Durisol (UK) Ltd
Technical Manual and Build Guide

November 2019 (Revision 2)

Contents

Introduction

British manufactured Durisol woodcrete wall forms are the simple and sustainable alternative to cavity masonry, brick and block, block and block and timber-frame construction. Whether you are a self-builder, a professional property developer or a social housing provider the system offers an easy, cost-effective and thermally efficient way to build.

The Durisol Wall System is a proven method of constructing modular insulated concrete walls with over 60 years of in-place experience. It is based on simple interlocking wall form units that are made from the unique Durisol material. Durisol is a proprietary material that is composed of only natural materials; specially recycled wood chips and Portland cement. Durisol does not use polystyrene, foams, plastics or other potentially detrimental materials in the manufacture of the products.

The wood chips are mineralized and bonded under pressure with Portland cement. The resulting lightweight, open-textured product is highly durable, non-combustible and resistant to insects and rot. Durisol is the original woodcrete ICF (insulated Concrete Form). The units were introduced to the UK in 2005 having been successfully used in build projects across mainland Europe for over 60 years.

The woodcrete ICF wall form units are quick and easy to construct. The pre-insulated interlocking units are dry stacked together to form the walls. They are then in-filled with concrete to form a monolithic structural walling system. Unlike other ICFs, there is no need to prop the walls during construction as the weight of the units holds them in place.

All of the wall form units are manufactured in South Wales from recycled cement-bonded treated wood fibre material. The finished units are thermally insulating, non-combustible, durable and sound absorptive. They can be used for a wide variety of builds from simple home extensions, one-off new builds and basement projects through to housing developments and commercial buildings.

Disclaimer

The advice, suggestions, statements and structural detail in this building guide are based on Durisol's best building knowledge worldwide. All information is provided for advice only and is not to be taken as exclusive. They do not override any building codes.

Durisol UK has no control over installation, workmanship, inspection, building conditions or applications and can therefore not be held responsible for this.

Structures built with Durisol wall forms should be designed and constructed in accordance with applicable building codes. Durisol material is not designed to carry any structural load other than temporary concrete pressures that occur during construction. The structural concrete within the Durisol walling unit after erection and pouring is designed to be the structural element of the wall system.

This document is non-specific to any particular type of build and is to be taken as general advice only.

Supporting Documentation:

This document should be read in conjunction with the current British Board of Agrément Certificate, the European Technical Approval document and the current suite of standard detail drawings, all of which are available from Durisol upon request.

1. The Durisol Components

The Durisol family of units is very simple and comprises four basic types. These are D170, D250, D300 and D365 Units. The number defines the thickness of the wall that such a unit will form. For example, the D170 Unit is 170mm thick. All the unit types are 500mm long and 250mm tall.

From left to right the D365, D300, D250 and D170 Units

The D300 and D365 units are insulated and intended to be used to form the external walls of a building. The D170 is for internal walls and the D250 with a thicker core is intended to form party walls between dwellings where acoustic separation is required.

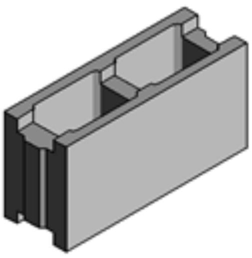
The units come in different derivatives of the original types as explained below.

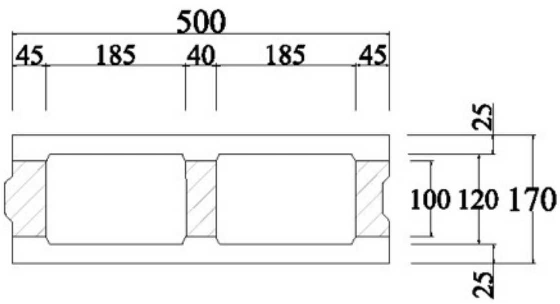
Dimensions and Types

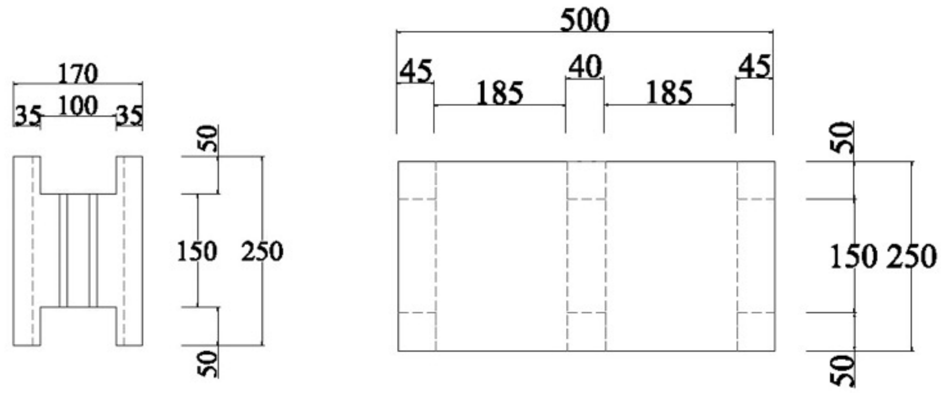
D170 Standard and Face unit

The D170 unit is primarily used as internal structural wall or for un-insulated garages etc. It comes as a standard or face unit.

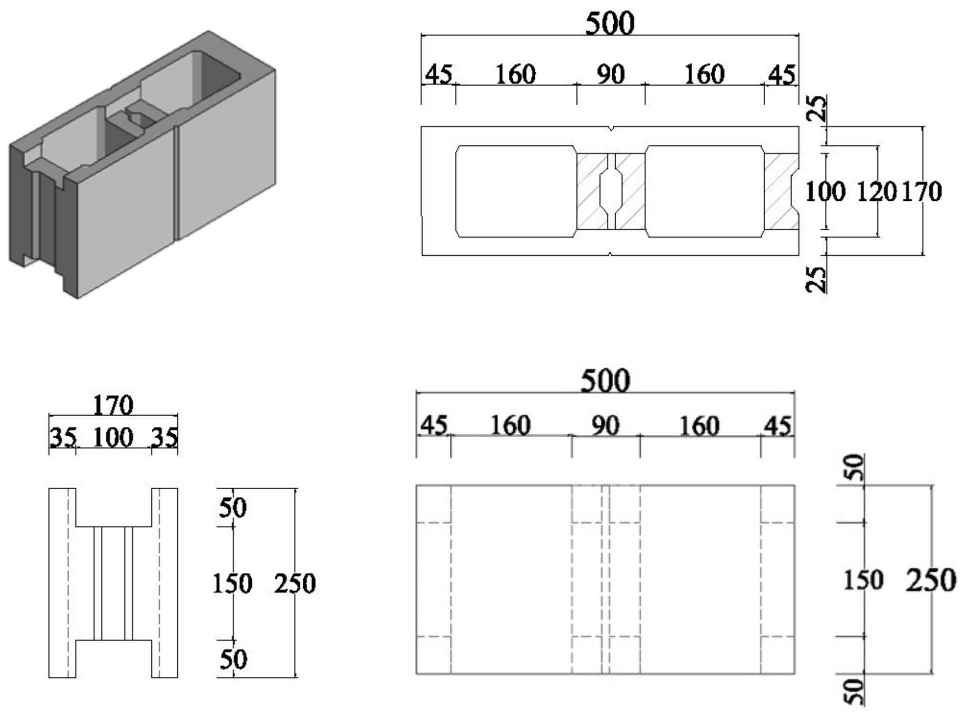
D170 Standard Unit:







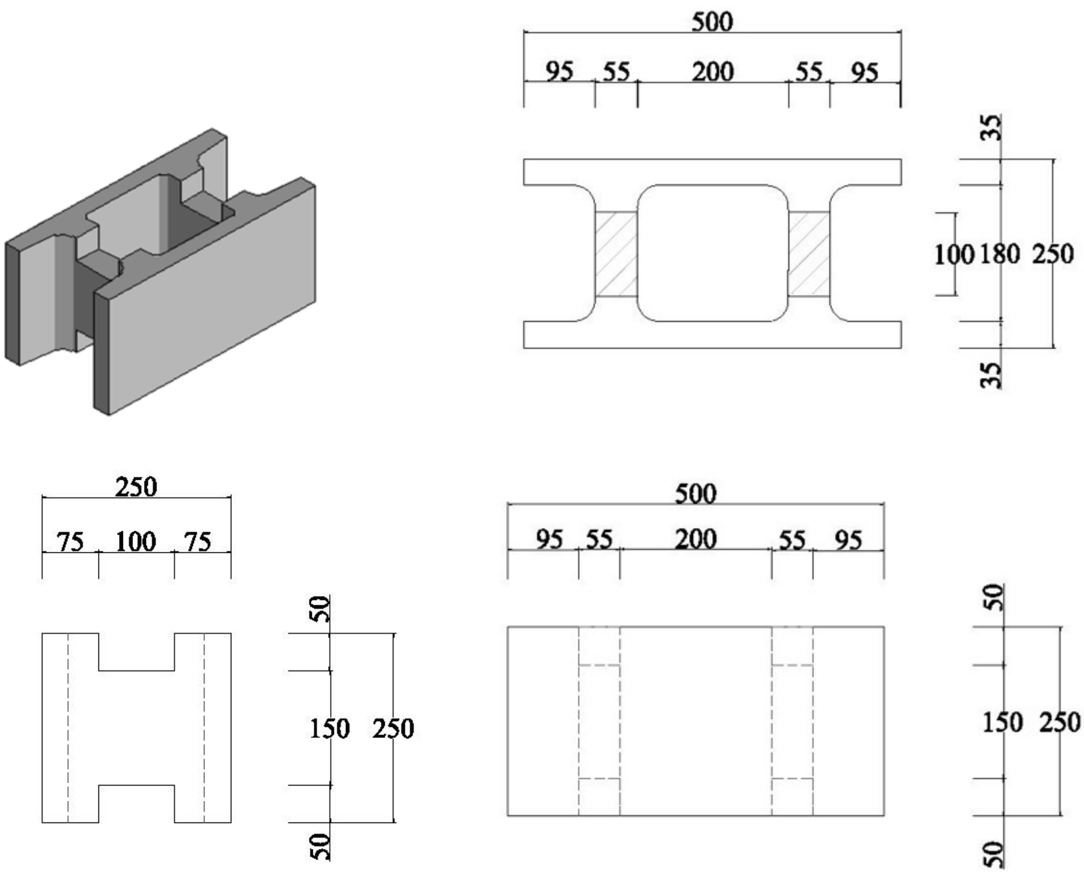
D170 Face Unit



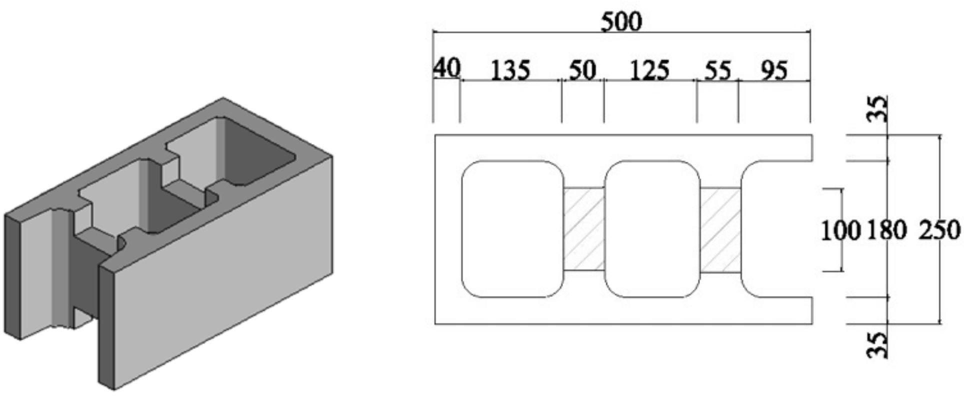
D250 Standard and Face Unit

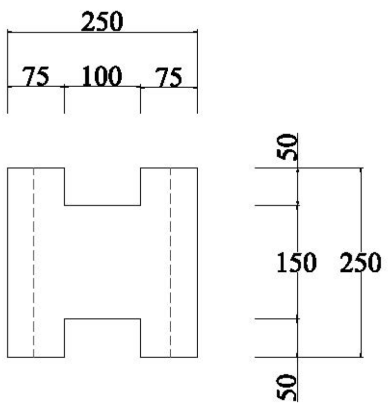
The D250 unit is primarily used for party walls or retaining wall construction. It comes as a standard or face unit.

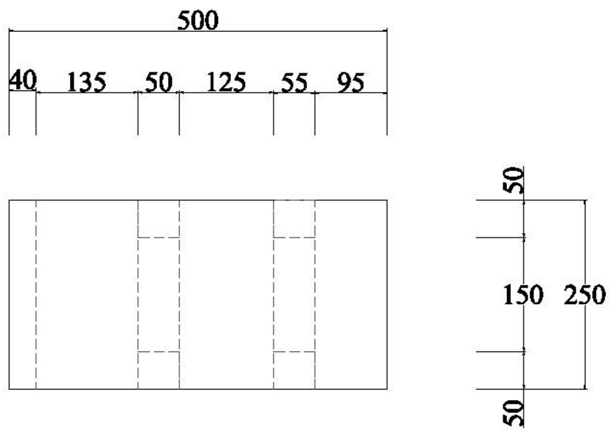
D250 Standard Unit:



D250 Face Unit



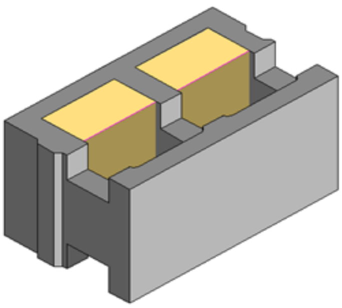
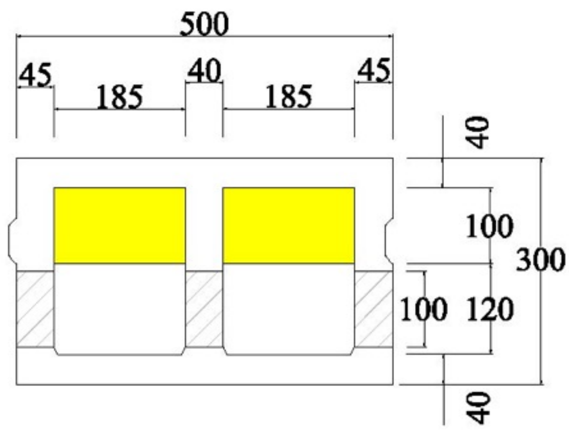


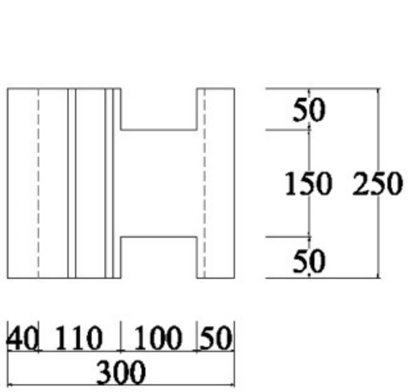


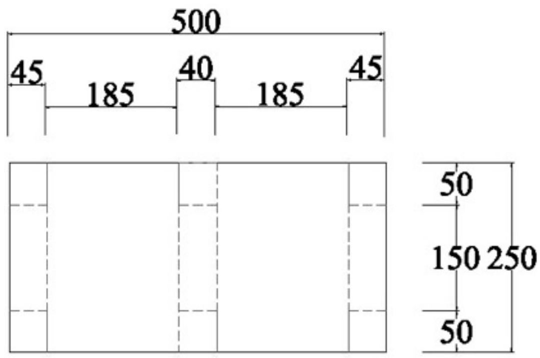
D300 Standard, Face and Corner unit

The D300 unit is the smaller of the two insulated units and it comes as a standard, face or corner unit. It is used primarily to form the external envelope of a structure. The yellow zones in the diagrams signify the insulation.

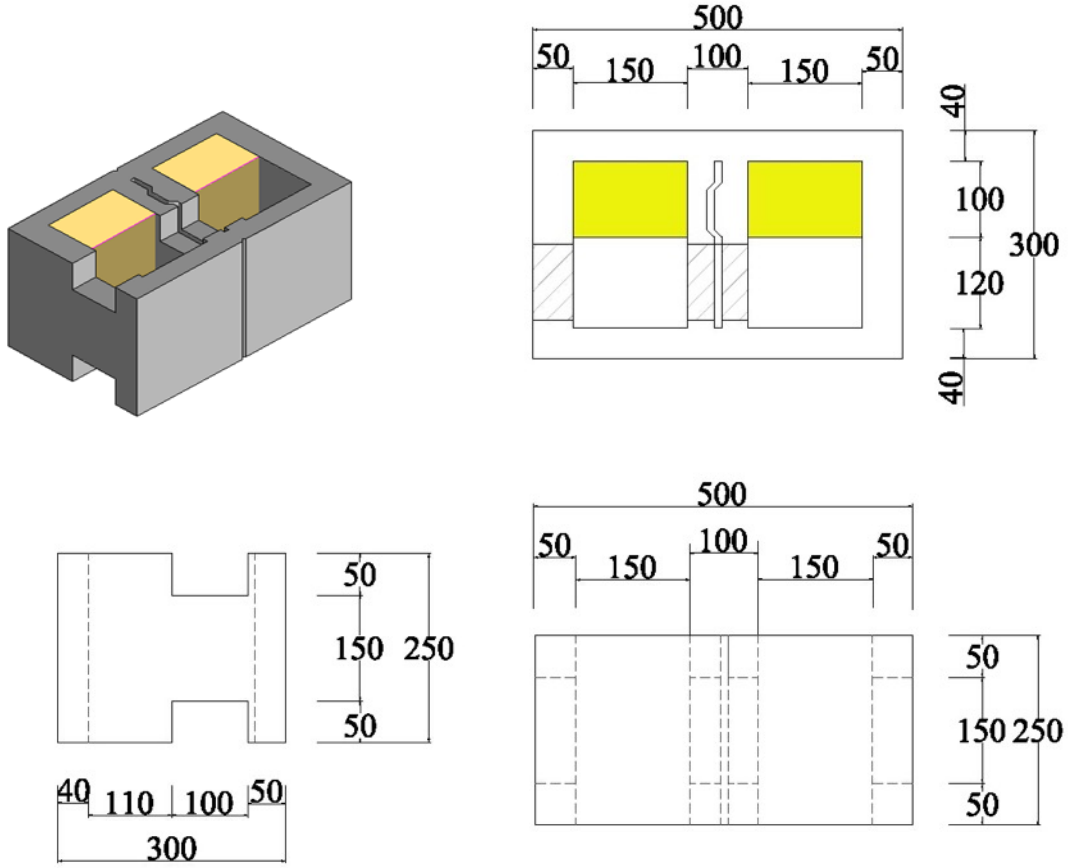
<u>D300 Standard Unit:</u>

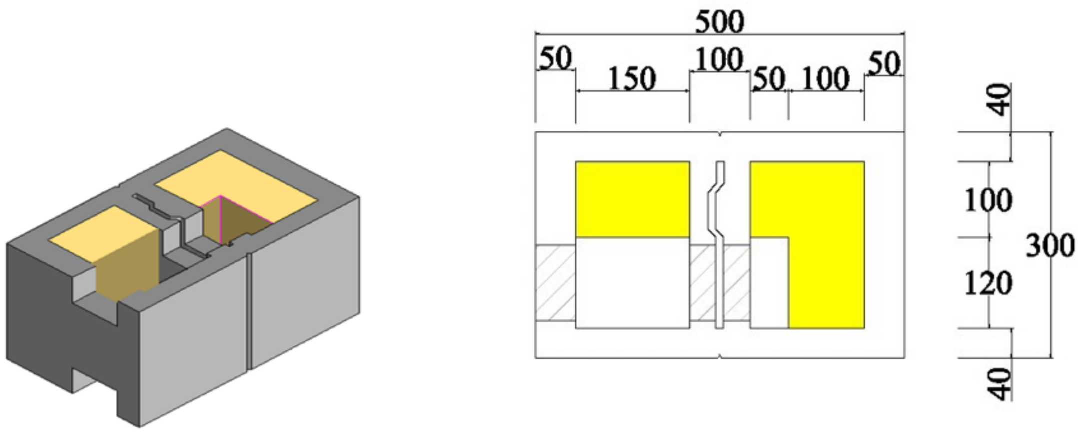


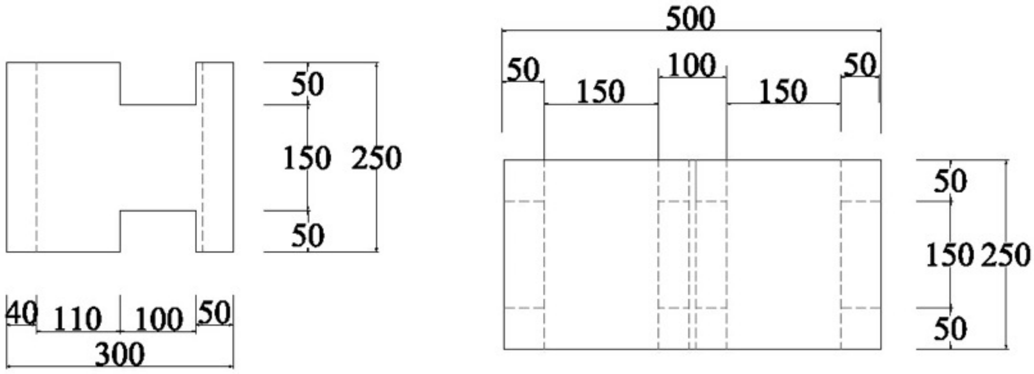


D300 Face Unit



D300 Corner Unit

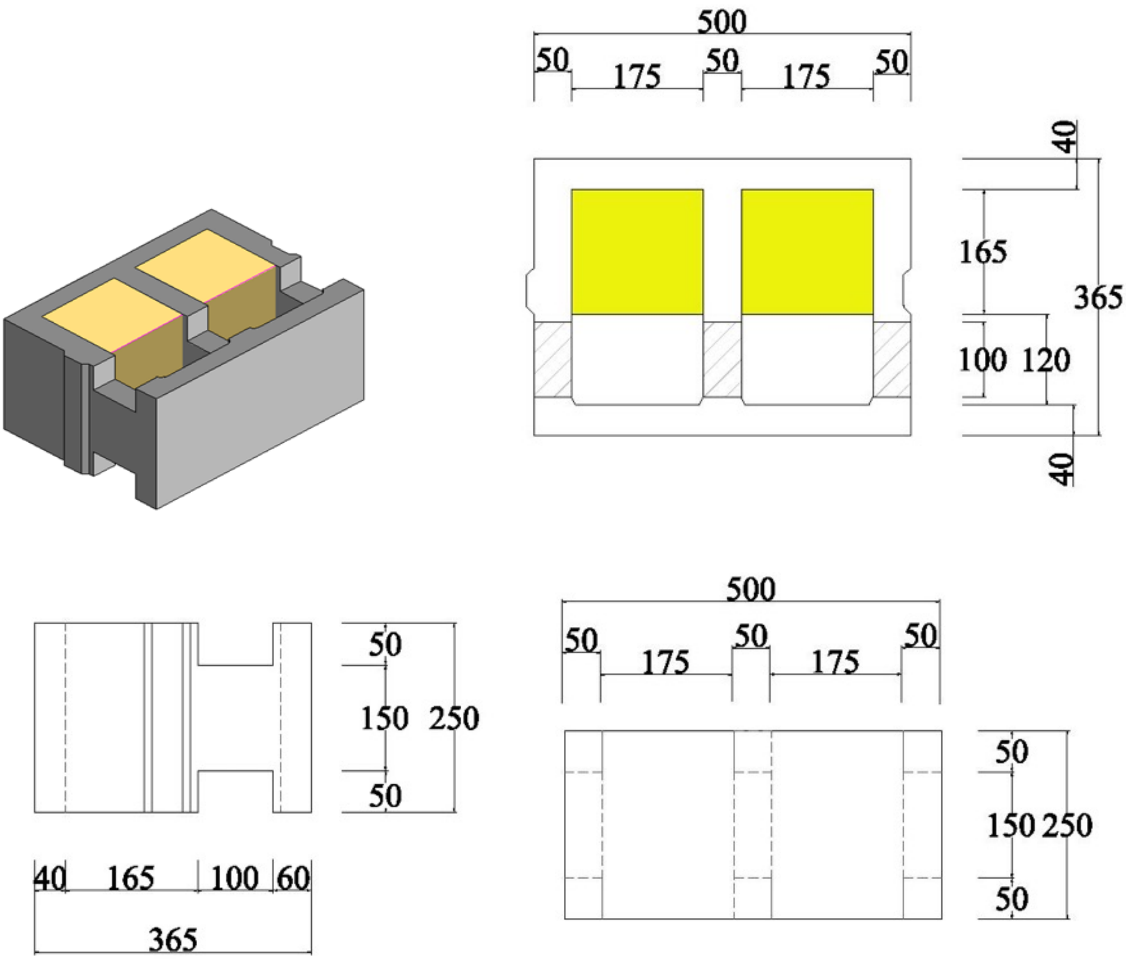




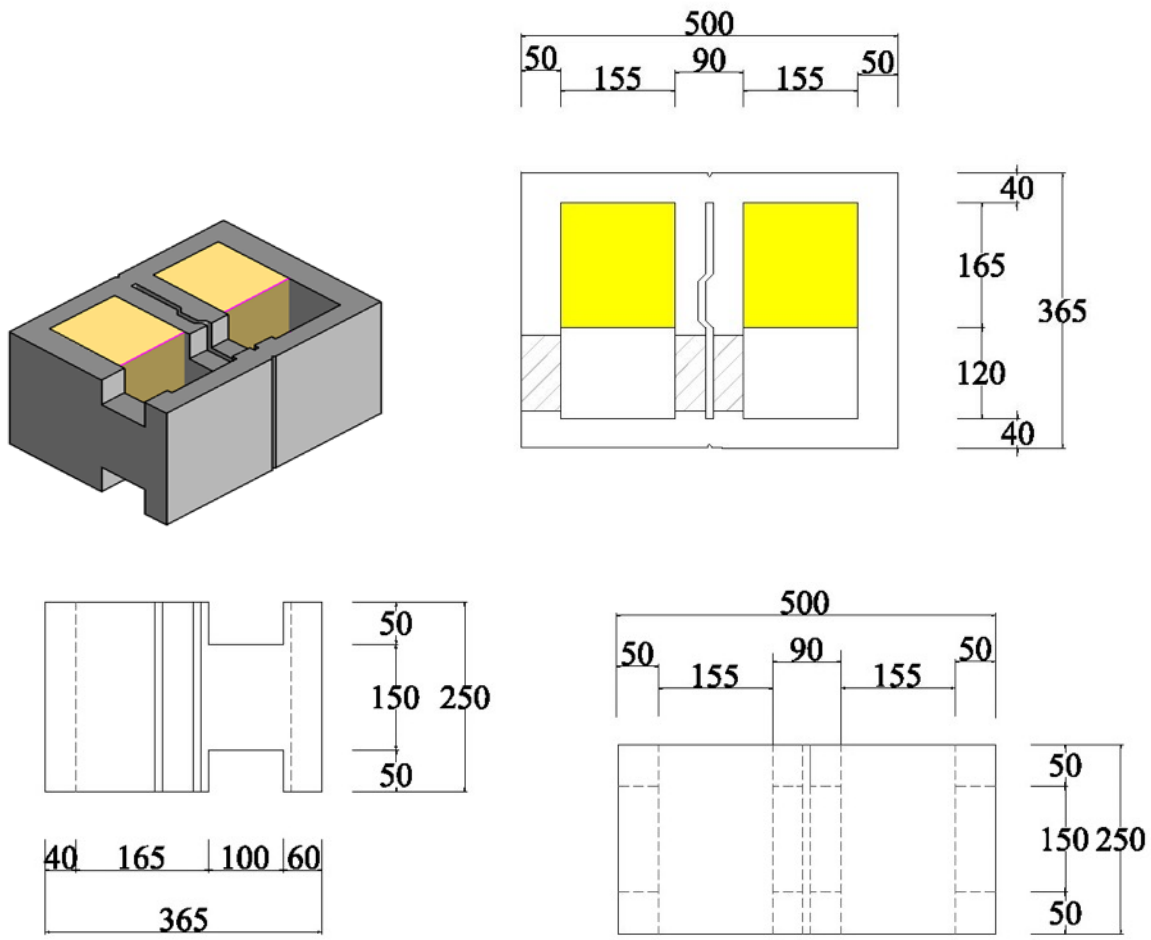
D365 Standard, Face and Corner Unit

The D365 unit is the larger of the two insulated units and comes as a standard, face or corner unit. It is used primarily to form the external envelope of a structure. The yellow zones in the diagrams signify the insulation.

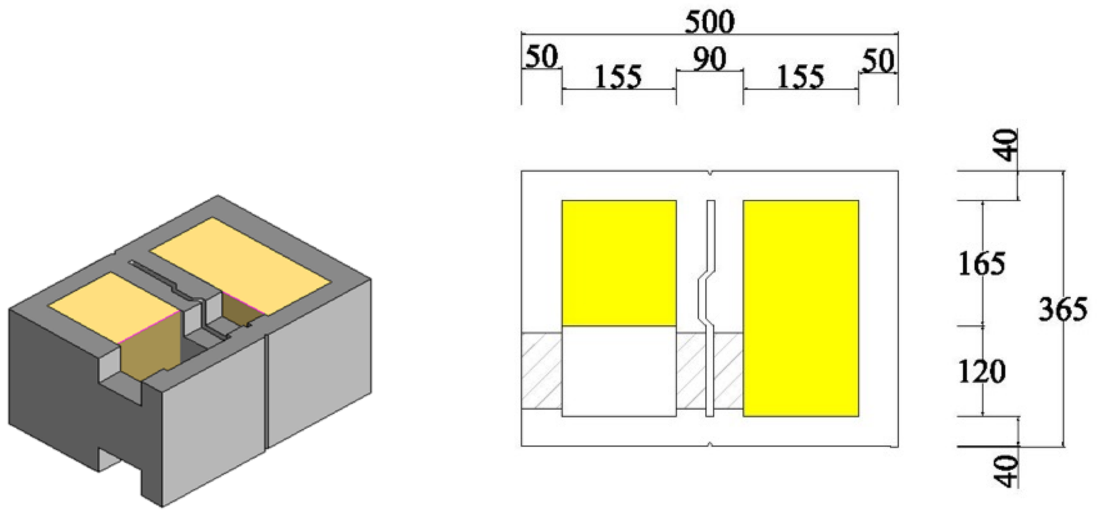
<u>D365 Standard Unit:</u>

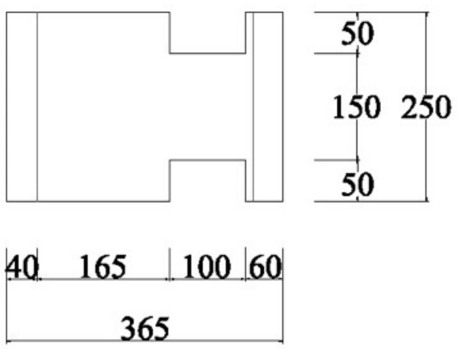


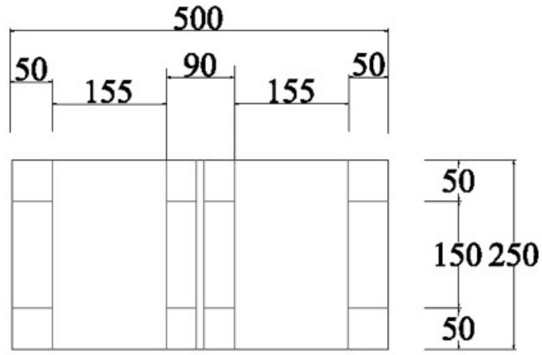
D365 Face Unit



D365 Corner Unit







Applications

Durisol Wall Forms have been used worldwide in every possible building application both above and below ground. In our 70+ year history of Durisol Wall Forms, wall systems have been constructed for use in the following:

Residential (Single and Multi-Unit)
Industrial
Agricultural
Commercial
Institutional
High Rise (Over 20-story buildings in-place (Best Western Hotel, Riverside Drive, Windsor – Ontario (Built in 1983))

Durisol Wall Forms have been designed to accommodate all practical ranges of concrete thickness. The load carrying capacity of the wall system depends entirely upon the thickness of the concrete core and the steel reinforcing (if required) schedule.

The independent laboratory verified Fire Resistance of the Wall Form makes the Durisol wall system ideal for use as a party wall or common wall between residential units.

Improved Indoor Air Quality

The cement content of the Durisol material creates an above average pH environment at the wall surface, which inhibits the growth of fungi and viruses. The Durisol material is completely inert with no VOCs or off-gassing. Furthermore, the hygroscopic nature of the material moderates the RH (Relative Humidity) level. This regulation of water vapour keeps humidity low and further serves to repress any type of fungal growth.

Sound Protection

Durisol wall systems provide considerable protection against unwanted noise. The 250 units have a thicker core of concrete than the others in the range and also feature open ends to produce a thick dense and heavy party wall to provide good acoustic separation between dwellings. See standard details showing parge coats and finishes required in conjunction with the Durisol itself to achieve optimum acoustic separation.

Thermal Mass Effect

Materials like concrete, brick, and Durisol have a high heat capacity; that is, they can store a significant amount of heat energy. This benefit of thermal mass results in reduced heating costs as the energy/heat in the wall is transferred back into the cooler air. Similarly, when the surrounding air is warmer than the walls, heat will be transferred to the thermal mass and reduce cooling energy consumption. The benefits of thermal mass are increased through the use of Durisol Wall Forms since the majority of the insulation is located on the exterior face of the wall system.

The true benefit that is realised from thermal mass effects depends on a number of site-specific parameters such as climatic conditions and building orientation.

Negligible Thermal Bridging

Durisol and framed wall systems are not simple one-dimensional assemblies. Real buildings are three-dimensional, with corners, window openings, etc. However, most wall U-value calculation methods, and almost all marketing brochures, do not factor in the effects of framing at windows, doors, corners, etc. Thus, they tend to over-estimate the true thermal performance.

The construction details that increase heat flow through a framed wall system have little or no influence on the heat flow through the Durisol Insulated Wall Form System. Durisol Wall Forms are designed to ensure that the U-value through the core of the wall is almost the same as that through the web. This not only avoids thermal short-circuiting, it ensures uniform wall temperatures with no cold spots to encourage condensation and create discomfort.

(See Appendix 3 for modelled U value calculations and Appendix 5 for a full suite of independently verified "Linear Thermal Transmittance" values for all junctions.)

Fire Resistance

The fire resistance properties of Durisol itself and the Durisol wall system as a whole provide considerable protection from fires. Tests in Canada have been conducted for two and four-hour fire ratings while independent testing has also been conducted in Austria and also the UK.

The surface burning characteristics of Durisol far surpass all other types of stay-in-place formwork. Durisol has a flame spread and smoke spread rating of zero. Unlike foam, Durisol will not ignite, melt, sustain fire or release toxic fumes in the event of a fire.

The resulting "reaction to fire" classifications are published in the Durisol European Technical Approval (ETA 05/0090).

Moisture Protection

Since no exterior finish will act as a perfect rain barrier, it is good practice to have a wall system that is capable of compensating for imperfections in the render/cladding. In the event that moisture does become temporarily trapped within the wall, the Durisol is capable of accommodating this moisture without any damage to itself. Damage to other wall components is of course a possibility. Although the Durisol material will not prevent moisture damage, it will mitigate the effects of moisture penetration through the exterior weather barrier. The behaviour of Durisol in this regard is similar to any other type of cement-based product with moisture storage capability, such as concrete or masonry. The permeable nature of the Durisol serves to regulate the water vapour in the air and provides a smoothing effect to rapid swings in relative humidity.

Durisol also has the benefit of being a relatively free draining material. In laboratory tests, saturated samples were able to drain over 60% of their moisture content within 1 hour with the majority draining in the first ten minutes.

Construction Advantages

Durisol Wall Forms are lightweight and straightforward to use. With only eight units per square metre of wall area, construction is fast and efficient. This results in lower labour costs and shorter construction time.

The Durisol material can be easily cut and screwed with simple carpenter tools. This provides the builder with the flexibility to cut and fit shapes to suit site-specific situations. Bracing and goalposts can be directly attached to the Durisol Wall Forms using appropriate screws (see section 6).

The insulating properties of Durisol Wall Forms allow winter construction without additional heating or insulation sources being required. Durisol wall systems have been constructed in temperatures as low as 22 °F (- 6°C) without any complication.

The unique free-draining Durisol material allows the use of high-slump concrete in the field that makes for easier and faster concrete pouring that ensures a solid wall without any compromise in strength.

Interior and exterior finishes are applied directly to the Durisol material, eliminating subsequent steps in the construction process. Drywall can be attached anywhere on the Wall form surface, while the open-textured nature of hardened Durisol makes it an ideal substrate for plasters and renders.

2. Safety Equipment and Risk Management

Durisol Composition:

Not deemed hazardous in relation to Regulation (EC) 1272/2008 (CLP)

Product components listed in the table below:

Substance Name	CAS Number	EC Number
Portland Cement	65997-15-1	N/A
Softwood (Chipped)	N/A (See HSE EH40 Paras 41-42)	N/A

Durisol is a mixture of inert wood aggregate, Portland cement, water and cement additives.

Risk to be managed:

- Cement/wood dust when cutting units. Sawing or other demolition techniques may result in exposure to dust and larger particles containing ingredients of Portland cement which, when in contact with water, produce calcium hydroxide with an alkalinity level of pH 12 to pH 13. This level of alkalinity can cause skin and eye irritation.

  Cement dust can cause inflammation of the tissue lining, the interior of the nose and the cornea (white) of the eye. Hyper-sensitive people may develop allergic dermatitis. Portland cement is not known to constitute a carcinogenic, reproductive, teratogenic, or mutagenic hazards.

- Manual handling of units.

Control measures:

- When wall forms are being modified (cut) safety glasses and a mask should be worn as best practice.

- Provide ventilation when sawing or using other demolition techniques to maintain low dust concentrations.

- During concrete pouring safety goggles should be worn and all care taken to avoid concrete coming into contact with eyes and/or skin.

- Durisol can be rough in texture when handled and can also release dust when cut using mechanical tools. When cutting mechanically, the use of an Alligator saw will minimise release of fine particles. The use of rotary abrasive wheel cutters should be avoided as this creates greater quantities of fine dust.

  Cutting of Durisol should be carried out only in outside air or highly ventilated spaces. It is also recommended that a vacuum attachment be used in conjunction with mechanical cutting tools.

- Dust from cutting should be damped down before removal, dry sweeping should always be avoided, the use of a HEPA vacuum cleaner is recommended. The use of local extract/ task ventilation should be considered if existing ventilation of the work area is not sufficient. Cutting and working zones should be set up if it is necessary to segregate any persons who are not wearing suitable PPE from the Durisol work areas.

