

Redi-Rock™

Specification and Installation Guide



Marshalls
Civils & Drainage

1.0 General

Marshalls Civils and Drainage is committed that its products are designed and manufactured to ensure the safety of users. Installation of products involves breaking ground and is thus considered as construction work under the Construction (Design and Management) Regulations 2015.

Scope

This specification covers the design, materials and installation of Redi-Rock concrete retaining wall units to the lines and grades designated on the construction drawings and as specified herein.

Reference Standards

- BS 8500-1 Concrete-Complimentary British Standard to BS EN 206-1 – Part 1: Method of specifying and guidance for the specifier
- BS EN 1992: Eurocode 2: Design of concrete structures
- BS EN 1997-1: Eurocode 7: Geotechnical design – Part 1 General rules

Delivery, Storage and Handling

The contractor should make sure any lifting equipment is capable of handling the weight of the blocks.

- a. The contractor shall check the materials upon delivery to assure correct unit types have been received.
- b. Full-length retaining blocks have forklift slots in their sides to aid unloading.
- c. When lifting the blocks using the main central lifter, it is important to balance the load of the 1520 mm and 1040 mm series blocks with the rear-lifting loop. Lifting hooks with the smallest suitable rating should be used; large hooks will not fit into the top lifter.
- d. Contractor shall prevent excessive mud, wet cement and like materials from coming in contact with the units.
- e. Contractor shall protect the materials from damage. Damaged material should not be incorporated in the project.
- f. Before installation the top and bottom surfaces of the blocks should be checked and if necessary cleaned of any detritus that may be on or stuck to the blocks such as clay.

Marshalls Civils and Drainage recommends that ALL lifting operations should comply with the Lifting Operations and Lifting Equipment Regulations (LOLER) 1998, and the Provision and Use of Work Equipment Regulations 1998 (PUWER).

2.0 Materials

Wall Units

- a. Wall units shall be Redi-Rock™ as produced by Marshalls Civils and Drainage.
- b. Wall units shall be made with concrete in accordance with BS8500 and comply with the following requirements.

Standard production:
Exposure Class XF2
Concrete strength class C40/50
Minimum cement content 380Kg/m³
Max W/C ratio 0.4
Intended design life 120 years.

Manufacture to order:
To meet exposure Class XF4

- c. Exterior block dimensions shall be uniform and consistent. Dimensional tolerances in accordance with factory documents available on request.
- d. Exposed face shall be finished as specified. Other surfaces to be smooth. Small blowholes on the block face may be patched and/or shake-on colour stain can be used to blend into the remainder of the block face.

Levelling Pad and Free Draining Backfill

- a. Option 1: Crushed stone or graded granular fill.
Well compacted crushed stone or graded granular fill in accordance with Cl. 803 of the Specification for Highway Works to provide of safe bearing pressure of 250KN/m².
Option 2: Concrete foundation
To the requirements of BS8500 Designated Concrete GEN1 for mass, RC40 for reinforced.
- b. Free draining backfill material to be granular, well draining sand or stone in accordance with Cl 513 'Permeable backfill to Earth Retaining Structures' of the Specification for Highway Works. It shall be placed to a minimum of 300mm width behind the back of the wall and shall extend vertically from the foundation pad to an elevation 130mm below the top of wall.
- c. Backfill material shall be approved by the geotechnical engineer. Site excavated soils may be used if approved unless otherwise specified in the drawings.
- d. Unsuitable soils with a PI>6, organic soils and frost susceptible soils shall not be used within a 1 to 1 influence area.
- e. Non-woven geotextile cloth shall be placed between the Free Draining Backfill and retained soil if required.
- f. Where additional fill is needed, contractor shall submit sample and specifications to the Engineer for approval.

Drainage

- a. Internal and external drainage shall be evaluated by the Professional Engineer who is responsible for the final wall.

3.0 Foundations

Excavation

- a. Contractor shall excavate to the lines and grades shown on the construction drawings.

Foundation Soil Preparation

- a. Native foundation soil shall be compacted to 95% of standard proctor or 90% of modified proctor prior to placement of the levelling pad material.
- b. In-situ foundation soil shall be examined by the engineer, to ensure that the actual foundation soil strength meets or exceeds assumed design strength. Soil not meeting the required strength shall be removed and replaced with acceptable compacted material or concrete.

Granular Foundation

- a. Foundation pad shall be placed as shown on the construction drawings.
- b. Foundation pad shall be placed on undisturbed native soils or suitable replacements fills.
- c. Foundation pad shall be constructed to the proper elevation to ensure the final elevation shown on the plans. Well-graded sand mixed with cement may be used to smooth the top 15mm of the Foundation Pad.
- d. Granular Foundation Pad shall have a 150mm minimum depth for free standing walls and a 300mm minimum depth for retaining walls. Pad dimensions shall extend beyond the blocks in all directions to a distance at least equal to the depth of the pad or as designed by engineer.
- e. For steps and pavers, a minimum of 25mm – 40mm of free draining sand shall be screeded smooth to act as a placement bed for the steps or pavers.
- f. Base material to be compacted to minimum 95% standard proctor density.

Concrete Foundation

- a. Concrete to be laid in accordance with the dimension on the construction drawings.

