

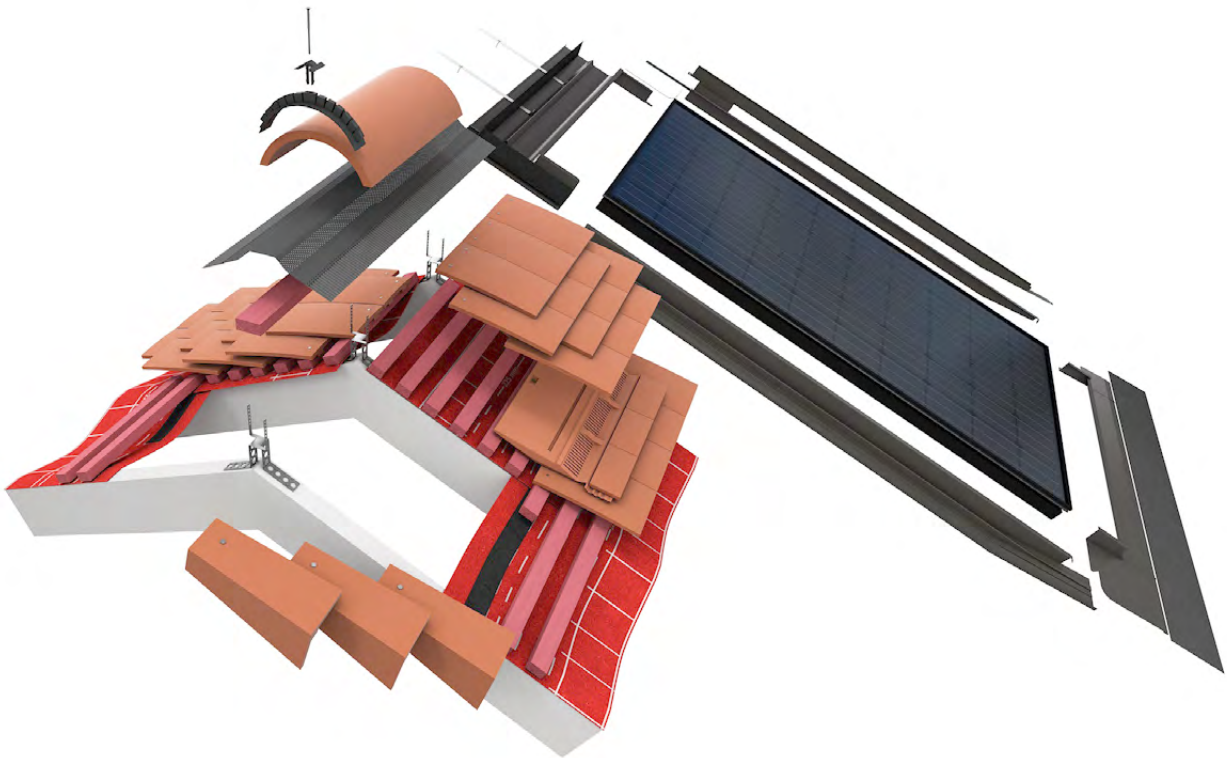


Design, risk and liability:
Designing out risk in
pitched roofing



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1. INTRODUCTION

The pitched roof has been with us in one form or another for around 5000 years, showing that this classic design has stood the test of time as a practical and robust way to provide a roof that protects the home below and the people who live within it. Of course, pitched roof design has advanced a lot over the years, however the basic principles behind choosing a pitched roof remain much the same.

The angled nature of a pitched roof not only keeps the building dry during the worst that nature can throw its way, but it also cleverly uses gravity to ensure that rainwater runs off the roof, away from the building. In this way the rainwater doesn't accumulate on the roof creating a potential source of leaks that can creep into the building over time. As well as providing vital protection from the weather, the extra space created underneath the angled waterproof covering of a pitched roof can be used either for storage or to increase the available living area.

A well designed and insulated roof can also play a huge part in enhancing the energy efficiency of a building, as the roof accounts for around a quarter of the heat loss from a typical home. As well as ensuring that the roof helps to save energy, pitched roofs are increasingly being designed to generate energy, through the incorporation of renewables such as Solar PV Panels.

Despite being relatively simple in concept, the myriad of possible designs of modern pitched roofs and the huge choice of roofing materials available, creates challenges for the specifier when looking for a way to choose the right combination of products that will meet a project's requirements. Those requirements must encompass not only compliance with building regulations but must also meet the expectations of building insurers and ultimately, the occupiers of the homes beneath those pitched roof designs.