- The unit weight of Durisol wall forms are not generally in excess of what a competent and capable building operative should be able to handle. However, as with all manual handling situations it is prudent to make an assessment of the work being done based on an individual worker's capacity and abilities, along with the degree of repetition, whether any work is being done at a physical disadvantage (such as whilst twisting, bending or at extended reach for example) and over how long a period of time. If in doubt, substitute manual lifting for mechanical aids wherever possible and consider taking advantage of lifting tackle or two person lifting as part of the work process.

Safety Equipment:

At all times when working with Durisol units:

- Safety footwear – Recommend footwear with a safety toe and sole.
- Gloves – Durisol recommends the use of gloves compliant with EN388 performance level 3 or 4.

Only when cutting or modifying Durisol units:

- Respiratory Protection – Recommended EN149 FFP3 rated dust mask, this is to be face fit tested to operatives to ensure an effective fit.
- Eye protection – Safety glasses compliant with EN166 with an impact rating of F or better.

This is in addition to any standard on-site health and safety requirements including situations that involve working at height and in confined spaces.

Stability and Reactivity:

- Durisol is considered stable under recommended use and handling conditions.
- Durisol is considered non-reactive under recommended use and handling conditions.

Ecological Information:

When this product is stored, handled, used and disposed of correctly, there should be no environmental or ecological impact.

Disposal Considerations:

Can be disposed of as an inert wood/ mineral/ hardened cement mix at any EA licensed waste processing facility. Durisol is a non-hazardous waste item.

Transport Information:

Durisol products are not classified as dangerous or hazardous goods whilst in transit under any current legislation.

Regulatory Information:

No additional specific regulations apply to Durisol but due regard must be given to all relevant regulations in force at the current time. It is the responsibility of the user to ensure that they are suitably competent and aware of all regulations relevant to their activities.

The following list of regulations, although not exhaustive, should be considered and complied with as and when relevant:

- Health and Safety at Work Act
- CDM Regulations
- Management of Health and Safety at Work Regulations
- Provision and Use of Work Equipment Regulations
- Work at Height Regulations
- PPE Regulations

The following HSE publications may also be of use when using this product:

- EH40 Work exposure levels
- Control of exposure to silica dust
- EH44 Dust in the workplace

3. Tools and Consumables for Building

Durisol wall forms require no specialised tools and the following list covers all that should be needed:

- A string Line
- A level preferably over 2m in length and a short level 450mm
- Reciprocating saw or alligator saw for cutting wall forms
- A handsaw (for cutting insulation, plywood and other wood)
- A hammer drill (if dowelling in rebar is required)
- A bricklaying trowel and float (for levelling the concrete during the pour)
- Foam gun with fire rated foam
- Tape measure
- Dustpan and brush to keep the top of the walls clean and clear of debris during the placing of units.
- Plastic wedges for levelling (1 to 5mm) (These are as a precautionary measure and should not be necessary if bocks are laid level, but for the pennies they cost, it is prudent to have some to hand)
- Wood for making formers (lengths of 4”x2” (100mmx47mm) timber for forming goalposts in door and window openings)
- Wood for bracing (sheets of 12-18mm ply for bracing corners and elsewhere as required)
- Coarse threaded screws (for type see section 6). (Generally, these will be 60mm long for fixing bracing ply and 100mm long for fixing goalposts due to the different thickness of the wood used)

4. Transport and Stacking/Storing on Site

Transport

Durisol will normally be delivered on a curtain side lorry and the following factors should be considered when planning a project:

- Access: Can the lorry access the property safely – turn the vehicle and drive out without damaging the cab or curtain sides of lorry? Vehicle dimensions are available upon request.
- Offload: Can the lorry offload with the moffet safely from both sides of the vehicle? Does the site require a moffet or are offloading facilities available on site already?
- Hard standing for storage: Is there suitable hard standing to store the units?
- Built-up areas: Is the street free of parked cars vehicles?
- Hills / slopes: Is the address on a hill or slope making the moffet (forklift) offload unsafe?
- Weight limits: Are there weight restrictions i.e. bridges nearby?
- Obstructions: Are there overhanging trees/branches/overhead power cables that could hamper delivery?
- Offload time: 2 hours is generally the maximum offloading time allocated by hauliers and may be chargeable thereafter. Will your site allow for this?

Stacking/Storing

- Durisol walling units are NOT concrete blocks and should be handled with care.
- Durisol wall forms are delivered in pack sizes approximately 1m x 1m x 1.2m. Each pack is on a wooden pallet. Specific pallet weights by block type are available upon request.
- Pallets should be lifted with forks and NOT grabs as the latter risks visibly damaging the product and/or weakening and distorting it.

Durisol units on pallets to be carefully lifted by forklift

- The packs MUST be stacked on level ground and should NOT be stacked more than 2 packs (pallets) high and should not overhang:

Pallets to be stacked no more than two high

- There is no requirement to cover the packs.
- Building multi-storey buildings - To minimise the use of scaffolding the best way to erect multi storey buildings is to build to 1st floor level, install the floor, stack the pallets of wall forms onto the floor and then build from the floor out, being conscious at all times of the load capacity of the floor in question.

Stacking the Wall Forms is easier from the inside of the structure. For this reason, all material should ideally be placed inside the perimeter of the wall. Wall Form pallets should be placed at a three-metre spacing along the length of the walls with approximately two metres of space between the pallet and footing. This will eliminate unnecessary movement of Wall Form units around the job site. When moving Wall Forms, use caution and avoid reckless handling. The rough texture of the Durisol material makes it difficult to notice a damaged unit.

5: How to Cut Durisol Units

If wall forms need to be modified, they can be cut with anything that will cut wood. Experience shows the best method is by a hand-held reciprocating or alligator saw with a wood blade. It is advisable to keep a blade just for this job.

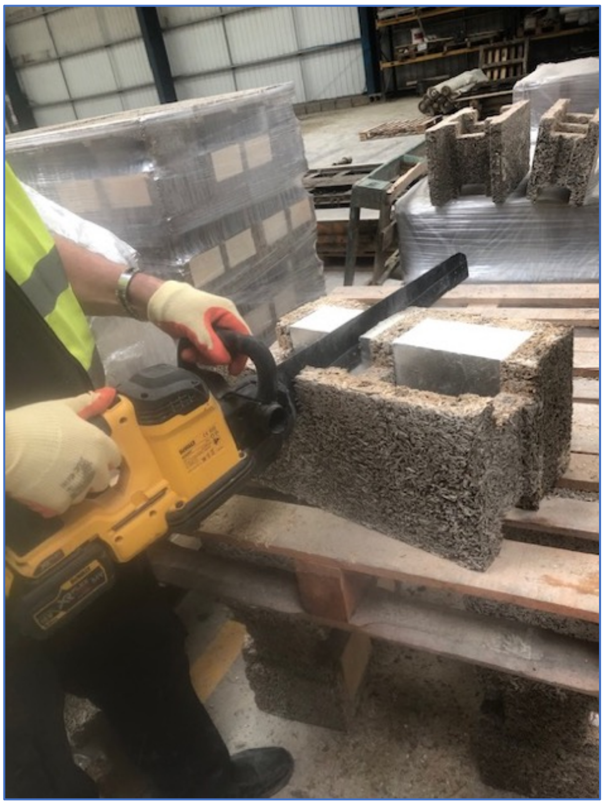
For cutting blocks to fill gaps, firstly, measure the gap to be filled:

A builder's pencil can be used to mark the top of the unit however it is difficult to mark the sides with a pen or pencil. It is better to instead use a tile scorer.

The top of a unit being marked with a pencil

The side of a unit being marked with a tile scorer

The unit can then be cut:



A unit being cut with an alligator saw

As can be seen in the diagram above, a separate cutting station has been created. It is good practice on site to designate an area for cutting blocks where offcuts, dust and debris can be isolated. It is not advised to cut blocks in situ as this can contaminate the working edge and prevent the wall being laid level.

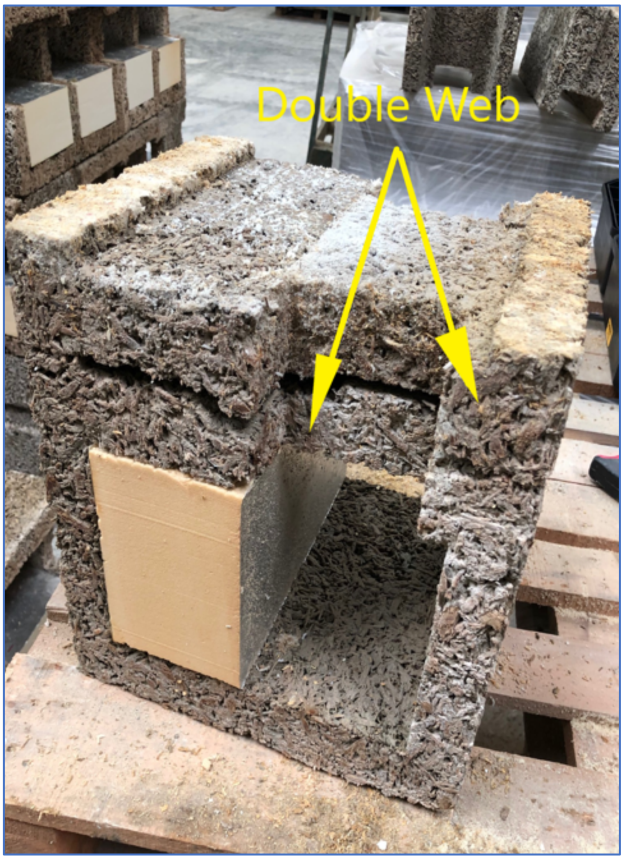
A unit being cut with a reciprocating (recip) saw

After the unit has been marked and cut, it can be inserted into the space:

The cut unit is placed in the run of the wall

If a wall form has to be cut, one should not insert a cut piece that is less than 120mm long. If the gap to fill is less than 120mm then the units either side should be cut to increase the opening size and allow a larger cut piece to be fitted.

D300 and D365 corner and face units have a double web in the middle. This gives them additional strength, but when cutting one of these units to fit into a gap it is usually necessary to remove one of the additional webs, see picture overleaf.



A D300 Face Unit showing the double web

To adapt the unit and make it suitable for insertion in the wall, it is usually necessary to remove the additional web as follows:

The additional web in a D300 Face Unit being removed

The cut unit can then be inserted into the wall with a piece of insulation cut to fit the gap created by the removal of the additional web:

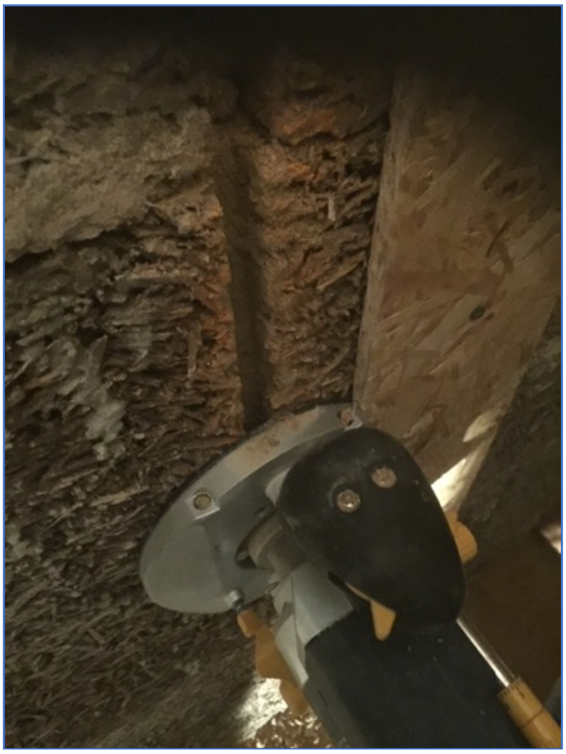
A modified D300 Face Unit inserted into a wall

When cutting units, it is wise to keep the good quality offcuts as they can often be used elsewhere on the build. Any pieces of insulation or cut units that are intact should be salvaged and reused where possible. Only discard broken or damaged pieces that have no further use:

Intact offcuts of Durisol units and insulation that can be used elsewhere

It is possible to 'chase out' the Durisol material for services conduit to be installed and either a hand-held circular saw can be used with the depth gauge set at least 1mm less than the Durisol material (check web thickness of various unit types), or a specialist wall chasing tool can be used. Once the two cuts are made it is very easy to chisel out the Durisol material with a cold chisel.

Alternatively, one can use a simple router to quickly and cost effectively chase out channels for services:



Router being used to chase for services

Thought should be given to the ventilation and control of dust when chasing or cutting Durisol units for the installation of services. There is a separate section dedicated to installing services in this guide.

Wall forms can be core drilled with traditional saw bladed hole saws, although the easiest way to cut curves and other non-standard shapes is with a reciprocating saw:

A Durisol unit being cut in a curved shape (with a recip saw) to install pipework

The insulation can also be easily cut with a hand saw:

Insulation being cut with a handsaw

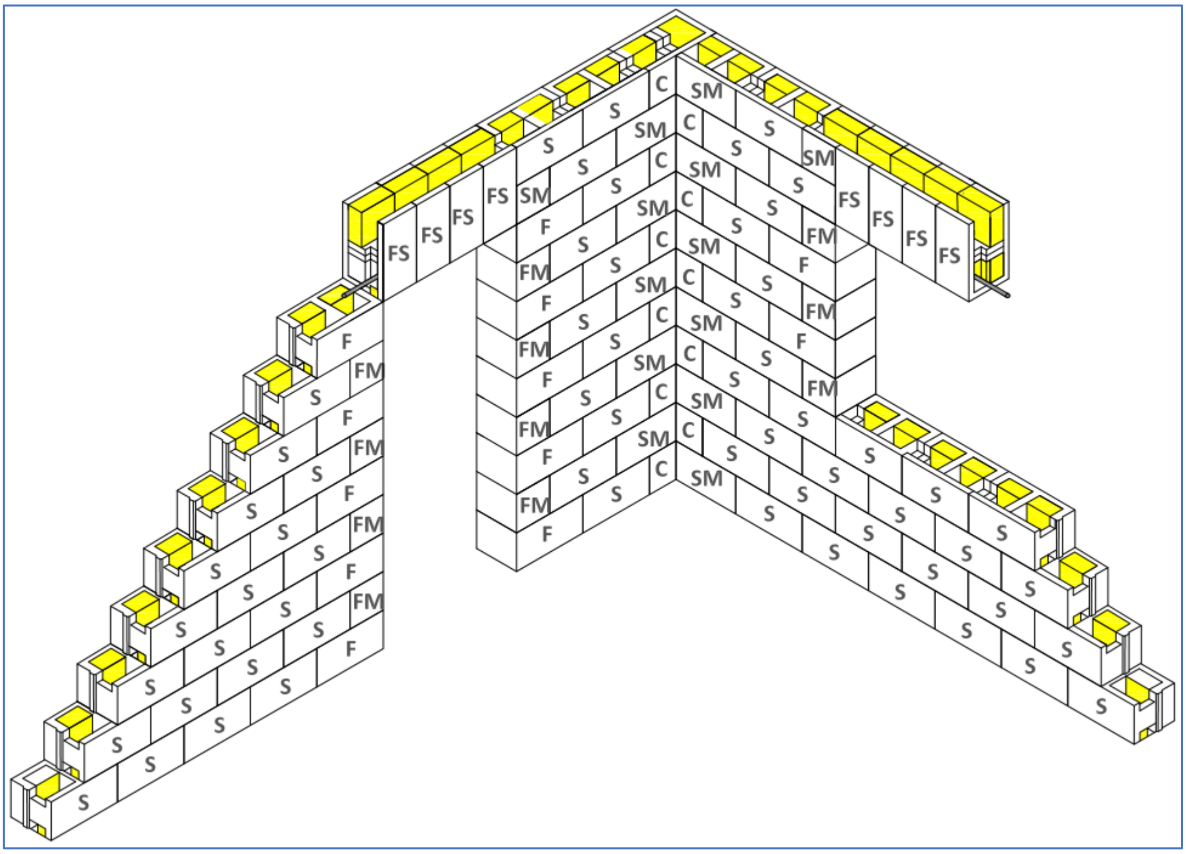
Corner units also require simple modification to allow concrete to flow around the corner and form the monolithic frame. For the notching procedure for corner units see section 6. “Building with Durisol - Corners”.

6: Building with Durisol

Building with Durisol is very easy. There are very few components and the principle is simple. The units are dry stacked i.e. there are no glues or mortars to fix them together. Wet concrete is then placed inside the units and it flows between them both horizontally and vertically through the voids. This process connects the units and forms one complete monolithic concrete frame.

When building, remember the insulation goes on the outside of the wall and the concrete infill goes on the inside. Be mindful of the need for the wet concrete to flow into all the voids within the wall forms. Some simple modifications are necessary in some cases to ensure this and all standard scenarios are covered below.

To understand the simple configuration, this isometric view below shows where the unit types of an external wall are typically used:



Isometric view of Durisol units in a simple construction

In the diagram above, the key is as follows:

S = Standard, SM = Standard Modified, F=Face, FM=Modified Face, FS= Face Soldiered, C=Corner Unit.

Dry Stacking

The Units should be built up starting from corners and openings and working inwards towards the middle of the wall spans. Therefore "goalposts" for door openings must be constructed and placed before any wall forms can be placed (see section 6, "Building with Durisol: Openings and Lintels").

Timber goalposts are used to form openings

Durisol wall forms should be dry stacked by overlapping half a unit each layer (the same as with laying concrete blocks or bricks). They should only ever be built in columns if absolutely necessary, and if stacked this way will need additional bracing to stop movement.

The ideal pattern:

Units stacked in a "brick bond" pattern

Building in a brick bond has two main benefits. It gives the wall greater stability before it is braced and filled with concrete. It also ensures the chambers within the units line up and this ensures concrete columns are formed within the units for maximum strength.

When placing units ready to be built, it is beneficial to stand them on their ends. This prevents the top and bottom edges from picking up muck and dirt that prevent them from sitting nicely on top of one another and forming a level wall:

Units should be placed on their ends if they are to stand on the ground before being used

For this reason, it is also important to brush down the top of the wall in between laying courses to ensure no debris is sitting on the working edge where it may cause issues with the level of the wall in any way:

The working top edge of the wall is brushed down between laying courses

Bracing

Durisol does not require the use of props to brace walls as is the case with polystyrene ICF systems. The only propping required is for openings. Bracing refers to the use of plywood and also 4”x2” timber which is screwed to the Durisol to support corners, cut units, ends of walls etc where possible movement during the concrete pour should be managed.

Dry stacked walls should be braced appropriately where cut units have been placed.

A cut unit in a wall being braced with ply

In the example above, a cut unit can be seen within the run of a wall. It is often necessary to cut units to fit to specific required dimensions of a build and also to keep the brick bond pattern. A cut unit such as this may try and move slightly during the concrete pour and should be appropriately braced with 12-18mm plywood. The patch should extend beyond the cut unit allowing the ply to be screwed into each of the adjoining units with 60mm wood screws. A single screw should also be placed into the cut unit itself. In the example above seven screws in total are used. The screws for this application can be standard coarse threaded woodscrews. The 60mm length requirement is derived from the 12-18mm thickness of the ply and the 40mm of Durisol into which the fixings are being screwed:

Coarse threaded wood screws

Any cut units in a wall or other modified units that would benefit from bracing can be simply marked during the placing of units with spray paint. This makes the job of returning to brace later a much easier exercise:

Cut Units being sprayed during placement to mark them for bracing later

One should start building from corners and also goalposts that form openings and work in full units towards the middle of wall runs:

Build from the corners and openings towards the midspans

In this way, the cut units will all generally be in a similar location (near the centre of the wall run) which saves on the use of plywood. The plywood can also be removed once the pour is successful (and the concrete cured) and can be re-used elsewhere.

Corners should also be braced with 12-18mm ply to prevent slight individual movement of units during a concrete pour:

For corners, the best approach is to attach a sheet of 12-18mm ply 600mm wide from the corner itself, screwed into every other unit in a staggered pattern as shown above. The length of the coarse threaded woodscrews to be used is 60mm which allows for a full fix into the 40mm thick Durisol unit outer leaf behind.

Screws should NOT BE OVER TORQUED with an impact driver or similar power tool. Screws should be tightened until they bite, and the screw head sits flush with the surface of the plywood, but should not spin freely in the hole.

There are instances where a wall terminates without forming an opening. This is another area where bracing is prudent given that the flowing wet concrete will apply pressure at this termination point:


A terminating wall braced with 4"x2" screwed into every unit with a 100mm screw

The units can be dry stacked up to six courses in height before the first concrete pour. For competent operatives and developers, it is also feasible to stack units to ten courses before pouring concrete, although this requires strict adherence to the guidelines of propping and bracing.

In order to give additional stability and to prevent the nozzle of the concrete pump from disturbing any of the units as it deploys concrete, it is quick and easy to screw the top course of units together through the webs. This creates rigidity in the top course and makes for a better concrete pour:


The top course of units can be screwed together with 100mm woodscrews

Joining Internal and External Durisol Walls (Including Bracing)

Internal Durisol walls are normally formed with D170 units and party walls between dwellings are formed with D250 units. There are common instances where these need to connect to the external Durisol wall.

Firstly, 4"x2" timber battens should be screwed to the internal face of the external wall at the correct width to receive the internal wall. If this is a D250 party wall, then spacing between the battens needs to be 250mm:

Timber is screwed to the inner face of an external wall to receive a 250mm party wall

A channel is then cut out of the inner face of the external wall leaf to allow the concrete to flow from the outer wall into the inner wall during the pour. This will make a monolithic strong concrete frame with internal and external walls poured together.

The void for concrete within a D250 unit is 180mm wide, so the channel cut out will also be 180mm wide. For a D170 wall joining an external wall, the width of the cut would be 120mm:



A 180mm wide channel is cut out of the external wall (inner leaf) to join a D250 party wall.

Once a 180mm wide channel has been cut into the external wall, the D250 units can be built between the timber bracing to create the party wall at 90 degrees to the external wall.


A D250 party wall being built against a prepared external wall

Once the party wall has been constructed it is clear how the concrete will flow between the external wall and the party wall and form a continuous single concrete structure:

Concrete free to flow at the junction

The concrete is free to flow in all directions at the junction between the internal and external wall. This creates a full height continuous concrete structure at the joint, which in this case is 180mm thick. This helps to overcome the possibility of any acoustic flanking around the edge of the wall between the dwellings on either side. For full details on how to finish a party wall (parge coat and board) see Durisol standard details.

Note how the party wall is constructed using full and half units to keep on brick bond. Every other course involves a D250 unit cut in half with the half offered up to the junction with the external wall. On the next course, a full unit sits above it.

If conducting the same operation with a D170 internal wall the process is almost identical. The D170 does not have an open end and it is therefore beneficial to cut the end open for those units directly connecting to the outer skin. The width of the slot in the outer skin is also different (120mm) whereas in the example above for the D250 party wall it is 180mm.

The outside face of an external wall should be braced where an internal wall joins it inside, regardless of whether the internal wall is a D250 or D170 wall. The act of cutting a slot up the entire height of the external wall creates localised weakness so it is prudent to brace the outer skin with a 600mm wide piece of 12-18mm ply (in the same way a corner is braced).

Foaming Joints

When placing units and moving them to create a wall that is vertical and level, there may be some small gaps between units. Whilst it may seem likely that wet concrete will pour out of the tiniest gap, in practice the 10mm aggregate in the mix (see section on concrete) and the porous nature of the units means that the mix stiffens up quickly and the aggregate plugs the gaps. There is no need to take action in all but the widest of gaps. It is certainly not necessary to foam all the joints and the vast majority will need no such intervention.

In the diagram below the gap is somewhat borderline in terms of whether it needs to be filled or not. The best way to judge it is to determine if the gap is as wide as one's little finger (accepting that not all little fingers are the same size). A gap approaching 10mm can be filled with a fire rated foam to seal the joint, prevent a dribble of concrete escaping and to provide an even surface for rendering/plastering etc.

A vertical gap between units being filled with fire rated foam and then cut off flush once dry (in practice the gap would be filled completely from top to bottom)

Corners

Remember to ensure the forms are always laid so that the insulation is in the outer side of the wall and the concrete is on the inside.

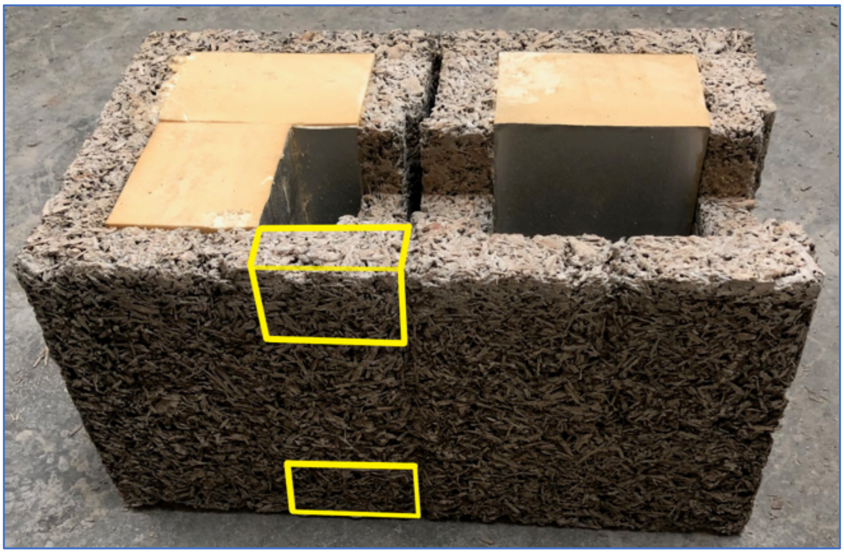
The corner forms should be some of the first laid as the walls are built inwards working from the corners and openings towards the middle of wall runs.

Note the corner units will have to have notches cut into the internal side of the form 50mm deep both top and bottom to line up with a standard unit. This only takes a few seconds and can be done with an alligator saw or reciprocating saw.

Notching the corner units has two purposes:

- to allow the flow of concrete around the corners; and
- to provide a position for any horizontal rebar (if necessary) to be located around the corners.

The areas in yellow on the diagram below need to be removed from a corner unit:



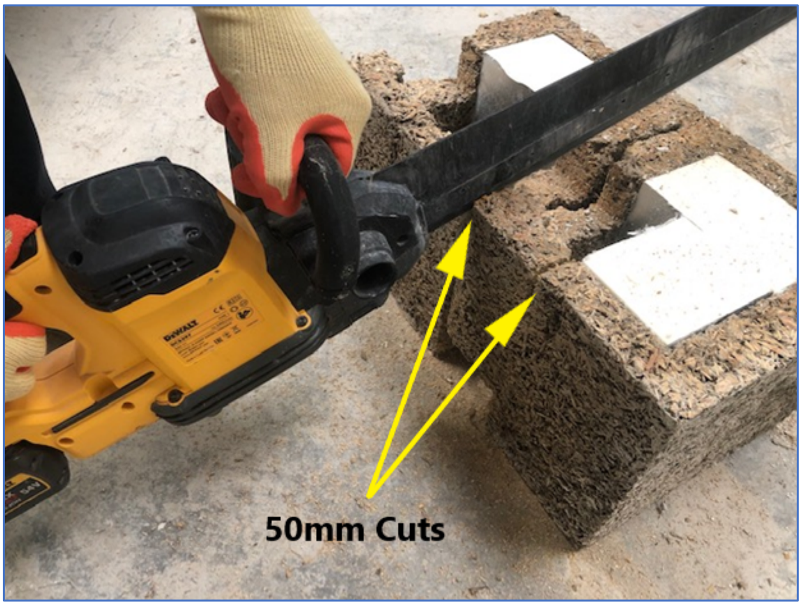
Removing the yellow zones will allow the concrete to flow freely around the corner

This is achieved as follows:

Unit prior to notching

It is preferable to place the units on level ground in a dedicated cutting area where all alterations of units can be made during the project. Units should not be cut whilst standing upon other units or upon a partially completed wall as the debris from the cut will make the laying surface uneven.

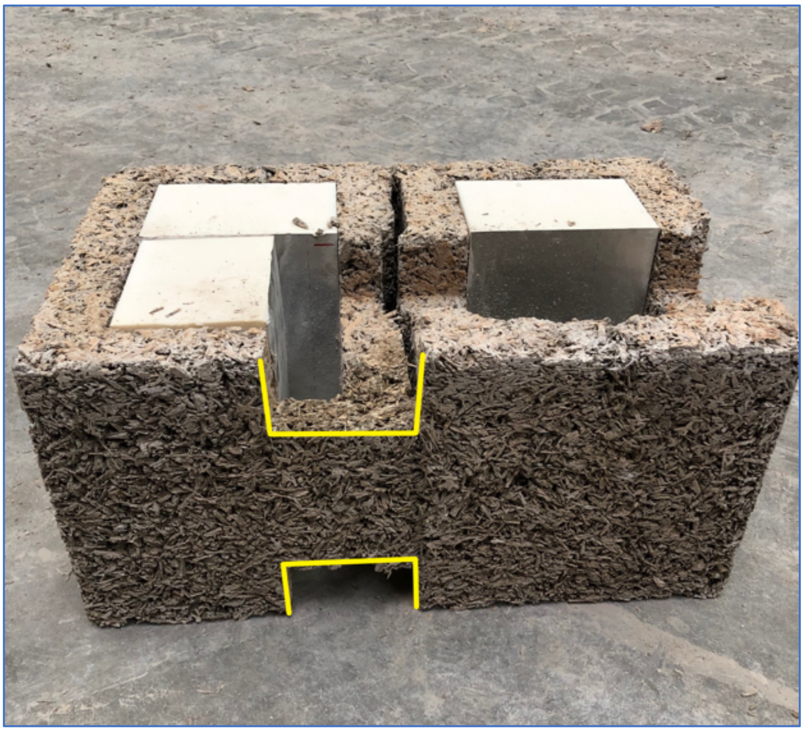
Two vertical cuts are then made 50mm deep:



Care must be taken not to cut the insulation or the outer face.

Once the vertical cuts are made, a rubber mallet can be used to gently tap the area to be notched until the piece breaks off and can be removed.

This operation is turned over and the operation repeated on the underside also, such that two pieces are removed, and the finished unit looks as follows:



Corner Unit notched (yellow lines signify what has been removed)

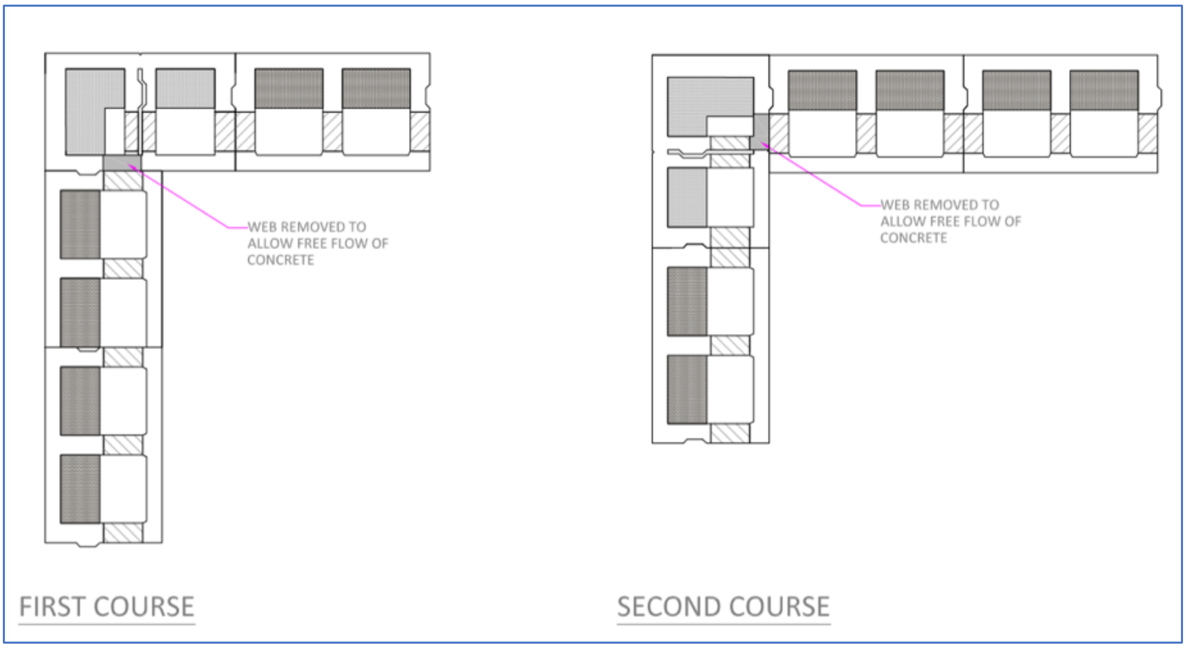
<u>All corner units will need to be notched in this way.</u>

Once the notch is removed, there is a pathway for wet concrete to flow around the corner at the top and bottom of the unit and provide complete continuity:

Concrete is free to flow around the corner once the notches are removed

D300 Corner:

For the D300 Units, the first and second course forming a corner is as follows:

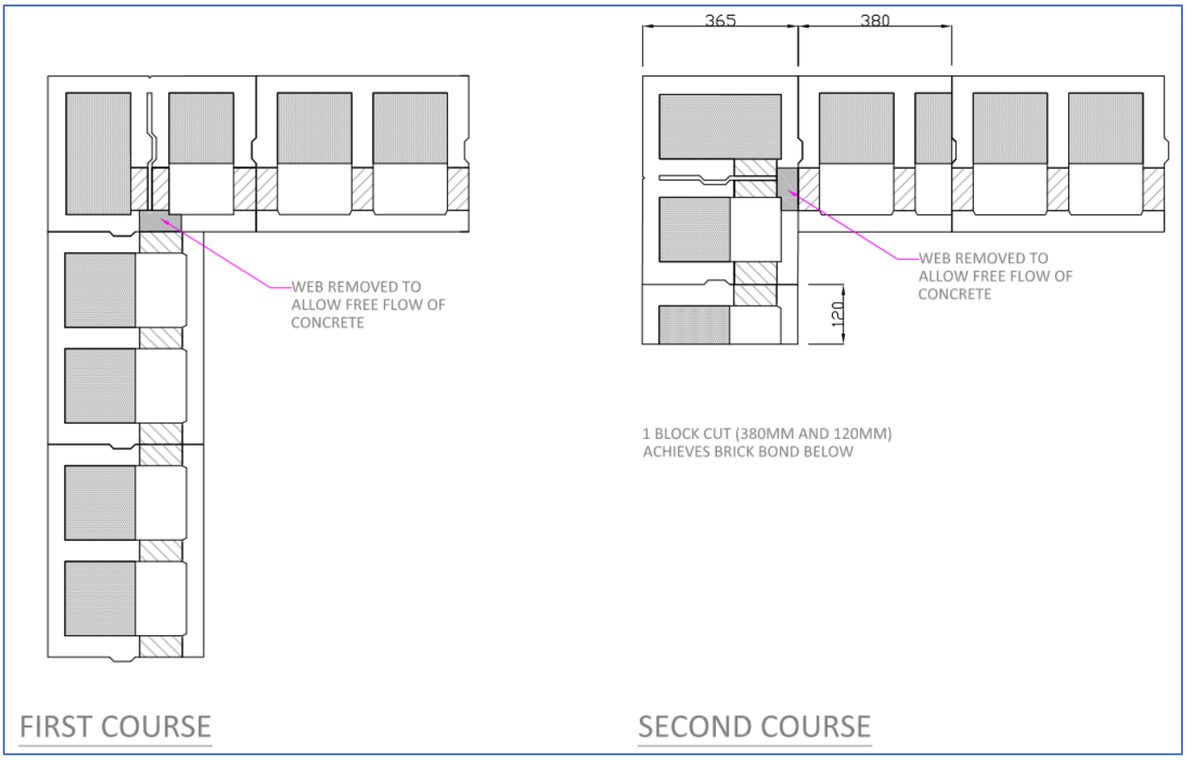


First and second course plan layouts for a D300 corner detail

The corner unit on the first and second course face in opposing directions (both with the insulation on the outside) to create the brick bond. In this way a D300 corner can be built up multiple courses without there ever being the need to cut a unit.

D365 Corner:

Due to the thickness of a D365 unit (365mm), it is necessary to make a modification to keep the corners on a brick bond and hence the internal voids suitably lined up to create columns of concrete within the wall forms:



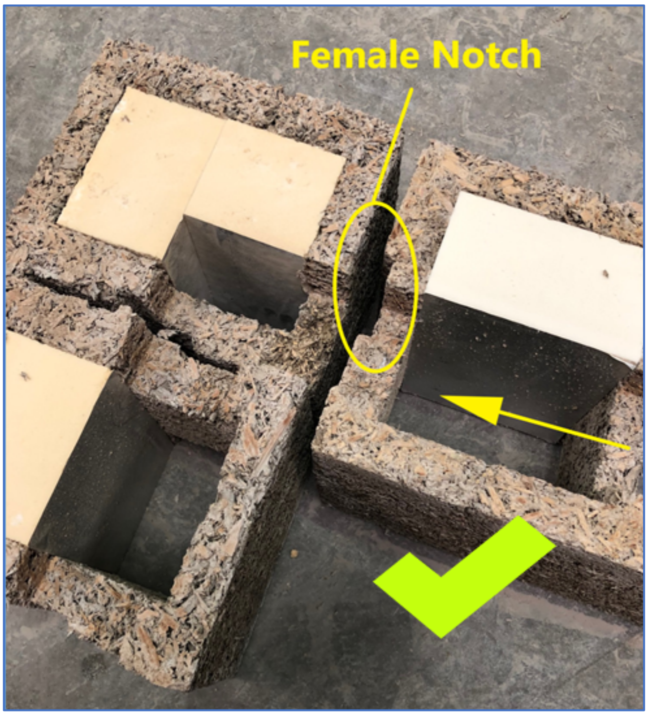
First and second course plan layouts for a D365 corner detail

To form the second course of a D365 corner detail, it is necessary to cut a D365 standard unit into two pieces, one of which is 380mm long and one which is 120mm. There is no waste produced in this operation as a single unit is cut to make the two pieces required. This keeps the corner on brick bond (see above).

