

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Alison Durie

Student ID 1803847

Submission 13 February 2020

Module code ACBA 5012

Sustainable use of buildings

HND Building Surveying

Juan Ferriz-Papi

Table of Contents

Sustainable use of Buildings 2

Option 1 – Building Survey 2

Orientation of House and Swimming Pool 2

Design Envelope of Building & Building Materials 4

Thermal Bridges – Solutions 8

Common Repeat Thermal Bridging 8

References/Bibliography 10

Appendices 12

1: First in Architecture – Beam & Block Floor slab 12

2: Rationel technical brochure – Window & Doors 12

3: Marley tiles technical brochure – Roof tiles 12

4: Warmcel technical brochure – Cellulose Insulation 12

5: Black mountain Insulation Technical specification leaflet – Hemp Insulation 12

6: Protect breathable membrane technical sheet 12

7: Kingspan Kooltherm K103 ridged floor insulation technical data sheet 12

8: BRE U-Value calculation for walls. 12

9: BRE U-Value calculation for Roof/Attic space (including ceiling) 12

10: BRE U- Value calculation for floor slab at ground floor 12

Sustainable use of Buildings

Option 1 – Building Survey

As a building surveyor and part of a team on the following project I have been asked to make recommendations, prior to the construction of a detached property with swimming pool, to improve the all-round energy efficiency of the building. Recommendations will fall into three distinct areas as follows:

- Orientation of property and swimming pool including shading and natural ventilation.
- Materials used in construction, with particular emphasis on roof, facades, windows or materials in contact with the ground.
- Any thermal bridging and solutions to mitigate.

All materials used must comply with current Building Regulations:

- Part L: 'Conservation of fuel and power' (The Building Regulations 2010).

As a way of achieving this I will base my recommendations, as far as possible, on a passive house design while utilising as much natural resources and materials as possible to meet this compliance. I will, as far as practicable, use UK-based manufacturers to help reduce the embodied energy of the materials. As information is limited, a number of assumptions will be made about the site and its proximity to other buildings and trees. **(greenspec.co.uk, 2020)**

Orientation of House and Swimming Pool

The best orientation of the building given its geographical location in Swansea, South Wales, would be for the front elevation to face south or a maximum of 30° east or west dependant on whether the early morning or late afternoon sun is preferred. South facing orientation takes full advantage of solar gain as it is in the suns direct path all day.

South facing properties would benefit from positioning the most frequently used rooms toward the front to benefit from the best solar gain and natural heating solutions, whilst maintaining occupant's comfort levels.

By paying particular attention to the orientation of a building and utilising what nature is providing for free, heating and ventilation can be achieved while limiting cost, ensuring the running cost of the building is as economic as possible.

The swimming pool should also be south facing with no buildings obstructing or shading the suns natural path. Innovative materials around the pool can be used to improve the heating process of the water. For example, mirrors that reflect the sunlight onto the water surface and provide some heat via solar gain. Photovoltaic Cells (PV) on the main house will provide power to heat the pool water.

Chimneys: Should be in positions where they benefit from the natural wind uplift/draught direction passing over the house, the higher the chimney the improved airflow. Natural ventilation and air exchange can be achieved fairly simply and for free by using the natural wind direction across the house. The use of a passive stack effect provides a good source of air exchange within the house but can produce draughts which may be noticeable and affect comfort levels for occupants when not in use. However, if not used or heated, they can eventually become problematic and can be a source of water ingress therefore, if there is no intention to use an open flue, the property could be built without chimneys or a stainless steel flue installed instead to serve a wood-burning stove.

Trickle vents at windows: A fairly inexpensive and effective solution to provide a constant air exchange and exhaustion of stale air. Ensuring trickle vents are open at all times, a low-level constant ventilation can be achieved in the background without affecting comfort levels of the occupants or significantly increasing heating costs.

Natural ventilation & airflow: Maximising the ventilation inlets on the windward side of the property and outlets on the leeward side, will create a natural cross ventilation within the property. When the external air temperature is lower than the internal air temperature, heat is transferred from the space to the inlet air. Cross ventilation also reduces heat gain from occupation (convection) by increasing the level of evaporation of perspiration, up to 1lt per person per day. **(Healthy Magazine, 2020)** The cooling rate from natural cross-ventilation is determined by the wind speed, the size of inlets which should achieve approximately 5% of the overall floor space **(Haywood, 2012)**, and the temperature difference between external and internal. **(DeKay, Brown, 2014)**

Design Envelope of Building & Building Materials

Energy efficiency requirements do not extend to any parts of the building that would not require to be heated or cooled, for example the garages beneath the main property, however it is important that insulation between these two areas is otherwise compliant with building regulations and does not become a heat sink if incorrectly insulated. With the generally acknowledged increase in rainfall in recent decades, building the garages beneath the house effectively places it on stilts protecting the main accommodation from flooding and defects associated with ground water. ***(Building Regulations 2010, pg 5)***

Building regulations state that, to show compliance in relation to regulations 25C (b), building fabric performance values need to be as good as, or better than, the worst values set out in the table below:

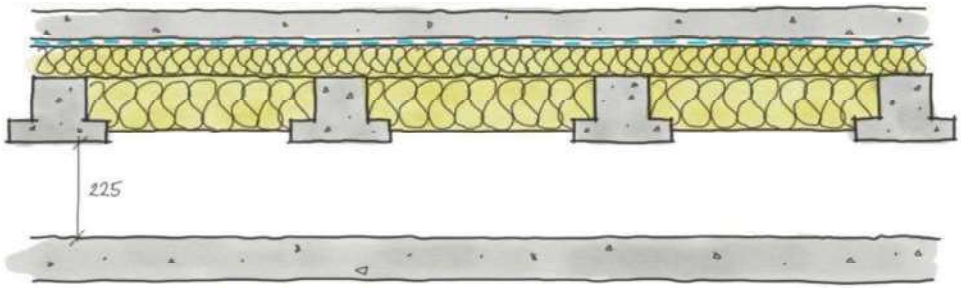
Table 1 Worst acceptable fabric performance values	
External walls	0.21 W/m².K
Party walls	0.20 W/m².K
Floor	0.18 W/m².K
Roof	0.15 W/m².K
Windows, roof windows, glazed roof lights, curtain walling2 and pedestrian doors	1.60 W/m².K
Air permeability	310.00 m³/h.m² at 50 Pa

(Table 1: pg 18 of The Building Regulations 2010, Part L)

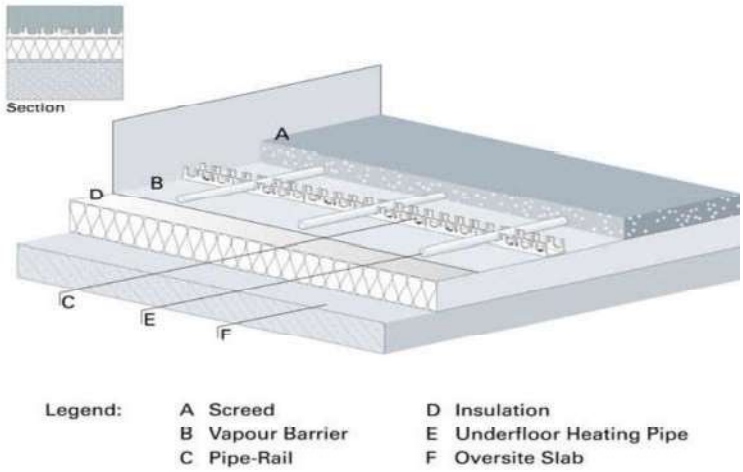
Table 2: Sustainable project fabric performance values achieved	
External Walls 386mm thickness	0.172W/m^{2}K
Floor	0.030W/m2K
Roof	0.147 W/m^{2}K
Windows, roof windows, glazed roof lights, curtain walling2 and pedestrian doors	0.78 W/m^{2}K
Air permeability	

(Table 2: Project calculations deemed to meet regulations) uncorrected values without allowances for thermal bridges.

Ground Floor: A simple beam and block type floor is to be installed forming the ground floor of the house, with wall construction at basement level in uninsulated cavity blockwork. The superstructure is of timber kit faced in brickwork. The ground floor rooms will have a wet underfloor heating system installed which will be powered by the PV cells on the roof. A constant lower heat will be maintained throughout the colder weather. **(Appendix 1: First in architecture brochure)**



A Simple beam and block floor insulated from underneath to reduce heat sink In the garage. It has a concrete overlay and wet underfloor heating system and a timber floorboard finish, alternatively a OSB finish with carpet overlaid. Kooltherm 103 ridged insulation by Kingspan used as floor insulation.



Windows: In order to comply with the building regulations, provision should be made to limit overheating due to solar gains in the summer. Solar gains are beneficial in the winter months to off-set space heating demand, therefore greater consideration should be given to the design of windows and their functionality all year round to achieve the optimum balance using natural sources.

The largest windows should remain at the front of the property, but essential consideration is required when implementing the shading of the windows during periods of direct sunlight (summer and winter) to ensure occupants comfort levels are also achieved. Additionally, manual canopies can be fitted outside for shade during the summer from direct sunlight, whilst installing directional internal shades can be beneficial when directing low sunlight during the winter months.

Windows to the north elevation will only act as light provision as they get relatively little heat from the sun's rays therefore, by selecting glazing that will allow light and as much

heat retention as possible into these rooms, will be beneficial for these naturally colder rooms. A taller window in upstairs rooms has a better throw of light. **(Haywood, 2012).** Windows on the east elevation need careful consideration in terms of shading from the sun during early morning summer sun which will then be in shade later in the day, whereas it is the opposite effect for windows on the west elevation. A mixture of window types and shapes should be considered to achieve their required individual performance.



Cross section of triple glaze Rationel Window. **Triple g lazed:**
– 0.78 W/m2 K U-value
– 42 dB Rw sound reduction

(Appendix 2: Rationel technical brochure)

Doors: Should be positioned on elevations where the natural wind direction occurs to make use of the natural air flow and circulation. To minimise direct wind direction planting bushes and shrubs directly in front of doors will act as a wind break, slowing the wind speed as it approaches the building. A porch area, whether internally or externally, provides additional support to the thermal comfort of the building. The Rationel system will be used for windows and doors, triple glazed and fitted with trickle/air vents.

Roof: Using a Marley plain clay tile that is aesthetically pleasing, but with a high embodied energy, can be offset by its life span of 30-100 years. The installation of photovoltaic (PV) cells on the south pitch of the roof will maximise the solar gain by heating water for the main house and that of the swimming pool in colder weather. Installation of PV cells is still expensive, however, due to rising electricity prices in the next 10-20 years this option could easily be off set, if energy bills can be substantially reduced. **(Roaf, 2007) (Appendix 3: Marley tiles technical brochure)**

Façade: The outer fabric or façade of the building will be considered in relation to the specific weather patterns experienced around Swansea and the increased level of rainfall in the last 20 years. As rainfall has increased, greater consideration must be given to the building fabric that can best protect against water penetration as well as providing a continuous insulation layer to limit thermal transfer.

The property is elevated with garages beneath therefore, the main living area will not be in contact with the ground and subject to heat loss to the ground. This does mean,

though, further consideration needs to be given to the insulation between the garage and ground floor of the property.

The outer leaf will be of brick with a 50mm clear cavity and timber frame; 18mm oriented strand board (OSB) attached to the timber frame filled with spray cellulose fibre insulation 200mm; 12.5mm plasterboard with taped joints and a 3mm skim coat of gypsum plaster. Wall ties will be mechanically fixed to the OSB and mortared into the brick façade.

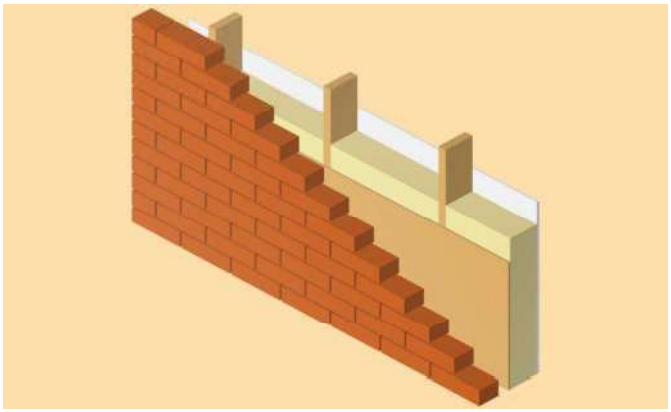


Figure 1: Section through typical timber framed wall, google 2020

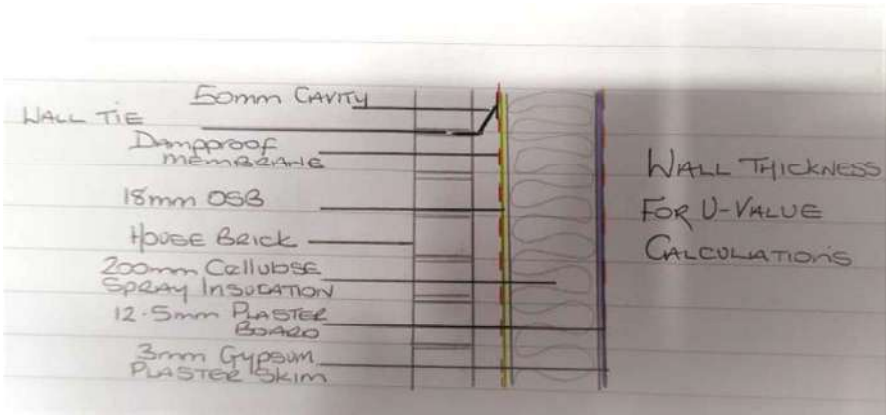


Figure 2: Sketch from information obtained at thermalcalconline.com, 2020

In order to keep the embodied energy low but the U-values exceeding minimum requirements natural and recycled insulation should be used. Two materials are preferred:

Cellulose fibre: This is made from recycled paper and available as boards or loose fill but can also be wet sprayed within a timber frame construction minimising thermal

bridging gaps at junctions and joints. Cellulose fibre to be used as a spray insulation application to the internal leaf 200mm to optimise the efficiency and reduce areas of thermal bridging throughout. **(Appendix 4: Warmcel technical brochure)**

Hemp: Is a natural product that can absorb up to 20% of its own weight without any reduction in its thermal performance. Due to its ability to do this it can absorb sudden influxes of condensation and release it again but in a much slower, controlled way. During the growth stage, hemp will lock in up to two tonnes of CO_2 per tonne of fibre harvested which will remain locked in throughout its use, far outweighing its carbon cost during planting and processing. Hemp will be used to insulate the loft area. **(blackmountaininsulation.com)**
(Appendix 5: black mountain insulation technical brochure)

Thermal Bridges – Solutions

When U-values are calculated, repeat thermal bridges are taken into account. In order to minimise the amount of thermal bridging, better quality control should be applied during the building process and in the methods of construction. Thermal bridging is extremely common and, in most cases, due to the poor detailing at junctions where materials meet or is absent or caused by the inappropriate use of materials, rather than the materials themselves. Heatloss through non-repeating thermal bridges at junctions where there is a concentration of heat flow can result in as much as 25% heat loss in a well-insulated property. **(RIBA, 2020)**

Common Repeat Thermal Bridging

- Timber studs in insulated timber frame walls
- Joints in insulating ceilings and rafters insulated in pitched roofs
- Mortar joints, steel wall ties
- Installation of windows

Material that conducts heat at a high rate can seriously reduce the insulation effectiveness if installed without a thermal break or if not detailed correctly. **(DeKay, Brown, 2014).**

The correct installation of insulation is key when reducing the effects of thermal bridging. This is improved dramatically if the insulation is applied in a continuous layer on either side of the building but much harder to achieve if between studwork.

Therefore, the construction envelope for the building to be as energy efficient as possible would be to design the construction and façade with this a key factor. For this project, a spray cellulose fibre was preferred in order to reduce the thermal bridging and aid a faster construction. **(RIBA, 2020)**

References/Bibliography

Books/Magazines/Journals

Building Regulations England/Wales 2010, Approved document 1LA – New Dwellings – In effect from July 2014

DeKay M, Brown GZ, (2014) *Sun, Wind & Light architectural design strategies.* 3rd ed John Wiley and Son, New Jersey

Hall, K, (2008) *The green building bible*. Vol 1. Green building press, Llandysul

Holland & Barret (2020) *Health magazine.*

Herne, J (2019) *Sustainable buildings.* Passive house magazine

Haywood H, (2012) 101 *rules of thumb for low energy architecture*. RIBA publishing, London

Roaf, S, Fuentes M, Thomas S, (2007) *Ecohouse*. 3rd ed Elsevier Ltd, Oxford

RIBA, 175 (no date found on publication) *Carbon Literacy Briefing*

RIBA, 175 (no date found on publication) *Principles of low carbon design and refurbishment.*

Wilhide, E (2002) ECO Quadrille Publishing Ltd, London

Website searches

Gov.wales. (2020). [online] Available at: https://gov.wales/sites/default/files/publications/2019-05/building-regulations-guidance-part-l-conservation-of-fuel-and-power-2014-l1a-new-dwellings.pdf [Accessed 10 Jan. 2020].Mark, L. and Ing, W. (2020). *Natural insulation materials*. [online] Architects Journal. Available at: https://www.architectsjournal.co.uk/buildings/specification/natural-insulation-materials/8643176.article [Accessed 10 Jan. 2020].

Black mountain insulation.com. (2020). [online] Available at: https://www.blackmountaininsulation.com/products/natuhemp [Accessed 10 Jan. 2020].

Ltd, E. (2020). *Rationel FORMAPLUS TImber/Aluminium Window Range*. [online] Ecotecwindows.com. Available at: https://www.ecotecwindows.com/rationel-formaplus.html [Accessed 25 Jan. 2020].https://www.carbonbrief.org/explainer-what-climate-models-tell-us-about-future-rainfal

First In Architecture. (2020). *Introduction to Beam and Block Flooring*. [online] Available at: https://www.firstinarchitecture.co.uk/introduction-to-beam-and-block-floors/ [Accessed 25 Jan. 2020].https://www.ggf.org.uk/insulating-glass-units-standard-and-ce-labelling/

Greenmatch.co.uk. (2020). *Double Glazing | Find prices and UK suppliers (2020) | GreenMatch*. [online] Available at: https://www.greenmatch.co.uk/double-glazing [Accessed 25 Jan. 2020].

Anon, (2020). [online] Available at: http://www.greenspec.co.uk/building-design/solar-siting-orientation/ [Accessed 25 Jan. 2020].

Homebuilding & Renovating. (2020). *12 Stylish Passivhaus Homes | Homebuilding & Renovating*. [online] Available at: https://www.homebuilding.co.uk/12-stylish-passivhaus-homes/ [Accessed 25 Jan. 2020].

Marley. (2020). *Clay Roof Tiles | Clay Tiles | Marley*. [online] Available at: https://www.marley.co.uk/products/clay-tiles [Accessed 5 Jan. 2020].

Insulationsuperstore.co.uk. (2020). *Protect TF200 Thermo Insulating Breather Membrane - 1.5m x 50m Roll | Insulation Superstore®*. [online] Available at: https://www.insulationsuperstore.co.uk/product/protect-tf200-thermo-insulating-breather-membrane-15m-x-50m-roll.html?gclid=EAIaIQobChMIgLi21fmy5wIVFeDtCh3u6QB6EAQYASABEgI4P_D_BwE#images-4 [Accessed 1 Feb. 2020].

Performancepanels.com. (2020). *Thermal Properties - Performance Panels*. [online] Available at: https://www.performancepanels.com/thermal-properties [Accessed 4 Jan. 2020].https://www.rationel.co.uk/windows-doors/

Leigh, E. (2020). *Glimmering Eco-Innovation: An Energy-Generating Glass Roof*. [online] RecycleNation. Available at: https://recyclenation.com/2010/11/glimmering-eco-innovation-recycle-glass-roof/ [Accessed 28 Jan. 2020].

CoffeeCup Software, I. (2020). *The Free Online U value, R value and thermal bridging calculator (psi value)*. [online] Thermalcalconline.com. Available at: http://www.thermalcalconline.com/examples/examples.html [Accessed 30 Jan. 2020].

Warmcel. (2020). *Warmcel - high performance insulation, passive house insulation*. [online] Available at: https://www.warmcel.co.uk/warmcel/performance/ [Accessed 25 Jan. 2020].

Appendices

1: First in Architecture – Beam & Block Floor slab

2: Rationel technical brochure – Window & Doors

3: Marley tiles technical brochure – Roof tiles

4: Warmcel technical brochure – Cellulose Insulation

5: Black mountain Insulation Technical specification leaflet – Hemp Insulation

6: Protect breathable membrane technical sheet

7: Kingspan Kooltherm K103 ridged floor insulation technical data sheet

8: BRE U-Value calculation for walls.

9: BRE U-Value calculation for Roof/Attic space (including ceiling)

10: BRE U- Value calculation for floor slab at ground floor

INTRODUCTION TO BEAM AND BLOCK FLOORS

Beam and Block Floors

Suspended concrete floor construction is increasingly the most common flooring system specified in residential construction.

When selecting a floor construction there are a number of functional requirements that need to be considered. These include:

Durability
Strength and stability
Resistance to ground moisture
Fire safety
Resistance to passage of heat
Resistance to passage of sound

In the UK the Building Regulations Approved Documents provide guidance on some of the requirements of ground floors.

There are two types of concrete floor system commonly used in residential construction; ground bearing and suspended. In this article we will be focusing on the suspended concrete floor, particularly beam and block floors.

The suspended floor does not rely on support from the ground below but instead is supported by the external walls, and therefore the foundations below.



Ground bearing floor



Suspended floor

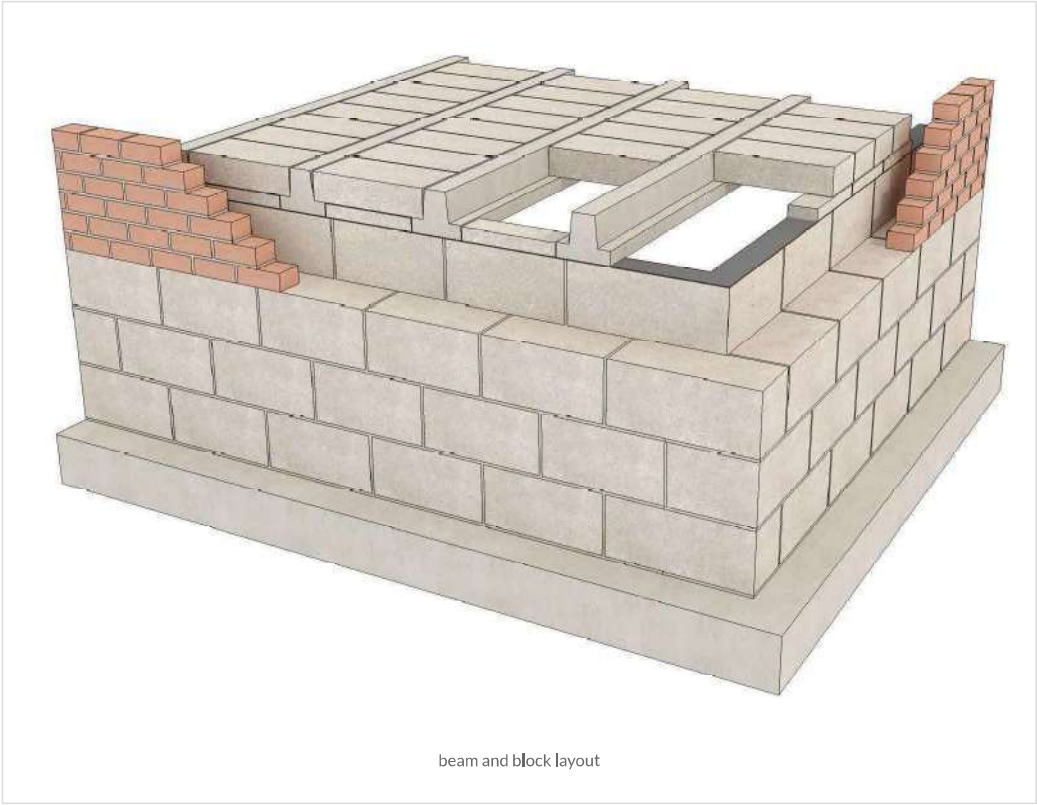
When is a suspended floor used?

Suspended concrete floors have become popular in UK house construction. They are typically used in situations such as sloping sites, areas where the ground has poor bearing capacity, or there is a likelihood of ground volume change. If the ground water table is high, or there are aggressive chemicals present in the soil, a suspended floor is often specified.

Different types of suspended concrete floor

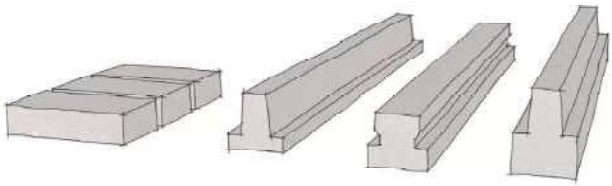
Suspended concrete floors can be constructed using different methods. They can be cast in situ reinforced concrete slabs, precast concrete planks or slabs, or the focus of this article, beam and block floors.

Beam and block floors systems



beam and block layout

The beam and block floor system is a popular form of domestic floor construction. It is an economical option due to off site manufacture of the beams and blocks, fast assembly and little requirement for specialist labour or equipment. The installation of a beam and block floor is not usually weather dependent and therefore specifying this form of construction can reduce site delays that other methods might encounter. Beam and block flooring demonstrates good noise reduction and fire resisting properties, and is also suitable to host underfloor heating systems.



beam profiles

The precast concrete inverted T-beams are supported by the perimeter walls and internal load bearing walls. They are reinforced with steel reinforcing bars. The beams vary in depth, and can be 130mm to 250mm made up to lengths of around 6m, they are usually designed and
manufactured to span specific distances. Beam depth and profiles are selected according to span and loading requirements, along with the type of block specified.

Infill blocks are then positioned between the T-beams, these blocks are usually lightweight concrete. A sand cement grout is often brushed over the surface, filling any gaps providing a good load distribution and avoiding movement in the blocks. The grout also keeps insects and vermin out and assists with air tightness.

Insulation is usually positioned on top of the beam and block floor, a concrete topping or screed is then laid onto the insulation. An upstand perimeter insulation is installed around the edge of the concrete topping or screed in order to prevent thermal bridging. Some insulation manufacturers recommend a separation/vapour control layer between the insulation board and the screed to prevent interstitial condensation and the seeping of screed into insulation board cracks.

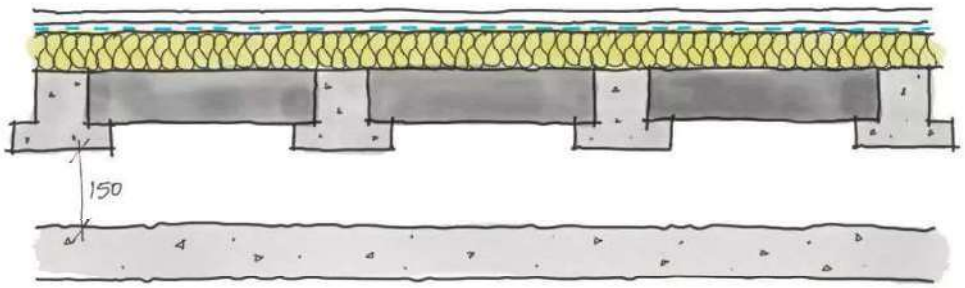
Timber deck finish can also be used – if this is specified a vapour control layer must be included in the design under the timber deck.

A void is left under the floor of at least 150mm between the soil and underside of the beam. If heavy clay soil is present it is good practice to increase the void depth to as much as 225mm or possibly more. All organic material must be removed from the soil and the surface should be treated with weedkiller. This void must be ventilated with air bricks or ventilation sleeves positioned in the external walls in order to avoid the potential build up of gas. Ground levels under floor should be relatively level, otherwise external walls become retaining walls and would need to be designed accordingly.

A DPM or concrete oversite in not usually required, unless needed for gas or vapour protection as per the Building Regulations. Some manufacturers do recommend a DPM over the beam and block floor before insulation – be sure to check manufacturers instructions.

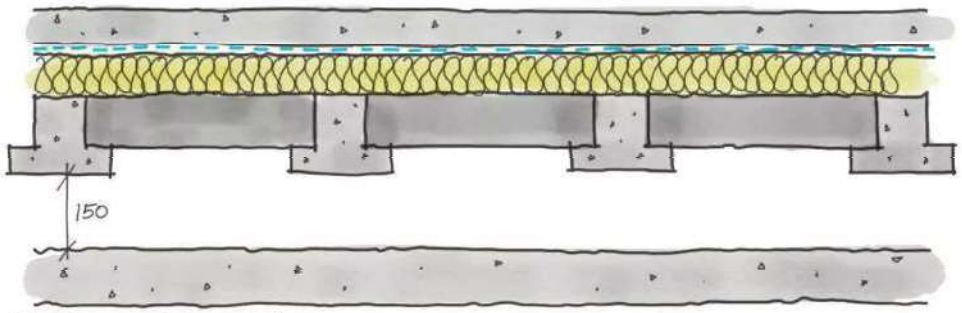
Expanded polystyrene (EPS) blocks are also used as infill between the beams. Not only do these blocks provide excellent thermal performance, they increase construction times as they are lightweight and easy to work with. The blocks are either designed to lap under the concrete T-beam in order to prevent cold bridging, or an additional insulation layer is positioned over the EPS infill blocks. More manufacturers are developing EPS block systems which have varying profiles and methods of construction. They are fast, efficient and would be likely to over take the concrete blocks in popularity over the years due to their enhanced benefits.