4.0 Product Details

- Retaining Series
- Free Standing Series
- Free Standing Corners
- Coping (Cap) Blocks

Retaining Series Blocks

Top Block:

Middle Block:

Bottom Block:



5.0 Wall Construction

Installing Retaining Series Wall Blocks:

- The first course of wall units shall be placed on the prepared levelling pad with the aesthetic surface facing out and the front edges tight together. All units shall be checked for level and alignment as they are placed.
- Ensure that units are in full contact with the foundation pad. Proper care shall be taken to develop straight lines and smooth curves on base course as per wall layout.
- The backfill in front and back of entire base row shall be placed and compacted to firmly lock them in place. Check all units again for level and alignment. All excess material shall be swept from top of units.
- Install next course of wall units on top of base row. Position blocks to be offset from seams of blocks below. Blocks shall be placed fully forward so knob and groove are engaged. Check each block for proper alignment and level. Backfill to 300mm width behind block with free draining backfill. Spread backfill in uniform lifts not exceeding 200mm. Employ methods using lightweight compaction equipment that will not disrupt the stability or batter of the wall. Hand-operated plate compaction equipment shall be used around the block and within 1 meter of the wall to achieve consolidation. Compact backfill to 95% of standard proctor density within 2% of its optimum moisture content.
- Install each subsequent course in like manner. Repeat procedure to the extent of wall height.
- Allowable construction tolerance at the wall face is 2 degrees vertically and 25mm in 3 meters horizontally.
- All walls shall be installed in accordance with local building codes and requirements.

Drain pipe Installation:

Placement

A wrapped perforated drainpipe should be installed behind the base course of block, along the bottom of the row. It should be surrounded by a minimum of 300mm of pipe gravel.

Note: Drain pipe should run the full length of the wall, and the end should be exposed to an open drain. This will help to alleviate hydro static water pressure building up behind wall.

Backfilling behind Wall:

Material

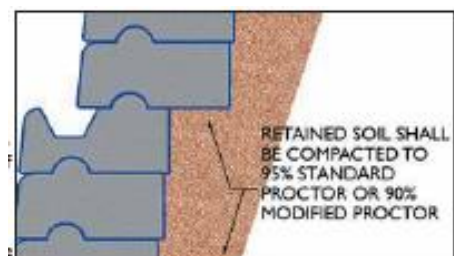
A minimum of 300mm of free-draining soil should be placed behind wall as backfill and compacted to a 95% standard proctor density.

Backfilling between Blocks:

Backfill between blocks should be free draining granular material ideally 10, 14 or 20mm single size gravel. Alternatively, if a suitable class 6N fill material is being used as backfill it is generally also acceptable.

Installing Planter Blocks:

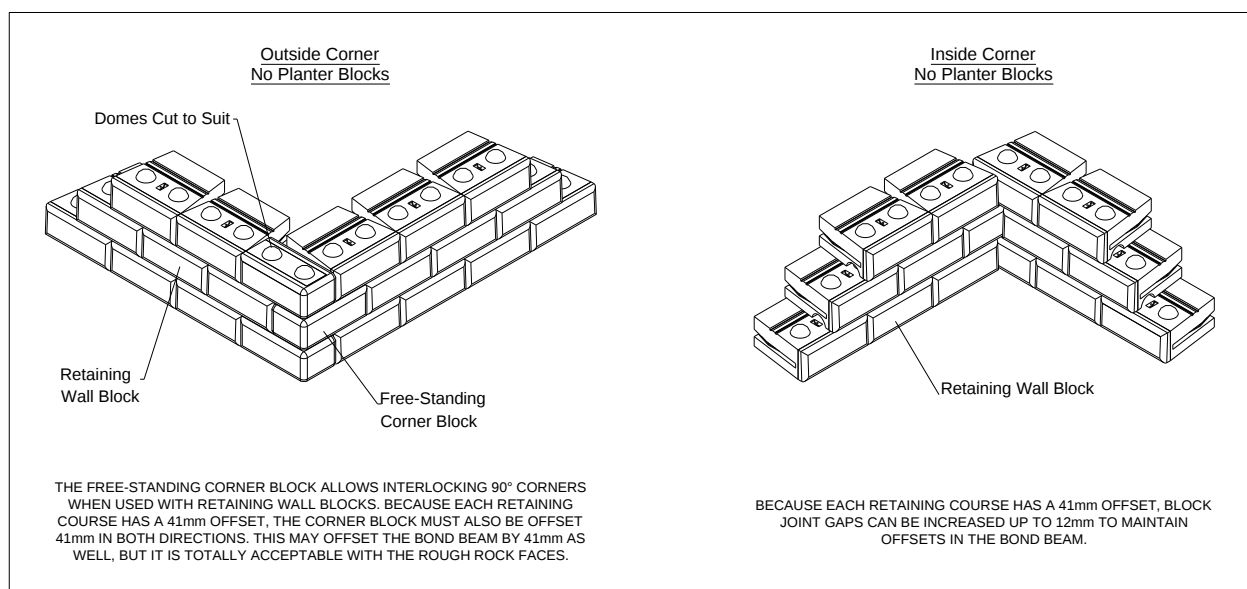
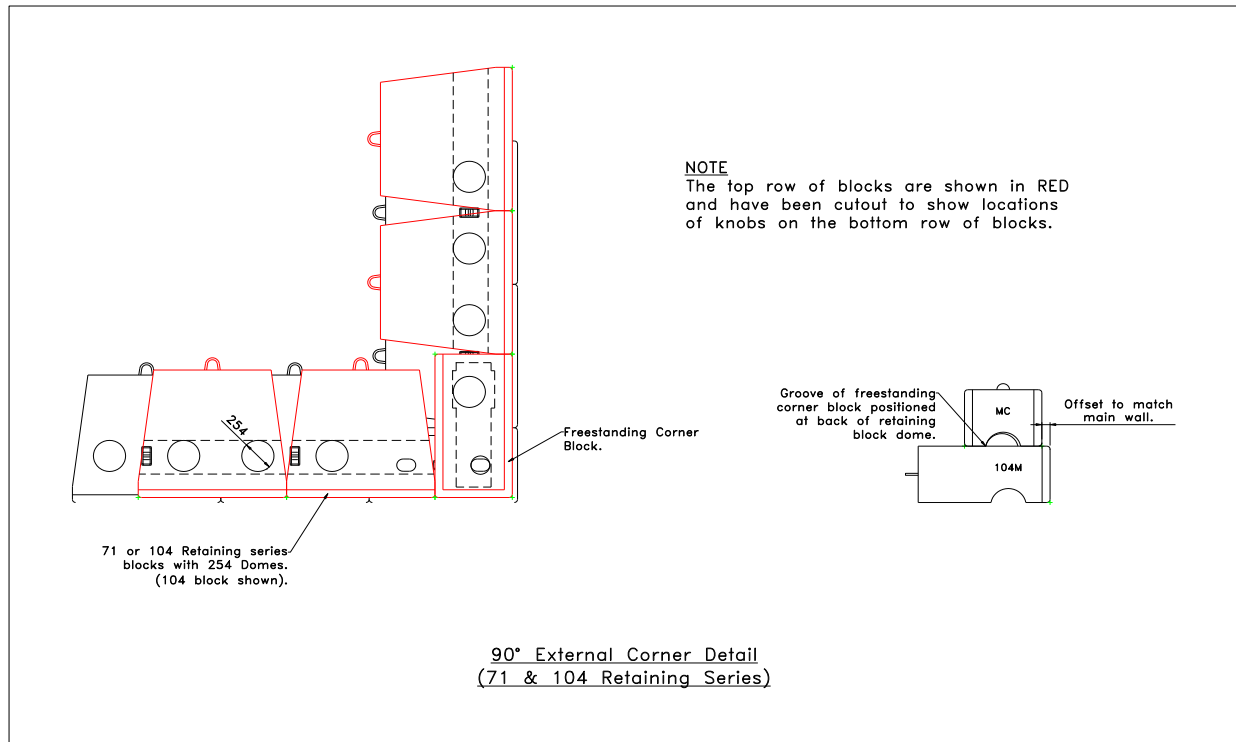
- Because the planter block is set back 422mm and rests partially on backfill material, it is crucial that the backfilled material be levelled and compacted to 95% density to ensure engineered design heights of the wall.



- b. Planter Blocks may be transitioned in or out of a normal middle block course in a wall by removing one or two knobs at the transition.
Note: This may offset the bond joints slightly from falling in the middle of the block below. This may be corrected by leaving a small gap between blocks until bond joints are centred again.
- c. Planters may be irrigated; a small piece of filter fabric may be placed over the joint of the planters to eliminate planting media from washing out.

Walls with 90 Degree Corners:

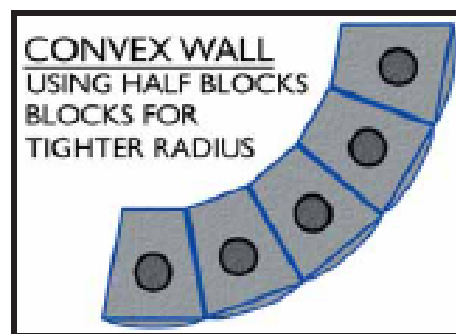
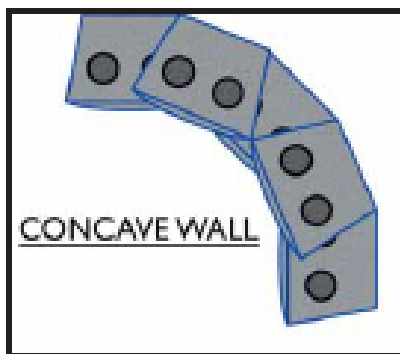
The free standing series corner block may be used to make either right or left corners. As with other walls begin each course at the lowest point until the course using the corner block is reached. At that point it is important to begin each course at the corner to assure a proper 90° corner.



For 90° corners using planter blocks, please see the sketches found on the Redi-Rock International website.