This white paper looks at ways specifiers can design out the risks associated with pitched roofing. We will cover the role of a pitched roof and the basic components that make up a pitched roof assembly. Those components each have a role to play in the performance of the roof and we will look at what can go wrong if any of them are incorrectly specified or installed. Liability will also be covered – who is liable and if problems do appear, how do they get handled by the building contractors and building insurers?

We will look at the choices facing the specifier when it comes to selecting the specification for a pitched roof and why cutting and pasting a previous specification may not always be the best option. We will compare the two options facing the specifier when it comes to selecting a specification – to take a piecemeal approach and use different components from different manufacturers or, to select a whole system specification from one manufacturer, where compatibility between components has been verified and the quality of the final system is backed by a guarantee.





2. WHAT IS THE ROLE OF
A PITCHED ROOF & WHAT
MAKES UP A PITCHED
ROOF ASSEMBLY?



WHAT IS THE ROLE OF A PITCHED ROOF & WHAT MAKES UP A PITCHED ROOF ASSEMBLY?

A pitched roof has two basic functions – to protect the building below from the elements and to reduce heat loss. It must achieve this in line with the relevant approved documents of the Building Regulations and therefore has many requirements to fulfil, such as structural integrity, durability, thermal performance, management of moisture, resistance to air leakage, fire safety, resistance to the passage of sound as well as security and aesthetic considerations.

So, the components that make up the humble pitched roof have a lot to do, on both an individual level and a group level, if they are to provide the robust roofing solution required. Once the final choice of components has been made, there is also the risk that, due to 'spec busting' or 'value engineering', one or more of them may be substituted. This can bring an extra layer of uncertainty to the performance of the final roof build-up as the importance of compatibility when substituting components may get overlooked.

We will briefly cover the components that make up a pitched roof assembly and then dig deeper into their function and role in reducing risks to the overall roof performance in the next section.

If we start from the outside of the roof, the waterproofing layer, for pitched roofs in housing stock can be made up of clay or concrete tiles, timber shingles and shakes, or natural and fibre cement slates. The choice of roof covering will depend on several factors including cost, performance, and the required aesthetics. Each type of roof covering will have a minimum roof pitch to prevent water penetration so this will be a further factor to consider during specification.

Below the waterproofing layer sit the roofing battens. Whilst these are hidden from view in a finished roof and may go unnoticed, their presence is vital to the safety and performance of the roofing system, and they must meet the requirements of BS 5534 to reduce risk when selecting battens for a roofing project.

The next layer down from the roof battens is the underlay that is placed over the rafters. This has a role to play both in preventing any water that has got behind the tiles from entering the roof space and in helping to control the risk of condensation building up within the roof. The underlay also helps to create an air barrier that improves the airtightness within the roof space and helps to improve its thermal efficiency.

The last set of components that play an important role in the effectiveness and robustness of the final pitched roof comprise of a variety of roofing accessories. Ventilation systems at eaves, ridges and abutments, or within the tiles themselves, ensure that the roof can breathe from the inside outwards. Roof cavity barriers installed under tiles and between roofing battens can help to prevent the spread of fire and smoke between the roofs of semi-detached or terraced properties. Dry fix accessories for hip, verge and valley make installation of a dry fix waterproofing layer simple and effective and a variety of tile clips and nails ensure that tiles of all types can be securely fitted. Ensuring that these accessories are compatible with the other components within the waterproofing system chosen will help to maximise the performance and durability of the finished pitched roof.

With the latest changes to Approved Document L – The Conservation of fuel and power in 2022, requiring a 31% reduction in carbon emissions on new builds, the specification of renewables such as Solar Panels is likely to increase and become a more integral part of the roofing system. This is due to the inclusion of Solar Panels in the Notional Building within the SAP (Standard Assessment Procedure) software. Whilst the Notional Building is not prescriptive and the proposed design can be altered, to do so without the inclusion of an element of renewable contribution will require the building fabric to do a lot more work to reduce the carbon emissions to the required level.

The new requirement in Part L to address the Performance Gap through the introduction of the 'The Building Regulations England Part L' report, or BREL report – where Building Control requires proof that the construction has been built correctly in line with the original specification, this also has a potential impact for pitched roofing applications. There will be more pressure on the roofing specifier to ensure that the materials chosen are compatible with each other and easy to install so they will pass inspection by Building Control.



3. WHAT ARE THE POTENTIAL RISKS THAT POOR COMPATIBILITY OR INSTALLATION OF A ROOF ASSEMBLY CAN LEAD TO?



WHAT ARE THE POTENTIAL RISKS THAT POOR COMPATIBILITY OR INSTALLATION OF A ROOF ASSEMBLY CAN LEAD TO?

