length	Description
0.8m	Post Steel 100PFC Galvanised for wall 0.4m
1.2m	Post Steel 100PFC Galvanised for wall 0.6m
1.6m	Post Steel 100PFC Galvanised for wall 0.8m
2.0m	Post Steel 100PFC Galvanised for wall 1.0m
2.4m	Post Steel 100PFC Galvanised for wall 1.2m
2.8m	Post Steel 100PFC Galvanised for wall 1.4m
3.2m	Post Steel 100PFC Galvanised for wall 1.6m
3.6m	Post Steel 150PFC Galvanised for wall 1.8m
4.0m	Post Steel 150PFC Galvanised for wall 2.0m
4.4m	Post Steel 150PFC Galvanised for wall 2.2m
4.8m	Post Steel 150PFC Galvanised for wall 2.4m
5.2m	Post Steel 250PFC Galvanised for wall 2.6m
5.6m	Post Steel 250PFC Galvanised for wall 2.8m
6.0m	Post Steel 250PFC Galvanised for wall 3.0m

Joiner Post Full Length

Length	Description
0.8m	Full Length 100UC Galvanised for wall 0.4m
1.2m	Full Length 100UC Galvanised for wall 0.6m
1.6m	Full Length 100UC Galvanised for wall 0.8m
2.0m	Full Length 100UC Galvanised for wall 1.0m
2.4m	Full Length 100UC Galvanised for wall 1.2m
2.8m	Full Length 100UC Galvanised for wall 1.4m
3.2m	Full Length 100UC Galvanised for wall 1.6m
3.6m	Full Length 150UC23.4 Galvanised for wall 1.8m
4.0m	Full Length 150UC23.4 Galvanised for wall 2.0m
4.4m	Full Length 150UC23.4 Galvanised for wall 2.2m
4.8m	Full Length 150UC23.4 Galvanised for wall 2.4m
5.2m	Full Length 250UB25.7 Galvanised for wall 2.6m
5.6m	Full Length 250UB25.7 Galvanised for wall 2.8m
6.0m	Full Length 250UB25.7 Galvanised for wall 3.0m

Fence Brackets and Accessories

Description
Large fence bracket 1200 × 65 × 10mm Galvanised
Offset Fence bracket 150UC 6mm Galvanised
Straight Fence Bracket 150UC 6mm Galvanised
Straight Fence Bracket 100UC 3mm Galvanised
Straight Fence Bracket 100UC 6mm Galvanised
Offset Fence Bracket 100UC 3mm Galvanised
Offset Fence Bracket 100UC 6mm Galvanised

