OCTOBER 2016

# HERON/HAYMAN

*retaining walls installation guide*

austral masonry

# RETAINING WALL

## *information*

Austral Masonry retaining wall blocks are an ideal choice for retaining walls in gardens, other residential applications and commercial projects. The interlocking and dry stacked nature of these, makes them easy to install for the "Do It Yourself" landscaper. No matter what the project, the result is always an attractive and low maintenance retaining wall. The flexibility of the system provides tremendous scope, from edging to terraces, straight walls to curves.

***Note: Information contained in this installation guide is offered as general advice only.*** *Please consult with regulating council for local design requirements prior to the commencement of any retaining wall and consult with a professional engineer prior to commencing any retaining wall project. Councils may request walls over 0.5m in height and / or where a surcharge exists (e.g. driveway, house, fence or other structure) be designed and certified by a suitably qualified engineer.*

### Specifications

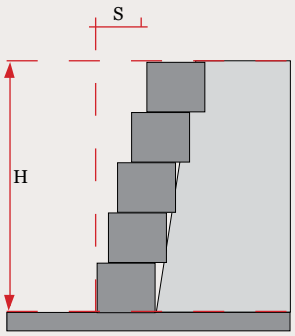
| Product | Range | Description | Max Wall Height | Size | Weight | Coverage |
|---|---|---|---|---|---|---|
|  | Heron | Standard Unit | 800 mm<br>3m with engineering | 390 L x 245 W x 198 H mm | 21.5 kg | 13 Blocks per m² |
|  | Heron | Corner Unit | - | 160 L x 360 W x 198 H mm | 20 kg | Available in left or right |
|  | Heron | End Unit | - | 160 L x 245 W x 198 H mm | 15 kg | Available in left or right |
|  | Heron | Capping Unit | - | 390 L x 245 W x 75 H mm | 16 kg | 2.56 Blocks per lineal metre |
|  | Hayman | Standard Unit | 800 mm<br>3m with engineering | 390 L x 245 W x 198 H mm | 21.5 kg | 13 Blocks per m² |
|  | Hayman | Corner Unit | - | 160 L x 360 W x 198 H mm | 17.2 kg | Universal - can be used for left and right corners |
|  | Hayman | Capping Unit | - | 390 L x 245 W x 90 H mm | 16 kg | 2.56 Blocks per lineal metre |

Maximum wall heights in good soils (gravels, sandy gravels, crushed sandstone).
* Heron and Hayman can be built up to 3m when designed by a suitably qualified engineerand combined with soil reforcement or No Fines concrete.
Please contact your Austral Masonry representative for more information.

# GENERAL INFORMATION

## Wall Setback

On straight walls, each course of blocks is set back 10mm (slightly more on curves). The table to the left shows the estimated setback based on wall height and is offered as a guide only.




***Wall Set Back 1:20 Easy Reference Chart***

| Wall Height (H) | Horizontal Setback Distance (S) |
|---|---|
| 1m | 40mm |
| 2m | 90mm |
| 3m | 140mm |

## Estimating Materials

***Calculating Block Quantities - Example Wall***

10m long by 3 courses high

*Blocks*

(10 metres x 2.57 blocks per metre) x 3 courses

= 77.1 blocks (78 blocks total)

Add 5% Extra (Breakages, curved walls, cuts) = 82 Blocks

*Capping*

10 metres x 2.57 capping blocks per metre

= 25.7 capping blocks (26 blocks total)

Add 5% Extra (breakages, curved walls, cuts) = 28 capping blocks

| *No. of blocks* | *Length of wall (metres)* | | | | | |
|---|---|---|---|---|---|---|
| | **2m** | **4m** | **6m** | **8m** | **10m** | **12m** |
| 1 | 6 | 11 | 16 | 21 | 26 | 32 |
| 2 | 11 | 22 | 32 | 42 | 52 | 63 |
| 3 | 16 | 32 | 47 | 62 | 78 | 94 |
| 4 | 21 | 42 | 63 | 83 | 104 | 125 |
| 5 | 26 | 52 | 78 | 104 | 130 | 156 |
| 6 | 31 | 62 | 93 | 124 | 156 | 186 |

