

Building Guide in English



Zentrale & Werk:

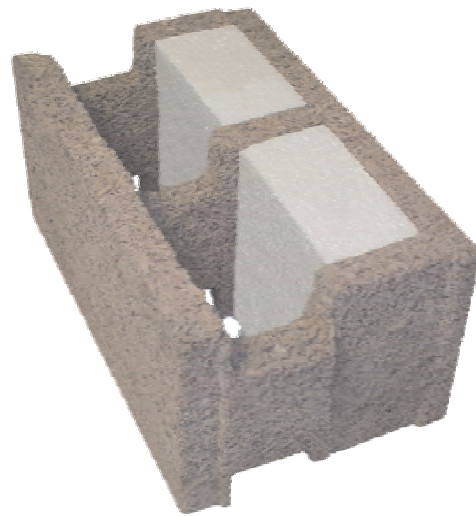
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The Intelligent Building System



The DURISOL modular system offers an appropriate solution for every problem technically perfect and low in cost. Follow the planning and construction guidelines contained in this document to make best use of what the system has to offer.

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Durisol formwork units

Planning guidelines:

DURISOL formwork units are a proven method of construction which enable the inherent robustness of concrete to be utilised for walling in a very cost effective manner. Compliance with the Building Regulations applicable to the part of the UK in which the product is being used should be readily achieved.

Cost Effective Construction with DURISOL walls is guaranteed if the DURISOL modular size is taken into account (i.e. a multiple of 250 mm for lengths and heights of the shell of the building to avoid the need for cutting.) The ground plan grid of 250 mm applies to wall sections in the shell of the buildings.

The height of the walls or the shell clearance between upper edge of ceiling and lower edge of ceiling should be a multiple of the block height of 250 mm plus 10-20 mm height adjustment for the 1st course of units

The range of block types (S,C,F,D) facilitates keeping to the module size and therefore the proper block running bond pattern for all block types. Jambs of windows are purpose-built with face units (F), the soffits of doors with face units (F)

Walls above openings are formed with the usual spans (up to 1.75 m) with half door frame or jamb units (F, cross bulkheads cut out). This gives a lintel height of 250 mm. The length of the wall should be a multiple of 250 mm. For large opening widths whole door frame or jamb units (F) can be used for the same purpose lintel height 500 mm.

All length and height dimensions can be accommodated. If the DURISOL modular size is not taken into account at the planning stage adaptor units will be required to adapt lengths and leveling units to adapt heights. These can be easily cut to size on site by hand.

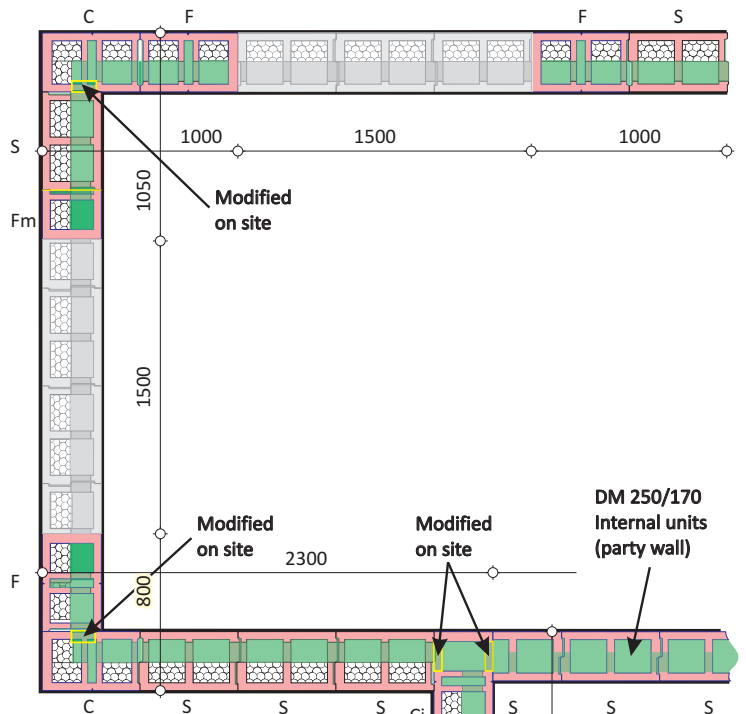
Special units may be manufactured for non-standard details.

The determination of the wall thicknesses required and the appropriate quality of the in-fill concrete for individual types of unit may be determined by structural calculation and the requirements of Building Regulations.

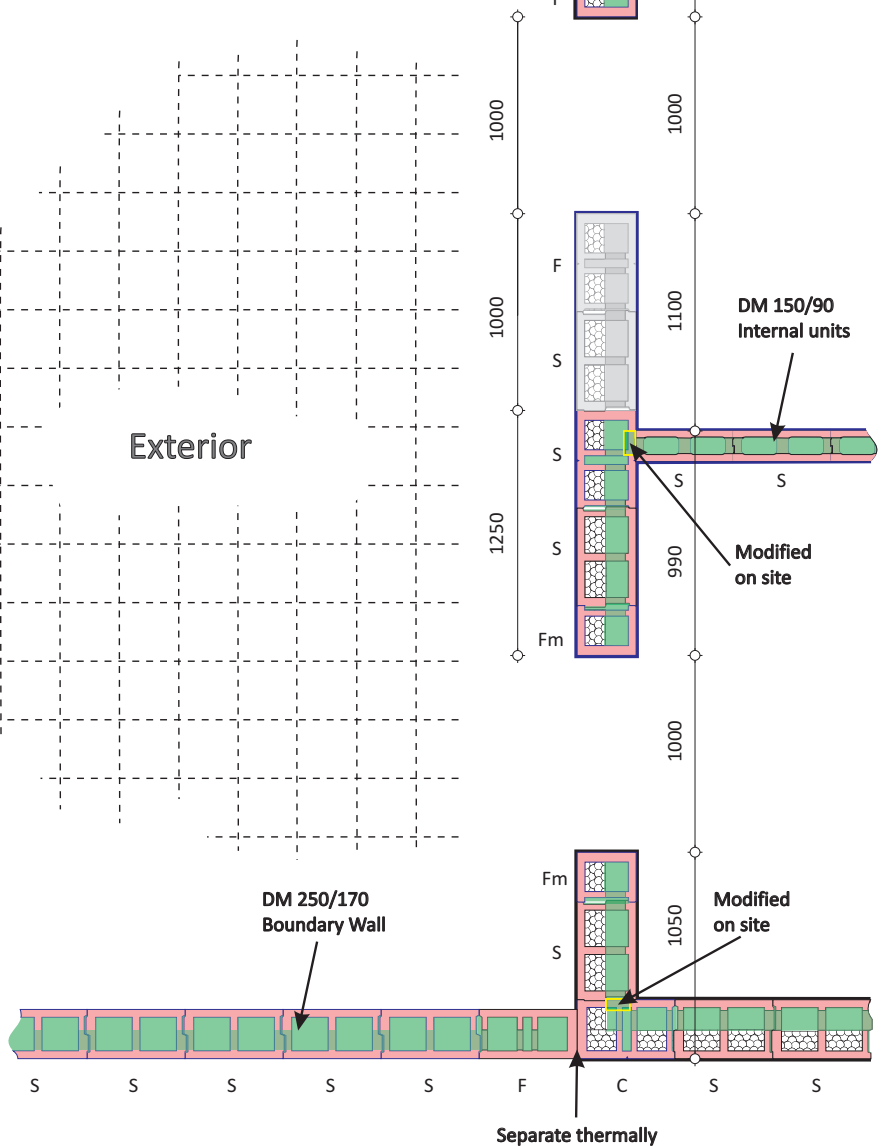
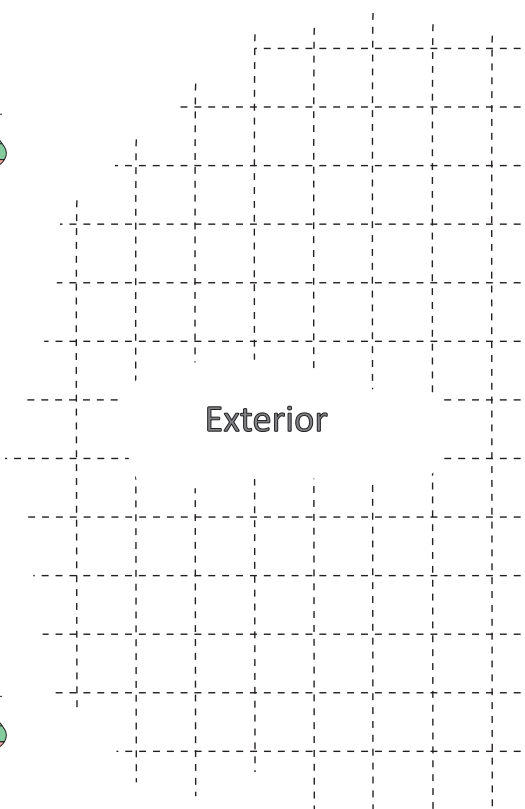
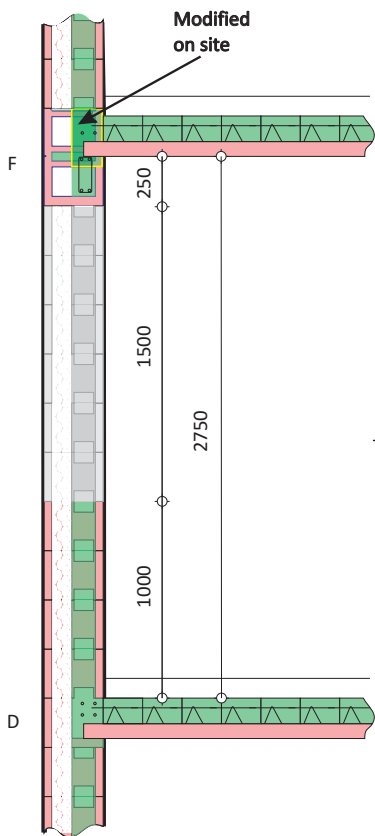
Ground floor modular grid:

Key to units:

- S Standard unit
- C Corner unit (outer)
- Ci Corner unit (inner)
- F Face unit
- Fm Face unit (cut onsite)
- D Deck plate unit
- Dm Deck plate unit (cut onsite)



Section:



Separate thermally

Durisol formwork units

Implementation guidelines:

DURISOL formwork units are supplied to site in packs of units stacked without pallets for crane handling. The packs are supplied according to type and shape of block (S,C,F,D, or special units).