When creating the corner, it can be seen that a D300 unit has a smooth face to which a standard unit is offered:

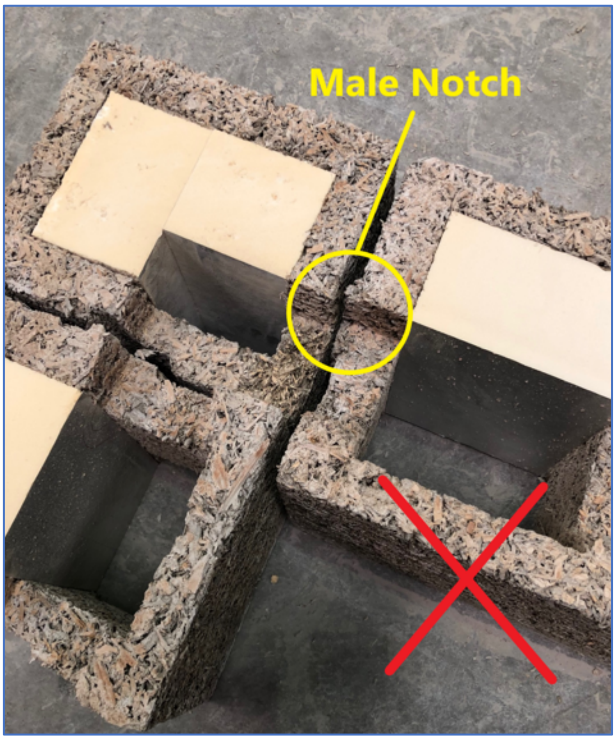
A D300 Unit with a smooth face

As there is no male or female notch on the corner unit, it is necessary to offer the female side of the standard unit to the corner:



Female end of a standard unit offered up to a D300 corner

If the standard unit is offered against the corner with the male notch facing the corner, the male notch prevents the standard unit from sitting flush against the corner.



A D300 standard unit offered up to a corner unit the wrong way around

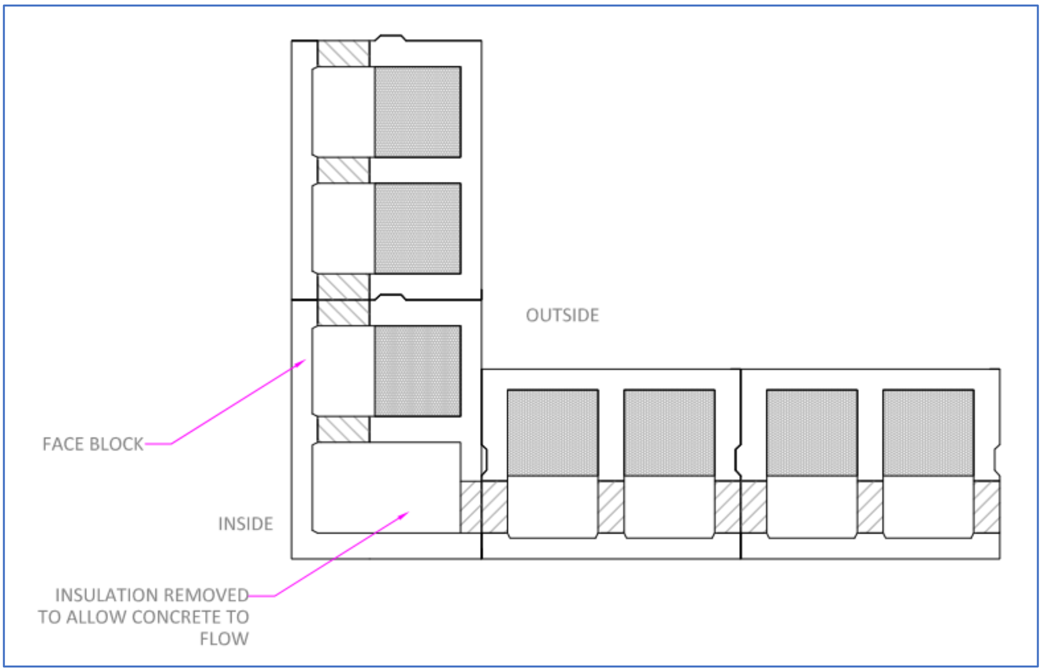
The same issue does not exist with the D365 unit which has a female notch formed in the corner. Therefore, a D365 standard will sit flush against a D365 corner regardless of which end is offered up to it.

The aim with any corner is to run insulation around the outside face, give the concrete a channel to flow and keep the respective courses on a brick bond pattern so that the vertical chambers inside line up and create strong concrete columns within the wall once filled with concrete.

Internal Corners:

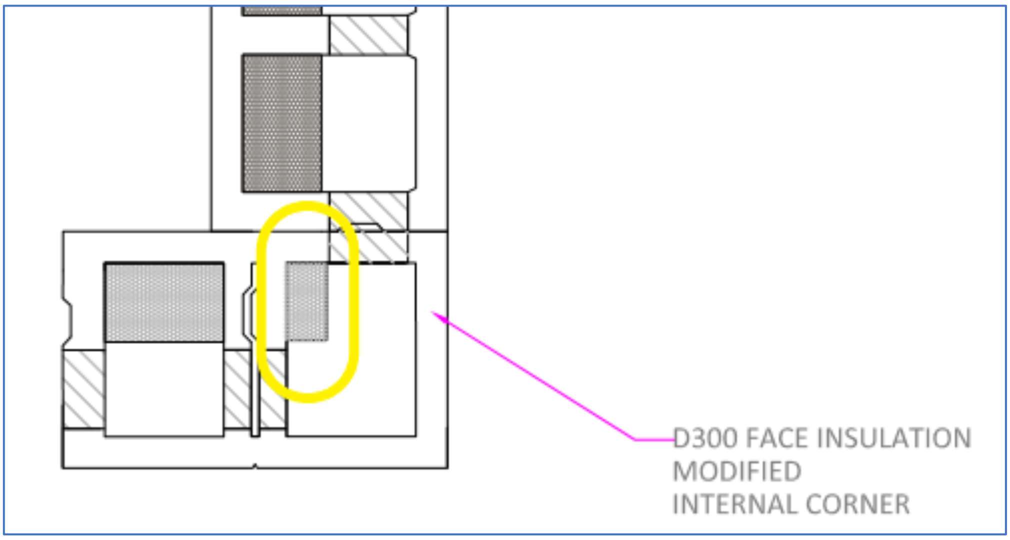
External corners are straightforward to form when creating a simple box shape structure. However, it is almost as common to encounter corners where the walls cut back the other way and create the corner pointing inwards, as can be seen in the following diagram.

In this instance the same principles apply. The insulation remains on the outside and the corner unit must be notched to enable concrete to flow around the corner in the normal way:



A D365 internal corner detail

With an internal corner, not all of the insulation in a corner unit is retained in the same way it would be with an external corner.



A D300 typical internal corner detail

In the diagram above a small piece of insulation is retained in the modified corner to ensure a continuity of insulation in the external envelope. The same has not been done in the typical D365 detail. Whether this is undertaken or not will be dependent on the U value requirement of the wall in the relevant building regulations and how critical it is in relation to the known performance of the wall type. To retain the small offcut for absolute completeness will require it being bonded into position, as once it is cut it won’t be friction fitted into the void. A small drop of “no more nails” type adhesive will hold it firmly and prevent the piece moving during concrete pour, which is critical as it must not impede the flow of concrete if dislodged.

D300/D365 combined corner:

In rare instances it may be necessary for a D300 and a D365 wall to intersect at a corner. This can be easily achieved but requires some attention to detail when notching corner pieces. It will also require the cutting of units on every other course to keep both wall types on a good brick bond. The corner unit used will alternate on each course between a D365 Corner and a D300 corner. The units are the same height and length so the only complexity is due to their differing thicknesses:

A D365 and D300 wall coming together at a corner

In the diagram above a D365 wall spans in from the bottom left and meets a D300 wall spanning in from the bottom right. Some adaption will be required to ensure continuity of the concrete and insulation as well as a good brick bond pattern in each respective wall. Durisol can advise if required.

For curves, the forms can be modified by cutting; the same method as used with traditional concrete blocks, see below:

Units cut to form curves

In this instance, D250 blocks have been cut in half and placed together to form a reasonably tight curve.

At Foundation Level

When considering the footings of a building, there is no differentiation between Durisol walls and concrete walls that are constructed using conventional forming techniques. The Durisol Wall Form system results in concrete walls that are 120mm in thickness*. Footings should be designed and constructed as following normal good practice, and in strict compliance with local building codes and regulations.

**The thickness of the core is dependent on the insulation used. It is possible to achieve a concrete core thickness of 185mm if 100mm of insulation is used within a D365 unit. It is also possible to fill the units with concrete without any insulation. This method is commonly employed below ground when building Durisol off the footing up to DPC. This creates a concrete core thickness of 285mm. However, it is uncommon to use this approach above ground because the U value of the wall is compromised by removing the insulation and filling the void entirely with concrete.*

Durisol does not rot and is perfectly suitable for use below ground where the units may be permanently wet (See Section on Basements”). As such, Durisol units can be used to build directly off the foundation up to DPC (Damp Proof Course). It is common for Durisol units below DPC to be uninsulated and completely filled with concrete if they do not have a thermal U value requirement. The above ground external wall forming the envelope of the building will have a thermal performance requirement in the building regulations.

As with any type of construction, it is good practice to ensure that all footings are level. Because Durisol is dry stacked, accuracy of foundations is very important. The aim should be to get the foundations within an accuracy of +/-5mm. If this is impossible the first course can be mortared down to create a level first course. The mortar mix is the same as if laying concrete blocks (generally 4:1 or 5:1). If mortaring, the first course must be left for 24 hours or depending on site conditions an appropriate time to develop strength and avoid any settlement when more units are stacked on top:

The area is brushed down and a prepared mortar is applied by trowel in two lines

The Durisol unit is bedded onto the mortar and carefully levelled

Care must be taken to ensure the insulation is not pushed up out of the units when the first course is placed on the mortar bed (if the first course is insulated). The insulation should remain flush with the top of the unit. In most instances, building below ground does not involve using insulated units.

In the case of a stepped foundation the bottom layer of wall forms might need to be modified to create a level bottom course. To avoid unnecessary modification, provision should be made for the steps to be in 250mm increments to match the depth of a Durisol wall form unit.

Rebar Connection to Foundations

In most circumstances, rebar tying the walls to the foundation is NOT necessary. In a traditional masonry build for example (brick and block) there is no physical tying in of the walls to the foundation upon which it sits.

However, in instances where significant lateral loads may be applied (retaining walls for example) it may be necessary. **This is for a structural engineer to decide and Durisol can offer guidance to an appointed independent structural engineer if required.**


Rebar stubs protruding from a foundation

If required, the rebar tails that come from the foundations can be installed by various methods.

Method 1: Whilst the foundation concrete is still wet measure out and inset the bars into the wet concrete such that they correspond with the concrete fill area in a Durisol wall form that will be placed above them. Great care should be exercised, taking into account the Durisol webs and any cut units that might need to be incorporated along the length of the wall.

Method 2: The rebar is cast into the foundations in an L shape (same caution as above).

Method 3: After marking out, a hole can be drilled in the foundation and the bars inserted with an appropriate epoxy or chem fix resin. This avoids any issue with the starter bars lining up with the units above, because the first course can be laid before the starter bars are drilled and inserted.

Regardless of reinforcement, the concrete fill should be brought level with the top of the units forming the below ground level element of the wall to ensure that the DPC can be effectively applied onto a flat surface:

Empty Durisol units below DPC filled completely with concrete to allow a DPC to be installed on the flush and flat surface that is created.

Thereafter, the DPC can be laid, and the wall built above in the conventional manner:

Where reinforcement tails need to run through the DPC they should be coated with a suitable waterproofing paint at the point of penetration.

Rebar Requirement - Durisol UK cannot specify the rebar requirement for a specific project. It is the responsibility of the structural engineer to create a schedule. Durisol can however advise on structural consultants with experience specifying and working with Durisol. Reinforcement can be specified in line with the reinforced concrete design code which structural engineers will be highly familiar with.

At the time of writing, it is a requirement in the Building Regulations for the DPC to be a minimum of 150mm above the external ground level. To achieve this, some thought must be given to ground level and the level of footings, such that an appropriate joint in the units will sit at a level that suits a DPC and is compliant with the regulations.

Openings and Lintels

When openings are formed in a concrete structure it is generally necessary to install a lintel above the opening to support the load above. Concrete is strong in compression but relatively week in tension. For this reason, concrete lintels require steel reinforcement. Lintels tend to be precast and come with reinforcing bars cast into them:

Typical Precast lintel (the ends of the two reinforcing bars are visible)

Durisol does not require the use of separate lintels. It is possible to form lintels within the Durisol units themselves and incorporate some rebar into the concrete pour to form integral lintels easily and cost effectively over openings:

A lintel formed across an opening using face units

Openings are generally formed with “face” units which have a closed end and can therefore be used to form the face of the opening (jambs and soffit) such that concrete cannot pour out and there is a continuous face around the opening into which to fix frames, windows etc.

Single Door Opening

A simple opening (door or window) will need to be framed with a timber goal post made from 4”x2” timber. This is temporary and can be removed once the concrete is cured. This is a simple construction with three pieces of wood screwed together to form the goalpost. The cross member at the top should sit on and be screwed down vertically into the uprights (see below).

A 4”x2” timber goalpost can be simply constructed and screwed together with the same screws used to secure the frame to the units i.e. 100mm coarse threaded wood screws.

The goalpost formed for a doorway opening will run full height to frame out the entire opening and will stand on the ground. Within the depth of the opening, this full goalpost will sit on the inside i.e. in line with where the concrete will be placed within the wall:

The full height timber goalpost for a door opening

Once the Goal post is in place it is possible to start building units up against the frame. A single 100mm coarse threaded woodscrew should be used to screw the goalpost into every unit forming the door jambs.

Full height goalpost screwed into every unit

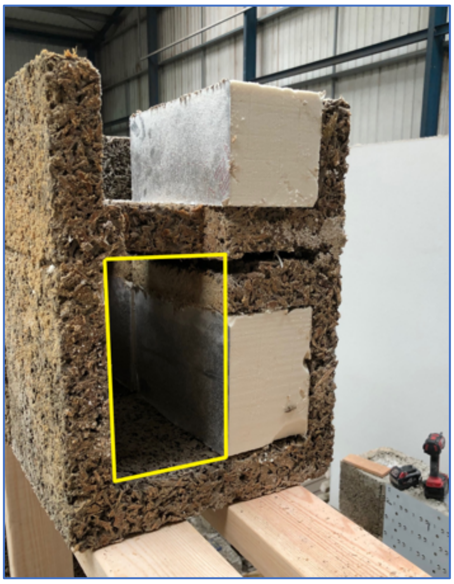
As Durisol external wall is either 300mm or 365mm thick, two goalposts will be necessary to span the entire cross section of the wall. One goalpost will sit under the concrete section and the other under the insulation section. The goal post sitting under the insulation in the unit (outer face) is only there to stabilise the empty lintel units before the concrete is poured. A full goal post is not necessary. In this instance the goal post only needs to extend three courses down the jambs of the opening (750mm) and be screwed into each course of units.

The partial goalpost sits towards the outer face of the wall in line with the insulation inside the units. The vertical uprights of the goalpost are 750mm long and are screwed into the top three courses of units.

Once the goalpost is formed for the opening, the lintel can be constructed. For a short span such as a doorway, a lintel can be formed by standing face units on their end and threading rebar into the lower chamber. Firstly, the face units must be modified:

The face unit is turned over in the second graphic to gain access to the lower web and cut it out. This increases the size of the lower chamber which will be used to form the reinforced lintel.

Once the unit has been modified it can be placed in position:

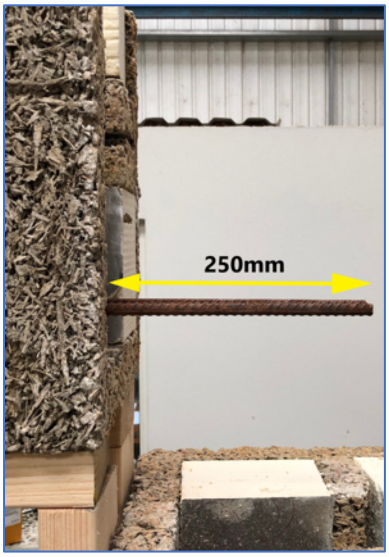


*The modified unit placed in position**

In this instance the top has also been cut off the unit. This is to bring it back into the same level as the standard units either side of the opening. This will be explored later.

Once a series of modified face units are placed side by side, a void is formed across the top of the opening which rebar can be threaded into (see below). The rebar should sit in the bottom of the chamber on plastic spacers which means the reinforcement will be fully encapsulated in concrete when the units are filled.

The rebar should also protrude 250mm beyond the ends of the opening as illustrated below. This means if the opening is one metre wide, the reinforcement must be 1.5m long to allow for an overhang of 250mm at either end.



The amount of rebar in the lintels is determined by the structural engineer.

The facing units used to form the lintel should be placed across the top of the opening. They should finish flush with the jambs either side of the opening but should NOT extend beyond the sides of the opening:

Face units finishing flush with the sides of the opening

The underside of the face units are closed off, so if they extend beyond the edge of the opening, they can prevent the free flow of wet concrete down the sides of the opening into the units below.

As the rebar in the lintel must extend 250mm beyond the edge of the opening, the rebar will extend into the standard units that will sit either side of the opening. A couple of simple cuts adapt these units to take the reinforcement:

Standard unit adapted to receive reinforcing bars from the end of the lintel

In this example the face units have been cut down (yellow line) to bring them back on course with the adjoining standard units (indicated with the arrow).

Face units forming lintel cut to bring them back onto course

In an ideal world all openings will be created in denominations of Durisol unit sizes (500mm long by 250mm wide). However, a door opening tends to be 2,100mm high and 860mm wide.

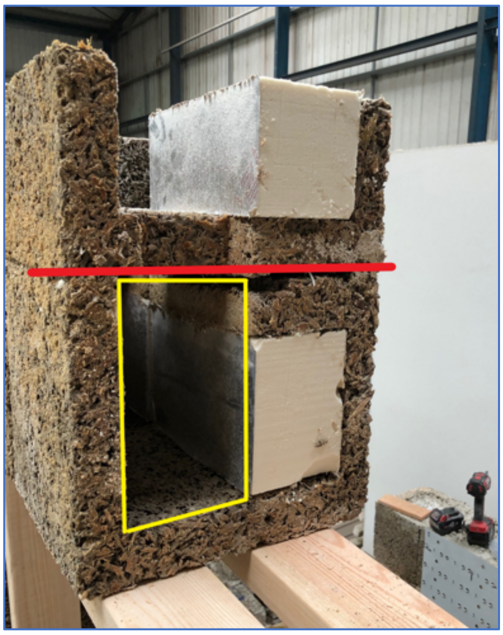
To bring the units back onto course higher up, simply cut the few units forming the opening. The cutting is not done in situ. Measure up, mark the units in a designated cutting area and then place them into position. It is also clear in the diagram above that the width does not perfectly match the width of the units. A face unit has been cut such that the width of the open is three full units and one cut unit.

It is prudent to brace a simple opening such as this with a piece of 4"x2" on either side, especially as the units have been cut open and the top web tying them together is hence lost:

Single door opening braced with 4"x2" secured with coarse threaded 100mm wood screws

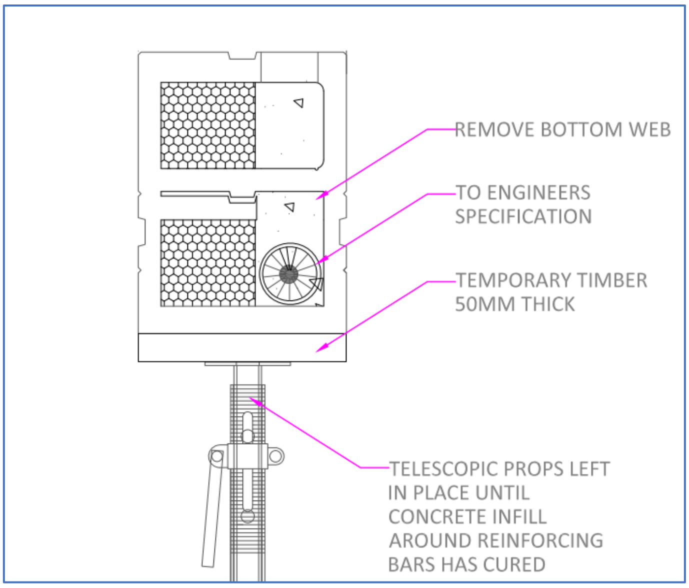
In this instance 100mm was cut from the top of the face units to bring them back onto course. If there are height restrictions above the opening i.e. there is very little space between the top of the opening and the eaves, the maximum amount that can be cut from the units forming the lintels is 250mm. This means half a unit minimum is required to form the lintel.

In the diagram below, the face unit cannot be cut any lower than the red line, as the yellow rectangle signifies the chamber where the lintel will be formed during the concrete placement and this must be maintained.



If there is less than 250mm clearance between the top of the opening and the eaves, please contact Durisol for advice. Additionally, if a face unit is cut fully in half to form a lintel, both inner webs will be removed in this process (the one remaining inner wed in the diagram above sits above the redline and would be removed if the red line signifies the cut). The unit will therefore need some bracing from front to back to hold it together during the pour, without the webs to stabilise it. This would involve screwing pieces of 4”x2” into the existing bracing on the front and back face of the lintel.

In section, the lintel detail for a door opening:



Indicative doorway section detail

The opening needs to be braced with a single telescopic prop (in the case of a single door opening) during the concrete pour and until the concrete is cured (minimum seven days in normal conditions). The 50mm temporary timber signifies the 2” timber used to form the goalpost.

A Single Window

A window can be formed in the same way as a door, except for the fact that it does not extend down to the ground. However, the lintel detail is exactly the same in terms of the forming of goalposts and the solider coursing of face units on their ends to form the lintel void. One difference is dealing with window cills. A window cill is initially an open arrangement:

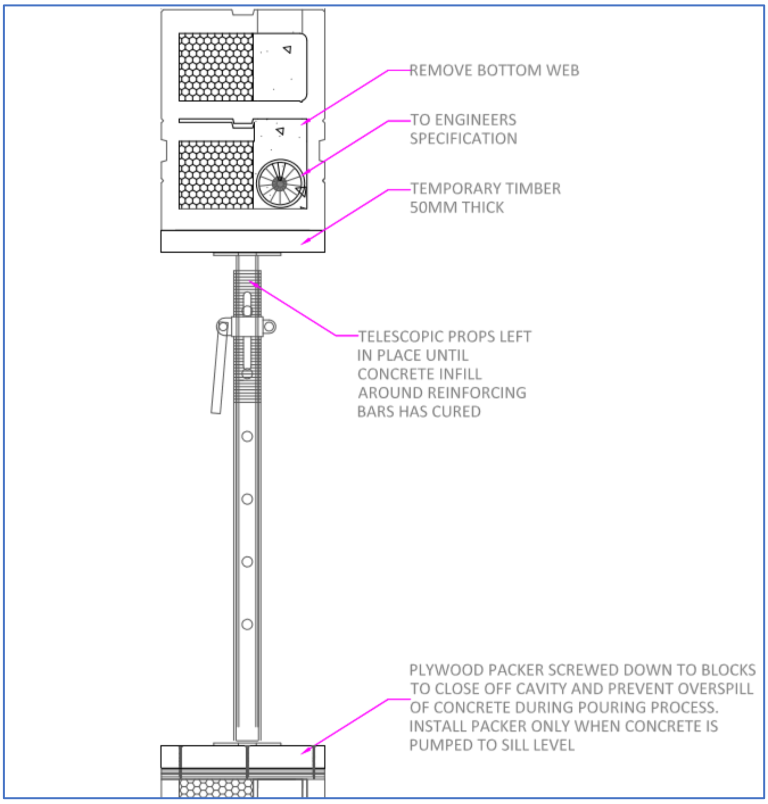
A window opening showing the cill area

Wet concrete will be poured to fill this wall and as such this cill must be closed off to contain the wet concrete temporarily (see page 86 also):

A window cill blanked off with 12-18mm plywood

When cills are blanked off in this way they can be secured with wood screws. In this case for a one metre wide opening the plywood is secured with 4 x 60mm coarse threaded wood screws. A cill wont experience the same dynamic pressure from falling wet concrete. The pressure is gentler and rises up from below.

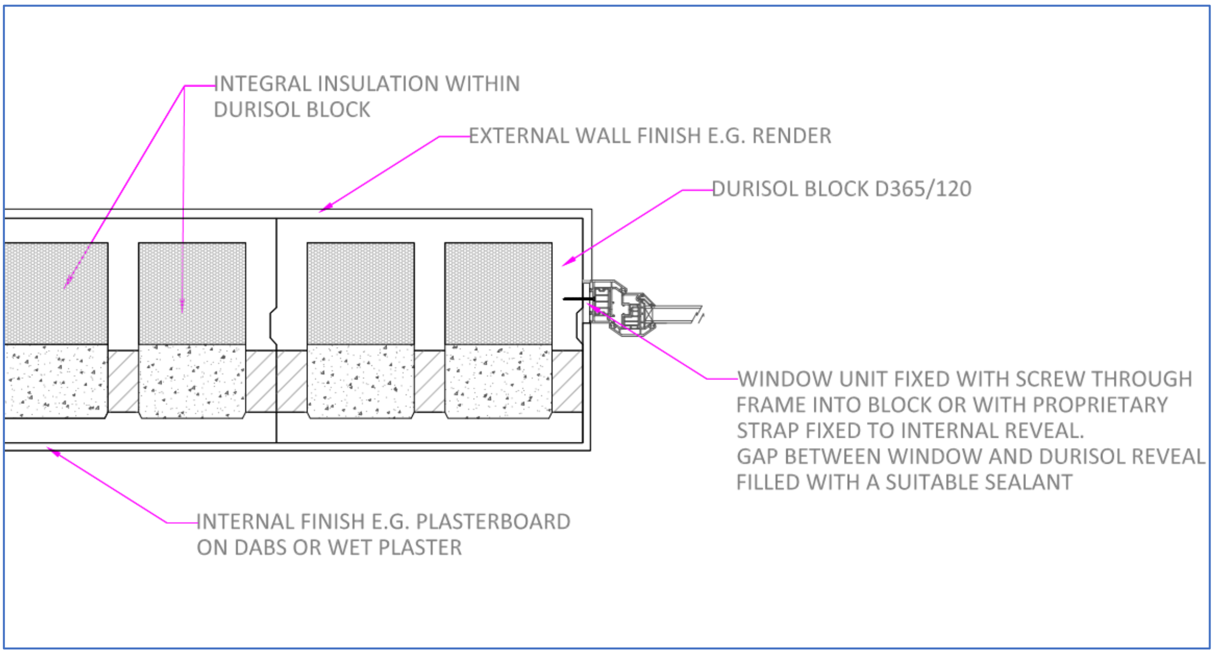
The Window detail in section:



Indicative window opening detail in section

As with a single door opening, a single telescopic prop must be used during the concrete pour and until the concrete has cured. This is a minimum of seven days in normal conditions.

A window can be fitted into the depth of the opening wherever desired. In the typical detail below the window is fitted in line with the insulation. For a small window the frame can be screwed into the Durisol which will hold it perfectly well.



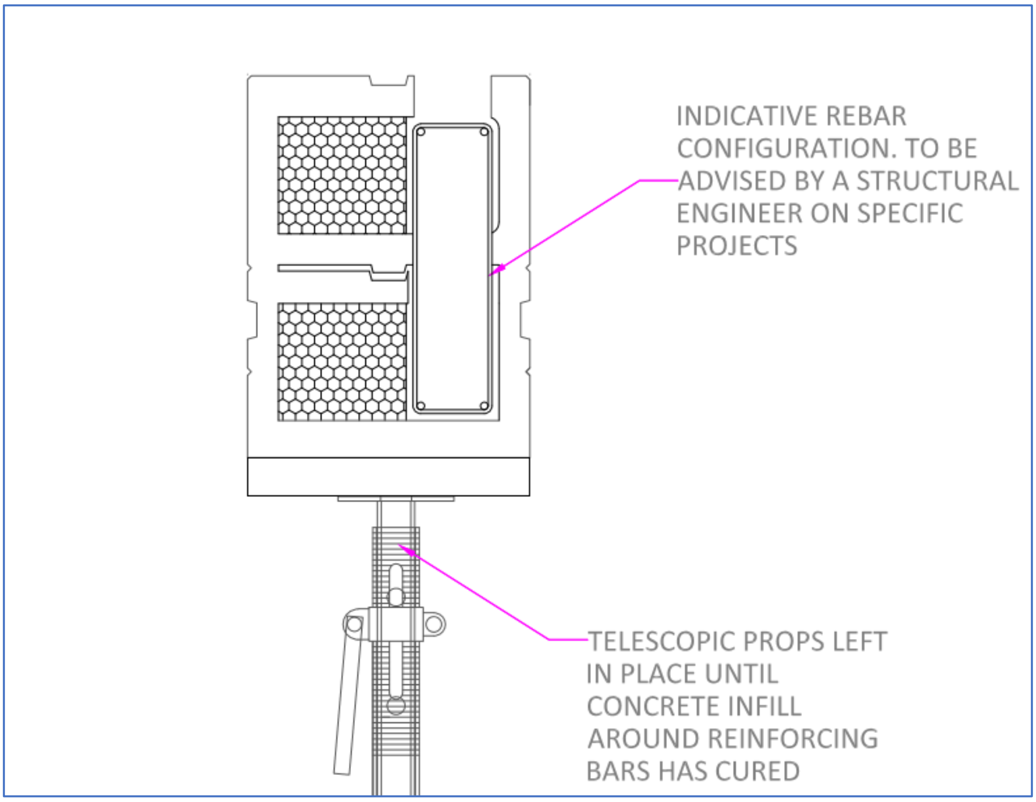
Plan view of window jamb detail

For a much larger opening the window can be fitted in line with the concrete infill i.e. more deeply recessed, or it can still be fitted in line with the insulation but with straps to tie it back to the structural concrete.

Substantial Openings

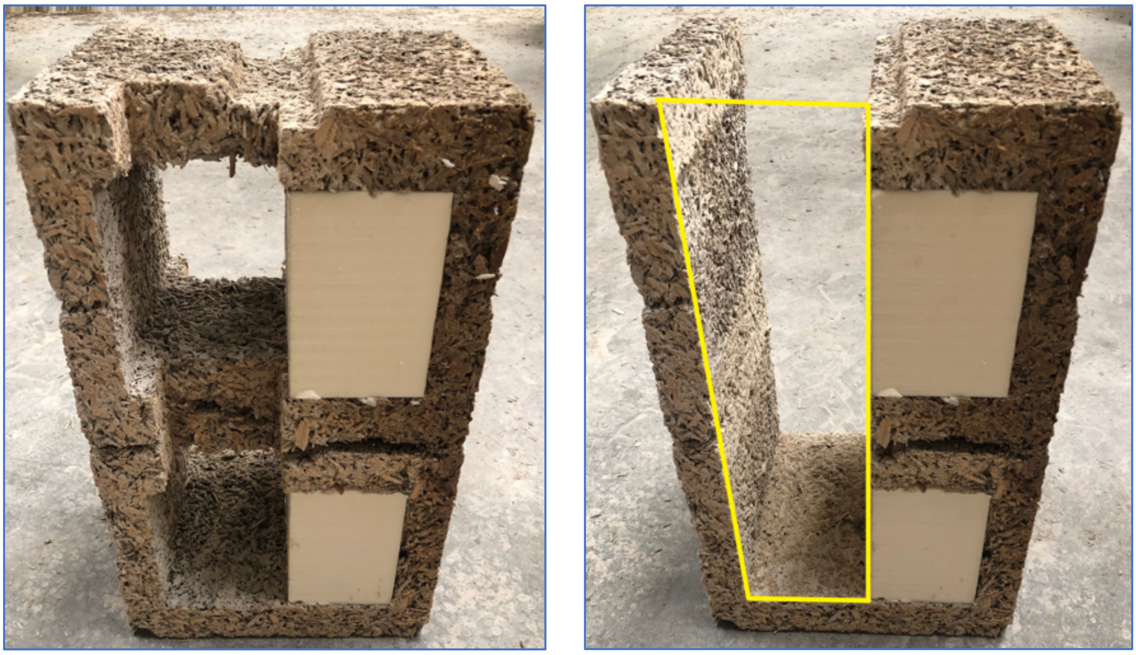
If a substantial opening is required, then more reinforcement may be necessary in the lintel and the opening will need to be propped with a series of telescopic props, rather than just one in the case of a small door or single window opening. A structural engineer will specify the reinforcement required and Durisol can advise on engineers who are conversant in the system and can provide support.

It may be necessary for a large opening (bi folding doors etc) that reinforcing steel is required in both the upper and lower chambers of the Durisol face units over the opening. The engineer may tie these together with shear links and if so, access is required form the top of the units to insert the prefabricated steel cage.



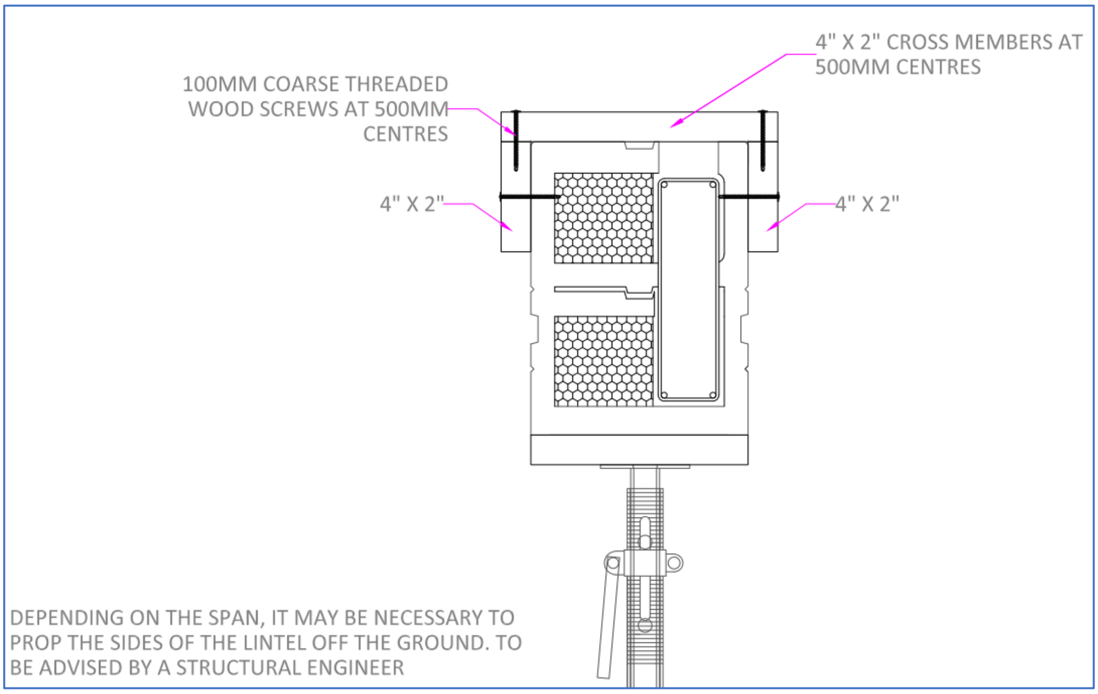
Indicative detail of a large span lintel formed within Durisol units

In this instance the unit will need to be modified as below to form a U shape:



All the webs removed from a face unit to enable the insertion of a reinforced steel cage

When the openings are formed a temporary prop should be made to support the lintel section until it's poured, this can be screwed into place. This can be done by screwing a piece of 4x2 either side of the unit as shown below and a bridging piece of timber screwed across the top every meter length.



Indicative bracing detail for a large span lintel formed within Durisol units

For larger span openings a prop should be inserted at a minimum of 1 metre centres across the length of the opening.

It is also important to ensure that all reinforcement is fully encapsulated in concrete during the pour. For this reason, it is prudent to use rebar spacers to keep any rebar off the face of Durisol voids and suspended in space where it can be fully wrapped when the wet concrete flows into the voids:

Indicative Rebar on spacers to ensure full encapsulation in the concrete pour

If a round or arched openings are required the best approach is to stack the forms, scribe on the opening, take apart the stacked forms, cut them and then restack. Use a temporary shutter to ensure the concrete does not come out of the forms; this can be attached by screws into the forms. For standard door, window openings face units are used. For further advice on this application please contact Durisol UK.

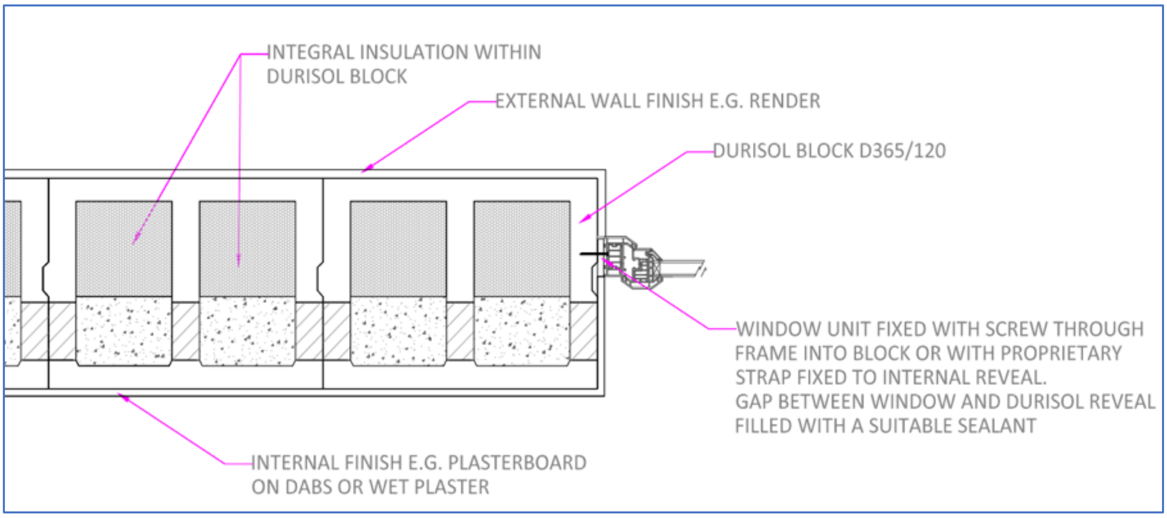
Windows

Once an opening is formed in Durisol a window of any style can be installed. Windows are held in place with frame anchors as they would be in a conventional build and then a bead of high-quality silicone sealant to seal around the edges.

In a cavity wall, the cavity is closed around openings. Once a cavity closer is installed it brings the inner and outer skins into contact with one another. To prevent this creating a path for moisture, a vertical DPC must then also be installed.

Durisol is free draining and the open matrix of the block means it doesn't support capillary action (i.e. it doesn't suck moisture) like a concrete block or brick will. For this reason there is not the same issue with ingress of water around doors and windows and controlling its movement. A masonry construction would be inclined to suck moisture across a cavity. Durisol has no such issue and allows for a solid wall construction. The other big advantage of removing all these components is no thermal bridge around the openings. Durisol thermal performance at junctions is superb (See Appendix 5).

As long as the frames are mechanically fixed into place, the gap sealed with a quality silicone sealant and the finish (render, cladding etc) then applied above, this will work perfectly well.



