start somewhere

TwistBlock

Construction Manual

Version 1 June 2024 | | info@startsomewhere.eu | www.startsomewhere.eu

Start Somewhere TwistBlocks

Construction Manual

Version 1: June 2024

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Introduction ……..…... 4

Construction method ……5

A. Documentation & planning …… 6
B. Safety Precautions ……..…… 6
C. Site preparation & setting out ……... 7
D. Excavations ……..……7
E. Foundation reinforcement and concrete …….…… 8
F. Foundation walling …… 10
G. Floor slab …… 12
H. Walling ……..13
I. Columns ……..…. 14
J. Service integration ……..…... 15
K. Windows and doors ……..... 16
L. Lintels ……..…... 18
M. Ring-beams ...……..…. 20
N. Slabs ……...…… 21
O. Stairs ……..…… 23
P. Wall plate, gables, roofs, rainwater and finishes ……... 27
Q. Cleaning and fixing into walls …….. 28

TwistBlocks

TwistBlocks are an affordable building solution that are produced in small scale factories in low-income areas. The blocks are interlocking, light-weight, fire-resistant and easy to use. For more information visit www.startsomewhere.eu

Using this manual

This document is a manual for the construction of buildings using TwistBlocks. The manual assumes that you have a basic understanding of general construction principals. Any detailed structural work should be designed and overseen by a structural engineer.

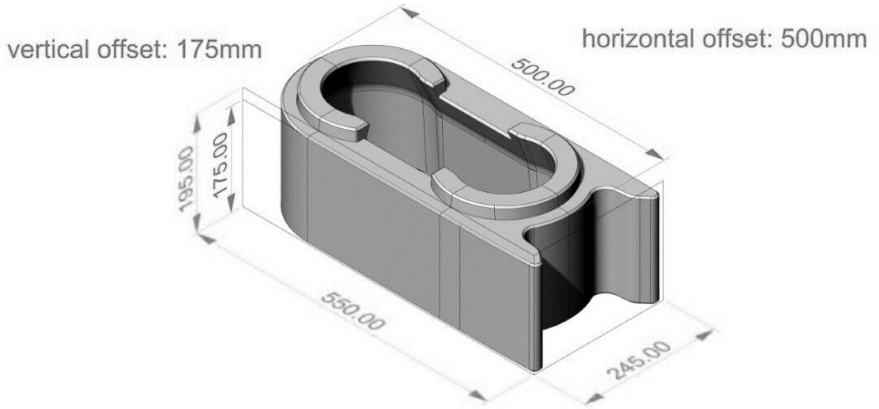
Non-standard construction methods are identified like this.

Other useful documents

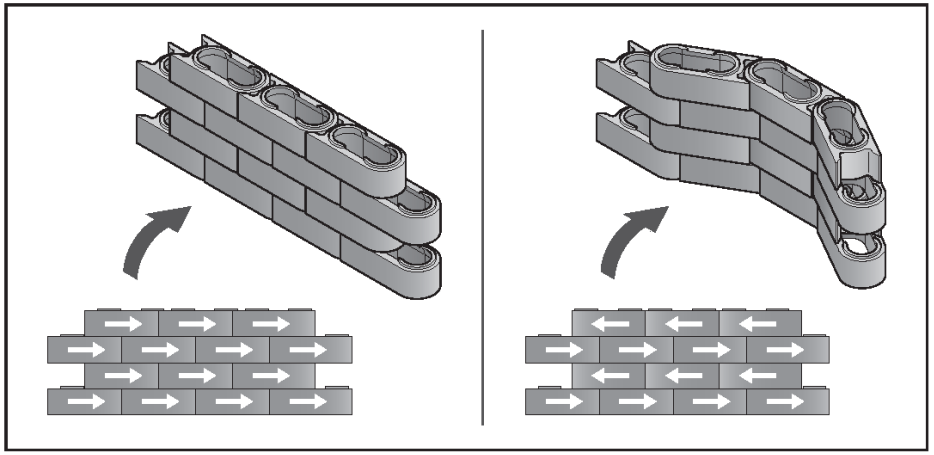
- Construction Manual – How to build with the “Somewhere Blocks”
- Standard Window Connection Detail
- TwistBlock Standard Details
- TwistBlock Building Manual

Disclaimer

This document assumes that the building plans have been approved by the local government and signed off by a registered architect and engineer. Construction is to be carried out by an experienced builder who is responsible for adhering to the local building regulations, approvals, standards and permissions. Start Somewhere will not be held liable for any loss or damaged occurring from the use of this document, the plans or any material pertaining to the Model Home.



TwistBlock dimensions for planning purposes.



Basic principles for TwistBlock interlocking walls.

CONSTRUCTION METHOD

A. Documentation & planning

Prior to construction, please address the following items:

1. Planning permission and construction approvals: ensure that you are legally permitted to construct your building. Contact your local municipality for the most up-to-date regulations.

2. Identify an experienced builder to oversee the construction. Many processes in TwistBlock construction follow standard construction practices.