Beam and block floor, timber deck finish



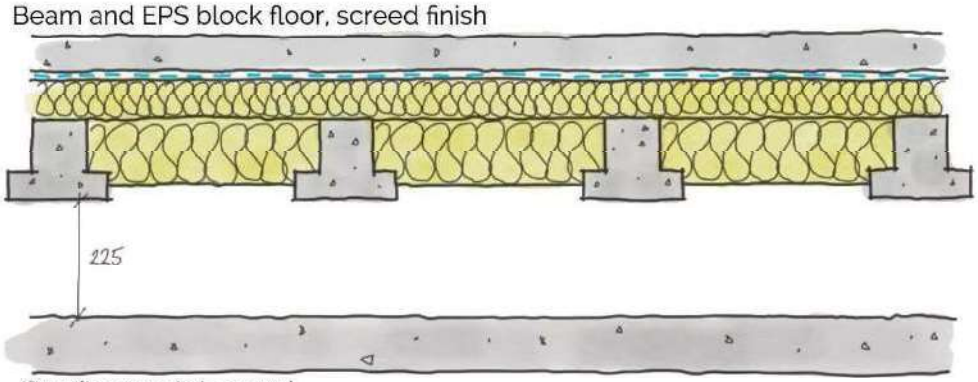
Oversite concrete to ground
150mm ventilated void
Beam and block floor
Rigid insulation with vapour control or dpm as required
Timber deck floor (flooriing grade OSB, Ply etc)

Beam and block floor, screed finish



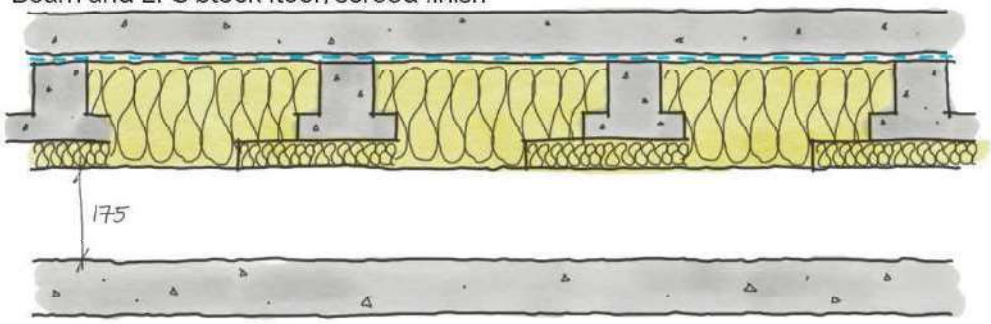
Oversite concrete to ground
150mm ventilated void
Beam and block floor
Rigid insulation with dpm as required
Sand cement screed finish

Beam and EPS block floor, screed finish

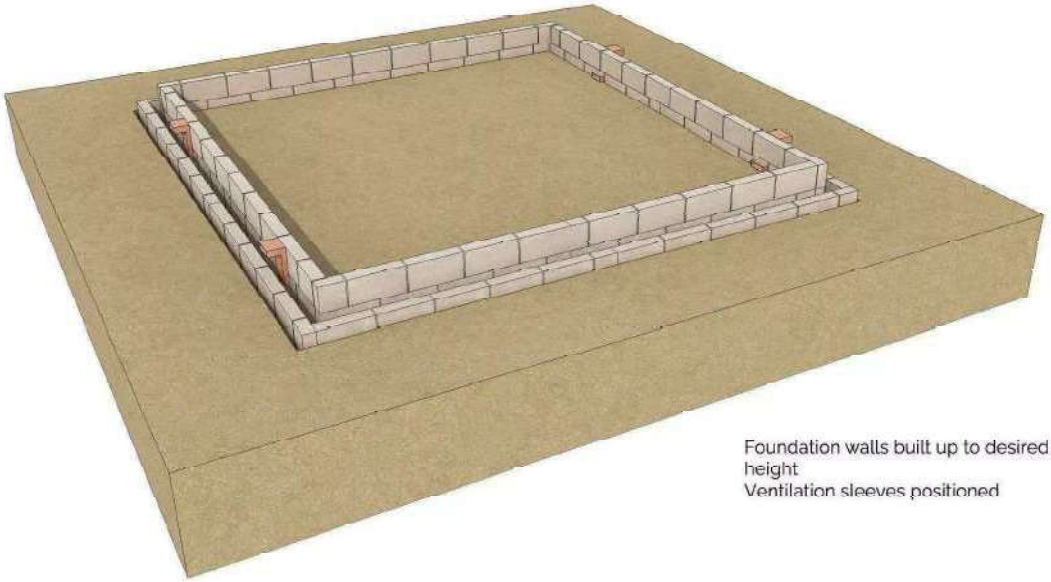


Oversite concrete to ground
225mm ventilated void
Beam and EPS block floor
Rigid insulation with dpm as required
Sand cement screed finish

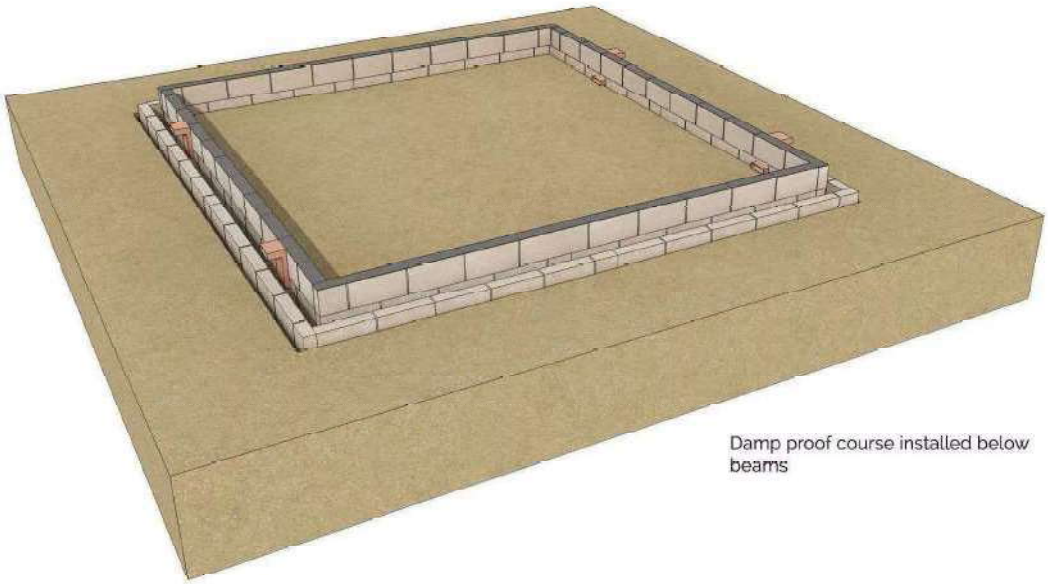
Beam and EPS block floor, screed finish



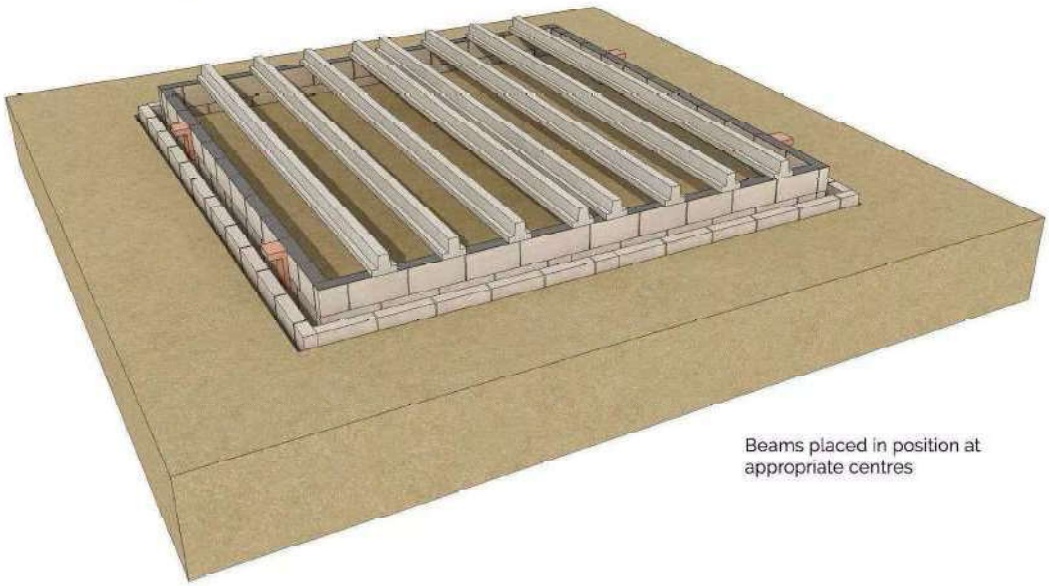
Oversite concrete to ground
175mm ventilated void
Beam and EPS block floor
DPM as required
Sand cement screed finish



Foundation walls built up to desired height
Ventilation sleeves positioned



Damp proof course installed below beams

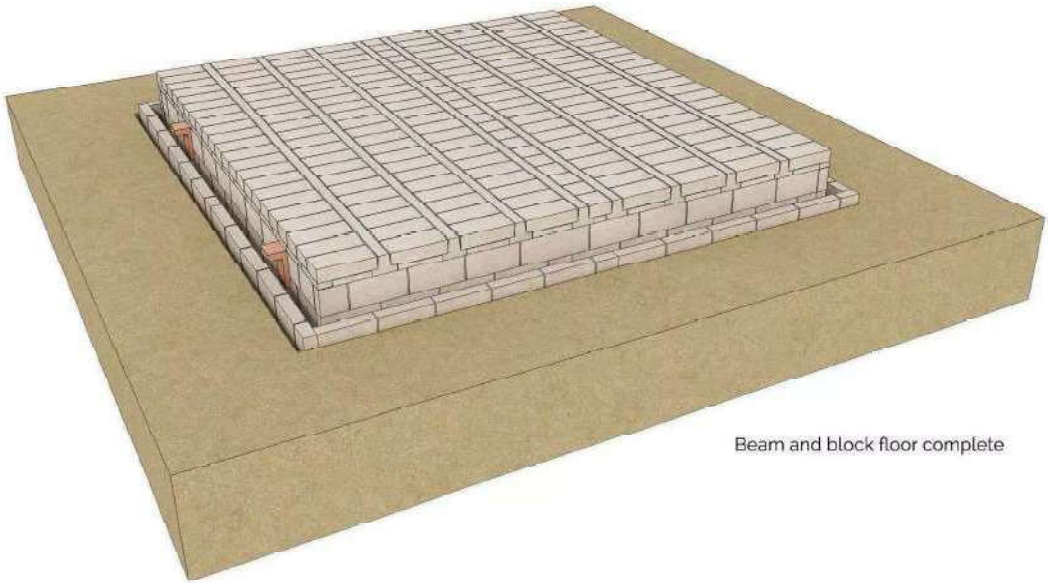


Beams placed in position at appropriate centres

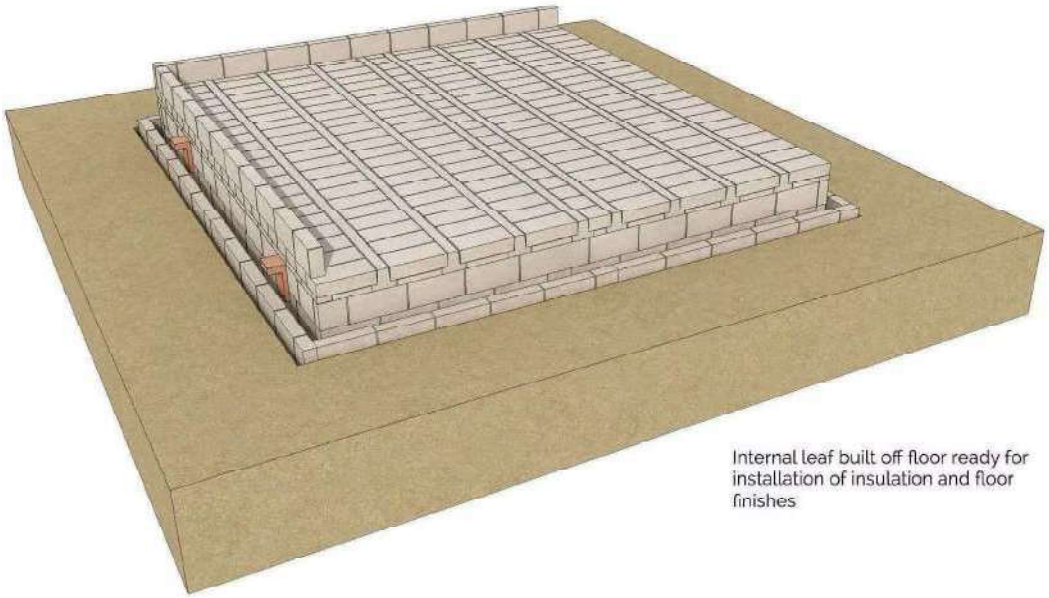




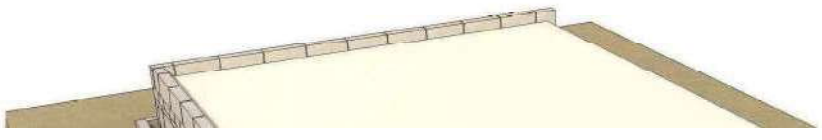
Blocks placed between beams
Infill blocks positioned at edges

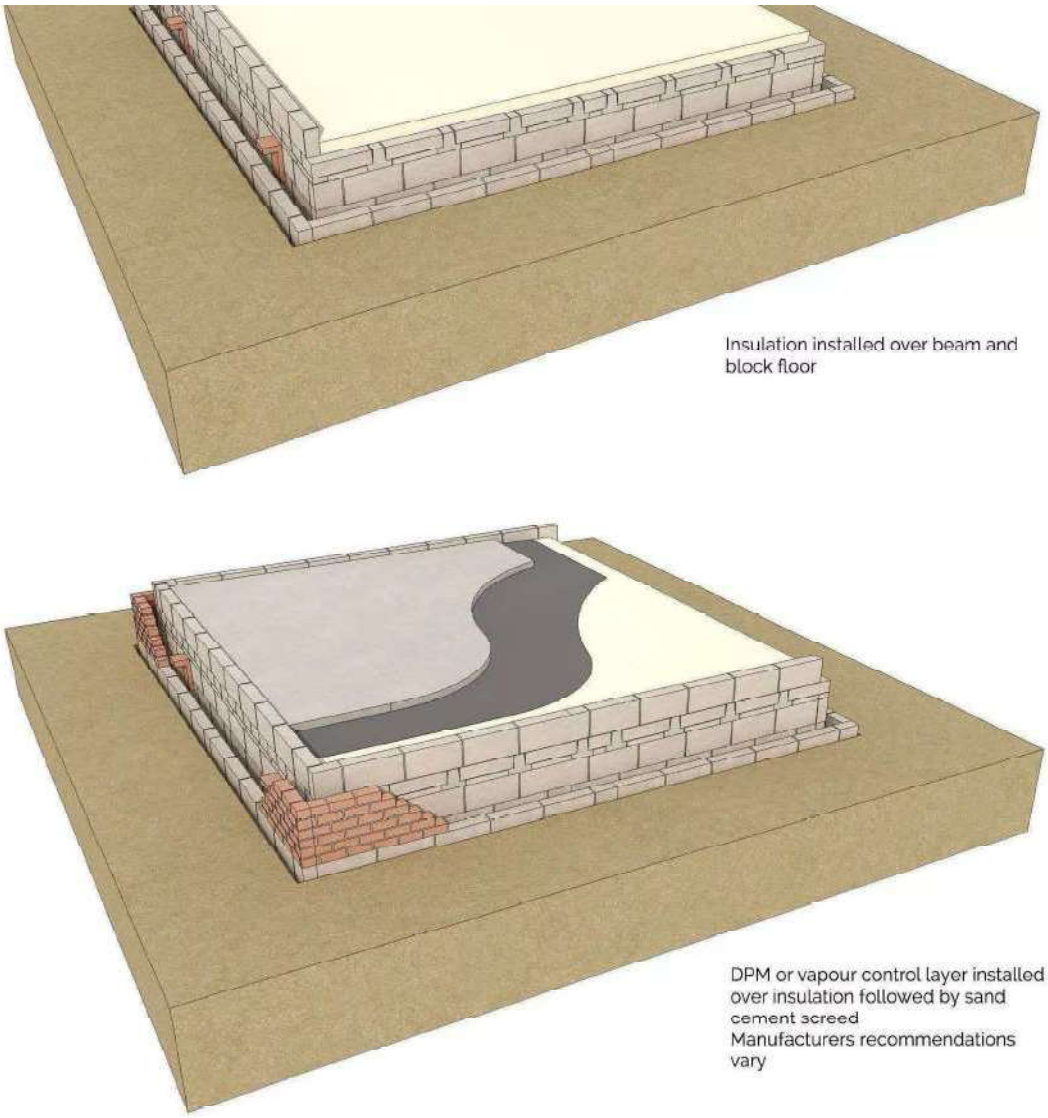


Beam and block floor complete



Internal leaf built off floor ready for installation of insulation and floor finishes





If we now revisit the functional requirements of a floor construction and apply the characteristics of the beam and block floor, we can establish whether the beam and block is a suitable option for our flooring system.

Strength and Stability

The beam and block system provides suitable strength and stability with specifically designed precast reinforced T-beams to suit the required spans. The structural concrete topping can also be designed with a reinforcing mesh if required.

The beams are suitably supported by the external walls and any load bearing internal walls or beams.

Resistance to ground moisture

The suspended system with suitable void, provides a natural resistance to ground moisture. If required a damp proof membrane can be positioned over the beam and block floor. A damp proof course installed on the perimeter walls will ensure ground moisture does not penetrate the structure.

Durability

Concrete in its nature is a very durable material, providing a sound floor construction system.

Fire Safety

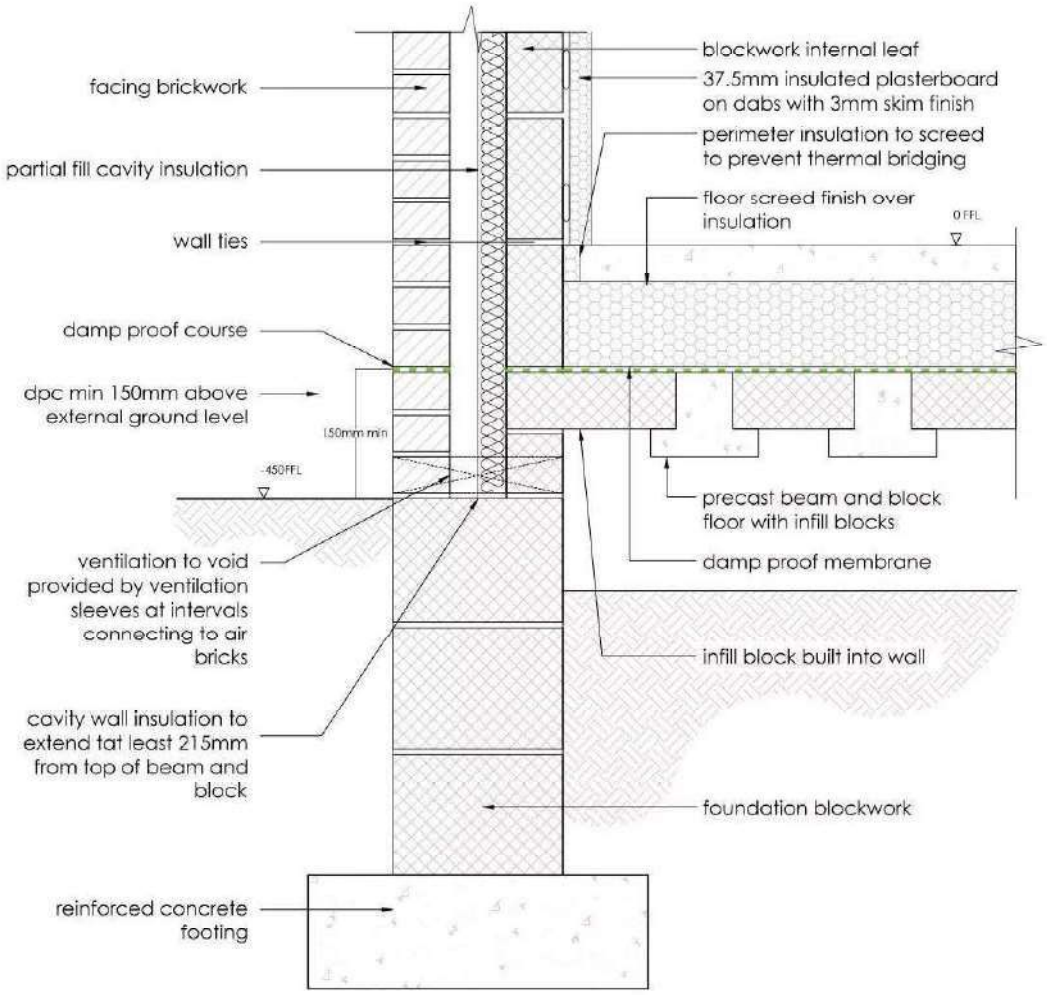
The beam and block floor fire resistance can vary according to the beam and its applied finishes. An individual beam should provide up to one hour resistance depending on its size.

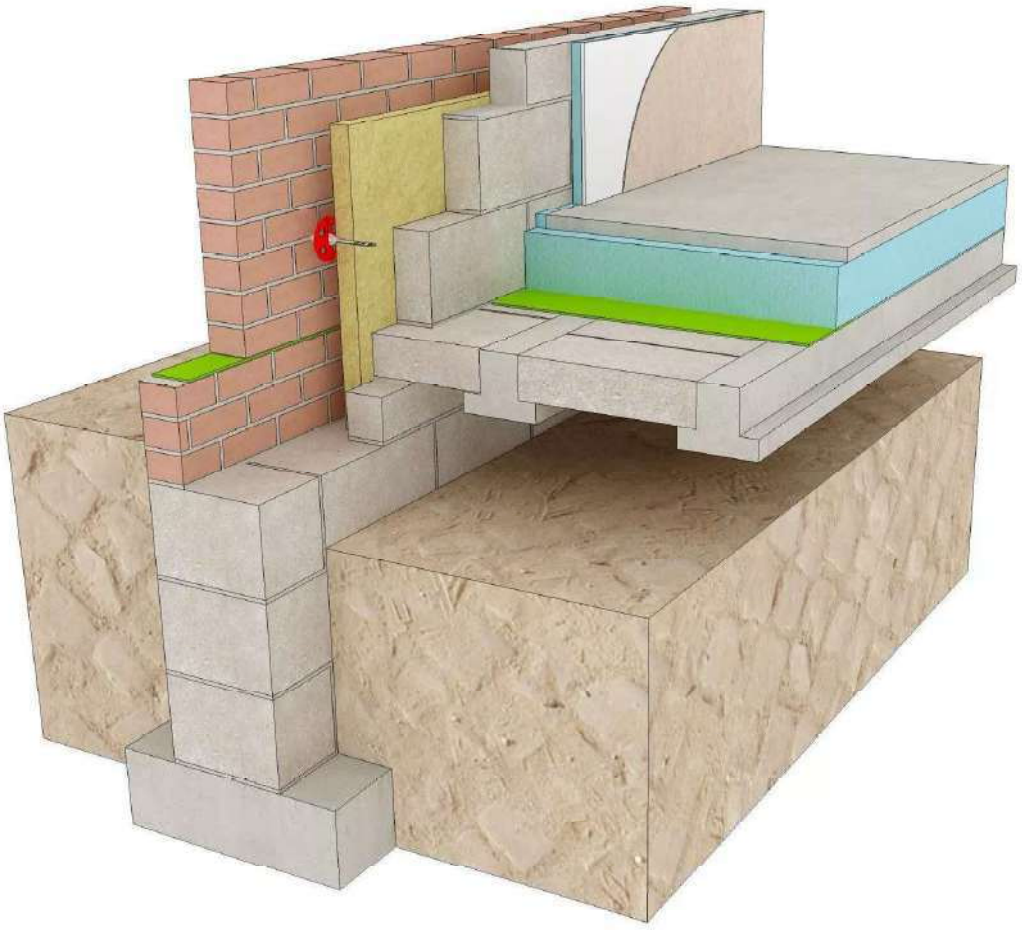
Resistance to passage of heat

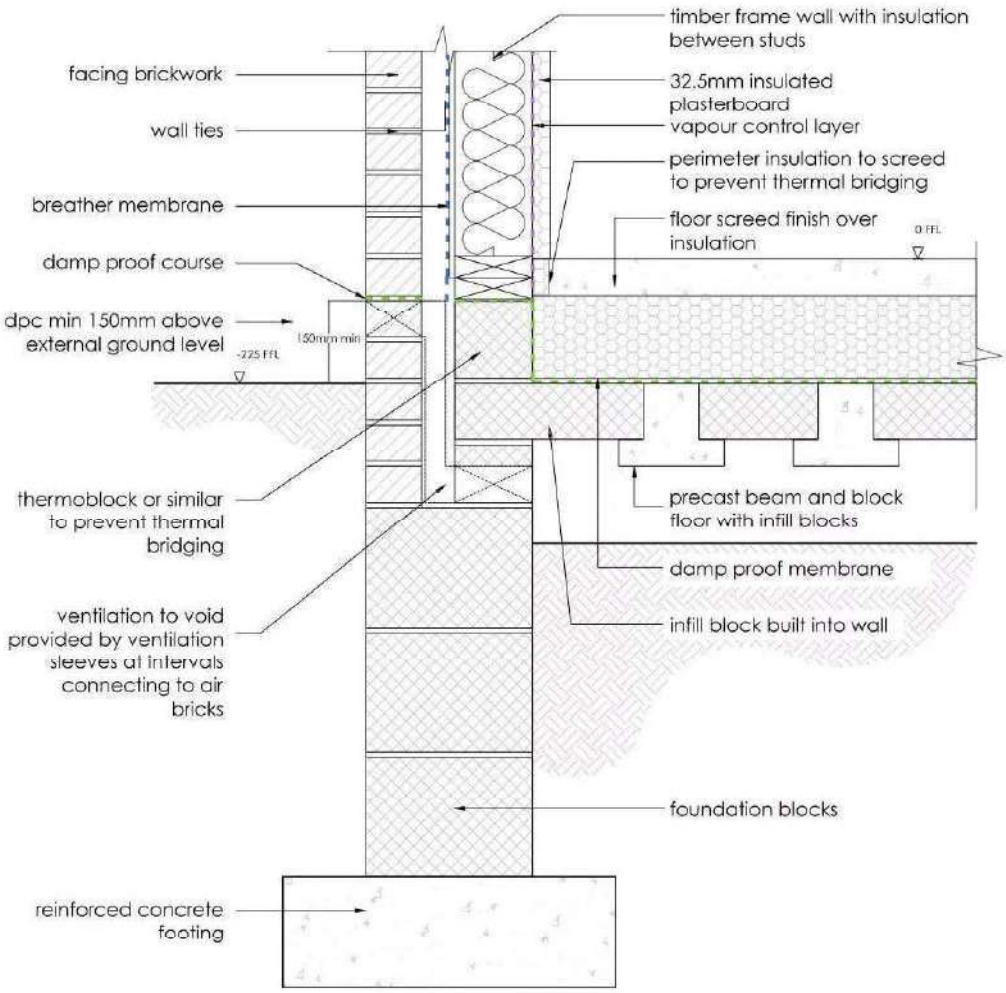
The beam and block floor offers good flexibility with thermal performance. High levels of rigid insulation can be installed over the beam and block floor. However, if EPS blocks are used, the floor system can achieve excellent thermal performance.

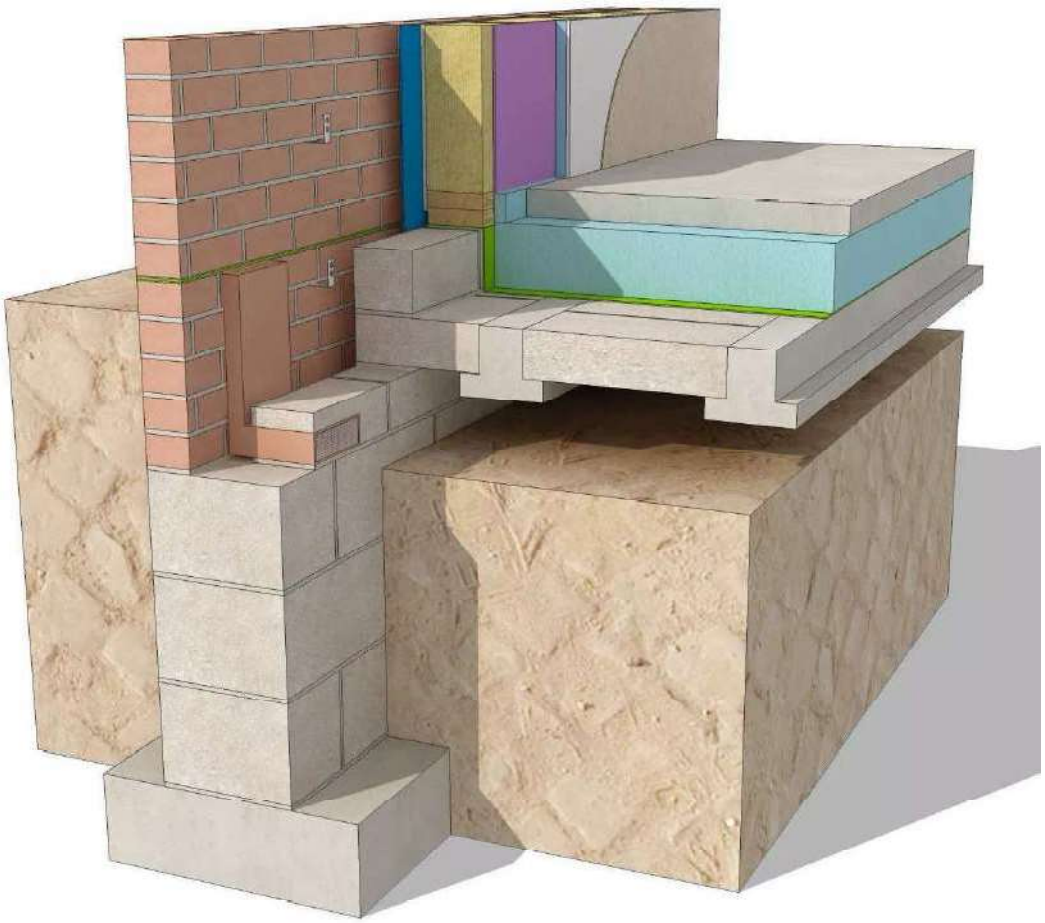
Resistance to passage of sound

The inherent mass and damping qualities of concrete give beam and block flooring construction a good noise reduction. Additional sound insulation can also improve the performance of the flooring system if required.


facing brickwork
partial fill cavity insulation
wall ties
damp proof course
dpc min 150mm above external ground level
150mm min
-450FFL
ventilation to void provided by ventilation sleeves at intervals connecting to air bricks
cavity wall insulation to extend tat least 215mm from top of beam and block
reinforced concrete footing
blockwork internal leaf
37.5mm insulated plasterboard on dabs with 3mm skim finish
perimeter insulation to screed to prevent thermal bridging
floor screed finish over insulation
0 FFL
precast beam and block floor with infill blocks
damp proof membrane
infill block built into wall
foundation blockwork




timber frame wall with insulation between studs
facing brickwork
32.5mm insulated plasterboard vapour control layer
wall ties
perimeter insulation to screed to prevent thermal bridging
breather membrane
floor screed finish over insulation
0 FFL
damp proof course
dpc min 150mm above external ground level
150mm min
-225 FFL
thermoblock or similar to prevent thermal bridging
precast beam and block floor with infill blocks
damp proof membrane
infill block built into wall
ventilation to void provided by ventilation sleeves at intervals connecting to air bricks
foundation blocks
reinforced concrete footing



There are many different configurations for beam and block flooring systems, with specifications varying according to different manufacturers. The images here offer just a few examples of the many solutions available.