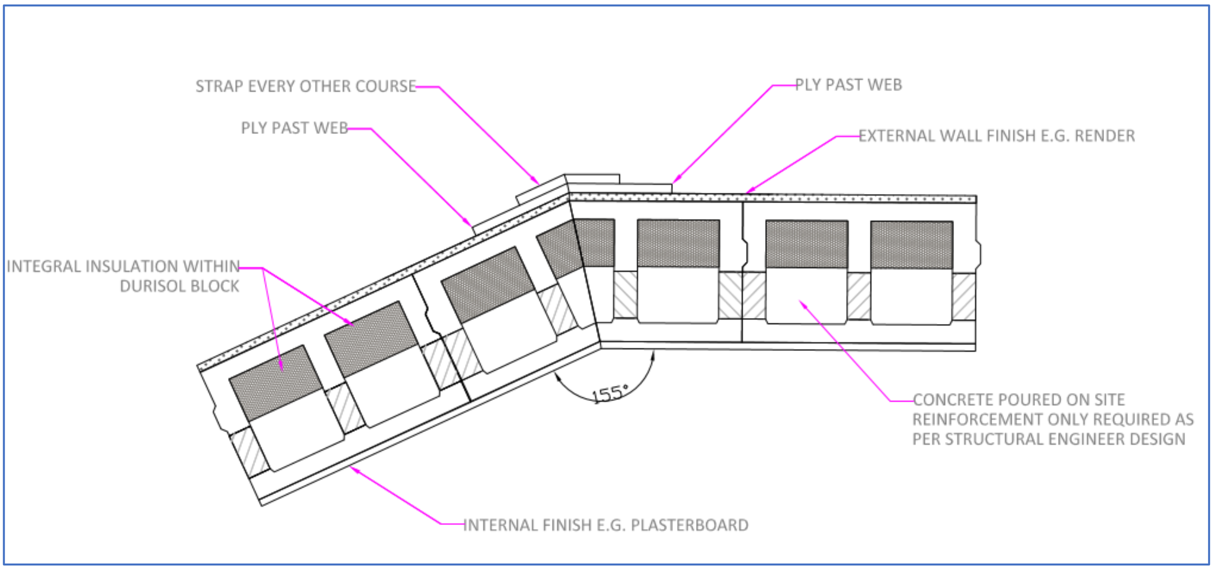
Indicative plan detail of a window being installed into a formed Durisol window jamb

In the illustration above the window is fixed into the Durisol woodcrete. For small windows and single doors this approach is valid. However, if the opening is for heavy long span windows or bi folding doors etc then it may be necessary to fix these back into the structural concrete. This means the window/door needs to sit within the depth of the wall level with the concrete infill where it can be directly fixed to the concrete. Alternatively, if such an installation needs to sit close to the outer face of the wall, straps can be employed to tie the windows/doors back to the structural concrete as required.

The same approach is employed on the window head detail as is applied to the jambs. Depending on the requirement of the structural engineer, the window head can be fixed into the woodcrete with frame anchors and sealed with a high-quality silicone sealant or mechanically fixed into the structural concrete.
Bay Windows are perfectly feasible in Durisol by cutting the units to form the desired shapes:

Typical bay window formed in cut Durisol Units

The standard detail to achieve a finish like this is:



A bespoke splayed corner requires cutting the units on site and bracing the joint

Internal Walls

How to join internal wall form walls to the external wall

When an internal wall is created using wall forms it is best done at the same time as the external wall to make it integral to the external structural envelope. The easiest and best way is to cut a channel into the external form the same width as the concrete core (for a 170mm form this is 120mm) to allow the concrete to have a flow path. This can be done after the external wall is stacked using a saw. It is advisable to use a 4”x2” either side of the connection point of the internal wall to keep it completely upright during pouring:

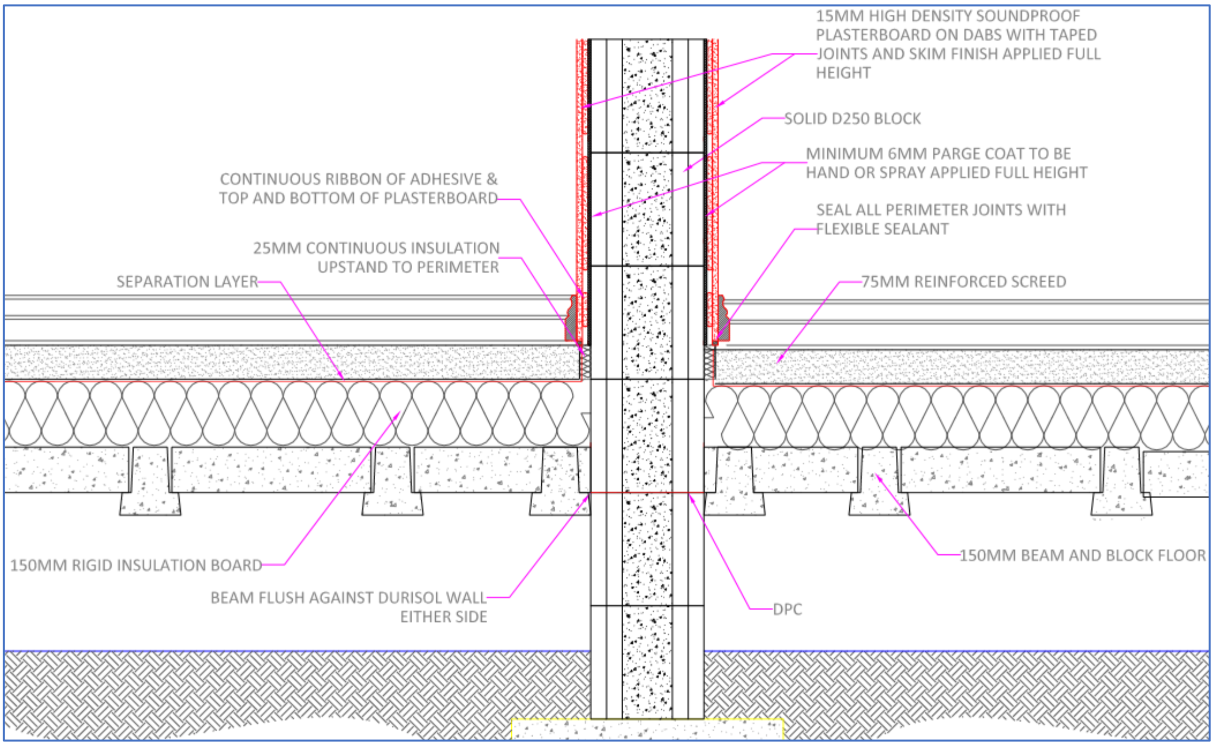
A D250 party wall being built against a prepared external wall

If an internal wall needs to be erected at a later date this can be done by connecting it to the external wall by inserting rebar into the original wall leaving tails to go into the new wall. This is almost identical to the section of “Connecting Durisol to an Existing Masonry Structure”, except there is no need for a vertical DPC when joining an internal wall to the inner skin of an external wall.

A party wall is normally constructed in 250 units which have fewer webs and a thicker core of concrete (180mm) to provide greater mass and more potential for acoustic separation. 250 units are stacked in a normal brick bond configuration as with the other units in the family. They are also connected to external wall leaves using the same methodology detailed above for the 170 wall forms. However, party walls must be poured as integral components to the external walls and not at a later date by dowelling into the external leaves.

Acoustic Performance of Party Walls

Achieving a good dB rating relies on more than just the Durisol wall i.e. any structural floor elements bridging the party wall etc will have an impact. Workmanship is also a factor. However, to achieve the best result from the Durisol wall component the following detail is advised:



Indicative ground floor party wall detail

Party walls should have a 6mm parge coat applied to both sides (full height) to seal the wall. Thereafter, a 15mm high density soundproof plasterboard on dabs should be fitted and taped full height both sides. In some construction types, the plasterboard behind the skirting does not run right down to ground to allow for expansion and movement. This is not necessary with Durisol and the plasterboard should span full height floor to ceiling.

Gables

Building gables in Durisol requires forming an angled wall that will at some stage receive wet concrete.

A gable being formed in Durisol units

The Durisol wall below the gable will have already been filled with concrete and will be structurally stable, with returns at either end as the wet concrete has flowed into the voids in the walls running perpendicular to the gable end also.

Once the gable is built creating a zig zag edge of blocks stepping up (see above) a piece of 4"x2" can be screwed to the side of the wall to designate the straight line to be created to form the top of the wall. The units can then be cut with an alligator saw to form a straight edge, using the timber as a guide.

Timber screwed along the top edge of the gable to guide the cut and make a straight edge at the top of the wall. It is good practice to leave this timber in place to act as bracing during the pour.

Once this operation has been undertaken, the gable will have a straight edge as below:

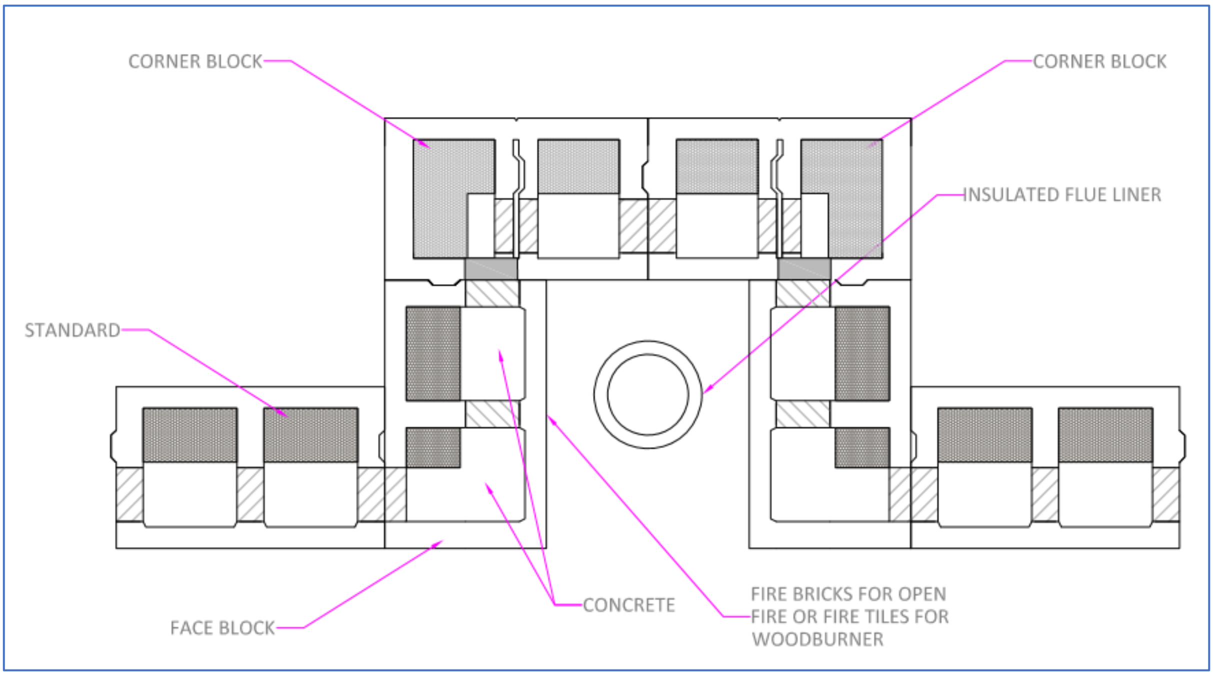
A formed gable end

To pour wet concrete into an angled wall it is necessary to place shuttering along the top of the gable to close off the opening and prevent the wet concrete spilling out. A scaffold board is a good width for such an operation. Alternatively, a piece of 6” x 2” can be screwed to the top of the wall to blank off the opening. One can leave a small gap at the top (just big enough for the concrete pump nozzle). If the gable is very tall it may be necessary to leave an opening half-way up the gable and to pour and fill the gable in two stages. Firstly, pour concrete into the “half-way” opening, close it off and pour the rest into the top opening to ensure full filling of the gable.

The open top edge of the gable needs to be blanked off with timber before pouring concrete

Chimneys

Chimney stacks can be built in Durisol just as they would be in conventional cavity masonry.



Indicative detail showing internal Durisol corners used to form the shape of the chimney stack

Building regulations stipulate that flues must be lined in new build properties where the fireplace is intended to be used as an open fire, wood burning stove or gas fire.

A competent designer/engineer should be engaged along with the manufacturer of any intended wood burner/gas fire system to select an appropriate insulated flue liner.

There are no other special provisions or additional measures (at the time of writing) that apply to the use of Durisol to form the chimney stack compared to other structural walling systems. It is normal to use fire bricks or tiles onto the chimney itself to protect the masonry with which a chimney is normally built. The same measures are to be taken with a Durisol construction.

The top of the opening of the hearth itself can be formed like a lintel with face units soldier coursed across the top of the opening. As these units do not form the outer envelope of the building they do not need to be insulated.

Connecting Durisol to Existing Stone Structures

It is often necessary to tie a Durisol build into an existing stone structure during an extension or renovation. To achieve this the two walls must be structurally tied together whilst removing the possibility of moisture from tracking between the two.

Durisol units when stacked in a brick bond configuration will create a lattice of columns and beams within them when filled with concrete. The horizontal beams are 100m deep and 100mm wide. When joining a Durisol wall to an existing wall the aim is to introduce reinforcing bar stubs to tie the two walls together. These are to be fixed into the existing wall with resin and then cast into the Durisol wall when the concrete is poured.

In the example below, a Durisol wall is to be joined to an existing stone cottage. The wall to be joined to is not particularly straight or even.

A Durisol wall be constructed perpendicular to an existing wall

The existing wall should be marked vertically

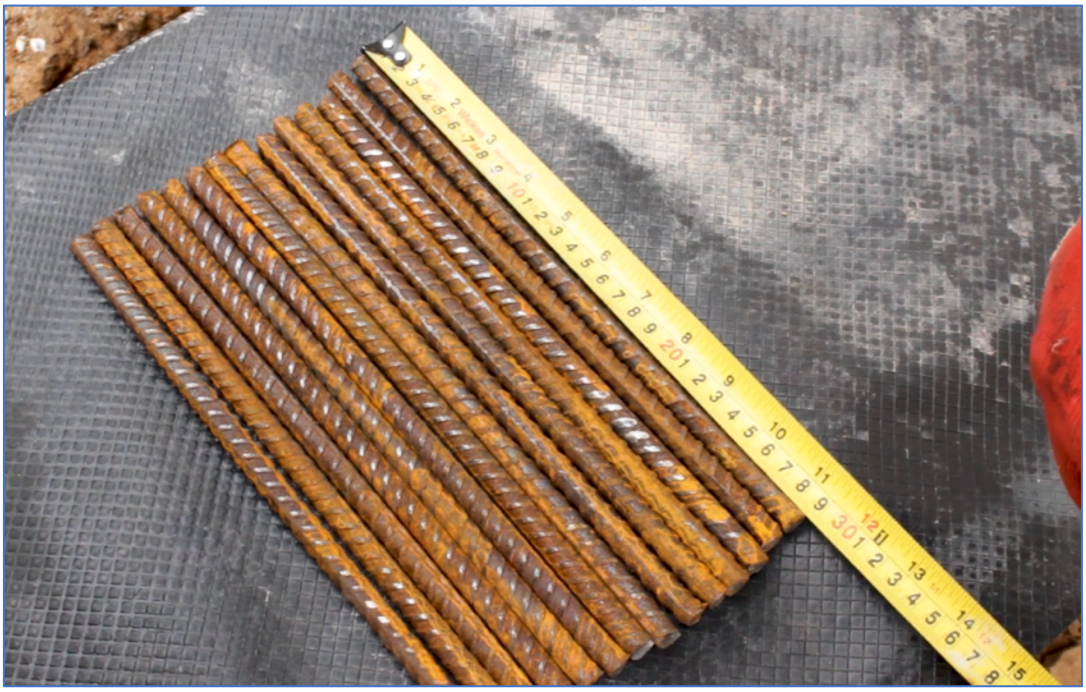
The existing wall should be marked with a vertical line (see below in blue) which indicates the centre of where the 100mm concrete core in the Durisol will meet the existing wall.

The yellow box in the image below signifies where the concrete beam inside the Durisol will flow against the wall. Half of the void is formed in the cut out in the Durisol unit that is visible. The rest will be formed by the unit that is placed on top. The blue mark indicates the centre of this beam and this is where the reinforcing bar will be resined into the existing masonry wall:

Existing wall marked for installation of rebar stubs

Durisol units are 250mm high.If a mark is made on the wall at 500mm vertical centres along the vertical line, a rebar stub can be installed in every other course up the wall.

As an indication, 10mm reinforcing bars, 300mm in length installed into every other course up the wall should be sufficient to tie the Durisol wall to an existing masonry wall together in almost all scenarios. A structural engineer should always satisfy themselves of a specific application:



10mm reinforcement bars, 300mm in length to tie a Durisol wall into an existing masonry wall.

The existing wall can now be drilled to 150mm depth and the reinforcement bar installed using a reputable epoxy resin suitable for masonry applications. The reinforcing bar will protrude 150mm out of the hole and this protruding piece will be encapsulated in concrete when the Durisol wall is filled with wet concrete:

The wall is drilled and a suitable reinforcing bar is resined in to position

A damp proof course (DPC) in now installed vertically up the wall to separate the new wall from the existing and prevent the transfer of moisture in either direction. DPCs come in a variety of widths. The important consideration is giving full separation. In this instance a 300mm wide Durisol wall is being constructed and a 400mm width DPC is being installed to separate it from the existing structure. As the rebar stubs penetrate the DPC, it is necessary to seal around the base of the stubs by liberally applying a bituminous paint with a brush:

A vertical damp proof course (DPC) in installed and the rebar protrusions are sealed

Thereafter the Durisol wall can be built against the existing masonry wall. The units may need to be shaped and cut slightly to match the profile of the uneven existing wall. Thereafter the wall can be filled with concrete whereby the protruding rebar stubs will be incorporated into the pour. The two walls are now structurally connected but separated by a DPC:

A Durisol wall connected to an existing stone structure

Connecting Durisol to Existing Brick Structures

System solutions exist that allow for new brick structures to be attached to existing brick structures quickly and easily. There are a number of manufacturers of “Wall Starter Systems” that provide a mounted rail with ties that can sit within the bedding joints of traditional masonry to connect one structure to another:


Indicative Wall Starter Systems available on the market

As opposed to an uneven stone wall, a nice straight brick structure provides an ideal surface upon which to fix one of these systems. It is easy to incorporate this into a Durisol wall and capture the ties within the poured concrete to provide a connection between the new Durisol wall and the existing brick wall:

In addition to the use of a wall starter system Durisol UK advocates the use of a vertical DPC to provide moisture separation between the new and existing structure. Where any fixings penetrate the DPC to fix the guide rail to the existing wall, bituminous paint should be applied to seal around these penetrations in the same way that rebar stubs are sealed in the earlier example of fixing to an uneven stone wall.

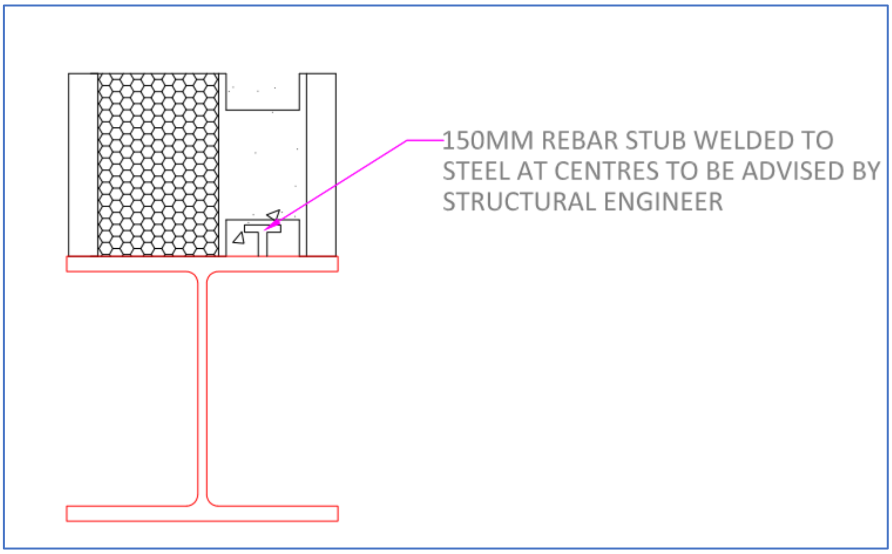
Building Different Units Types on Top of One Another

There are instances where it may be necessary to build different unit types on top of one another. For example, if the building steps in at first floor level then may be a requirement for a party wall (D250 units) on the ground floor to transition into an external wall (D300 or D365) on the first floor.

There are many scenarios in which this may occur. The important consideration is to ensure a continuity in the concrete core. Whilst a D300 and D365 unit have different overall thicknesses (300mm and 365mm respectively), the concrete core within both (when insulated) is 120mm. This core must line up vertically when the units transition from one type to another. Used in their normal configuration an insulated D365, D300 and a standard D170 all have the same concrete core thickness of 120mm. There will of course be a step in the wall where it changes in thickness and thought will need to be given as to how this will be covered and finished. Such scenarios are too numerous to list here, but Dursiol can advise on individual cases.

Building Durisol off Structural Steelwork

Should it be necessary to incorporate structural steelwork into a Durisol build or if Durisol becomes incorporated into an existing refurbished structure, then there may be instances where it is desirable to build Durisol units on top of structural steelwork:



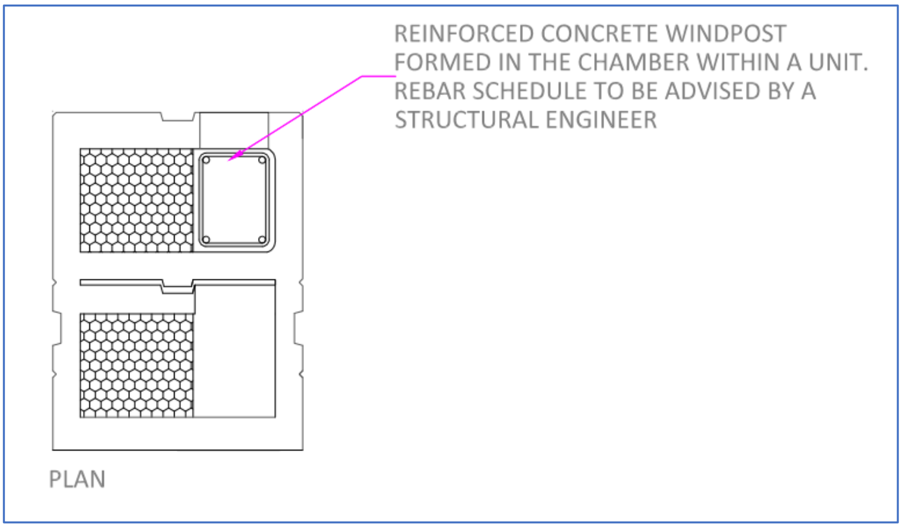
Indicative detail of a Durisol unit sitting on top of structural steelwork

The two elements can be tied together using rebar stubs welded to the flange of the structural steelwork, in a size and spacing that satisfies the structural engineer.

The question should be asked if structural steelwork is necessary when reinforcement can be introduced within the Durisol units to create a structural frame. The latter options avoids any issues with cold bridging that can exist when a structural steel frame is employed.

Introducing Wind Posts in Long Span Walls

Should a Structural Engineer deem it necessary to introduce a wind post into a long spanning Durisol wall, this can easily be achieved.



Indicative detail of a reinforced concrete wind post formed within a Durisol unit

Depending on the size of the post to be formed, a single chamber can potentially be used to accommodate vertical reinforcing bars tied together with shear links into a reinforced concrete wind post.

To make this detail work it is very important the units within the wall are perfectly aligned in a brick bond to create a vertical chamber than runs perfectly down the height of the wall, into which the post can be constructed. Should a much deeper wind post be necessary, a pier can be created by turning a section of blocks 90 degrees such that they project into the building by 250mm. The internal webs can be removed, and a much larger post can be created, although this is very unusual.

Movement Joints

In standard masonry construction movement joints are generally needed at 12.0m centres in brickwork and 6.0m centres in blockwork, although this is dependent on the composition and type of brick/block used. Concrete has a considerably lower expansion coefficient in relation to temperature variations. The main reason for movement in concrete is due to shrinkage as the concrete cures. The Durisol unit matrix will act as an alternative to a movement/ shrinkage joint and for this reason, movement joints are not required and Durisol UK does not have a standard detail for such an application.

7. Placing Concrete

Prior to placing concrete in the Durisol Wall Forms, re-check the walls for plumb and make any adjustments necessary. Walls should be suitably braced (see section 9). Experience has shown that it is also helpful to place a string line at the top perimeter of the wall to aid in adjusting the straightness of the wall prior to, during, and following placement of concrete into the Wall Forms.

Estimating Concrete Requirement

There are four wall form units in the family. These are D170, D250 (both uninsulated) and D300 and D365 (both insulated) as standard. The D300 unit as standard contains 100mm thickness of insulation and the D365 units contain 165mm thick insulation (as standard). In these formats, the core (to be filled with concrete) is the same across the D170, D300 and D365 units at 120mm thick. This makes it easy to calculate the required concrete for the pour regardless of the unit used. The one exception is the D250 unit which is designed for party walls and this deliberately has a thicker concrete core (180mm to provide better acoustic separation).

As a rule of thumb, 1 cubic metre of concrete will fill 10 square metres of wall. Calculate the square metre area of the walls to be filled. Dividing this number by 10 will provide the cubic metre volume of concrete required. There will also be approximately 0.5 m^3 retained in the pump (if this is the chosen method of placement) which will not make it through the hoses.

Example:

Area of wall for a single storey extension = 55m^2

Volume of concrete required = (55/10) + 0.5 = 6m^3

As a simple guide, the following table shows how much concrete each wall type will consume:

Unit Type	Square metreage of wall per 1m^3 of concrete
D300 with 100mm insulation	10m^2
D365 with 165mm insulation	10m^2
D250 Unit	7m^2
D170 Unit	10m^2
D365 with 100mm insulation	6.5m^2
D365 uninsulated	4m^2
D300 uninsulated	5.5m^2

Concrete quantities used are dependent on-site conditions, units modified, concrete composition etc so should be taken as a guide.

Concrete Type

All concrete placed within Wall Form units should be in accordance with applicable standards and codes. Concrete should be used with an aggregate of 10mm. This helps the concrete flow through the wall forms. The slump should be between S4 and S5 and is critical in achieving a void free pour. It is advisable to slump test the concrete prior to pouring. Caution should be used when ordering S4 concrete. The table below shows the slump but ready-mix suppliers often quote a tolerance of -20 to +30mm, the lower end of which would be too dry. Durisol recommends that the maximum range is specified (with no deviation) at 180mm - 220mm slump:

Class	Slump Range	Target Slump
S1	10-40	20
S2	50-90	70
S3	100-150	130
S4	160-210	180
S5	210-n/a	220

Slump class from BS8500

Durisol holds footage of wet concrete with the ideal consistency which is available upon request.

Concrete Placement

There are many methods of concrete placement that can be used with Durisol Wall Forms, including but not limited to, conveyor belts, concrete pumps, crane and bucket, by hand or directly from truck chute. The concrete pump is typically the method of choice.

The vast majority of mechanical concrete pours are achieved using a boom pump (although static pumps are available). DO NOT confuse a static pump with a screed pump. Most screed pumps will NOT pump concrete:

Boom Pump

If a boom pump is to be used it is essential to specify a max 100mm discharge pipe (preferably 75mm) and an S bend as low as possible in the vertical pipe to slow the concrete speed vertically before it enters the wall form. This can be achieved by clamping two 90º bends together.

The pump should be set to its lowest possible flow rate where a steady flow can be achieved. A good pump operator will be able to hold the pump flow at a low level (without the concrete spitting) and this will impose the least stress possible onto the wall form units during concrete placement.

Durisol has footage of concrete being pumped under a desirable pressure which is in the public domain and available upon request. A good pump operator who is familiar with the system and its requirements will make for a straightforward experience.

If unsure about pump specification (and reliable operators in your area) contact Durisol for further details.

When pouring, ensure no spills occur, cleaning any that do, paying particular attention to the tops of the wall forms to ensure they remain totally clean and free of debris.

No concrete pokers or other electrical vibrators are required to compact the concrete. These impose undue stresses onto the Durisol units and are not required if the slump and aggregate size of the concrete specification are strictly adhered to. The concrete should be inspected as it is deployed and any hard to reach corners or complicated arrangements can be fully filled with gentle hand rodding to assist where required.

Alignment and Stability

It is assumed that all measures have been taken to properly brace the walls as per Section 6: “Building with Durisol”.

To stabilise the wall during the pour it is also best practice to screw the top course of wall forms together horizontally through the adjoining webs. This takes seconds to do but provides additional stability and peace of mind:

The top course of units can be screwed together with 100mm woodscrews

Once the concrete has been placed, make any final adjustments to the wall alignment to ensure a straight and plumb wall. If continuing Durisol above the present stage of construction, it is recommended that the initial placement of concrete stop 100mm below the top of the top course of Wall forms with the surface left rough and unfinished to facilitate a better bond with subsequent lifts. This ensures the “day joint” sits within the depth of the unit.

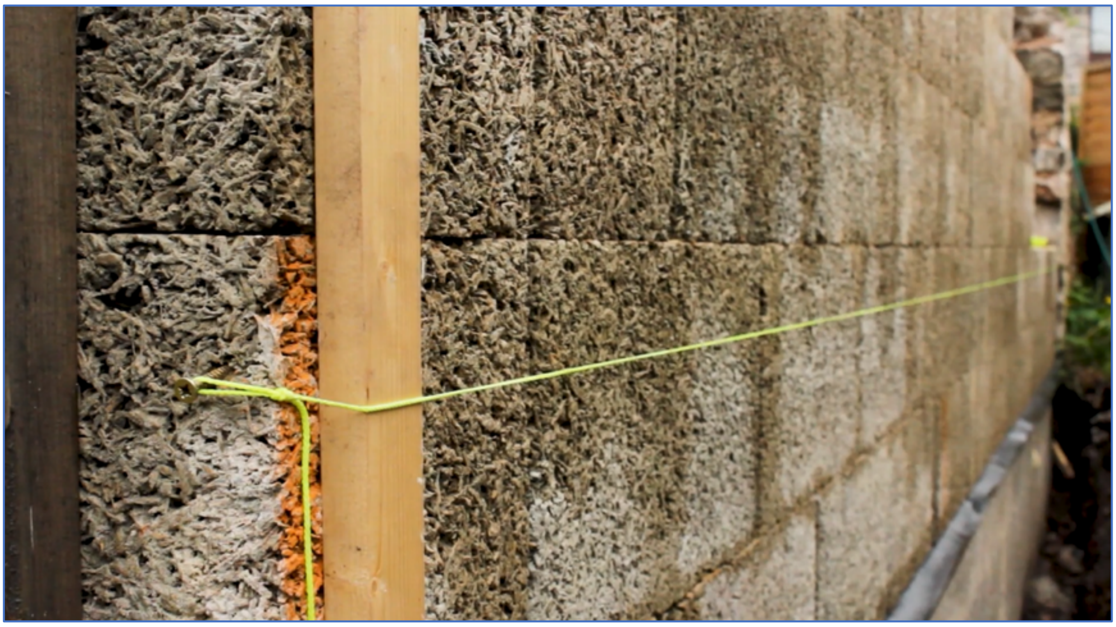
Half-filled top course during a pour

When the wall will not be continued for further stages of construction, the concrete will need to be finished at the top of the wall to provide a relatively smooth surface. Typically, the wall will have a wood plate installed in conjunction with anchor bolts to provide attachment for roof trusses/rafters. Anchor bolts can be placed following finishing of the wall according to local building code requirements for anchorage.

Placement of concrete should typically begin by placing concrete below the window openings such that when the remainder of the wall is filled, a void is not created below the opening. Section 7 shows how to blank off a window cill. For a small window (1 metre) it is not necessary to fill below it beforehand. When the wall is filled, the wet concrete will flow in from each side and fill the void beneath the cill. However, for a large span window it will be necessary to fill this void before blanking off the cill. This ensures the space under the cill is fully filled. The pump can be stopped for a minute or two while the ply is screwed into position after the voids beneath long span windows has been filled. Following this, the installer should then continue placing concrete into the remainder of the walls from the top, passing the pump around the wall three times, filling it a third with each pass.

Do not place the concrete pump hose directly into the corners or intersections of walls, but instead allow it to flow into these spaces from 30-50cm away. This prevents any undue pressure directly on the junction points which could cause movement.

It is important to monitor the wall alignment relative to the string line installed prior to concrete placement. This will make the job of final alignment much simpler following concrete placement.



Rig up a string line and use a piece of timber either end to sit it proud of the wall

The approach above prevents the line from catching on any rough pieces of Durisol. A piece of timber of the same thickness can then be offered up behind the string line at various intervals along the wall to ensure the line is equidistant from the wall along its entire length:

Distance of the string line from the wall can be checked

If at any point the wall is not straight, small adjustments can be carefully made with a rubber mallet:

Small adjustments made prior to pouring concrete

Unlike conventional formwork, the wall form units are porous and will dewater the wet concrete. The high slump nature of the mix and the small aggregate size means the concrete is free flowing. It should still be closely monitored, and gentle hand rodding applied in any areas where further flow and compaction is needed.

During and after the pour brush down and clean the top of the wall to ensure no wet concrete is allowed to cure and compromise the level nature of the top of the wall. The next layer of wall forms will be built off this base and it needs to be level.

The insulating properties of Durisol Wall Forms allow winter construction without additional heating or insulation sources being required. Durisol wall systems have been constructed in temperatures as low as - 6°C without any complication.

8. Installing Services

If services are required to pass through the wall the best method is to install a duct prior to pouring.

Drainage penetrations formed in a Durisol retaining wall

If main services need to be put in the void in the wall forms they should take up more than 25% the void and appropriate conduit should also be installed:

It is easy to cut shapes into the Durisol with a reciprocating saw.

Durisol units shaped to accommodate a waste pipe

For internal services, the Durisol material can also be chased out after pouring. This can be done with either a wall chaser or a powered circular saw with a depth gauge, the gauge should be set at slightly less than the Durisol woodcrete and then cold chiselled out.

Alternatively, a router can be used.

A router being used to create recesses

The Durisol material is soft to chase out in comparison to concrete and there is 40mm depth of woodcrete to work width before one reaches the structural concrete on the inner face of external walls.

First fix electrical wiring and conduit being installed

9. Floor Systems

Durisol can be used in conjunction with all commonly encountered flooring systems including:

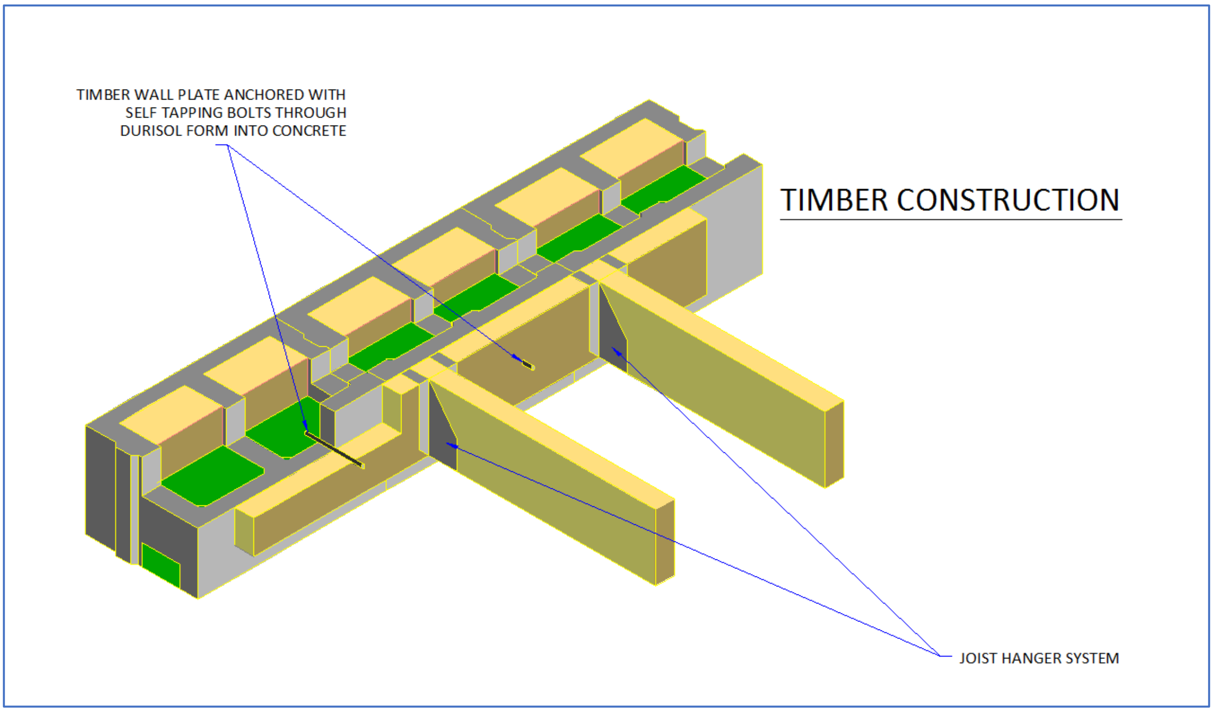
- Timber Joists and/or Posi Joists
- Block & Beam and/or Concrete Plank
- Lewis Deck Dovetailed Sheeting

Timber Joists and Posi Joists

Timber joists can be fixed to Durisol walls by first bolting a timber wall plate to the inner face of the Durisol wall. The bolts span through the timber plate and the woodcrete and gain a fix in the structural concrete core.

The bolts used to fix a wall plate will be as per the manufacturer's specification. They will generally be either self-tapping concrete screws or expansion anchors of a 16mm diameter with a minimum of 100mm embedment into the concrete and at no more than 500mm centres.