## Your Checklist

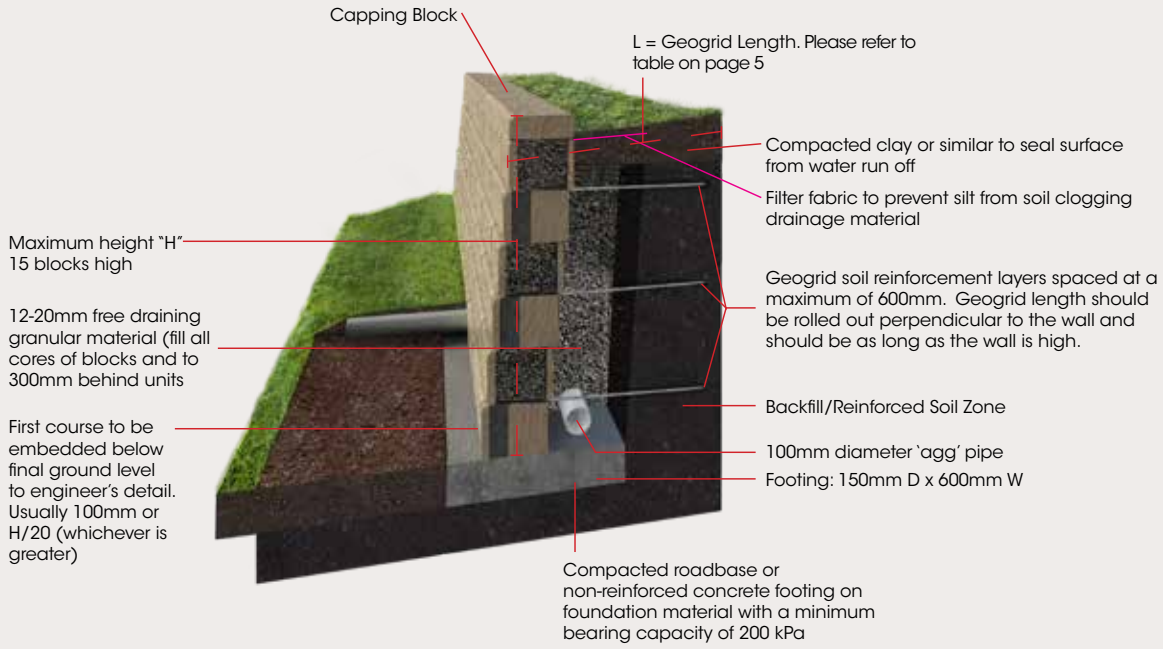
- ☐ String line
- ☐ Tape measure
- ☐ Walling units
- ☐ Compaction Tool
- ☐ Shovel
- ☐ Spirit level
- ☐ Wheel barrow
- ☐ Agriculture Drain Pipe
- ☐ Pegs or stakes
- ☐ Broom
- ☐ Gloves & eye protection
- ☐ Mitre saw (to cut blocks if required)
- ☐ 10-20mm Crushed stone
- ☐ Crushed rock (for base)

# SOIL REINFORCED WALLS WITH GEOGRID

## Overview

Austral Masonry's Heron segmental block retaining wall system utilizes its shape and weight in order to resist the lateral earth pressures. In combination with geogrid soil reinforcement, these walls can be built to substantial heights, without costly structural reinforced concrete footings.

## Cross Section Diagram - Heron or Hayman Soil Reinforced Walls with Geogrid




## Geogrid Requirements

The length, location and grade strength of geogrid is dependent on the wall height, loading on top of the structure, and soil properties. The following table is in accordance with AS4678: 2002 - Earth Retaining Structures.

***Note:*** Please consult with appropriate council for design and construction regulations. Councils in general require walls to be designed and certified by a suitably qualified engineer where the wall is over 500mm in height or will have a surcharge load such as a road, building or hydrostatic pressure is present. The suitability of the information contained in the table must be referred to a qualified consulting engineer. These tables are provided as a guide only.

# SOIL REINFORCED WALLS WITH GEOGRID

## Geogrid Table - Guide Only

| | | | *Geogrid Placement above Levelling Pad (m)* | | | | | | *Geogrid Length L (m)* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Surcharge* | *Wall Height (m)* | *Geogrid Layers* | *Number of Geogrid layers* | | | | | | *Friction Angle Ø (°)* | | |
| | | | **1** | **2** | **3** | **4** | **5** | **6** | **25** | **30** | **35** |
| *5kPa Driveway Surcharge* | 1.0 | 2 | 0.2 | 0.6 | | | | | 1.7 | 1.7 | 1.7 |
| | 1.2 | 2 | 0.4 | 0.8 | | | | | 1.7 | 1.7 | 1.7 |
| | 1.4 | 2 | 0.4 | 0.8 | 1.2 | | | | 2.0 | 1.7 | 1.7 |
| | 1.6 | 3 | 0.4 | 0.8 | 1.2 | | | | 2.2 | 1.7 | 1.7 |
| | 1.8 | 3 | 0.4 | 0.8 | 1.4 | | | | 2.2 | 1.7 | 1.7 |
| | 2.0 | 4 | 0.4 | 0.8 | 1.4 | 1.8 | | | 2.3 | 2.0 | 2.0 |
| | 2.2 | 4 | 0.4 | 0.8 | 1.4 | 1.8 | | | 2.5 | 2.0 | 2.0 |
| | 2.4 | 4 | 0.4 | 0.8 | 1.4 | 2.0 | | | 2.6 | 2.1 | 2.0 |
| | 2.6 | 5 | 0.4 | 0.8 | 1.6 | 2.0 | | | 2.8 | 2.2 | 2.2 |
| | 2.8 | 5 | 0.4 | 0.8 | 1.4 | 2.0 | 2.6 | | 2.9 | 2.5 | 2.4 |
| | 3.0 | 6 | 0.2 | 0.6 | 1.2 | 1.8 | 2.4 | 2.8 | 3.1 | 2.8 | 2.6 |