Conclusion

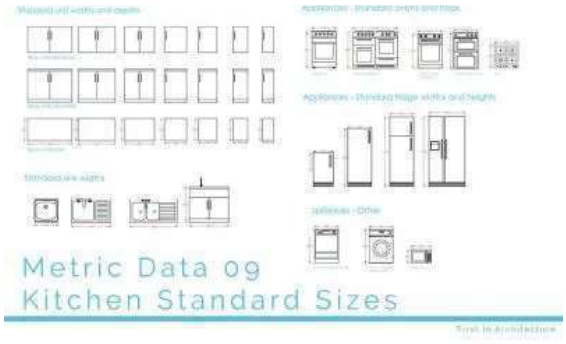
Emma has written four popular books on construction detailing. **Understanding Architectural Details** is a series based on UK construction and standards and looks at both residential and commercial construction. **Residential Construction Details** is based on US construction methods and codes. All books are full of both 2d and 3d images, and it is possible to download all of the 2d cad files and 3d SketchUp files with the books.



This post appeared first on First In Architecture

All images copyright to First In Architecture

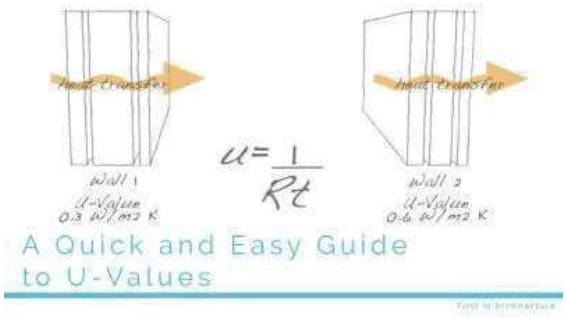
Recent Posts



Metric Data 09 – Kitchen Standard Sizes



How to Write a Professional Email



A Quick and Easy Guide to U-Values

1 Comment

Rebecca Berrisford on June 11, 2019 at 9:59 pm

Amazing book!!! I will be buying.
I'm studying a MSc in Construction but I'm also a visual person, this book really helps.

Reply

This site uses Akismet to reduce spam. Learn how your comment data is processed.

ezoic report this ad

MY FAVOURITE TOOLS AND RESOURCES

I have curated a list of some of the tools and resources I would strongly recommend for anyone studying or working in Architecture.

Check it Out

JOIN US

First Name Email Address

Subscribe

Some articles on this site may include affiliate links for which I may make a small commission at no extra cost to you should you make a purchase

SOCIALS

© First in Architecture | All rights reserved | Designed by **DIVI NERD**

rationel®



Rationel windows and doors

Beautiful design for sustainable living.

Contents

Our story 3

The right choice for your home 5

Windows 7

AURA and AURAPLUS 8

FORMA and FORMAPLUS 10

Window types and openings 12

Doors 15

Customising your door 16

For your inspiration 18

Door types and openings 20

Glazing options 22

Handles and accessories 23

Secured by Design and Part Q 24

Colour 26



Our story

From a small workshop in Denmark in 1954, a lone carpenter worked diligently to create his first order of 31 barn windows. He invested the profits in modern machinery and Rationel was born.

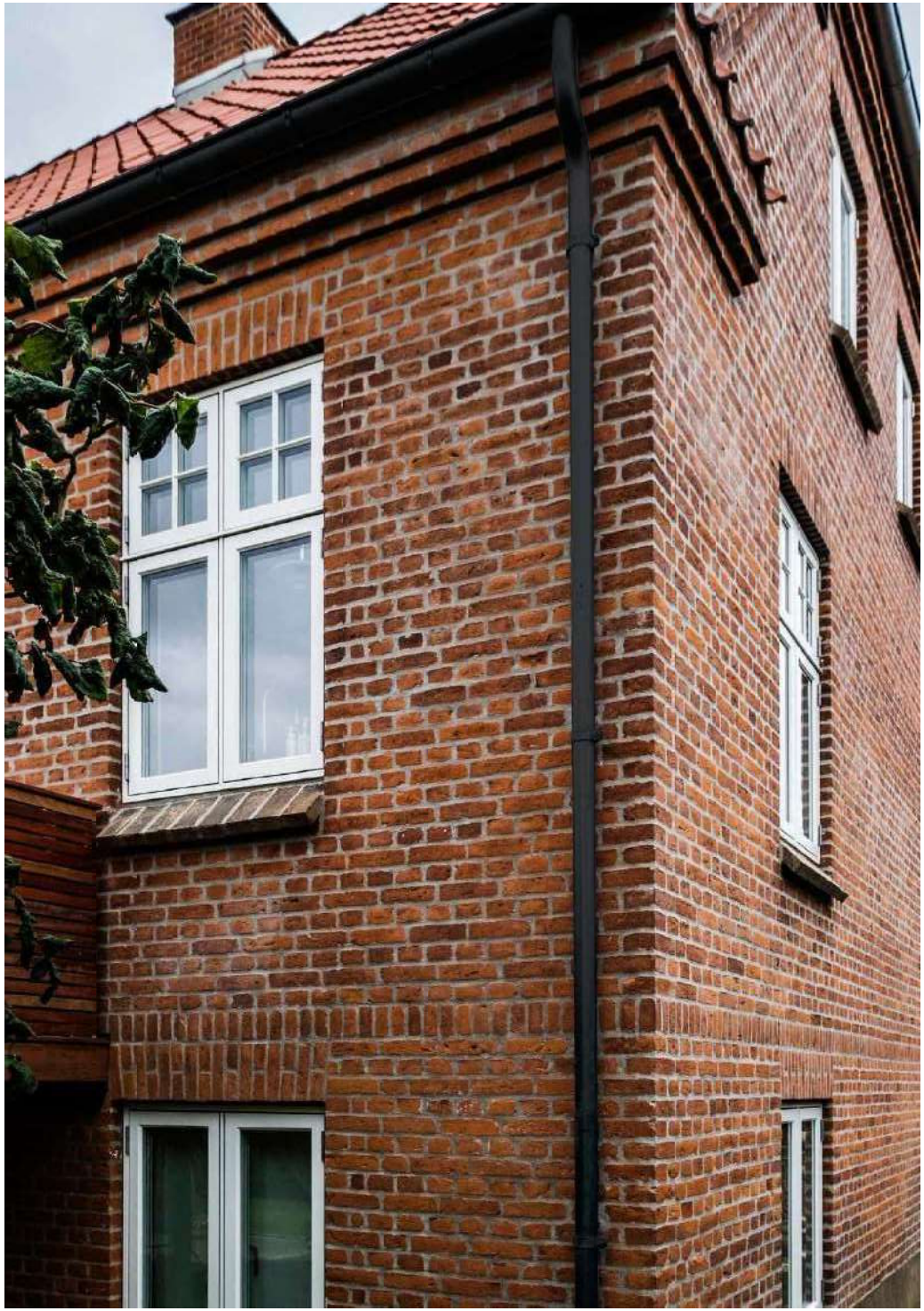
More than 60 years later we're still here, shipping 600,000 state-of-the-art windows and doors around the world each year. All of them bespoke, all of them beautiful. We may have grown, but we've maintained our firm focus on quality craftsmanship and service.

Rationel specialises in Scandinavian design. Slim sight lines, high-quality timber and unique ironmongery, along with the flexibility to stand tall, slant or curve to your requirements, mean our windows and doors add something truly special to your home. Our experts will help you find the perfect style to suit your project, whether that's traditional, modern or somewhere in between.

Our doors and windows look good but they perform even better; they're built to last, designed to meet the highest standards of comfort, security and weather-tightness. For your peace of mind, our doors and windows have Secured by Design accreditation, which means they are extremely difficult to break into.

We plan to be crafting windows and doors for homes for generations to come. So we go out of our way to source sustainable materials, whether that's the FSC®-certified trees that go into our frames or the waste timber that fuels our factories. Our cleverly positioned, energy-efficient windows maximise natural light to reduce CO_2 emissions and utility costs.

We make it our mission to provide exceptional service, from initial design support to hassle-free delivery and efficient after-sales care. Our network of local distributors means we're never far away, and for the times we can't talk in person, we're just a phone call, live chat or email away.



The right choice for your home

Your door is the gateway to your home; the way it looks and moves influences the building's architectural expression. Your windows set the mood, determining the light and temperature of your environment. Every detail changes how you and your guests feel about your home.

All our products are bespoke, so it's important to carefully consider every aspect – from colour to glazing options to opening and closing functions.

The pages ahead feature our regular style options for your inspiration; we can also manufacture specially shaped units to suit unique spaces. Our experts can help guide your decisions by taking into account the details of your build and the overall impact you are aiming for.

You can visit our website for technical drawings, certification data, videos and more: www.rationel.co.uk



Windows

Windows can shape your outlook in more ways than one. From the way the light gathers at dawn to the flow of air during a hot summer, every element should complement your lifestyle. Let us introduce our two signature styles, AURA and FORMA. Both are available with double and triple glazing. The PLUS models feature timber frames with aluminium cladding, which opens up a new range of possibilities.

AURA and AURAPLUS

AURA personifies clean lines. The sleek, flat frame gives your window a flush finish for a truly modern, Scandinavian feel. This is our most popular profile, especially for a stand-out "grand design". Optional glazing bars can increase the architectural elegance of this style. Made from sustainably sourced timber, your windows and doors will last for decades if looked after.

Choose AURAPLUS and we add aluminium cladding to the timber, which means maintenance becomes minimal and life expectancy rises by another 20+ years. The cladding comes in hundreds of colours and gives you the flexibility to have one colour inside your home and another on the outside. It can make a real impact and adds the durability to deal with the harshest of weather.

FORMA and FORMAPLUS

Designed to complement traditional British architecture, FORMA brings a softer line to your windows and ensures your project blends with its environment. Beautifully styled in sustainable timber that will last for decades, the bevelled edges bring a homely feel. The colour palette is extensive, with the most popular choices shown on page 27; you'll be choosing the same colour inside and out.

Make it FORMAPLUS and the aluminium cladding gives you the option of another colour for the outside of your home – however, it's unlikely you'll want to cover up this beautiful styling. The cladded frame requires minimal maintenance and is extremely durable in all weather conditions. All styles are available with glazing bars, which particularly suit this style of window.

AURA and AURAPLUS

Our contemporary style



Top guided



Side opening with fixed lights



This development used fully reversible windows with coloured opaque glass on the first floor.



Casement door

AURA

Key features:

- Timber frame
- 60-year life expectancy*
- Available in more than 200 colours
- Best performance

Triple glazed:

- 0.78 W/m² K U-value
- 42 dB Rw sound reduction

Double glazed:

- 1.29 W/m² K U-value
- 41 dB Rw sound reduction

AURAPLUS

Key features:

- Aluminium-clad timber frame
- Low-maintenance
- 83-year life expectancy*
- Available in more than 200 colours
- Dual colour no extra charge
- Best performance

Triple glazed:

- 0.79 W/m² K U-value
- 42 dB Rw sound reduction

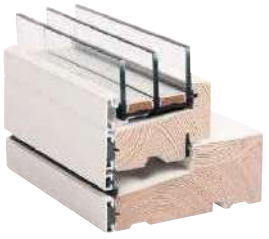
Double glazed:

- 1.29 W/m² K U-value
- 40 dB Rw sound reduction









AURA and AURAPLUS come with security hardware as standard to meet Secured by Design requirements. The majority of timber originates from FSC®-certified forests. Read more at www.rationel.co.uk

*Dr Gillian Menzies, Institute for Building and Urban Design, Heriot-Watt University, Edinburgh

FORMA and FORMAPLUS

Our traditional style



Double casement door



Double side hung window with satin glass



Double patio door



This residential development used sideguided windows with horizontal glazing bar

FORMA

Key features:

- Timber frame
- 60-year life expectancy*
- Available in more than 200 colours
- Best performance

Triple glazed:

- 0.78 W/m² K U-value
- 42 dB Rw sound reduction

Double glazed:

- 1.27 W/m² K U-value
- 40 dB Rw sound reduction

FORMAPLUS

Key features:

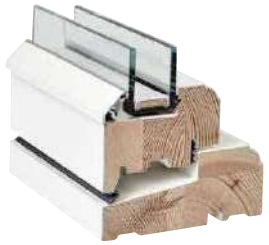
- Aluminium-clad timber frame
- Low-maintenance
- 83-year life expectancy*
- Available in more than 200 colours
- Dual colour no extra charge
- Best performance

Triple glazed:

- 0.80 W/m² K U-value
- 43 dB Rw sound reduction

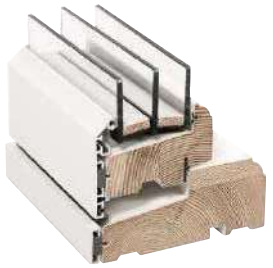
Double glazed:

- 1.28 W/m² K U-value
- 40 dB Rw sound reduction









FORMA and FORMAPLUS come with security hardware as standard to meet Secured by Design requirements. The majority of timber originates from FSC®-certified forests. Read more at www.rationel.co.uk

*Dr Gillian Menzies, Institute for Building and Urban Design, Heriot-Watt University, Edinburgh

Window types and openings

Hung, swung or guided: the drawings below show the range of styles available.
Contact Rationel for information on different style combinations.



Top guided

Opening function

Elegant style that is suitable for all rooms. Simple, seamless opening function allows for effective ventilation when open, both above and below the sash. Clean look with no visible external hinges.

Measurements

Min. width	358mm
Min. height	383mm
Max. width	1,798mm
Max. height	1,598mm



Fully reversible

Opening function

Multi-functional style suitable for multi-storey buildings. Sash can be turned to clean the glass from the inside. Comes with a child-proof opening limiter.

Measurements

Min. width	553mm
Min. height	548mm
Max. width	1,598mm
Max. height	1,598mm



Fixed light

Opening function

Simple style that allows for optimal views. Ideal when you need maximum internal light and solar heat. Can be fitted with trickle-vents for ventilation.

Measurements

Min. width	253mm
Min. height	253mm
Max. width	2,998mm
Max. height	2,998mm



Side hung

Opening function

Simple, stylish design with a seamless opening function. On larger windows, the friction brake allows the window to be fixed in any open position. Suitable as escape windows.

Measurements

Min. width	353mm
Min. height	358mm
Max. width	948mm
Max. height	1,798mm



Side guided

Opening function

Minimalist design that moves seamlessly, with no visible external hinges. When fully open the glass can be cleaned from the inside.

Measurements

Min. width	453mm
Min. height	438mm
Max. width	998mm
Max. height	1,798mm



Tilt and turn

Opening function

Multi-functional style suitable for multi-storey buildings. Tilt function opens the top of the sash inwards for ventilation. Can be cleaned from the inside, and are perfectly suited as "escape windows" or emergency exits.

Available in AURAPLUS triple glazed only.

Measurements

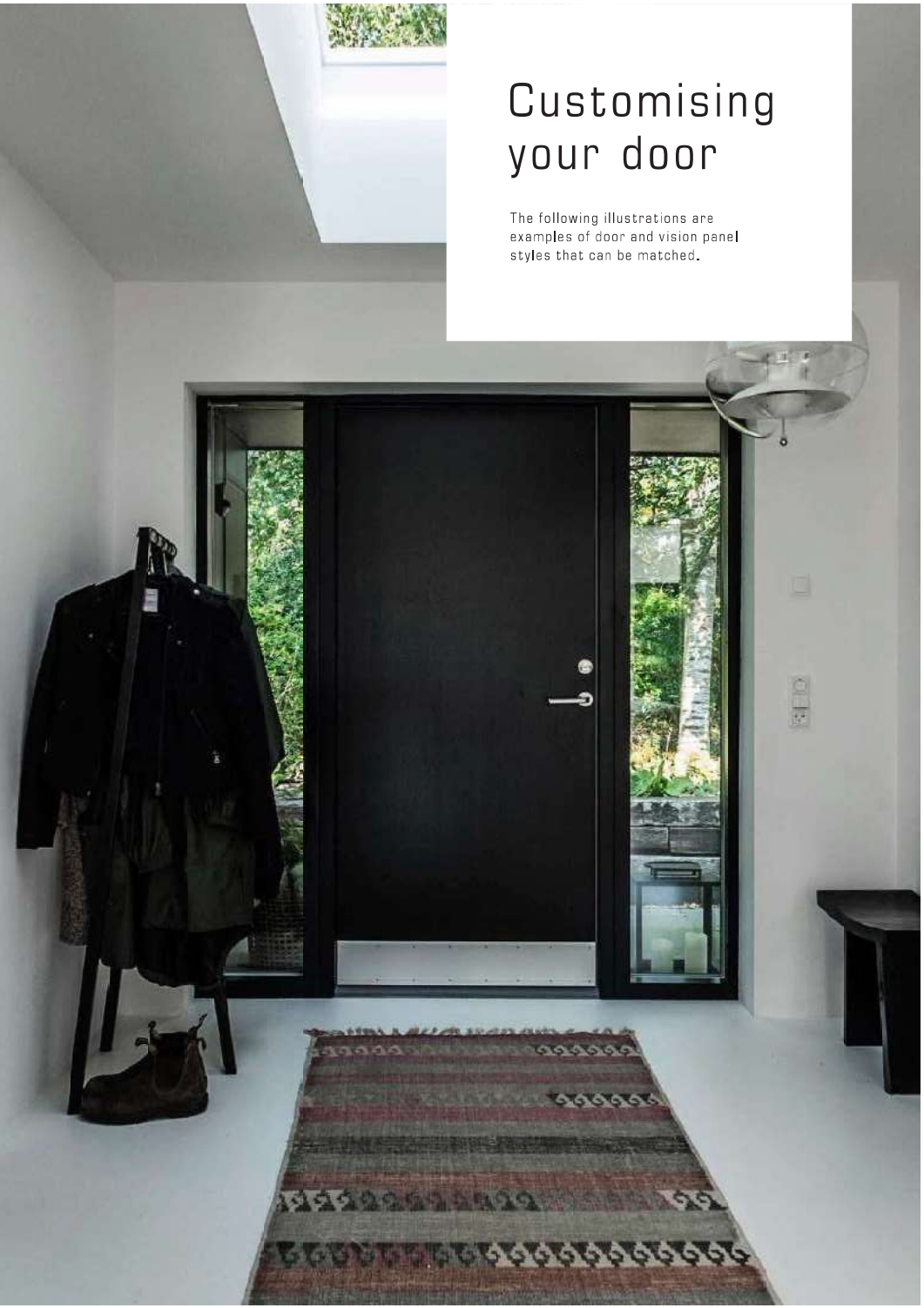
Min. width	478mm
Min. height	438mm
Max. width	1,298mm
Max. height	1,598mm

All maximum width and height measurements are subject to glass weight and specification.



Doors

Make a grand entrance with a bold front door or bring fluidity to your space with sliding patio doors; a great door will change the way you live. Browse the styles, colours, materials and security features we offer in the following pages.



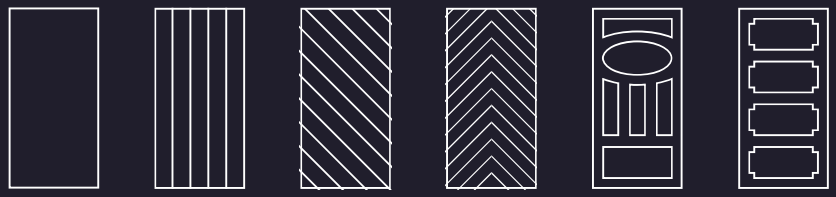
Customising your door

The following illustrations are examples of door and vision panel styles that can be matched.

Flush entrance doors

Flush entrance doors can be customised, with several options to mix and match your preferred door with vision panel style and position.





Plain | Vertical | Diagonal | Herringbone | Oval | Antique

Window types

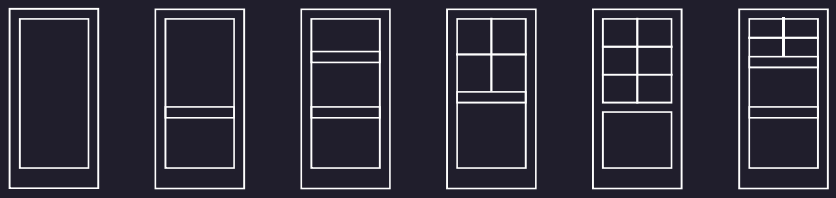


Oval | Farmhouse | Rectangle | Square | Circle | Diamond

Glazed entrance doors and patio doors

Glazed entrance doors can also be customised. We can recommend standard options or work with you to create any variation you require.





Glazed door | Glazed door with single glazing bar | Glazed door with two glazing bars | Multi-light glazing door | Multi-light glazing door | Multi-light glazing door

For your inspiration



01

Glazed entrance door



02

Glazed entrance door



03

Flush entrance door



04

Flush entrance door



05

Flush entrance door
with integrated sidelight



06

Flush entrance door
with integrated sidelight



07

Flush entrance door
with sidelight



08

Glazed entrance door
with intergrated sidelight



09

Double casement door



10

Sliding door
Only available in AURAPLUS
triple-glazed only

Your choice

Contact us for more options, we can help you design the perfect door for your project.



Door types and openings

Tilt, turn or slide: the drawings below show the range of styles available.
Contact Rationel for information about more options and style combinations.



Flush entrance door

Features

Available as inward- or outward-opening, flush doors are hung on grey powder-coated adjustable hinges and fitted with a minimum three-point locking espagnolette bolt.

Flush doors can be manufactured with a wide range of patterns and vision panels. See examples on page 17.

Measurements

Min. width	653mm
Min. height	1,703mm
Max. width	1,198mm
Max. height	2,398mm



Glazed entrance door

Features

Available as inward- or outward-opening, glazed entrance doors are hung on grey powder-coated adjustable hinges and fitted with a multipoint lock box with latch deadbolt locking espagnolette bolt.

Glazed entrance doors are constructed using a frame and sash with an option of glazing bars, transoms and mullions. The glass can be composite or insulated panel.

Measurements

Min. width	653mm
Min. height	1,703mm
Max. width	1,198mm
Max. height	2,498mm



Patio door

Features

Available as either inward- or outward-opening, patio doors are ideal for access to balconies, gardens and patios.

Doors have an inbuilt friction brake*, operated by turning the handle down in any given position. They are hung on grey powder-coated adjustable hinges and fitted with a minimum three-point locking espagnolette bolt.

*Available on master door leaf only.

Measurements

Min. width	1,188mm
Min. height	1,703mm
Max. width	2,328mm
Max. height	2,498mm

All maximum width and height measurements are subject to glass weight and specification.



Tilt and turn door

Features

Available as inward-opening only, tilt and turn doors function in two ways. They are hinged from the side and open inwards, or, for ventilation, the leaf can be tilted. Tilt is available on master leaf only.

Available in Rationel AURAPLUS triple-glazed only.

Measurements

Min. width	1,003mm
Min. height	1,803mm
Max. width	1,998mm
Max. height	2,198mm



Casement door

Features

Available as outward-opening only, casement doors are ideal for access to balconies, gardens and patios. The slim construction allows maximum daylight and heat into the house without compromising functionality and comfort.

Casement doors come fitted with an inbuilt friction brake operated by turning the handle down in any given position. They are hung on grey powder-coated adjustable hinges and fitted with a minimum three-point locking espagnolette bolt.

Measurements

Min. width	938mm
Min. height	1,703mm
Max. width	2,328mm
Max. height	2,398mm



Sliding door

Features

Designed to be as beautiful as the views they frame, sliding doors allow the garden into your home in the summer but keep the heat inside throughout the winter.

Sliding doors, where one half slides and the other is fixed, are ideal when space is at a premium. The sliding part lifts easily and glides in front of the fixed section to create a clear opening of up to 1.55 metres.

Available in AURAPLUS triple-glazed only.

Measurements

Min. width	1,788mm
Min. height	1,863mm
Max. width	3,588mm
Max. height	2,388mm

Glazing options

Rationel windows combine safety, privacy and energy-efficiency features that help you make the very best of your home.

Rationel SECURE
Our windows are built with security in mind. Read more about our Secured by Design certification on page 24 or watch the video on our website.

Rationel OBSCURE
Our panes are designed to restrict the view into private areas such as bathrooms. Choose from six different types of glass to get the combination of light and privacy you desire.

Rationel SAFETY
Our glass holds together when shattered, reducing the risk of injury if someone falls into the pane. The toughened glass is designed to fall out of the sash and shatter into small, harmless pieces. Panes can be made of toughened glass, laminated glass or a combination of both.

Rationel FACADE
Used in buildings either to create a visually coherent facade or for special colour effects, FACADE is well suited to storey divisions as well as ventilated and insulated panels, and is available in special colours on request.

Rationel SOUND
If your home is subject to environmental noise, our noise-reducing panes are for you. Panes feature two glass sheets that act as a break, dramatically reducing the movement of sound into your home and creating a peaceful environment.

Rationel SOLAR
Our solar panes limit the amount of sunlight and heat coming into a building, depending on the light and heat shielding levels required. This means significantly less energy will be required to cool hot rooms.

Durability tests

All our windows are tested for durability. A series of videos are available to view on the Rationel website.

Air permeability
600Pa

Wind resistance
1600Pa

Operation
10.000 cycles

Water tightness
600Pa

Handles and accessories

Customise your windows and doors with different handles and accessories.



Handle for outward opening window and patio door



Handle with child lock



Handle with lockable child safety lock



Entrance door handle with round rose key thumb turn



Entrance door handle with round rose key-key



Entrance door handle with back plate key thumb turn



Entrance door handle with back plate key-key



Patio door handle with key internal only



Sliding door finger pull



Sliding door handle



Night vent position



Restrictor



Secured by Design letterplate



Normal letter plate

Secured by Design and Part Q

Secured by Design

SBD

Official Police Security Initiative

Our experience working with housing associations, community developments and commercial projects means the security and safety of our doors are second to none.

Our doors are tested and marked according to several national and European standards, including Secured by Design. That means the frame, lock and hardware can withstand common burglary methods.

To meet Part Q requirements, windows and doors must satisfy particular standards of robustness, use approved hardware and demonstrate proven security performance.



Three-point espagnolette locking mechanism inhibits burglary.



Reinforced espagnolette increases the strength of all closing points.



Extra-strong reinforced screws increase the strength of all hinges.



Hook bolts in hardened steel combined with a reinforced front plate resist even severe attacks.



The length of time it takes to break a laminated pane will discourage even the most persistent burglar.



The letterbox has an inner protective housing with a unique concealed hinge mechanism. This limits the opening of the inner flap for maximum protection from "fishing" burglaries.



Colour

Make a statement or play it cool with your choice of colour. Our standard colours suit most architectural styles, while our special range is ideal for highlighting unique features.

Our windows and doors are available in one standard colour all over. AURAPLUS and FORMAPLUS windows can also be ordered with a different colour inside to outside, with no additional cost.



Standard colours

If you can't see the colour you want here, you can choose from the whole RAL classic colour chart. Non-standard colours be subject to additional costs and lead times.

Colours shown are indicative only.

Our most popular RAL colours are:

Our bestseller
Anthracite grey
RAL 7016

Black
RAL 9005

White
RAL 9010

White
RAL 9010

Cream white
RAL 9001

Light grey
RAL 7035

Silver grey
RAL 7001

Slate grey
RAL 7015

Anthracite grey
RAL 7016

Mid grey
RAL 7042

Black
RAL 9005

Dark brown
RAL 8017

Olive green
RAL 6003

Navy blue
RAL 5013

Rowanberry
RAL 3011

Pebble grey
RAL 7032

Beige
RAL 1001

Beige grey
RAL 7006

Yellow
RAL 1018

Dark green
RAL 6007

Blue black
RAL 5008

Granite

Available for external AURAPLUS and FORMAPLUS windows and doors only.

Colours shown are indicative only.

Granite 01
White (SAA10F)

Granite 10
Light grey (S2150)

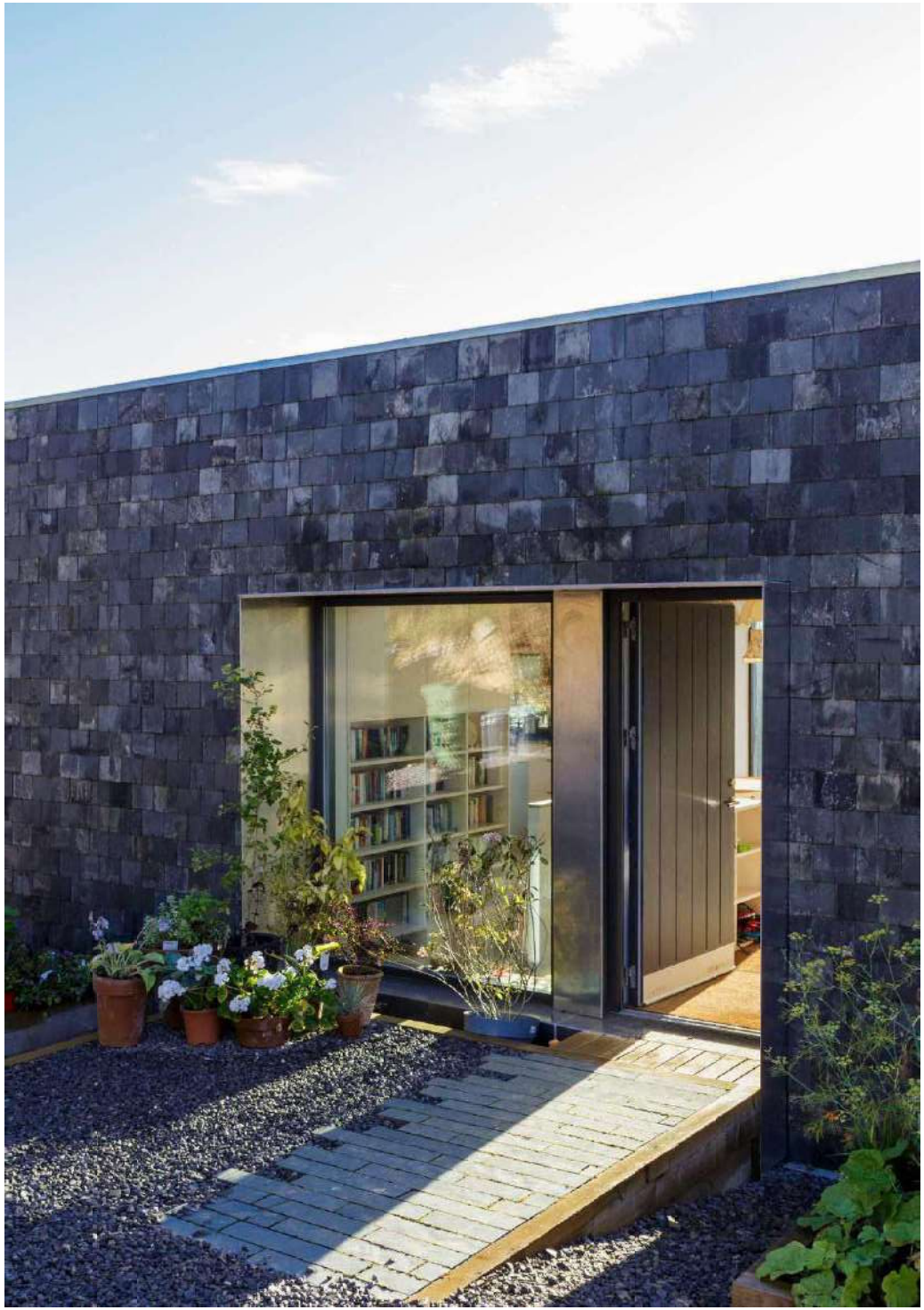
Granite 20
Medium grey (S2400)

Granite 30
Warm grey (S2900)

Granite 60
Dark grey (S2100)

Granite 80
Black (S900)





Turn your dream home into a design reality

Rationel is part of the VKR Group, whose mission is to establish model companies that create products useful to society and treat customers, suppliers, employees and shareholders better than most other companies.