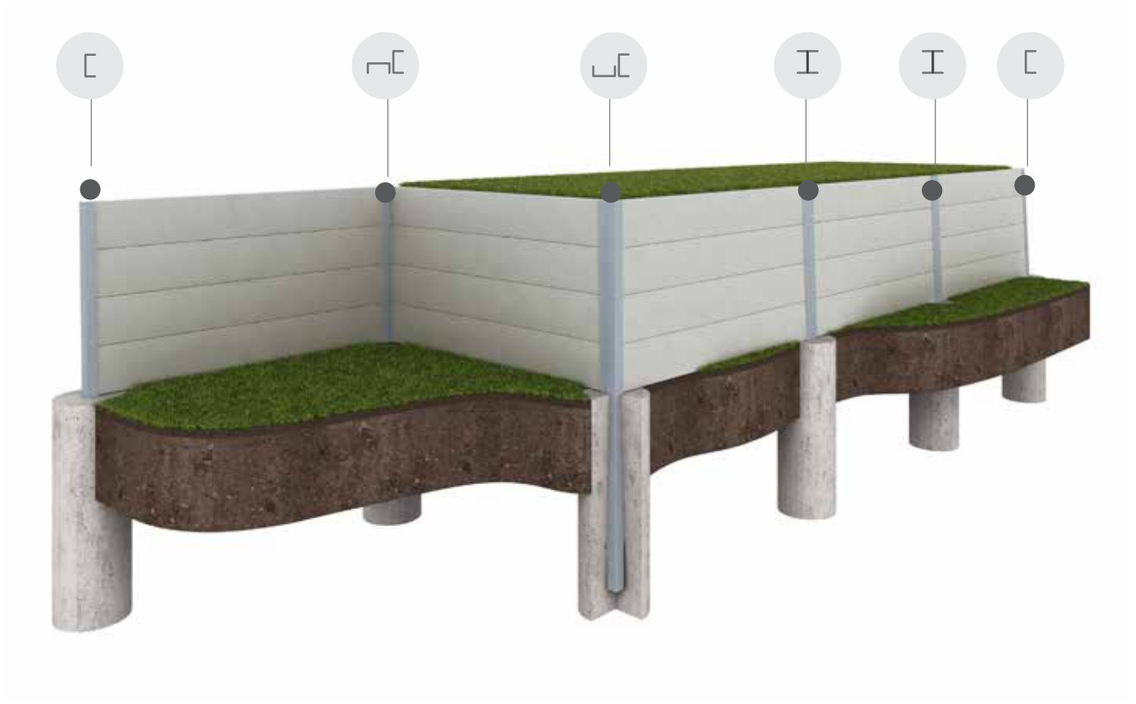
Offset Fence Bracket

Straight Fence Bracket

Joiner

Ender

Overview
Post Types + Placement



Post Types

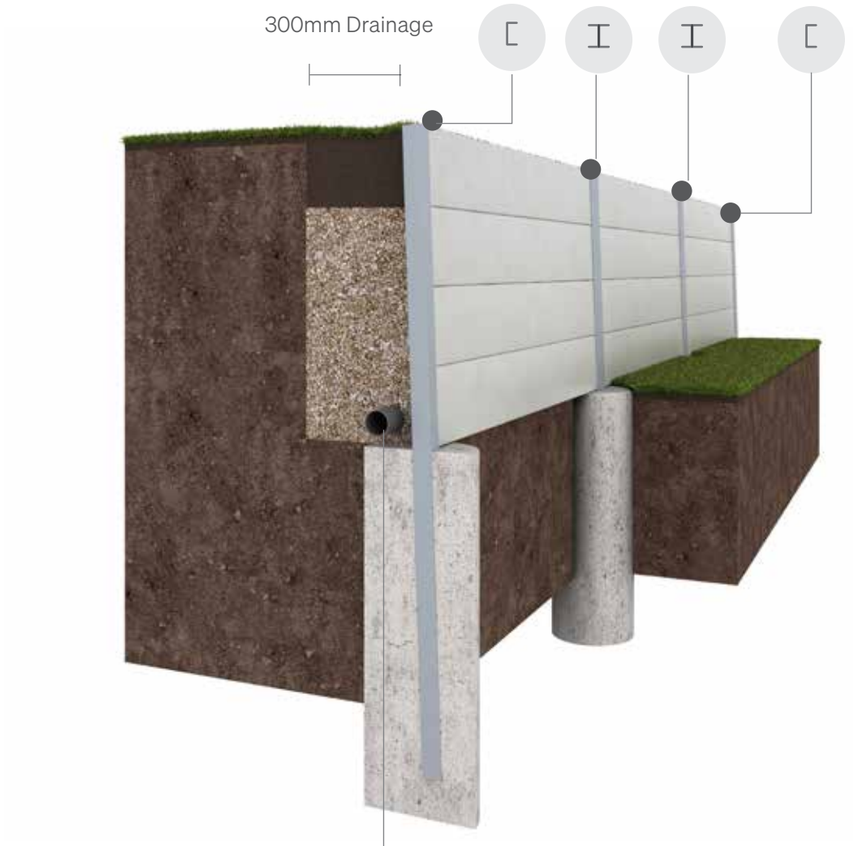
- Ender
- 2 x Enders for 90 degree corners
- Joiner

Note:

Retaining walls must be designed to AS4678.

Local Councils require that retaining walls to have a building approval when they are over a certain height. This varies region to region, but is typically 0.8m in height from natural ground level. Check with your local Council to confirm.

Any retaining wall that is less than 1.5m away from a building or other retaining wall also requires building approval.