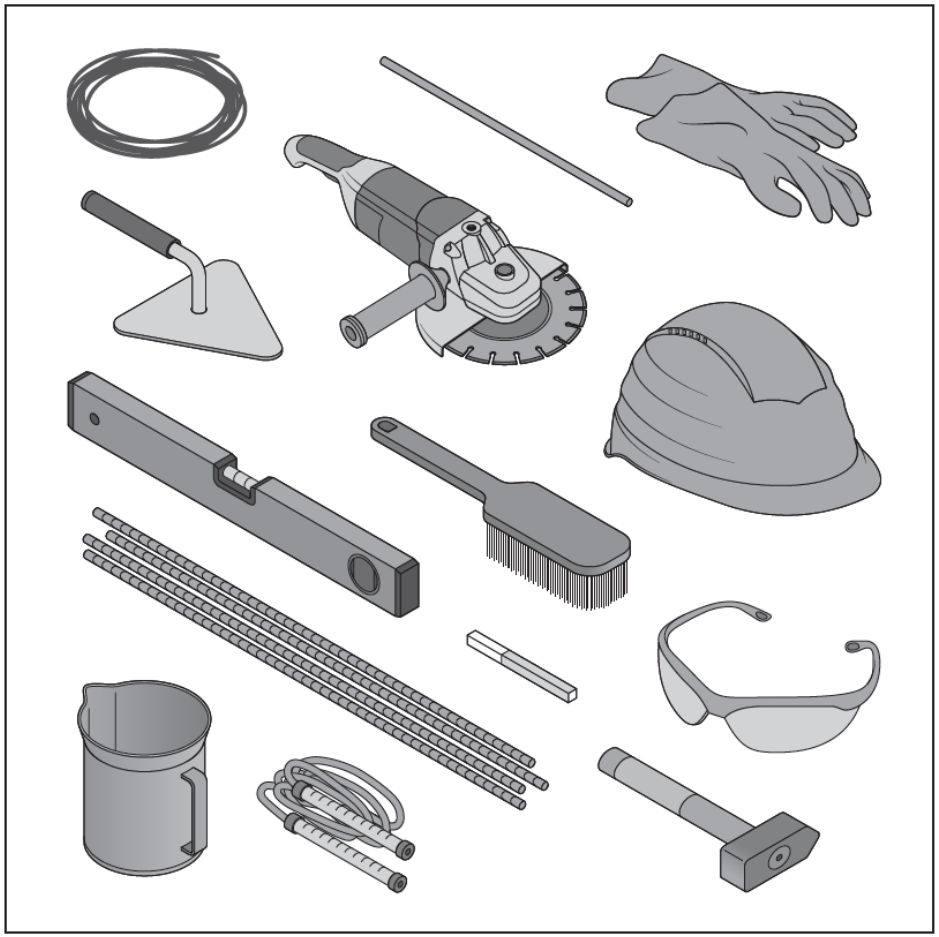
3. Read this manual before construction, in order to understand Coordinate with an electrician and a plumber to ensure that conduits, pipes, drainage installations etc. are constructed property at the correct time during the process.

B. Safety Precautions

- The following safety gear should be available to workers: hard hats, steel-toed boots, safety glasses, work gloves, high-visibility vests, ear protection for use with power tools, eye protection for welding.

- The site should be equipped with the following: scaffolding and ladders, a fully stocked first aid kit, fire extinguisher.

- Conduct regular safety briefings and training sessions on the proper use of equipment and machinery.



Tools and PPE specifically needed TwistBlock construction.

C. Site preparation & setting out

1. Protect the site with fencing to prevent unauthorized access and theft.
2. Identify and clear the area that the building will be constructed on. Be sure to follow the local government regulations for waste disposal.
3. Verify the site boundaries and ensure they match the approved plans.
4. Set out the wall/foundation positions using a standard technique for brick wall. When doing a more complex building, use the triangulation plans provided by Start Somewhere.
5. Test Layout 1: using the block plans provided, do a **test layout of the first TwistBlock course.** If possible, use a drone to take a picture of the layout and tweak the wall position as necessary.
6. Using the TwistBlock layout as a template, mark the positions for excavations using builder's chalk.

D. Excavations

1. Remove the test layout. Dig trenches to the specified depths and widths according to what you have marked in chalk.
2. Ensure adequate bracing is provided for the sides of the excavations to prevent flooding and collapse.
3. Prepare the bottom surface by compacting and leveling the soil to create a stable base for the concrete footings.
4. Prepare the surface of the foundation as per the engineer and architect specifications (compaction, anti-termite treatment, base course and blinding layers, drainage allowance etc.)

Step C5: test layout of the first course of TwistBlocks to verify the layout fits correctly.

Step D1: Digging the foundation trenches according to the TwistBlock layout.

E. Foundation reinforcement and concrete

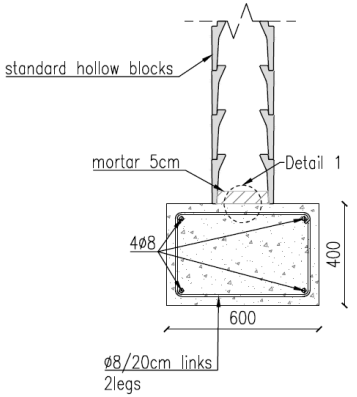
1. Prepare the steel reinforcement cages for the foundation using the document “TwistBlock standard details” in conjunction with the engineer’s specification.

   - Detail A shows the standard arrangement for a strip foundation.
   - Detail B shows the extension of rebar for a reinforced concrete column.

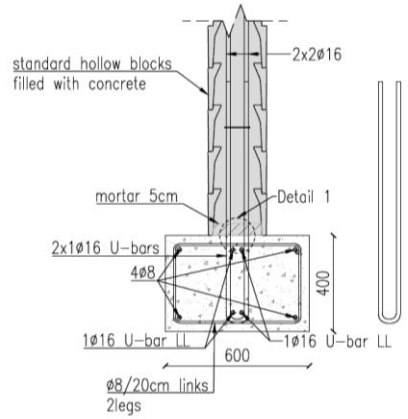
2. Test layout 2: test the TwistBlock layout of the first course on top of the reinforcement cage.

3. Mark the column positions on the cage using spray paint, ensuring that the steel passes easily through the blocks at this location. (see image on next page).