To better understand the scale and type of risks that poor compatibility or installation of a roof assembly can lead to, it is best to look at the role that the individual products play within the roof in more detail.

Again, starting from outside of the roof and working our way inwards, we look first at the roof covering layer commonly made up of tiles, shingles, shakes or slates. They come in different materials, shapes, sizes and weights and need to be chosen to match the designed pitch of the roof as well as any aesthetic project requirements. They must be fitted in line with the manufacturer's instructions. Failure to fit individual components such as tiles correctly could mean that some come loose over time. Any gaps between the tiles could allow rainwater to flow behind the roof covering causing potential damage to the roof structure and creating leaks in the building below.

Incorrect fixing of tiles, timber shingles and shakes, or slates can lead to more dramatic consequences for a roof during high winds. The action of high winds rushing over one side of a roof can lead to low pressure on the other side. This low pressure creates a situation where the individual sections that make up the waterproof covering are subject to forces that are trying to lift them off the roof – known, appropriately, as 'wind uplift'. This wind uplift effect can lead to wide scale damage to the roof and expose the building below to the elements. Even if damage caused by high winds is not so severe, the loss of any roof tile can result, depending on where it falls, in damage to surrounding properties, vehicles or, in the worst-case scenario, people, which highlights the importance of ensuring all parts of all roof coverings are fixed securely. The risk posed by wind uplift will vary depending on many factors including the pitch of the roof, its location, height above sea level and building dimensions. Wind uplift calculations must be sought from the roofing manufacturer to determine the fixing requirements for the roof. Using a complete roof system approach from a single manufacturer with tested performance characteristics for each component increases the accuracy of the wind uplift calculation, giving extra reassurance that the roof will perform as designed during periods of high wind speeds.



The roof battens

Below the tiles, shingles, shakes or slates sit the roofing battens. They not only bear the loads from the waterproofing layer and any snow that may accumulate on the roof, but they also help resist the forces of wind uplift we have just discussed. During the roofing install process itself, battens carry out an important safety role by providing footholds for roofers.

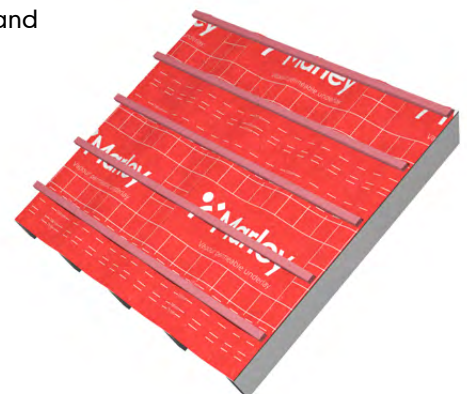
Battens are subject to strict requirements set out by BS 5534:2014+A2:2018 'Slating and tiling for pitched roofs and vertical cladding. Code of practice'. Whilst not required by law, including BS 5534 in a specification aids compliance with building regulations, the Competent Roofer scheme and third-party warranty providers such as the NHBC. Therefore, specifying and installing to BS 5534 helps to reduce the risk that inappropriate battens or fixing methods will be used for the roof. To ensure that the wooden battens will be resilient to the conditions they will encounter within the roofing system, the timber from which they are made must adhere to the requirements of BS 5534. They must arrive on site with clear documentation and a grading stamp on the battens to confirm that this is the case.

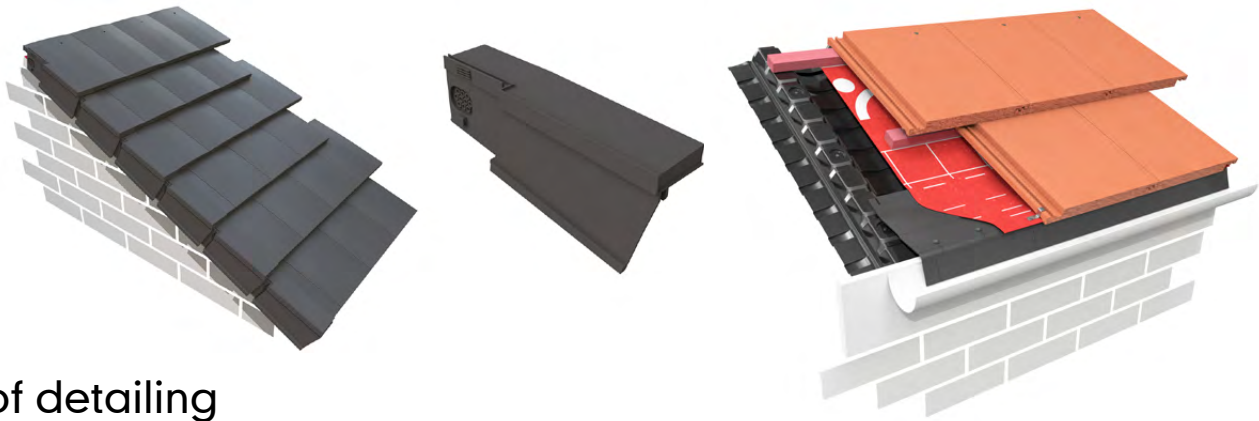
It is not just important that the correct timber is used, the battens must also be the correct size for the roof and be placed at the correct spacings (gauge) for the size and weight of the chosen slates or tiles. Failure to use battens compatible with the specified system can compromise its structural integrity. The moisture content of battens should be less than 22% according to BS 5534 and if battens are chosen with a higher moisture content this can cause them to degrade more quickly, yet again compromising the durability of the roof.