At the heart of the organisation is a set of Charitable Foundations created to assist employees and their local communities, as well as fund a wide range of environmental, cultural and social programmes.

www.rationel.co.uk
quotation@rationel.co.uk
01869 248 181

Contact Rationel

Phone: +44 1869 248 181
Email enquiries: generalenquiry@rationel.co.uk
LiveChat: visit our website rationel.co.uk

Rationel Windows Ltd.
7 Avonbury Business Park
Bicester, OX26 2UA



7000.03.19.VI © 2019 Rationel Vinduer A/S ® rationel and rationel logo, Rationel AURA and Rationel AURAPLUS logos are registered trademarks used under licence by Rationel Vinduer A/S.
Rationel is not responsible for misprints and reserves the right to make technical changes.
All images are for inspiration only and are subject to change.

CE

FSC
www.fsc.org
FSC® C101947
The mark of responsible forestry

Secured by Design
SBD
Official Police Security Initiative

Supporting Custom & Self Build
NaCSBA
GOLD PARTNER 2019



CLAY PLAIN TILES

Marley

CONTENTS

6 CLAY PLAIN TILE ROOF SYSTEMS

8 INNOVATION IN CLAY

10 CANTERBURY HANDMADE

16 ASHDOWNE HANDCRAFTED

22 ACME DOUBLE CAMBER

32 ACME SINGLE CAMBER

44 HAWKINS MACHINE-MADE

52 DETAILING CLAY PLAIN TILE ROOF SYSTEMS

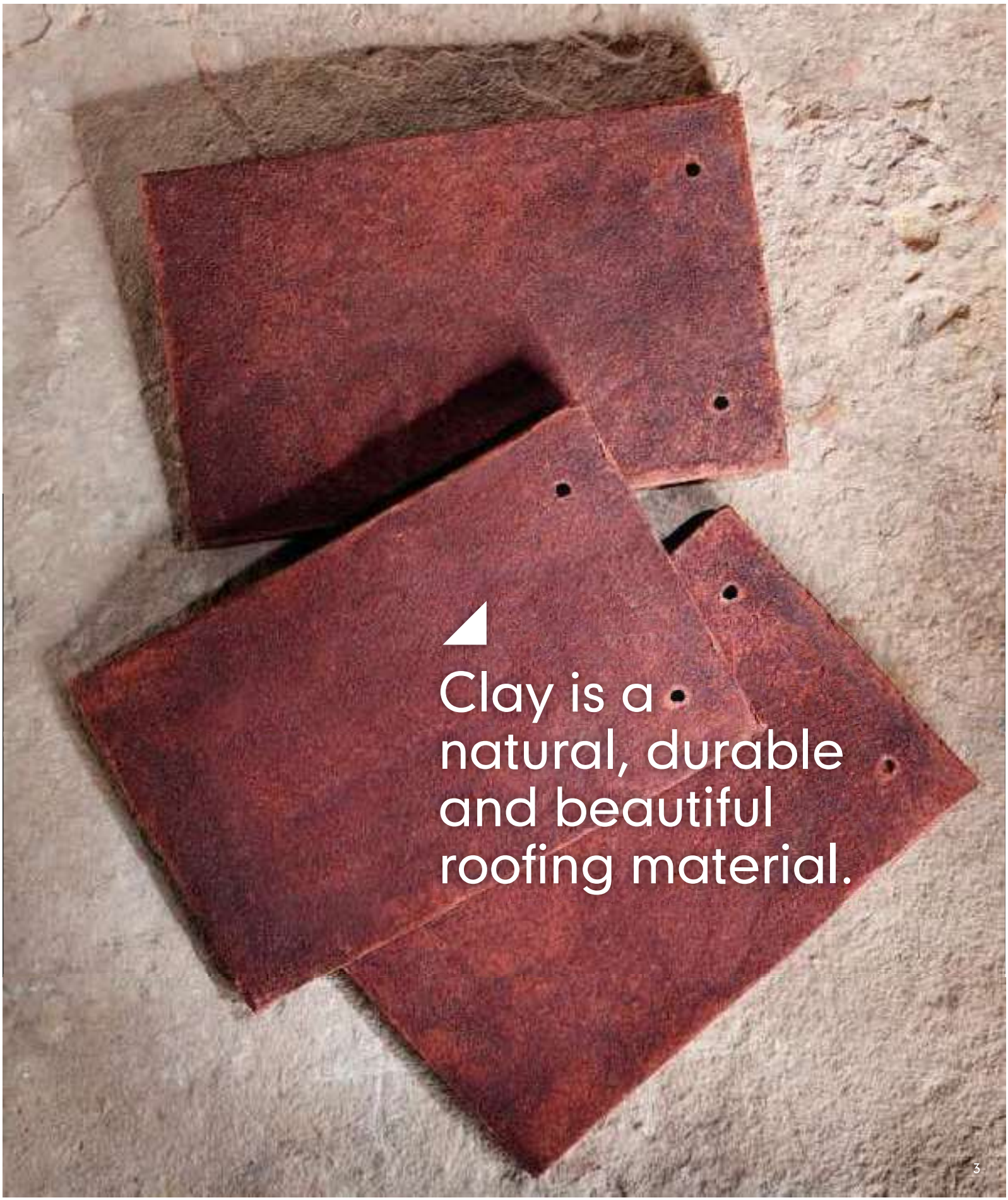
54 BASE LAYERS

56 FITTINGS & ACCESSORIES

60 PROPERTIES & PERFORMANCE

62 DESIGN DETAILS

74 HERE TO HELP


Clay is a
natural, durable
and beautiful
roofing material.

The undulating roofline of the Quintain House disguises the complex and challenging roofing structure underneath. Marley's Acme Double Camber clay tiles deliver a highly textured, curved and seamless finish that highlights the roof's dramatic rises and falls, pushing the boundaries of traditional roofing. The result is a unique building that fits in with houses in nearby traditional villages, and exudes beauty and comfort."

ANDREW ROWLANDS, ROOFING CONTRACTOR, ROWLANDS ROOFING



CLAY PLAIN TILE ROOF SYSTEMS

We offer the most comprehensive roof system on the market today, underwritten by a 15 year warranty.

Our complete, one-source roof system, gives levels of accountability and product integration that reduce specifier and contractor design and installation liability.

More elements guaranteed to work seamlessly together, give you more time to focus on design and management of your project, complete peace of mind and, of course, better, easier-to-install, more durable, lower maintenance roofs.

01/ ROOF COVERINGS

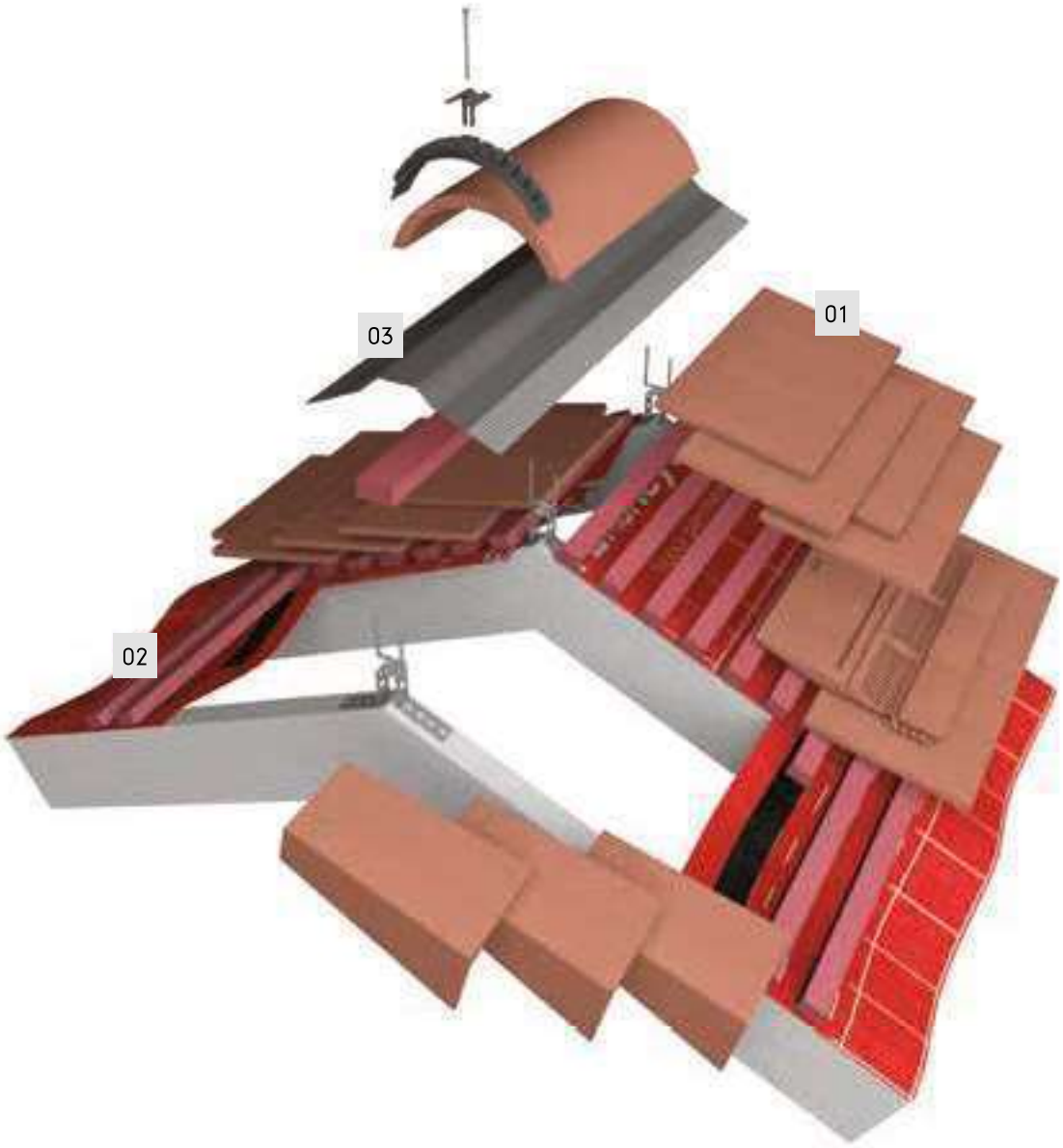
A range of clay plain tiles to suit every sector, pitch, geographical location and aesthetic requirement: at the same time complying with BS 5534 and BS 5250 and fully integrating with our base layers and dry fix systems to create a complete roof system.

- Clay plain tile range (pages 10-51)
- Properties and performance (pages 60-61)
- Case studies pages (14, 20-21, 26, 38-39 and 48)

02/ BASE LAYERS

With Universal permeable or non-breathable fully taped underlay and JB Red pre-graded BBA-certified battens, we offer BS 5534-compliant NHBC approved base layers that work seamlessly with all the other elements of our roof systems.

- Universal underlays (page 54)
- JB-Red battens (page 55)



03/ DETAILING

Dry fix BS 5534 and BS 5250-compliant systems for eaves, verge, valley hip, ridge abutment and other areas. These systems are made from high quality materials and tested together to work with our clay plain tile and other roof coverings to give secure, weathertight and durable finishing and detailing for our roof systems.

- Dry fix and ventilation systems (pages 52-53)
- Fittings and accessories (pages 56-59)
- Design details pages (pages 62-73)

KNOWLEDGE

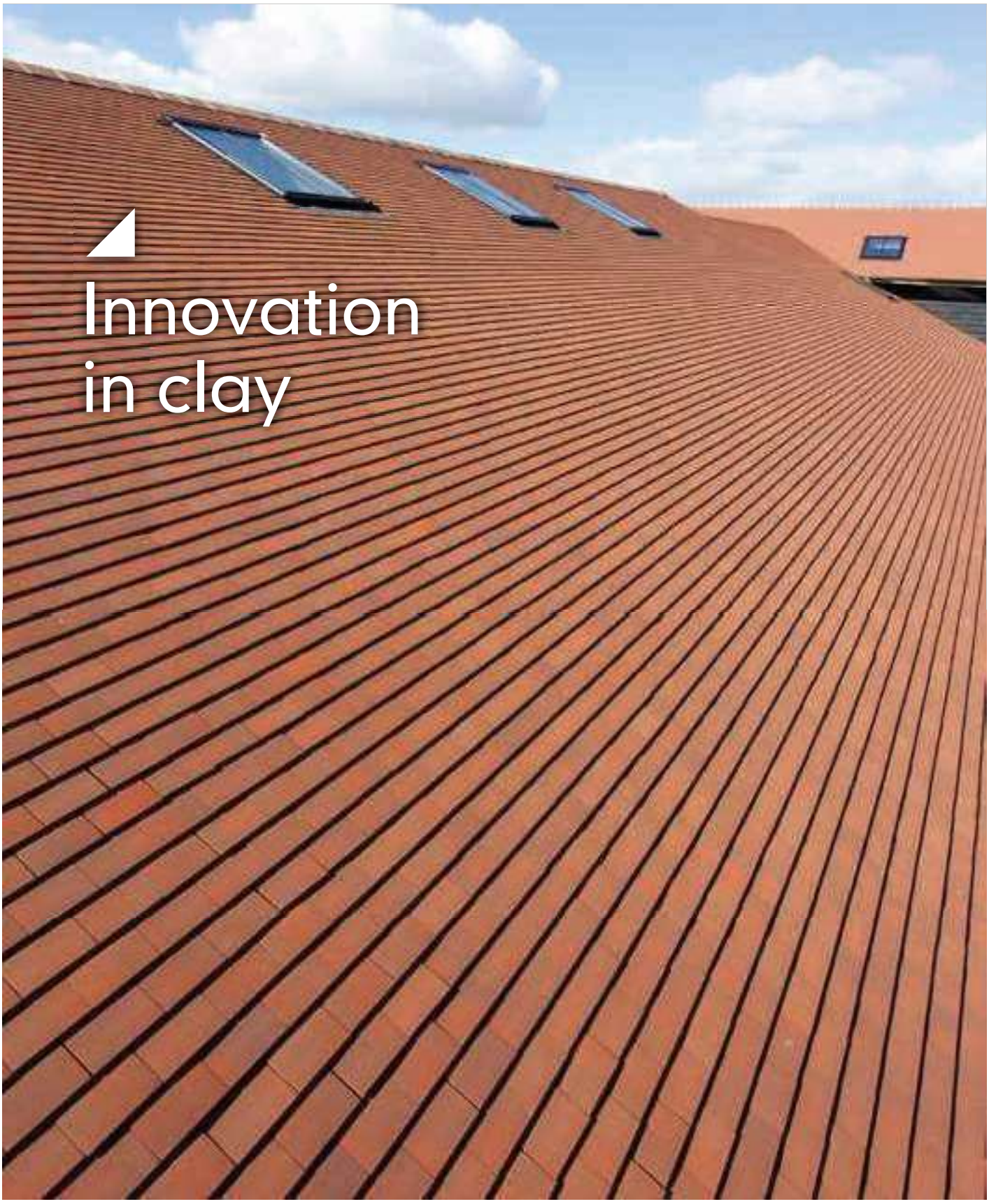
A key part of our roof system is ease of access to tools and knowledge that make the design, specification and fixing process easier and faster. Our suite of free-to-use online tools is designed to get our knowledge into your designs and specs quickly and easily.

- Resources (pages 74-75)

WARRANTY

Our 15 year warranty covers more pitched roofing elements than any other manufacturer and gives the ultimate assurance that our integrated roofing solutions can be specified and installed with complete confidence.

- For more information visit marley.co.uk/resources


Innovation
in clay

Plain tiles made from clay have been used to cover roofs in Britain for over eight hundred years and they form much of the character of the roofs seen in the South East of England and the Midlands, where the largest deposits of clay are located.

Our extensive range contains colour, texture and camber options which meet the aesthetic and performance demands of all types of roofing applications.

- BES 6001 'Excellent' rating and A+ rated in the BRE Green Guide
- Durable, natural material
- Full range of colours and finishes
- 30° low pitch options
- Full range of fittings and accessories
- Independent carbon footprint certification
- Premium range of handmade tiles

CANTERBURY
HANDMADE CLAY PLAIN TILES



Nothing compares to handmade clay plain tiles. That's why our range of Canterbury handmade roof tiles are created true to tradition. For extra versatility, the colour range can be mixed together on the roof to create your own personal blend.

TECHNICAL TOOLKIT

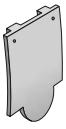
Marley provides a comprehensive technical service and a range of online tools to ensure design performance and compliance to the latest British Standards and NHBC technical guidelines. These services include:

- Fixing specifications: marley.co.uk/tilefix
- NBS clauses: marley.co.uk/specrite
- CAD details: marley.co.uk/cad
- BIM models: marley.co.uk/bim

For more information on the recent update to the British Standard for Slating and Tiling (BS 5534) and how it might affect your project, please visit marley.co.uk/BS5534

FEATURE TILES

Available in a range of colours. For advice on the use of feature tiles in main roof areas, contact the Technical Advisory Service.



Club

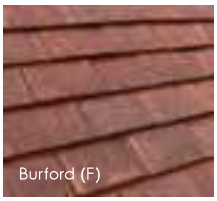


Bullnose

COLOUR AVAILABILITY

See pages 12-15 for more detailed colour panels.







Key: (F) Fine sanded finish

TECHNICAL DATA

Size of tile	265mm x 165mm
Minimum pitch*	40°
Maximum pitch	90°
Minimum headlap	65mm (roof) 35mm (vertical)
Maximum gauge	100mm (roof) 115mm (vertical)
Cover width	165mm (nominal)
Tile thickness	13mm (nominal)
Covering capacity (net)	60 tiles/m^2 at 100mm gauge (roof) 53 tiles/m^2 at 115mm gauge (vertical)
Weight of tiling (approx.)	74kg/m^2 (0.73 kN/m^2) at 100mm gauge (roof) 66kg/m^2 (0.64 kN/m^2) at 115mm gauge (vertical)
Battens required (net)	10.0 lin.m/m^2 at 100mm gauge (roof) 8.7 lin.m/m^2 at 115mm gauge (vertical)
Batten size recommended	38 x 25mm for rafters/supports not exceeding 600mm centres (fixed to BS 5534)
Tile nails	38mm x 2.65mm
Authority	BS EN 1304

* The minimum recommended pitch and lap may be influenced by special circumstances, please contact the Technical Advisory Service.

SUSTAINABILITY

Green guide rating	A+ (Element ref: 812410006)
BES 6001	Excellent– can achieve 3 credits



CANTERBURY LOXLEIGH
FINE SANDED FINISH



CANTERBURY BURFORD
FINE SANDED FINISH



MYRTLE FARM
CASE STUDY



PROJECT INFORMATION

Location/
Oxfordshire

Application/
Residential

Product/
Canterbury Mix (Chailey, Burford and Loxleigh)

Specifier/
Rivar Homes

Properties at Myrtle Farm have been designed to complement the rural village location. Canterbury handmade tiles in all three colours (Chailey, Burford and Loxleigh) have been mixed on the roof to create a truly unique blend.

◢ Find more case studies at marley.co.uk/casestudies

CANTERBURY CHAILEY
FINE SANDED FINISH



ASHDOWNE
HANDCRAFTED CLAY PLAIN TILES



Ashdowne handcrafted clay plain tiles offer all the warmth and mellow appearance of traditional handmade tiles, with a granular texture and slight random irregularities that make each tile unique.

TECHNICAL TOOLKIT

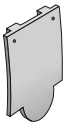
Marley provides a comprehensive technical service and a range of online tools to ensure design performance and compliance to the latest British Standards and NHBC technical guidelines. These services include:

- Fixing specifications: marley.co.uk/tilefix
- NBS clauses: marley.co.uk/specrite
- CAD details: marley.co.uk/cad
- BIM models: marley.co.uk/bim

For more information on the recent update to the British Standard for Slating and Tiling (BS 5534) and how it might affect your project, please visit marley.co.uk/BS5534

FEATURE TILES

Available in a range of colours. For advice on the use of feature tiles in main roof areas, contact the Technical Advisory Service.



Club



Bullnose

COLOUR AVAILABILITY

See pages 18-19 for more detailed colour panels.





Key: (F) Fine sanded finish

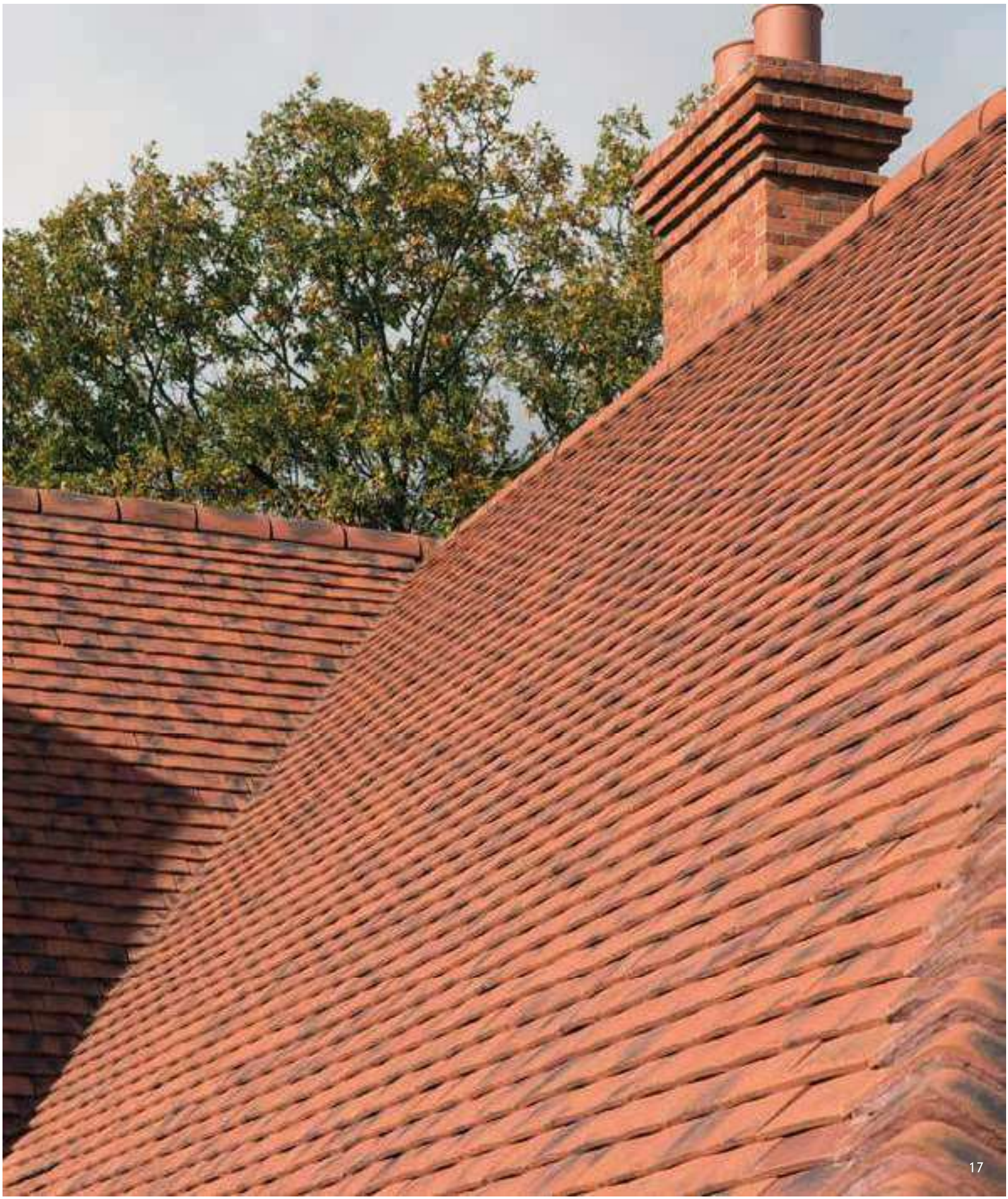
TECHNICAL DATA

Size of tile	265mm x 165mm
Minimum pitch*	35°
Maximum pitch	90°
Minimum headlap	65mm (roof) 35mm (vertical)
Maximum gauge	100mm (roof) 115mm (vertical)
Cover width	165mm (nominal)
Tile thickness	11mm (nominal)
Covering capacity (net)	60 tiles/m² at 100mm gauge (roof) 53 tiles/m² at 115mm gauge (vertical)
Weight of tiling (approx.)	65kg/m² (0.64 kN/m²) at 100mm gauge (roof) 57kg/m² (0.56 kN/m²) at 115mm gauge (vertical)
Battens required (net)	10.0 lin.m/m² at 100mm gauge (roof) 8.7 lin.m/m² at 115mm gauge (vertical)
Batten size recommended	38 x 25mm for rafters/supports not exceeding 600mm centres (fixed to BS 5534)
Tile nails	38mm x 2.65mm
Authority	BS EN 1304

* The minimum recommended pitch and lap may be influenced by special circumstances, please contact the Technical Advisory Service.

SUSTAINABILITY

Green guide rating	A+ (Element ref: 812410006)
BES 6001	Excellent– can achieve 3 credits
Embodied carbon	Carbon footprint of 28 $KgCO_2e/m^2$ at 100mm gauge



ASHDOWNE ASHURST
FINE SANDED FINISH



ASHDOWNE AYLESHAM MIX

FINE SANDED FINISH



THE CLOISTERS
CASE STUDY



The weathered appearance of these beautiful handcrafted clay plain tiles help the new houses blend into their surroundings and give a premium handmade finish.

Ashdowne Handcrafted Clay Plain Tiles in Aylesham Mix give a handmade appearance on the roof of these prestigious houses in Stanmore Country Park ranging from £2.4 to £3.8m in value. Located in a conservation area close to the capital, Signia (part of Jaysam Developments) specified Ashdowne handcrafted tiles to meet with strict planning requirements for this sensitive site.

◢ Find more case studies at marley.co.uk/casestudies

PROJECT INFORMATION

Location/
Stanmore

Application/
Residential

Product/
Ashdowne (Aylesham Mix)

Specifier/
Signia Homes

ACME DOUBLE CAMBER
CLAY PLAIN TILES



Acme double camber clay plain tiles have both a longitudinal and latitudinal camber, which accentuates light and shade and creates highly textured roofscapes.

TECHNICAL TOOLKIT

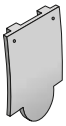
Marley provides a comprehensive technical service and a range of online tools to ensure design performance and compliance to the latest British Standards and NHBC technical guidelines. These services include:

- Fixing specifications: marley.co.uk/tilefix
- NBS clauses: marley.co.uk/specrite
- CAD details: marley.co.uk/cad
- BIM models: marley.co.uk/bim

For more information on the recent update to the British Standard for Slating and Tiling (BS 5534) and how it might affect your project, please visit marley.co.uk/BS5534

FEATURE TILES

Available in a range of colours. For advice on the use of feature tiles in main roof areas, contact the Technical Advisory Service.



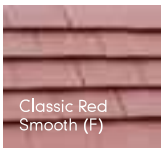
Club



Bullnose

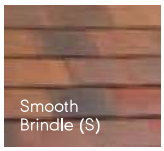
COLOUR AVAILABILITY

See pages 24-31 for more detailed colour panels.

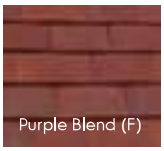














Key: (F) Fine sanded finish (S) Smooth finish

TECHNICAL DATA

Size of tile	265mm x 165mm	
Minimum pitch*	35°	
Maximum pitch	90°	
Minimum headlap	65mm (roof)	35mm (vertical)
Maximum gauge	100mm (roof)	115mm (vertical)
Cover width	165mm (nominal)	
Tile thickness	11mm (nominal)	
Covering capacity (net)	60 tiles/m^2 at 100mm gauge (roof) 53 tiles/m^2 at 115mm gauge (vertical)	
Weight of tiling (approx.)	64kg/m^2 (0.63 kN/m^2) at 100mm gauge (roof) 56kg/m^2 (0.55 kN/m^2) at 115mm gauge (vertical)	
Battens required (net)	10.0 lin.m/m^2 at 100mm gauge (roof) 8.7 lin.m/m^2 at 115mm gauge (vertical)	
Batten size recommended	38 x 25mm for rafters/supports not exceeding 600mm centres (fixed to BS 5534)	
Tile nails	38mm x 2.65mm	
Authority	BS EN 1304	

* The minimum recommended pitch and lap may be influenced by special circumstances, please contact the Technical Advisory Service.