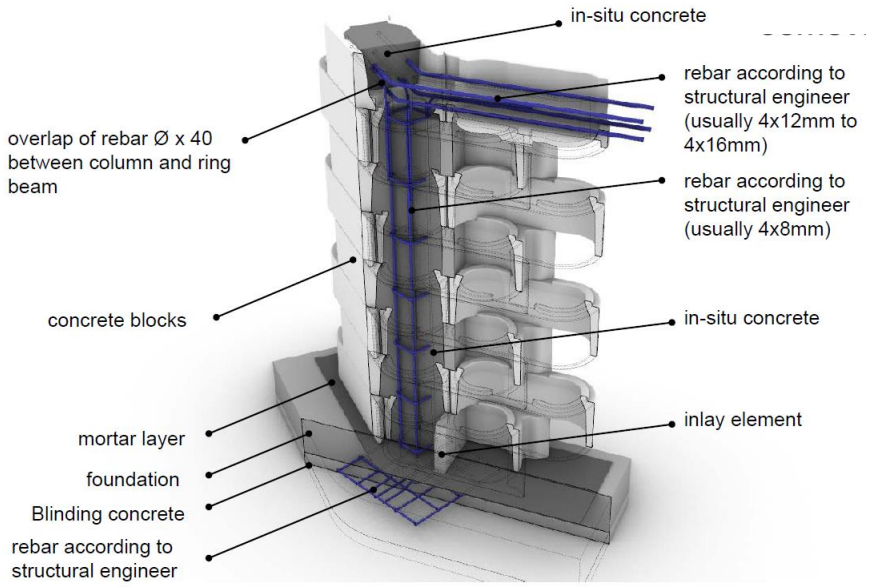
4. Mix or order concrete as per the engineer’s specification. Cast and cure the foundations according to standard practices. Ensure the top surface is level.



Detail A
- typical section through undation



Detail B
- typical section through column/foundation



TwistBlock construction system for reinforced concrete frames.

TwistBlock test layout on the foundation steel cages to locate the column positions.

F. Foundation walling

1. Co-ordinate with the plumber to identify any pipes that might need to intersect the foundation walls. Note that any pipe under the floor of the building should be encased in a concrete sleeve, in accordance with 5.4 of SABS 1200-LB.

2. Determine how many TwistBlock courses are required for the foundation wall: foundation depth divided by TwistBlock height (175mm). Courses one and two of the Block Plans can be repeated and alternated to reach the desired depth.

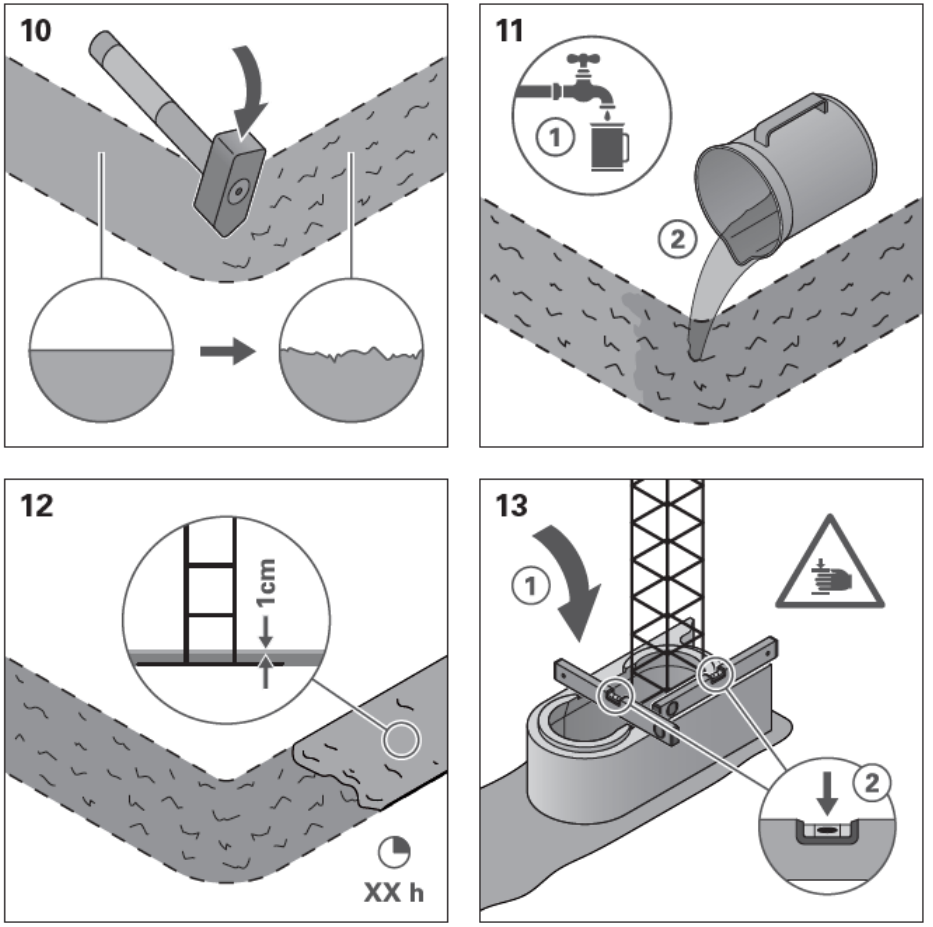
3. Prepare the TwistBlocks. Use an angle grinder to cut the blocks according to the colour coded Block Plans.

4. Hack the surface of the foundation concrete where the blocks will lie to create a bonding surface.

5. Lay the first course of Twist Blocks on the foundation concrete, ensuring proper levels using a small amount of mortar for precision. Check levels with spirit level.

6. Next page…

Snapshot from the "TwistBlock building manual" showing different cut blocks.



Snapshot from the "TwistBlock building manual" showing how to prepare the top surface of the foundation to receive the first course of TwistBlocks.