Roofing underlay

Underneath the battens sits the roofing underlay layer. It is fixed over the rafters by the battens and can either be vapour permeable or non-breathable. It is important that the correct type of underlay is chosen to be compatible with the ventilation strategy of either a cold, or a warm roof design. Ventilation of the roof space to remove any moisture laden air from the building below is essential to prevent the build-up of harmful condensation within the roof space. Such condensation can ultimately lead to rotting timbers and require a comprehensive, and expensive, re-roof to take place.

Correct installation of the underlay is essential to ensure that it forms a complete layer, with the sections correctly overlapped and joined, forming a barrier with no gaps or holes. As well as assisting with the control of condensation, underlay helps to increase the airtightness of the roof space and, in turn, increases its thermal performance. If poorly installed, any gaps will reduce the effectiveness of the underlay as an air barrier.





Roof detailing

A variety of special roof detailing products make up the last element of a pitched roof assembly. Some provide the roof with the means to get the correct volume of air both into and out of the roof. These ventilation paths are provided by ridge ventilation and eaves ventilation products as well as tile vent terminals. They ensure that adequate ventilation is available for the roof to move moisture laden air from within the roof space to the outside of the building. These, and other detailing products such as dry hip, ridge, verge, and valley systems, work best when specified in harmony with the other roofing components we have just described. Mixing and matching is possible. This can happen at the initial specification stage, or later, if the specification is subjected to the process of value engineering, however, there is no guarantee that all the components will work together or that installation of products from different manufacturers will be compatible. Specifying a complete roofing system from one manufacturer that can offer a guarantee that all the components have been tested and work together, offers peace of mind that the system has proven performance and will provide a solution with lower risk and liability. It also makes the process of substitution of components less attractive as the system will then no longer be covered by a system provider's warranty.

This principle also applies when looking at the incorporation of renewables as part of a pitched roof system. The option of installing, for example, a Solar PV, as an integral part of the roof covering layer rather than as a bolt-on accessory, reduces the risk of damage and disruption to the roof tiles and ensures that there will be minimum disruption through the inclusion of renewables as part of the roofing system specification. In addition, when considering the requirements of the BREL report as covered earlier in this white paper, a system approach where compatible products are installed correctly and covered by a guarantee, is more likely to pass any checks carried out by Building Control.