Pioneer Concrete Sleepers
Design Details

2

Design Details

Design for Surcharge Table - Pioneer 200 sleepers up to 1.0m high panels - Guide Only

Wall Height	Post Spacing (m)	Post Size (Min)	Bored Pier Diameter (mm)	Minimum Pier Embedment Length L (m))	Joiner with Deformed Bar Post Length	Joiner/Ender Post Length
0.21 to 0.4m	Sleeper length + 30mm	100UC14.8	450	1.0m	1.35m	1.6m
0.41 to 0.6m	Sleeper length + 30mm	100UC14.8	450	1.0m	1.55m	1.6m
0.61 to 0.8mm	Sleeper length + 30mm	100UC14.8	450	1.0m	1.75m	1.8m
0.81 to 1.0m	Sleeper length + 30mm	100UC14.8	450	1.0m	1.95m	2.2m
1.1 to 1.2m	Sleeper length + 30mm	100UC14.8	450	1.2m	2.35m	2.4m
1.21 to 1.4m	Sleeper length + 30mm	100UC14.8	450	1.4m	2.75m	2.8m
1.41 to 1.6m	Sleeper length + 30mm	100UC14.8	450	1.6m	3.15m	3.2m
1.61 to 1.8m	Sleeper length + 30mm	100UC14.8	450	1.8m/2.2m#	3.55m	3.6m
1.81 to 2.0m	Sleeper length + 30mm	150UC 23.4*	450	2.0m/2.4m#	3.95m	4.0m
2.01 to 2.2m	Sleeper length + 30mm	150UC 23.4*	450	2.2m/2.5m#	4.35m	4.4m
2.21 to 2.4m*	Sleeper length + 30mm	150UC 23.4*	450	2.4m/2.8m#	4.75m	4.8m
2.41 to 2.6m*	Sleeper length + 30mm	150UC 23.4*	450	2.6m/3.0m#	5.15m	5.2m
2.61 to 2.8m*	Sleeper length + 30mm	150UC 30*	600	2.8m/3.2m#	5.55m	5.6m
2.81 to 3.0m*	Sleeper length + 30mm	150UC 30*	600	3.0m/3.4m#	5.95m	6.0m

***150UC posts have N10-225 ties #-Denotes values are calculated based on 2.03m post spacing**

Please Note: Please always check your local council requirements for building a retaining wall before commencement**. The above table allows for the additional load of fences up to 1.8m height, with a design service wind pressure of 0.75kPa. Pioneer 200mm high sleepers are only suitable for top of wall coursing for wall over 1.4m tall.

Design Notes:1. The concrete design strength adopted for the bored piers in this design is Grade N25 in accordance with AS 3600 and AS 2159. 2. The information contained in this drawing are based on the soil and load conditions in Table 1.1, these do not consider the presence of a water table. The presented values are for guidance and information only and shall not be used for construction. 3. For any project site-specific retaining wall system design, construction drawings shall be certified by a qualified engineer to ensure the ground conditions, soil parameters and loading conditions are suitable for each individual site. Austral Masonry and CMT Engineers do not take any responsibility in the retaining wall system design. 4. The serviceability limit state (SLS) check including deflection calculations and assessment are not considered in the presented tables; these are the responsibility of the retaining wall designer.

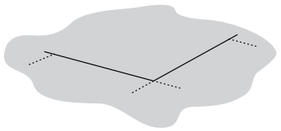
Notes - Ensure when backfilling do not push soil from behind into the back of the wall with any machinery. Always place soil/fill fromthe top, when using a Bobcat/Dingo, or if you prefer, by hand. Retaining walls in QLD over 0.8m or within 1.5m of another building require a Form 15 and 16 to be completed by an engineer (RPEQ) in order to receiving council approval. This requirement differs from state to state so please check with your Local Council before commencing on your project.

* Walls above 2m may require deflection checks performed by competent engineer to determine whether doubling up of sleepers is required at base courses to keep deflection within tolerance.

Pioneer Concrete Sleepers Installation

3

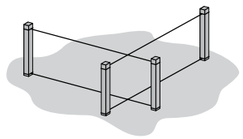
Installation Steps



1.

Prepare the Area

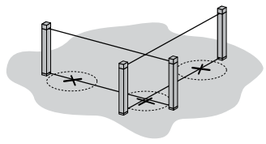
Clear and level your site where you plan to build the retaining wall. Ensure you leave 300mm behind the retaining wall area for backfill.



2.

Alignment

Place a star piquet or peg at both ends of the proposed wall. Attach two string lines at each end of the wall, top and bottom, to keep your wall aligned.



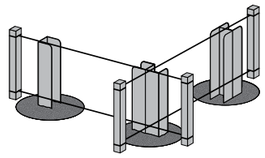
3.