F. Foundation walling continued

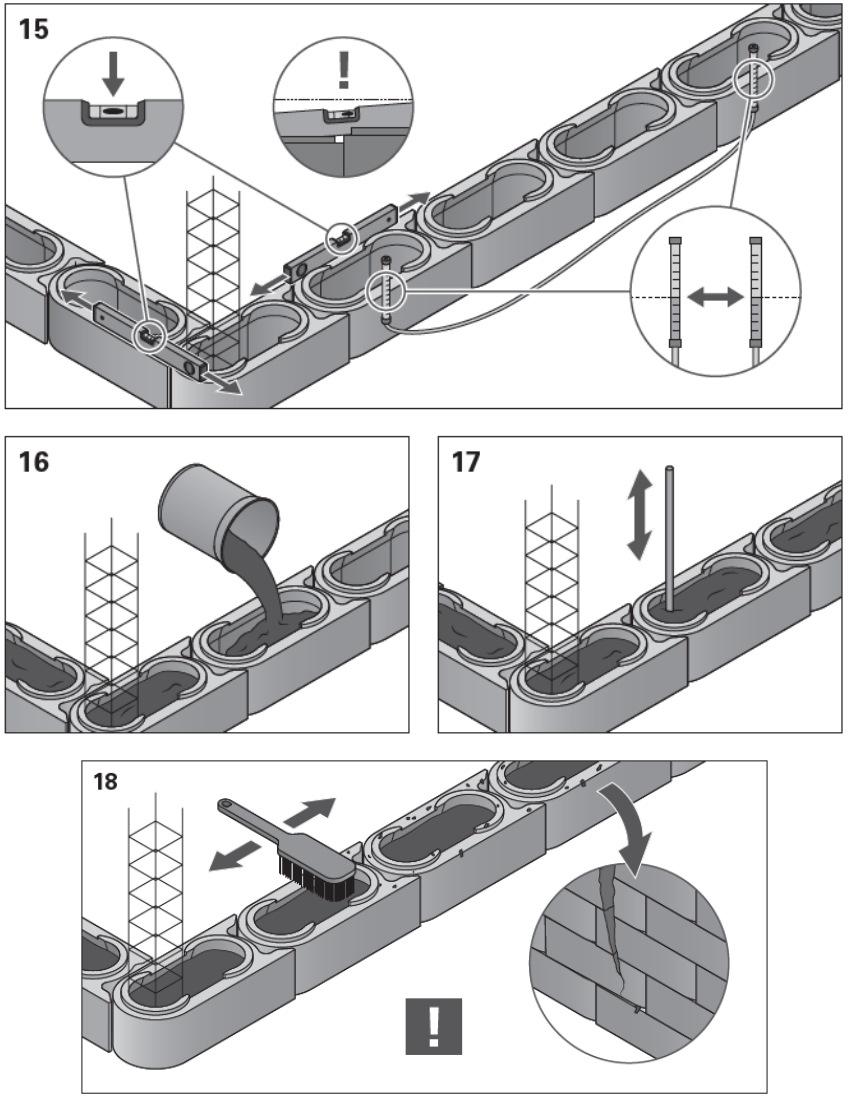
5. To stabilize the first course of Twist Blocks, pour concrete halfway into the blocks, preventing movement during subsequent block laying.

   Follow the TwistBlock block plans to ground level.
6. Use a broom/brush to sweep off any debris between courses. (One small stone can cause the whole wall to crack later!)

7. Ensure that every course is perfectly level using a spirit level.

8. Backfill any excess excavations around the foundations and compact.

Filling the first layer of TwistBlocks with cement helps the foot of the wall bind with the slab.



First course preparation (Snapshot from the ”TwistBlock building manual”)

G. Floor slab

1. Prepare the surface under the slab as per industry standards and according to the engineer's detail (compacted fill, sand layer, anti-termite etc.)

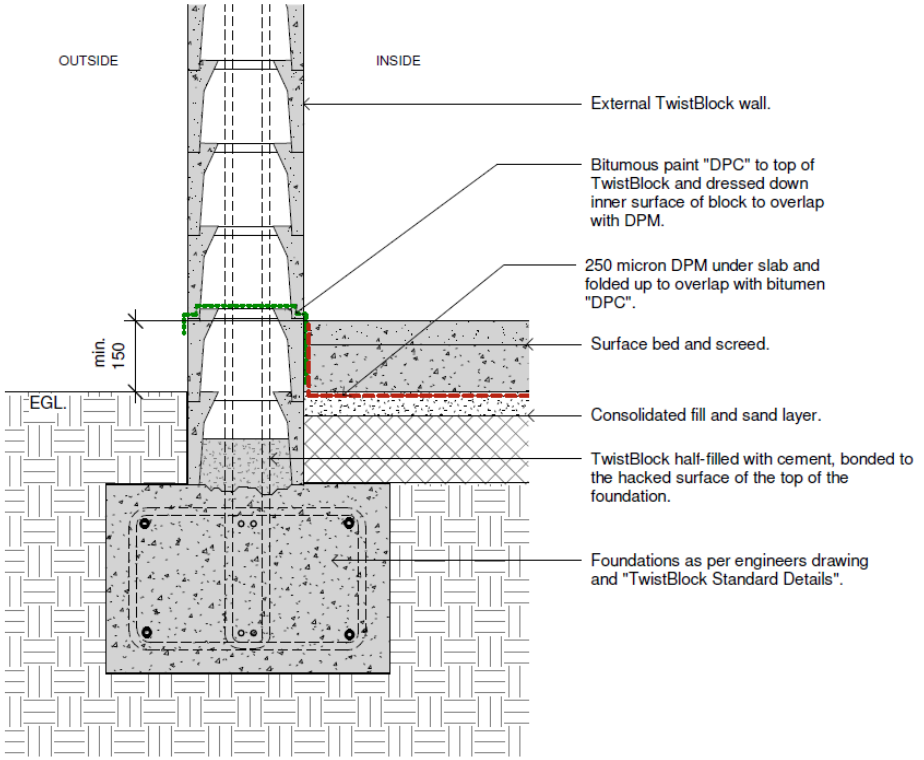
2. Coordinate with the plumber and electrician to identify routes and positions for pipes/conduits under or through the slab. Any water or waste pipes running beneath the slab should be protected according to SANS 10400 - P.