## Soil Types

- Poor (Ø = 25°): Soils with friction angle ≥ 25°, may include sandy clays, gravelly clays and sand. Expansive clays and organic soil MUST not be used within the soil reinforced zone.
- Average (Ø = 30°): Soils with friction angle ≥ 30°, may include gravelly sands and well graded sands.
- Good (Ø = 35°): Soils with friction angle ≥35°, may include gravels, sandy gravels, weathered sandstone and crushed sandstone.

## Design Considerations

- 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.

- The Table above assumes the foundation material has a minimum bearing capacity of 200kPa.

- Designs assume no hydrostatic loading.

- The minimum embedment of wall below ground level is assumed to be the greater of H/20 or 100mm.

- Designs are based on Geogrid strength of 55kN/m²

- 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.

# SOIL REINFORCED WALLS WITH GEOGRID

**Construction Steps**

***Step 1: Excavation and Foundations***

Excavate in accordance with the specific design requirements. Bench out site to allow for full length of geogrid as per design. Excavate levelling pad trench 600mm wide by a minimum 250mm deep. This allows for a 150mm deep levelling pad + 100mm minimum block embedment.

***Step 2: Levelling Pad***

The footing shall be 600mm wide x 150mm deep, of compacted roadbase or un-reinforced concrete.

***Step 3: First Course***

The first course is to be laid on the levelling pad and aligned using a string line along the back of the units. Ensure units are levelled side to side and front to back. It is critical that the first course is accurate and level in order to ensure acceptable horizontal and vertical tolerances. Sand or mortar can be used as a levelling aid on the first course.

***Step 4: Drainage Materials***

Place a 100mm agricultural drainage pipe for subsoil drainage behind the first course of blocks, with a minimum fall to the drainage outlet of 1:100. Fill all the voids within the blocks and extend 300mm behind the blocks with 12- 20mm clean granular material, to the top of the first course.

***Step 5: Placement of Geogrid***

The geogrid must be placed between the blocks as specified on the drawings. Geogrids shall be cut to the required length. Place the next course of blocks on top of the geogrid. Gently pull taut to remove any slack in the geogrid. Secure the back end of the geogrid before repeating Step 3 and proceeding with Step 6.

***Step 6: Backfill and Compaction***

Place approved backfill material over the geogrids. Backfill shall be spread in a maximum of 200mm lifts, starting at the front of the wall (behind the drainage zone) to back of the soil reinforced zone. Compaction equipment must not make contact with the geogrids. Hand held plate compactors to be used within 1.5m from the front of the wall. Heavier compaction equipment may be used 1.5m away from the front of the wall face. Compaction to be 98% of Standard Maximum Dry Density. Surface drainage during and after construction of the wall shall be provided to minimise water infiltration in the compacted soil reinforced zone.

***Step 7: Subsequent Courses***

Repeat steps 4 through to 6. Ensure compaction lifts are kept at 200mm. Blocks need to be levelled after compacting each lift.

***Step 8: Capping of Wall***

Install capping units and fix with concrete adhesive (Maxbond/Liquid Nails).

# NO FINES CONCRETE

## Overview

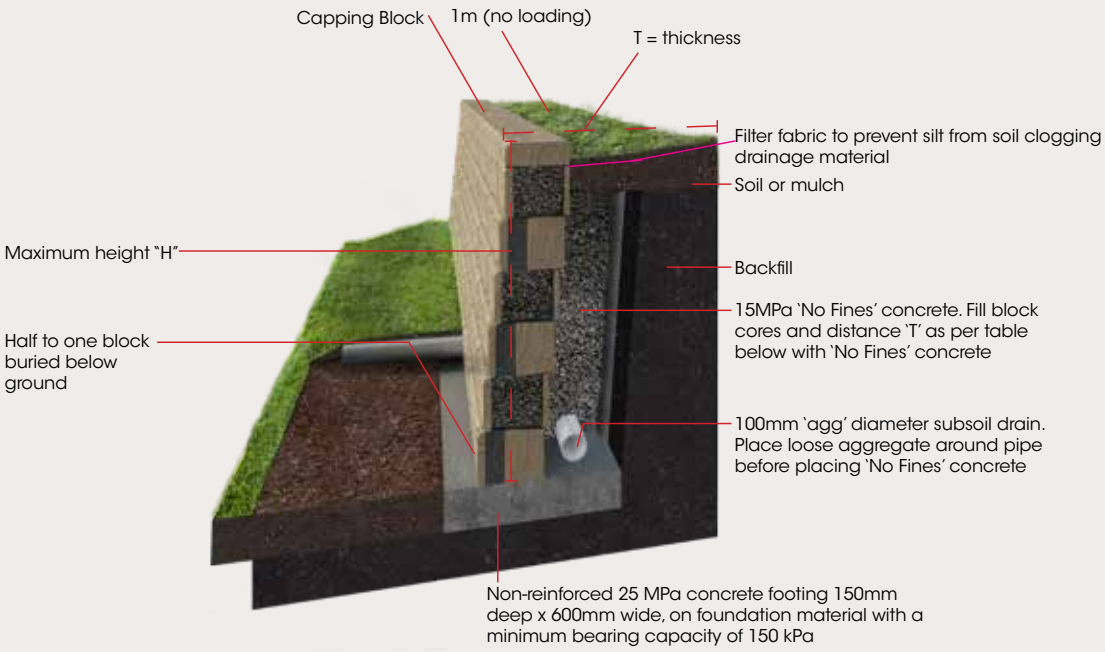
'No Fines' concrete is ideal for cut sites and boundaries, where the use of soil reinforcement and excavation of the backfill is impractical. The use of 'No Fines' adds mass to the Heron retaining wall system allowing for the overall height to be increased from a standard gravity wall without the need for geogrid reinforcement.