Mark Out Hole Positions

Starting from one end of the wall, mark a cross on the ground at intervals with their centre being approximately 20mm more than the length of the panel.

For example: If you are using 1530mm sleepers the hole centres should be 1550mm apart.

If you are using 2000mm panels the hole centres should be 2030mm apart.



4.

Auger Holes and Pour Concrete

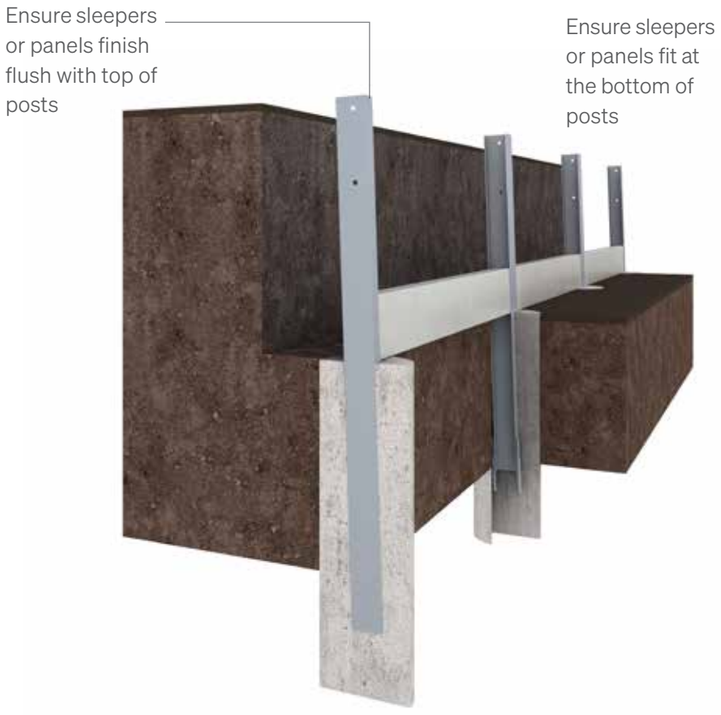
- Auger holes as per your engineers specifications as approved by council.
- Pour concrete into holes, one at a time.
- Make the concrete stiff. If using readymix concrete, orderN25, 60 slump.
- Set your post by lowering into ground until level with the top string lines.
- Ensure there is a minimum lean back of 30mm for every 1.0m in height.
- The hole depth should be an extra 200mm deeper than the wall height to allow the concrete to encase the steel post.

Installation Steps

5.

Check Posts

- Use a spirit level to make sure all your posts are aligned with the string line and are perpendicular on the sides.
- It is also important to measure the remaining distance to the top of your steel posts, to ensure the panels finish flush with the top of the posts.
- If required, lay a concrete pad on both sides of the steel post.



6.