3. Lay the DPM, bringing it up against the interior of the foundation wall.

4. Waterproof the inner surface of the TwistBlock foundation wall with bitumous paint. Paint over the top of the TwistBlocks on the ground floor. The DPM and the bitumous paint should overlap. See detail.

5. Lay BRC mesh as per engineer's specification.

6. Mix or order concrete as per the engineer's specification. Cast and cure the floor slab according to standard practices. Ensure the top surface is level.



TwistBlock standard detail for wall base, showing waterproofing.

H. Walling

1. Prepare the TwistBlocks. Use an angle grinder to cut the blocks according to the colour coded Block Plans.

2. Follow the Block Plans and continue with the walling up to the 4th course above floor level. Use a spirit level regularly to check the courses are level. Brush between courses and ensure proper interlocking.

3. Clean out the cavities regularly and remove any debris.

4. Extend the rebar for the columns.

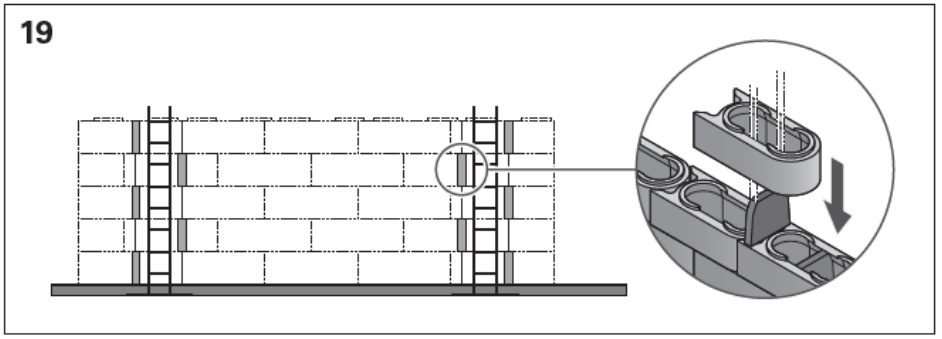
(Right) walling going up with scaffolding. Rebar for reinforced columns is extended.

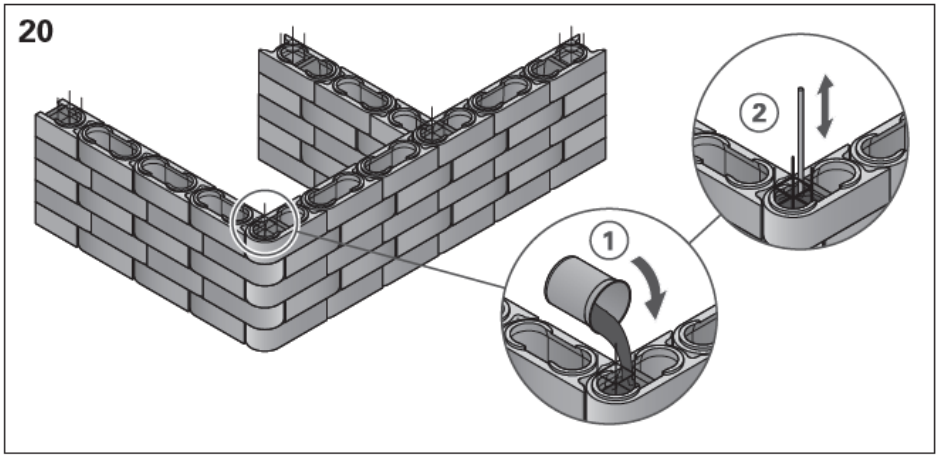
Cutting of blocks using correct protective equipment.

I. Columns

1. Extend the reinforcement bars and stirrups as you go up.
2. To avoid concrete from spilling out into the wall, timber inserts should be placed in the column blocks (see image 19).
3. Fill the columns with concrete every 6 courses. Use a poker vibrator. This must only be done every 6 courses, to prevent the hydrostatic pressure from cracking the blocks further down.
4. Follow the details for fixing in the TwistBlock Standard Details.

Type two column in progress: concrete should be poured and vibrated every 6 courses.
Note – save on concrete and use timber inserts to only fill the ½ of the blocks around the steel.





Snapshot from the TwistBlock Building Manual showing the timber inserts to prevent concrete from seeping into the wall.

J. Service integration

1. Coordinate with the electrician and plumber from an early stage.
2. Use an angle grinder to cut routes through the middle of the TwistBlocks walls, usually in the 4th course above floor level.
3. Cut the face of blocks with an angle grinder to allow water and drainage pipes to pass through or to mount electrical fittings.
4. Toilet vent pipes can be placed within the wall. It is advised to minimise the water supply and drainage pipes within walls as much as possible to avoid access problems in the future.

Electrician cutting grooves for conduits to pass through TwistBlock walls.

Toilet vent pipes can be slotted into the walls.

Openings are cut into the face of the TwistBlocks to receive electrical fittings.

K. Windows and doors

As with conventional practices, window and door frames are fixed by drilling into the walls and inserting an anchor bolt. Blocks at the fitting points should be filled with concrete to provide a solid element to fix into. See the pre-casting instructions on the next page.

1. Every 4th - 6th course, install a concrete-filled TwistBlock at the openings. Allow minimum 6 points for doors and minimum 4 points for windows. (see adjacent image.)