## No Fines Concrete Specification

- Footing: 25 MPa Concrete
- Fill block cores and behind the wall with 15MPa concrete.
- Backfill behind wall with 15 MPa concrete with a 6:1 ratio (Gravel: Cement).
- Density range: 1800kg/m³ to 2100kg/m³.
- Void ratio of the mix is expected to be between 20% to 30% and should be free draining.

**Note:** Please consult with appropriate council for design and construction regulations. Councils in general require walls to be designed and certified by a suitably qualified engineer where the wall is over 500mm in height or will have a load such as a road, building or hydrostatic pressure.

## Cross Section Diagram - No Fines Concrete



# NO FINES CONCRETE

## Construction Steps

***Step 1: Excavation and Leveling Pad***

Excavate a trench 600mm wide by a minimum of 250mm deep (150mm depth of concrete footing + 100mm minimum block embedment). Place 25MPa non-reinforced concrete to form the footing.

***Step 2: First Course***

The back "wings" of 30% of the blocks need to be bolstered off to ensure the No-Fines concrete in the blocks engages with the No-Fines concrete behind the wall, and becomes a monolithic mass. Place blocks onto levelling pad and align with string line at the rear of units. Ensure blocks are level side to side and front to back tapping gently with rubber mallet to make the necessary adjustments. It is critical the first course be level. Brush any excess 'No Fines' concrete material from the top of the blocks (before it is allowed to harden). Place the next course of blocks and repeat steps 2 and 3 until the required wall height is reached.

***Step 3: 'No Fines' Concrete Backfill***

Fill block cores and backfill to the specified depth with 'No Fines' concrete. The vertical height of pour must not exceed 600mm. Alternatively the wall may be propped. Ensure the face of the wall is not stained with the concrete, as once set will be difficult to remove.

***Step 5: Placement of Capping Units***

Secure capping units with a flexible adhesive such as Maxbond or Liquid Nails to finish the wall.

## Design Considerations

• The 'No Fines' concrete maximum wall heights table is based on a 5 kPa surcharge load acting on top of the wall as per AS4678: 2002. This table is supplied as a guide only.

• For higher walls the use of geogrid soil reinforcement is recommended. Contact Austral Masonry for further details.

• This product has zero slump exerting similar pressures on the soil and formwork, as loosely poured aggregate.

• The vertical height of any pour of 'No Fines' concrete is to be limited to 3 blocks high (approx. 600mm). The concrete must be allowed to harden before pouring the next lift.

• Global stability should be checked by a suitably qualified engineer. - The design assumes no ground water to be present. For site conditions where ground water exists, the wall must be re-designed by a suitably qualified engineer.

## Wall Height and Retained Soil Quality

| *Wall Height H (mm)* | *Retained Soil CLAY = 26° (POOR) T (mm)* | *Retained Soil SAND=30° (AVERAGE) T (mm)* | *Retained Soil GRAVEL = 34° (GOOD) T (mm)* |
|---|---|---|---|
| 1000 | 500 | 500 | 500 |
| 1200 | 750 | 650 | 600 |
| 1600 | 950 | 850 | 800 |
| 2000 | 1100 | 1000 | 1000 |
| 2400 | N/A | 1200 | 1100 |
| 2800 | N/A | 1500 | 1400 |

# TYPICAL TERRACED WALL APPLICATIONS

## Overview

- Walls may be terraced for a number of reasons. To increase the aesthetic appeal of the retaining wall, to level off a sloping site, and in some instances to reduce the single wall heights to levels were they can behave as gravity walls, thus reducing the need to use geogrid or 'no fines' concrete. In the latter instances, it is important to remember that the upper terrace wall can put pressure on the lower terrace when the walls are built close together.
- As a general rule, for the terraces to act as individual retaining walls, the minimum distance between the wall terraces must be at least 1.5 times the height of the lower wall. Note, this rule does not address global stability issues where walls are built on steep sites or in poor soils. A Global stability analysis should be undertaken by a suitably qualified engineer where such conditions may exist.
- Where insufficient room exists on site to space the terraces at 1.5 x H1, the bottom terrace must be designed to accommodate the loading from the top terrace. The design analysis may model the structure as a single wall (i.e. H1 + H2) to allow for the additional load from the upper terrace wall on the lower terrace.