Curved Walls

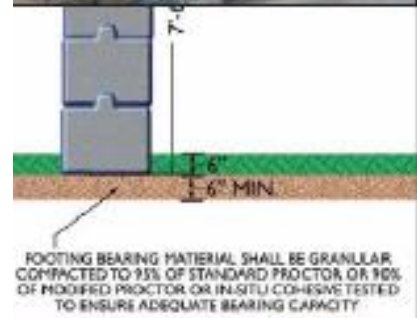
- a. The tightest recommended curve for the retaining wall series is 5.00m with a minimum of 4.42m.
- b. Concave curves may be installed at a tighter radius than the 4.42m outside radius. However, doing so will cause greater exposed overlap. You may experiment and build walls to your satisfaction.
- c. Convex curves may also be installed at a tighter radius than 4.42m by using half blocks on all radii. This will allow a 2.44m radius for outside corners.
- d. When going around convex curves, it is important to note that the radius will shrink by 41mm for each course of height because of each block's built in 41mm setback.
- e. Consideration should be given to the finish type on curved walls. Using half blocks, or planters will impact upon the coursing of the blocks and maybe less noticeable with the cobblestone finish.



Free Standing Series Walls:

For best results in placing free standing walls, the following procedures are recommended.

- a. Base should be level, compacted sand, gravel, stone or approved native matter.
- b. NOTE: Free standing walls stack straight up on top of each other while retaining series walls step back approximately 41mm per course. Free standing series walls step back approximately 65mm when placed on top of a retaining series wall.
- c. Free standing walls should be founded a minimum of 150mm below finished ground level. If the wall is built on a frost susceptible soil, then it is recommended to increase the founding level to 450mm below finished ground level.
- d. Free standing walls may be placed in either straight walls using straight blocks, curved walls using curved blocks or a combination of the two to achieve the desired radius.
- e. Free standing walls should start and end with corner blocks. Corner blocks are only available with a straight block joint.
- f. NOTE: When transitioning from straight blocks to curved blocks, a maximum joint gap of up to 12mm is considered acceptable by Redi-Rock International.



Flood Block Series Walls:

Note:-

Formation of foundation to be as per detailed design for scheme, ensuring starter bars or columns are left exposed.

- a. Lean mix or sand/cement dry mix to be laid out along foundation line to achieve water tight joint at base
- b. Foundation blocks to be lowered over starter bars. Ensure layout drawing is followed and correct block types are selected in order to achieve enclosed casting channel.
- c. Additional upper layers to be placed in stretcher bond formation. End blocks placed and construction joints to be formed.
- d. Internal cages to be tied to starter bars and horizontal bars to be laced as per bending schedule and cage layout.
- e. Any visibly open joints to be sealed locally before pouring. Construction joints to be specific to design of scheme.
- f. If wall is to be higher than two courses, then no higher than 2 courses to be poured in an individual lift. Protruding bars to be left to continue coursing.
- g. If capping is required upon completion of upper layer then please refer to capping details below.



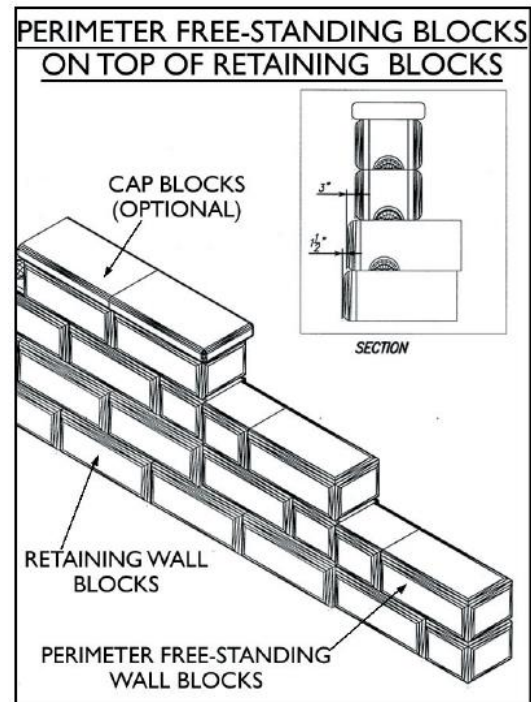
Free Standing Curved Walls:

Using all free standing curved blocks will result in a 4.4m radius. Alternate between free standing curve blocks and free standing full blocks to achieve different radii.

Curved Free Standing Walls on Top of Retaining Walls:

To ensure proper fitting of curved blocks on top of retaining series blocks, you must pre-plan your retaining block installation so that the top course ends up with either an 8.8m or 4.4m radius*. This allows for the curved free standing wall to fit correctly. Failure to do this will result in gaps on one side or the other of the free standing blocks.

*As this is likely to be difficult to achieve it is recommended that variable radius blocks are utilised. These blocks have a rebated end to make the face of the block easier to cut, allowing for a full range of radii.



Coping Stone:

Installation

For best results in placing cap stones on the top of free standing series walls, we recommend the following procedures:

- a. Mark the centre of free standing series blocks to monitor the correct bond beam spacing.
- b. Place a minimum of two beads of construction adhesive on top of the free standing block before setting the cap. Alternatively, a mortar bed or bitumastic sealant pads may be used if desired.
- c. At the ends of walls three sided capstones should be used to compliment the corner blocks beneath. Standard two-sided capstones may be used where the wall finishes against a structure.
- d. Joints between capstones may be grouted after installation for a more refined look.
- e. Suction lift devices or mechanical grabs can be used for ease of installation of capstones.