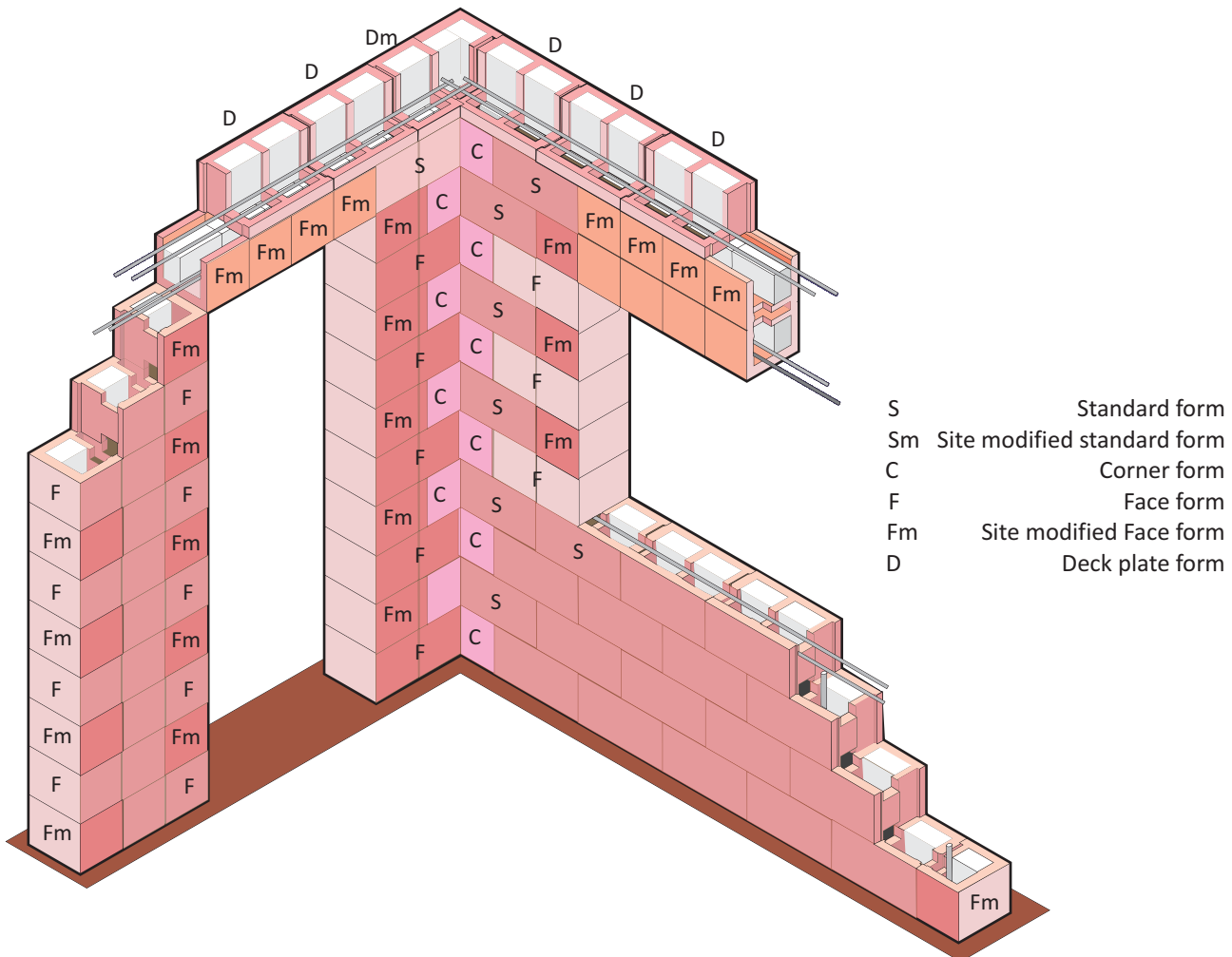
The units are designed to be laid dry in a running bond pattern without joint mortar- and are therefore milled to the same height.

No thermal bridges!

DURISOL walls require a level horizontal base which is provided, if necessary, by using mortar under the first course of units. It is important to ensure that the horizontal alignment is correct!

Important:

The 1st course of units is accurately aligned flush and vertical and laid starting from the corners. Account needs to be taken of window supports and openings so that a block joint or the centre of a block lies in the wall adjoining the opening (see Construction Details). If possible, any adapted pieces required should be provided in the wall above or below the opening. Small corrections to the height of the laid units can be made using wooden wedges.



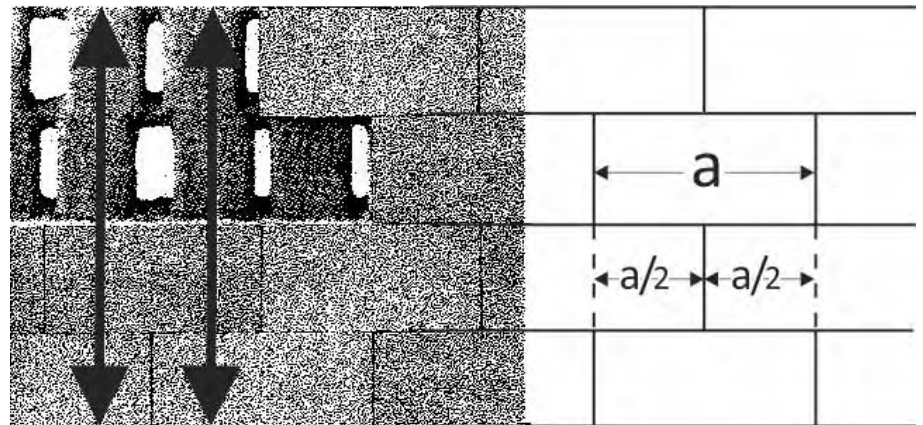
Durisol units

Laying the units:

Bonding Pattern

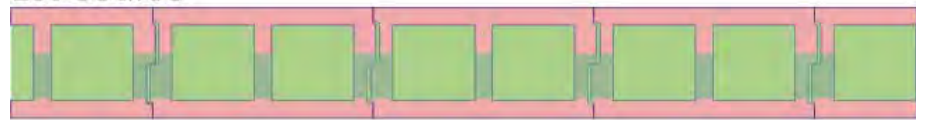
Continuous pattern

The bonding pattern is designed to produce continuous concrete columns within the permanent formwork from floor to ceiling. It is therefore important that the correct bonding pattern is maintained in the wall with the minimum of disruption.



a = form length

1st Course



2nd Course



DURISOL formwork units are laid dry close jointed in a running bond pattern i.e. the cross webs in the middle of the units must be exactly central above the ends of the units of the previous course. The use of units for forming corners and/or jambs ensures that the pattern is kept to (even when forming corners of different thicknesses).

It is particularly important to maintain the correct bonding pattern when forming piers and other elements subjected to heavy loading.

Discontinuous pattern

Piers or wall lengths not corresponding to the Durisol grid (multiples of 250 mm) are constructed using adaptor pieces.

These adaptor pieces need to be installed one above the other with the cut surfaces facing. By avoiding small adaptor pieces (<250 mm) the discontinuous area, and therefore the reduction in load-bearing capacity, can be kept to a minimum.