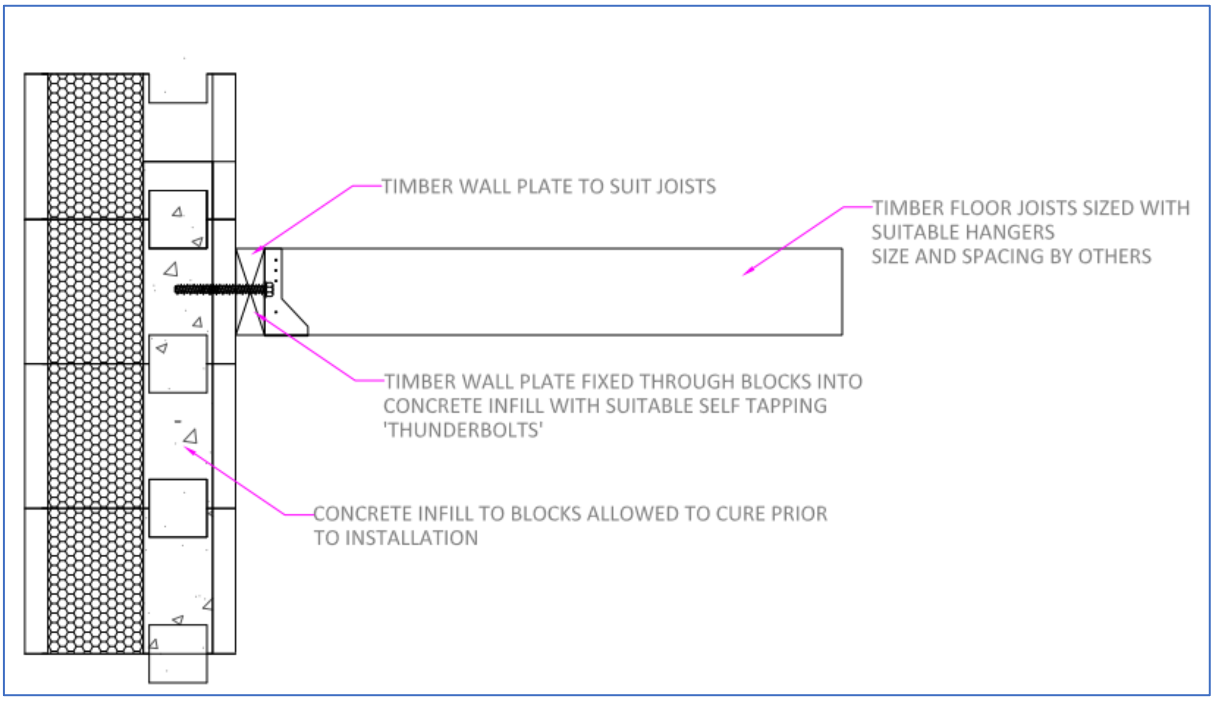
Joist hangers are then attached to the wall plate and the individual joists fitted into the hangers as normal.



A typical detail showing a timber wall plate bolted to a Durisol wall

The manufacturers guidelines should be followed when selecting a self-tapping concrete screw. However, a minimum of seven days should be allowed for the structural concrete within the Durisol to cure before such fixings are installed, or for as long as is necessary to cure the concrete given specific site conditions.

Fixing a timber wall plate is the quickest and easiest method of fixing joists as opposed to fixing each of them separately to the wall which can be done but which creates challenges with getting them all exactly level. Fixing the joists to a level wall plate circumvents this potential issue.



Indicative cross section showing timber wall joists sitting on a wall plate installed with self-tapping concrete screws into the structural core of the Durisol wall.

Either a standard timber joist or a Posi Joist can be installed using appropriate joist hangers and a wall plate fastened to the Durisol wall:

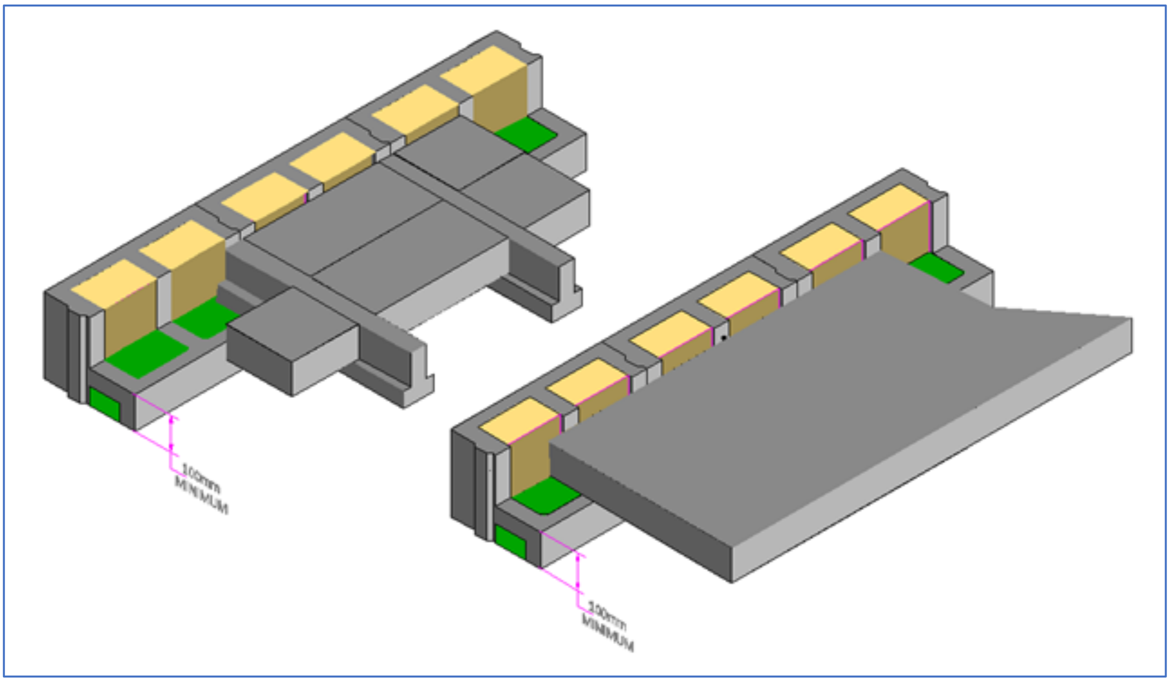
Posi joists sitting in joist hangers and bolted to the core of a Durisol wall via a timber wall plate

Alternatively, a cast in fixing could be used. In this instance, 100mm coarse threaded wood screws can be used to position the wall plate. **These are only there to locate the wall plate whilst cast in bolts are installed. The screws are not intended (or able) to carry the floor loads in use**. Lengths of threaded rod can then be installed through the wall plate such that the rods span into the cavity of the Durisol wall prior to it being filled with concrete. A nut can also be screwed onto the end of the threaded rod in the cavity such that it keys into the concrete once it is poured.

In some instances where the speed of build is critical, it may be preferable for a floor to be installed before the poured concrete has sufficiently cured to hold the cast in bolts. In such instances it is necessary for the floor to be sufficiently propped and supported with no reliance given to the cast in bolts until the concrete has sufficiently cured.

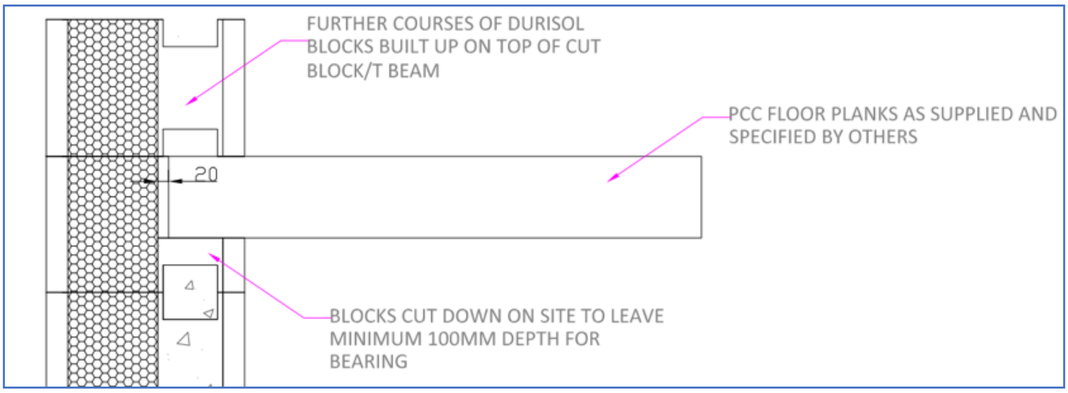
Block & Beam and Concrete Plank

In the case of block and beam flooring or precast floors the wall forms can be modified to suit the system by cutting into an L shape but leaving the insulation in place as shown below. The cut needs to leave a minimum of 100mm depth of the cut unit to bear upon as signified by the dimension in the diagram below.



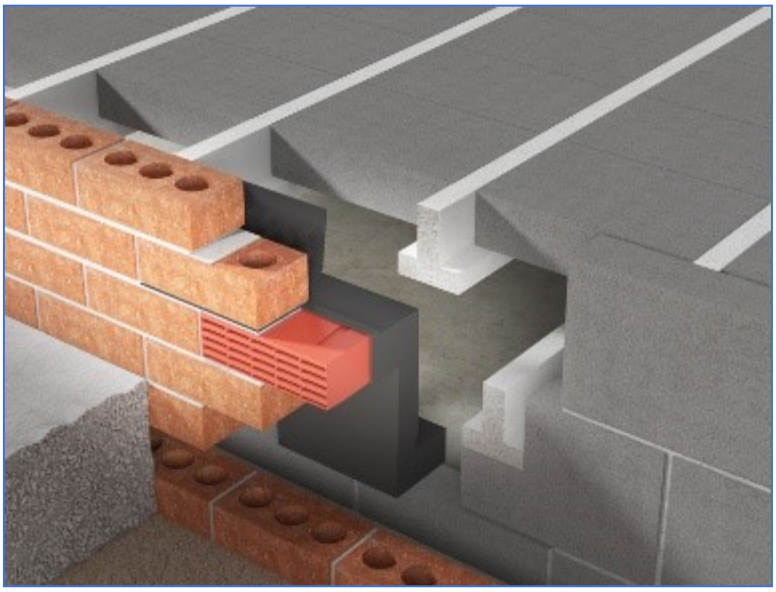
"Beam and Block" floor and Precast Concrete Plank Floor Bearing onto Durisol Wall

In addition to ensuring there is a minimum of 100mm bearing on a cut unit, it is also necessary to leave the floor 20mm short of the insulation as per the diagram below. This allows for the next concrete pour above to flow down behind the edge of the slab. It also makes it easier to install block and beam or plank floors without knocking and damaging cut Durisol units in the process.



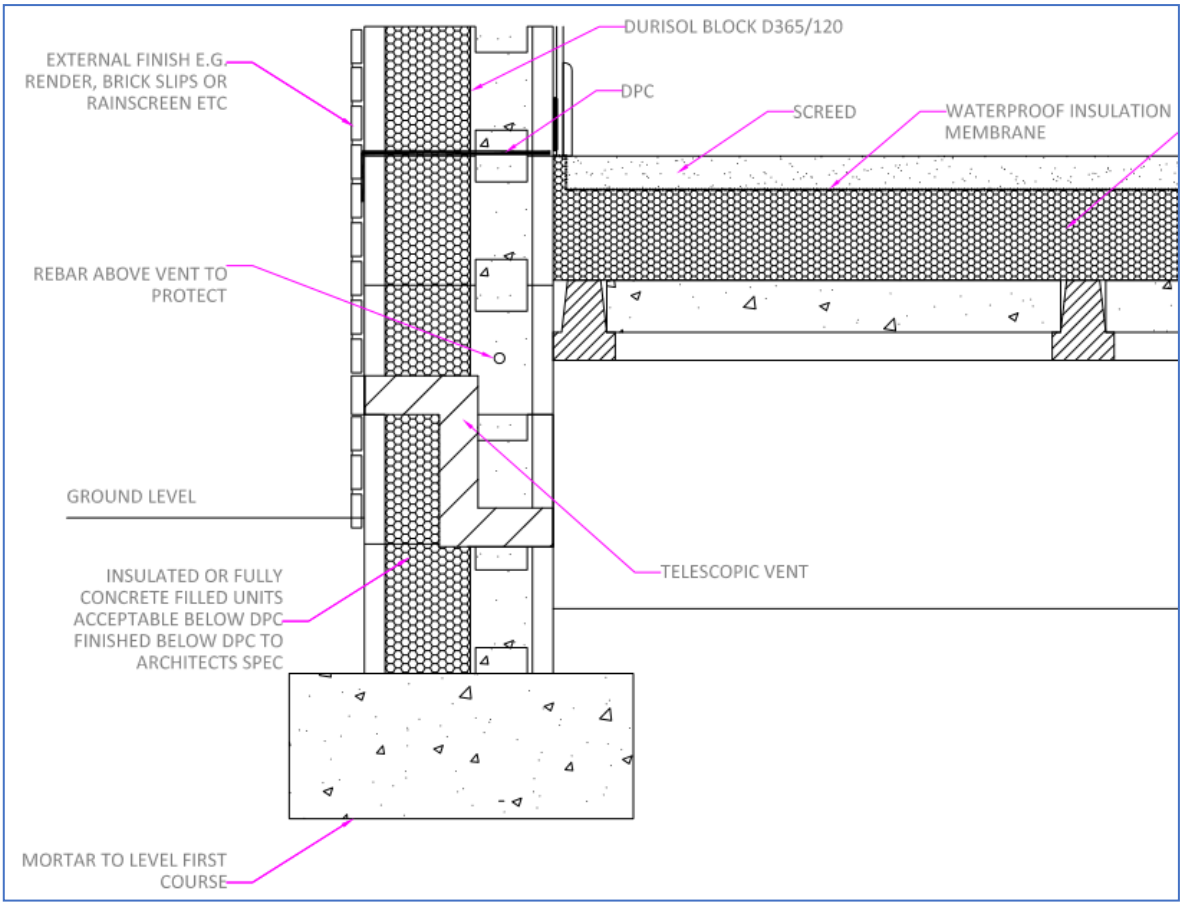
Beam and block or concrete plank floors should be installed with a 20mm clearance

The most common use of a beam and block floor in a domestic application is at ground floor level. Building regulations require ventilation for the space beneath suspended floors and this can be achieved in traditional masonry with air bricks and also telescopic vents to allow the movement of air:



Indicative telescopic vent through a cavity masonry wall

The same detail can be achieved through a Durisol wall. Units can be modified to allow a telescopic vent to sit within the depth of the wall.



Durisol units can be cut to allow a telescopic vent to sit in the depth of the solid wall and ventilate the space beneath a suspended floor.

Telescopic vent cut into a Durisol wall:

Outside face of wall

Inside face of wall

Telescopic vents come in all shapes and sizes, but the point is the units can be cut and adapted to receive them as required. Any small gaps around the vent can be sealed with a good quality fire rated expanding foam.

Where a beam and block floor sits on a Durisol wall (see below) there will be small gaps between the beams unless the beams and notched into the wall. The preffered method is to simply sit the beams onto the wall and seal the gap between them with foam before placing the bocks on top. The foam prevents any small quantity of wet cocnrete from seeping out when it travels down the 20mm clearance (see diagram on page 95) and fills the void between the beams:

Beam and block floor sitting on Durisol walls

Lewis Deck Dovetailed Sheeting

Lewis Dovetailed metal decking is formed as part of a joisted flooring system and allows for A profiled metal deck to be laid on top of the joists upon which a thin screed (typically 50mm) is laid to create a solid floor. This can have underfloor heating installed and has excellent acoustic and fire-resistant properties. It is simple to connect such a flooring system to a Durisol wall using a timber wall plate in the same way one would connect a conventional timber joist floor:

Easi joists supporting a lewis deck floor, spanning onto a timber wall plate bolted to a Durisol wall

Other Flooring Systems

There are a multitude of flooring systems available on the market. Given that Durisol walls contain a concrete frame that floors can either be designed and detailed to mechanically fixed to or bear directly onto, there are no systems at the time of writing that Durisol has found to be incompatible with the Durisol system. Advice for individual projects is available upon request.

10. Roof Systems

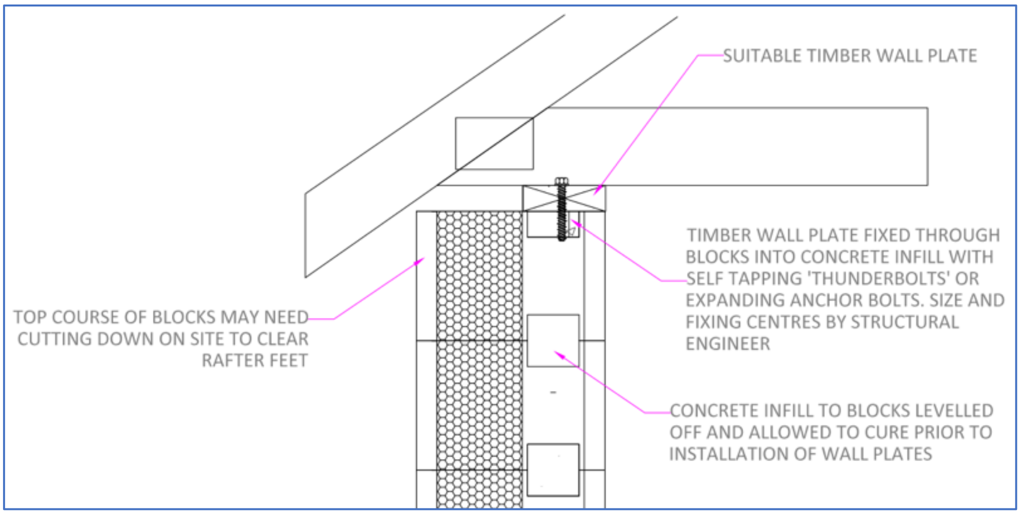
Roof Connection

Durisol works with all manner of roof systems as it provides a structural concrete frame upon which to sit (and fix) all conventional roof types from SIPS panels to traditional timber roof trusses.

Once the roof is on and finishes applied, it is impossible to tell the structure is Durisol

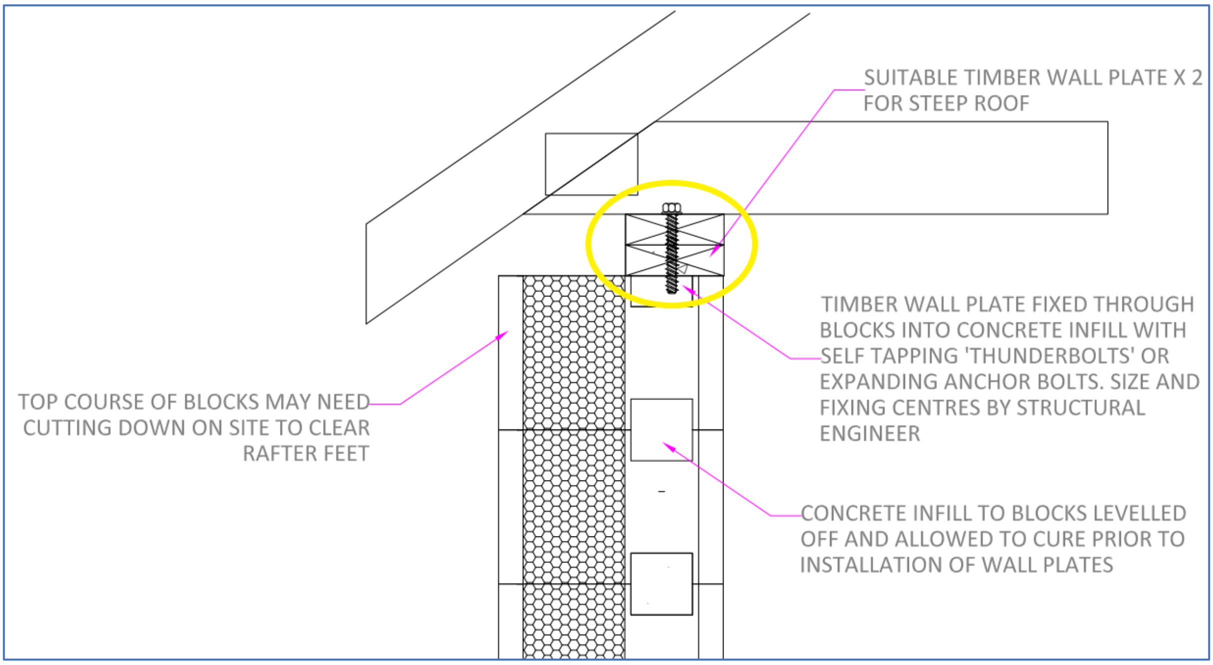
In traditional masonry construction it is normal to strap the roof trusses to the face of the masonry walls to provide lateral restraint to the masonry and to tie the structural elements together.

The top of the Durisol wall presents a 120mm thick structural concrete core into which the roof trusses can be readily fixed using a timber wall plate and self-tapping concrete screws or expanding anchors. The size, embedment and spacing of the anchor bolts to retain a timber wall plate for a roof vary depending on the size and scope of the build. A Structural Engineer must make a decision on these, but certainly as a minimum requirement, 10mm anchors with 60mm embedment into the concrete and spaced at 500mm centres.



Roof trusses fixed to the head of a Durisol wall using concrete screws

If the pitch of the roof is steep, it may be necessary to install a double wall plate to provide sufficient clearance for the rafters to clear the top of the wall. The Durisol is also adaptable and can be cut if required:



A double timber wall plate used for additional clearance on a steeply pitched roof

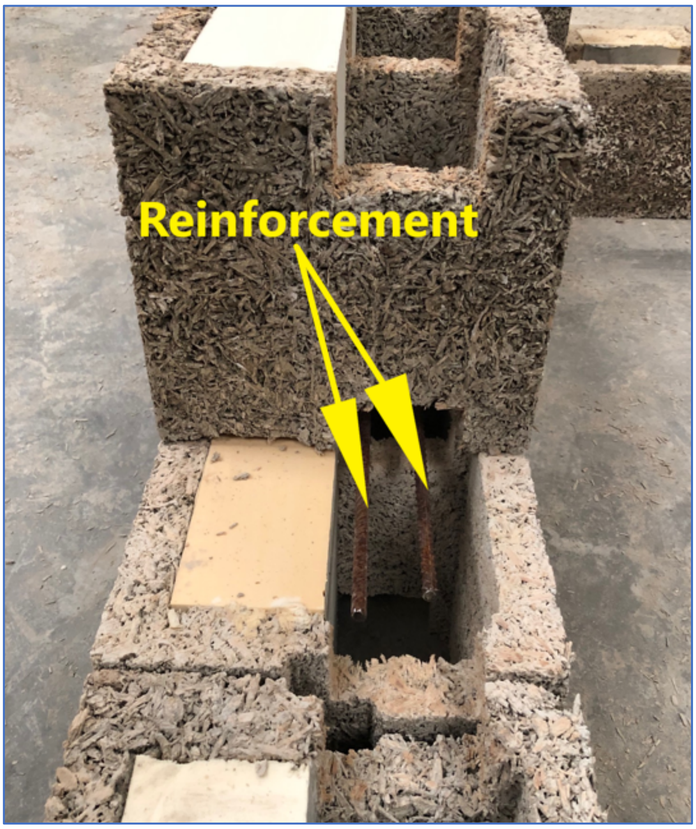
Forming Ring Beams

Roof rafters have a tendency to flatten under gravity, thrusting outwards on the walls. This lateral load can destabilise thin walls and those of a longer span. To prevent rafters from imposing lateral loads it is common for roofs to be built using closed trusses where a tie beam locks the structure together and prevents it pushing outwards:

Closed timber roof trusses with horizontal tie beams

Tie beams become a challenge if a full height vaulted ceiling is desired with no cross members or other structural components interfering with the open space. The same is true if one wishes to extend into the roof space at a later date to convert an attic for example.

When forming a concrete frame with Durisol it is possible to very quickly, easily and cheaply avoid the issue of lateral loads transferred into the walls from roofs that are not tied together. By placing reinforcement into the top one or two courses of units around the entire perimeter of the building, it is possible to create a closed ring beam that locks the perimeter of the top of the wall together and prevents lateral loads being transferred into the walls below. Reinforcing bars can be laid into the horizontal void in the top course on spacers and be tied together with sufficient overlap to ensure a constant ring of steel:



Indicative reinforcement

Best practice dictates that the very top chamber shown in the diagram above is not used to carry reinforcement. The chamber into which the reinforcing bars are placed in the diagram above is 100mm wide and 100mm deep, as it is formed from cut outs in two units pushed together. The top-most chamber (at the head of the wall) is 100mm wide but only 50mm deep and this may be insufficient to provide the necessary concrete cover to protect the bar. This depends on the size of bar used. It is possible to cut the units to increase the depth of the top chamber if this is deemed preferable on a specific project.

11. Internal and External Finishes

Internal Finishes

As a substrate, Durisol material can be easily fixed to mechanically, and it also readily takes renders and plasters.

The typical options internally are:

- Wet plaster applied exactly as one would to masonry blockwork. As Durisol units do not suck moisture like a concrete block, plasterers have more working time. Durisol also has very low levels of thermal expansion and cracking which will minimise cracking versus traditional substrates.
- Dot and Dab Plasterboard.
- Plasterboard on a timber frame.
- Internal Render.
- Simple sand and cement render. It is always advised this be installed with a mesh to prevent cracking.

External Finishes

A range of external finishes can be readily applied to Durisol.

The typical external options are:

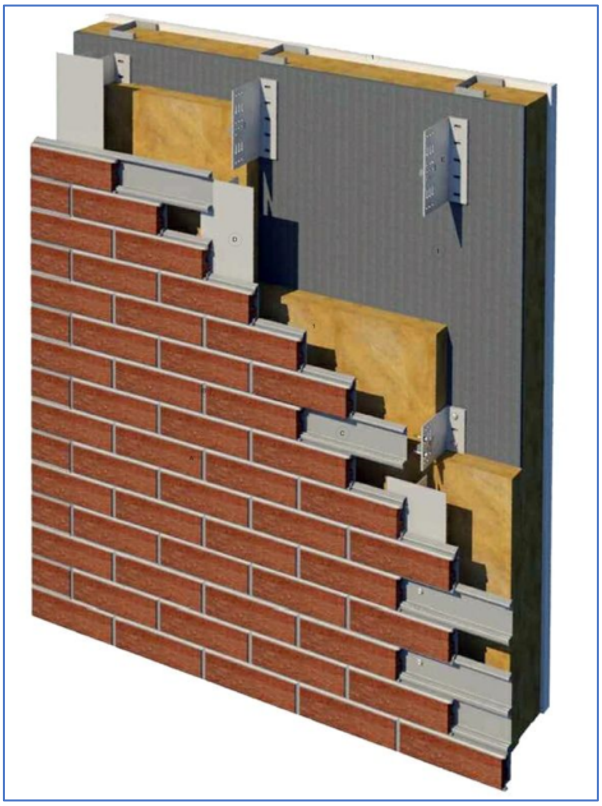
- Render – This should be from a reputable certified manufacturer and installed by an accredited installer. Durisol recommends the introduction of a plastic mesh in external renders to control cracking. It is inexpensive and gives added peace of mind regarding cracking. - Structural Warranty Providers and Building Control Officers will take a view on the suitability of finishes and Durisol can advise upon request.
- Stone Cladding. In the case of synthetic stone and real stone slips, these can be bonded directly to the substrate. For full thickness stone facades, it is necessary to build these off the foundation and tie back into the Durisol with brick ties, leaving a small cavity to allow moisture to drain behind the façade.
- Brick Slips – These come in a variety of types. Some slips are mounted on frames or come in sheets, while others involve bonding individual slips directly to the Durisol substrate. Durisol can advise on case studies and available systems that work.
- Timber Cladding -This can be mounted to the Durisol by screwing timber battens into the woodcrete and hanging the cladding from the frame.
- Rainscreen Cladding – Many systems exist and generally involve frame mounted cladding screwed back into the Durisol. Provision needs to be made for the loading (including wind loading) that will be transferred back into the Durisol via the fixings. A structural engineer can make an assessment based on the test data available (See Appendix 1).

All of the following indicative diagrams and photographs are finishes that can be achieved onto a Durisol wall:


Indicative stone slip cladding bonded directly to Durisol units

Stone/brick/timber cladding and render can be applied to Durisol to create properties that match in with traditional styles across the country from Cotswold stone, to flint on the Fens and a variety of renders and stone finishes in different counties.

A stone clad finished property



Indicative rail mounted brick slip system

Indicative bonded brick slip systems

Rendered Durisol property

Timber Cladding on a Durisol build

Air Tightness

Part L of the Buildings Regulations requires that all non-domestic buildings which have a gross floor area greater than 500m², be subject to mandatory air permeability tests. For domestic dwellings a representative sample of houses (in a development) must be tested.

The regulations require no more than 10 m³/hr/m² air loss at a pressure of 50 Pa. Standard good practice for air tightness testing in the UK is a maximum of 7 m³/hr/m² and best practice is 3 m³/hr/m² of air loss. The stringent Passivhaus requirements are for less than 0.6 m³/hr/m².

Durisol units are porous which is beneficial in dewatering the wet concrete. The open matrix also contains trapped air and provides excellent thermal insulation and negligible capillary action when in contact with water. It does however mean that the airtightness of the envelope is dependent upon the finishes that are applied internally and externally. Air tightness right down to Passivhaus requirements is possible and has been achieved dependent on the choice of finishes.

The highest level of airtightness in a Durisol wall will be achieved by applying wet finishes to both the internal and external faces. This includes wet plaster internally and either render or approved bonded brick/stone slips externally. If plasterboard is applied internally and a form of cladding on battens externally then a Tyvek style weatherproof membrane behind the cladding is desirable to achieve compliance with building regulation requirements. Durisol can advise upon request. See also Appendix 2 - Technical Memorandum on External Cladding Application

Finishes and Weathertightness

There are three mechanisms by which moisture can ingress through a wall into a dwelling. They are:

- Hydrostatic Pressure
- Capillary Action
- Vapour Pressure

Hydrostatic pressure is restricted to basements where water under the force of gravity is pressing against the wall. See “Basements” Section. Above ground, water pressure will only be due to driving rain. Durisol is a free draining material and will not suck moisture that arrives at the surface in the same way a brick or concrete block would. In this respect, as long as rain is prevented from impacting directly onto the Durisol surface by applying any form of finish (render, slip, cladding etc) then moisture will not penetrate the woodcrete under pressure.

Capillary Action - Water can be drawn above the water table by capillarity. Capillary water is under negative pressure in respect to atmospheric pressure and is therefore in tension. The surface tension can draw water into hydrophilic materials. Conversely, Durisol is an open matrix material and resultantly has an extremely low capillary rise. In any case it is standard practice as per this guide to install a damp-proof course.

Vapour Pressure - The moisture transport and storage properties of Durisol are an interesting and unique mix of vapour permeability and vapour storage capacity. The only other “structural” material which behaves in a similar manner is compacted straw, although straw, unlike Durisol has potential fire, moisture, and insect problems. When compared to other common building materials the vapour permeability (the permeance per unit thickness of material) is much higher.

As a hygroscopic material Durisol absorbs moisture from the air around (and in) it and in so doing is effective at regulating the relative humidity of the air and reducing any risk of condensation. A Durisol wall is also a high thermal mass structure as it is filled with concrete and this concrete is protected from the external environment by a thick layer of insulation (and thermally efficient woodcrete). This configuration prevents rapid swings in temperature across the profile of the wall which mitigates any risk of condensation forming at an interface due to a steep temperature gradient which can cause air to reach its dew point and lay down moisture as condensation. The risk of interstitial condensation at all interfaces within a Durisol wall in all seasons have been modelled and eradicated for the UK climate.

External Finishes and Structural Warranties

At the time of writing:

Premier Guarantee and LABC have confirmed to the ICFA (Insulating Concrete Formwork Association) that they will only consider insuring an ICF building if the product is supplied by a member of the ICFA (of which Durisol UK is a member). However, if the builder has a claims history with either of the above or the company has a poor trading record then they are likely to refuse insurance. So please ensure any contractor one uses does not fall into this category.

It is currently a requirement of Premier Guarantee and LABC to have a 50mm Cavity behind brick or dressed stone and also a 50mm cavity would be required in “exposed” conditions. If random stone is being used then a cavity will not be required as long as the external surface of the ICF is waterproofed to type A waterproofing. But it is important to choose a waterproof membrane that will accommodate the wall ties one plans to use. Advice can be sought from a Certified Surveyor in Structural Waterproofing. Durisol has industry contacts and can advise.

Render – The preferred render option by Premier & LABC, is the Parex “Monorex” system, with special requirements for zone 4 exposure (Durisol to advise). Other systems are in testing, but no other renders should currently be used on ICF if a Premier or LABC insurance is to be sought. Other A rated warranty providers may take a broader view.

Bonded Brick and Stone Slips – Monolith Brick and Stone Ltd have a BBA certified bonded brick and stone system (BBA certificate number 18/5604). Advice can be sought directly from Monolith Brick and Stone Ltd, however the system is certified for use onto ICF systems and this is accepted by Premier Guarantee and LABC.

Rainscreen Cladding – There are numerous cladding systems available on the market and a warranty provider will assess them on their own merit. Third party accreditation and a qualified installer is always a good starting point when selecting a cladding system. Durisol can advise on suitable fixings that can be used in conjunction with various cladding systems and input may be required from a structural engineer to validate the loads involved.
It is normal practice for Durisol to combine cladding with a Tyvek membrane (or similar) which will assist with air tightness. (See Appendix 2 - Technical Memorandum on External Cladding Application).

12. Fixing to Durisol

Durisol is non-structural. It is a formwork system designed to contain wet concrete until it has cured and developed strength as the structural frame of the building. However, the Durisol woodcrete material does have inherent strength and can be mechanically fixed to using a range of fasteners.

Applications for fixing to Durisol:

Externally:

- Rain screen cladding (timber on battens or metal cladding on brackets)
- Rail mounted brick slip systems
- Window frames
- Stop beads for render application
- Lateral ties for stone and brick facades built off the foundation
- Julliette Balconies (loadings to be clarified by an engineer)
- Timber Bracing and Goalposts during construction

Internally:

- Low level storage e.g. floor mounted kitchen cabinets etc.
- Pictures
- Flat Screen Televisions
- Skirting boards, architraves and other lightweight finishes

For the above applications, Durisol has worked in conjunction with Fischer fixings to produce testing data on a range of Fischer fixings to give allowable tensile resistance (Pull-out resistance) with factors of safety applied.

As a non-structural material it is NOT appropriate to fix into Dursiol for the following applications:

Externally:

- Shelf angles to carry real brick or stone facades. Should this be necessary, brick and stone slips can be bonded directly to the Durisol or full thickness stone or brick facades can be built off the foundation and tied back to the Durisol will lateral ties (please ask Durisol for advice on such applications)
- Air Conditioning Units

Internally:

- High level and heavy cabinets and storage units. These should be bolted through the 40mm Durisol into the structural concrete within.

If unsure about the suitability of Durisol to be fixed to in a specific application, please ask Durisol directly for advice.

For the Fischer Fixings/Durisol report see Appendix 4.

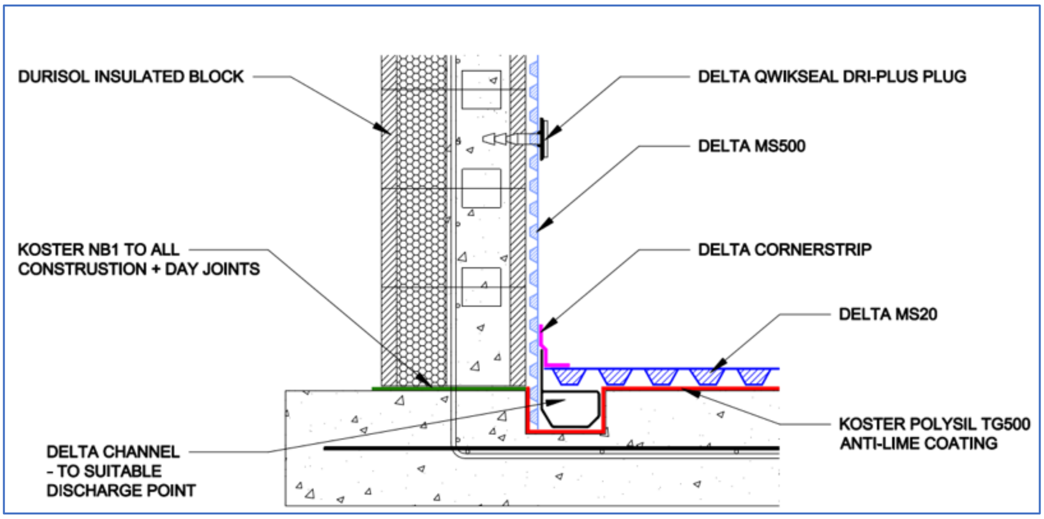
13. Basements

Structural Waterproofing:

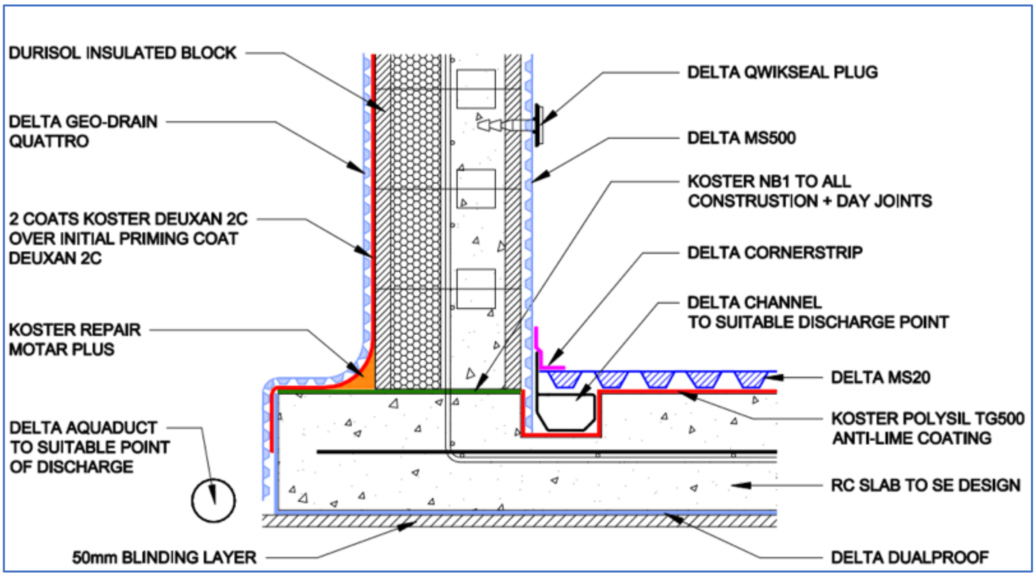
Durisol does not rot and is perfectly suitable for use below ground in permanently wet conditions.

Whilst the units do not support capillary action, they are porous. Therefore, below ground (in basements) where hydrostatic pressure is a design consideration, use of a structural waterproofing solution is essential, as would be the case with any other below ground walling system (traditional masonry, concrete frame etc).

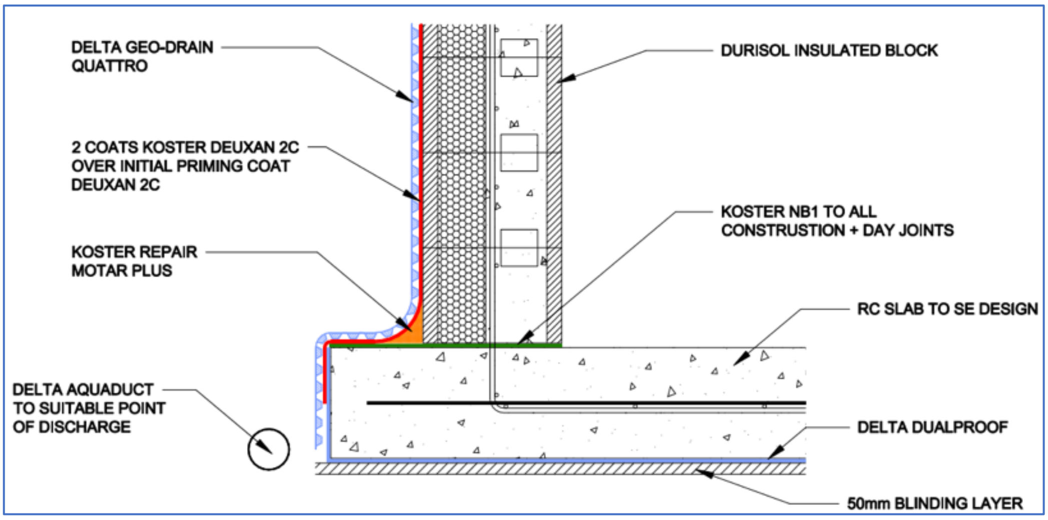
Below are some indicative details of structural waterproofing systems that can be used in conjunction with the Durisol wall forms. The type of waterproofing used will depend on the intended use of the basement space and will be subject to building regulations.