   Alternatively, use a type 1 column at the sides of openings.

2. At sill height, cut the sill blocks at a 45° to receive a sill tile. See detail.

3. Place timber inserts in the base of the sill blocks and fill with concrete.

4. Continue with blockwork to the lintel level (next page).

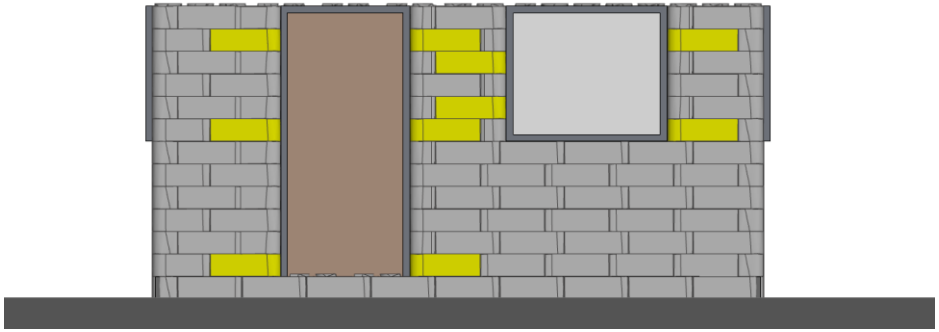
5. Confirm the measurements of the openings and engage a local steel fabricator to manufacture the windows and doors.

6. To fit the frames, drill into the filled blocks and insert a steel lug.

7. Weld or bolt the door/window frame to the lugs.

8. Fit the doors and windows as usual.

9. Use a silicone / waterproof sealant to seal the connection between the TwistBlocks and the frame, internally and externally.



At openings, provide 4-6 concrete-filled blocks to provide a solid element to fix the frames into.

To fix a frame, drill into the concrete-filled blocks and fit with a concrete rawl bolt.

K. Windows and doors continued

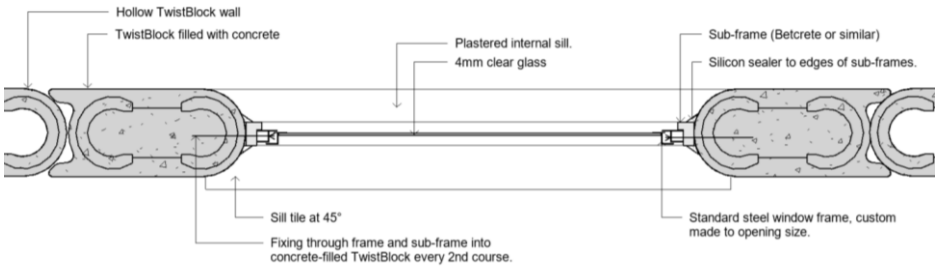
Pre-casting instructions for the concrete-filled TwistBlocks as connection points for window and door frames:

1. Use the block plans to identify the number and type of blocks needed as the fixing points.

2. Turn the blocks upside-down. Cut a timber insert for each block to prevent concrete from flowing out.

3. (Optional) drill into the round side of the blocks and insert a metal lug to provide a connection point for the door/window frame.

4. Cast with concrete and cure. Ensure the blocks are not filled completely, to allow space for them to interlock.



Snapshot from the standard window detail showing fixing into a solid block.

(Right) Pre-casting the window & door frame connection blocks with metal lugs for frame connection.

L. Lintels

1. Use a piece of shutter-ply to span the length of the opening, supported by props. Insert a 30mm half round dowl to create a drip moulding to the underside of the opening. Coat the timber with a lubricant for easy release of the concrete after casting.

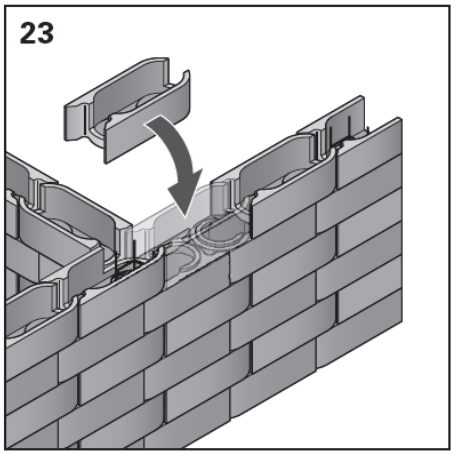
2. Lie the lintel blocks on the ground and cut a route for the reinforcement to pass between them. The lintel should extend one block to either side of the opening.

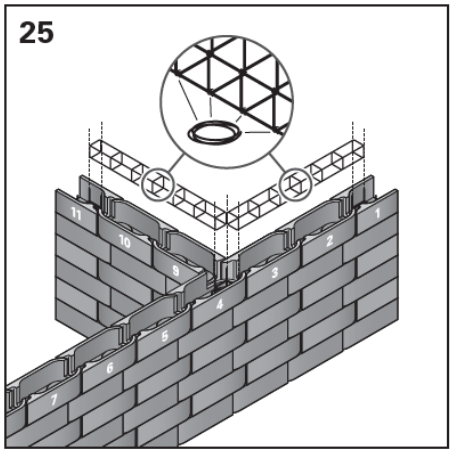
3. Place the cut lintel blocks in position on the propped shuttering.