6.0 Site Construction Tolerances

- a. Vertical Alignment: Plus or minus 40mm over any 3m distance.
- b. Horizontal Alignment:
 - Straight Lines: Plus or minus 40mm over any 3m distance.
 - Corner and Radius Locations: Plus or minus 300mm
 - Curves and Serpentine Radii: Plus or minus 600mm.
- c. Bulging: Plus or minus 30mm over any 3m distance.

7.0 Health and Safety

All due care should be undertaken to ensure the safety of the installation crew during the block installation and the finishing phase. Requirements will vary from site to site and depend on the wall design however the following general measures should be considered.

The contractor should make sure any lifting equipment is capable of handling the weight of the blocks.

It is recommended that edge protection will be necessary which can be provided by means of vertical scaffold poles placed in the backfill at approximately 5m centres and horizontal poles fixed to the uprights. Operatives can wear a safety harness which is secured to the horizontal rail by means of a zone restriction lanyard. The horizontal can be raised accordingly as the wall height increases.

The provision of air bags at the front toe of the wall can also be considered.

8.0 Maintenance

Redi-Rock walls are generally maintenance free however if any remedial work is required the following is advised.

- a. For cleaning or stain removal a general purpose industrial detergent and water should be used. Cleansing acid is not advised as it can be detrimental to the surface.
- b. Minor concrete repairs can be carried out using a non-shrink repair mortar.
- c. For major repairs contact Marshalls Civils and Drainage Technical Department.
- d. Where walls are located in high profile areas, or are likely to be subjected to graffiti consideration should be given to the application of a protective coating to aid cleaning and removal of graffiti.
- e. For use in hostile environment blocks can be supplied with stainless steel lifters and different specifications of concrete.

For further assistance, contact Marshalls Civils and Drainage Technical Department on 01902 356220

9.0 Handling

Retaining Series Wall Blocks:

Utilising correctly sized and adjustable 2 legged chain set (with protective sleeving), connect the first chain to the blocks top lifting point. Attach the second chain to the rear lifting point and adjust in length so that the block is lifted level.



Free Standing Series Walls:



Utilising correctly sized chain or strap (single leg of 2 legged chain set as used for retaining series can also be used), connect chain/strap to the blocks single top lifting point.

Flood Block Series Walls (including copings etc):



Utilising correctly sized sling, pass the sling through the internal rib/s as in photos (fitting them with wear sleeves is advisable).



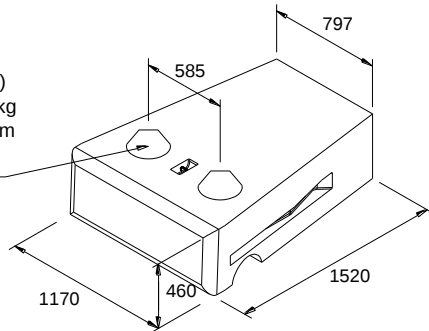
Final adjustment/closing up of the vertical spacing of any units can be carried out by levering the last block laid with a jemmy/demolition crowbar or similar (typically 1.5m in length).

1520 mm SERIES BLOCKS

Middle

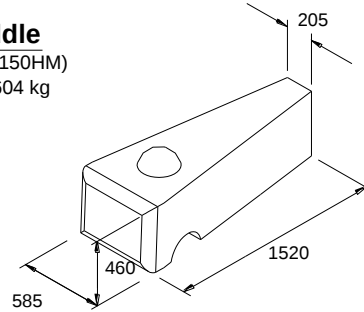
Full Block (150M)
Mass = 1492 kg
COG = 795 mm

254mm Dia.
102mm High
(Typ.)



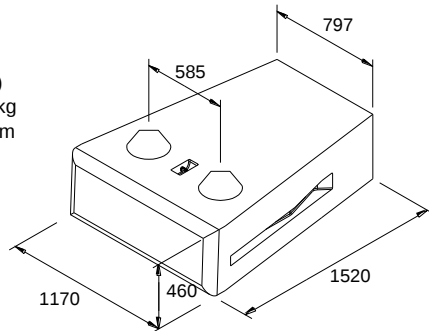
Half Middle

Half Block (150HM)
Mass = 604 kg



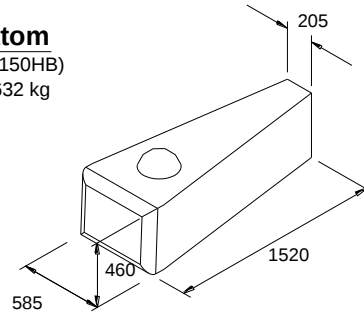
Bottom

Full Block (150B)
Mass = 1551 kg
COG = 810 mm



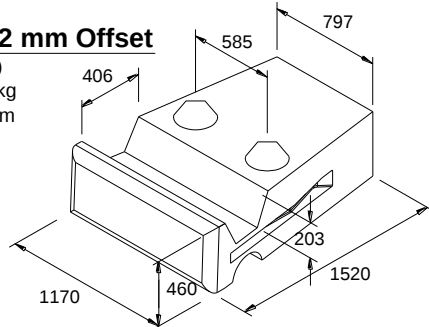
Half Bottom

Half Block (150HB)
Mass = 632 kg



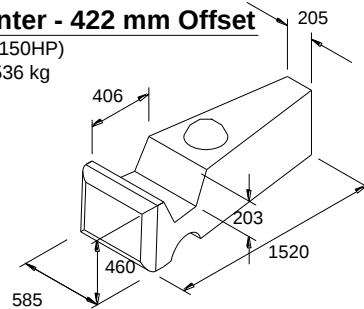
Planter - 422 mm Offset

Full Block (150P)
Mass = 1342 kg
COG = 740 mm



Half Planter - 422 mm Offset

Half Block (150HP)
Mass = 536 kg



NOTES:

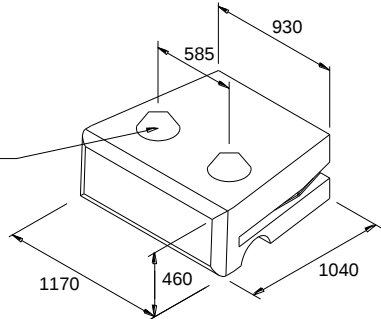
Actual weights may vary.
Dimensions based on a Cobblestone finish.
Mass shown based on concrete density of 2300 kg/m³.
Standard offset from face of each course = 41mm.
Center of Gravity (COG) measured from rear of block.
Lifting hooks omitted for clarity.

1040 mm SERIES BLOCKS

Middle

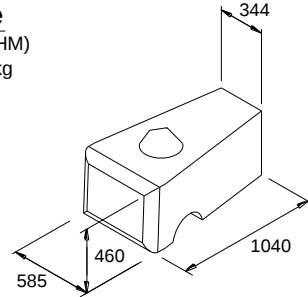
Full Block (104M)
Mass = 1066 kg
COG = 531 mm

254mm Dia.
102mm High
(Typ.)



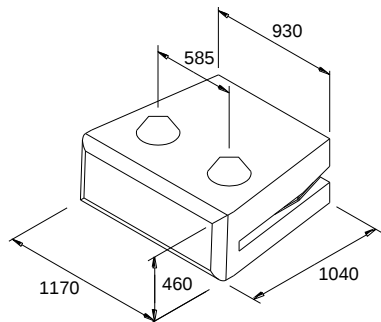
Half Middle

Half Block (104HM)
Mass = 472 kg



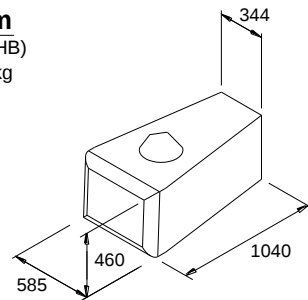
Bottom

Full Block (104B)
Mass = 1126 kg
COG = 541 mm



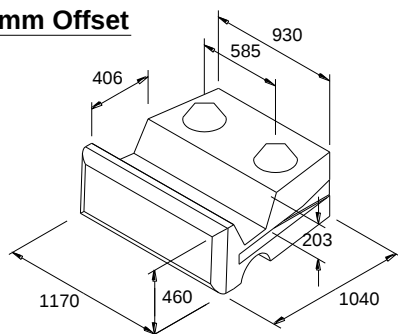
Half Bottom

Half Block (104HB)
Mass = 501 kg



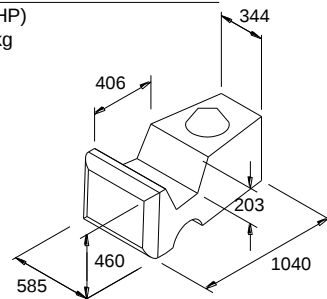
Planter - 422 mm Offset

Full Block (104P)
Mass = 916 kg
COG = 491 mm



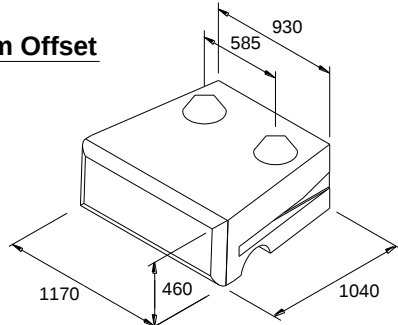
Half Planter - 422 mm Offset

Half Block (104HP)
Mass = 404 kg



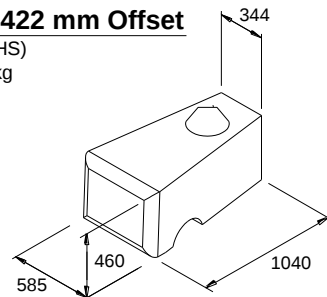
Step - 422 mm Offset

Full Block (104S)
Mass = 1066 kg
COG = 526 mm



Half Step - 422 mm Offset

Half Block (104HS)
Mass = 472 kg



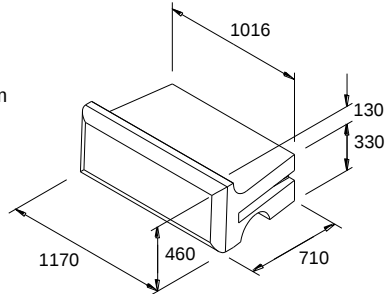
NOTES:

Actual weights may vary.
Dimensions based on a Cobblestone finish.
Mass shown based on concrete density of 2300 kg/m³.
Standard offset from face of each course = 41mm.
Center of Gravity (COG) measured from rear of block.
Lifting hooks omitted for clarity.