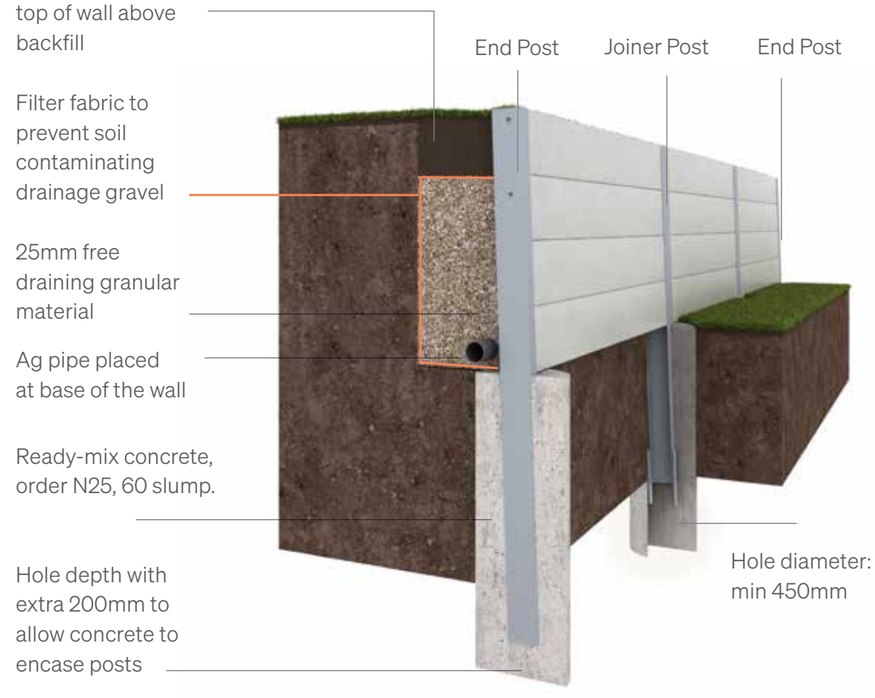
Ag Pipe and Backfill

- Allow the concrete to cure for two to three days before you place your panels in place. Lay geofabric in place at base of the wall.
- Place ag pipe at the base then backfill with gravel to 200mm from the top.

7.

Soil Plug

A soil plug is compacted over the drainage layer to prevent silt intrusion.



Installation Steps

Fence Applications

Walls must be suitably designed to accommodate additional wind loading imposed on all types of closed fences; for example, increasing the embedment for the posts.

Cross Section Diagram - Fence Application

Installation Steps

1.

Fence Brackets

Before installing the top level of concrete sleepers, slide fence brackets into place, making sure to align the holes in the posts with the fence bracket holes.

Slide fence brackets down into the posts.

2.

Bolts Installed

Firmly bolt the fence brackets to the posts ensuring the head of the bolt will still allow the concrete panel to be put in place.

Bolts installed to secure brackets to posts

3.

Concrete Sleepers

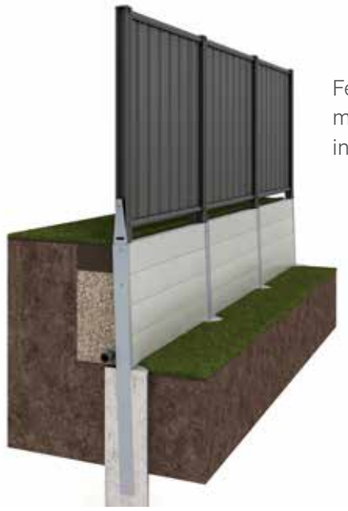
Install top level of concrete sleepers flush with the top of the posts.

Top level of concrete panels installed

4.

Fence Installation

Firmly bolt the fence brackets to the posts ensuring the head of the bolt will still allow the concrete sleepers to be put in place.



Fence to be no more than 2m in height

Fence posts are attached to concrete panel wall posts before fence panels are installed

Design
Details

4

Technical Guide

Ready to see what Pioneer can do? Here's the specifications you'll need for your next project.

Specifications - Pioneer 200
Smooth 1.2m Standard

Average Weight / Unit (kg)	40
Units/m2	4.16
Pack size	-
f'c (MPa)	50
Durability Class: (as per AS3600)	B2

Specifications - Pioneer 200
Smooth 1.53m Standard

Average Weight / Unit (kg)	49
Units/m2	3.27
Pack size	-
f'c (MPa)	50
Durability Class: (as per AS3600)	B2

Specifications - Pioneer 200
Smooth 2m Standard

Average Weight / Unit (kg)	67
Units/m2	2.5
Pack size	-
f'c (MPa)	50
Durability Class: (as per AS3600)	B2

Specifications - Pioneer 400
Smooth 2m Standard

Average Weight / Unit (kg)	145
Units/m2	1.25
Pack size	-
f'c (MPa)	50
Durability Class: (as per AS3600)	B2

Specifications - Pioneer 600
Smooth 2m Standard

Average Weight / Unit (kg)	218
Units/m2	0.83
Pack size	-
f'c (MPa)	50
Durability Class: (as per AS3600)	B2

Specifications - Pioneer 1000
Smooth 2m Standard

Average Weight / Unit (kg)	362
Units/m2	0.5
Pack size	-
f'c (MPa)	50
Durability Class: (as per AS3600)	B2

Backed by Brickworks

Local expertise. Global quality. Brickworks Building Products is one of Australia's biggest building material producers. With heritage going all the way back to one of Australia's founding brick producers, we're proud of our reputation for design, innovation and sustainability.