SUSTAINABILITY

Green guide rating	A+ (Element ref: 812410006)
BES 6001	Excellent– can achieve 3 credits
Embodied carbon	Carbon footprint of 27 $KgCO_2e/m^2$ at 100mm gauge



ACME DOUBLE CAMBER
CLASSIC RED SMOOTH
FINE SANDED FINISH



ACME DOUBLE CAMBER
BURNT FLAME
FINE SANDED FINISH



QUINTAIN HOUSE
CASE STUDY

PROJECT INFORMATION

Location/
Gloucestershire

Application/
Residential

Product/
Acme Double Camber
in Burnt Flame

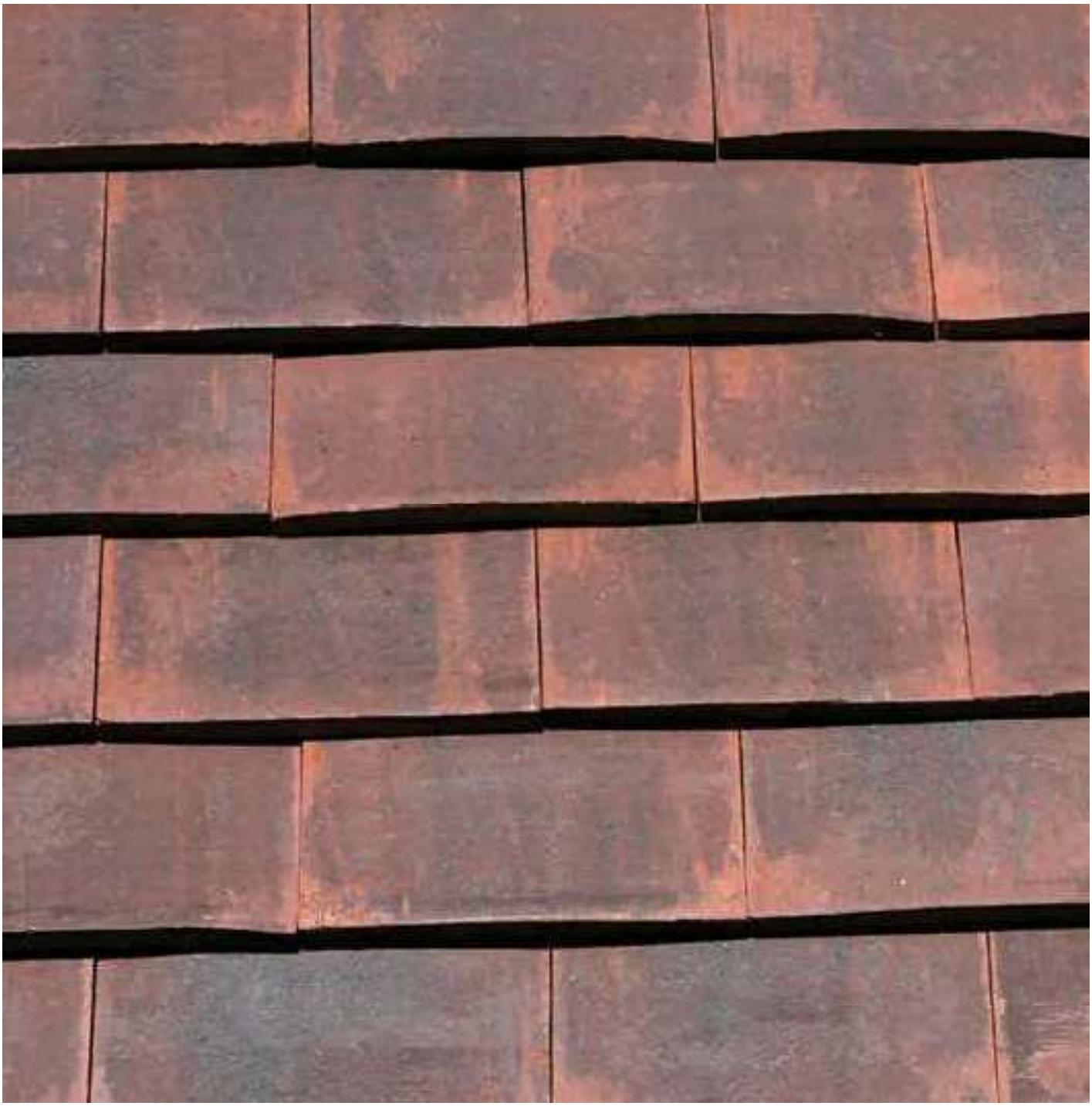
Specifier/
Kirkland Fraser Moor



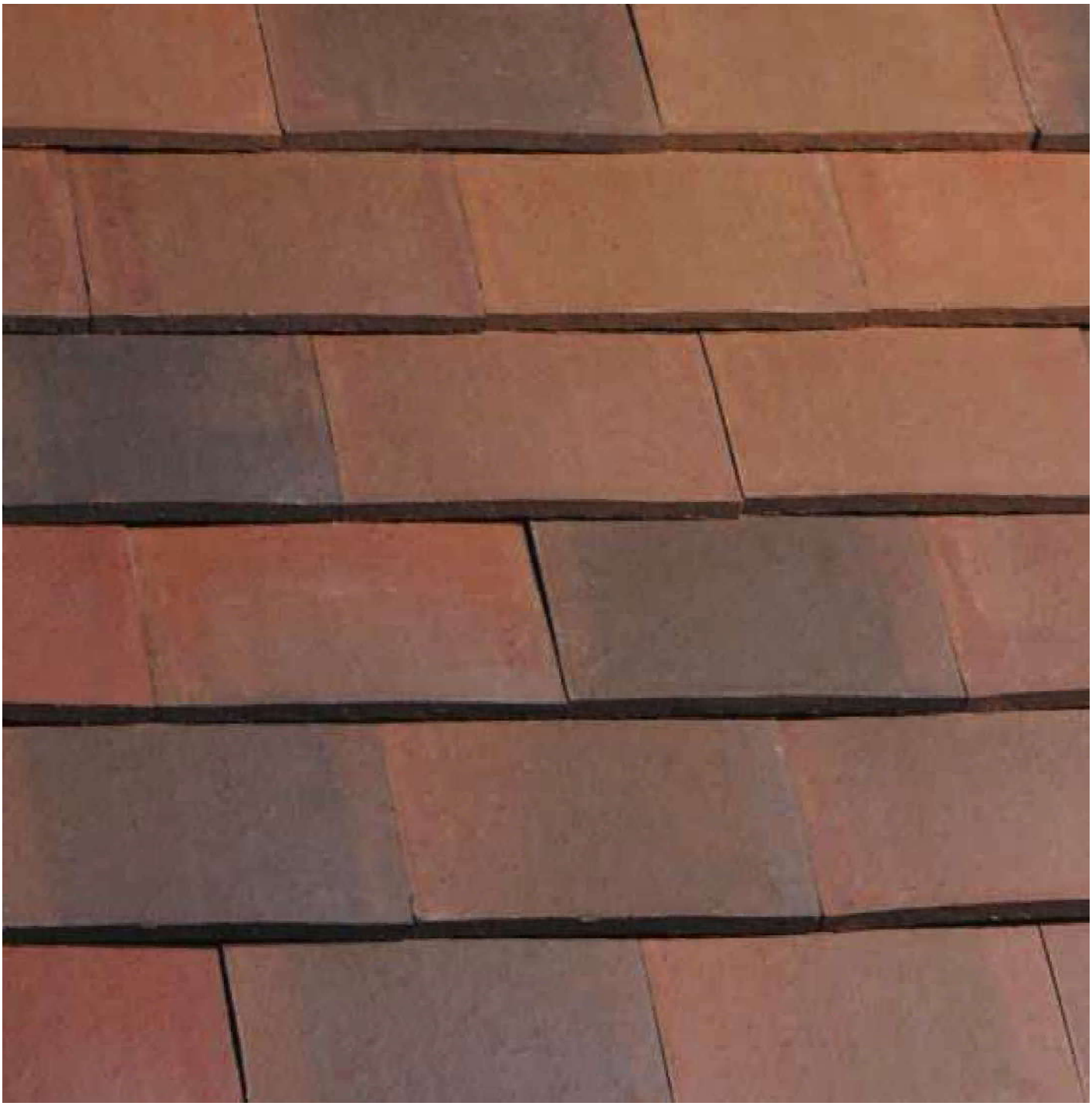
Quintain House's clay tiled roof is sympathetic to those in nearby traditional villages in the surrounding area. Its striking undulating form was very challenging on a technical level and was achieved using Acme Double Camber clay plain tiles in Burnt Flame, demonstrating their versatility in creating complex roof designs.

◢ Find more case studies at marley.co.uk/casestudies

ACME DOUBLE CAMBER
ANTIQUE
FINE SANDED FINISH



ACME DOUBLE CAMBER
SMOOTH BRINDLE
SMOOTH FINISH



ACME DOUBLE CAMBER
DARK BRINDLE
FINE SANDED FINISH



ACME DOUBLE CAMBER
PURPLE BLEND
FINE SANDED FINISH



ACME DOUBLE CAMBER
NATURAL ORANGE
SMOOTH FINISH



ACME SINGLE CAMBER
CLAY PLAIN TILES



The Acme single camber clay plain tile allows the creation of traditional and contemporary low pitch roof designs with the warmth and character of clay.

TECHNICAL TOOLKIT

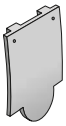
Marley provides a comprehensive technical service and a range of online tools to ensure design performance and compliance to the latest British Standards and NHBC technical guidelines. These services include:

- Fixing specifications: marley.co.uk/tilefix
- NBS clauses: marley.co.uk/specrite
- CAD details: marley.co.uk/cad
- BIM models: marley.co.uk/bim

For more information on the recent update to the British Standard for Slating and Tiling (BS 5534) and how it might affect your project, please visit marley.co.uk/BS5534

FEATURE TILES

Available in a range of colours. For advice on the use of feature tiles in main roof areas, contact the Technical Advisory Service.



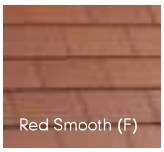
Club

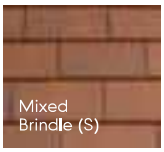


Bullnose

COLOUR AVAILABILITY

See pages 34-43 for more detailed colour panels.

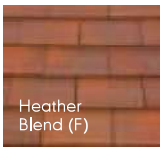




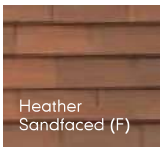












Key: (F) Fine sanded finish (S) Smooth finish

TECHNICAL DATA

Size of tile	265mm x 165mm	
Minimum pitch*	30°	
Maximum pitch	90°	
Minimum headlap	65mm (roof)	35mm (vertical)
Maximum gauge	100mm (roof)	115mm (vertical)
Cover width	165mm (nominal)	
Tile thickness	11mm (nominal)	
Covering capacity (net)	60 tiles/m² at 100mm gauge (roof) 53 tiles/m² at 115mm gauge (vertical)	
Weight of tiling (approx.)	64kg/m² (0.63 kN/m²) at 100mm gauge (roof) 56kg/m² (0.55 kN/m²) at 115mm gauge (vertical)	
Battens required (net)	10.0 lin.m/m² at 100mm gauge (roof) 8.7 lin.m/m² at 115mm gauge (vertical)	
Batten size recommended	38 x 25mm for rafters/supports not exceeding 600mm centres (fixed to BS 5534)	
Tile nails	38mm x 2.65mm	
Authority	BS EN 1304	

* The minimum recommended pitch and lap may be influenced by special circumstances, please contact the Technical Advisory Service.

SUSTAINABILITY

Green guide rating	A+ (Element ref: 812410006)
BES 6001	Excellent– can achieve 3 credits
Embodied carbon	Carbon footprint of 27 $KgCO_2e/m^2$ at 100mm gauge



ACME SINGLE CAMBER
RED SMOOTH
SMOOTH FINISH



ACME SINGLE CAMBER
CENTURY
SMOOTH FINISH



ACME SINGLE CAMBER
MIXED BRINDLE
SMOOTH FINISH



ACME SINGLE CAMBER
RED SANDFACED
FINE SANDED FINISH



POACHER'S RETREAT
CASE STUDY



The environmentally sustainable aspect of the range featured highly on the product selection criteria. We also felt it was important to choose tiles that were made in the country where they are to be used and that they stand the test of time and work with the climate.”

MALCOLM COX, HOMEOWNER

This idyllic home set in it own country grounds needed a traditional tile with a strong performance. The Acme Single Camber Clay Tile ability to drop to 30° minimum pitch provided great versatility for the designers and contractors to work with.

◢ Find more case studies at marley.co.uk/casestudies

PROJECT INFORMATION

Location/
South

Application/
Residential

Product/
Acme Single Camber
(Grey Sandfaced)

Specifier/
Malcolm Cox

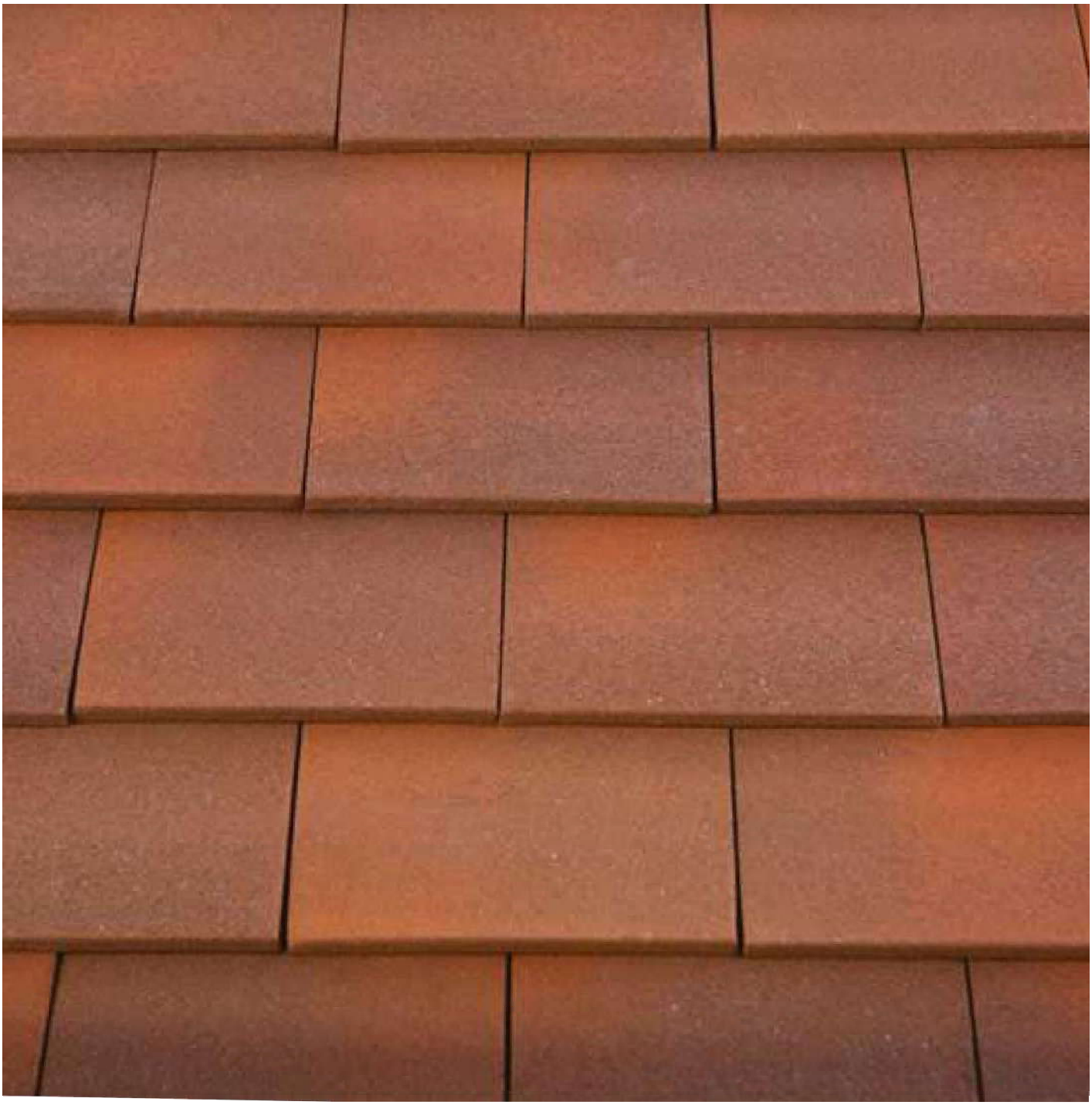
ACME SINGLE CAMBER
GREY SANDFACED
SMOOTH FINISH



ACME SINGLE CAMBER
FARMHOUSE BROWN SANDFACED
FINE SANDED FINISH



ACME SINGLE CAMBER
HEATHER BLEND
FINE SANDED FINISH



ACME SINGLE CAMBER
HEATHER SANDFACED
FINE SANDED FINISH



HAWKINS
MACHINE-MADE CLAY PLAIN TILES



The name 'Hawkins' has been synonymous with quality roofs for over 150 years. This heritage, combined with our modern firing techniques, gives a unique colour range.

TECHNICAL TOOLKIT

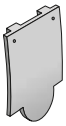
provides a comprehensive technical service and a range of online tools to ensure design performance and compliance to the latest British Standards and NHBC technical guidelines. These services include:

- Fixing specifications: marley.co.uk/tilefix
- NBS clauses: marley.co.uk/specrite
- CAD details: marley.co.uk/cad
- BIM models: marley.co.uk/bim

For more information on the recent update to the British Standard for Slating and Tiling (BS 5534) and how it might affect your project, please visit marley.co.uk/BS5534

FEATURE TILES

Available in a range of colours. For advice on the use of feature tiles in main roof areas, contact the Technical Advisory Service.



Club

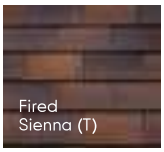


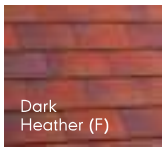
Bullnose

COLOUR AVAILABILITY

See pages 46-51 for more detailed colour panels.











Key: (F) Fine sanded finish (S) Smooth finish (T) Textured finish

TECHNICAL DATA

Size of tile	265mm x 165mm	
Minimum pitch*	30°	
Maximum pitch	90°	
Minimum headlap	65mm (roof)	35mm (vertical)
Maximum gauge	100mm (roof)	115mm (vertical)
Cover width	165mm (nominal)	
Tile thickness	11mm (nominal)	
Covering capacity (net)	60 tiles/m^2 at 100mm gauge (roof) 53 tiles/m^2 at 115mm gauge (vertical)	
Weight of tiling (approx.)	64kg/m^2 (0.63 kN/m^2) at 100mm gauge (roof) 56kg/m^2 (0.55 kN/m^2) at 115mm gauge (vertical)	
Battens required (net)	10.0 lin.m/m^2 at 100mm gauge (roof) 8.7 lin.m/m^2 at 115mm gauge (vertical)	
Batten size recommended	38 x 25mm for rafters/supports not exceeding 600mm centres (fixed to BS 5534)	
Tile nails	38mm x 2.65mm	
Authority	BS EN 1304	

* The minimum recommended pitch and lap may be influenced by special circumstances, please contact the Technical Advisory Service.

SUSTAINABILITY

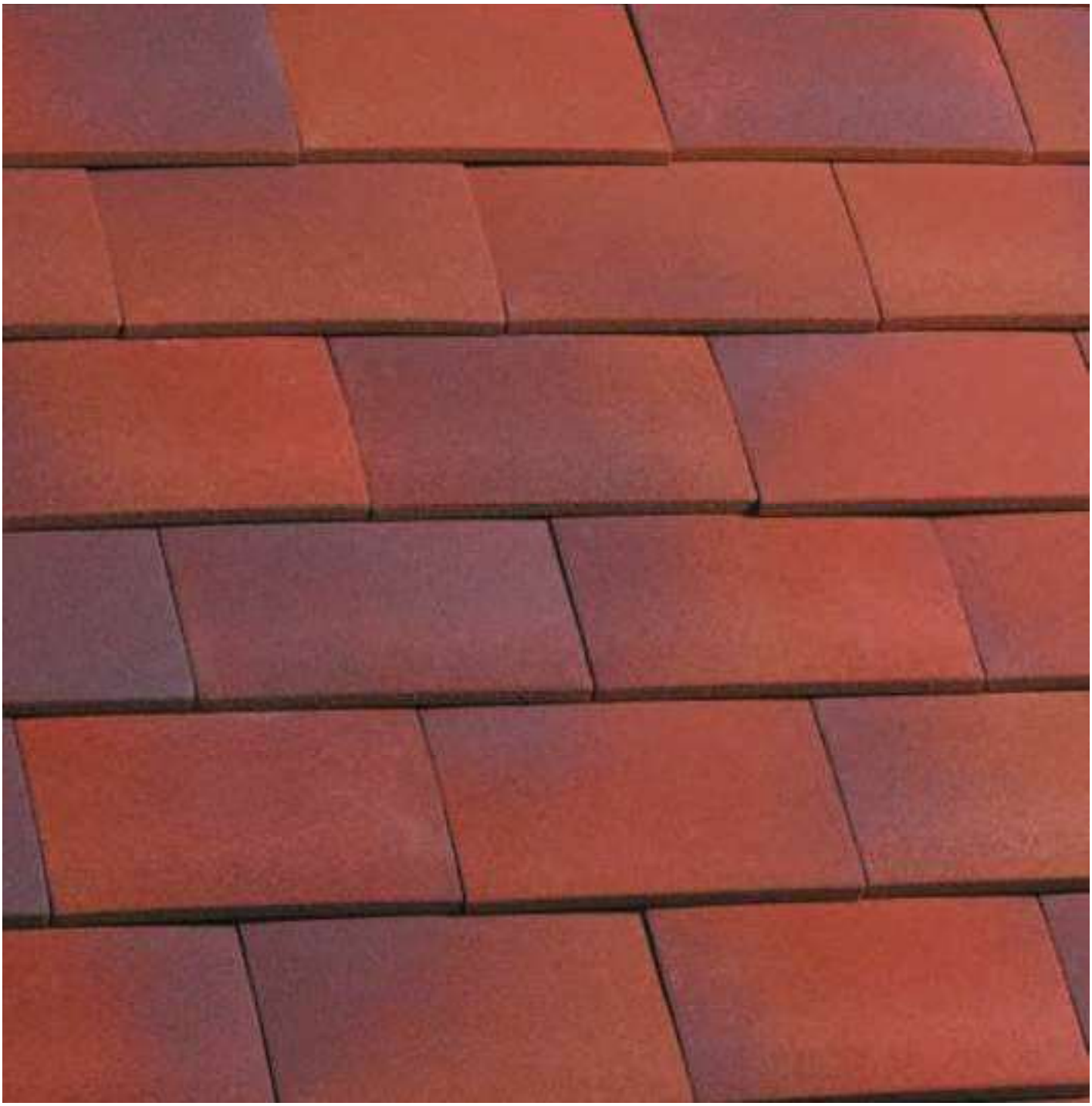
Green guide rating	A^+ (Element ref: 812410006)
BES 6001	Excellent – can achieve 3 credits
Embodied carbon	Carbon footprint of 33 $KgCO_2e/m^2$ at 100mm gauge


N
S

HAWKINS BLUE SMOOTH
SMOOTH FINISH



HAWKINS DARK HEATHER
FINE SANDED FINISH



MALVERN CHURCH
CASE STUDY



PROJECT INFORMATION

Location/
Midlands

Application/
Refurbishment

Product/
Hawkins Fired Sienna

Specifier/
Nick Joyce Architects

The unique weathered texture was the deciding factor in the specification of Fired Sienna for this renovation. Following a successful restoration appeal, the Baptist Church wanted a reclaimed look about the finished roof whilst ensuring it would last for years to come.

◢ Find more case studies at marley.co.uk/casestudies

HAWKINS FIRED SIENNA
TEXTURED FINISH



HAWKINS STAFFORDSHIRE MIX
SMOOTH FINISH



HAWKINS STAFFORDSHIRE BLUE
FINE SANDED FINISH



DETAILING CLAY PLAIN TILE ROOF SYSTEMS

We at Marley design our roofing products as holistic systems. Our dry fix and ventilation solutions are a key part of our roof system, enabling flexibility in design and detailing; offering weatherproofing, security and refined aesthetics, as well as providing excellent levels of ventilation.

They are also quick, straightforward and economical to install, and for the building owner, they require minimal ongoing maintenance but give maximum durability and long life.

01 EAVES VENT SYSTEMS



10mm & 25mm Universal eaves vent systems

02 DRY VERGE SYSTEMS



Plain tile cloak verge system

03 DRY HIP SYSTEMS



Universal HipFast system

04 DRY VALLEY SYSTEMS



GRP slate dry valley system

05 DRY RIDGE SYSTEMS



Universal RidgeFast



Ventilated dry ridge system



MARLEY DRY FIX SYSTEMS

To improve the speed and economy of roof construction, a choice of high performance, maintenance-free dry fix systems are offered to suit ridge, verge, hip and valley details providing easy to fix alternatives to traditional mortar bedding. When correctly installed, they are designed to satisfy the requirements of BS 5534 'Code of practice for slating and tiling' with respect to the mechanical fixing of roof fittings to resist wind uplift and the provision of a weathertight roof.

Available systems: Universal RidgeFast, Universal HipFast, Dry Hip system, Dry ridge and mono ridge, Universal plain tile dry verge system, Cloak verge tiles, Universal GRP Dry valley, Bonding gutters.

MARLEY VENTILATION SYSTEMS

To assist the designer in meeting the requirements of the Building Regulations, Marley has developed a range of ventilation accessories that combine discreet and aesthetic solutions with the highly efficient removal of moisture-laden air and gases. This comprehensive range is designed to ventilate roof voids with terminals for the ridge and roof, with connection to mechanical extract systems and soil vent pipes, allowing easy provision of precise amounts of free airspace.

Available systems: Universal eaves ventilation systems (10 and 25mm), Universal RidgeFast, Universal HipFast, Ventilated dry ridge and mono ridge, Ridge vent terminals, In-line vents.



06 BONDING GUTTERS



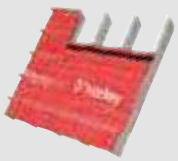
GRP bonding gutters

07 ROOF SLOPE SYSTEMS

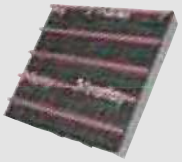


Contour and in-line vents

10 BASE LAYERS



Universal vapour permeable and non-breathable underlays



JB-Red, BS 5534 compliant battens

08 ABUTMENT SYSTEMS



Dry fix soakers

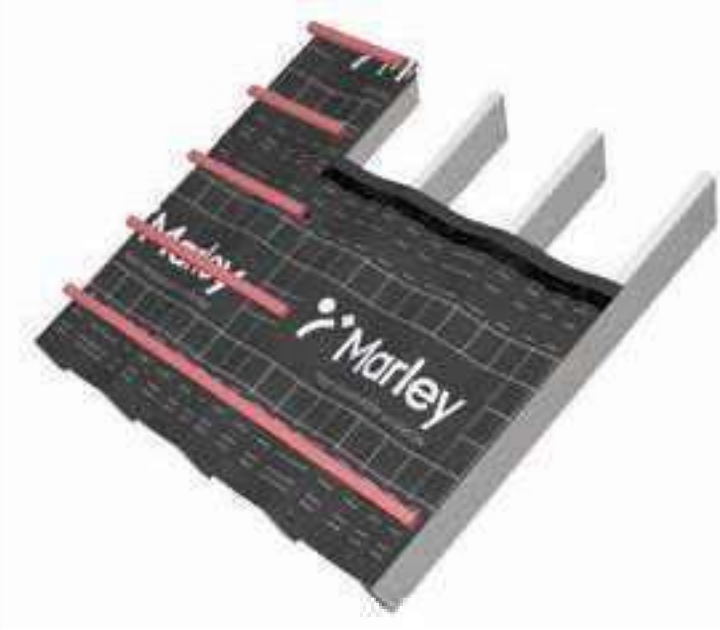
09 RIDGE VENT TERMINALS



Ridge vent and gas vent ridge vent terminals

BASE LAYERS
UNDERLAYS & BATTENS FOR ROOF SYSTEMS





UNIVERSAL VAPOUR PERMEABLE UNDERLAY

Universal vapour permeable underlay is a lightweight, high performance breathable membrane for pitched roofs. Supplied in 1m x 50m rolls with integrated tape for sealing laps, the underlay is fully compliant to BS 5534 and suitable for all UK wind zones 1-5.

Universal vapour permeable underlay is designed to integrate seamlessly within a full Marley roof system and provides an additional means of ventilation to meet the requirements of BS 5250*.

* Consideration must be given to the type of roof covering used, which will influence the ventilation requirements. For further info, please contact the Marley technical department.

BENEFITS

- Vapour permeable
- High tensile and tear strength
- Clean and easy to handle
- Durable
- UV resistant
- BBA approved – Certificate No. 16/5335
- Integrated tape for sealing laps
- Guidance lines for minimum laps
- Suitable for vertical applications

UNIVERSAL NON-BREATHABLE UNDERLAY

Universal non-breathable underlay is a lightweight, high performance membrane for pitched roofs. Supplied in 1m x 45m rolls with integrated tape for sealing laps, the underlay is fully compliant to BS 5534 and suitable for all UK wind zones 1-5.

Universal non-breathable underlay is designed to integrate seamlessly within a full Marley roof system and is suitable for roofs with traditional ventilation products or ventilated batten cavities.

BENEFITS

- Non-breathable
- High tensile and tear strength
- Clean and easy to handle
- Durable
- UV resistant
- BBA approved – Certificate No. 16/5334
- Lightweight alternative to traditional IF
- Integrated tape for sealing laps
- Guidance lines for minimum laps





JB RED

JB Red is a high quality roofing batten and the first fully pre-graded batten available to the roofing industry.

JB Red completely meets the NHBC requirements for fully graded roofing battens. Its RED colour means that it is highly visible on site, therefore Local Authority Building Control, NHBC and other inspectors can see that high quality, pre-graded and compliant battens have been used.

All JB Red has full chain of custody (FSC or PEFC) certification and is available in both 25 x 38mm and 25 x 50mm sizes.

BENEFITS

- Pre-graded to all the strength requirements of BS 5534 for roofing battens.
- Marked according to BS 5534 showing supplier name, origin/species, grade (BS 5534) and size.
- The product and process is UKAS third party assessed by the BBA with a BBA Agrèment certificate.
- JB Red is LABC registered detail and is approved for use by local authorities.
- JB Red carries full product liability insurance.
- Manufactured from slow grown, high grade timber, selected from the approved species within.
- BS 5534, typically European Redwood (PNSY) or European Whitewood (WPCA).
- Only kiln dried sideboards are used to ensure stability and dimensional accuracy.
- Treated to BS 8417 Usage Class 2, using Koppers MicroPro® with a unique Red Colour.
- Carries 60 year lifetime guarantee against insect attack and wood rotting fungi (when installed correctly in accordance with the requirements of Usage Class 2).
- Packaged in easy to handle bundles of 10.

BATTEN END CLIPS

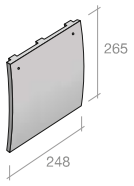
These are for use with all dry verge units. Easily fitted to the batten end, they provide easy, fast and positive fixing of dry verge units to the batten end. Compliant with BS 8612.

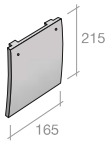
FITTINGS & ACCESSORIES
FOR CLAY PLAIN TILES

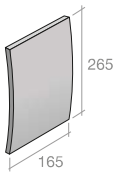
Marley manufacture a wide range of clay plain tile fittings, decorative ridges and finials. All products can be installed in line with the latest BS 5534 'Code of Practice for Slating and Tiling' and NHBC Technical Standards.

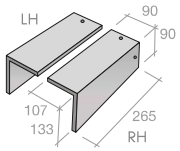
Important note: All the fittings shown on these pages can be used with clay plain tiles, but should not be used on rafter pitches below 35° with Acme double camber or Ashdowne handcrafted clay plain tiles.