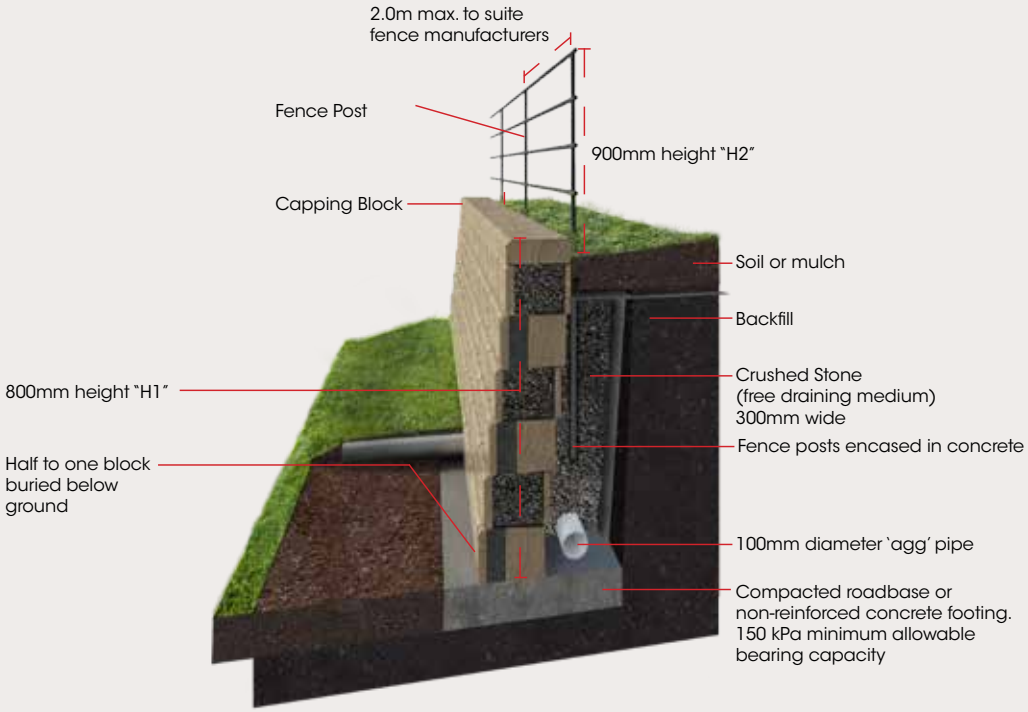
## Cross Section Diagram - Typical Terraced Wall Application

# FENCE APPLICATIONS

## Overview

- Fence posts should be embedded a minimum of 800mm from top of cap, and post encased with concrete. All other cores to be filled with gravel for drainage, or 'no fines' concrete as required. This embedment depth is for open fences only, where no wind loading is imposed on the wall and no impact loading is applied.
- 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.
- When incorporating fences into the Heron Retaining wall system, the fence posts are to be placed behind the wall as shown.

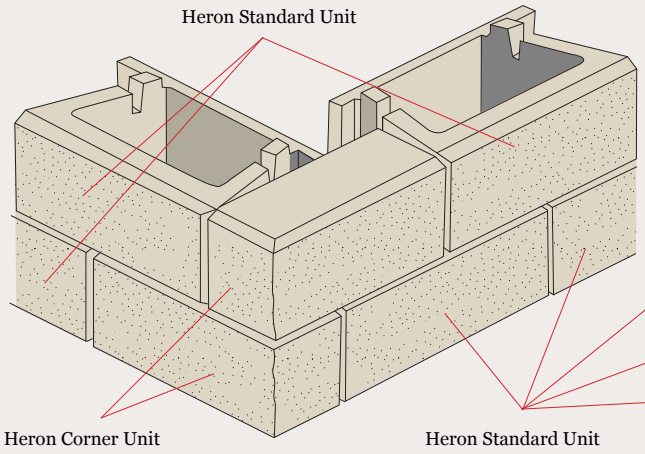
## Cross Section Diagram - Fence Application