Indicative Internal Cavity Drain System



Indicative Internal and External Waterproofing



Indicative External Waterproofing

In principle, Durisol can be used for all basement applications. 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. Thereafter, the design and installation of the accompanying structural waterproofing solution should be overseen by a Certified Surveyor in Structural Waterproofing, as would be the case with basements built in any traditional material. Details of industry contacts are available upon request.

Resisting Lateral Loads

It is normal in basements for backfill material to press directly against the external walls of the basement structure. This brings both the possibility of hydrostatic pressure from groundwater and also pressure from the weight of the backfill material itself, both of which can be significant.

In these instances, basements walls are acting to retain material and they should be designed and certified by a qualified structural engineer. It is likely that a retaining wall will require some vertical and or horizontal reinforcement. This is easy to incorporate into a Durisol wall as both vertical and horizontal reinforcement can be placed in the voids when the units are being dry stacked to form the wall.

14. Swimming Pools

At the time of writing, updates to Part L of the building regulations state: ""Where a swimming pool is being provided in a building, the U-value of the basin (walls & floor) should not be worse than 0.25W/m2/K as calculated according to BS EN ISO 13370."

It is common practice to build the base of a swimming pool using reinforced concrete. In this regard, Durisol units which come pre insulated and which exceed the building regulations thermal requirements make for a quick and easy system of forming an insulated concrete frame.

An indoor swimming pool based formed in insulated Durisol units.

Working on this principle, it is straightforward to incorporate an insulated slab and insulated Durisol walls into a reinforced, insulated concrete swimming pool base in a fast and cost-effective manner. As with other methods of swimming pool construction, the base will need to be suitably lined and an experienced structural engineer and swimming pool practitioner should oversee such a design.

15. Retaining Walls

As Durisol acts as a permanent formwork system it can be readily used to create reinforced concrete retaining walls:

Durisol reinforced concrete retaining wall under construction

The advantage of Durisol in this situation is the speed of the build and the fact the formwork (Durisol) remain in situ permanently, which saves additional operations later and permanently protects the concrete.

A reinforced concrete retaining wall resists the load of the backfill material it is retaining through tension in the reinforcement within the wall. The wall will need to be tied into the foundation upon which it is built, and a qualified structural engineer can detail the steel required by simply applying the reinforced concrete design codes.

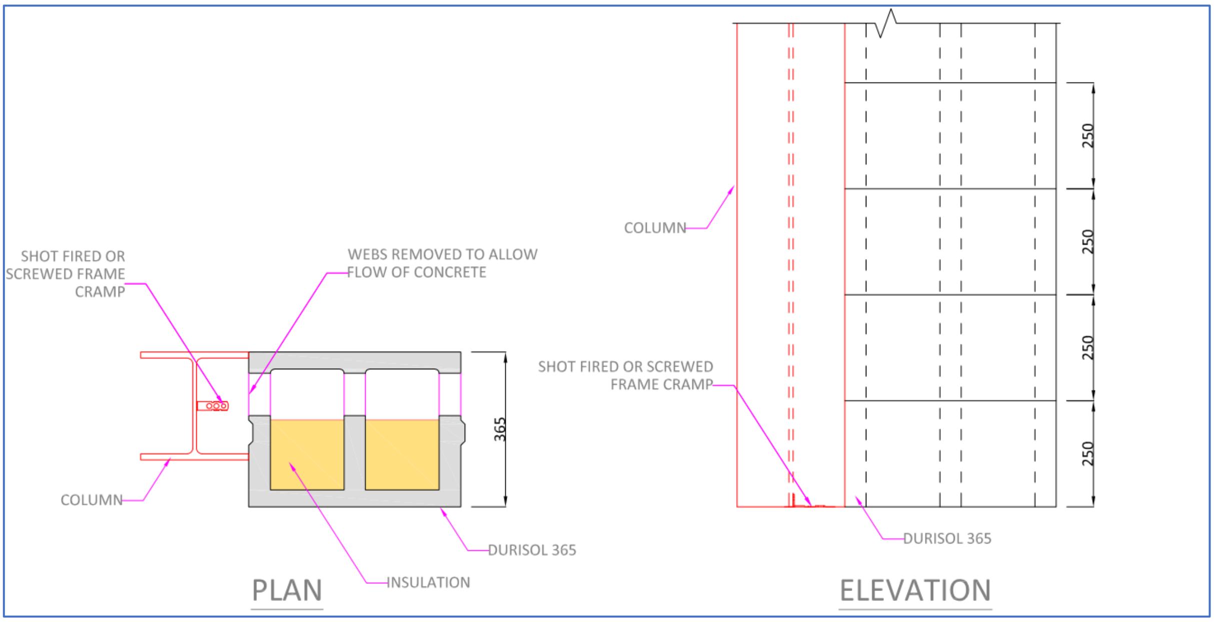
It is possible to create a retaining wall with any unit in the Durisol family. It is not usually necessary to use insulation within an external retaining wall (see example above) and this provides a greater void in the unit for concrete. An empty D300 unit has a void with a thickness of 220mm and an empty D365 has a void with a thickness of 285mm. A 285mm thick concrete wall can accommodate plenty of reinforcement and has the scope to form a relatively tall and very strong retaining structure quickly and easily.

16. Industrial and Commercial Applications

Industrial:

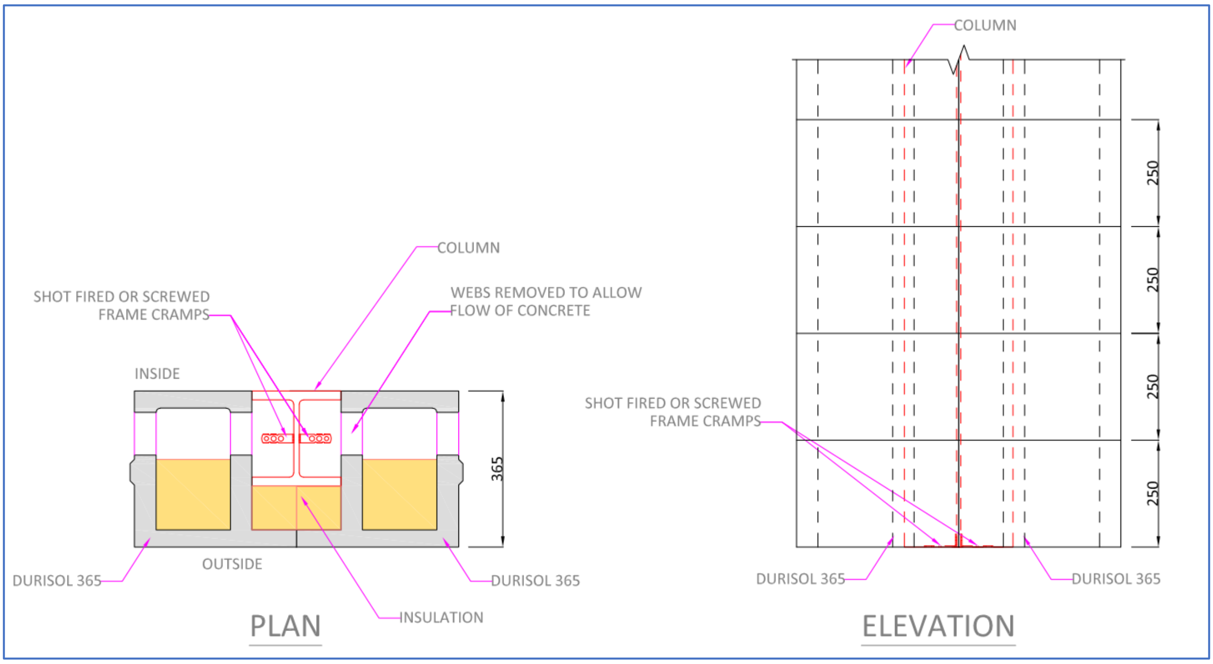
Connecting Durisol Infill walls to steel columns:

Connecting Durisol units to steel columns can be achieved by screwing or shot firing ties into the web of the column and incorporating into the pour.



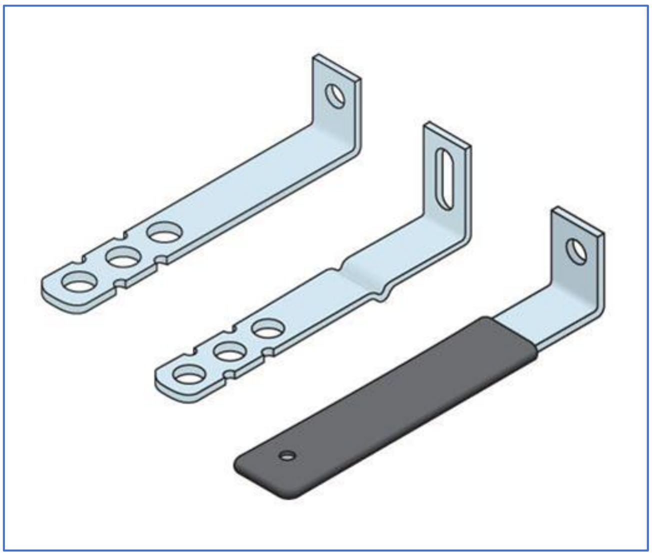
Bracing requirement to be advised by Durisol UK

Depending on the dimensions of the column and the size of wall unit selected (300mm or 365mm) it is possible to hide a column within the depth of a wall. For specific project requirements and bespoke details contact Durisol UK.



A column can be incorporated into the depth of a Durisol wall

The structural engineer may deem it necessary to allow for the steel columns and Durisol walls to move independently of one another during thermal fluctuations. Debonded frame cramps are available that allow for such independent movement of the column and the concrete wall when cramps are incorporated into a pour:



Indicative frame cramps including a "debonded" version

Commercial:

Durisol is used to create a concrete frame and as such is suitable for a range of commercial applications including retail units, schools, hospitals, libraries etc:

Commercial and retail units – East Anglia

Cullompton Library (featuring cantilevered Durisol walls over the entrance

Interserve Headquarters – The first passive commercial build in the UK

Braunton School

17. Mortgage and Insurance

Mortgage

The Valuation Panel of the Council of Mortgage Lenders has confirmed that ICF (Insulating Concrete Formwork) construction is acceptable for mortgage purposes as a standard form of construction, subject to provision of valid product certification and monitoring of ICF System providers by the ICFA (Insulating Concrete Formwork Association) of the UK.

Durisol UK is a full member of the Insulating Concrete Formwork Association (ICFA) which is a UK Trade Association founded in 1992 to promote ICF as a concept in the UK construction market.

Insulating Concrete Formwork Association https://icfa.org.uk/

The letter from the Council of Mortgage Lenders confirming their stance can be viewed in Appendix 3. It can also be viewed and downloaded from the ICFA website:

https://icfa.org.uk/building-with-icf/mortgages/

Upon request Durisol can provide details of mortgage brokers who are experienced with Durisol and who deal directly with lenders to secure mortgages for Durisol builds.

Insurance

Durisol works with a range of buildings insurance companies and has both case studies and current certification from a number of providers, including LABC and Premier Guarantee.

Insurance companies have different criteria depending on the preference of their underwriters, so please speak to Durisol directly for advice on the best options for your specific scheme.

From the ICFA website:

"*LABC, now one of the leading buildings insurance companies in the UK, has confirmed they fully approve ICF (Insulating Concrete Formwork) construction but only if the ICF Company being used is a member of the ICFA.*

This effectively means that members of the ICFA are recognised as being able to provide a first class and robust system and are also able to compete head to head with all other forms of construction – especially for large housing projects.

Christopher Stride, Chairman of the ICFA said that "this is yet another example of the confidence placed in ICF construction and I am delighted that LABC has recognised the benefits of ICF, as a standard form of construction."

Appendix 1: Council of Mortgage Lenders Letter

This letter can also be viewed and downloaded from the ICFA website: https://icfa.org.uk/building-with-icf/mortgages/

cml
Council of Mortgage Lenders

Christopher Stride
Insulating Concrete Formwork Association
Thermal House
PO Box 72
Billingshurst
West Sussex
RH14 0FD

13 September 2012

Dear Christopher

Insulating Concrete Formwork

I write to you on behalf of the Valuation Panel of the Council of Mortgage Lenders to confirm the following statement:

> **FEBRUARY 2010. The Valuation Panel of the Council of Mortgage Lenders confirmed that ICF (Insulating Concrete Formwork) construction is acceptable for mortgage purposes as a standard form of construction, subject to provision of valid product certification and monitoring of ICF System providers by the ICFA (Insulating Concrete Formwork Association) of the UK.**
>
> **The lending decision is always at the discretion of the mortgage lender advancing the funds.**

Yours sincerely

Jennifer Bourne
Senior Policy Advisor
020 7438 8989
Jennifer.bourne@cml.org.uk

address North West Wing Bush House Aldwych London WC2B 4PJ
telephone 0845 373 6771 fax 0845 373 6778 website www.cml.org.uk

Appendix 2: Technical Memorandum on External Cladding Application

Durisol UK Limited	Technical Memorandum	Rev A 8 FEB 2018
EXT 01- Typical External Weather Screen and Cladding Application		

- Most lightweight weather screen systems, such as those that involve the fixing of a softwood 'counter batten' type primary fixing grid can be applied to Durisol as follows:

- The external face of the Durisol must be covered with a breather membrane, we recommend Tyvek Structure Guard as this provides good air tightness as a secondary benefit to the function of the breather membrane.

- Similar breather membrane products are available from many manufacturers, but you should select a product that has an air leakage value of less than 1.0 m3/hr/m2@50Pa to ensure you maintain the air tightness of the structure.

- When fixing the membrane always follow manufacturer's instructions with regard to side and top overlap requirements at all joints.

- Apply the breather membrane either vertically or horizontally (observing suitable overlap joints), it is generally best to 'flytack' the membrane using construction grade staples or small timber battens to hold it in place whilst applying it to the façade.

- Once the membrane is in place and taught, over fix this with softwood battens as per the cladding manufacturer's recommendations using coarse threaded woodscrews.

- Note that we recommend that you contact Durisol if fixing cladding systems that exceed 40-50Kg/m2 in weight.

- All lap joints in the membrane should be fully sealed using Tyvex butyl double sided jointing tape or similar.

- Use Tyvek or Dupont NF Tape (150mm wide) or EZ Tape (60mm wide) to bond all cut edges of the membrane into reveals and onto wall plates at roof/ eaves level. It is advisable to fully cover the Durisol at external reveals of openings with either membrane or sealing tape.

- At DPC level, the membrane can either be stuck to the face of the Durisol with the butyl joint tape or the edge secured with NF tape.

- All joints and edges should be sealed to maintain integrity of the membrane for air tightness purposes.

- Where there are joints between different finishes on a single façade such as where weather screen meets a direct render finish, ensure the edge of the membrane is bonded and sealed in this location.

Appendix 3 – Modelled U Value Calculations for D300 and D365 Insulated Walls

D365 PIR insulated wall rendered externally and dry lined internally:

Project Information

Reference

Date 6 April 2013

Construction Type

Element : Wall - 365 with PIR Rendered + dry Lined

Internal surface emissivity : High External surface emissivity : High

	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m^2K/W)	Pitch (º)	Bridge Details
Outside surface resistance	-	-	0.040		
Render (BS5250)	15.0	0.800	0.019		
Durisol	40.0	0.130	0.308		
EcoTherm Eco-Versal Timber Frame (25 - 200mm, lambda 0.022)	165.0	0.022	7.500		17.4% Durisol (165.0mm)
Concrete, dense (BS5250)	120.0	1.701	0.071		17.4% Durisol (120.0mm)
Durisol	40.0	0.130	0.308		
Cavity >=25mm, wall (CIBS)	0.0	0.000	0.180		8.3% Softwood (~500kg/m³) (0.0mm)
Gyproc Wallboard	12.5	-	0.070		
Inside surface resistance	-	-	0.130		

U-value = 0.14W/m²K

U-value, Combined Method : 0.14W/m²K (upper/lower limit 3.793 / 10.236m²K/W, dUf 0.0000, dUg 0.0000, dUp0.0000, dUr0.0000, dUrc0.0000)

(Correction for mechanical fasteners, Delta Uf = 0.000W/m²K)
(Correction for air gaps, Delta Ug = 0.000W/m²K)

(Based on the combined method for determining U-values of structures containing repeating thermal bridges)

A Durisol wall is not isotropic. In some areas there is PIR insulation and concrete and in others there is thermally efficient Durisol woodcrete webs spanning across the concrete core. To accurately model the combined U value, one must accurately model the fraction of the heat flow paths represented by the respective components. This operation and the resulting output can be seen below.

Detailed U-value Calculation Results

Construction includes 3 bridged layers.

Non-bridged layers	
Outside surface resistance	0.040 m²K/W
Render (BS5250)	0.019 m²K/W
Durisol	0.308 m²K/W
Durisol	0.308 m²K/W
Gyproc Wallboard	0.070 m²K/W
Inside surface resistance	0.130 m²K/W
Resistance of non-bridged layers, R_{NB} =	0.875 m²K/W

Bridged layers
EcoTherm Eco-Versal Timber Frame (25 - 200mm, lambda 0.022) (L1) bridged by Durisol (B1)
Concrete, dense (BS5250) (L2) bridged by Durisol (B2)
Cavity >=25mm, wall (CIBS) (L3) bridged by Softwood (~500kg/m³) (B3)

Path 1 - EcoTherm Eco-Versal Timber Frame (25 - 200mm, lambda 0.022) / Concrete, dense (BS5250) / Cavity >=25mm, w
Path 2 - Durisol / Durisol / Cavity >=25mm, wall (CIBS)
Path 3 - EcoTherm Eco-Versal Timber Frame (25 - 200mm, lambda 0.022) / Concrete, dense (BS5250) / Softwood (~500kg
Path 4 - Durisol / Durisol / Softwood (~500kg/m³)

Resistance and fraction of heat flow paths

$R_{P1} = R_{NB} + R_{L1} = 0.875 + 7.751 = 8.626$ m²K/W $F_{P1} = 75.725\%$
$R_{P2} = R_{NB} + R_{L2} = 0.875 + 0.180 = 1.055$ m²K/W $F_{P2} = 15.942\%$
$R_{P3} = R_{NB} + R_{L3} = 0.875 + 7.571 = 8.446$ m²K/W $F_{P3} = 6.884\%$
$R_{P4} = R_{NB} + R_{L4} = 0.875 + 0.000 = 0.875$ m²K/W $F_{P4} = 1.449\%$

Upper resistance limit

$R_{upper} = 1 / ((F_{P1}/R_{P1}) + (F_{P2}/R_{P2}) + (F_{P3}/R_{P3}) + (F_{P4}/R_{P4}))$
$R_{upper} = 1 / ((0.757/8.626) + (0.159/1.055) + (0.069/8.446) + (0.014/0.875)) = 3.793$m²K/W

Lower resistance limit

$R_{lower} = R_{NB} + 1 / ((F_{L1}/R_{L1}) + (F_{B1}/R_{B1})) + 1 / ((F_{L2}/R_{L2}) + (F_{B2}/R_{B2}))$
$R_{lower} = 0.875 + 1 / ((0.826/7.571) + (0.174/0.000)) + 1 / ((0.917/0.180) + (0.083/0.000)) = 10.236$m²K/W

Total resistance of wall

$R_T = (R_{upper} + R_{lower}) / 2 = (3.793 + 10.236) / 2 = 7.01$ m²K/W

Correction for mechanical fasteners, Delta Uf = 0.0000W/m²K. Correction for air gaps, Delta Ug = 0.0000W/m²K

(Delta Uf + Delta Ug + Delta Up) is less than 3% of (1 / Rt) so U = (1 / Rt) + (Delta Ur) + (Delta Urc) = 0.14 W/m²K

D300 PIR insulated wall rendered externally and dry lined internally:

Project Information

Reference
Date 6 April 2013

Construction Type

Element : Wall - 300 with PIR Rendered + dry Lined
Internal surface emissivity : High External surface emissivity : High

	Thickness (mm)	Thermal Conductivity (W/mK)	Thermal Resistance (m²K/W)	Pitch (º)	Bridge Details
Outside surface resistance	-	-	0.040		
Render (BS5250)	15.0	0.800	0.019		
Durisol	40.0	0.130	0.308		
EcoTherm Eco-Versal Timber Frame (25 - 200mm, lambda 0.022)	100.0	0.022	4.500		17.4% Durisol (100.0mm)
Concrete, dense (BS5250)	120.0	1.701	0.071		17.4% Durisol (120.0mm)
Durisol	40.0	0.130	0.308		
Cavity >=25mm, wall (CIBS)	0.0	0.000	0.180		8.3% Softwood (~500kg/m³) (0.0mm)
Gyproc Wallboard	12.5	-	0.070		
Inside surface resistance	-	-	0.130		

U-value = 0.20W/m²K

U-value, Combined Method : 0.20W/m²K (upper/lower limit 3.264 / 6.604m²K/W, dUf 0.0000, dUg 0.0000, dUp0.0000, dUr0.0000, dUrc0.0000)

(Correction for mechanical fasteners, Delta Uf = 0.000W/m²K)
(Correction for air gaps, Delta Ug = 0.000W/m²K)

(Based on the combined method for determining U-values of structures containing repeating thermal bridges)

The detailed modelling of the fractional heat flow paths and the resulting outputs are:

Detailed U-value Calculation Results

Construction includes 3 bridged layers.

Non-bridged layers

Outside surface resistance	0.040 m²K/W
Render (BS5250)	0.019 m²K/W
Durisol	0.308 m²K/W
Durisol	0.308 m²K/W
Gyproc Wallboard	0.070 m²K/W
Inside surface resistance	0.130 m²K/W
Resistance of non-bridged layers, R_{NB} =	0.875 m²K/W

Bridged layers
EcoTherm Eco-Versal Timber Frame (25 - 200mm, lambda 0.022) (L1) bridged by Durisol (B1)
Concrete, dense (BS5250) (L2) bridged by Durisol (B2)
Cavity >=25mm, wall (CIBS) (L3) bridged by Softwood (~500kg/m³) (B3)

Path 1 - EcoTherm Eco-Versal Timber Frame (25 - 200mm, lambda 0.022) / Concrete, dense (BS5250) / Cavity >=25mm, w
Path 2 - Durisol / Concrete, dense (BS5250) / Cavity >=25mm, wall (CIBS)
Path 3 - EcoTherm Eco-Versal Timber Frame (25 - 200mm, lambda 0.022) / Durisol / Cavity >=25mm, wall (CIBS)
Path 4 - Durisol / Durisol / Cavity >=25mm, wall (CIBS)
Path 5 - EcoTherm Eco-Versal Timber Frame (25 - 200mm, lambda 0.022) / Concrete, dense (BS5250) / Softwood (~500kg
Path 6 - Durisol / Concrete, dense (BS5250) / Softwood (~500kg/m³)
Path 7 - EcoTherm Eco-Versal Timber Frame (25 - 200mm, lambda 0.022) / Durisol / Softwood (~500kg/m³)
Path 8 - Durisol / Durisol / Softwood (~500kg/m³)

Resistance and fraction of heat flow paths
R_{P1} = R_{NB} + R_{L1} = 0.875 + 4.751 = 5.626 m²K/W F_{P1} = 62.555%
R_{P2} = R_{NB} + R_{L2} = 0.875 + 0.251 = 1.126 m²K/W F_{P2} = 13.170%
R_{P3} = R_{NB} + R_{L3} = 0.875 + 4.680 = 5.555 m²K/W F_{P3} = 13.170%
R_{P4} = R_{NB} + R_{L4} = 0.875 + 0.180 = 1.055 m²K/W F_{P4} = 2.773%
R_{P5} = R_{NB} + R_{L5} = 0.875 + 4.571 = 5.446 m²K/W F_{P5} = 5.687%
R_{P6} = R_{NB} + R_{L6} = 0.875 + 0.071 = 0.946 m²K/W F_{P6} = 1.197%
R_{P7} = R_{NB} + R_{L7} = 0.875 + 4.500 = 5.375 m²K/W F_{P7} = 1.197%
R_{P8} = R_{NB} + R_{L8} = 0.875 + 0.000 = 0.875 m²K/W F_{P8} = 0.252%

Upper resistance limit
$R_{upper} = 1 / ((F_{P1}/R_{P1}) + (F_{P2}/R_{P2}) + (F_{P3}/R_{P3}) + (F_{P4}/R_{P4}) + (F_{P5}/R_{P5}) + (F_{P6}/R_{P6}) + (F_{P7}/R_{P7}) + (F_{P8}/R_{P8}))$
$R_{upper} = 1 / ((0.626/5.626) + (0.132/1.126) + (0.132/5.555) + (0.028/1.055) + (0.057/5.446) + (0.012/0.946) + (0.012/5.375) + (0.003/0.875)) = 3.264$ m²K/W

Lower resistance limit
$R_{lower} = R_{NB} + 1 / ((F_{L1}/R_{L1}) + (F_{B1}/R_{B1})) + 1 / ((F_{L2}/R_{L2}) + (F_{B2}/R_{B2})) + 1 / ((F_{L3}/R_{L3}) + (F_{B3}/R_{B3}))$
$R_{lower} = 0.875 + 1 / ((0.826/4.571) + (0.174/0.000)) + 1 / ((0.917/0.180) + (0.083/0.000)) + 1 / ((0.917/0.180) + (0.083/0.000)) = 6.604$ m²K/W

Total resistance of wall
$R_T = (R_{upper} + R_{lower}) / 2 = (3.264 + 6.604) / 2 = 4.93$ m²K/W

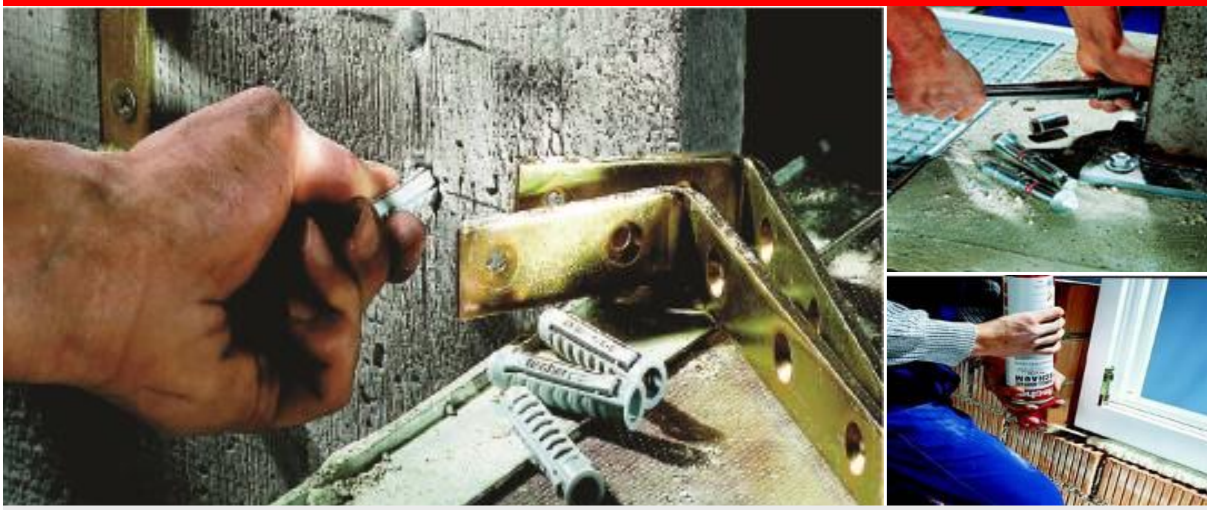
Correction for mechanical fasteners, Delta Uf = 0.0000W/m²K. Correction for air gaps, Delta Ug = 0.0000W/m²K

(Delta Uf + Delta Ug + Delta Up) is less than 3% of (1 / Rt) so U = (1 / Rt) + (Delta Ur) + (Delta Urc) = 0.20 W/m²K

Appendix 4: Fischer Fixing Report for Durisol

(Available Separately Upon Request)

fischer Test Report



Fixing Tests for Durisol blocks

Durisol UK

fischer

innovative solutions

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1. Test Parameters

The fixings were tested Durisol D300 Blocks.

The tests were carried out by Adrian Williams – fischer Senior Technical Advisor, on 6th April 2018

Tests were carried out on individual blocks.

Fixings were fitted into the cavity area of the blocks through the block side walls and ends to simulate the unpredictability of locating fixings into any surface where the structure of the block cannot be determined.

All fixings were installed to their recommended embedment depth.
The fixings requiring wood screws were installed using the largest standard wood screw the fixing was designed for.

All tests were carried out using a calibrated Hydrajaws 2000 tensile meter.
To conform to CFA (Construction Fixings Association) guidelines each type of fixing was tested five times.

2. Substrates Tested

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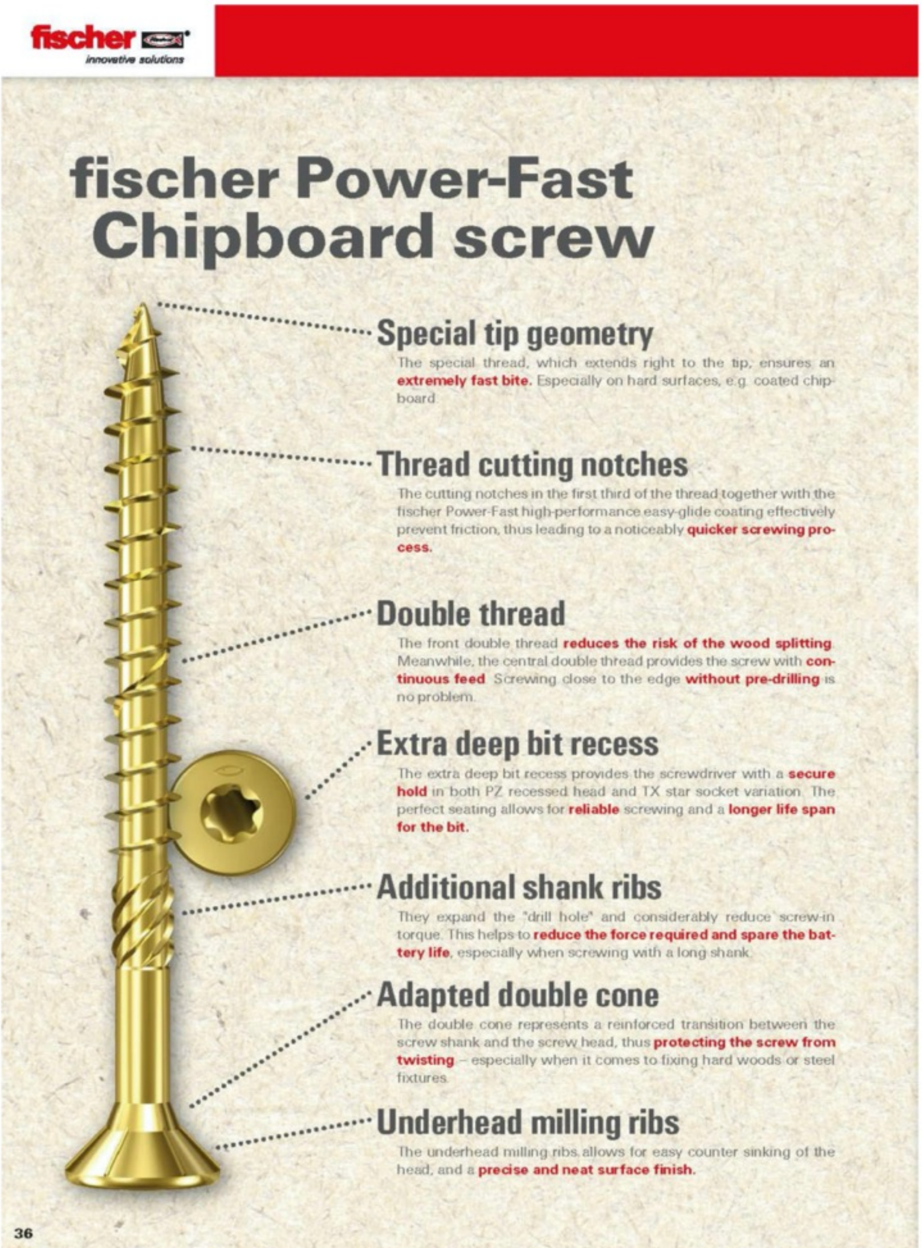
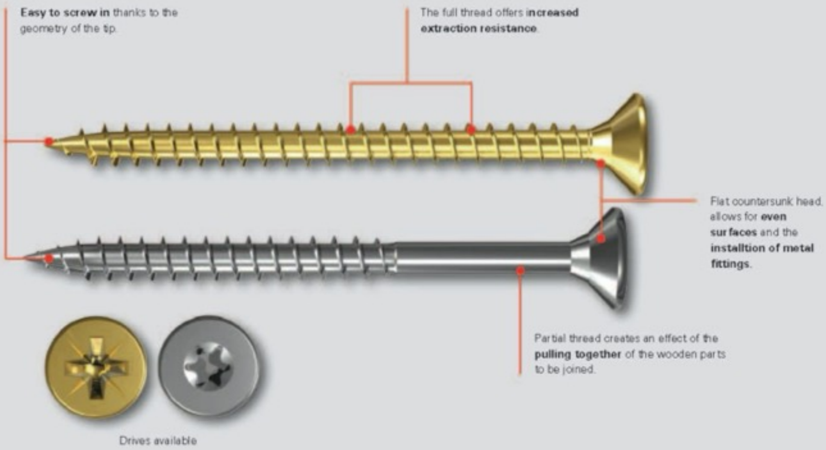
3. Fixing Products Tested

3.1 fischer FPF Power-Fast wood screws



3.2 fischer FSP II Classic-Fast wood screws

fischer Chipboard screw FSP II
The cost-effective screw for numerous applications



The advantages at a glance

- The chipboard screws can be used universally in all wooden materials.
- The screws offer lasting safety thanks to their CE conformity.
- The countersunk head ensures an appealing surface appearance.
- The partial thread creates an effect of the pulling together of the wooden parts to be joined.
- The full thread offers increased extraction resistance thanks to the longer thread.
- Easy glide coating reduces the screw effort.

Applications

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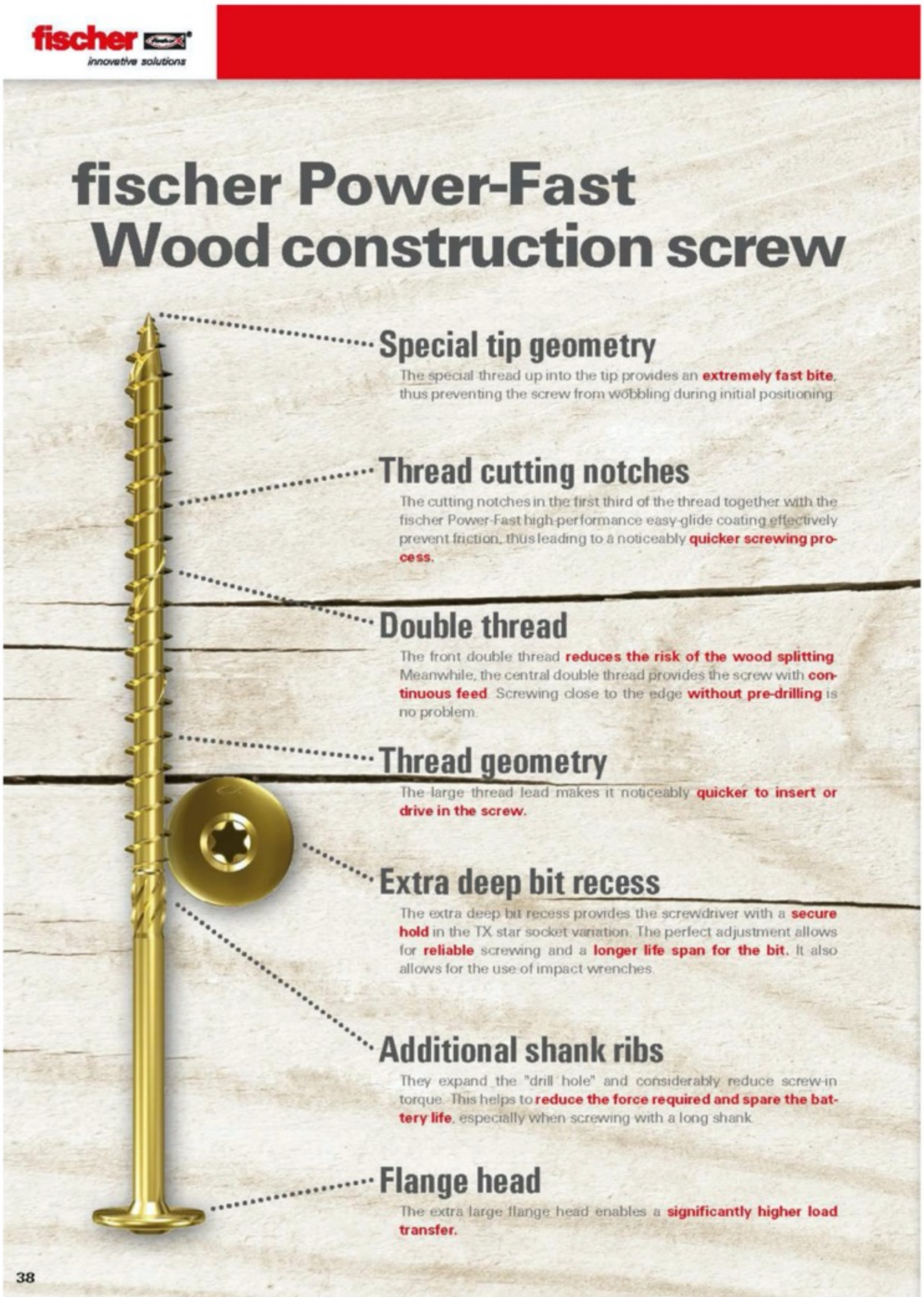
3.3 fischer FPF-WT Power-Fast wood Construction screw



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fischer Power-Fast Wood construction screw

Special tip geometry

The special thread up into the tip provides an **extremely fast bite**, thus preventing the screw from wobbling during initial positioning.

Thread cutting notches

The cutting notches in the first third of the thread together with the fischer Power-Fast high-performance easy-glide coating effectively prevent friction, thus leading to a noticeably **quicker screwing process.**

Double thread

The front double thread **reduces the risk of the wood splitting.** Meanwhile, the central double thread provides the screw with **continuous feed**. Screwing close to the edge **without pre-drilling** is no problem.