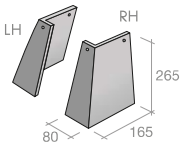
PLAIN TILE FITTINGS







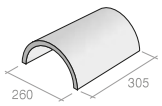


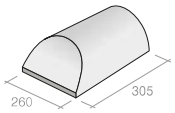


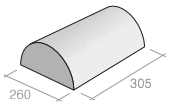
Description	Tile-and-a-half	Eaves/top tile	Creasing tiles§	Cloaked verge tiles*	external angle tiles
Angles available	n/a	n/a	n/a	n/a	90°, 135°

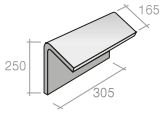
RIDGE TILES

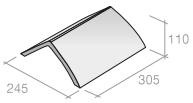
Mortar bedded security ridge kits are available (see page 59)



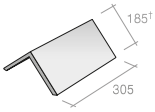


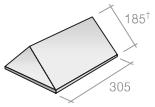


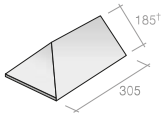


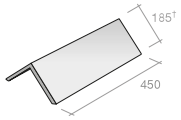


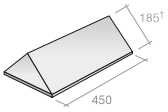
Description	Half round ridge	Half round ridge hip end*	Half round ridge stop end*	Mono ridge*	Hogs back ridge**
Angles available	n/a	n/a	130°, 135°, 145°	130°, 135°, 140°, 145°, 150°	n/a
Colours available	All colours	All colours	All colours	All colours	All colours
Pitch range	30-50°	30-50°	30-50°	30-45°	30-45°



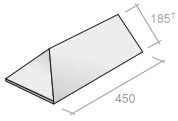


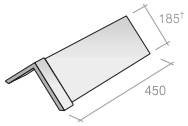


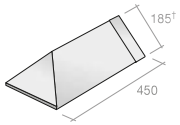


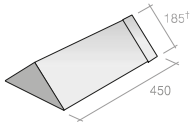


Description	305mm Angular ridge**	305mm Angular ridge stop end*	305mm Angular ridge hip end*	450mm Angular ridge	450mm Angular ridge stop end*
Angles available	90°, 105°	90°, 105°	90°, 105°	75°, 90°, 105°, 115°, 125°, 135°	75°, 90°, 105°, 115°, 125°, 135°
Colours available	All colours	All colours	All colours	Red Smooth, Slate Black	Red Smooth, Slate Black
Pitch range	See Tables 1, 3, 4, 5 & 6	See Tables 1, 3, 4, 5 & 6	See Tables 1, 3, 4, 5 & 6	See Tables 1, 3, 4, 5 & 6	See Tables 1, 3, 4, 5 & 6





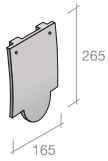


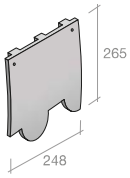


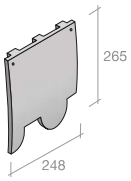
Description	450mm Angular ridge hip end*	450mm Capped angular ridge	450mm Capped angular ridge hip end	450mm Capped angular ridge stop end
Angles available	75°, 90°, 105°, 115°, 125°, 135°	75°, 90°, 105°, 115°, 125°, 135°	75°, 90°, 105°, 115°, 125°, 135°	75°, 90°, 105°, 115°, 125°, 135°
Colours available	Red Smooth, Slate Black	Red Smooth, Slate Black. Staffordshire Blue‡	Red Smooth, Slate Black. Staffordshire Blue‡	Red Smooth, Slate Black. Staffordshire Blue‡
Pitch range	See Tables 1, 3, 4, 5 & 6	See Tables 1, 3, 4, 5 & 6	See Tables 1, 3, 4, 5 & 6	See Tables 1, 3, 4, 5 & 6

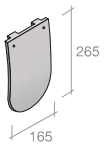
FEATURE TILES

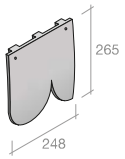
Available in a range of colours, please contact customer services for more information.

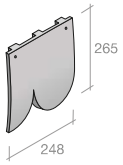








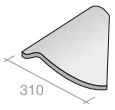


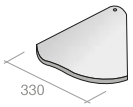


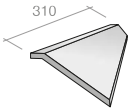
Description	Club feature tile*	RH club tile-and-a-half*	LH club tile-and-a-half*	Bullnose feature tile*	RH bullnose tile-and-a-half*	LH bullnose tile-and-a-half*

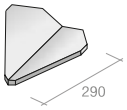
HIPS AND VALLEYS

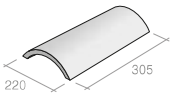
Mortar bedded security hip kits are available for third round ridges (see page 59)

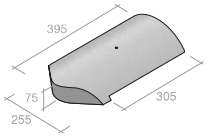












Description	Granny hip	Semi bonnet hip	Arris hip**	Valley**	Third round hip**	Third round hip end**
Angles available	n/a	n/a	130°, 135°, 145°	130°, 135°, 140°, 145°, 150°	n/a	n/a
Pitch range	40-60°	30-40°	30-45°	30-50°	30-45°	30-45°

TABLE 1

Relationship of roof pitch to internal angle of hip

Known roof pitch	internal angles of hip tile Plain tile roof	Slate roof
20-25°	–	135°
30°	145°	135°
35°	145°	125°
37.5°	140°	125°
40°	135°	115°
42.5°	135°	115°
45°	130°	115°
47.5°	127°	115°
50°	125°	105°
52.5°	120°	–
55°	120°	–
57.5°	115°	–
60°	115°	–

TABLE 2

Relationship of roof pitch to valley angle

Known roof pitch	internal angles of hip tile Plain tile roof
30°	150°
35°	150°
37.5°	145°
40°	140°
42.5°	140°
45°	135°
50°	130°

TABLE 3

Relationship of plain tile roof pitch to internal angle of ridge tiles

Known roof pitch	internal angles of ridge tile Plain tile roof
30°	115°
35°	105°
37.5°	105°
40°	105°
42.5°	90°
45°	90°
47.5°	90°
50°	90°
52.5°	75°
55°	75°
57.5°	75°
60°	75°

TABLE 4

Relationship of slate roof pitch to internal angle of ridge tiles

Known roof pitch	internal angles of ridge tile Slate roof
20-25°	125°
30°	115°
35°	105°
37.5°	90°
40°	90°
42.5°	75°
45°	75°
47.5°	75°
50°	75°

TABLE 5

Relationship of internal angle of ridge tiles to roof (plain tiles)

Known internal angle of ridge tile	Plain tile roof pitch
75°	52.5-60°
90°	42.5-52.5°
105°	30-42.5°

TABLE 6

Relationship of internal angle of ridge tiles to roof (slates)

Known internal angle of ridge tile	Slate roof pitch
75°	45-50°
90°	35-45°
105°	35°
115°	30°
125°	20-30°

* Made to order (subject to minimum order quantities)

** Some colours and angles made to order (subject to minimum order quantities)

‡ Staffordshire Blue available to order

† Angle ridge wing length will vary depending on ridge angle

§ Available in Red Smooth

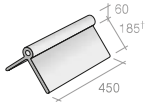
FITTINGS & ACCESSORIES
FOR CLAY PLAIN TILES

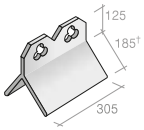
Marley manufacture a wide range of clay plain tile fittings, decorative ridges and finials. All products can be installed in line with the latest BS 5534 'Code of Practice for Slating and Tiling' and NHBC Technical Standards.

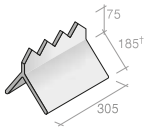
Important note: All the fittings shown on these pages can be used with clay plain tiles, but should not be used on rafter pitches below 35° with Acme double camber or Ashdowne handcrafted clay plain tiles.

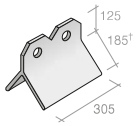
DECORATIVE RIDGES

Mortar bedded security ridge kits are available (see page 59)





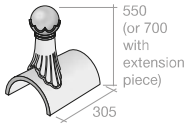


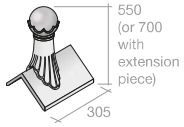


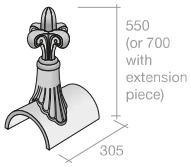
Description	Plain roll top**	Club crested ridge	Cocks comb crested ridge	Two hole crested ridge
Angles available	75°, 90°, 105°, 115°, 125°, 135°	90°, 105°	90°, 105°	90°, 105°
Colours available	Red Smooth, Slate Black	Red Smooth	Red Smooth	Red Smooth
Pitch range	See Tables 1, 3, 4, 5 & 6 (page 57)	See Tables 1, 3, 4, 5 & 6 (page 57)	See Tables 1, 3, 4, 5 & 6 (page 57)	See Tables 1, 3, 4, 5 & 6 (page 57)

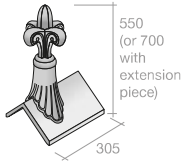
RIDGE TILES

Mortar bedded security ridge kits are available (see page 59)



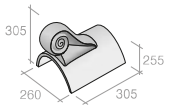


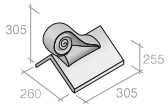






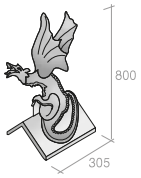
Description	Ball top finial* (half round base)	Ball top finial* (plain angle base)	Fleur-de-Lys gable* (half round base)	Fleur-de-Lys gable* (plain angle base)	Extension piece (for Ball top / Fleur-de-Lys)
Angles available	n/a	75°, 90°, 105°, 115°, 125°, 135°	n/a	75°, 90°, 105°, 115°, 125°, 135°	n/a
Colours available	All colours	Red Smooth, Slate Black (all angles) Other colours (90°, 105° angles only)	All colours	Red Smooth, Slate Black (all angles) Other colours (90°, 105° angles only)	All colours
Pitch range	30-50°	See Tables 1, 3, 4, 5 & 6 (page 57)	30-50°	See Tables 1, 3, 4, 5 & 6 (page 57)	n/a











Description	Scroll finial* (half round base)	Scroll finial* (plain angle base)	Falcon finial* (half round base)	Falcon finial* (plain angle base)	Dragon finial* (plain angle base)
Angles available	n/a	75°, 90°, 105°, 115°, 125°, 135°	n/a	75°, 90°	n/a
Colours available	All colours	Red Smooth, Slate Black (all angles) Other colours (90°, 105° angles only)	All colours	All colours	All colours
Pitch range	30-50°	See Tables 1, 3, 4, 5 & (page 57)	30-50°	See Tables 1, 3, 4, 5 & 6 (page 57)	See Tables 1, 3, 4, 5 & 6 (page 57)

* Made to order (subject to minimum order quantities)

** Some colours and angles made to order (subject to minimum order quantities)

† Angle ridge wing length will vary depending on ridge angle

SERVICES

Marley offer a full range of technical and online advice services, including NBS and fixing specifications, which will help you meet the requirements of BS 5534.

◢ Fixing specifications marley.co.uk/tilefix ◢ NBS clauses marley.co.uk/specrite

MORTAR BEDDED SECURITY FIXING

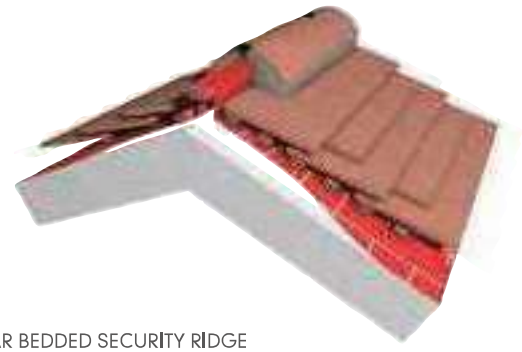
Under BS 5534, the use of mortar as a sole means of fixing roof tiles and fittings is insufficient. Not only should careful consideration be given to the creation of a suitable roof mortar through the correct sand and cement mix, but tiles or fittings bedded with this mortar must also be accompanied by a mechanical fix.



MORTAR BEDDED SECURITY HIP

Mechanical fixing system for mortar bedded ridge hip, helping house builders and contractors meet British Standards and NHBC guidelines.

Watch a quick video on mortar bedded mechanical fixing at marley.co.uk/securityhip or scan the QR code shown



MORTAR BEDDED SECURITY RIDGE

Mechanical fixing system for mortar bedded ridge ridges, helping house builders and contractors meet British Standards and NHBC guidelines.

Watch a quick video on mortar bedded mechanical fixing at marley.co.uk/securityridge or scan the QR code shown

DRY FIX SOLUTIONS

Avoiding mortar with its associated risks and maintenance will always be best practice, and the changes to BS 5534 should assist in the continued adoption of dry fix.

For a mortar and maintenance free mechanical fix, Marley also offers a range of high performance dry fix solutions, including ridge and hip systems that are able to contribute towards ventilation to meet the requirements of BS 5250.

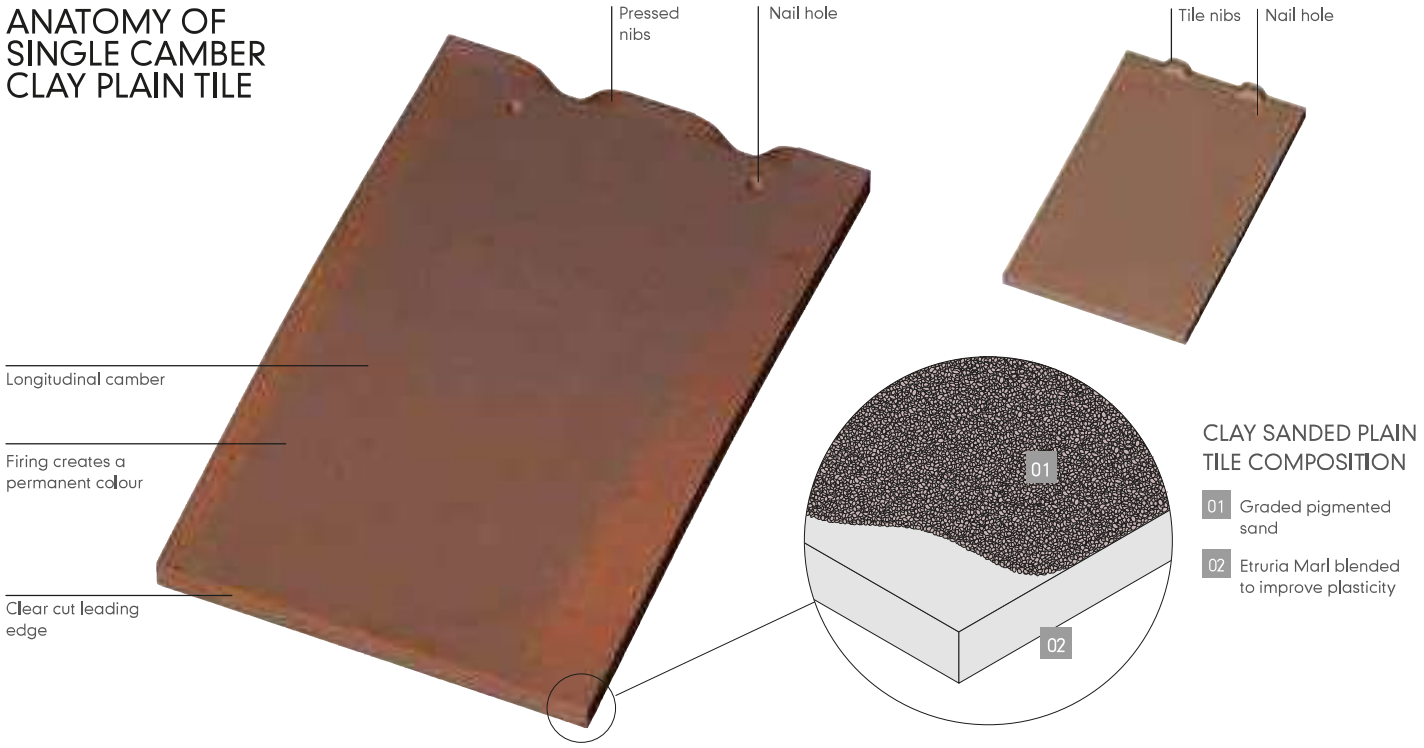


MORE ABOUT OUR DRY FIX SYSTEMS

Our website contains further information about dry fix and ventilation solutions, including the Universal range, which not only works with our roof tiles but those of other manufacturers too: www.marley.co.uk/dryfix

PROPERTIES & PERFORMANCE

ANATOMY OF SINGLE CAMBER CLAY PLAIN TILE



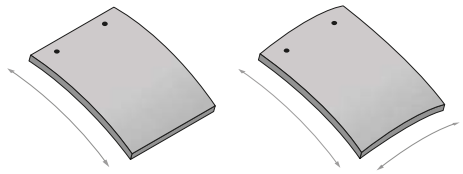
CLAY SANDED PLAIN TILE COMPOSITION

01 Graded pigmented sand

02 Etruria Marl blended to improve plasticity

FEATURES OF CLAY PLAIN TILES

- Low pitch options down to 30°
- BES 6001 Certified 'Excellent'
- Can achieve A+ in the BRE Green Guide
- Suitable for roofing or vertical tiling
- 100% recyclable



Single camber (Acme Single Camber, Hawkins, Ashdowne)

Double camber (Acme Double Camber)

AUTHORITY

Marley clay roof tiles are manufactured to BS EN 1304 'Clay roofing tiles for discontinuous laying – Product definitions and specifications', operating a quality management system meeting the requirements of BS EN ISO 9001 'Quality Management Systems – requirements'.

Additionally, the manufacturing plant operates an environmental management system, in line with BS EN ISO 14001 'Environmental management systems – Specification with guidance for use' and Health and Safety Standard OHSAS 18001.

Marley clay plain tiles are CE marked in line with the Construction Product Regulation (marley.co.uk/ce). They are also rated 'Excellent' in the BES 6001 Framework Standard for the Responsible Sourcing of Construction Products.

CARBON FOOTPRINTING

Clay plain tiles can have a carbon footprint figure as low as 27 CO_2e/m^2.

RECYCLABILITY

At end of life, clay plain tiles can be reused or crushed and used as aggregate without the need for further processing. As a natural product, no special disposal considerations are required.

BES 6001 Responsible Sourcing www.greenbooklive.com

CE

COMPOSITION AND MANUFACTURE

All Marley clay plain tiles are manufactured from high quality Staffordshire Etruria Marl, generally accepted as the finest clay for strength and durability.

Clays are carefully blended to improve plasticity and strength. The tiles are machine or hand moulded, dried and fired in gas fired tunnel kilns, using an advanced computer controlled system. This ensures that the products are made to exact tolerances in shape, size, colour and strength.

PERFORMANCE

Marley clay plain tiles are tested for resistance to wind driven rain and meet the requirements of BS 5534 'Code of practice for slating and tiling (including shingles)' with respect to wind loading, when fixed in accordance with our recommendations.

STRENGTH AND DURABILITY

Marley clay plain tiles are also extremely strong, with a transverse strength well in excess of the 600N minimum requirement in BS EN 1304.

FIRE RESISTANCE

Marley clay plain tiles are non-combustible and meet the requirements for external fire performance without the need for further testing in accordance with Class B roof of BS EN 13501-5 using data from external exposure to fire roof tests (BS 476-3) as defined in ENV 1187. There are no restrictions on their use under the Building Regulations and are designated AA in Table A5 of Appendix A, Approved Document B, 'Fire Safety'.

ENVIRONMENTAL EFFECTS

THERMAL

Unaffected by extremes of temperature. Tiles should be laid with a slight gap (1-3mm) to accommodate any movement induced by changes in temperature.

The thermal resistance (R) of Marley clay tiles when dry is $0.013m^2K/W$.

For the purpose of thermal transmittance calculations, the preceding 'R' values should be substituted by a figure of $0.12m^2K/W$ which includes the roof covering and the airspace behind the tiles or slates. An 'R' value of $0.020m^2K/W$ should be added for the roof underlay.

FROST

Unaffected by frost, and meets the requirements of BS EN 1304 Annex A when tested to EN 539-2 in accordance with national requirements.

SUNLIGHT

Clay tiles do not fade and are unaffected by prolonged exposure to UV and sunlight.

ATMOSPHERIC POLLUTION

Suitable for all rural, marine and normal industrial environments. Avoid discharge of gases or liquids from chemical processes onto the surface of the tiles. Resistant to all but the most highly polluted atmospheres, where sulphur dioxide levels exceed 70 micrograms/m^3 of air.

ELECTRICITY

Marley clay tiles are electronically insulating. Reference should be made to BS 6651 for recommendations on the protection of buildings against lightning strikes.

BIOLOGICAL EFFECTS

BIRDS AND RODENTS

Not affected or degraded by birds, rodents or insects.

MOSSES AND LICHENS

Water absorption of Marley clay plain tiles is very low, making their surface less likely to support growth of mosses and lichens, unless promoted by local environmental factors such as overhanging trees. Removal may only be required if growth is sufficient to restrict the drainage of water from the roof.

HEALTH AND SAFETY

When cutting tiles using an angle grinder, measures to reduce the effect of dust should be taken in accordance with the HSE Guidance Note EH 40 'Occupational Exposure Limits', EH 44'Dust in the workplace: general principles of protection' and HSE Guidance Note EH59/2 (Respiratory Crystalline Silica). For a copy of the Marley clay tiles COSHH datasheet, visit marley.co.uk/about/HealthandSafety

APPEARANCE

To avoid the risk of colour patching and bands of different shades, tiles should be randomly selected from at least three separate pallets from the same production batch. Ensure there are sufficient quantities of mixed tiles to complete each roof elevation.

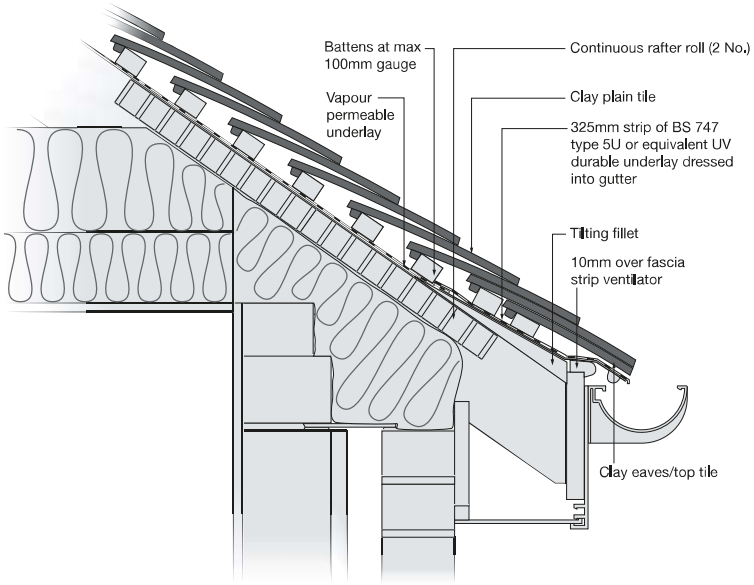
FIXING SPECIFICATION

Tiles should be fixed in accordance with the recommendations of BS 5534. The Marley Technical Advisory Service can provide a fixing specification applicable for every roof design, given the relevant criteria relating to type of roof tile, site location, topography, and building/roof dimensions. Fixing specifications can also be completed online at marley.co.uk/tilefix

DESIGN DETAILS
EAVES

UNIVERSAL EAVES VENT SYSTEM

- eaves ventilation to satisfy 10mm or 25mm conditions
- continuous rafter roll compresses insulation to allow free air passage (use two rolls to compress deep insulation)
- strip ventilator has discreet ventilation grille and is nailed to fascia or timber fillet
- suitable with or without soffit board
- mechanically fix all tiles at eaves





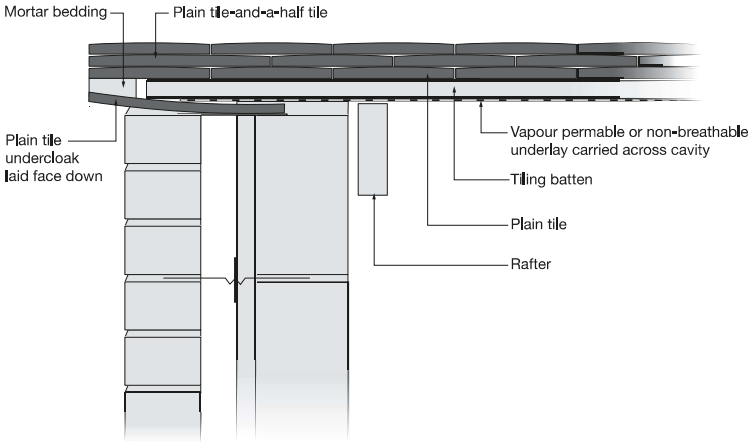
UNIVERSAL 10MM EAVES VENTILATION

- cold roof with vapour permeable underlay shown

DESIGN DETAILS
VERGES



PLAIN TILE CLOAK VERGE
- maximum pitch for duo-pitch and mono-pitch roofs is 55° (mitre top cloak verge tiles if required)
- not suitable for raking verges
- finish tiling battens flush with edge of bargeboard or brickwork
- complete verge using cloaked verge tiles
- fix all tiles with 2 No. 38mm x 2.65mm aluminium nails
- at apex of roof/verge fit block end ridge tile



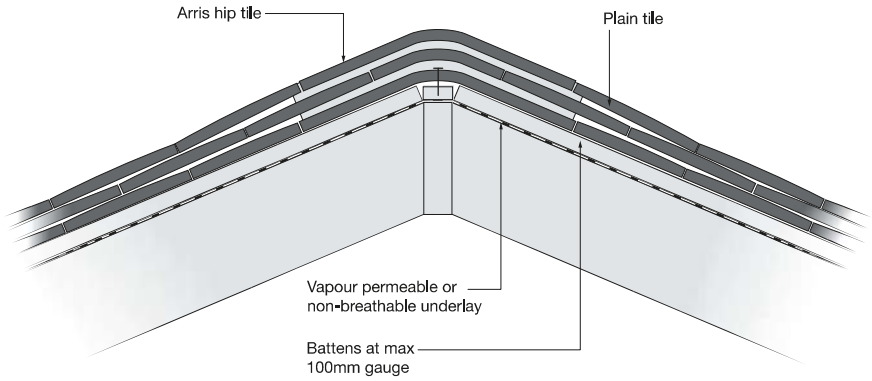
BEDDED VERGE
- form using tile and tile-and-a-half tiles in alternate courses
- use undercloak of either fibre cement laid with slope away from outer wall or plain tiles laid face down and overhanging wall
- verge overhang to be 38mm-50mm
- fully nail all tiles at verge where possible
- mortar bedding to comply with tensile board strength in BS 5534

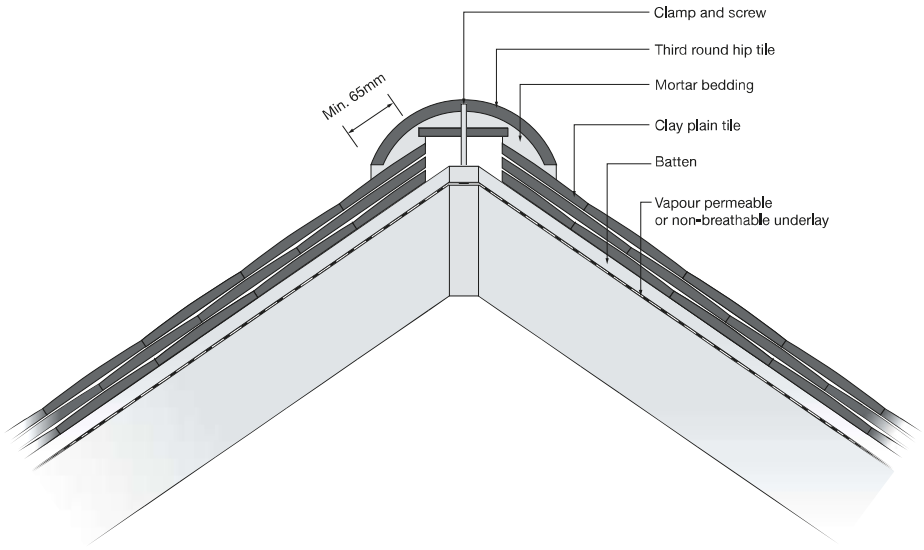
TECHNICAL TOOLKIT
Marley provides a comprehensive technical service and a range of online tools to ensure design performance and compliance to the latest Building Regulations and NHBC Technical Standards. These services include:
- Fixing specifications marley.co.uk/tilefix
- CAD details marley.co.uk/cad
- NBS clauses marley.co.uk/specrite
- BIM models marley.co.uk/bim

DESIGN DETAILS
HIPS

ARRIS HIP

- maximum rafter pitch 45°
- use on hips with plan angle of 90° and equal pitches on adjacent roof slopes
- fix to hip batten using 65mm x 3.35mm aluminium nail
- bed top of tiles with 3:1 sand/ cement mortar to BS 5534
- complete hip at ridge or top abutment with lead saddle





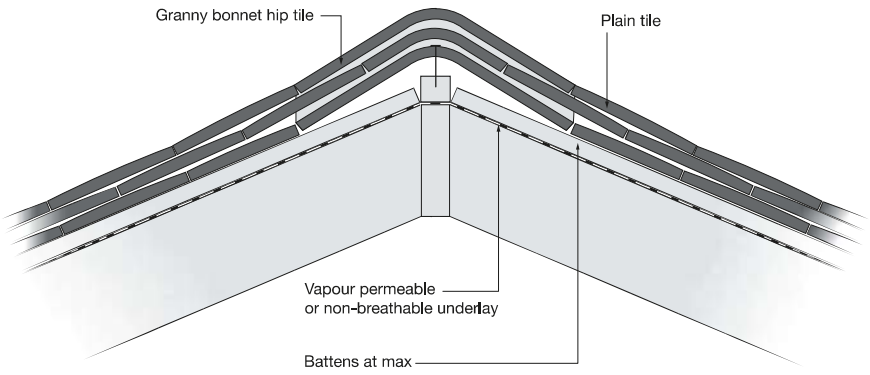
MORTAR BEDDED SECURITY HIP (MECHANICAL FIXING)

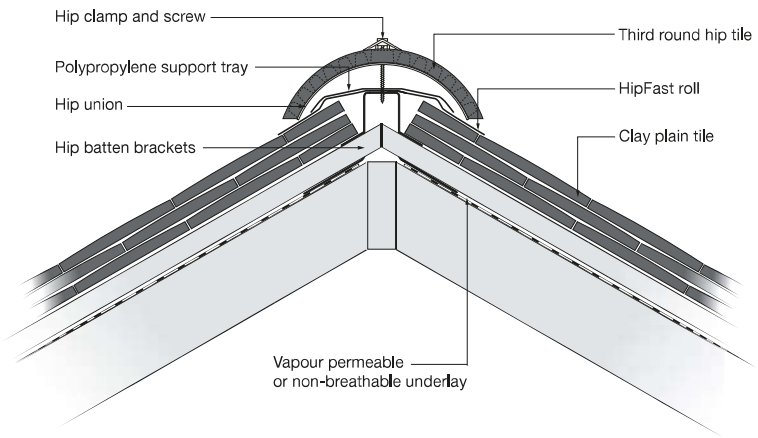
- fix galvanised hip iron at base of hip
- edge bed hip tiles onto close mitred tiles with 3:1 sand/cement mortar
- mechanically fix in line with BS 5534. Security ridge packs are available for half round and third round ridges (Code 43605)
- complete hip at ridge apex with three way mitre or half round ridge hip end

Watch a quick video on mortar bedded mechanical fixing at marley.co.uk/securityhip

GRANNY BONNET HIP

- maximum rafter pitch 60°
- use on hips with plan angle of 90° and equal pitches on adjacent roof slopes
- fix to hip batten using 70mm x 3.35mm aluminium nail
- bed and point with 3:1 sand/cement mortar to BS 5534
- complete hip at ridge or top abutment with lead saddle





UNIVERSAL HIPFAST DRY HIP SYSTEM

Provides additional ventilation to the roof void when a 5mm gap is provided in the underlay and is used in conjunction with either eaves or ridge ventilation systems, or vent tiles.