4. WHO IS LIABLE WHEN PROBLEMS OCCUR?

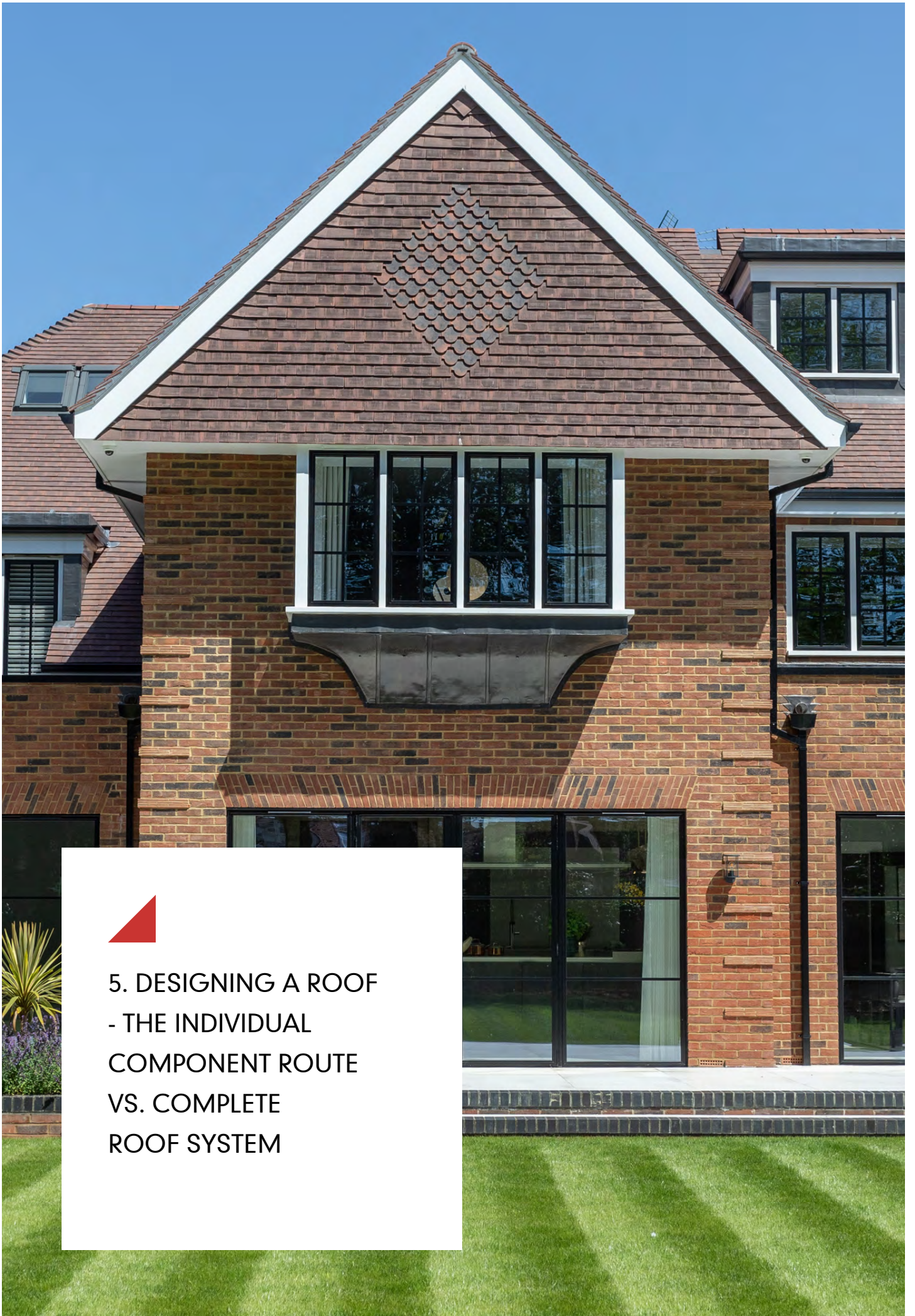


WHO IS LIABLE WHEN PROBLEMS OCCUR?

The designer of the roof system is liable for any defect resulting from an error in design and where materials are specified there is no implied warranty from the contractor that the materials used will be fit for purpose. This makes it important for the specifier to satisfy themselves that the specification chosen is of a robust design and will deliver a pitched roof that performs as expected by the client. Using a roofing system from one manufacturer, where no substitution of components that could alter the effectiveness of the overall system has taken place, and that comes with an additional guarantee can therefore be an attractive proposition should problems occur.

For the owner of a new build house, any problems that do appear with the pitched roof are covered by a 10-year building warranty supplied by an independent building insurance provider such as the National House Building Council (NHBC). In the first 2 years after legal completion, the original housebuilder will be required to fix the issue. In the subsequent 8 years, certain defects are covered by the building insurance provider, and they should be contacted to arrange for any remedial works to be carried out.

Building insurers such as the NHBC keep a record of claims on various aspects of problems associated with new build houses. NHBC data taken from 2010 shows problems with roofs were the most frequent with 59% of claims being related to pitched roofs at a cost to the NHBC of £11m. The actual cost, when considering damage settled outside of the claims system, could be as much as £33m. Given that the NHBC claim to have around 80% of the new home warranty market, the true cost back in 2010 could have been more than £40m. This highlights the need for both specifiers and contractors to design out the risk associated with pitched roofs as much as possible. Choosing a guaranteed roofing system can bring them peace of mind and ensure that the homeowners have the best chance of enjoying a high performance and reliable pitched roof.