Staggered pattern

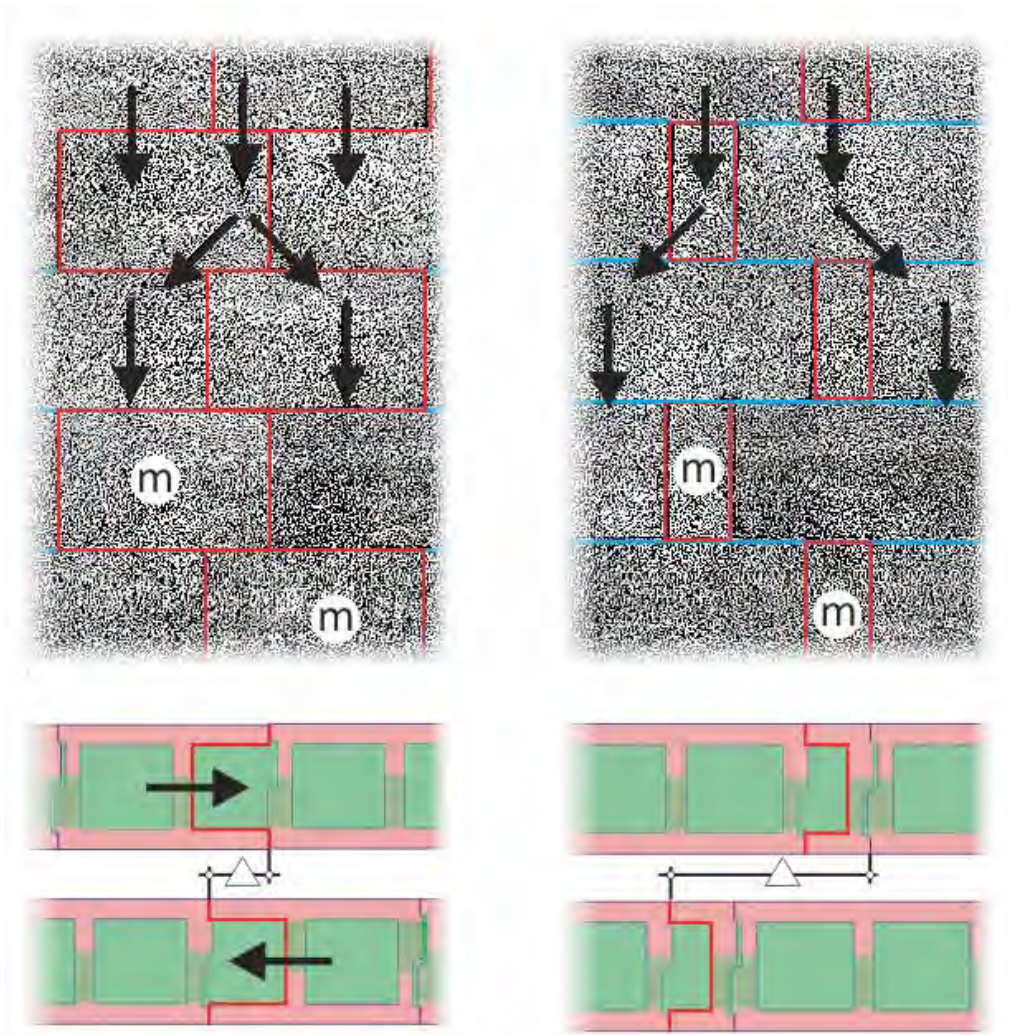
This occurs if an uninterrupted pattern is built up to sill height and then the wall is laid in a staggered manner without keeping to the bonding pattern, giving rise to a reduction in the load-bearing capacity throughout the width of the entire section of walling. This should be avoided at all costs - particularly with highly stressed sections of wall.

Length and height adjusting pieces:

The necessary units may be accurately cut square to size on site using hand saws or circular saws. Length adaptor pieces should generally be arranged below sills or in the centre of wall sections. Height adaptor pieces (leveling units) are best installed as the penultimate course beneath the ceiling.

An essential rule is that the individual wall parts (e.g. external walls) can be constructed closed i.e. intersecting walls are butt-jointed and may not penetrate the continuous body of the wall (see construction details for increased sound insulation). The structural connection is made via the concrete core by cutting out the side wall of the units forming the continuous wall section.

Where there are different wall thicknesses in the longitudinal direction of the wall (e.g. for recesses for radiators) the two wall sections are butt-ended (cut block walls for lateral connection of the concrete core - if necessary insert reinforcement).



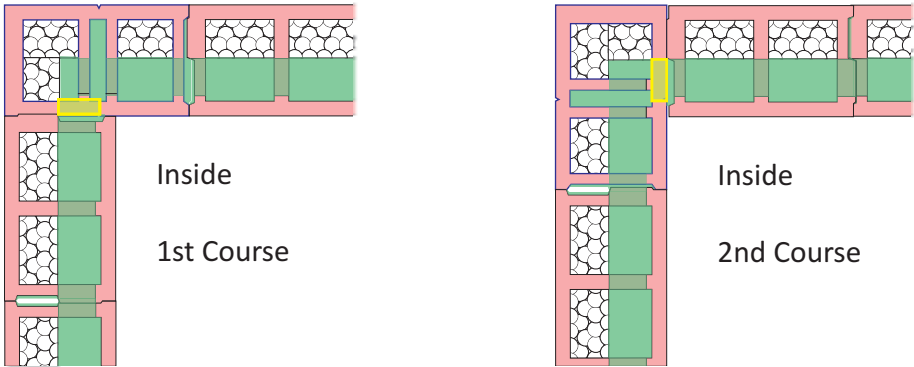
Large adaptor piece
Small area of disruption

Small adaptor piece
Large area of disruption

Corner patterns outside edges
(same wall thickness):

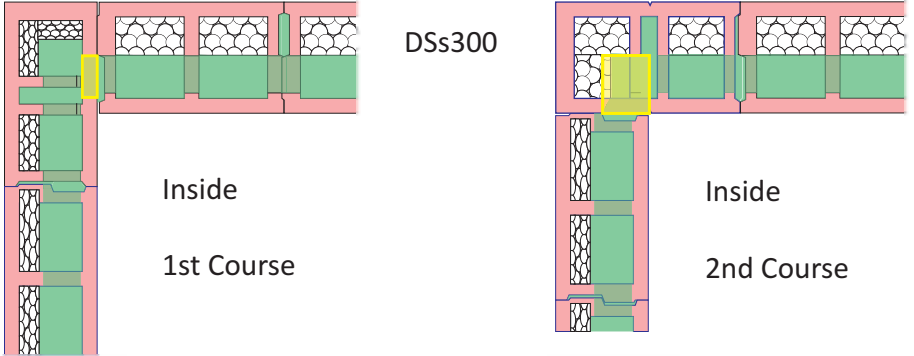
Wall corners are implemented using the appropriate block units (C, Ci)

DSs 250/120, DSs 300/120 and DSs365/120



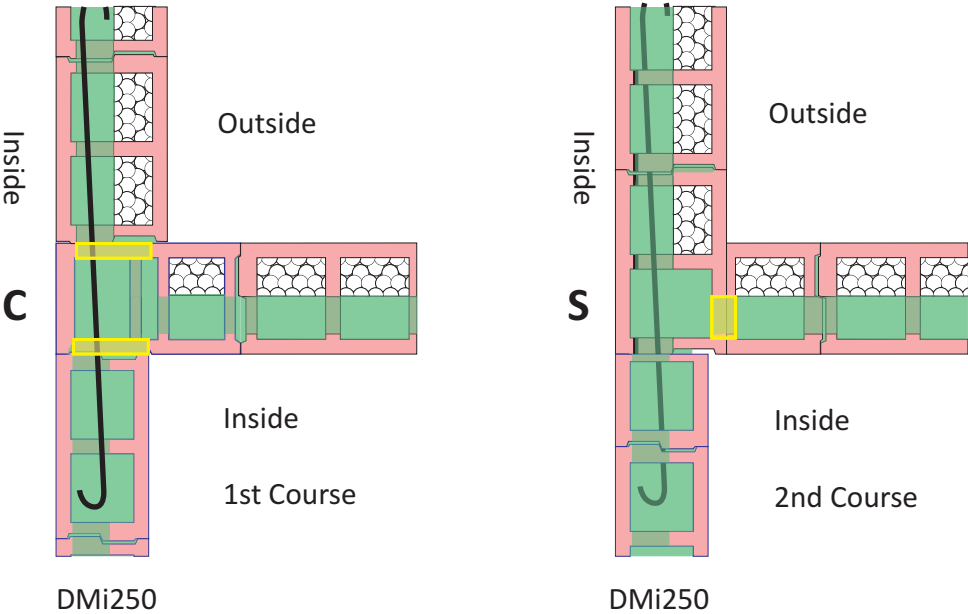
Outer corners DSs 250/120 to DSs 300/120

Different wall thickness



Corner patterns of outer walls is continuous.