710 mm SERIES BLOCKS

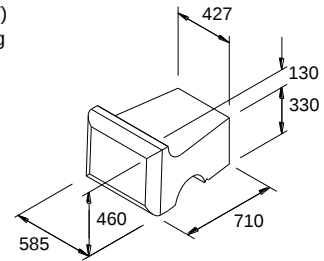
Top

Full Block (71T)
Mass = 555 kg
COG = 383 mm



Half Top

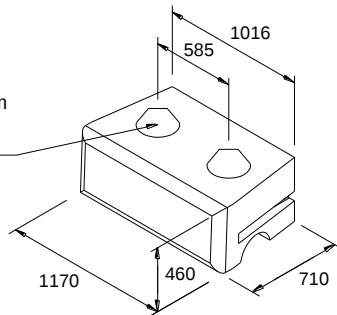
Half Block (71HT)
Mass = 268 kg



Middle

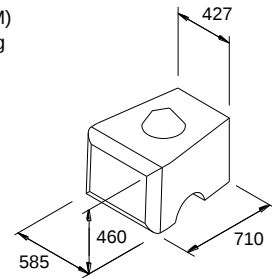
Full Block (71M)
Mass = 739 kg
COG = 360 mm

254mm Dia.
102mm High
(Typ.)



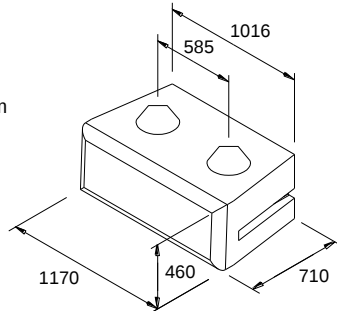
Half Middle

Half Block (71HM)
Mass = 347 kg



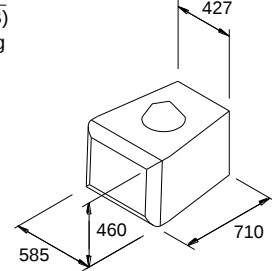
Bottom

Full Block (71B)
Mass = 802 kg
COG = 361 mm



Half Bottom

Half Block (71HB)
Mass = 375 kg



NOTES:

Actual weights may vary.
Dimensions based on a Cobblestone finish.
Mass shown based on concrete density of 2300 kg/m³.
Standard offset from face of each course = 41mm.
Center of Gravity (COG) measured from rear of block.
Lifting hooks omitted for clarity.

FREESTANDING SERIES BLOCKS

(FINISHED ON TWO SIDES)

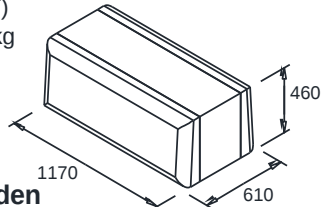
Straight Top

Full Block (ST)

Mass = 679 kg

Half Block (HST)

Mass = 339 kg



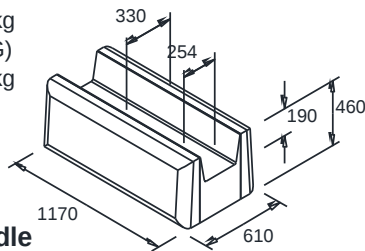
Straight Garden

Full Block (SG)

Mass = 518 kg

Half Block (HSG)

Mass = 257 kg



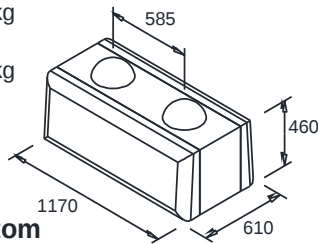
Straight Middle

Full Block (SM)

Mass = 693 kg

Half Block (HM)

Mass = 346 kg



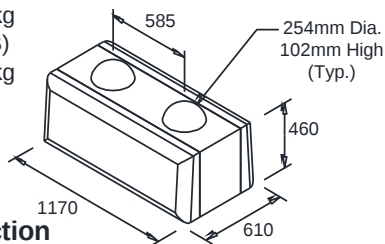
Straight Bottom

Full Block (SB)

Mass = 748 kg

Half Block (HSB)

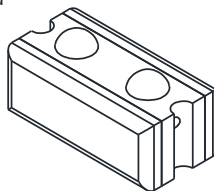
Mass = 372 kg



Force Protection

Straight blocks can be manufactured with a 75 mm horizontal tube for post-tensioned cable installation.

Straight and curved blocks can be manufactured with 150 mm vertical tubes for mechanical tie-down bolt installation.