5. DESIGNING A ROOF
- THE INDIVIDUAL
COMPONENT ROUTE
VS. COMPLETE
ROOF SYSTEM



DESIGNING A ROOF - THE INDIVIDUAL COMPONENT ROUTE VS. COMPLETE ROOF SYSTEM

Now that we have examined the pitched roof components in some detail and explored the ways in which they need to work together to deliver an overall system that performs, let's look at some of the benefits of specifying a complete roof system.

Ease of design

Re-using specifications that have worked in the past for new projects is relatively common, however, in the case of pitched roofing it is important to create a new roofing specification every time. This ensures that changes in standards or products are captured and that any designs meet the performance requirements of current building regulations. One of the easiest ways to do this is to get the manufacturer of a roofing system involved early in the project. Using this method, free design and specification support about a tried and tested system is available that will help to meet the project demands and comply with the required regulations and standards. This includes the creation of the fixing specification bespoke to that system. This avoids the risk that a generic fixing specification is used by contractors that may not always be suitable for every system.

Compatibility and performance

Using a complete roof system brings the reassurance that each component of the design is compatible and will work together to deliver the expected performance. Whilst selecting individual components from different manufacturers may also produce a roof that appears to meet the project requirements, it lacks conviction when put up against a proven roofing system. It also increases the possibility that value engineering using generic products will occur. If a generic batten is used and does not meet the BS 5534 criteria it can compromise the long-term structural integrity of the roof. Equally, if an inadequate underlay is used as the sole means of ventilation, it can cause condensation issues to appear within the roof.

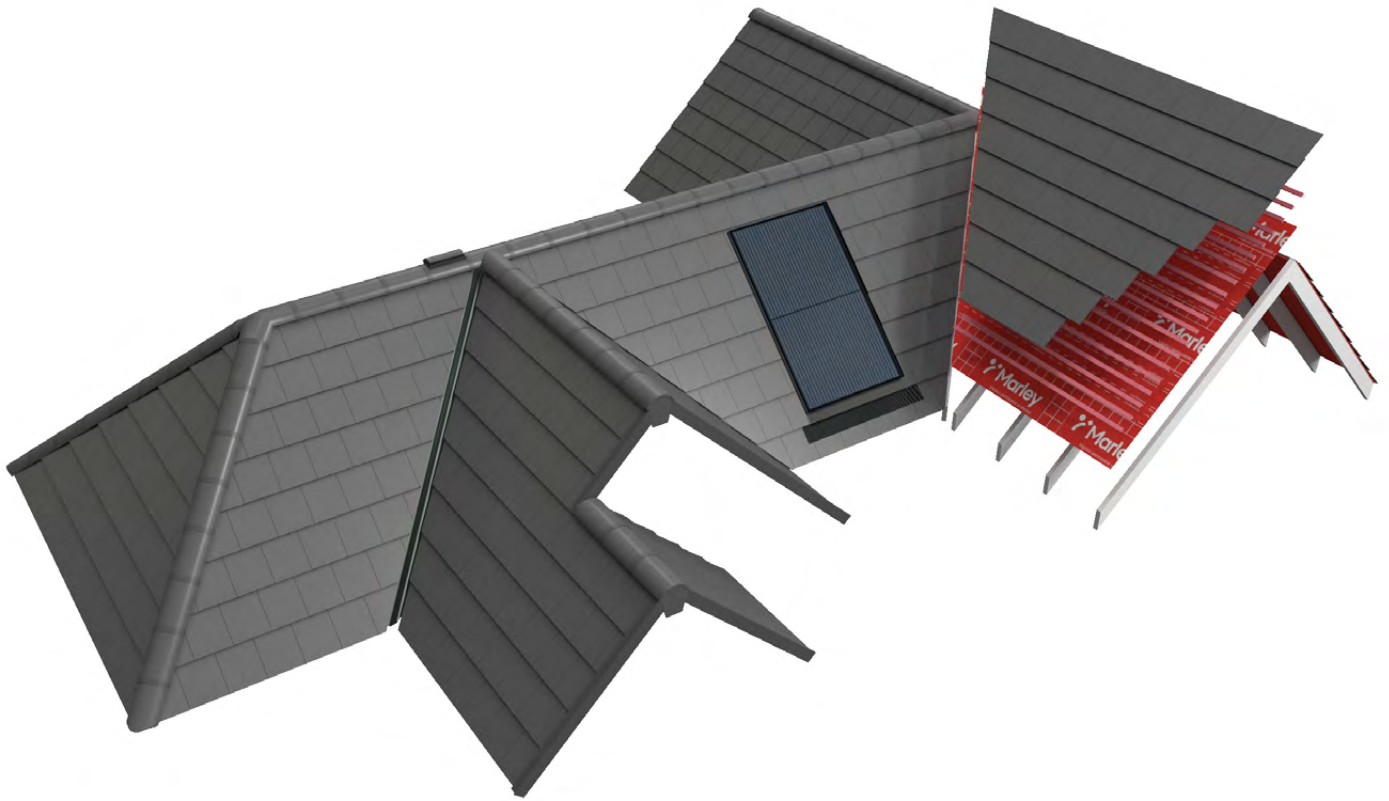
Using a complete roof system approach to designing pitched roofs gives reassurance that the key performance areas we have highlighted in this white paper on wind uplift resistance, waterproofing, structural integrity and ventilation will deliver as designed and help to design out risk in the process. It also reduces the chances that the specification will be subject to the process of product substitutions where performance of the system as a whole, can be compromised.