Inner corners DSs 250/120, DSs 300/120 and DSs365

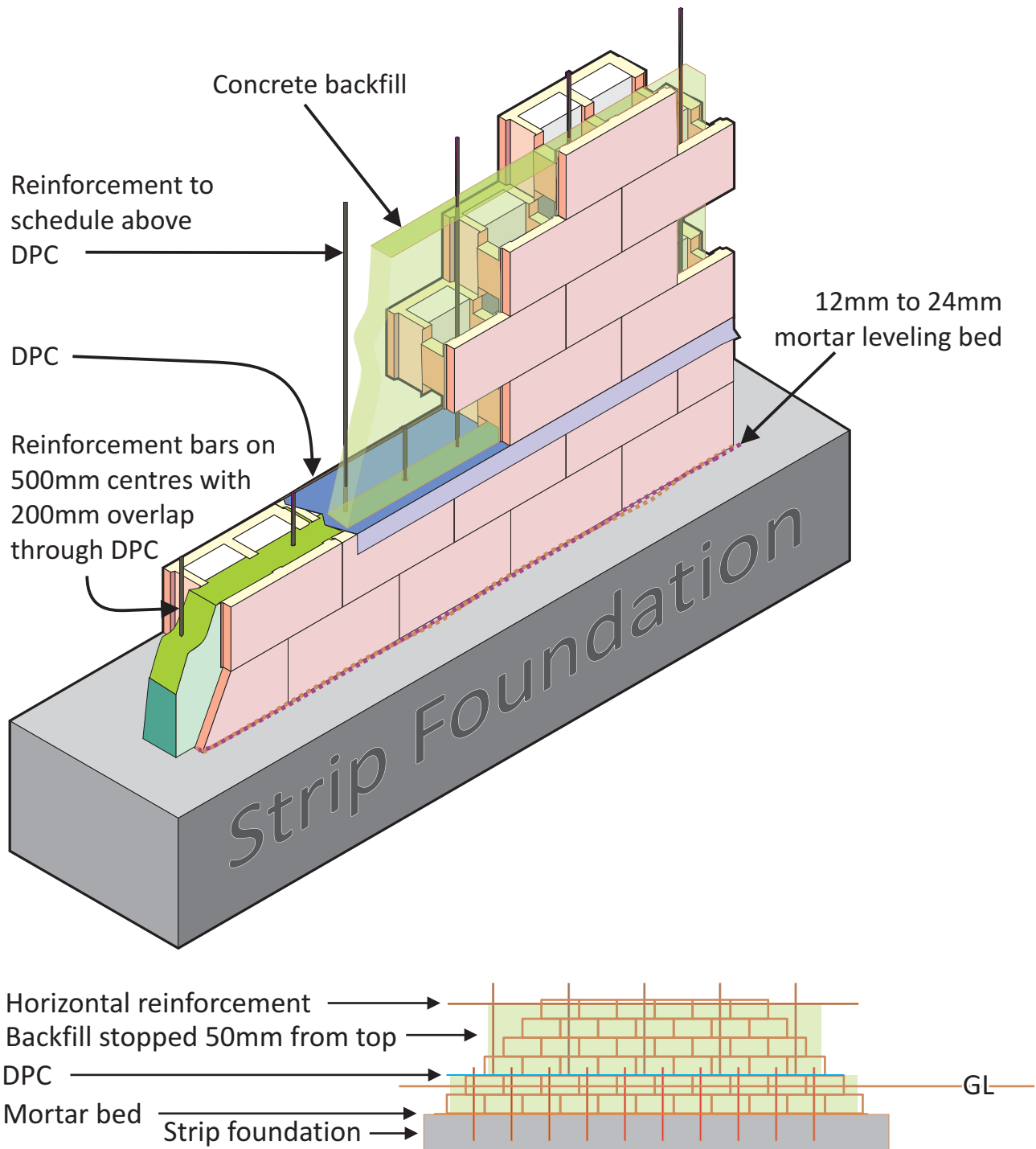


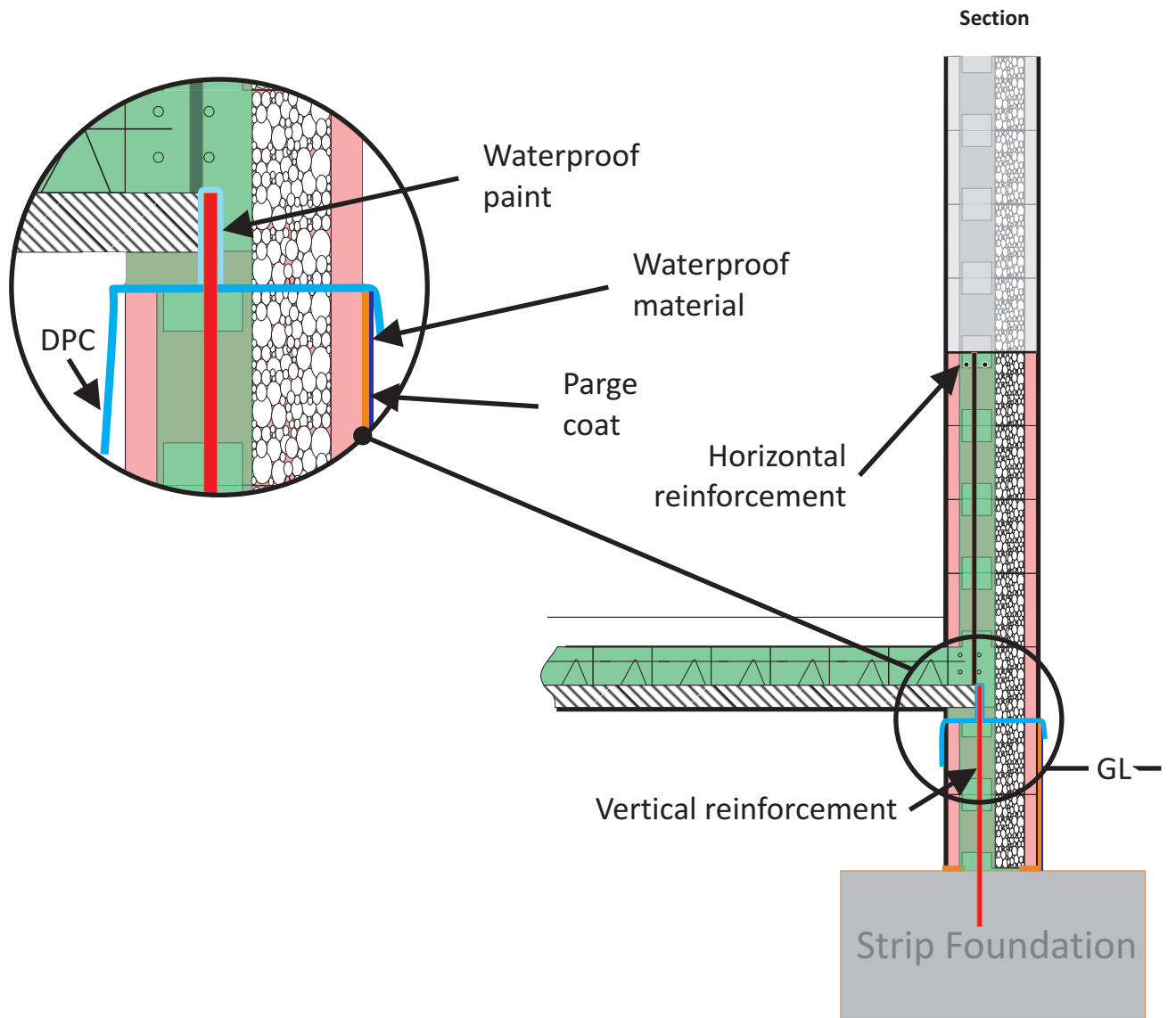
Durisol formwork units:

Construction details

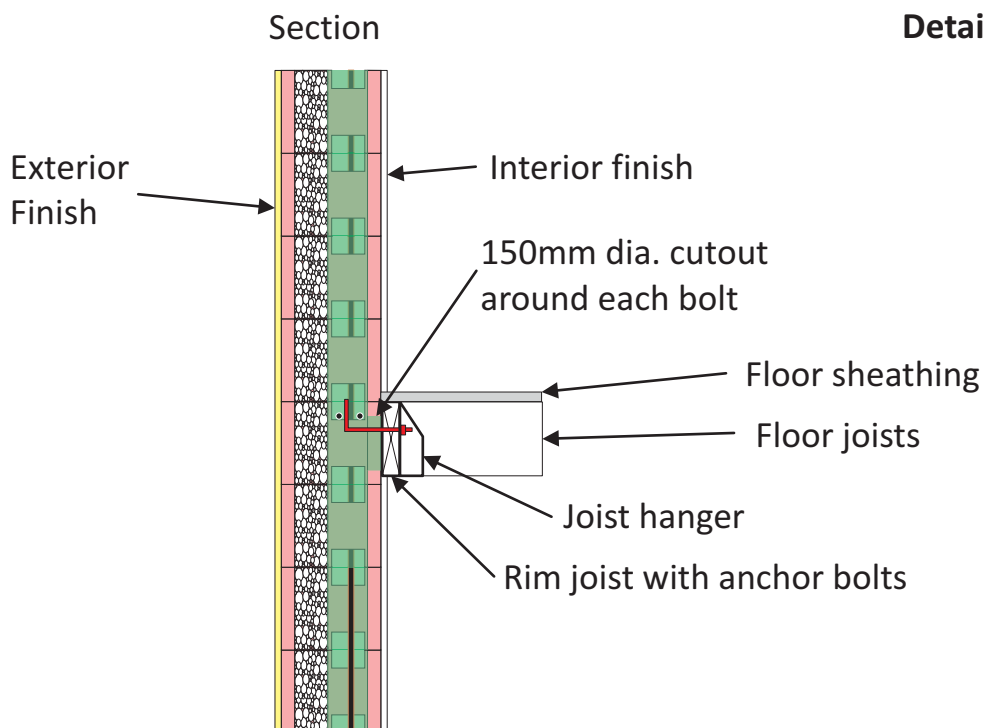
Foundations & DPC

Foundations for a Durisol building are the same as concrete walls constructed using conventional techniques. In the event that site conditions demand step footings, it is recommended that vertical steps of 250mm are used to match the height of Durisol units. The backfill should be brought level to the top of the units forming the below ground level element of the wall to ensure that the DPC can be effectively applied. Where reinforcement tails need to run through the DPC they should be coated with a suitable waterproofing paint. When proofing the vertical face of the units an inexpensive parge coat is recommended to make a sound and solid surface for the application of a damp proofing material.