4. Insert the steel reinforcement for the lintel, as per the engineer's specification.

5. Cast the concrete, cure and keep supported for 21 days. Remove the shutter-ply and the supports.

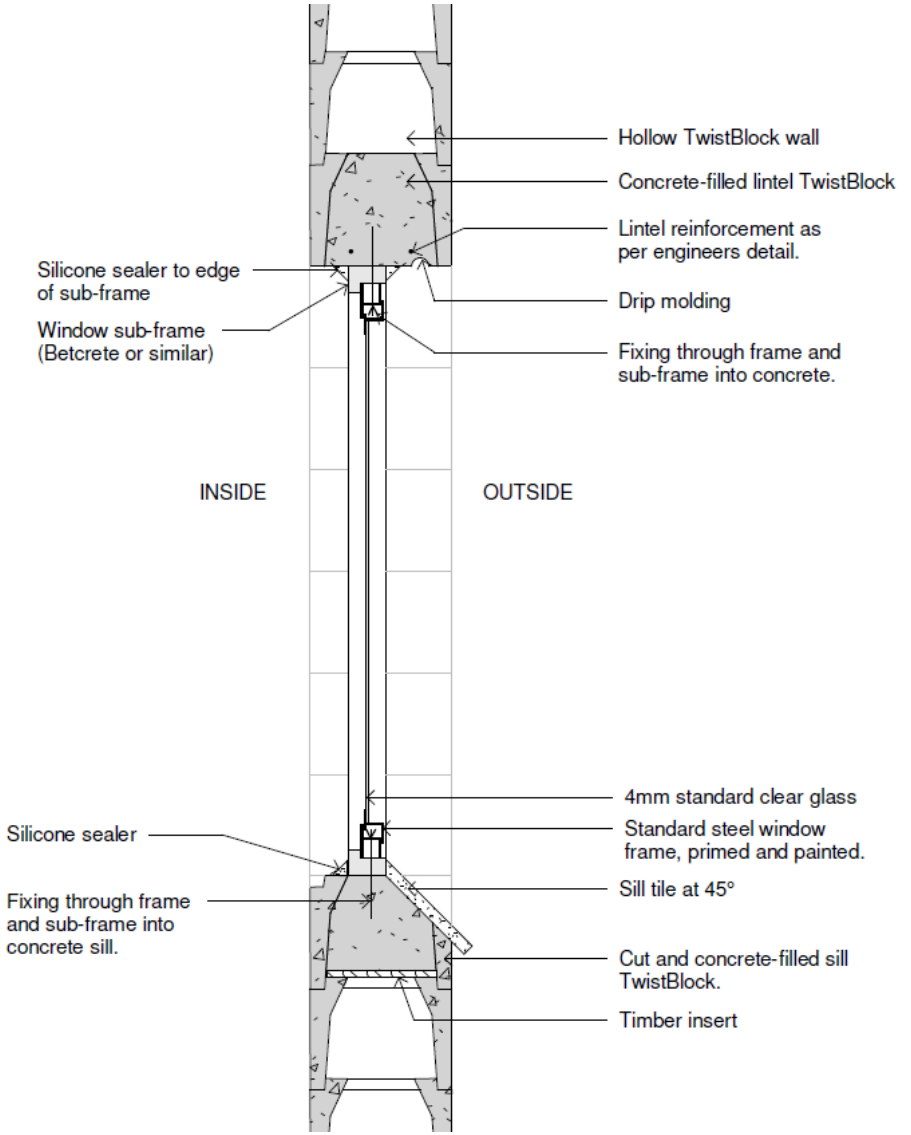
Props supporting the lintels.





Place the cut blocks back in position and insert the lintel / beam reinforcement.

L. Lintels continued



Snapshot from the standard construction details for windows.

M. Ring-beams

Ringbeams are constructed in a similar way to lintels but are continuous and should be installed at the head of every wall. If a floor slab is to be constructed, the ringbeam should happen concurrently.

Refer to steps 21 – 36 of the Start Somewhere TwistBlock Building Manual

1. Cut the route through the ringbeam course for the steel to pass.
2. Use timber inserts for each block to support the concrete. Alternatively, lay a durable plastic sheet under the ringbeam course. Excess can be cut/burned off later.
3. Connect the rebar of the columns, ring-beam and slab as per the engineer's specifications and the TwistBlock standard details.
4. Cast concrete as per standard practices.

Alternative

The ringbeam can also be cast using conventional shuttering methods where timber formwork is built to support the concrete and removed later.

This results in a beam that is visible on the exterior of the building.

See adjacent image.

Plastic sheet strip used as "formwork" to support the concrete during casting.

Visible ringbeam and slab edge when using conventional formwork.

N. Slabs

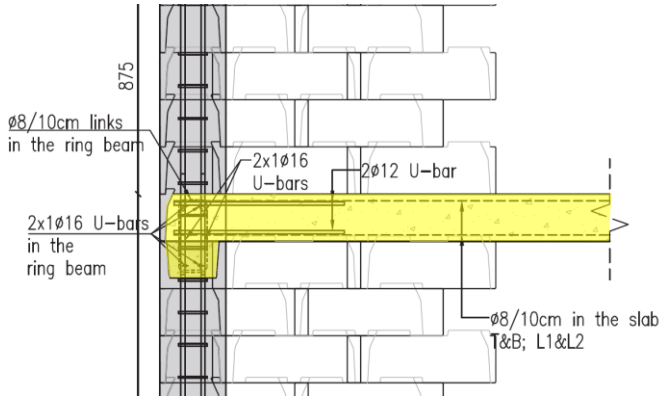
Reinforced concrete slabs are constructed in a similar way to conventional slabs. The TwistBlocks on the external walls are used as a permanent shuttering. Typically, slabs are cast to the full height of a TwistBlock course: 175mm.

Conventional formwork is used to support the underside of the slab and serve as a platform for the assembly of the slab steel.

The slab is generally cast over internal walls. Column rebar should be extended through the slab.

As with the ringbeam, the TwistBlocks around the edge of the slab need to be cut to allow the steel to pass through the wall and connect to the ringbeam steel.

See images on next slide.
Refer to the TwistBlock “Structural Connection Details”



Snapshot from the “Structural Connection Details” showing continuous concrete of the slab and ringbeam, passing through the cut blocks.