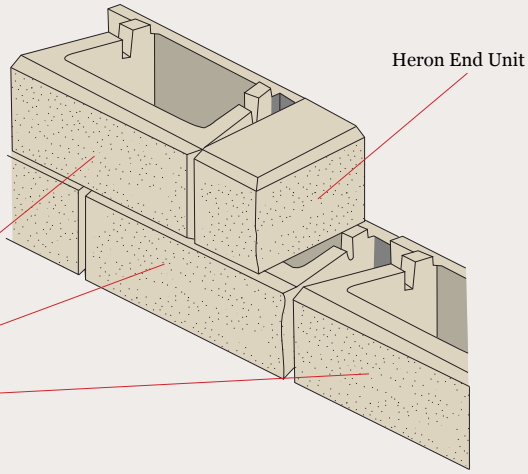
# STRAIGHT CORNERS

## Laying Information - Standard 90° Corner Layout/Step Down on Top of Wall

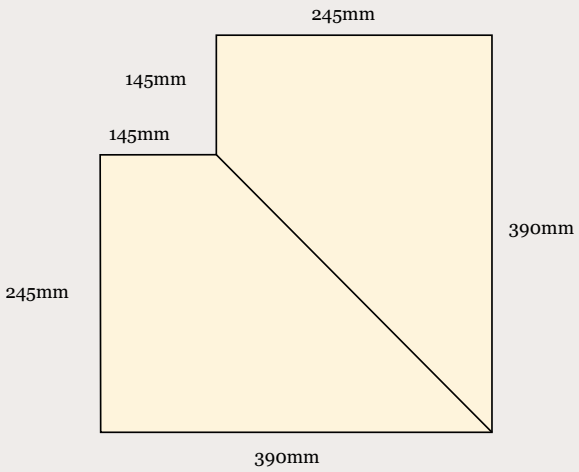
*Standard 90º Corner Layout*




*Detail for Stepping Down Blocks*

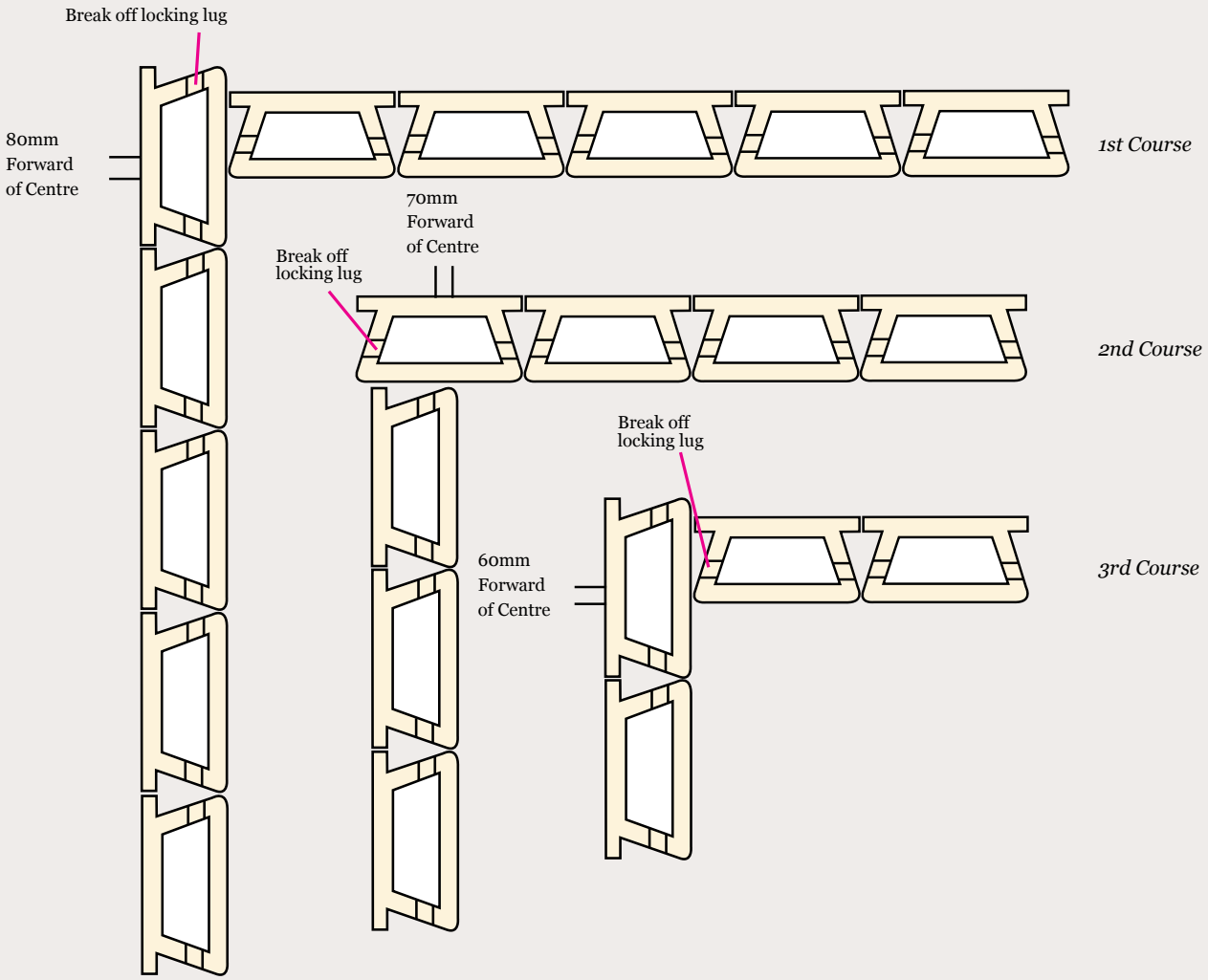



## Capping Layout for 90° Corner



# STRAIGHT CORNERS

## Internal Corner Details

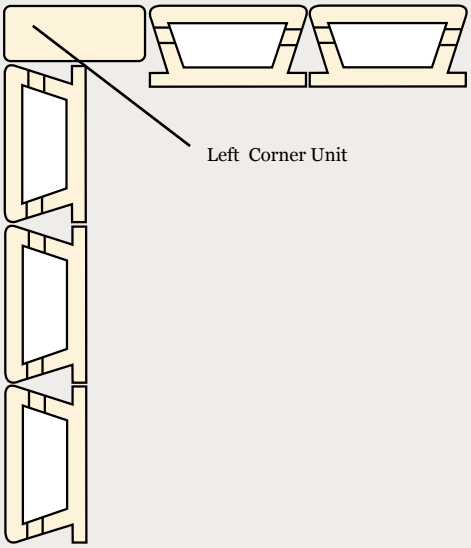



The above applies to installation of a retaining wall at 8 courses high.

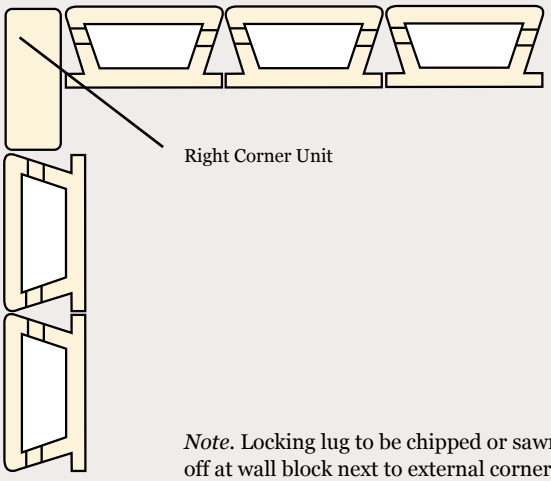
# STRAIGHT CORNERS

**External Corner Details**

*Odd Corners*




*Even Corners*

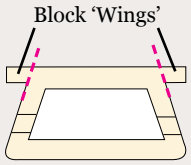



*Note.* Locking lug to be chipped or sawn off at wall block next to external corner to fit next course corner unit.