Guarantees

Using a complete roof system where all the elements have been designed and tested to work together means that a longer and more detailed guarantee can be offered by the manufacturer when compared to a pick and mix specification from several manufacturers.



6. DESIGNING OUT
RISK THROUGH A
SYSTEM APPROACH



DESIGNING OUT RISK THROUGH A SYSTEM APPROACH

If individual components are chosen as part of a roofing system, the task of collating information on each product, checking for installation guidelines and potential compatibility conflicts can become onerous and time consuming. Not only does this make the project logistics and procurement more challenging, but it also makes it more complex for the specifier to easily assess the potential risks associated with the chosen design.

This is not the case when specifiers take a system approach as the manufacturer of the complete roof system has effectively already carried out that risk assessment for the specifier. Testing ensures all parts of the system are compatible with each other and will create a pitched roof that delivers the performance as designed. The roof system is also backed up by the manufacturer's guarantee plus support from the technical team who provide a single point of contact for the specifiers. Specifiers know that they will be able to use the system manufacturer to get quick access to expert information and advice, making it easier to design out risk and design in reassurance that the pitched roof specification will deliver the high performance required by the modern built environment.



7. CONCLUSION



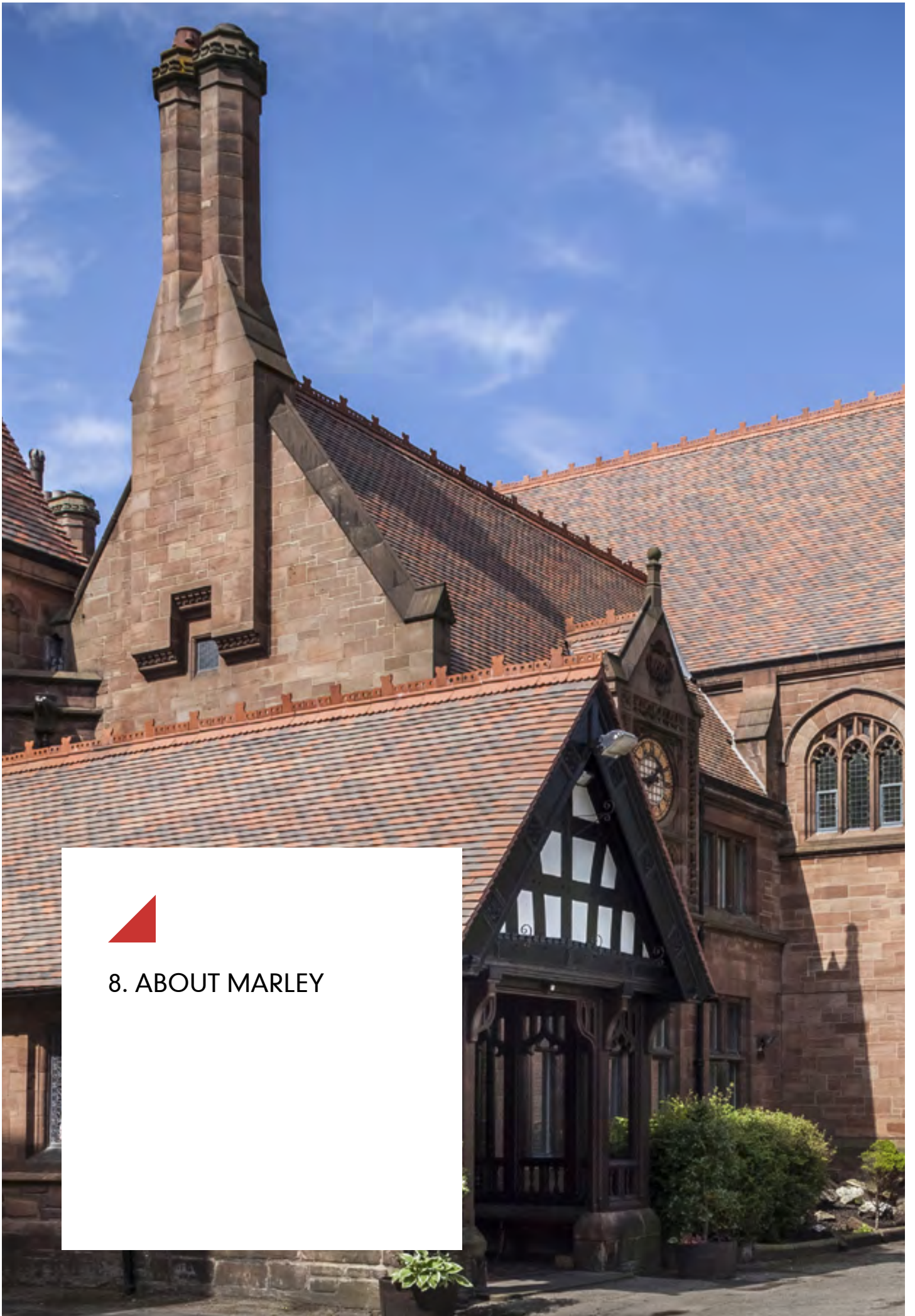
CONCLUSION

This white paper has shown that although pitched roofs have been providing simple, practical and effective roofing solutions for many years, their job of protecting the building and its occupants from the challenges posed by the weather does not come without risk.

We have looked at how the various components within a pitched roof, when working together, can, each play their part in delivering a robust roof design. However, failure to correctly specify or install just one of those individual components risks undermining the effectiveness of the complete roof system. Such failures expose the specifiers and housebuilder to the risk of being liable for correcting potentially costly repairs where the integrity of the roof has been compromised due to a poor design or product selection.

The choice for the specifier is simple – to take a piecemeal approach to the selection of roofing components and hope that they all combine successfully to give the desired result and that any that are subsequently substituted after specification do not compromise the roofs performance, or, to remove hope from the equation and specify a complete roof system instead where the components are proven to work successfully together. The former brings with it more risk that issues with the performance of the roof will appear, and the latter greatly reduces that risk. The risk is reduced as the specifier has the reassurance that the complete roof systems will be compliant with the latest regulations, standards and will be aligned with best practice within the roofing industry.