- maximum rafter pitch 60°
- provides additional ventilation to the roof void when a 5mm gap in the underlay is used in conjunction with either eaves or ridge ventilated systems or ventilation tiles
- use one or two thicknesses of 50mm x 25mm batten to fit batten brackets
- use block end hip tile at eaves
- mechanically fixes each hip tile via hip unions and clamps
- complete hip at ridge with lead soaker/ saddle

TECHNICAL TOOLKIT

Marley provides a comprehensive technical service and a range of online tools to ensure design performance and compliance to the latest Building Regulations and NHBC Technical Standards. These services include:

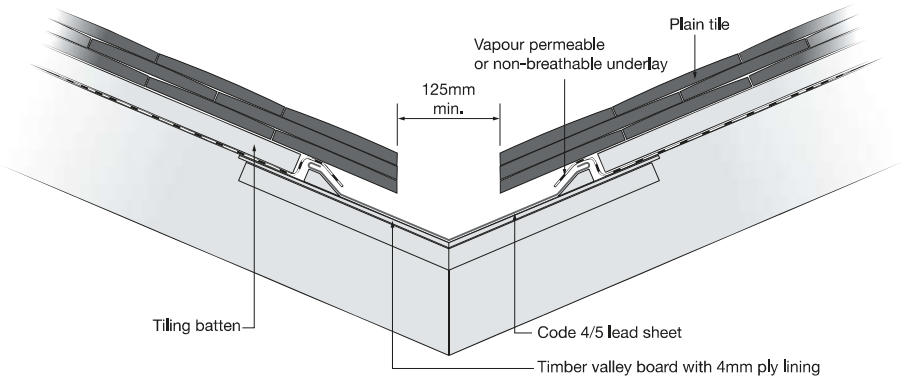
- Fixing specifications marley.co.uk/tilefix
- CAD details marley.co.uk/cad
- NBS clauses marley.co.uk/specrite
- BIM models marley.co.uk/bim

DESIGN DETAILS
VALLEYS



GRP DRY VALLEY

- maximum valley length 8m
- suitable for all plan angles and where the pitch either side of the valley varies by a maximum of 20°
- provides continuous support for valley trough using 19mm timber ply boards inset between rafters or 6mm continuous ply boards laid over rafters
- tightly butt tiles or slates to central upstand of valley units to prevent ingress of birds or vermin
- provide metal apron at foot of valley and dress into gutter at eaves. For rafter pitches below 25° cut fascia board to maintain valley pitch
- nail or clip adjacent tiles to the valley and avoid small cuts by using half tiles as penultimate tile to valley. Fix smaller cut tiles with secret cut tile clips
- complete top of valley with a lead saddle



SHEET METAL VALLEY

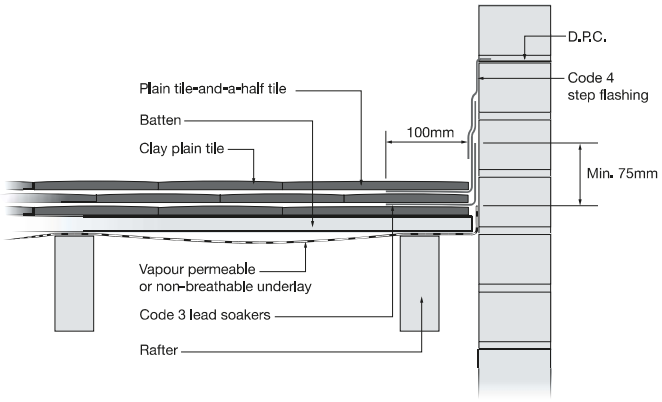
- minimum rafter pitch 35°
- suitable for all plan angles and where the pitch either side of the valley varies
- provide continuous support for metal valley lining using timber lay boards inset between rafters with 4mm ply lining board over
- form 125mm minimum gap between raking cut tiles
- carry metal lining into gutter at eaves
- use tile-and-a-half tiles to minimise small cut tiles
- nail all adjacent tiles to the valley
- complete top of valley with a lead saddle

DESIGN DETAILS
VALLEYS & ABUTMENT



PURPOSE MADE VALLEY TILES
Suitable for all clay plain tiles. Vapour permeable underlay shown.

- a range of valley tiles are available to suit 30-50° roof pitches
- suitable for a plan angle of 90° only and equal pitches either side of the valley
- provide continuous support for valley tile using timber lay boards of battens inset between rafters
- use tile-and-a-half tiles adjacent to valley tile to avoid small cuts
- complete top of valley with a lead saddle



SIDE ABUTMENT
- bring tiles as close to abutment as possible
- use Code 3 lead soakers or Marley GRP soakers and Code 4 lead cover flashing

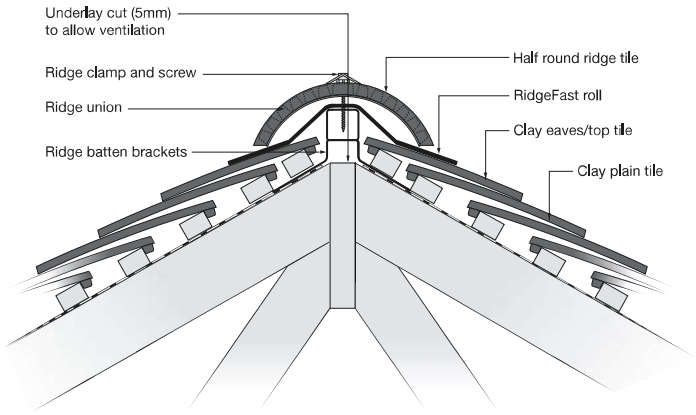
TECHNICAL TOOLKIT
Marley provides a comprehensive technical service and a range of online tools to ensure design performance and compliance to the latest Building Regulations and NHBC Technical Standards. These services include:

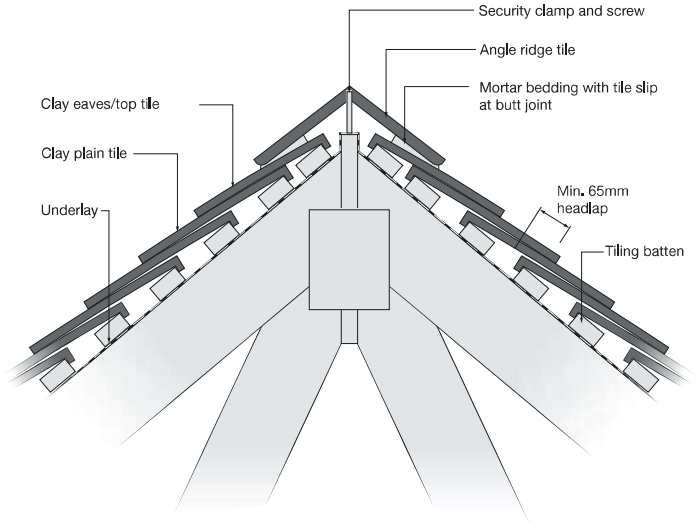
- Fixing specifications marley.co.uk/tilefix
- CAD details marley.co.uk/cad
- NBS clauses marley.co.uk/specrite
- BIM models marley.co.uk/bim

DESIGN DETAILS
RIDGES

UNIVERSAL RIDGEFAST DRY RIDGE SYSTEM

- maximum rafter pitch 60°
- provides 5,000mm²/m free vent area at ridge apex
- ensure gap is provided in roof underlay to vent roof void
- use one or two thicknesses of 50mm x 25mm batten to fit batten brackets
- mechanically fix all top course tiles
- use block end ridge tile at ridge end





MORTAR BEDDED SECURITY RIDGE (MECHANICAL FIXING)

- mechanically fix ridge tile in line with BS 5534 fixing guidelines
- security ridge packs are available for all angle, half round, third round, hog's back and decorative ridge tiles, exceot Roll Top ridges (Code 43605)

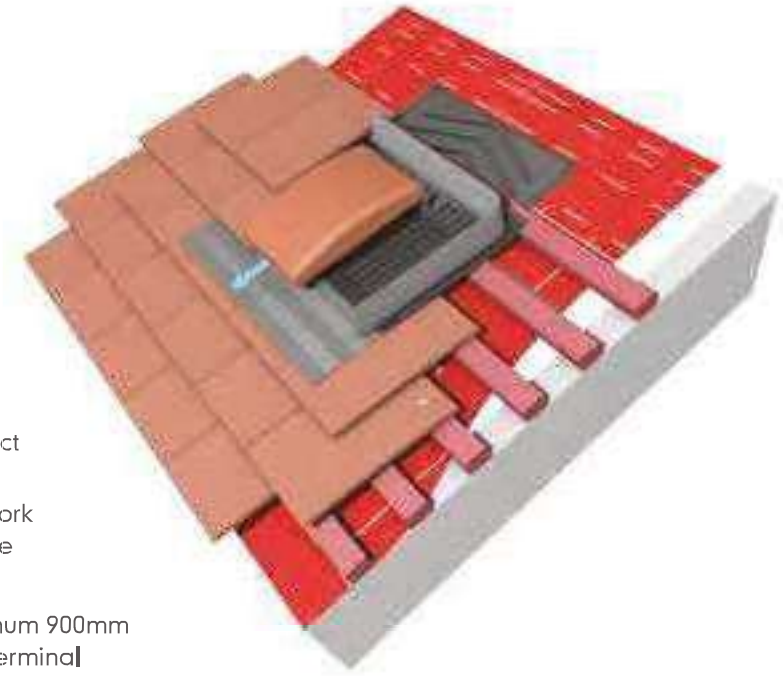
Watch a quick video on mortar bedded mechanical fixing at marley.co.uk/securityridge

TECHNICAL TOOLKIT

Marley provides a comprehensive technical service and a range of online tools to ensure design performance and compliance to the latest Building Regulations and NHBC Technical Standards. These services include:

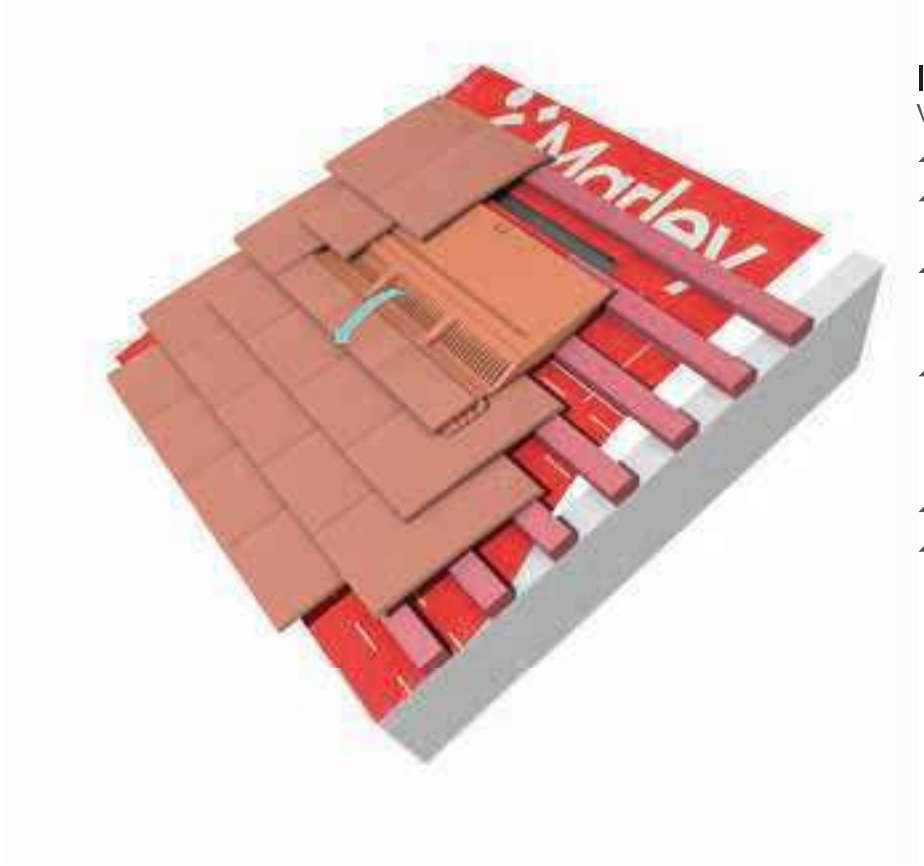
- Fixing specifications marley.co.uk/tilefix
- CAD details marley.co.uk/cad
- NBS clauses marley.co.uk/specrite
- BIM models marley.co.uk/bim

DESIGN DETAILS
ROOF SLOPES



UNIVERSAL PLAIN TILE VENT TERMINAL
Vapour permeable underlay shown.

- locate clear of rafters
- use soaker tray to weather hole in underlay
- locate at 2.0m centres for 5,000mm²/lin.m ventilation and 1.0m centres for 10,000mm²/lin.m ventilation
- suitable for roof space ventilation, mechanical extract and soil vent pipe
- use flexible pipe for connection to 110mm dia. pipework as termination to mechanical extract or soil vent pipe
- do not use as exhaust for hot flue gases
- when used as extract for soil vent pipes, keep minimum 900mm above any opening into building within 3m of vent terminal



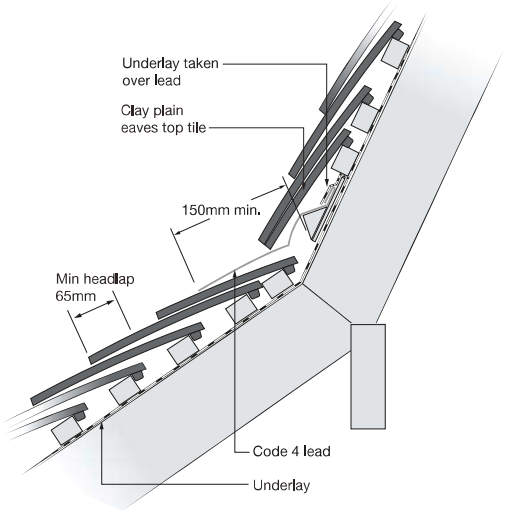
IN-LINE CLAY TILE VENT TERMINAL
Vapour permeable underlay shown.

- locate clear of rafters
- use soaker tray to weather hole in underlay for spigot
- locate at 1.5m centres for 5,000mm²/lin.m ventilation and 0.75m centres for 10,000mm²/lin.m ventilation
- use tile vent adaptor and flexible pipe for connection to 110mm dia. pipework as termination to mechanical extract or soil vent pipe
- do not use as exhaust for hot flue gases
- when used as extract for soil vent pipes, keep minimum 900mm above any opening into building within 3m of vent terminal

DESIGN DETAILS
OTHER CONSTRUCTIONS

CHANGE OF PITCH

- provide timber layboard and fillet for lead flashing
- maintain continuous lap of underlay at junction of two pitches
- extend upper course of tiles over lead to conceal flashing
- allow minimum 150mm lap of flashing onto lower course of tiles





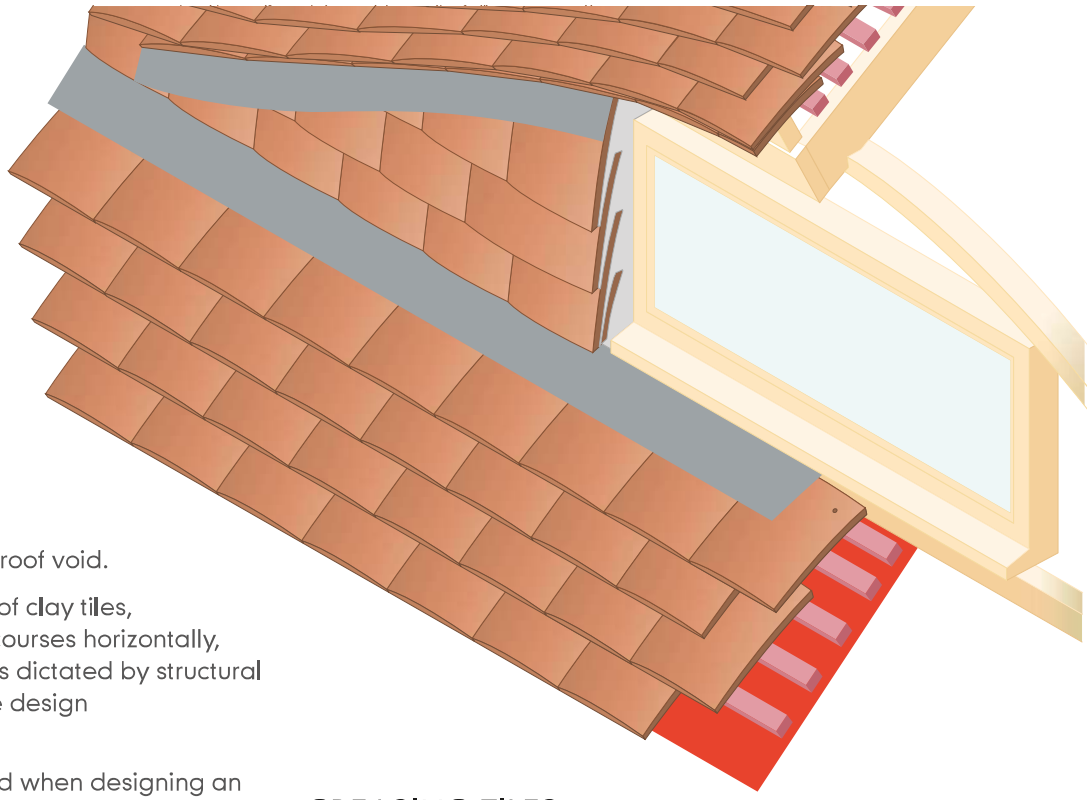
CURVED AND CONICAL ROOFS

Curved roofs can be designed with either horizontal or vertical curves, or a combination of both to form a dome. Double-lap clay plain tiles are the most suitable covering as they are relatively thin and are easily tapered to accommodate the radius of the roof. Designers should, however, be aware of the limitations of using tiles on curved roofs, as the shape and pitch may compromise their function as a weatherproof roof covering. In these circumstances, the tiles are decorative and a suitable weatherproof sub-roof should be provided.

Conical roofs can be formed as a complete circle on plan, as in the case of a turret or can also be segmental as in an apse end.

The following points should be considered when designing a curved or conical roof:

- maintain a steep roof pitch – 55° and above. (At pitches below this, extensive use of tile-and-a-half tiles may be required to maintain the necessary side laps below).
- consider the maximum and minimum radii of the curve – this will dictate the available taper in the tile and the side-lap that can be achieved. Plain tiles require a minimum side lap of 55mm (35-55° rafter pitch), and 45mm (56° rafter pitch and over) in moderate exposure.
- keep spacing of the rafters at 450mm or less.
- provide two or three layers of plywood (min. thickness 4.5mm) or softwood boards (min. thickness 15mm) with counter layers laid diagonally around radius of the roof as groundwork for battens or for direct nailing of tiles.



EYEBROW DORMERS

This form of curved roof using clay tiles has been derived from thatched roofs, where the thatch was swept over dormer windows providing daylight to the habitable roof void.

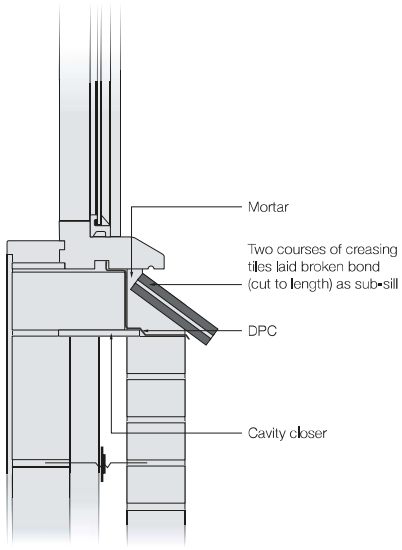
When designed for the application of clay tiles, they have the effect of parting the courses horizontally, but the final shape of the eyebrow is dictated by structural considerations and the ability of the design to be weathertight.

The following points should be noted when designing an eyebrow dormer:

- best formed in roofs of 55° pitch or above
- pitch of eyebrow should not be less than 35° in moderate exposure
- the transition curve of the eave should be as smooth as possible with the actual span of the total transition not more than 10 units for each unit of height of the window opening (measured from top tile below to the eaves tile at the centre of the eyebrow)
- the two central rafters should intersect with the roof slope a minimum of 1m down from the ridge
- use metal soakers with tiles on the eyebrow where the roof pitch is below 55°
- the bond of the tiles should be set out from the two sides towards the centre to give an increased side lap on the lower side
- provide special groundwork for the battens, which should be scarfed to fit the swept profile of the roof timbers
- allow at least 900mm of regular tiling to follow from the sweep of the eyebrow

CREASING TILES

Creasing tiles are nibless clay plain tiles and can be used for cappings or copings to walls and sills. Their decorative and crisp lines can also be used in corbelling, arches, chimneys and decorative quoins and their weatherproof properties make them ideal for use in free-standing walls and parapets. Available in Red Smooth.

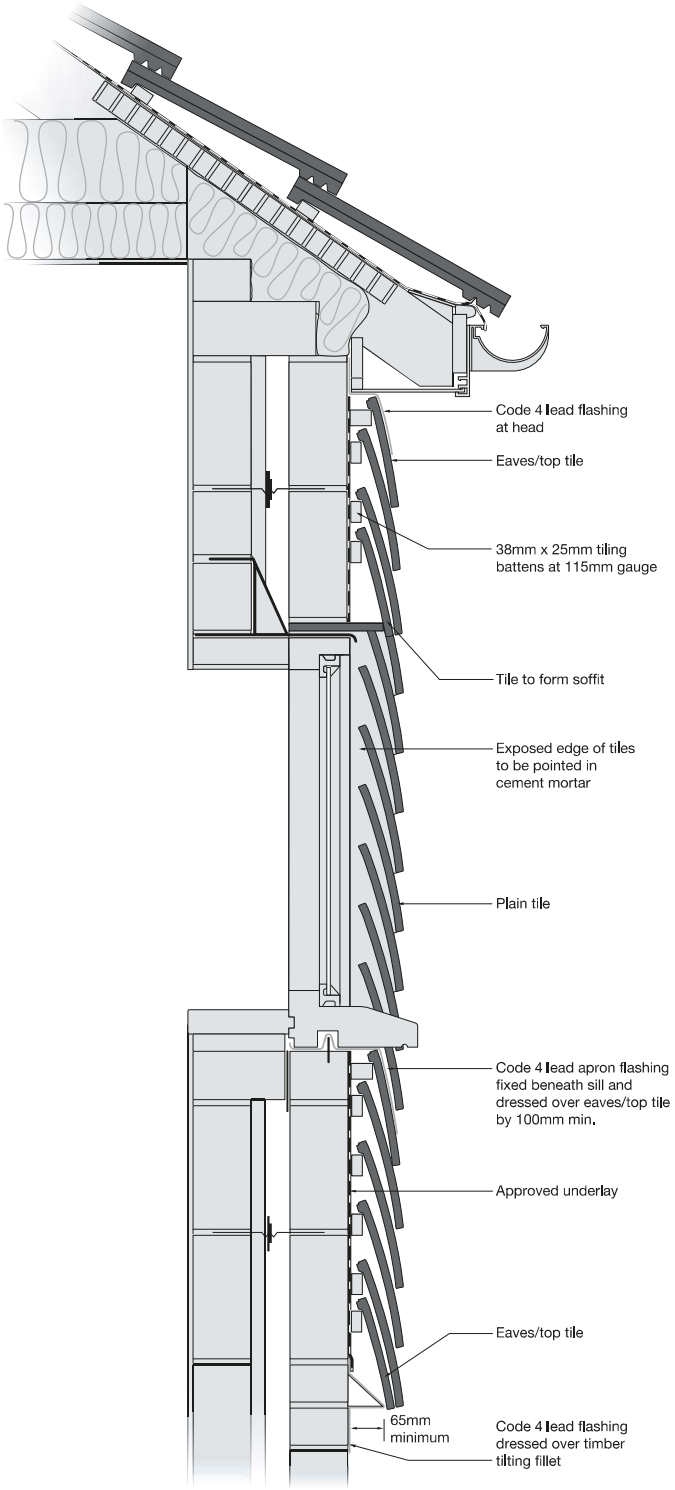


DESIGN DETAILS
OTHER CONSTRUCTIONS

VERTICAL TILING

Clay plain tiling is an excellent weatherproof and attractive cladding to the vertical walls of any building. Feature and ornamental tiles may also be used with clay plain tiles to create decorative patterns.

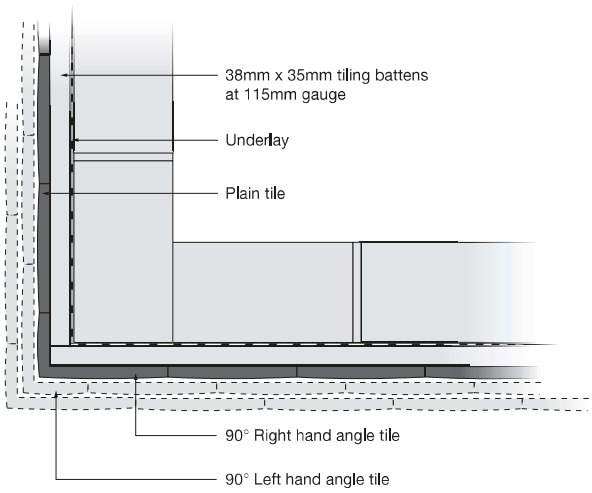
- use counter battens over masonry construction (38mm x 25mm minimum) to reduce direct fixing. Special masonry fixings may be required
- ensure tiling details do not interfere with the opening of windows and doors
- lead flashings and soakers should be used around openings in accordance with Lead Sheet Association details
- use double course of tiles at eaves, by laying first course of eaves/tops tiles with course of full tiles over
- at top of wall or under a sill, use a course of eaves/tops tile laid over a course of full tiles. Dress a Code 4 lead cover flashing over by 100mm
- use internal and external angle tiles at all 90° corners. Purpose made 135° angle tiles are also available. For other angles, close mitre tiles and use Code 3 lead soakers
- all tiles should be twice nailed



90° EXTERNAL ANGLE TILES

Vertical angle tiles are available in left and right handed formats to fit 90° and 135° angle external corners of wall elements and are designed to bond with standard plain tiles. The following guidance notes apply to this detail:

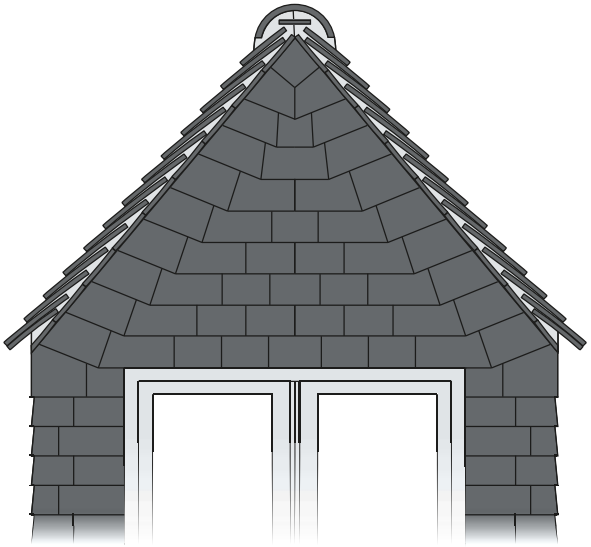
- counter battens, where used, should be fixed 20mm in from the end of the tiling battens at the corner, to prevent the end nail or screw fixing from splitting the tile batten
- cut ends of the tiling battens should be alternated to coincide with the short leg of the external angle tiles
- fix left and right handed external angle tiles in alternate courses up the external corner to fit with the adjacent standard plain tiles
- avoid cutting the angle tiles to fit with the adjacent tiles
- secure each vertical angle tile by twice nailing



WINCHESTER CUT

This gable end detail avoids the use of small triangular pieces of tile by providing a secure fixing of a tile-and-a-half against the rake of the gable.

- best suited for roof pitches of 40° and above
- fix batten parallel with rake of verge and level with vertical tiling battens
- use tile-and-a-half at end of each course and cut to rake (all tiles should be of uniform cut)
- cut adjacent tile to raking cut tile-and-a-half
- use Code 3 lead soakers (200mm x 200mm) where side laps are less than 55mm
- at apex use a tile-and-a-half turned through 45° and cut to shape



TECHNICAL TOOLKIT

Marley provides a comprehensive technical service and a range of online tools to ensure design performance and compliance to the latest Building Regulations and NHBC Technical Standards. These services include:

- Fixing specifications marley.co.uk/tilefix
- CAD details marley.co.uk/cad
- NBS clauses marley.co.uk/specrite
- BIM models marley.co.uk/bim

Here to help

Getting our knowledge to you and your project smoothly and efficiently

CUSTOMER SERVICES

Marley is committed to providing outstanding customer care and is staffed by experienced personnel: Tel 01283 722588 or e-mail info@marley.co.uk

To find your nearest stockist, please visit: marley.co.uk/stockists

TECHNICAL ADVISORY SERVICE

Specifiers require prompt, knowledgeable and detailed responses to a vast range of enquiries covering everything from the embodied energy of a typical roof tile, to the different ventilation options available.

Our Technical Advisory Service is staffed by a qualified team with specialist knowledge not only of all Marley products, but also crucially, how those systems integrate with other roofing components and comply with Building Regulations, Health and Safety, environmental and other critical roofing criteria.

Tel 01283 722588, E-mail info@marley.co.uk or visit marley.co.uk/resources

ACTING RESPONSIBLY AND DELIVERING SUSTAINABLE QUALITY

BES 6001

Demonstrating our commitment to sustainable building, all our roofing products are certified under the BES 6001 standard for responsible sourcing and therefore contribute to extra credits under BREEAM and The Code for Sustainable Homes.

QUALITY STANDARD

All our factories in the UK are ISO 9001, 14001 and ISO OHSAS 18001 accredited. They achieve the highest standards in quality, health & safety and the environment.

CE MARKING

All of our products covered by EN Standard carry an appropriate CE Mark. This means that our products meet the required safety standards and have a guaranteed level of quality.

TOOLS

Tools and assets that make design and specification as straightforward as possible.