(right) TwistBlocks used at a floating beam position as a formwork for the slab edge.

N. Slabs continued

Below: marine shutterply being set up to support the slab.

Right: Steel mesh integrating with the ringbeam over an internal wall.

O. Stairs

Reinforced concrete stairs can be pre-cast or cast in-situ.
It is recommended to create one stair per TwistBlock course, ie. 175mm high risers. Recommended step unit height is 100mm, allowing a 75mm toe gap (see image on next page).

Option 1: Pre-cast stairs

This option is recommended because it saves on curing time and formwork. You can also cast tread and nosing details into the units. The stairs, however, must be built concurrently with the walling.

1. Prepare formwork for the pre-casting of stair units. Include timber inserts to form grip strips and nosing. Remember that the unit will be cast upside down. Lubricate the formwork thoroughly.

2. Insert the reinforcement as indicated by the engineer. Pay attention to the position of the rebar (typically located at the bottom of the stair, therefore placed at the top of the formwork)

3. Cast, cure and remove the formwork for future use.

4. As walling moves up, cut the blocks to allow the insertion of a pre-cast stair units. Ensure the edges of the units are well supported by the walls. Allow the rebar to extend into the wall cavity.

5. Fill the wall cavity with concrete to encapsulate the stair rebar.

Reusable formwork for pre-cast stairs showing rebar and tread inserts.

Right: pre-cast spiral stair being placed in the wall.

Pre-cast spiral staircase in progress.

O. Stairs continued

Option 2: In-situ stairs

This method is suitable when the wall has already been constructed.

1. Mark the stair positions on the wall and cut slots into the TwistBlocks, the height and width of a stair unit.

2. Using paper offcuts, cement bags etc. pack the bottom of the inside of the slots so that concrete will not run down into the wall.

3. Construct shutterply formwork for each stair unit, aligned with the slots.

4. Lay the stair reinforcement in the correct place of the stair, as outlined by the engineer. Ensure the rebar protrudes at least 150mm into the wall cavity.

5. Cast concrete into the formwork, poking it into the wall slot to ensure it fills the wall cavity sufficiently.

6. Allow proper curing time before removing the formwork.

7. Grind down the nose of the stairs to prevent chipping.

Stair slots cut into an existing wall.

Temporary formwork constructed for in-situ stair casting.

In-situ stairs of 175 x 250mm with a 75mm gap.

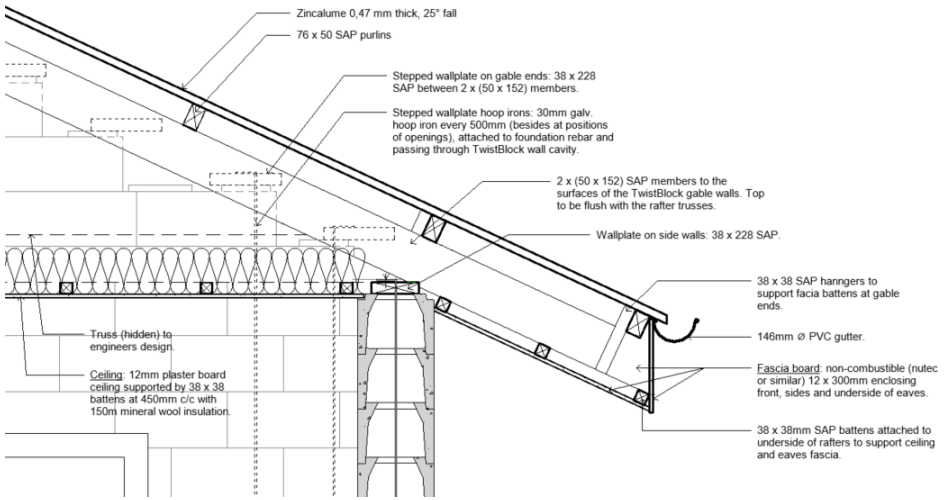
P. Wall plate, gables, roofs, rainwater and finishes

Columns should be continued as usual throughout subsequent floors. A concrete ringbeam at the top of the building acts as a wall plate for attachment of roof members using hoop iron or similar.

Gable walls can be cut at the angle of the roof to allow a snug fit between the roof sheeting and the wall. Blocks that will support roof members should be filled with concrete. In some cases is might be necessary to cast a second, sloped ringbeam.

At the eaves, blocks may be cut to allow the roof members to pass through the wall.

Roofs are constructed as per standard construction processes. Rainwater down pipes can be mounted to the surface of the TwistBlock walls, or in some cases, passed through the TwistBlocks.



Gabled wall with steel purlins extending through the cut blocks.

(right) Example drawing for a timber roof with wall plate connection. (note, no RC ringbeam was used here.)

Q. Cleaning and fixing into walls

Cleaning

TwistBlock walls can be scrubbed with wire brushes to remove any messy concrete. Openings often receive a plaster moulding to neaten up the edges.

Nail Placement

Avoid placing nails in the middle of blocks to prevent cracking. Instead, place nails in the joints where the blocks meet.

Drilling Guidelines

Use a normal drill setting and refrain from using hammer drills or the hammer setting to drill holes, as this could damage the blocks.

Wall Plugs

When using wall plugs for holes, ensure they are the kind specifically designed for dry walls to maintain the integrity of the blocks.

Weight Limitation

The maximum weight for items mounted on the walls should not exceed 10kg to prevent stress on the blocks.

Alternative Mounting

For heavier items or fittings, consider attaching them to the ceiling slab, floor slab, or reinforced concrete columns identified from the building plans provided. This helps distribute weight and minimize stress on the walls.

Thank you for building with us.

Please email us with your feedback so that we may improve this document.

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