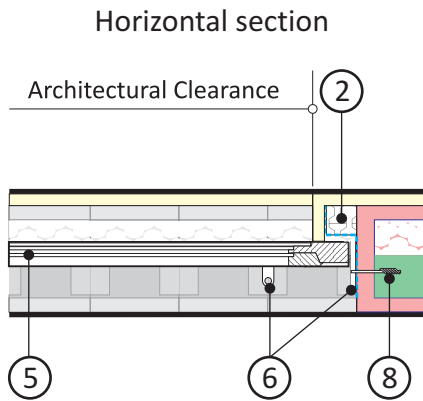
Detail showing joist fixing



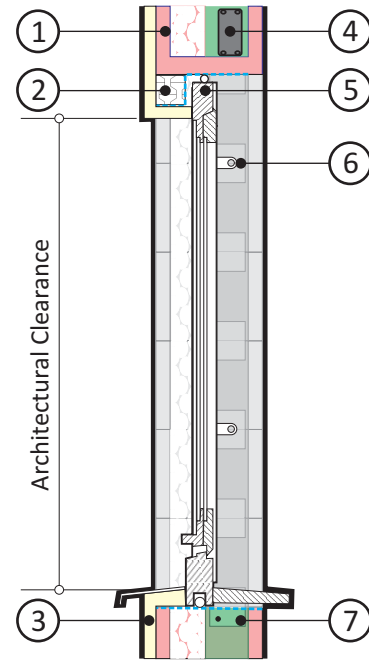
Durisol formwork units: Construction details

Window openings

The walls and lintels around window openings are preferably formed using face units (F, Fm). For equal distribution of loads, steel reinforcement of at least 2 No. 10 mm diameter bars (or the equivalent) should be provided in the layer of units beneath window openings. This reinforcement should be fully covered by concrete and installed to continue at least 750 mm into the adjoining wall - or better still - be continuous within the cast wall. The window frame should be fastened into the concrete core using a suitable fixing. For normal windows 2 or 3 fastenings into the wall on each side and 1 fastening beneath and above the window will be adequate.



Vertical section



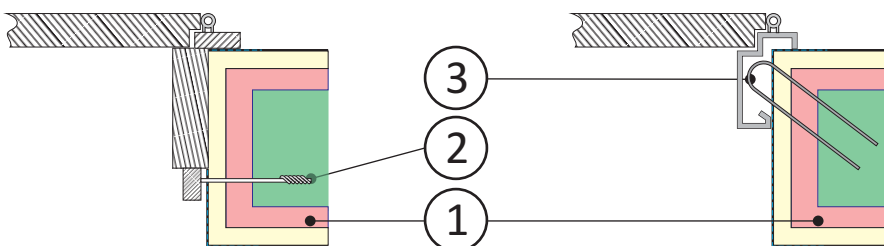
- ① Face unit modified on site
- ② Additional insulation baton
- ③ Exterior finish
- ④ Lintel reinforcement
- ⑤ Window frame
- ⑥ Flat strap
- ⑦ Fixing

Door openings

The piers and lintels of door openings are formed using face units (F, Fm). The fastening of the door frame must be made into the concrete core e.g. using suitable fixings or a tie wire loop embedded in the concrete.

Post

Upright frame



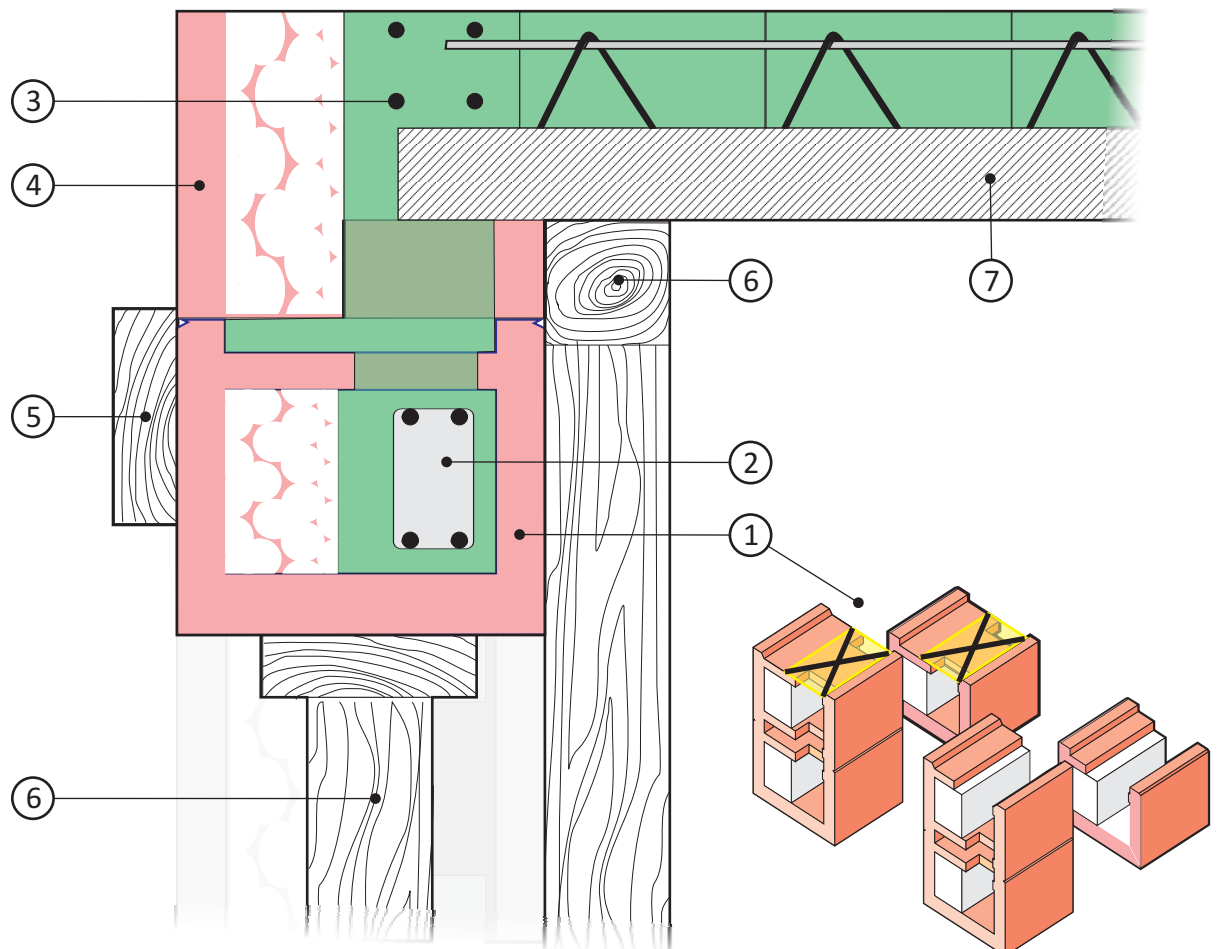
- ① Face unit
- ② Fixing
- ③ Wire loop

Walls above openings, forming lintels

The construction of window and door lintels is usually carried out using face units (F). The units are cut to size on the building site.

The lintel units should be arranged according to the width of the opening and supported by formwork to prevent movement of the units during filling and maintain the correct alignment. For wider openings deeper lintels may be required for structural reasons and these may be formed from whole face units (F, Fm). To achieve this the middle and end units will need to be cut out on site. (See 1 below)

Lintels may also be formed using prefabricated DURISOL lintel units which come in lengths of 0.75, 1.00, 1.25, 1.50 and 1.57 m, or if required, 150 to 500 mm high in every DURISOL block type, when pre-ordered. Further details on page 20 to 21.



- | | |
|------------------------------|----------------------------|
| ① Face unit modified on site | ⑤ Supporting formwork |
| ② Lintel reinforcement | ⑥ Supporting formwork |
| ③ Ring beam | ⑦ Prefabricated deck panel |
| ④ Deck plate unit | |

Floors

All current units of floor structure can be used with DURISOL walls. Floors should be supported along the entire width of the concrete.

The appropriate provision of thermal insulation for the floor is important.

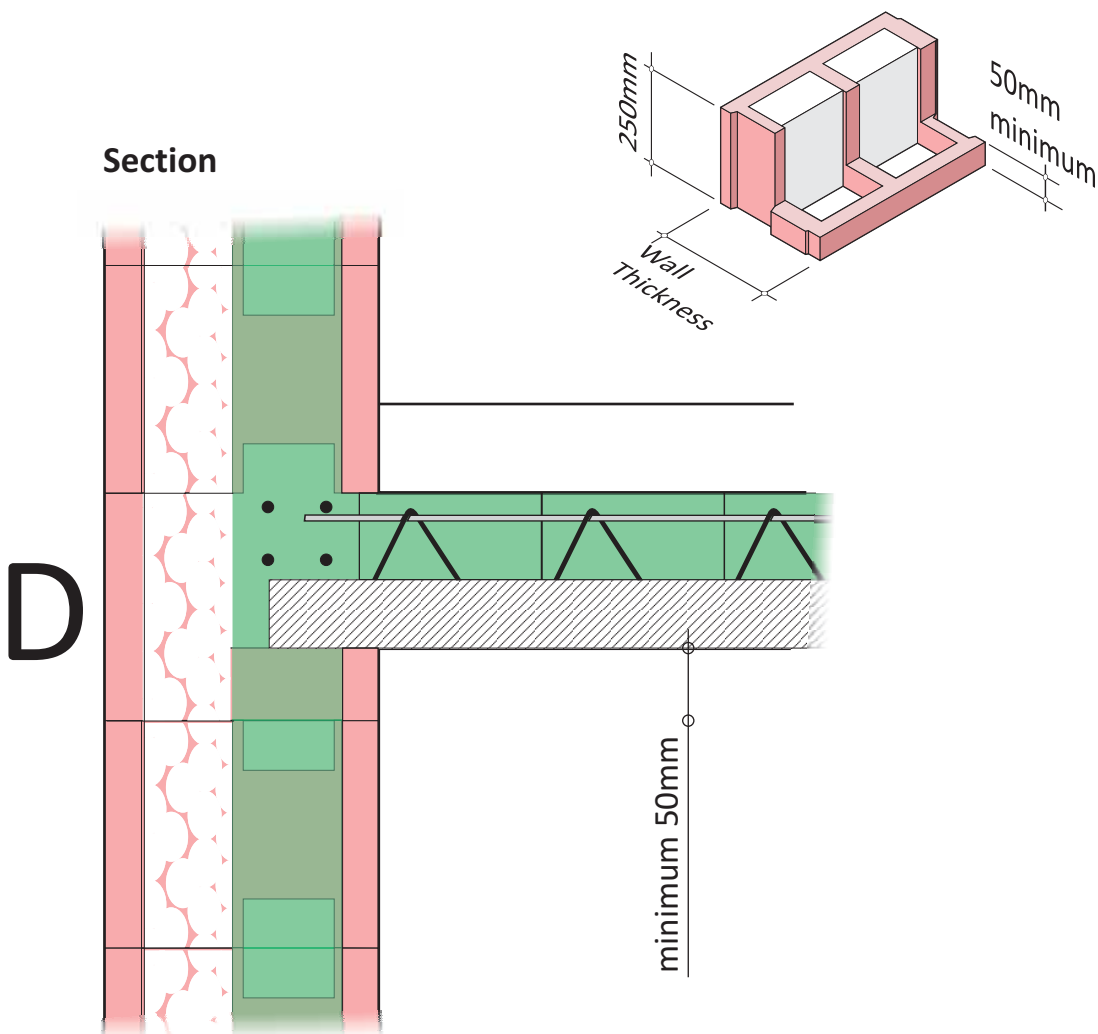
This may be achieved in the following way:

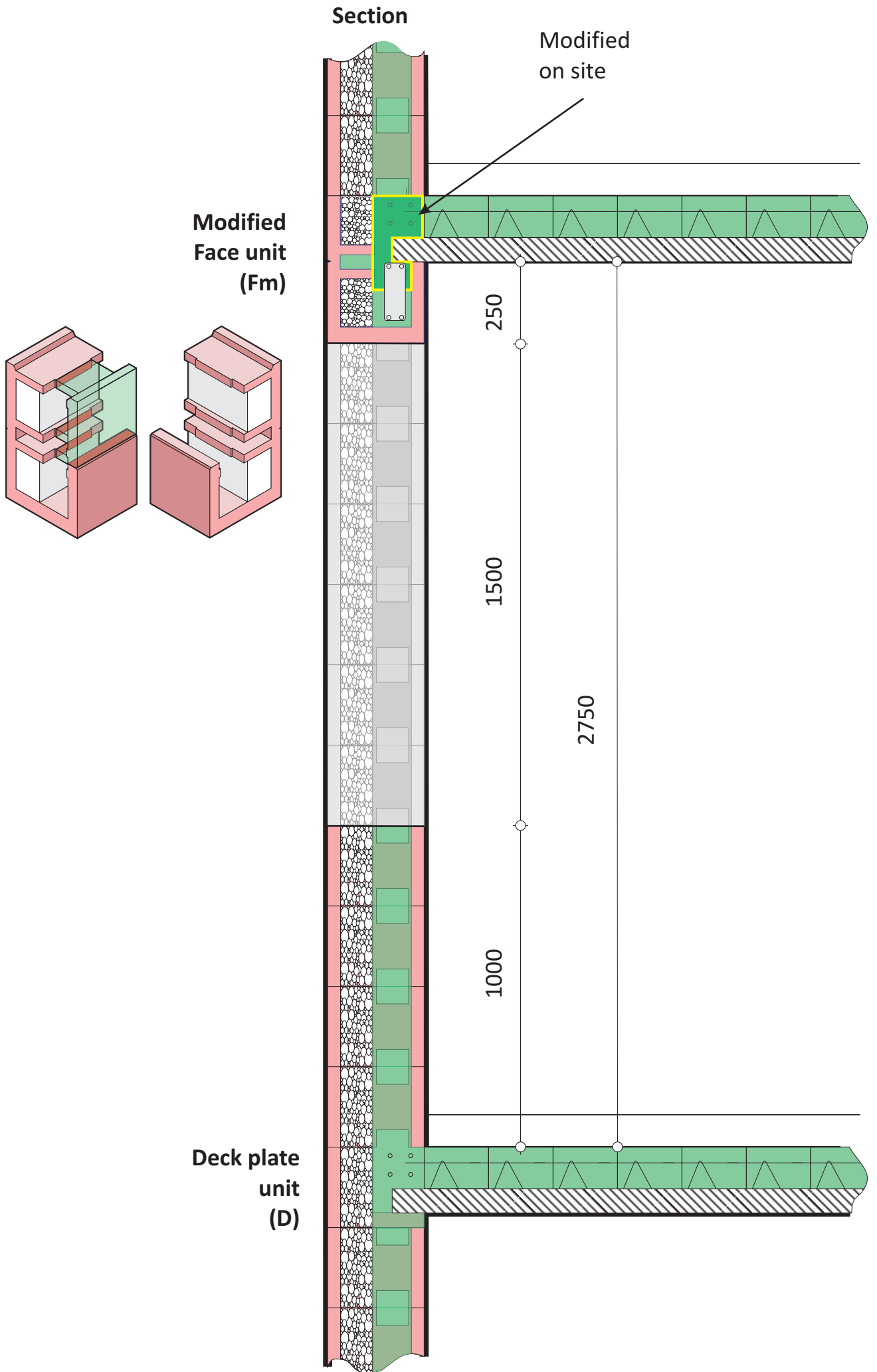
-For floor thicknesses up to 200 mm:

- DURISOL floor grid units DR, used with the relevant type of formwork block chosen for the wall design. When pre-ordered they are supplied in the floor thickness specified

-For floor thicknesses greater than 200 mm:

- DURISOL insulating boards Di or multi-layered insulating boards
- DIS, which are cut to the necessary height on the building site.





Durisol construction details for increased sound insulation

Increased sound insulation in housing requires increased care and attention to planning and construction, particularly for party (separating) walls.

These recommendations are based on Durisol's 50 years of experience supported by test data and expert opinion.

The following points should be noted:

- Construction of monolithic floors under or over the house party wall
- Massive ceiling grids under or over the house party wall
- No chimneys or shafts in association with house party walls
- Avoid openings in walls and cable apertures through the party wall
- Slots for wiring should be restricted to the thickness of the Durisol material and should not weaken the concrete
- Socket outlets (even for TV aerials) should not be located opposite each other in the wall
- Plastering, mostly soft and not very thick, to avoid resonance effects.

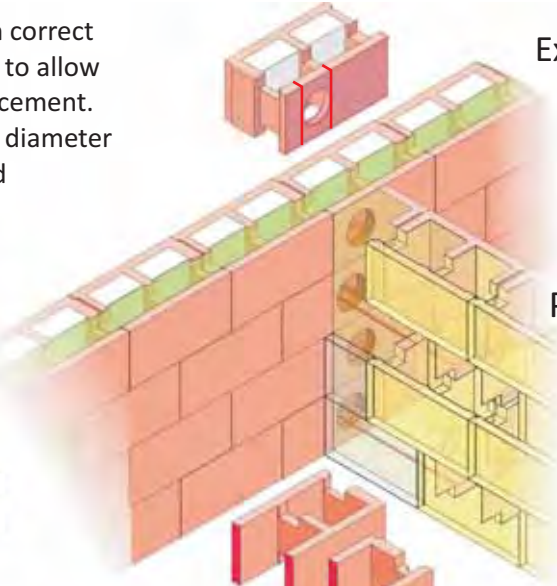
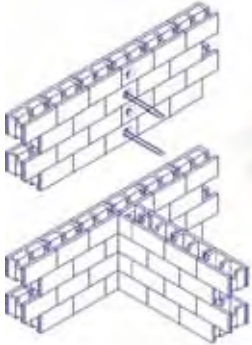
When constructing Durisol walls with increased sound insulation take special care to ensure that:

- The block running bond pattern is adhered to
- The open butt joints are tightly formed
- The connection of house party walls DMI 25/18 (or DSi 30/20) to external walls or monolithic floors takes place in every course of units where they adjoin i.e. beams and partitions of Durisol formwork units in the connection area are cut to full block height. This is irrespective of whether the connection is to the modular size or using small or large cut pieces.
- The connections of interior walls to the house party walls DMI 25/18 (or DSi 30/20) should be done flexibly using felt, mineral wool, EMFA strips or as otherwise specified.
- The consistency of the concrete should be such that it adheres well to the block (maximum aggregate size 16 mm).
- The compaction of the concrete using full depth poker vibrators (maximum diameter 40 mm) should be carried out carefully so that all cavities are fully filled.

Sound performance will also be influenced by factors such as the weight of the ceiling, the way the floors are constructed and the susceptibility to impact.