SPECRITE

Produce instant NBS clauses that meet the recommendations of British Standards and Codes of Practice: marley.co.uk/specrite

TILEFIX

Tool to create fixing specifications based on the geographical location and building dimensions of specific roofing projects: marley.co.uk/tilefix

ROOFING ESTIMATOR

Create a complete bill of materials for your project based on a wide range of building and roof types: marley.co.uk/estimator

BIM

BIM Space is a set of free-to-download Building Information Modelling (BIM) objects that provide a standard range of build ups for all of our products: marley.co.uk/bim

CAD DETAILS

Access to over 2,000 CAD drawings illustrating how specific tile and slate details can be formed: marley.co.uk/cad

ROOF SYSTEM SELECTOR

Easy-to-use and comprehensive system finder delivering results from choice of pitch, material or tile type: marley.co.uk/productselector

RESOURCES AND TRAINING

SAMPLES

Samples of clay and concrete interlocking and plain tiles are available on request.
Call 01283 722588 or visit marley.co.uk/samples

FIXING INSTRUCTIONS AND LITERATURE

Comprehensive sitework, fixing and installation literature and videos: marley.co.uk/resources
All current product and technical literature can be downloaded: marley.co.uk/downloads

CPDS

A range of Continuous Professional Development roofing seminars accredited by the RIBA CPD Certification Service. For more information or to make a booking: marley.co.uk/cpd

TRAINING

Theoretical, practical, engaging and informative training available at three locations nationwide.
marley.co.uk/training

This publication is based on the latest data available at the time of printing. Due to product changes, improvements and other factors, the Company reserves the right to change or withdraw information contained herein without prior notice. For specific applications users should refer to the Technical Advisory Service and relevant Standards and Codes of Practice for guidance. The photography shown in the document should not necessarily be taken as recommendations of good practice. The printing process restricts the exact representation of colours. For true colour reference, please request product samples.

Tell me more

Call 01283 722588
Email info@marley.co.uk
Or visit marley.co.uk

Marley, Lichfield Road, Branston, Burton upon Trent, DE14 3HD

WARMCEL®
Insulation For Timber Frame

TECHNICAL DATA SHEET

PRODUCT CHARACTERISTICS

Warmcel® is a unique thermal and acoustic insulation, made using a natural cellulose fibre base. The cellulose insulation raw material is recycled newsprint, which is shredded, milled an impregnated with mineral additives (Boric Acid and Magnesium Sulphate). The product is unattractive to vermin and small organisms and is resistant to mould and mildew. Mineral fire retardants are add to the product in order to provide excellent reaction to fire performance. The advantage is natural ability to balance moisture and to accumulate heat at a much greater extent than synthetically made insulation.

USE, APPLICATION

Warmcel® is designed for thermal and acoustic insulation in both external and internal building element structures - pitched roofs, attics, ceilings, floors between joists or beams, partition walls, ceilings and others.
Installation is carried out by using blowing machines (dry application or by spraying). Dry insulation application is possible by open blowing (e.g. lofts) or, more commonly by injection filling into prepared cavity walls, roofs or ceilings. The system enables penetrate very easily into the smallest corners and hence provides a fall fill installation without any air gaps. Blowing technology ensures quick and easy work. When using the open blowing application is necessary to apply a settlement value of about 10% - 15% (install the product at 10-15% increased depth in order to meet a target settled U value). For dry cavity injection, the manufacturer installation instructions regarding minimum required density should be followed, in order to avoid any settlement.
The damp spray technique can be applied to internal and external wall structures using a fine mist of moisture or glue. For horizontal application the damp spray technique can be used in combination with a suitable glue only.

Density ranges for dry cellulose insulation application:
- open blowing in horizontal surfaces: 30 – 48 kg/m^3
- volume filling in horizontal, pitched or vertical structures: 34 - 70 kg/m^3

Volume spray density:
- when spraying with glue: 45 - 90 kg/m^3
- when spraying with water: 38 - 50 kg/m^3

PACKIGING, TRANSPORT, STORAGE

Warmcel® is packed in PE bags and can be stacked on EUR pallets, UK (industrial) pallets or freely on dry ground in a covered warehouse. For hassle-free transportation, EU or UK pallets are recommended, wrapped by a stretch film. Thermal insulating material is original labeled from the manufacturer with identification data.
The product must be transported in covered vehicles in order to protect from weathering effects.
The product is stored in covered storage areas protected from the weather and from heat sources with temperatures above 80°C. Packaging insulator is not waterproof. When stored outdoors, this fact stated in the order. Delivery for this purpose is possible only on pallets and the pallets are covered by special packaging in the production process. This packaging can be left outdoors for 3 months (UV stabilization bag period) on an elevated site from flooding pallets.

ADVANTAGES

- *excellent thermal insulation properties ($\lambda_{D(23/50)}$ = 0. 038 W·m^{-1}·K^{-1})*
- *significant improvement in building acoustics*
- *high value of specific heat capacity of material (Cd =2020 ± 6 % J/kg.K)*
- *improving of accumulated properties a reducing the room temperature in summer*
- *low diffusion resistance allowing the realization of structures with open-diffusion construction*
- *perfect completion of all construction details*
- *good fire parameters*
- *resistance to fungi, mold, rodents and insects*
- *application thicknesses in the range from 1 to 100 cm*
- *environmentally friendly product (trademark since 1994)*

DIMENSIONS

Trade Mark	Weight (kg)
Warmcel ®	10 / 12 / 12.5

TECHNICAL PARAMETERS

Parameter	Measured Value	Unit	Harmonized Technical Specification
THERMAL PROPERTIES			
Thermal conductivity $\lambda_{D(23/50)}$ - dry injection/dry open blowing	0,038[i]	W·m^{-1}·K^{-1}	EN 12667, EN ISO 10456
Thermal conductivity factor λ - spraying with moisture (binding agent)	0,039 (0,042)	W·m^{-1}·K^{-1}	
Specific heat capacity c_d	2020 ± 6%	J·kg^{-1}·K^{-1}	EN ISO 8990, EN 675
PHYSICAL PROPERTIES			
Volume weight	30-90[ii]	kg·m^{-3}	EN 1602
Settling rate (open blowing on horizontal surface)	≤10 - 15	%	-
Settling rate (volume filling – ceilings, roofs, partitions)	undetectable (≤1)	%	-
FIRE PROPERTIES			
Reaction to fire – dry material	C-s1, d0	-	CSN EN 13501-1
Reaction to fire – dry material in the cavity under specified conditions	B-s1, d0	-	
Reaction to fire – spraying with the Karsil E01 binding agent	B-s1, d0	-	
Reaction to fire – spraying with the Sokrat 2802A binding agent	D-s2, d0	-	
Flame spread index i_s	0,00	mm·min^{-1}	CSN 73 0863
Maximum used temperature	80 (105 for short time)	°C	-
OTHER PROPERTIES			
Diffusion resistance factor μ	1,1-3[ii]	-	CSN EN 12086

[i] Declared lambda 90/90 value given for the mean temperature of 10°C and moisture content equal to the moisture of the material in the equilibrium state at 23°C and the relative humidity of 50%

[ii] Based on the method of application for various structures and their inclination.

November 21, 2016 Based on information valid at the time of publishing. The manufacturer reserves the right to change the given data.

CIUR a.s.
Pražská 1012, 250 01 Brandýs nad Labem
Tel.: +420 326 901 411, Fax: +420 326 901 456
E-mail: info@ciur.cz , www.ciur.cz , www.climatizer.com

Historic value

Hemp fibre has been used throughout history for durable applications such as, ropes, sails and clothing. Even today, ships still use hemp in sails and rigging around the world due to its strength and natural resistance to mildew and weathering.

The hemp fibre used at Black Mountain Natuhemp is incredibly resilient, with an ability to buffer moisture, regulate thermal performance and retain its structural rigidity – making hemp an ideal natural insulator.

True sustainability

Hemp fibre is a biodegradable, non-toxic fibre. The organic hemp fibres used at Black Mountain are derived from waste straw left at the end of the hemp seed harvest. Annually, the growth rate and versatility of this agricultural crop means that hemp insulation is truly sustainable and will flourish in diverse conditions.

Hemp needs little water to grow and thus does not require artificial irrigation – an important factor for many areas where water shortages regularly occur.

Hemp is also a natural weed suppressor due to the speed at which the plant grows. It can be grown without the use of herbicides and other chemical pesticides – a condition rare in agriculture today. Hemp is also used as a 'break' crop between other crop rotations thus allowing the soil to regain the nutrients necessary to produce healthy cereal crops. Black Mountain hemp insulation has a 95% natural fibre content – one of the highest available on the market today. This high natural content enables the product to achieve the maximum natural performance and provide the maximum benefit to the end user.

Carbon footprint

During its growth stage, hemp will lock away up to two tonnes of CO_2 per tonne of fibre harvested, combating the effects of global warming. The CO_2 will remain stored in the hemp fibre throughout the life of the product. Black Mountain use up to 90% less manufacturing energy compared to alternative insulation products. At the end of a building's life, the hemp fibre is biodegradable or it can be incinerated to provide further energy.

Overall the product will lock up more CO_2 than was emitted during production – which has a significant positive impact on the environment.

Moisture permeability

Condensation is a fundamental problem facing many architects today. A lack of 'breathability' in building materials can lead to structural damage, e.g. wood rot and health issues as a result of damp and mould.

Hemp can absorb up to 20% of its weight in moisture without any deterioration in its thermal performance, whilst some man-made insulations will deteriorate significantly. Natuhemp also acts as a 'moisture buffer' by absorbing sudden influxes of condensation and allowing it to evaporate at a more gradual rate. This ability to regulate moisture makes hemp insulation an ideal product for use in timber frame structures as it is able to draw out moisture and keep the frame conditioned.

Black Mountain Natuhemp superior moisture performance is achieved through our high natural fibre content.

Thermal Performance

The thermal conductivity of hemp insulation is 0.039 W/m°K. Low conductivity levels make hemp an excellent insulator. Natural insulations also have a higher thermal mass which enables them to not only retain heat but also regulate thermal performance for an optimum indoor environment. This allows buildings to stay warmer in winter and offers some protection against overheating in the summer – a unique attribute particularly relevant to buildings with warm lofts.

Durability

The greater strength of hemp fibres, together with the high natural fibre content of Black Mountain insulation, means that our product maintains a semi-rigid structure and is more resistant to slumping. These characteristics make Black Mountain hemp insulation an ideal solution for warm lofts and timber frame walls. Some insulations are known to compact over time resulting in a significant loss of performance. Hemp fibres have a natural resilience that enables them to maintain their structure.

The ability of Black Mountain hemp insulation to resist compaction from human disturbance ensures the energy efficiency of the building is retained throughout its life.

Greener alternative

Black Mountain has a dedicated natural insulation factory in the UK, which is one of the most modern in Europe achieving one of the lowest energy consumption. Many companies claim their products save the energy consumed in their manufacture – however, this is true for all insulation products.

Natuhemp insulation uses very little energy in its manufacture; it is a carbon negative product. During its growth stage it will lock up significantly more carbon than is produced in the manufacturing process. Truly sustainable products require minimal energy to manufacture.

Black Mountain Natuhemp insulation is one of the most innovative, technically superior and environmentally sensitive natural insulation products available on the market today.

Fire standards

Black Mountain hemp insulation achieves a fire performance rating of Euro Class E which ensures that the material is flame retardant.

All our hemp is treated with a non-toxic chemical compound to make it fire safe. This means that the product will not cause or exacerbate a fire.

Installation & application

All our insulation products are safe to install without protective clothing and are easy to cut to fit any size or shape. Hemp insulation is resilient yet flexible and ideal for use in confined spaces. This ease of use makes the installation process faster and more efficient. Black Mountain hemp insulation is ideally suited to timber frame structures and can be applied to:

- Lofts
- Rafters
- Walls
- Inter-floor

Widths & Dimensions

Older properties generally fail to meet current new-build dimensions. Therefore the resizing required for an exact fit is usually time consuming and produces a substantial amount of waste material.

Black Mountain provides a bespoke sizing service for larger projects – minimising installation time, eliminating waste material and reducing overall cost.

We reserve the right to make alterations to our technical specifications and literature content at any time.

England/Wales	Approved Document L1, L2 – Table 1
Scotland	Technical Standard Table J23
Northern Ireland	Technical Booklet F –Table 1.2/1.4

Performance & Technical Standards

Fire	BS 5803-4:1985 Euro Class E
Condensation	BS 5250: 1989
Thermal Conductivity	0.039 W/m°K
Density	30 kg m³
ODP*	Zero
GWP*	Zero

GET A QUOTE FOR NATURAL INSULATION

PASSIVE SOLUTIONS TO INDOOR AIR QUALITY

FOR TRADITIONAL AND PERIOD PROPERTIES

FREQUENTLY ASKED QUESTIONS

INSTALLATION GUIDE

NATUWOOL
NATURAL SHEEP WOOL INSULATION

NATUHEMP
NATURAL HEMP INSULATION

Contact our sales team on 01745 361911

COPYRIGHT NOTICE (HTTPS://WWW.BLACKMOUNTAININSULATION.COM/LEGAL/COPYRIGHT-NOTICE) COOKIE POLICY (HTTPS://WWW.BLACKMOUNTAININSULATION.COM/LEGAL/COOKIE-POLICY)
PRIVACY POLICY (HTTPS://WWW.BLACKMOUNTAININSULATION.COM/LEGAL/PRIVACY-POLICY) SITEMAP (HTTPS://WWW.BLACKMOUNTAININSULATION.COM/SITEMAP)
TERMS OF USE (HTTPS://WWW.BLACKMOUNTAININSULATION.COM/LEGAL/TERMS-OF-USE)

TWITTER (HTTPS://TWITTER.COM/_BLACKMOUNTAIN) FLICKR (HTTP://WWW.FLICKR.COM/PEOPLE/BLACKMOUNTAININSULATION/)

© Black Mountain Insulation Limited 2020
SITE BY RUBBER DUCKIEE (HTTPS://WWW.RUBBERDUCKIEE.COM/WORK/BLACK-MOUNTAIN-INSULATION)

U-value calculation
by BRE U-value Calculator version 2.03
Printed on 02 Feb 2020 at 15:29

Filename: C:\Users\44776\Documents\Uni 2nd year\ACBA5010 BIM Sustainable buildings\Sustainability submission ACBA5010 part 1\Sumbimission paperwork\Sustainability project wall u-value.uva (File saved: 02 Feb 2020 15:28)

Element type: Wall - Timber framed - insulation between studs
Calculation Method: BS EN ISO 6946

Sustainability project wall

Layer	d (mm)	λ layer	λ bridge	Fraction	R layer	R bridge	Description
					0.130		Rsi
1	3	0.400			0.007		Gypsum plaster (1000 kg/m³)
2	12.5	0.210			0.060		Plasterboard
3							Vapour control layer
4	200	0.039			5.128		insulation / timber frame
5	18	0.130			0.138		OSB
6							Breather membrane
7	50	R-value			0.180		Cavity unventilated
8	103	0.770	0.940	0.190	0.134	0.110	Brick outer leaf
					0.040		Rse
	387 mm (total wall thickness)				5.817		

Total resistance: Upper limit: 5.813 Lower limit: 5.812 Ratio: 1.000 Average: 5.812 m²K/W

U-value (uncorrected) 0.172

U-value corrections
Air gaps in layer 4 ΔU = 0.008 (Level 1)

Total ΔU 0.008

U-value (corrected) 0.180
U-value (rounded) 0.18 W/m²K

Calculated by:
Windows User

U-value calculation
by BRE U-value Calculator version 2.03
Printed on 02 Feb 2020 at 16:01

Element type: Roof - Pitched roof - insulated ceiling
Calculation Method: BS EN ISO 6946

Roof space & ceiling

Layer	d (mm)	λ layer	λ bridge	Fraction	R layer	R bridge	Description
					0.100		Rsi
1	12.5	0.210			0.060		Plasterboard
2	300	0.039	0.130	0.0900	7.692	2.308	Hemp wool insulation
3	13	1.000			0.013		Clay tiles
4		0.020					Vapour control layer
5		R-value[1]			0.200		Roof space
					0.040		Rse
	326 mm				8.105		

[1]Roof space - tiled roof, with felt or sarking boards

Total resistance: Upper limit: 6.879 Lower limit: 6.770 Ratio: 1.016 Average: 6.825 m²K/W

U-value (uncorrected) 0.147

U-value corrections

Air gaps in layer 2	ΔU = 0.000	(Level 0)
Loft hatch	ΔU = 0.001	(Insulation thickness = 100 mm)

Total ΔU 0.001

U-value (corrected) 0.148
U-value (rounded) 0.15 W/m²K

Calculated by:
Windows User

U-value calculation
by BRE U-value Calculator version 2.03
Printed on 02 Feb 2020 at 22:08

Element type: Floor - Suspended beam-and-block floor
Calculation Method: BS EN ISO 6946, BS EN ISO 13370

Main entrance - ground floor

U-value of floor construction:

Layer	d (mm)	λ layer	λ bridge	Fraction	R layer	R bridge	Description
					0.170		Rsi
1	65	1.150			0.057		Screed
2	50	0.025			2.000		insulation board
3	100	0.180	1.350	0.137	0.556	0.074	AAC (600 kg/m³)/concrete beams
					0.170		Rs (underfloor)
	215 mm				2.952		

Total resistance: Upper limit: 2.875 Lower limit: 2.690 Ratio: 1.069 Average: 2.783 m²K/W
U-value of floor construction: 0.359 W/m²K

Ground parameters:

Perimeter P:	40.00 m	Wall thickness:	382 mm
Area A:	100.00 m²	Ground type:	default (λ = 2.0 W/m·K)
P/A:	0.400	Rse:	0.04 m²K/W
Resistance on solum Rg:			0.000 m²K/W
Depth of underfloor space below ground:			0.200 m
Floor height above ground:			2.400 m
U-value of walls above ground (but below inside floor level):			1.15 W/m²K
Mean wind speed:			5.00 m/s
Wind shielding factor:			0.050
Ventilation openings per metre length:			0.0015 m²/m

U-value for ground (Ug)	0.733
U-value of floor deck (Uf)	0.359
Ventilation equivalent U-value (Ux)	1.210

U-value overall 0.303
U-value (rounded) 0.30 W/m²K

Calculated by:
Windows User

PRODUCT RANGE



PROTECT ROOFING UNDERLAYS

The Protect range of roofing underlays provides the complete solution for all types of slate or tile roofs and they can be used as a temporary roof covering.

The range includes both vapour permeable (Type LR) and impermeable (Type HR) underlays.

Vapour Permeable (Type LR)	Impermeable (Type HR)
VP400 Plus^{LR}	A1T3
Zytec	A1
VP300	Wunderlay

For more information or to request a brochure, email: info@protectmembranes.com or visit www.protectmembranes.com

PROTECT CONSTRUCTION MEMBRANES

The Protect range of building membranes are designed and developed to provide cost-effective innovative solutions for the construction standards of today and the future. The range includes the latest in reflective technology and air tightness.

Wall	AVCL	Floor	Other
TF200	VC Foil Ultra	FCM750	PWAB
TF200 Thermo	BarriAir	F1	Sealing Tapes & Accessories
5000 Facade			

For more information or to request a brochure, email: info@protectmembranes.com or visit www.protectmembranes.com

Stockist's stamp

PROTECT MEMBRANES LIMITED
2 Brooklands Road, Sale, Cheshire M33 3SS
Tel: 0161-905 5700 Fax: 0161-905 2085
Email: info@protectmembranes.com Web: www.protectmembranes.com

Protect Membranes Limited maintains a policy of continuous development and reserves the right to amend product specifications without notice.

BPD
A division of Building Product Design Ltd. Company Registration No: 3944123

CI/SfB (47) Ln6
Uniclass L6813
June 2015

TF200 THERMO

INSULATING BREATHER MEMBRANE





protect

TF200 THERMO INSULATING BREATHER MEMBRANE

TF200 THERMO INSULATING BREATHER MEMBRANE



Specification clause:
Timber frame breather membrane to be Protect TF200 Thermo supplied by Protect Membranes Ltd, 2 Brooklands Road, Sale, Cheshire M33 3SS. Tel: 0161 905 5700 Fax: 0161 905 2085. Email: info@protectmembranes.com Breather membrane to be non-woven PP core, with a permeable high purity aluminium foil layer with a thermal resistance of 0.77 W/m²K and a vapour resistance of 0.55MNs/g. Breather membrane to be fitted into wall in accordance with TRADA recommendations and manufacturers instructions.

Additional clause for further thermal performance:
Air and Vapour control layer to be Protect VC Foil Ultra supplied by Protect Membranes Ltd, 2 Brooklands Road, Sale, Cheshire M33 3SS. Tel: 0161 905 5700 Fax: 0161 905 2085. Email: info@protectmembranes.com .
Air and vapour control layer to be of triple ply construction with non-woven core and solid corrosion resistant aluminium layer and integrated sealing tapes on opposing edges of the roll. Air and vapour control layer to be fitted into wall/ceiling/floor* in accordance with BS 5250, BS 9250 and manufacturers instructions.
* Delete as required

Protect TF200 Thermo is a high performance timber frame membrane with high tear strength, weather resistance and vapour permeability. Protect TF200 Thermo has all the features and benefits of the tried and tested Protect TF200 membrane, but with the addition of a highly reflective surface enhancing the thermal performance of the final wall construction.

Low emissivity technology

Protect TF200 Thermo provides a highly reflective yet permeable low emissivity layer. When installed facing into an unventilated airspace this effectively blocks infra red radiation and enhances the thermal performance of the airspace, and hence the overall U-value of the wall construction. Normal high emissivity airspaces are compared with low 'e' spaces in the table below.
Thermal resistance has been tested in accordance with BS EN ISO 8990.

Composition

Protect TF200 Thermo includes a tough non-woven PP core with a durable bright high purity permeable aluminium layer, bonded to the substrate.

Roll sizes

Protect TF200 Thermo is available 1.5m x 50m, 2.7m x 100m and 3.0m x 100m.

BENEFITS

- Resists the passage of water, wind blown snow and dust into the interior of the building.
- Low emissivity reflective surface enhances the thermal performance of the wall.
- Helps to meet the requirements of Approved Document Part L and Scotland Part J.
- Corrosion and damage resistant reflective surface.
- UV and heat stabilised.
- Good nail tear resistance compared with alternative membranes.
- High burst strength, tough and durable.
- Unaffected by conditions found in timber frame walls.
- Meets the permeability requirements recommended by TRADA and NHBC.
- BM TRADA Independently certified.

Improvement in thermal resistance values using Protect TF200 Thermo

Wall Heat flow horizontal	Airspace (mm)	Unventilated airspace: No special treatment (m^2K/W)	Protect TF200 Thermo facing into airspace (m^2K/W)	Improvement with Protect TF200 Thermo
	>20	0.18	0.77*	272%

Performance

	MD	CD
Nail Tear Strength (N) to EN 12310-1 with modifications	160	160
Tensile Strength (N/50mm) to EN 12311-1 with modifications	229	226
Water vapour resistance (MNs/g) to BS EN ISO 12572	0.55	
Thermal Resistance (W/m^2K)	0.77*	
Weight (g/m^2)	150	

*Independently tested by National Physical Laboratories (NPL) in a typical UK house timber frame wall construction and verified by BM TRADA.



Construction Products
BMTRADA
CPS 4432

CE
EN13859-2
Flexible Sheets for Waterproofing. Underlays for walls. Reflective breather membrane, non-woven PP core with high purity permeable aluminium layer.

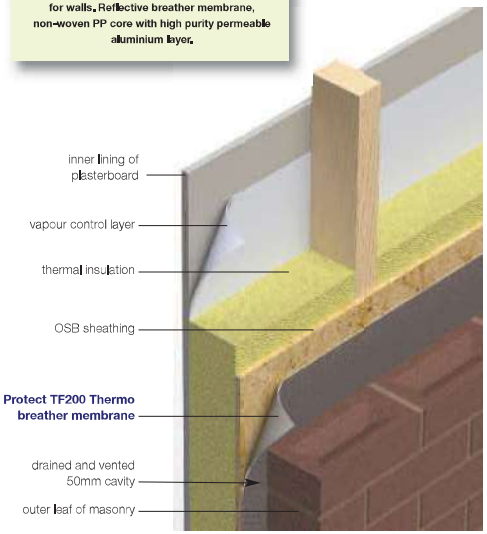


Table 1
Protect TF200 Standard breather membrane

140mm stud in timber frame		Insulation lambda value 0.022	0.030	0.035
Description	**Thickness**	**Thermal resistance values**		
Rsi	–	0.130	0.130	0.130
Plasterboard	12.5mm	0.060	0.060	0.060
Vapour control layer	-	-	-	-
Timber frame (insulation between studs)	140.0mm	6.364	4.667	4.000
OSB sheathing	9.0mm	0.069	0.069	0.069
Protect TF200 Standard breather membrane				
Unventilated air cavity	50.0mm	0.180	0.180	0.180
Brick outer leaf	102.5mm	0.133	0.133	0.133
Rse	–	0.040	0.040	0.040
Total	314.0mm	4.427	3.830	3.544
U-value W/m²K (rounded)		0.22	0.26	0.28

Table 2
Timber frame construction with Protect TF200 Thermo breather membrane

140mm stud in timber frame		Insulation lambda value 0.022	0.030	0.035
Description	**Thickness**	**Thermal resistance values**		
Rsi	–	0.130	0.130	0.130
Plasterboard	12.5mm	0.060	0.060	0.060
Vapour control layer	-	-	-	-
Timber frame (insulation between studs)	140.0mm	6.364	4.667	4.000
OSB sheathing	9.0mm	0.069	0.069	0.069
Protect TF200 Thermo breather membrane				
Low emissivity cavity	50.0mm	0.770	0.770	0.770
Brick outer leaf	102.5mm	0.133	0.133	0.133
Rse	–	0.040	0.040	0.040
Total	314.0mm	5.017	4.420	4.134
U-value W/m²K (rounded)		0.19	0.22	0.23

THE ULTIMATE PROTECT SOLUTION

Further thermal performance can be obtained by using Protect TF200 Thermo in combination with Protect VC Foil Ultra, see the table below

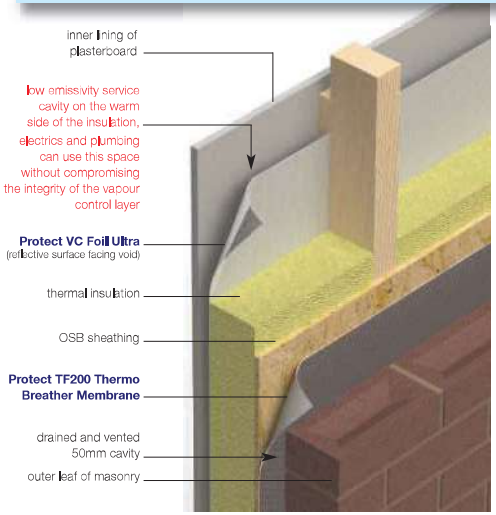


Table 3
Timber frame construction with Protect TF200 Thermo breather membrane and Protect VC Foil Ultra

140mm stud in timber frame		Insulation lambda value 0.022	0.030	0.035
Description	**Thickness**	**Thermal resistance values**		
Rsi	–	0.130	0.130	0.130
Plasterboard	12.5mm	0.060	0.060	0.060
Low emissivity service cavity	20.0mm	0.780	0.780	0.780
Protect VC Foil Ultra				
Timber frame (insulation between studs)	140.0mm	6.364	4.667	4.000
OSB sheathing	9.0mm	0.069	0.069	0.069
Protect TF200 Thermo breather membrane				
Low emissivity cavity	50.0mm	0.770	0.770	0.770
Brick outer leaf	102.5mm	0.133	0.133	0.133
Rse	–	0.040	0.040	0.040
Total	334.0mm	5.519	4.923	4.636
U-value W/m²K (rounded)		0.18	0.20	0.21

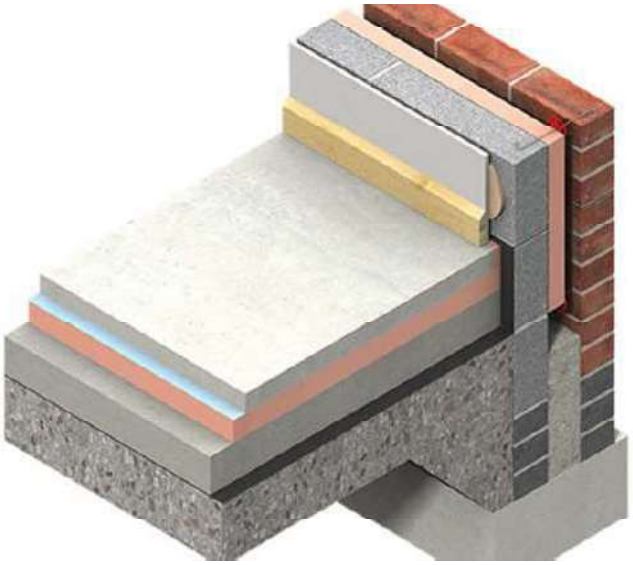
Kingspan

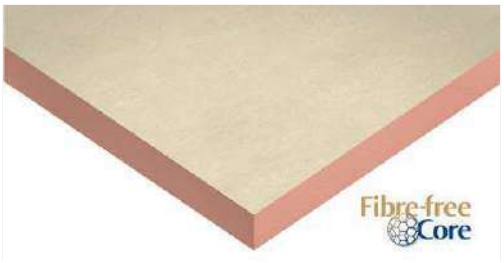
Insulation

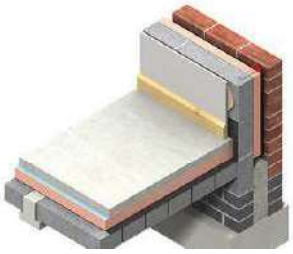
Kooltherm K103 Floorboard

Jump to: Product brochure Product information Related case studies

Solid concrete floor with insulation below screed







As part of our Kooltherm K100 range, it provides a level of performance that is unrivalled in the world of rigid thermoset insulation materials with a thermal conductivity of just 0.018 W/m·K across all thicknesses.

Manufactured with a blowing agent that has zero ODP and low GWP, it is used to insulate beam and block, concrete and timber floors.

Product brochure

Our product brochures include U-value tables, handling advice and installation guidance.

Kooltherm K103 Floorboard — Download

Product information

Product details | Services | Sustainability | Training | Useful links | Blog

Thermal conductivity	0.018 W/m·K across all thicknesses
Compressive strength	Compressive strength 120 kPa
Core	Premium performance lower-lambda rigid thermoset pheno Ozone Depletion Potential (ODP) and low Global Warming F
Facings	Glass tissue
Board size	1.2 x 2.4 metres
Green Guide Rating	Kingspan Kooltherm K103 Floorboard achieves a Green Guid

Insulation









Floor to ceiling height

Using premium insulation when refurbishing floors in residential properties may help maintain existing floor to ceiling heights.

Learn more →

Kingspan Insulation Ltd

For queries relating to insulation boards, cavity closers or membranes.
Pembridge
Leominster
Herefordshire
HR6 9LA
General enquiries: 01544 388 601
Technical advice: 01544 387 382

Kingspan Insulated Panels
Kingspan Insulation
Kingspan Water & Energy
Kingspan Timber Solutions

Product Groups

Insulated Sectional Doors
Natural Ventilation Solutions
Timber Frame Construction
Service & Maintenance
Smart Monitoring
Smoke Control Systems
Structural Steel Solutions
Wastewater Management

Daylighting Solutions
Diesel, AdBlue & Oil Tanks
Ductwork
Insulated Panel Systems

Legal Information

Website Privacy Notice
Cookie Policy & Control
Terms & Conditions of Website Use
Modern Slavery Act Statement
Group Approach to Tax
Manage Cookie Preferences

© Kingspan Group