# CURVED CORNERS

## Block Preparation - Remove Block 'Wings'

The Heron and Hayman blocks have been designed with 'wings' on either side that can be removed when constructing curved walls. Simply use a hammer or mallet to knock these off as required.

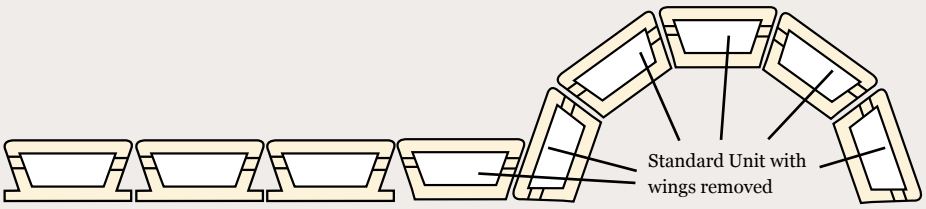



## Block Preparation - Remove Locking Lugs for External Corners

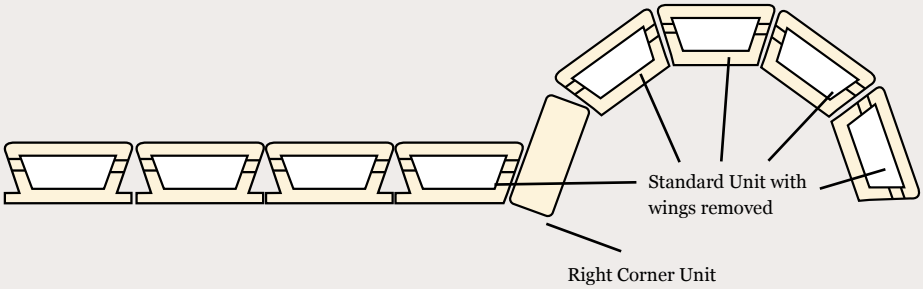
Using a hammer or mallet, knock off one concrete nib to fit next course corner unit.


## Straight Walls leading to Curved Sections

Heron and Hayman blocks can be used to create circular walls with ease. Make sure to plan out the laying of the blocks by plotting the first course before getting started. Pay careful attention to spacing of the blocks as you lay them to ensure the circles angle allows full blocks to be laid around the circumference of the wall.