Connecting internal party walls to external walls

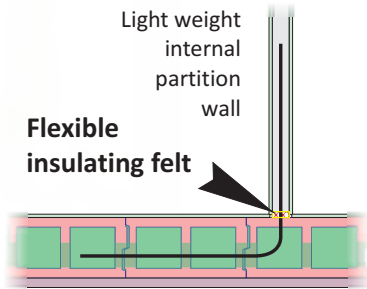
External wall units modified to maintain correct flow of concrete and to allow placement of reinforcement. A 100mm to 140mm diameter hole saw can be used



External wall DSs

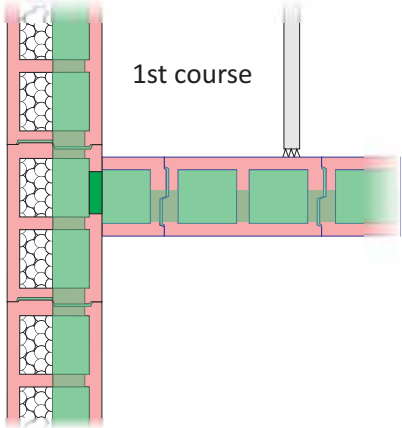
Party wall

Internal wall units modified to maintain modular grid and correct bond pattern

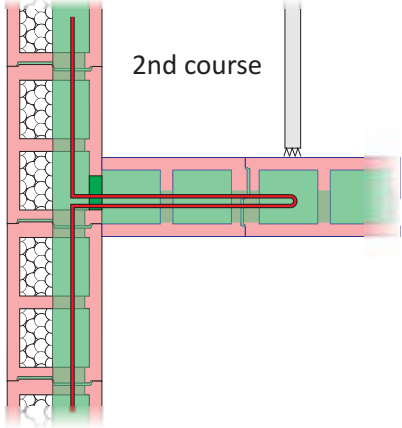


Party wall

Connection maintaining modular size

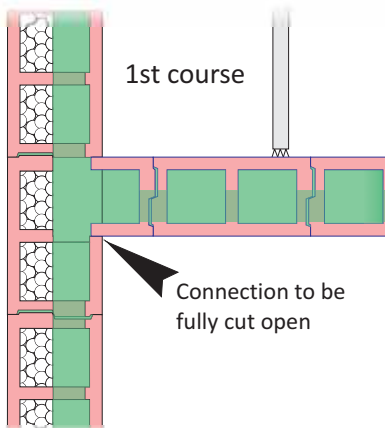


1st course



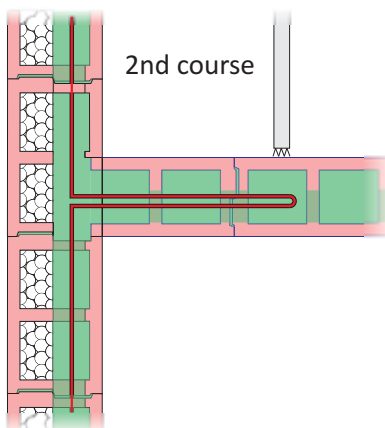
2nd course

Connection non-modular size



1st course

Connection to be fully cut open



2nd course

Durisol formwork units: Placing the concrete

The concrete used to infill the DURISOL units for the structural wall that supports the structural loads.

Concrete specification

Concrete should be specified in accordance with BS EN 206.

Minimum specification for unreinforced walls

Compressive strength class	C20/25
Maximum w/c ratio	0,70
Minimum cement/combination content	280 kg/m ³
Cement or combination types	CEM I, IIA, IIB, IIIA, IIIB, IVB
Maximum aggregate size	10mm
Chloride class	Cl, 1,0
Consistence	S3
Additional requirements	Pumpable

Minimum specification for reinforced walls

Compressive strength class	C25/30
Maximum w/c ratio	0,65
Minimum cement/combination content	300 kg/m ³
Cement or combination types	CEM I, IIA, IIB, IIIA
Maximum aggregate size	10mm
Chloride class	Cl, 0.40
Consistence	S4
Additional requirements	Pumpable

The concrete cover required to any reinforcement should be assessed in accordance with BS 8500. Most buildings are likely to fall into exposure class XC1 or XC3. For class XC1 the C20/25 concrete requires a nominal cover of 25mm. For XC3/4 the C25/30 concrete requires a nominal cover of 45mm.

Consistency

The consistency of the backfill concrete mix should be such that the concrete sticks to the whole surface of the units when it is compacted. Aggregates rich in fine particles are preferred with respect to the bond between the concrete and the units.

The slump class of the concrete must be at least S3 (130mm) for compaction using internal vibrators, or at least S4 (190mm) if not compacted by means of a vibrator.

Placing the concrete

When filling with concrete proceed with care so that the concrete can penetrate into all the cavities formed by the formwork block without bleeding.

The concrete may be placed using a concrete pump, a crane bucket with a small outlet aperture or by hand using hoppers to feed the concrete.

Pouring by means of a crane bucket or hopper should be done after every four layers of units are laid. The top course should be filled to half the block height. Exceeding the 1.0 m level (4 layers of units) may lead to excessive bleeding.

If poured using a concrete pump the flow volume will usually need to be regulated by a reducer or elbows as to reduce the pressure exerted on the permanent formwork during placing. If filling a full storey height please contact the DURISOL office for more advice.

Once placed the concrete should be carefully compacted by rodding or the use of a small diameter internal vibrator (maximum diameter 40 mm). Where the wall contains embedded metal which relies upon the concrete for protection against corrosion the concrete should be compacted using an internal vibrator.

Avoid construction joints in which the concrete within a storey height is not to be placed whilst adjoining layers of concrete are still fresh.

Unavoidable construction joints should be secured using bar reinforcement. The bars must penetrate at least 200 mm each into the adjacent concrete cores. The spacing of the bars should not be greater than 500 mm, the overall cross section must be at least 1/2000 of the cross sectional area of the concrete section to be connected. A minimum of two 6mm diameter bars should be used per metre of wall length.

Plastering

Plastering should be carried out in accordance with the requirements of BS EN 13914-2 Design, preparation and application of external rendering and internal plastering Part 2: Design considerations and essential principles for internal plastering.

External rendering should be carried out in accordance with the requirements of BS EN 13914-1 Design, preparation and application of external rendering and internal plastering Part 1: External rendering.

In addition the following guidance is provided:

- on the basis of the latest knowledge
- on the basis of the guidance provided by the manufacturers of premixed mortars
- on the basis of experience in practice
- in collaboration with the manufacturers of premixed mortars, manufacturers of building materials and suppliers of premixed mortars.

Notes on the application table:

In the table various internal and external plaster types are shown together with the notes on their application.

These notes are generally applicable to average situations and are based on long years of practical experience and the results of laboratory tests on test walls.

A prerequisite for obtaining the appropriate plaster quality, e.g. being free of damaging cracks, is that wall and ceiling building materials should have standard characteristics, that the shell walls and ceilings should have been manufactured according to the relevant standards and that these application guidelines for factory produced mortars have been adhered to.

Special climatic or building conditions are outside of the scope of these recommendations.

Application Table D

Plaster application with substrate made from:

Cement bonded wood chip units with or without integral additional insulation

	Internal plaster as one coat plaster	
Type of plaster		Pre-treatment of plaster base and/or additional steps
Gypsum plaster (floated coat) Gypsum lime plaster (floated coat, mineral finish plaster) Lime gypsum plaster (mineral finish plaster, floated coat) Gypsum light plaster (floated coat) Gypsum heat insulation plaster (floated coat, mineral finish plaster) Lime plaster (mineral finish plaster)		No pre-treatment required
	Internal plaster as multi-layered plaster	
Undercoat plaster	Finish plaster	Pre-treatment of base and/or additional measures
Lime cement plaster ¹ (sanded, cut, butted) lime cement light first coat plaster (sanded, butted)	Fine plaster containing gypsum or made of gypsum Lime cement plaster Lime cement finishing coat	No pre-treatment required
Lime cement heat insulation plaster Perlite (sanded, cut) Lime cement heat insulation plaster EPS (sanded, cut)	Lime plaster Silicate plaster ² Artificial resin plaster ³ Silicone resin plaster ⁴	Depending on the plaster product it may be necessary: Cement pre-spray At least 2 weeks between coats Note manufacturer's guidance.
	External plasters	
Undercoat plaster	Finish coat	Pre-treatment of rendering base or additional measures
Lime cement plaster (sanded, cut, butted)		Cement pre-spray At least 2 weeks between coats
Lime cement light basic plaster (sanded, butted)	Lime cement plaster Lime cement finishing coat Silicate plaster ⁵ Artificial resin plaster ⁶	Pre-treatment not required ⁸ Only fixed alkali resistant glass cloth ⁹
Lime cement heat insulation plaster Perlite (sanded, cut) Lime cement heat insulation plaster EPS (sanded cut)	Silicon resin plaster ⁷	May be necessary depending on plaster product Cement pre-spray At least 2 weeks between coats Manufacturer's details to be noted. Only fixed alkali resistant glass cloth recommended
	Special plasters Note	

¹ May be used on very good conditions e.g. weak and evenly absorbent base, with few different plaster thicknesses and even, full walling joints, also as once coat plaster

² Finish plasters, as silicate or silicon hard plasters, require an intermediate layer and always a primer on heat insulation plasters and on coarse lime cement plasters

³ Finish plasters, as artificial resin plasters, require an intermediate layer and always a primer on coarse lime cement plasters. They are not recommended for use on lime cement heat insulation plasters