BRICKWORKS

AUSTRALIA

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NORTH AMERICA

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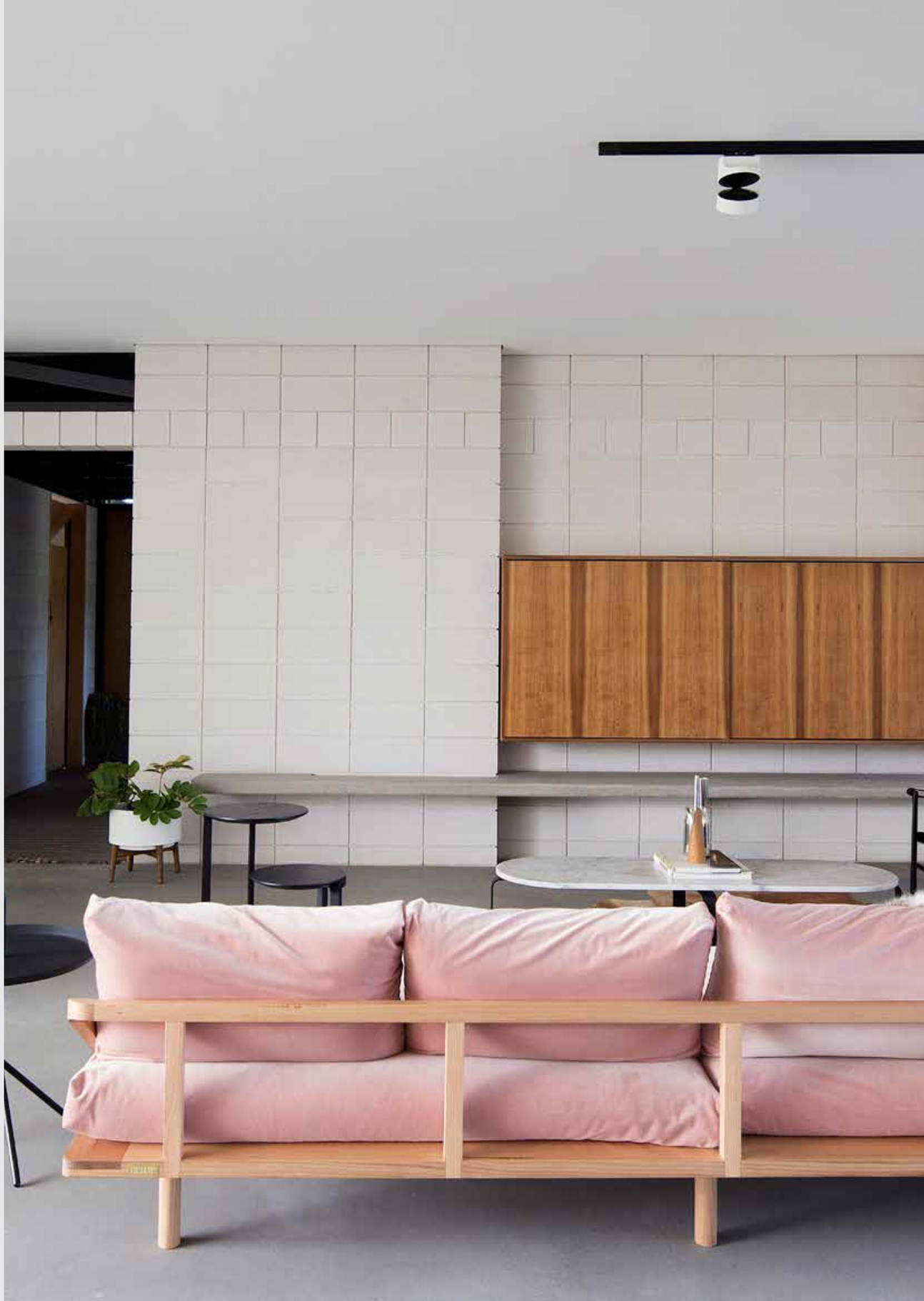
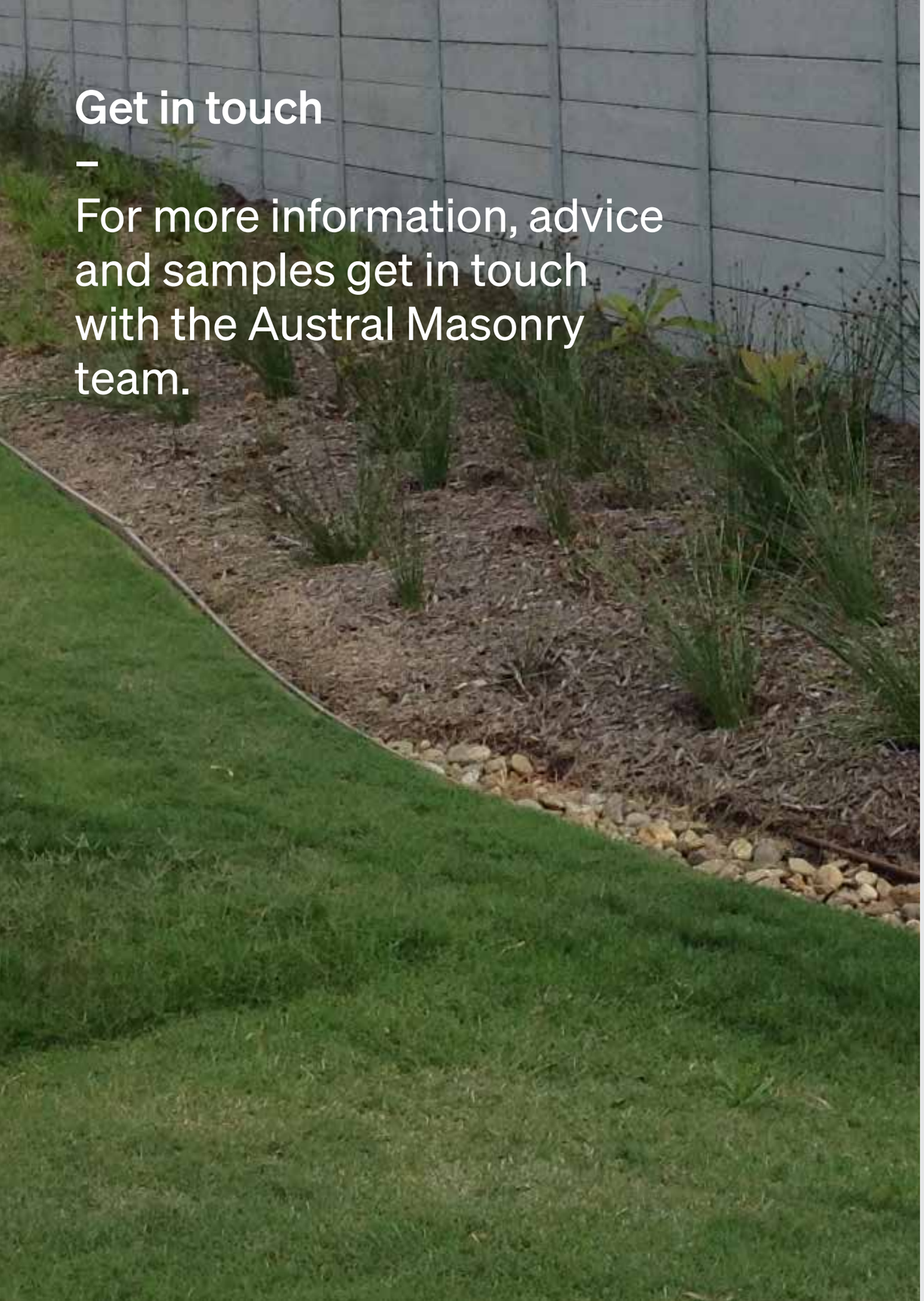
INTERNATIONAL BRANDS

La Escandella Roofing the World · S.Anselmo vivere la differenza · la paloma cerámicas · Ceramiche Keope





Get in touch
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For more information, advice and samples get in touch with the Austral Masonry team.

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105 Gardner Road
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200 Nicklin Way,
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45 Princes Highway
Albion Park NSW 2527

Coffs Harbour
Tel. 02 6690 6200
27 Lawson Crescent
Coffs Harbour NSW 2450

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2 Latitude Road
Horsley Park NSW 2175

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7 Lithgow Street
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972 Western Highway
Deer Park VIC 3023

Geelong
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200 Torquay Road
Grovedale VIC 3216

Lynbrook
Tel. 03 8788 8300
Cnr Westernport Highway
& Northey Road
Lynbrook VIC 3975

Wollert
Tel. 03 9303 4000
Brick Makers Drive
Wollert VIC 3750

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201 Greenwith Rd
Golden Grove SA 5125

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