Thread geometry

The large thread lead makes it noticeably **quicker to insert or drive in the screw.**

Extra deep bit recess

The extra deep bit recess provides the screwdriver with a **secure hold** in the TX star socket variation. The perfect adjustment allows for **reliable** screwing and a **longer life span for the bit.** It also allows for the use of impact wrenches.

Additional shank ribs

They expand the "drill hole" and considerably reduce screw-in torque. This helps to **reduce the force required and spare the battery life**, especially when screwing with a long shank.

Flange head

The extra large flange head enables a **significantly higher load transfer.**

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3.4/3.5 **fischer Duopower 10 two component wall plug.**

DUOPOWER

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The duo of power and intelligence

Wall cabinets

TV-brackets

6 General fixings

BUILDING MATERIALS

- Concrete
- Solid brick
- Solid sand-lime brick
- Aerated concrete
- Vertically perforated brick
- Perforated sand-lime brick
- Plasterboard
- Gypsum plasterboard and gypsum fibreboards
- Hollow blocks made from lightweight concrete
- Cavity floor slabs made from bricks and concrete or similar
- Natural stone
- Chipboard
- Solid panel made from gypsum
- Solid brick made from lightweight concrete

CHARACTERISTICS

ADVANTAGES

- Two component materials for top load values and intelligent functioning depending on the substrate.
- Great feedback (feel-good factor) of the plug. You can feel exactly when the plug is installed perfectly.
- The short plug length ensures fast fixing without deep drilling.
- The narrow plug rim prevents slipping into the drill hole.
- The serrated anti-rotation feature prevents rotation in the drill hole during installation.
- The greater anchorage depth of the DUOPOWER 6 x 50, 8 x 65 and 10 x 80 means that the plug is especially suited to fixings in hollow building materials, aerated concrete and to bridge plaster.

APPLICATIONS

- TV consoles
- Lighting
- Shelves
- Mirror cabinets
- Letter boxes
- Pictures
- Fixing blinds
- Curtain rails
- Wash basin fixings
- Plumbing and heating fixings
- Bath and toilet installations
- Wall cabinets
- Range hood

FUNCTIONING

- The DUOPOWER is suitable for pre-positioned and push-through installation.
- The duo of two different materials and its multiple functional abilities (expanding, folding, and knotting) extend the range of applications to additional materials with top loads.
- The required screw length is given by the plug length + fixture thickness + 1x the screw diameter.
- Suitable for wood and chipboard screws, as well as stud screws.
- In the case of fixing boards, the threadless part of the screw must not be longer than the fixture.

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3.6 fischer SXR 10 Universal frame fixing

Frame fixing SXR

fischer innovative solutions

The all-round solution with short drill hole depth

Façade substructures

Façade substructures

VERSIONS

- Zinc-plated steel
- Stainless steel
- Hot-dip galvanised steel

BUILDING MATERIALS

Approved for:

- Concrete ≥ C12/15
- Vertically perforated brick
- Hollow blocks made from lightweight concrete
- Perforated sand-lime brick
- Solid sand-lime brick
- Aerated concrete
- Solid block made from lightweight and normal weight concrete
- Solid brick
- Thermal insulation blocks

Also suitable for:

- Natural stone with dense structure
- Solid panel made from gypsum

ASSESSMENT/APPROVAL

ETA-07/0121
ETAG 020 a, b, c, d
Multiple use in concrete and masonry for non-structural applications

Fire resistance classification R 90 for facade systems in concrete

ADVANTAGES

- The special functioning allows for use in solid and hollow building materials with an anchorage depth of just 50 mm, ensuring an economical fixing.
- The ETA assessment covers use in a range of solid and hollow building materials, and guarantees a secure fixing.
- The specially developed combination of plugs and screws ensures the very best handling. The plug has a noticeable hold, making installation more convenient.
- The extensive range with diameters of 6, 8 and 10 mm offers the right plug for every fixing.

APPLICATIONS

- Façade, ceiling and roof substructures made of wood and metal
- Windows
- Gates and doors
- Wardrobes
- Cable trays
- Squared timbers
- Kitchen hanging cabinets

FUNCTIONING

- The SXR is suitable for push-through installation.
- The SXR expands in solid building materials and knots in hollow building materials.
- With vertically perforated bricks, only use rotary drilling (no impact drilling).
- Countersunk head screws are recommended for the installation of timber constructions; in the case of metal constructions, use plugs with a wide sleeve rim and a moulded washer on the screw, which also features an integrated hexagon socket.

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3.7 fischer SXRL Universal frame fixing with long sleeve

Frame fixing SXRL

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The powerful problem solver with long expansion sleeve

Timber substructures

Wall consoles

5

Frame fixings / Stand-off installation

VERSIONS

- Zinc-plated steel
- Stainless steel

BUILDING MATERIALS

Approved for:
- Vertically perforated brick
- Aerated concrete
- Hollow blocks made from lightweight concrete
- Perforated sand-lime brick
- Thermal insulation blocks
- Solid block made from lightweight and normal weight concrete
- Solid brick
- Solid sand-lime brick
- Concrete ≥ C12/15

Also suitable for:
- Natural stone with dense structure
- Solid panel made from gypsum

ASSESSMENT/APPROVAL

ADVANTAGES

- Through the special geometry of the plug, the retention forces are evenly distributed in the drill hole.
- When the plug is to be set below the plaster, the longer ribs prevent plug rotation during installation.
- The variable anchorage depths of 70 or 90 mm offer special advantages and high loads when anchoring in aerated concrete.
- When anchoring in hollow and solid construction materials, the two expansion zones lead to optimum retention values.
- SXRL 14 is approved for the application under compression load and is thus for example useable for facade substructures that are mounted at a distance without wall brackets.
- The SXRL with effective lengths up to 290 mm provides the right plug for every application.

APPLICATIONS

- Façade, ceiling and roof substructures made of wood and metal
- TV consoles
- Kitchen hanging cabinets
- Wardrobes
- Squared timbers
- Windows
- Gates and doors
- Facade substructures under compression load (e.g. distance installation without wall brackets)

FUNCTIONING

- In perforated brick masonry, the two expansion zones ensure that the introduction of force is gentle on the substrate. The porous block fillets are not crushed by the second expansion zone and therefore serve to transmit the force.
- In aircrete and solid building material, the two expansion zones combine to form one long expansion element, thus providing for a uniform and flat distribution of the load into substrate.

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3.8 fischer SXS High performance frame fixing

Frame fixing SXS

fischer innovative solutions

5 Frame fixings / Stand-off installation

The high-performance specialist with SX-technology

Cable trays

Façade substructures

VERSIONS

- Zinc-plated steel
- Stainless steel

BUILDING MATERIALS

Approved for:

- Concrete ≥ C12/15
- Solid sand-lime brick
- Perforated sand-lime brick
- Aerated concrete
- Solid brick

Also suitable for:

- Natural stone with dense structure
- Solid brick made from lightweight concrete
- Solid panel made from gypsum
- Three-layer composite exterior wall panels
- Hollow blocks made from lightweight concrete

ASSESSMENT/APPROVAL

ADVANTAGES

- The ideal interaction of the SXS with the fischer CO-NA (CO-NA is short for the German term for "conical expansion") screw allows for the highest load-bearing capacities in solid building materials and cracked concrete. This allows for an economical fixing.
- The CO-NA screw causes the plug to expand in the crack. This is confirmed by the first approval for a plastic frame fixing for single fixings.
- The large diameter of the CO-NA screw means that high shear loads can be supported safely. Thus fewer fixing points are required.

APPLICATIONS

- Façade and roof substructures made of wood and metal
- Windows
- Fire protection doors
- Guard rails
- Handrails
- Squared timbers
- Kitchen hanging cabinets
- Gates

FUNCTIONING

- The SXS is suitable for push-through installation.
- Screwing in the CO-NA screw causes the SXS to expand in four directions and anchor into the building material.
- When a crack forms in the concrete, the cones of the screw actively expand, thus increasing the expansion effect and the holding force of the plug.
- Countersunk head screws are recommended for the installation of timber constructions; in the case of metal constructions, use plugs with a wide sleeve rim and a moulded washer on the screw, which also features an integrated hexagon socket.

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3.9 fischer HM 6x80 S Metal cavity anchor

Metal cavity fixing HM

fischer innovative solutions

The versatile metal cavity fixing with metric screws

Curtain rails

Shelves

7

Cavity fixings

BUILDING MATERIALS

- Gypsum plasterboard and gypsum fibreboards
- Cavity floor slabs
- Light building boards made of wood wool
- Chipboard
- Plywood boards

ADVANTAGES

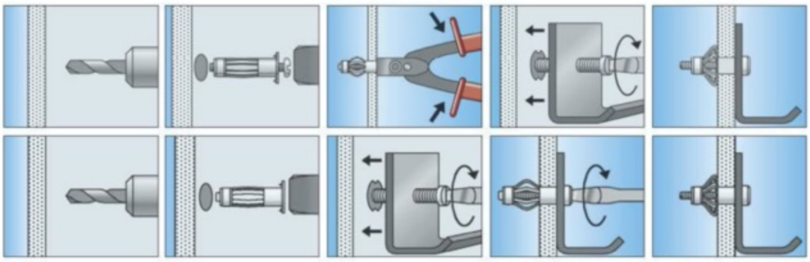
- Due to the extensive range, the HM is suitable for board building materials with a thickness of 3-50 mm and thus suitable for a number of different applications.
- The metric internal thread allows the attachment to be removed and refitted several times, thus offering the best possible flexibility.
- The HM's expanding arms ensure a large supporting surface, thus allowing a high load-bearing capacity.
- The claws around the edge of the fixing penetrate the board building material, preventing the fixing from rotating, thus ensuring a secure installation.

APPLICATIONS

- Pictures
- Lighting
- Light shelves
- Towel rails
- Mirror cabinets
- Curtain rails
- Sub-structures

FUNCTIONING

- The metal cavity fixing HM is suitable for pre-positioned installation.
- The fixing should be selected based on the thickness of the board building material, to allow the very best expansion in the cavity.
- During installation, the expanding arms swing open and press onto the reverse side of the board.
- The HM can be installed using installation pliers. If using a battery operated screwdriver or screwdriver for installation, the pre-assembled screws must be removed first. When screwing in and expanding the fixing, the attachment, or a max. 6 mm plate, needs to be used as a turning stop.



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3.10 fischer FTP M8 Metal anchor for metric threads

Turbo aircrete anchor FTP M

fischer innovative solutions

The metal anchor for metric screws for aerated concrete

Motion detectors

Shelves

6 General fixings

BUILDING MATERIALS

- Aerated concrete
- Solid panel made from gypsum

ADVANTAGES

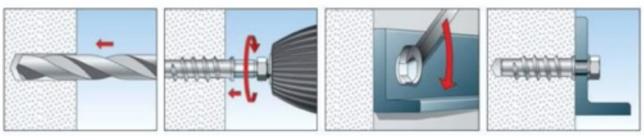
- The Allen key chuck makes it possible to set the FTP M without the need for a special setting tool. This allows for a simple installation.
- The FTP M achieves a very high load-bearing capacity in aerated concrete for increased safety.
- The spiral-shaped outer thread taps itself into the aerated concrete with a positive fit. This means that it can be set without the need for much force.
- The special geometry allows for an almost expansion-force-free anchoring. This allows for small edge and spacing distances, and avoids splitting in the case of plastered surfaces.

APPLICATIONS

- Pictures
- Lighting
- Shelves
- Mirror cabinets
- Curtain rails
- Cable and pipe clips
- Stand-off installations
- Radiators
- TV consoles

FUNCTIONING

- The FTP M is suitable for pre-positioned installation.
- The aircrete anchor taps itself into the aerated concrete with a positive fit during the installation process.
- Suitable for metric screws with diameter 6 to 10 mm.
- For installation with an Allen key: Allen key size corresponds to screw diameter, e.g. FTP M6 is installed with Allen key size 6.
- For installation with cordless screwdriver: use a low torque and use the correct 6-kt bit FTP EM.



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4. Test Results according to BS 8539 Annex B 2.3.1

4.1 fischer Power-Fast wood screw (Ø6mm).

Test No	Load in kN	Mode of Failure
1	0.30	Tensile Slip
2	0.40	Tensile Slip
3	0.40	Tensile slip
4	0.15	Tensile Slip
5	0.35	Tensile Slip

Lowest Ultimate Tensile Load = **0.15kN**
Using a global safety factor of 3, allowable resistance in tension = **0.05kN**

4.2 fischer Classic-Fast wood screw (Ø6mm)

Test No	Load in kN	Mode of Failure
1	0.65	Tensile Slip
2	0.95	Tensile Slip
3	0.70	Tensile slip
4	0.80	Tensile Slip
5	0.70	Tensile Slip

Lowest Ultimate Tensile Load = **0.65kN**
Using a global safety factor of 3, allowable resistance in tension = **0.22kN**

4.3 fischer Power-Fast wood screw (Ø8mm)

Test No	Load in kN	Mode of Failure
1	1.20	Tensile Slip
2	1.30	Tensile Slip
3	0.80	Tensile slip
4	0.80	Tensile Slip
5	1.00	Tensile Slip

Lowest Ultimate Tensile Load = **1.00kN**
Using a global safety factor of 3, allowable resistance in tension = **0.33kN**

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4.4 fischer Duopower two component wall plug 10x80

Test No	Load in kN	Mode of Failure
1	0.50	Tensile Slip
2	0.55	Tensile Slip
3	0.40	Tensile slip
4	0.50	Tensile Slip
5	0.45	Tensile Slip

Lowest Ultimate Tensile Load = **0.40kN**
Using a global safety factor of 7, allowable resistance in tension = **0.06kN**

4.5 fischer Duopower two component wall plug 10x50

Test No	Load in kN	Mode of Failure
1	0.60	Tensile Slip
2	0.65	Tensile Slip
3	0.50	Tensile slip
4	0.65	Tensile Slip
5	0.60	Tensile Slip

Lowest Ultimate Tensile Load = **0.50kN**
Using a global safety factor of 7, allowable resistance in tension = **0.07kN**

4.6 fischer SXR 10 Universal frame fixing

Test No	Load in kN	Mode of Failure
1	0.20	Tensile Slip
2	0.30	Tensile Slip
3	0.25	Tensile slip
4	0.30	Tensile Slip
5	0.20	Tensile Slip

Lowest Ultimate Tensile Load = **0.20kN**
Using a global safety factor of 7, allowable resistance in tension = **0.03kN**

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4.7 fischer SXRL 10 Universal frame fixing

Test No	Load in kN	Mode of Failure
1	0.90	Tensile Slip
2	1.00	Tensile Slip
3	0.70	Tensile slip
4	0.80	Tensile Slip
5	0.75	Tensile Slip

Lowest Ultimate Tensile Load = **0.70kN**
Using a global safety factor of 7, allowable resistance in tension = **0.10kN**

4.8 fischer SXS 10 Universal frame fixing

Test No	Load in kN	Mode of Failure
1	0.60	Tensile Slip
2	0.55	Tensile Slip
3	0.60	Tensile slip
4	0.65	Tensile Slip
5	0.50	Tensile Slip

Lowest Ultimate Tensile Load = **0.50kN**
Using a global safety factor of 7, allowable resistance in tension = **0.07kN**

4.9 fischer HM 6x80 S Metal cavity anchor

Test No	Load in kN	Mode of Failure
1	0.40	Tensile Slip
2	0.80	Tensile Slip
3	0.60	Tensile slip
4	0.45	Tensile Slip
5	0.50	Tensile Slip

Lowest Ultimate Tensile Load = **0.40kN**
Using a global safety factor of 3, allowable resistance in tension = **0.13kN**

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4.10 fischer FTP M8 Metal anchor for metric threads

Test No	Load in kN	Mode of Failure
1	1.90	Tensile Slip
2	1.50	Tensile Slip
3	1.40	Tensile slip
4	1.50	Tensile Slip
5	1.80	Tensile Slip

Lowest Ultimate Tensile Load = **1.50kN**
Using a global safety factor of 3, allowable resistance in tension = **0.50kN**

5. Conclusion

fischer has a range of different types of fixings suitable for Durisol blocks.
From fixing requiring metric threads to general purpose light weight applications, the correct solution can be found.

For the highest loads, the FTP M8 Metal anchor for metric threads gives the best results with recommended loads of up to 0.50kN per fixing

For simple and fast installation, The Power-Fast screws prove a good option with allowable loads up to 0.33kN for the Ø8mm

For through fixing applications the SXRL 10 frame fixings have the highest loads. The standard SXR 10 with an embedment depth of just 50mm is an economical solution. The HM6x80 works into the insulation to give a solid removable thread.

The Duopower plug offers a first class light duty fixing for general applications. It friction locks in block walls and the longer version also expands behind the outer skin into the void/insulation. Allowable loads in the region of 0.07kN were achieved.

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Summery Table:

Product tested	Lowest Test Load (kN)	Allowable Resistance (kN)	Average Failure Mode
Power-Fast wood screw (Ø6mm)	0.15	**0.05**	1st Tensile Slip
Classic-Fast wood screw (Ø6mm)	0.65	**0.22**	1st Tensile Slip
Power-Fast wood screw (Ø8mm)	1.00	**0.33**	1st Tensile Slip
Duopower 10x80	0.40	**0.06**	1st Tensile Slip
Duopower 10x50	0.50	**0.07**	1st Tensile Slip
SXR 10	0.20	**0.03**	1st Tensile Slip
SXRL 10	0.70	**0.10**	1st Tensile Slip
SXS 10	0.50	**0.07**	1st Tensile Slip
HM 6x80 S	0.40	**0.13**	1st Tensile Slip
FTP M8	1.50	**0.50**	1st Tensile Slip

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Technical disclaimer / Decisive factors

Due to the complexity of building materials, tools, fixing elements and installation techniques a comprehensive recommendation depends on full and detailed understanding of specific site conditions.

This document is a factual record of results obtained under specific conditions and does not constitute an endorsement of the suitability of the product tested for any specific application. This responsibility remains with the customer.
The test results shall be used as a guide for assessment or anchor suitability. Even when our advice is given in good faith it cannot be binding for this reason and we cannot accept any liability for any anchor failure due to the incorrect design, misuse or incorrect installation.

If a product has an ETA approval, ETA values take precedence and will be used in any structural design.

For full Test Reports please contact the fischer Technical Department:

Phone: 01491 827 920
E-mail: technical@fischer.co.uk

fischer Fixings (UK) Ltd.
Whitely Road, Wallingford, Oxon, OX10 9AT.

We cannot be responsible for any errors, and we reserve the right to make technical and range modifications without notice.
No liability is accepted for printing errors and omissions

Technical Training
We also offer training seminars suited to your individual needs and requirements.
Please call the technical department on the number below to find out more.

Call: 01491 827920

The information in this catalogue is intended for general guidance only and is given without engagement. Additional information and advice on specific applications is available from our Technical Support Team. For this however, we require a precise description of your particular application.
All the data in this price list concerning work with our fixings must be adapted to suit local conditions and the type of materials in use.
If no detailed performance specifications are given for certain articles and types, please contact out Technical Department for advice.

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Appendix 5 – Linear Thermal Transmittance and Junction Details (PsiValues)

SAP Detail Reference	Description of Detail	Durisol D365 Block	Durisol D300 Block	Default SAP Values	Accredited Details Values	Notes/ Comments
		W/mK*	W/mK*	W/mK*	W/mK*	
E2	Other lintels	0.037	0.049	1.000	0.300	Durisol values significantly better than accredited details
E3	Cill	0.015	0.019	0.080	0.040	Durisol values significantly better than accredited details
E4	Jamb	0.030	0.034	0.100	0.050	Durisol values significantly better than accredited details
E5	Ground Floor - B&B Parallel (Aircrete floor infill)	0.176	0.077	0.320	0.160	Durisol 300mm values are significantly better and 365mm values are very close to accredited details
E5	Ground Floor- B&B Parallel (Aircrete at edges only, conc. block infill)	0.176	0.075	0.320	0.160	Durisol 300mm values are significantly better and 365mm values are very close to accredited details
E5	Ground Floor- B&B Perpendicular (Aircrete floor infill)	0.176	0.050	0.320	0.160	Durisol 300mm values are significantly better and 365mm values are very close to accredited details
E5	Ground Floor - B&B Perpendicular (Aircrete at edges only, conc. block infill)	0.039	0.048	0.140	0.070	Durisol 300mm values are significantly better and 365mm values are very close to accredited details
E6	Intermediate floor within dwelling	0.039	0.048	0.140	0.070	Durisol values significantly better than accredited details
E10	Eaves (insulation at ceiling level)	0.002	0.009	0.120	0.060	Durisol values significantly better than accredited details
E12	Gable (insulation at ceiling level)	0.011	0.015	0.480	0.240	Durisol values significantly better than accredited details
E16	Normal Corner	0.002	0.002	0.180	0.090	Durisol values significantly better than accredited details
E17	Inverted Corner	-0.002	-0.001	0.000	-0.090	Durisol values significantly better than accredited details
E18	Party wall between dwellings	0.011	0.015	0.120	0.060	Durisol values significantly better than accredited details
P1	Ground Floor- B&B Parallel	0.059		0.480	0.080	Durisol values significantly better than accredited details
P1	Ground Floor- B&B Parallel	0.059		0.180	0.080	Durisol values significantly better than accredited details
P1	Ground Floor - B&B Perpendicular	0.063		0.000	0.080	Durisol values significantly better than accredited details
P1	Ground Floor - B&B Perpendicular	0.061		0.120	0.080	Durisol values significantly better than accredited details
P4	Roof (insulation at ceiling level)	0.140		0.160	0.240	Durisol values significantly better than accredited details

Building with Durisol delivers highly efficient thermal performance due to excellent U Values and low loss through thermal bridging

Linear Thermal Transmittance (Ψ) and Temperature Factor (*f*)

Certificate No:	2638 – 300mm Lintel E2	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

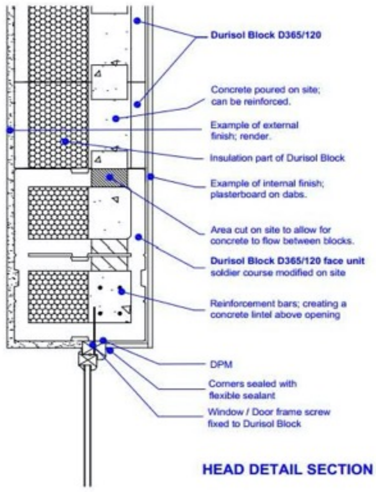
Utilises standard Durisol detail for 300mm blocks.

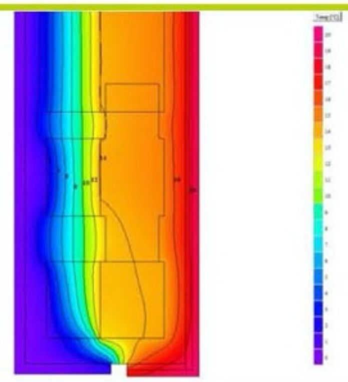
Material Thermal Conductivities:

Reinforced Concrete @ Lintel: **2.3 W/m.K**
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**

Description:	300mm Standard Lintel Junction
Reference:	2638 – 300mm Lintel E2

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.049

Temperature Factor[3] for Humidity and Mould	
f =	0.882

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

CarbonPlan Ltd. Omnibus Workspace 39-41 North Road London N7 9DP
Tel. / Fax: +44 (0)207 683 1432 E-mail: enquiries@carbonplan.co.uk

Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – 365mm Lintel E2	Issued:	11/18/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

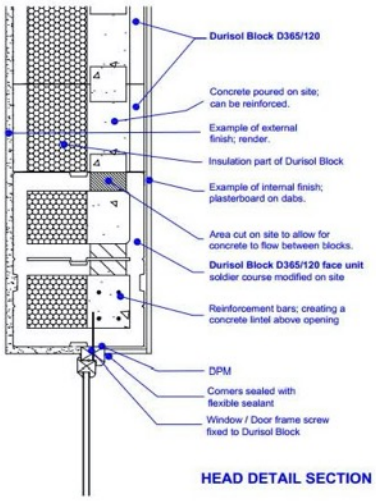
Utilises standard Durisol detail for 365mm blocks.

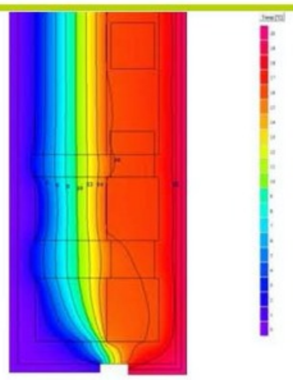
Material Thermal Conductivities:

Reinforced Concrete @ Lintel: **2.3 W/m.K**
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**

Description:	365mm Standard Lintel Junction
Reference:	2638 – 365mm Lintel E2

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.037

Temperature Factor[3] for Humidity and Mould	
f =	0.946

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- ❑ **EN ISO 10211_2007** *(British Standards)*
- ❑ **IP 1/06 & BR497** *(BRE Press)*
- ❑ **EN ISO 6946** *(British Standards)*
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Linear Thermal Transmittance (Ψ) and Temperature Factor (*f*)

Certificate No:	2638 – 300mm Cill E3	Issued:	11/18/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

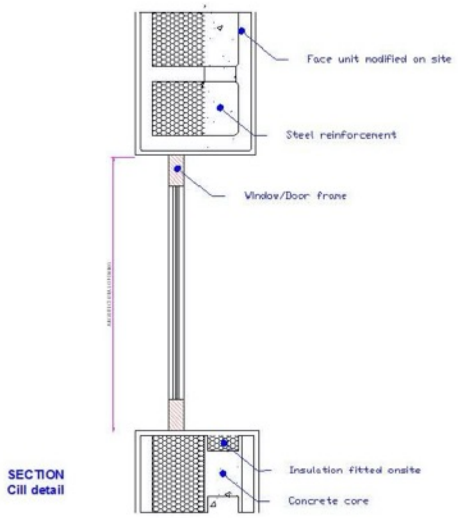
Utilises standard Durisol detail for 300mm blocks.
Concrete not poured at Cill, but special 50mm PIR 0.022 W/m.K insulation inserted below timber cill.

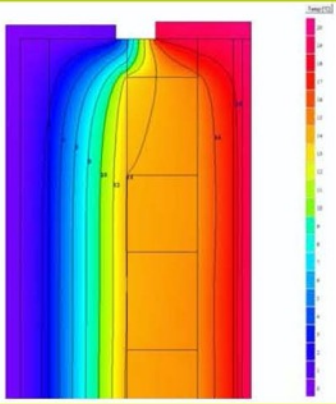
Material Thermal Conductivities:

Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**
Timber Cill: **0.15 W/m.K**

Description:	300mm Cill Junction with insulation insert
Reference:	2638 – 300mm Cill E3

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.019

Temperature Factor[3] for Humidity and Mould	
f =	0.961

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ)
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Certificate No:	2638 – 365mm Cill E3	Issued:	11/18/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

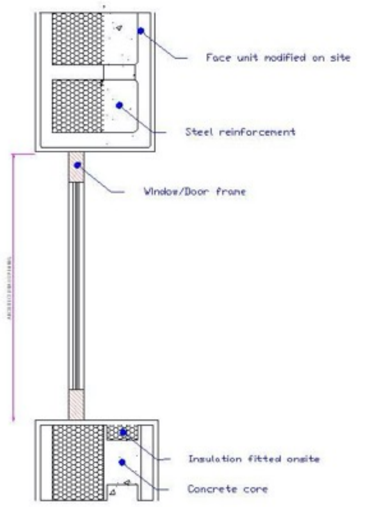
Notes about Detail:

Utilises standard Durisol detail for **365mm** blocks.
Concrete not poured at Cill, but special **50mm PIR 0.022 W/m.K insulation** inserted below timber cill.

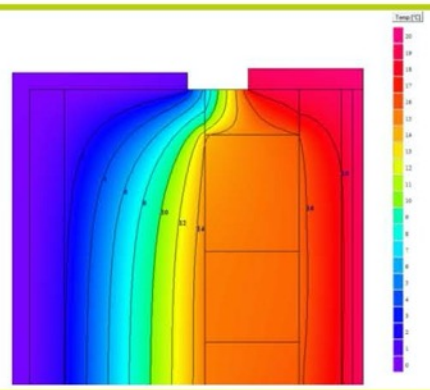
Material Thermal Conductivities:
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**
Timber Cill: **0.15 W/m.K**

Description:	**365mm Cill Junction with insulation insert**
Reference:	**2638 – 365mm Cill E2**

Junction Detail



SECTION
Cill detail



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	**0.015**

Temperature Factor[3] for Humidity and Mould	
***f* =**	**0.969**

Calculation Prepared By:	**Alan Calcott**

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

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Certificate No:	2638 – 300mm Jamb E4	Issued:	11/18/2014

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Crumlin,
Gwent,
NP11 3EF

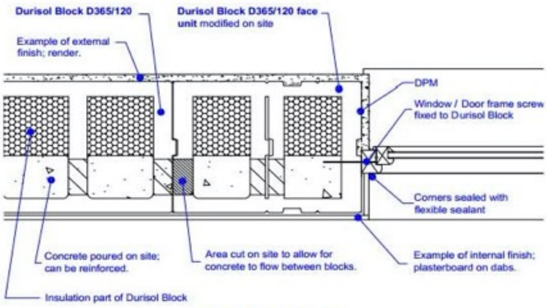
Notes about Detail:

Utilises standard Durisol detail for 300mm blocks.

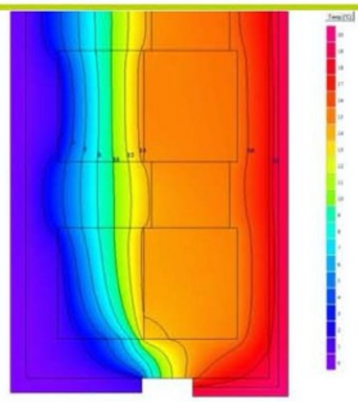
Material Thermal Conductivities:
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**

Description:	300mm Standard Jamb Junction
Reference:	2638 – 300mm Jamb E4

Junction Detail



JAMB DETAIL PLAN



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.034

Temperature Factor[3] for Humidity and Mould	
f =	0.935

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ) and Temperature Factor (*f*)

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Certificate No:	2638 – 365mm Jamb E4	Issued:	11/18/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

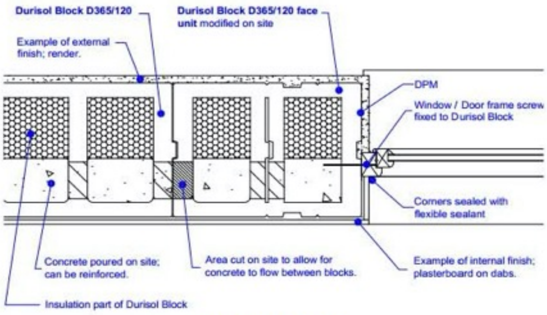
Utilises standard Durisol detail for 365mm blocks.

Material Thermal Conductivities:

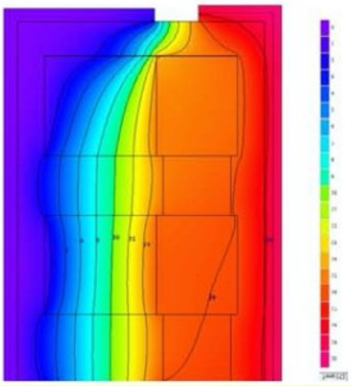
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**

Description:	**365mm Standard Jamb Junction**
Reference:	**2638 – 365mm Jamb E4**

Junction Detail



JAMB DETAIL PLAN



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.030

Temperature Factor³ for Humidity and Mould	
f =	0.935

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – 300mm GF B&B E5 PERP Aircrete	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

- Utilises standard Durisol 300mm block.
- 440mm wide and deep Aircrete Trenchblock foundation
- 170mm high Aircrete coursing block @ 100mm wide rests on Trechblock to external face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 65mm high Aircrete coursing block @ 215mm wide rests on Trechblock to internal face
- 170mm pre-stressed concrete beams run Perpendicular to wall.
- Floor infill with Aircrete Floor Blocks
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

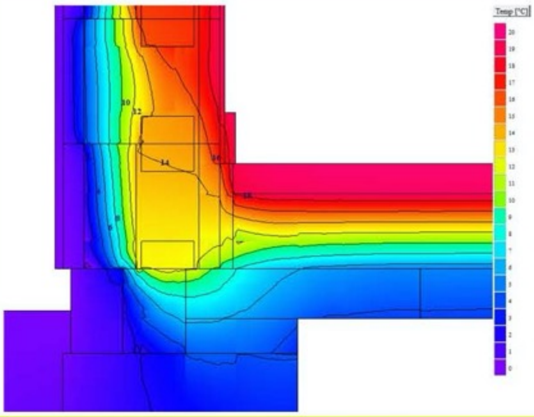
Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.

Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
- **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	300mm Ground Floor Block and Beam – Perpendicular with Aircrete Floor Blocks
Reference:	2638 - 300mm GF B&B Perpendicular E5 Aircrete Infill



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.050

Temperature Factor for Humidity and Mould	
f =	0.865

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Linear Thermal Transmittance (Ψ) and Temperature Factor (*f*)

Certificate No:	2638 – 365mm GF B&B E5 PAR Aircrete	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

- Utilises standard Durisol 365mm block.
- 440mm wide and deep Aircrete Threnchblock foundation
- 170mm high Aircrete coursing block @ 100mm wide rests on Trechblock to external face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 65mm high Aircrete coursing block @ 215mm wide rests on Trechblock to internal face
- 170mm pre-stressed concrete beams run Parallel to wall.
- Floor infill with Aircrete Floor Blocks
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

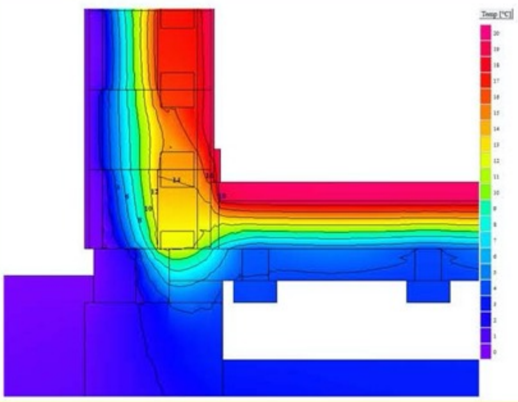
Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.

Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
- **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	365mm Ground Floor Block and Beam – Parallel with Aircrete Floor Blocks
Reference:	2638 - 365mm GF B&B Parallel E5 Aircrete Infill



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.176

Temperature Factor for Humidity and Mould	
f =	0.894

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – 300mm GF B&B E5 PAR Conc	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

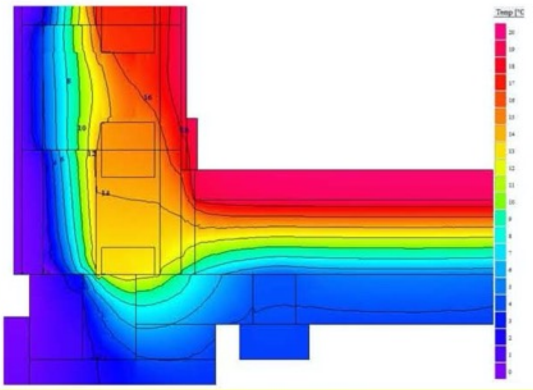
Notes about Detail:

- Utilises standard Durisol 300mm block.
- 440mm wide and deep Aircrete Trenchblock foundation
- 170mm high Aircrete coursing block @ 100mm wide rests on Trechblock to external face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 65mm high Aircrete coursing block @ 215mm wide rests on Trechblock to internal face
- 170mm pre-stressed concrete beams run Parallel to wall.
- Floor infill with Aircrete Blocks to perimeter and Medium Density Concrete Blocks elsewhere
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
   Calculations have been performed in accordance and with reference to the following publications:
   - **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
   - **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	**300mm Ground Floor Block and Beam – Parallel with Medium Density Concrete Blocks**
Reference:	**2638 - 300mm GF B&B Parallel E5 Concrete Infill**



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.077

Temperature Factor for Humidity and Mould	
f =	0.910

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Linear Thermal Transmittance (Ψ) and Temperature Factor (*f*)

Certificate No:	2638 – 365mm GF B&B E5 PAR Conc	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

- Utilises standard Durisol **365mm** block.
- **440mm wide and deep Aircrete Trenchblock** foundation
- **170mm high** Aircrete coursing block @ **100mm wide** rests on Trechblock to external face under Durisol blocks
- **120mm thick 0.022 W/m.K** insulation @ **170mm high** between coursing block to underside of Durisol Block
- **65mm high** Aircrete coursing block @ **215mm wide** rests on Trechblock to internal face
- **170mm** pre-stressed concrete beams run **Parallel** to wall.
- Floor infill with **Aircrete Blocks to perimeter and Medium Density Concrete Blocks elsewhere**
- Min **150mm 0.022 W/m.K** insulation between screed and structure
- Min **20mm thick 0.022 W/m.K** Edge insulation from top of B&B floor to top edge of screed

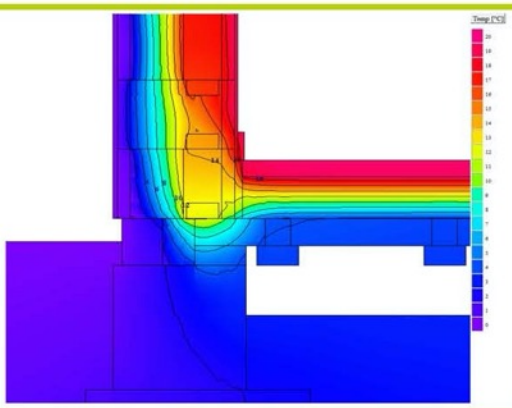
Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.

Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
- **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	365mm Ground Floor Block and Beam – Parallel with Medium Density Concrete Blocks
Reference:	2638 - 365mm GF B&B Parallel E5 Concrete Infill



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.176

Temperature Factor for Humidity and Mould	
f =	0.878

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Certificate No:	2638 – 300mm GF B&B E5 PERP Aircrete	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

- Utilises standard Durisol 300mm block.
- 440mm wide and deep Aircrete Threnchblock foundation
- 170mm high Aircrete coursing block @ 100mm wide rests on Trechblock to external face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 65mm high Aircrete coursing block @ 215mm wide rests on Trechblock to internal face
- 170mm pre-stressed concrete beams run Perpendicular to wall.
- Floor infill with Aircrete Floor Blocks
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

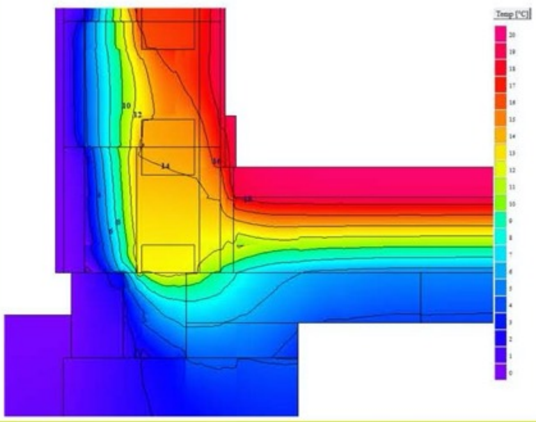
Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.

Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
- **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	300mm Ground Floor Block and Beam – Perpendicular with Aircrete Floor Blocks
Reference:	2638 - 300mm GF B&B Perpendicular E5 Aircrete Infill



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.050

Temperature Factor for Humidity and Mould	
f =	0.865

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – 365mm GF B&B E5 PERP Aircrete	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

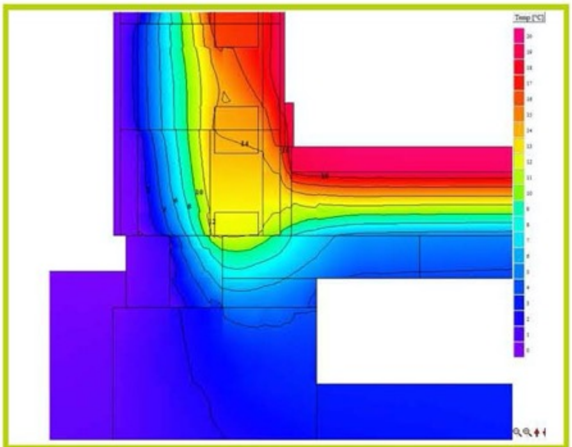
Notes about Detail:

- Utilises standard Durisol 365mm block.
- 440mm wide and deep Aircrete Trenchblock foundation
- 170mm high Aircrete coursing block @ 100mm wide rests on Trechblock to external face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 65mm high Aircrete coursing block @ 215mm wide rests on Trechblock to internal face
- 170mm pre-stressed concrete beams run Perpendicular to wall.
- Floor infill with Aircrete Floor Blocks
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth. Calculations have been performed in accordance and with reference to the following publications:
   - **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
   - **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	365mm Ground Floor Block and Beam – Perpendicular with Aircrete Floor Blocks
Reference:	2638 - 365mm GF B&B Perpendicular E5 Aircrete Infill



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.176

Temperature Factor for Humidity and Mould	
f =	0.808

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – 300mm GF B&B E5 PERPEND Conc	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

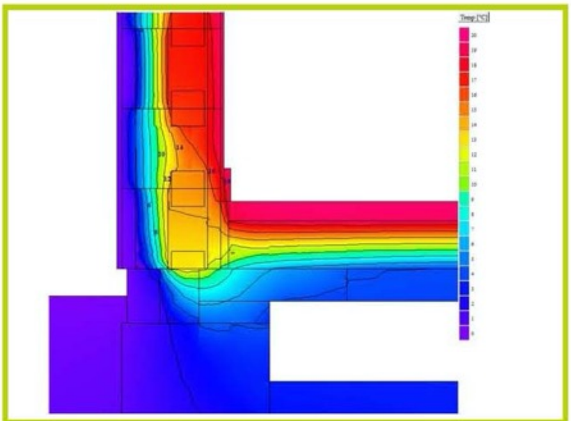
Notes about Detail:

- Utilises standard Durisol 300mm block.
- 440mm wide and deep Aircrete Trenchblock foundation
- 170mm high Aircrete coursing block @ 100mm wide rests on Trechblock to external face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 65mm high Aircrete coursing block @ 215mm wide rests on Trechblock to internal face
- 170mm pre-stressed concrete beams run Perpendicular to wall.
- Floor infill with Aircrete Blocks to perimeter and Medium Density Concrete Blocks elsewhere
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
   Calculations have been performed in accordance and with reference to the following publications:
   - **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
   - **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	300mm Ground Floor Block and Beam – Perpendicular with Medium Density Concrete Blocks
Reference:	2638 - 300mm GF B&B Perpendicular E5 Concrete Infill



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.050

Temperature Factor for Humidity and Mould	
f =	0.890

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – 365mm GF B&B E5 PAR Conc	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

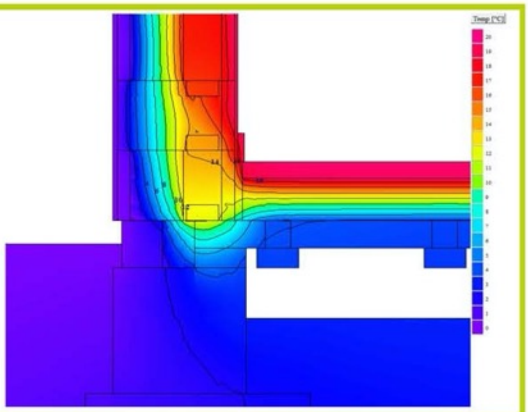
Notes about Detail:

- Utilises standard Durisol 365mm block.
- 440mm wide and deep Aircrete Trenchblock foundation
- 170mm high Aircrete coursing block @ 100mm wide rests on Trechblock to external face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 65mm high Aircrete coursing block @ 215mm wide rests on Trechblock to internal face
- 170mm pre-stressed concrete beams run Parallel to wall.
- Floor infill with Aircrete Blocks to perimeter and Medium Density Concrete Blocks elsewhere
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth. Calculations have been performed in accordance and with reference to the following publications:
   - **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
   - **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	365mm Ground Floor Block and Beam – Parallel with Medium Density Concrete Blocks
Reference:	2638 - 365mm GF B&B Parallel E5 Concrete Infill



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.176

Temperature Factor for Humidity and Mould	
f =	0.878

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Certificate No:	2638 – 300mm E6-Intermediary Floor	Issued:	18/11/2014

Issued to:

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Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

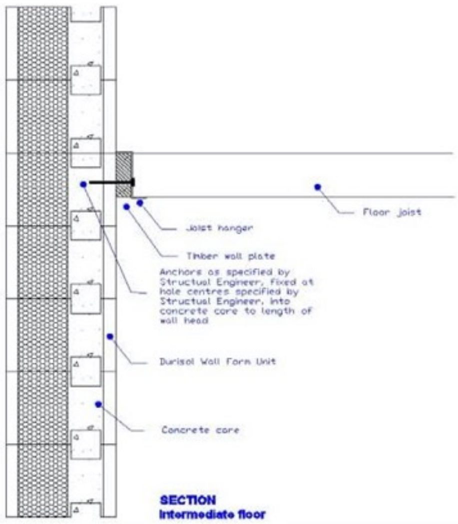
Utilises standard Durisol detail for 300mm blocks.

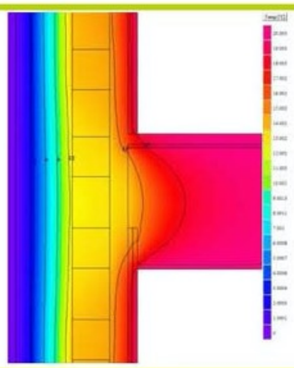
Material Thermal Conductivities:

Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**
High density acoustic floor membrane: **0.5021 W/m.K**
Air gap between ceiling and floor: **0.0251 W/m.K**

Description:	**300mm E6 - Intermediary Floor**
Reference:	**2638 – 300mm E6 - Intermediary Floor**

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.048

Temperature Factor[3] for Humidity and Mould	
f =	0.914

Calculation Prepared By:	Alan Calcott

Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.

Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

CarbonPlan Ltd. Omnibus Workspace 39-41 North Road London N7 9DP
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Linear Thermal Transmittance (Ψ) and Temperature Factor (*f*)

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Certificate No:	2638 – 365mm E6-Intermediary Floor	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

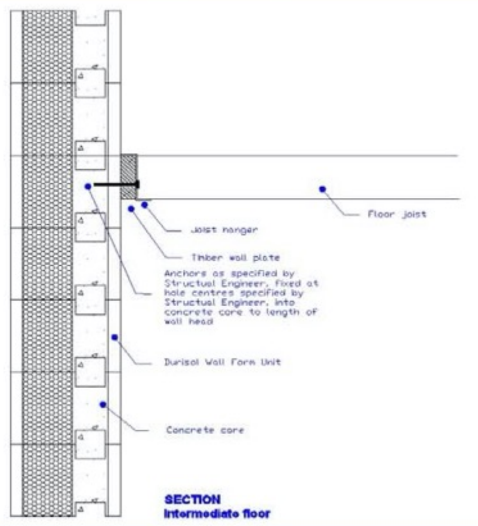
Notes about Detail:

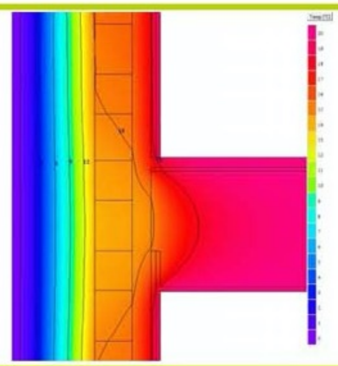
Utilises standard Durisol detail for 365mm blocks.

Material Thermal Conductivities:
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**
High density acoustic floor membrane: **0.5021 W/m.K**
Air gap between ceiling and floor: **0.0251 W/m.K**

Description:	365mm E6 - Intermediary Floor
Reference:	2638 – 365mm E6 - Intermediary Floor

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.039

Temperature Factor[3] for Humidity and Mould	
f =	0.932

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – 300mm Eaves Ins @ Ceiling E10	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

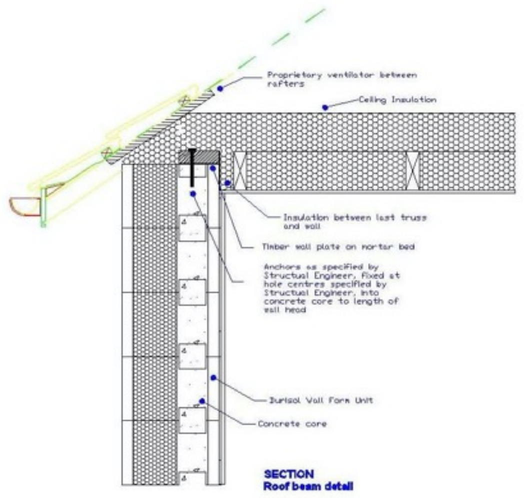
Notes about Detail:

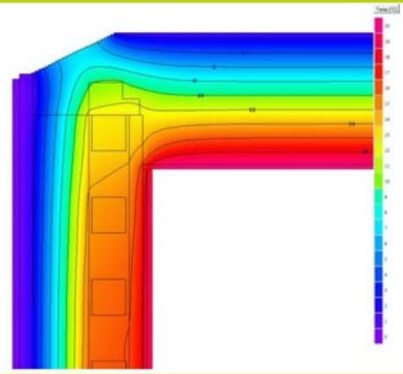
Utilises standard Durisol detail for **300mm** blocks.
Area behind wall plate to be packed with **min 200mm** mineral wool insulation with **R = 0.036 W/m.K**

Material Thermal Conductivities:
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**
Mineral wool loft roll insulation: **0.036 W/m.K**

Description:	365mm Eaves Insulation at Ceiling Junction
Reference:	2638 – 365mm E10 Eaves Ins at Ceiling Junction

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.009

Temperature Factor[3] for Humidity and Mould	
f =	0.882

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.

2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

CarbonPlan Ltd. Omnibus Workspace 39-41 North Road London N7 9DP
Tel. / Fax: +44 (0)207 683 1432 E-mail: enquiries@carbonplan.co.uk

Certificate No:	2638 – 365mm Eaves Ins @ Ceiling E10	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

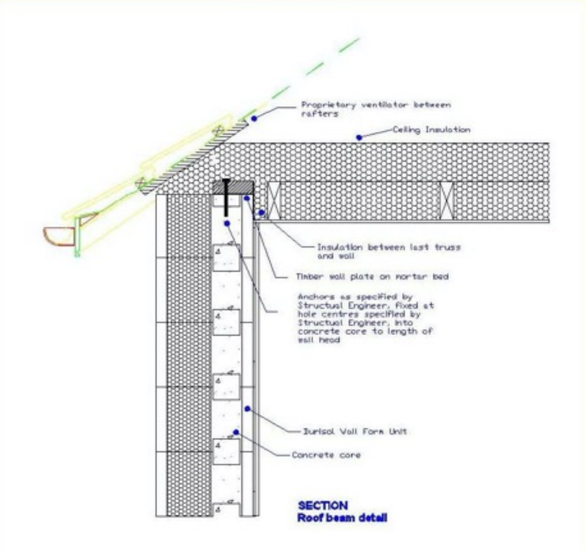
Notes about Detail:

Utilises standard Durisol detail for 365mm blocks.
Area behind wall plate to be packed with min 200mm mineral wool insulation with R = 0.036 W/m.K

Material Thermal Conductivities:
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**
Mineral wool loft roll insulation: **0.036 W/m.K**

Description:	365mm Eaves Insulation at Ceiling Junction
Reference:	2638 – 365mm E10 Eaves Ins at Ceiling Junction

Junction Detail



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.002

Temperature Factor[3] for Humidity and Mould	
f =	0.882

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

CarbonPlan Ltd. Omnibus Workspace 39-41 North Road London N7 9DP
Tel. / Fax: +44 (0)207 683 1432 E-mail: enquiries@carbonplan.co.uk

Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – Gable with Ins @ ceiling 300mm E12	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

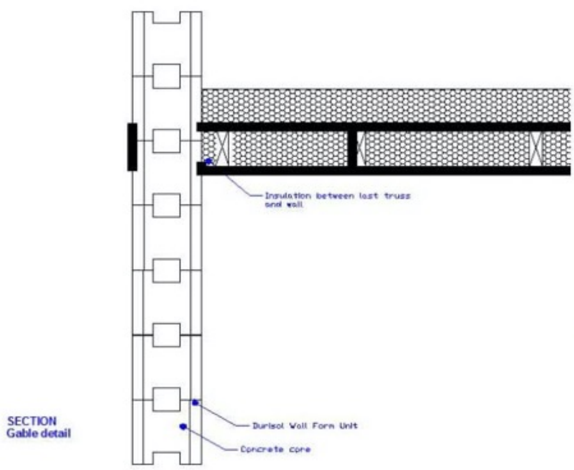
Utilises standard Durisol detail for 300mm blocks.

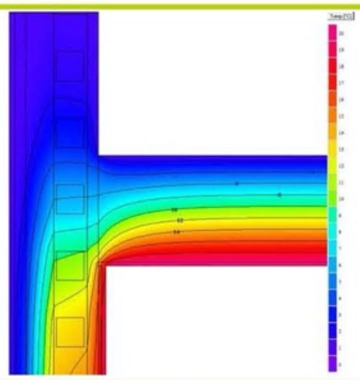
Material Thermal Conductivities:

Reinforced Concrete @ Lintel: **2.3 W/m.K**
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**
Mineral wool loft roll insulation: **0.036 W/m.K**

Description:	300mm E12 Gable Ins at Ceiling Junction
Reference:	2638 – 300mm E12

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.015

Temperature Factor[3] for Humidity and Mould	
f =	0.893

Calculation Prepared By:	Alan Calcott

Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
   Calculations have been performed in accordance and with reference to the following publications:
   - **EN ISO 10211_2007** *(British Standards)*
   - **IP 1/06 & BR497** *(BRE Press)*
   - **EN ISO 6946** *(British Standards)*
   - **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ) and Temperature Factor (*f*)

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Certificate No:	2638 – Gable with Ins @ ceiling 365mm E12	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

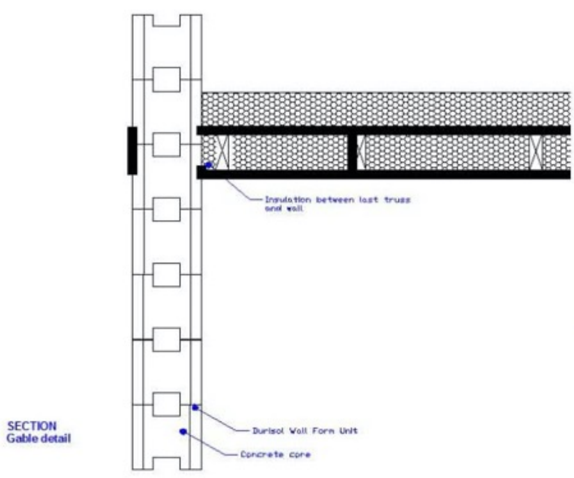
Utilises standard Durisol detail for 365mm blocks.

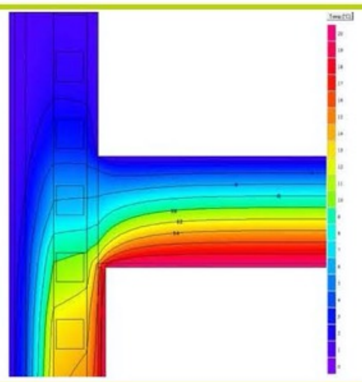
Material Thermal Conductivities:

- Reinforced Concrete @ Lintel: **2.3 W/m.K**
- Medium Density Concrete: **1.65 W/m.K**
- PIR Insulation: **0.022 W/m.K**
- PIR Insulation Bridged by Durisol: **0.064 W/m.K**
- Durisol Block: **0.13 W/m.K**
- Plasterboard: **0.21 W/m.K**
- Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
- Durisol Bridged with Concrete: **0.8 W/m.K**
- Mineral wool loft roll insulation: **0.036 W/m.K**

Description:	365mm E12 Gable Ins at Ceiling Junction
Reference:	2638 – 365mm E12

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.011

Temperature Factor[3] for Humidity and Mould	
f =	0.921

Calculation Prepared By:	Alan Calcott

Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.

Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ) and Temperature Factor (*f*)

Certificate No:	2638 – Corner 300mm E16	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

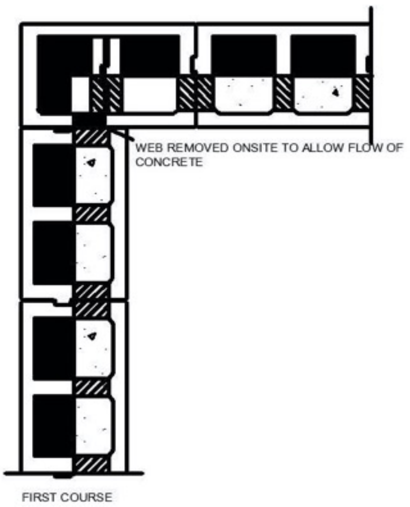
Utilises standard Durisol detail for 300mm blocks.

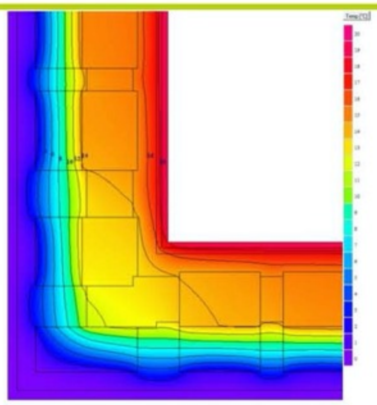
Material Thermal Conductivities:

Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**

Description:	**300mm E16 Normal Corner Junction**
Reference:	**2638 – 300mm E16**

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	**0.002**

Temperature Factor[3] for Humidity and Mould	
f **=**	**0.899**

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

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Certificate No:	2638 – Corner 365mm E16	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

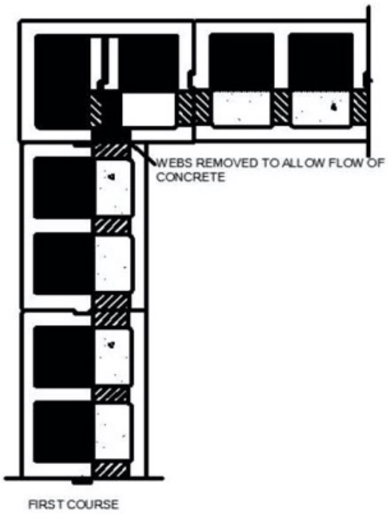
Notes about Detail:

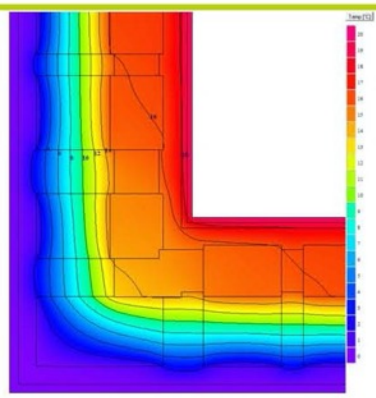
Utilises standard Durisol detail for 365mm blocks.

Material Thermal Conductivities:
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**

Description:	365mm E16 Normal Corner Junction
Reference:	2638 – 365mm E16

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.002

Temperature Factor[3] for Humidity and Mould	
f =	0.921

Calculation Prepared By:	Alan Calcott

Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
   Calculations have been performed in accordance and with reference to the following publications:
   - **EN ISO 10211_2007** *(British Standards)*
   - **IP 1/06 & BR497** *(BRE Press)*
   - **EN ISO 6946** *(British Standards)*
   - **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ) and Temperature Factor (*f*)

Certificate No:	2638 – Inverted Corner 300mm E17	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

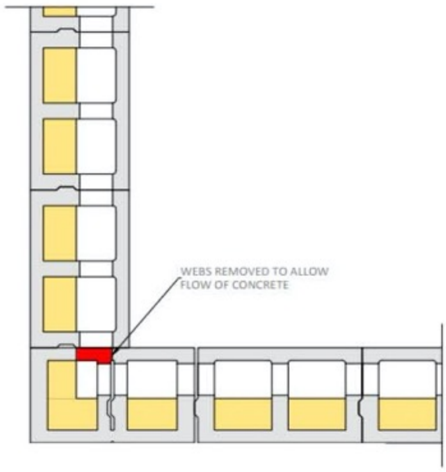
Notes about Detail:

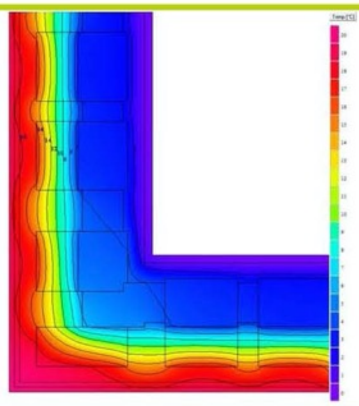
Utilises standard Durisol detail for 300mm blocks.

Material Thermal Conductivities:
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**

Description:	300mm E17 Inverted Corner Junction
Reference:	2638 – 300mm E17

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	-0.001

Temperature Factor[3] for Humidity and Mould	
f =	0.999

Calculation Prepared By:	Alan Calcott

Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.

Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

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Certificate No:	2638 – Inverted Corner 365mm E17	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

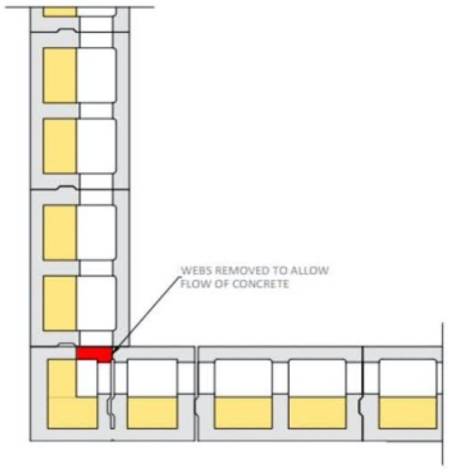
Notes about Detail:

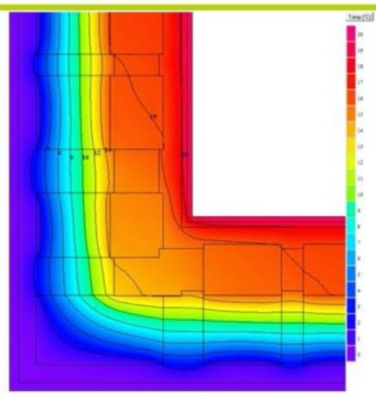
Utilises standard Durisol detail for 365mm blocks.

Material Thermal Conductivities:
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**

Description:	365mm E17 Inverted Corner Junction
Reference:	2638 – 365mm E17

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.002

Temperature Factor[3] for Humidity and Mould	
f =	0.999

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- ❑ **EN ISO 10211_2007** *(British Standards)*
- ❑ **IP 1/06 & BR497** *(BRE Press)*
- ❑ **EN ISO 6946** *(British Standards)*
- ❑ **BR443** *(BRE Press)*

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – 300mm E18	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

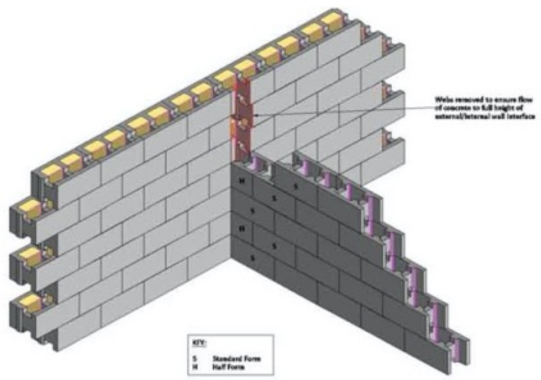
Utilises standard Durisol detail for 300mm blocks.

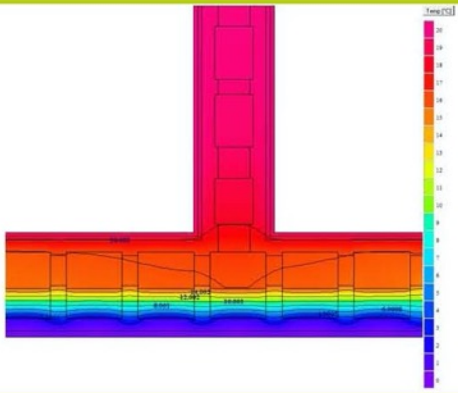
Material Thermal Conductivities:

Reinforced Concrete: **2.3 W/m.K**
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**

Description:	300mm E18 Party Wall Junction
Reference:	2638 – 300mm E18

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.015

Temperature Factor[3] for Humidity and Mould	
f =	0.893

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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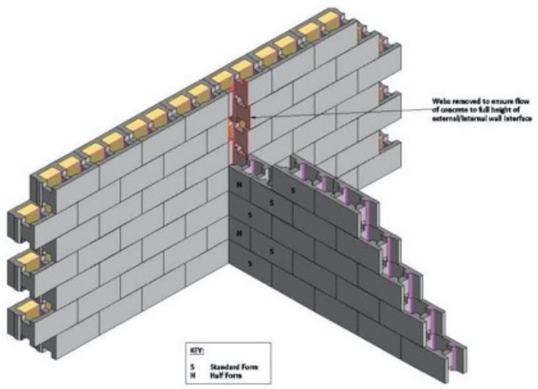
Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

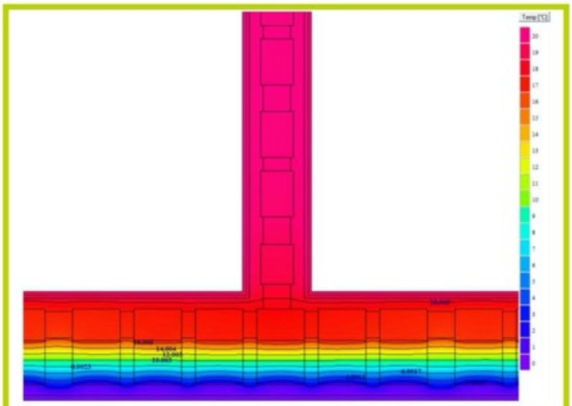
Certificate No:	2638 – Party Wall 365mm E18	Issued:	18/11/2014

Issued to:	Notes about Detail:	Material Thermal Conductivities:
DURISOL UK Parkway, Pen-y-Fan Industrial Estate, Crumlin, Gwent, NP11 3EF	Utilises standard Durisol detail for 365mm blocks.	Reinforced Concrete: **2.3 W/m.K** Medium Density Concrete: **1.65 W/m.K** PIR Insulation: **0.022 W/m.K** PIR Insulation Bridged by Durisol: **0.064 W/m.K** Durisol Block: **0.13 W/m.K** Plasterboard: **0.21 W/m.K** Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K** Durisol Bridged with Concrete: **0.8 W/m.K**

Description:	**365mm E18 Party Wall Junction**
Reference:	**2638 – 365mm E18**

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.011

Temperature Factor[3] for Humidity and Mould	
f =	0.921

Calculation Prepared By:	**Alan Calcott**

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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Certificate No:	2638 – BOTH GF B&B P1 PARAL AIRCRETE	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

- Utilises standard Durisol 300mm and 365mm block with 170mm party wall block.
- 440mm wide and deep Aircrete Threnchblock foundation
- 65mm high Aircrete coursing block @ 160mm wide rests on Trechblock to external face and internal face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 170mm pre-stressed concrete beams run Parallel to wall.
- Floor infill with Aircrete Blocks
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

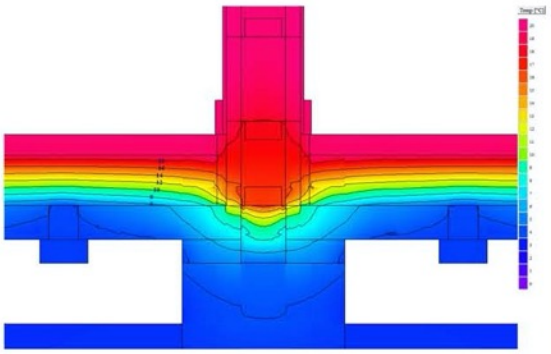
Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.

Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
- **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	Ground Floor Block and Beam Party Wall – BOTH Parallel with Aircrete Floor Blocks
Reference:	2638 - Both GF B&B Party Wall Parallel P1 Aircrete Floor Blocks



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.059

Temperature Factor for Humidity and Mould	
f =	0.966

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – BOTH GF B&B P1 PERPEND Conc	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

- Utilises standard Durisol 300mm and 365mm block with 170mm party wall block.
- 440mm wide and deep Aircrete Threnchblock foundation
- 65mm high Aircrete coursing block @ 160mm wide rests on Trechblock to external face and internal face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 170mm pre-stressed concrete beams run Perpendicular to wall.
- Floor infill with Aircrete Blocks to perimeter and Medium Density Concrete Blocks elsewhere
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

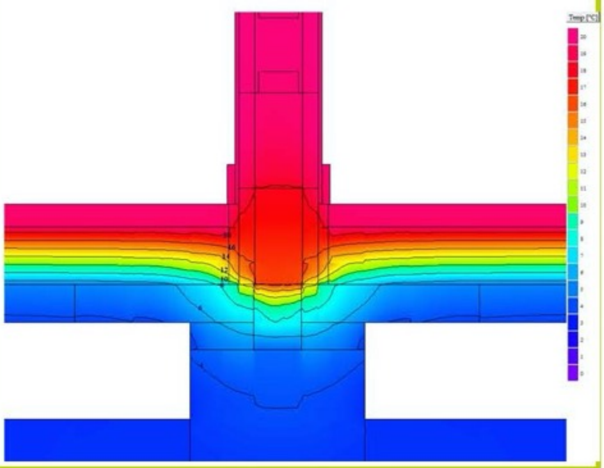
Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.

Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
- **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	Ground Floor Block and Beam Party Wall – BOTH Perpendicular with Medium Density Concrete Blocks
Reference:	2638 - Both GF B&B Party Wall Perpendicular P1 Concrete Infill



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.061

Temperature Factor for Humidity and Mould	
f =	0.967

CarbonPlan Ltd. Omnibus Workspace 39-41 North Road London N7 9DP
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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – BOTH GF B&B P1 PERPEND AIRCRETE	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

Notes about Detail:

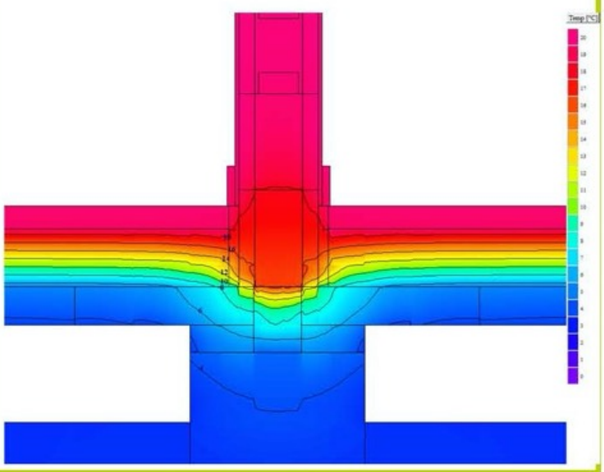
- Utilises standard Durisol 300mm and 365mm block with 170mm party wall block.
- 440mm wide and deep Aircrete Trenchblock foundation
- 65mm high Aircrete coursing block @ 160mm wide rests on Trechblock to external face and internal face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 170mm pre-stressed concrete beams run Perpendicular to wall.
- Floor infill with Aircrete Blocks
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
- **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	Ground Floor Block and Beam Party Wall – BOTH Perpendicular with Aircrete Floor Blocks
Reference:	2638 - Both GF B&B Party Wall Perpendicular P1 Aircrete Floor Blocks



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.063

Temperature Factor for Humidity and Mould	
f =	0.968

CarbonPlan Ltd. Omnibus Workspace 39-41 North Road London N7 9DP
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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

Certificate No:	2638 – BOTH GF B&B P1 PERPEND Conc	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

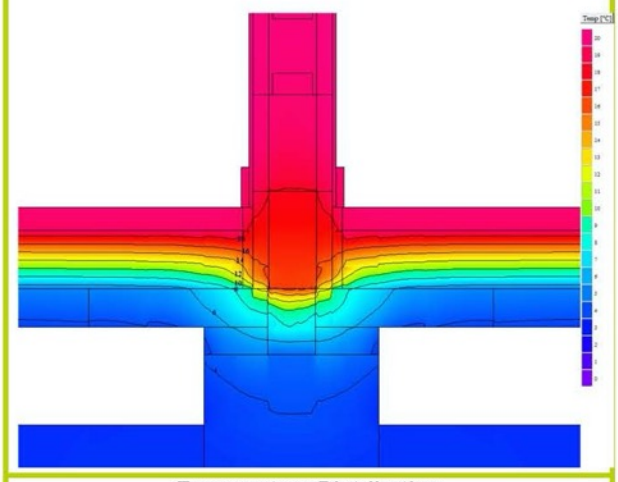
Notes about Detail:

- Utilises standard Durisol 300mm and 365mm block with 170mm party wall block.
- 440mm wide and deep Aircrete Trenchblock foundation
- 65mm high Aircrete coursing block @ 160mm wide rests on Trechblock to external face and internal face under Durisol blocks
- 120mm thick 0.022 W/m.K insulation @ 170mm high between coursing block to underside of Durisol Block
- 170mm pre-stressed concrete beams run Perpendicular to wall.
- Floor infill with Aircrete Blocks to perimeter and Medium Density Concrete Blocks elsewhere
- Min 150mm 0.022 W/m.K insulation between screed and structure
- Min 20mm thick 0.022 W/m.K Edge insulation from top of B&B floor to top edge of screed

Notes: -

1. Ψ and *f* are only valid for the detail drawn and described above.
2. In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth. Calculations have been performed in accordance and with reference to the following publications:
   - **EN ISO 10211_2007 & EN ISO 6946** *(British Standards)*
   - **IP 1/06 & BR497 & BR443** *(BRE Press)*

Description:	Ground Floor Block and Beam Party Wall – BOTH Perpendicular with Medium Density Concrete Blocks
Reference:	2638 - Both GF B&B Party Wall Perpendicular P1 Concrete Infill



Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.061

Temperature Factor for Humidity and Mould	
f =	0.967

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Linear Thermal Transmittance (Ψ)
and Temperature Factor (*f*)

carbonplan

Certificate No:	2638 – Party Gable Ins @ Ceiling P4	Issued:	18/11/2014

Issued to:

DURISOL UK

Parkway,
Pen-y-Fan Industrial Estate,
Crumlin,
Gwent,
NP11 3EF

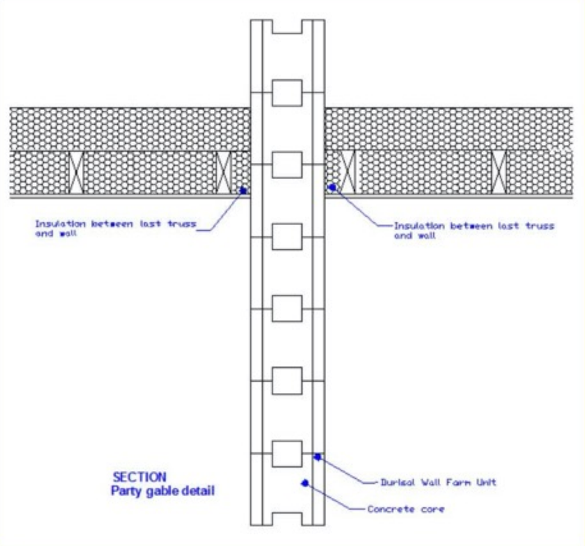
Notes about Detail:

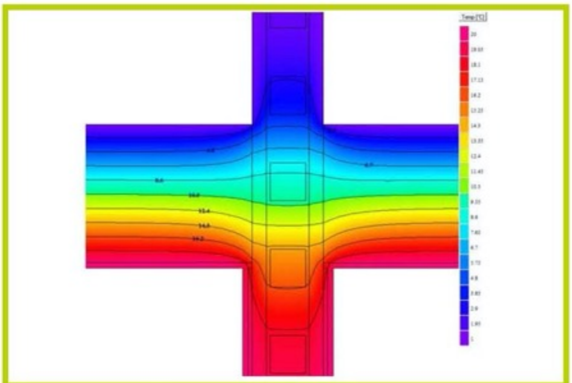
Utilises standard Durisol 300mm and 365mm block with 170mm party wall.

Material Thermal Conductivities:
Reinforced Concrete @ Lintel: **2.3 W/m.K**
Medium Density Concrete: **1.65 W/m.K**
PIR Insulation: **0.022 W/m.K**
PIR Insulation Bridged by Durisol: **0.064 W/m.K**
Durisol Block: **0.13 W/m.K**
Plasterboard: **0.21 W/m.K**
Vertical High E Plaster dabs cavity: **R= 0.125 W/m.K**
Durisol Bridged with Concrete: **0.8 W/m.K**
Mineral wool loft roll insulation: **0.036 W/m.K**

Description:	P4 Party Gable Ins at Ceiling Junction
Reference:	2638 – 300mm and 365mm P4 Party Wall Gable Ins at Ceiling Junction

Junction Detail





Temperature Distribution

Linear Thermal Transmittance W/m.K	
Ψ =	0.140

Temperature Factor[3] for Humidity and Mould	
f =	0.937

Calculation Prepared By:	Alan Calcott

Notes: -

1 Ψ and *f* are only valid for the detail drawn and described above.
2 In dwellings, a temperature factor f that is >0.75 would avoid the risk of mould growth.
Calculations have been performed in accordance and with reference to the following publications:

- **EN ISO 10211_2007** *(British Standards)*
- **IP 1/06 & BR497** *(BRE Press)*
- **EN ISO 6946** *(British Standards)*
- **BR443** *(BRE Press)*

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