⁴ Same as 2

⁵ Same as 2

⁶ Same as 3

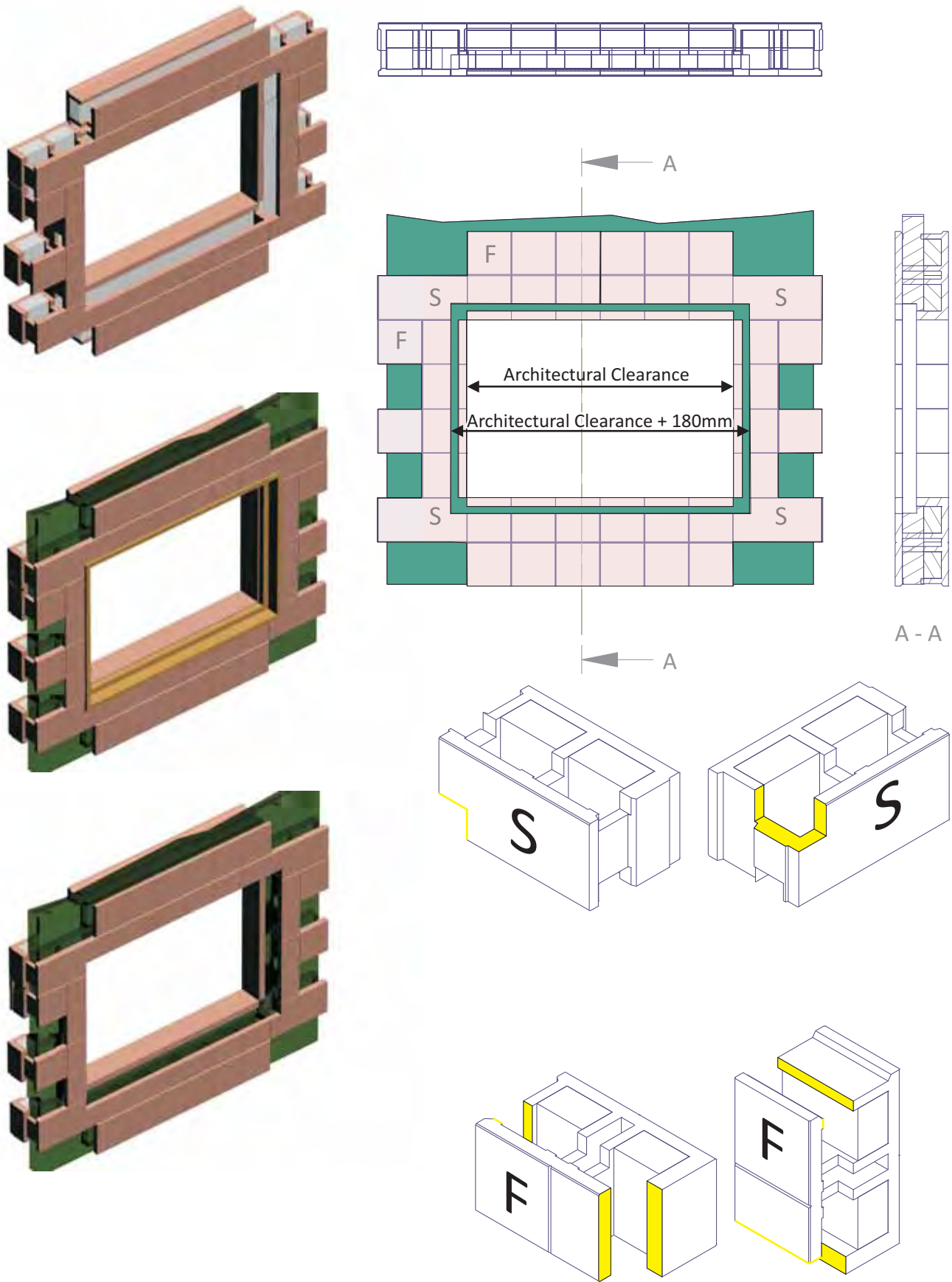
⁷ Same as 2

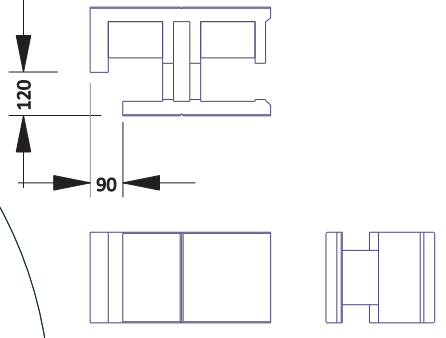
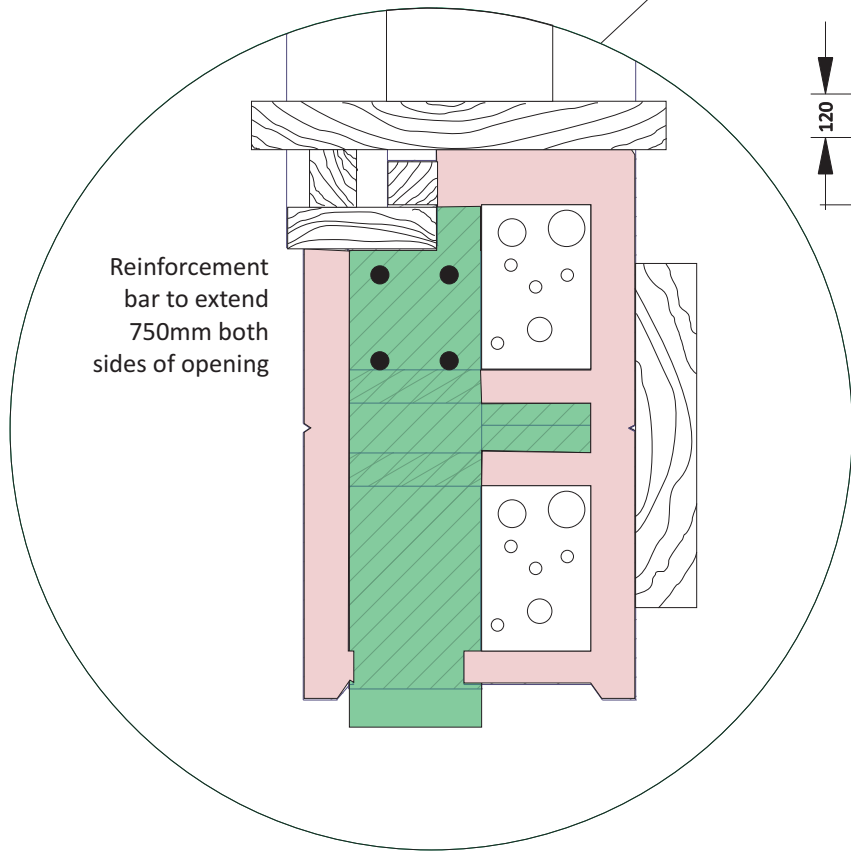
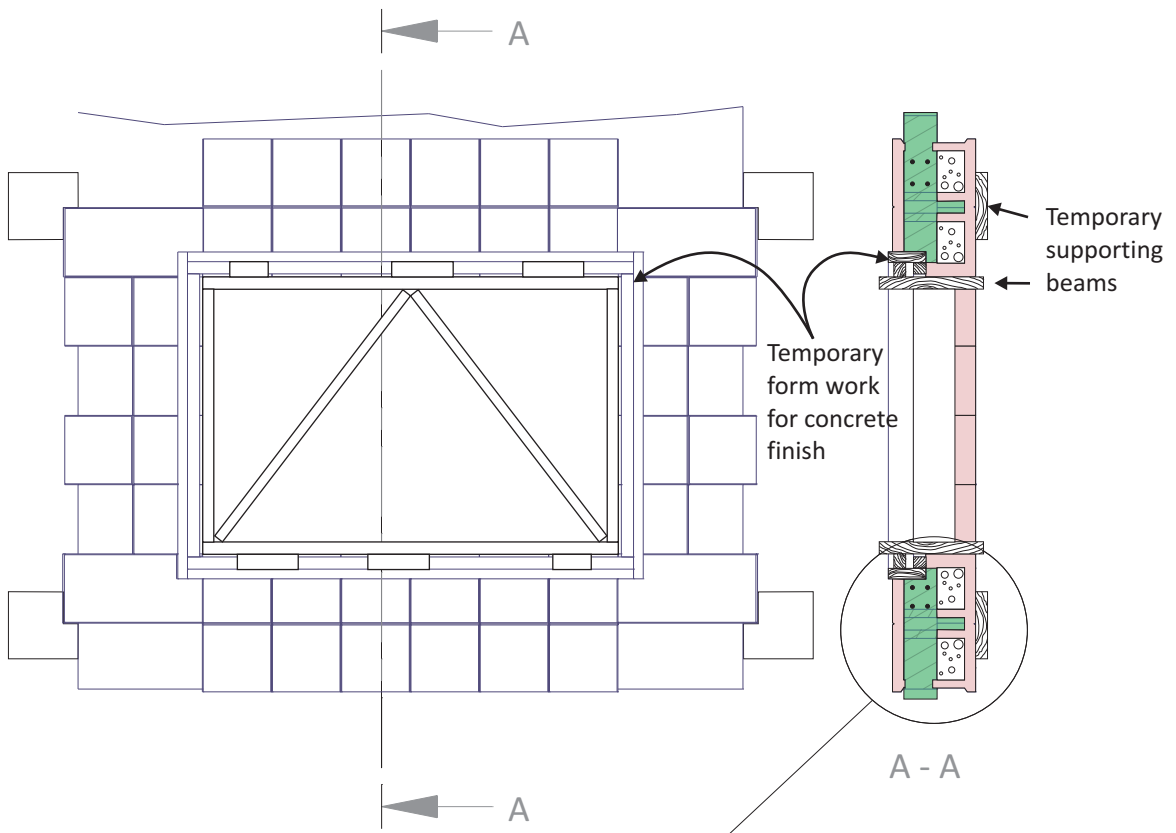
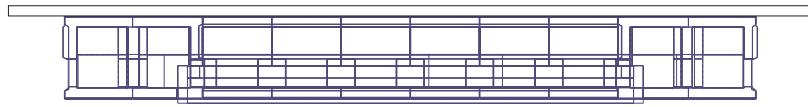
⁸ For manual processing cement, pre-spraying is necessary

⁹ For wood chip units without integral additional insulation alkali resistant glass cloth is not required

Modification for providing cast concrete lip to openings

To produce a 40mm x 40mm cast lip to openings





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