*1st Course*

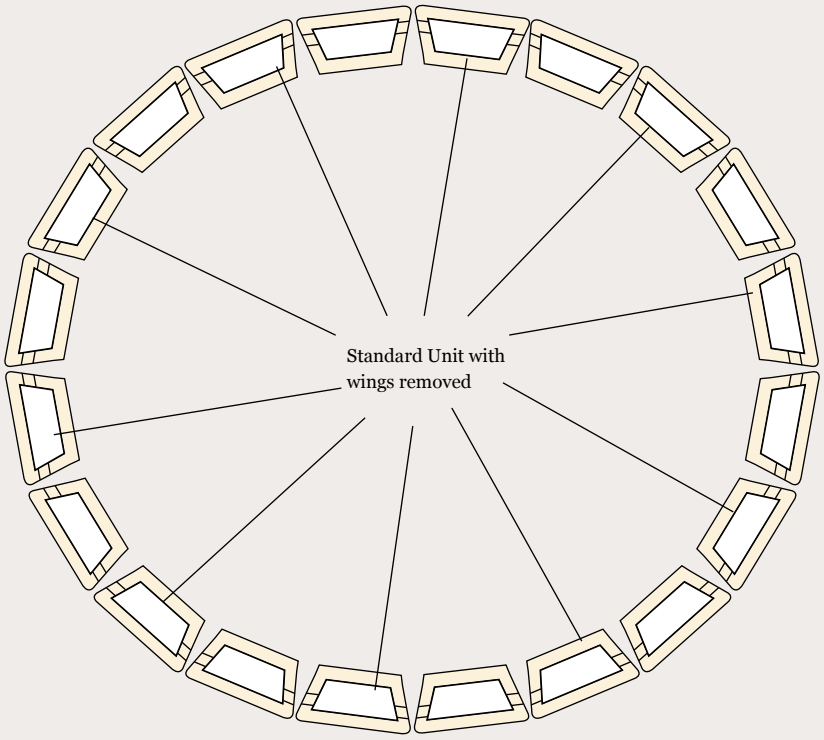



*2nd Course*

# CURVED WALLS

## Circular Walls

These blocks can be used to create circular walls with ease. Make sure to plan out the laying of the blocks by plotting the first course before getting started. Pay careful attention to spacing of the blocks as you lay them to ensure the circles angle allows full blocks to be laid around the circumference of the wall.



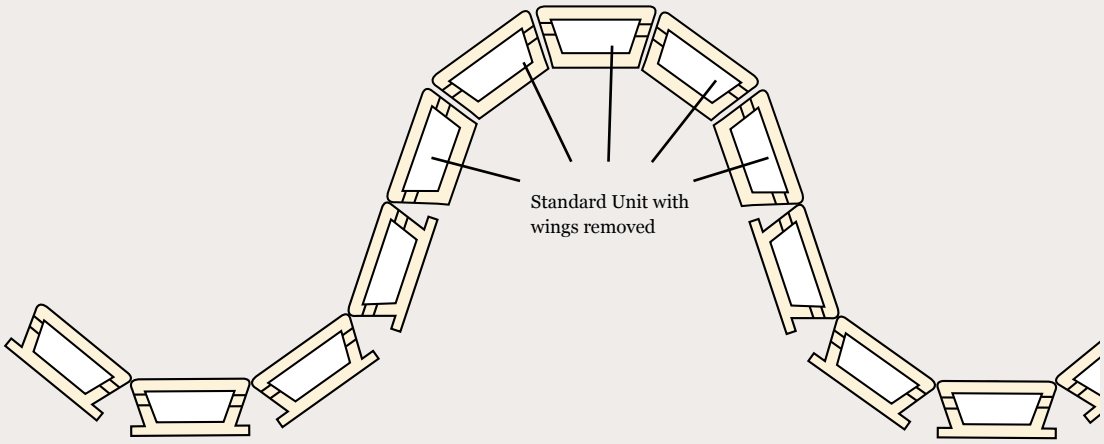

**Notes when creating a circular wall**

- The smallest circle achievable should be composed of 20 blocks giving a 1.250m radius. This is for the top course.
- If there are two courses below the top course the first course of a three course wall needs 8mm gaps between blocks which will act as weep holes.
- The middle course needs a 4mm gap between each block.
- Where a 12mm set back can be achieved the radius decreases by 24mm and circumference by 76mm for the course above.
- Larger radius walls will have more units per course to share the gap required for the larger circumference.
- The 10mm set back between each course increases as curves get tighter. Tight curves will need nibs and cores trimmed for 12mm set back.
- The wall circumference will be larger at its base compared to the top.

# CURVED WALLS

**Curved Walls**

Curved walls can be created by removing the ‘wings’ as referenced on page 15 for the external curved sections of the wall.



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