Complete roof system manufacturers are experts in their products and can provide practical support and advice to specifiers. That, coupled with a system performance guarantee from the manufacturer, gives specifiers the peace of mind that they have chosen a route that minimises risk and maximises performance to deliver a robust pitched roof solution for their clients.



8. ABOUT MARLEY



ABOUT MARLEY

The Marley Tile Company was formed in 1924 and the innovation that drove the company forward is still at the heart of everything we do today. We are proud of our history and strive to continue to advance the whole industry by providing cutting edge roofing product design and technology such as our Marley Roof System.

The Marley Roof System offers a complete roof system. All the elements of the Marley Roof System come from the same source and are designed, selected and tested, to ensure that they work together in perfect harmony.

The Marley Roof System covers all bases, from rafter to tile and everything in between and includes:

Marley's JB Red roofing battens

The only machine graded battens on the market guaranteeing strength and durability

Roof Defence fire barrier

Helps to prevent the spread of fire between adjoining properties with a tested 60-minute fire rating

High performance underlays

A choice of BS 5534-compliant vapour permeable or non-breathable membranes

Clay and concrete tiles plus timber shingles and shakes

Offering an extensive range of roof covering options suitable for contemporary new builds through to heritage restoration projects.

Fully integrated Solar PV Panels

Marley SolarTile® is a low profile, lightweight, compact easy to install system that is integrated with all tile types

Ventilation, clips and fixings; verges, ridges and hips

The dry fix components are all chosen to be compatible with the rest of the system to provide fast, secure and durable detailing and ventilation options.

This wide choice of elements within the Marley Roof System enables the specifier to create bespoke specifications to match the specific needs of each roofing project. All the elements are fully compatible with each other, bringing complete peace of mind to the specifier. This is further reinforced by the reassurance of knowing that the Marley Roof System is supported by an experienced technical support team and comes with Marley's 15-year system guarantee. It is no wonder that it was a winner at the Housebuilder Product Awards in 2022.

If you would like more information on how the Marley Roof System can bring peace of mind when specifying a pitched roof for your next project, please visit www.marley.co.uk/roofsystem and if you would like to get your hands on any of the range of tiles that we offer, then please [click here](#) to take advantage of our free sample service.