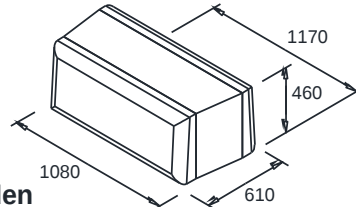


(Straight Bottom Shown)

Curved Top

Full Block (CT)

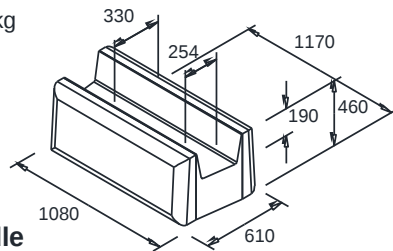
Mass = 651 kg



Curved Garden

Full Block (CG)

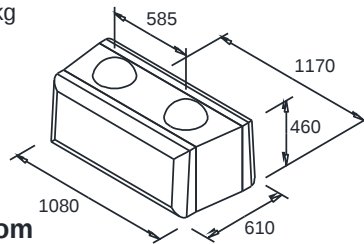
Mass = 496 kg



Curved Middle

Full Block (CM)

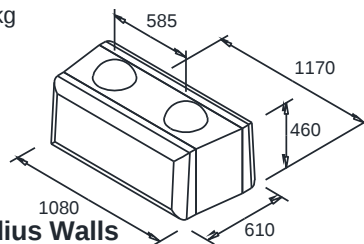
Mass = 665 kg



Curved Bottom

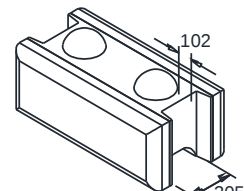
Full Block (CB)

Mass = 720 kg



Variable Radius Walls

Straight block styles can be manufactured with the end block insert to allow the blocks to be used in a variable radius wall.



(Straight Middle Shown)

NOTES:

Actual weights may vary.

Dimensions based on a Cobblestone finish.

Mass shown based on concrete density of 2300 kg/m³.

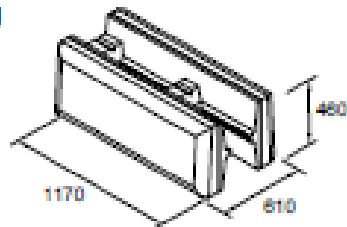
Lifting hooks omitted for clarity.

FREESTANDING SERIES FLOOD BLOCKS (HOLLOW CORE TO FORM COMPOSITE WALL)

Straight

Full Block (WDS)

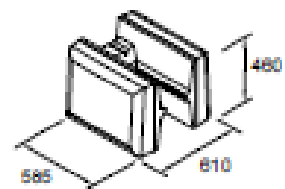
Mass = 414 kg



Half Straight

Half Block (WDHS)

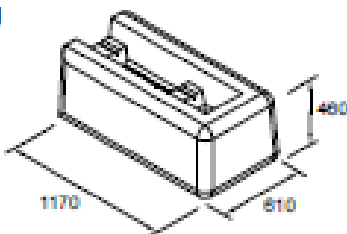
Mass = 207 kg



Corner

Full Block (WDC)

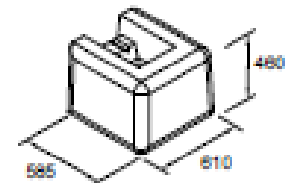
Mass = 455 kg



Half Corner

Half Block (WDHC)

Mass = 247 kg



NOTES:

Actual weights may vary.

Dimensions based on a Cobblestone finish.

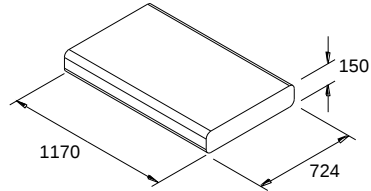
Mass shown based on concrete density of 2300 kg/m³.

Lifting stops required, units contain no lifting hooks.

150 mm CAP BLOCKS

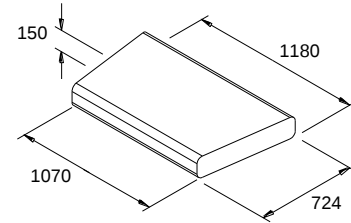
Two Sided Capping

Full Block (2SC)
Mass = 292 kg



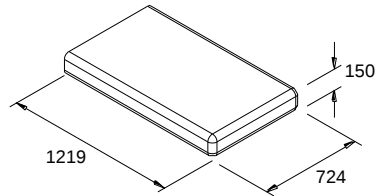
Two Sided Curved Capping

Full Block (2SCC)
Mass = 281 kg



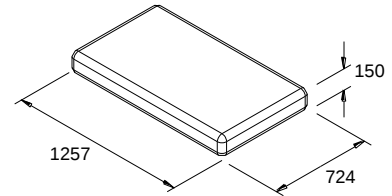
Three Sided Capping

Full Block (3SC)
Mass = 303 kg



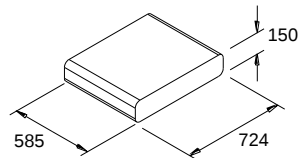
Four Sided Capping

Full Block (4SC)
Mass = 312 kg



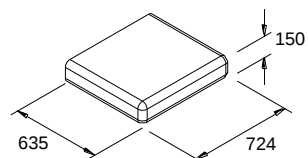
Two Sided Half Capping

Half Block (2SHC)
Mass = 146 kg



Three Sided Half Capping

Half Block (3SHC)
Mass = 157 kg



NOTES:

Actual weights may vary.
Dimensions based on a Cobblestone finish.
Mass shown based on concrete density of 2300 kg/m³.
Lifting hooks omitted for clarity.