

**SPECIAL
GUIDE**

IN ASSOCIATION WITH THE



**STRUCTURAL
TIMBER ASSOCIATION**

Structural Timber Construction

Timber frame, SIPS, oak frame, CLT and more...

Produced by
SELF BUILD
& DESIGN
magazine

**BUILDING
WITH TIMBER**
48-page guide



INSIDE...

- 6 amazing structural timber homes
- Guide to timber frame
- Structural insulated panels
- Oak-framing
- Cross-laminated timber
- Glulam beams
- Insurance and warranties
- A-Z directory





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Picture: Taylor Lane



The wonder of wood

A self build can be rewarding in so many ways, not least financially, and using timber as the main structural component for your new home gives you a great head start.

With impressive cost efficiencies, as well as environmental credentials, it's small wonder that timber is fast becoming the building material of choice for selfbuilders, accounting for around 25 per cent of the market and as much as 75 per cent in Scotland.

Structural timber delivers a whole host of advantages, both long and short term:

it's sustainable, economical, thermally efficient and can be constructed quickly. In short, it's an excellent way to build!

The build time of a two-storey house is reduced by around 30 per cent – erected and watertight in as little as five days, with factory prefabrication making for simple on-site assembly.

Timber construction also allows for more accurate budgeting and the finished building is better insulated, reducing your energy bills. It is kinder to the environment too, with the lowest overall carbon footprint of any building material. It easily exceeds Building Regulations requirements, with superior thermal

efficiency resulting in homes that remain warm in winter and cool in summer.

And then there is the design flexibility, along with guaranteed accuracy, where the structural timber components fit together exactly as designed. Not to mention the emerging new systems which allow for timber to be used in more applications than ever before.

Produced in association with the Structural Timber Association, this guide explores all the options, from timber and oak frame, to SIPs and CLT, with case studies to show how these have been used to build some amazing homes. Our thanks to STA members who have supported this guide.

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14



36

Contents

Timber frame

- 8 **Guide to timber frame**
This form of construction is popular for reasons of speed and efficiency.
- 14 **In with the new**
Pip and Steve Gunn have built their timber-frame, barn-style home with spacious interiors.
- 18 **Oak-look home**
This oak-style country home was built using modern methods of construction.
- 42 **Barn-style home**
The construction of this timber-frame home was a labour of love for its owners.

SIPs

- 20 **Building with structural insulated panels**
SIPs form a strong, lightweight structure, requiring no additional frame or skeleton.
- 22 **Fast, efficient and green**
A modern, energy-efficient home, built using SIPs and other innovative technologies, fits in with its traditional village surroundings.
- 26 **A view to the future**
Richard and Ros Maudslay's dream home has been built with their future in mind.
- 28 **Rising to the challenge**
A hybrid timber-frame solution was required for this unusual bespoke home in Sheffield.



42



20

Oak frame

- 32 **Discovering the charm of oak**
How this ancient construction method has been brought bang up to date to meet modern building requirements.
- 36 **Oak dream home**
Steven and Helen James have realised their dream, building a new oak-frame home in their old garden.



7



24



18



22



28

CLT and glulam beams

40 Cross-laminated timber explained.

Essentials

7 **STA Assure**

Why you are in good hands.

31 **Mortgages**

The implications for timber-frame builds.

Directory

44 A guide to relevant STA members.



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Off-site manufactured structural timber systems have advanced greatly in recent years, and they can offer genuine cost, programme and performance assurances for selfbuilders, especially when backed by STA Assure.

STA Assure is the largest UK trade association within the structural timber sector and there are a host of reasons why construction professionals and selfbuilders should choose one of its members. The STA's mission is to enhance quality and drive product innovation through technical guidance and research, underpinned by a members' quality standard assessment – the STA Assure Membership and Quality Standards Scheme.

STA Assure is designed to benefit both members and their clients by promoting the differing accreditations and quality standards held by individual STA member companies. This scheme offers reassurances to the construction community that its members meet or even exceed current legislation and regulatory requirements.

The STA has three levels of membership accreditation – Gold, Silver and Bronze – to highlight the different levels of quality procedures, management systems and product performance standards, together with external accreditations held by STA members.

It is not always feasible, possible or necessary for a member to achieve a Gold level membership. Specific quality requirements differ for each type of member and customer activity depending on the nature of a company's business so a Bronze or Silver member may be the most appropriate company for your project.

The STA has a formal agreement with the NHBC that recognises STA Assure Gold members as compliant with Chapter 6.2 of NHBC's assessment processes for timber structures without the need for further review or completing a HB2445 form. STA Assure has also received formal

recognition from other the industry-leading structural warranty and Building Control bodies including:

LABC Warranty
Premier Guarantee
Protek Warranty
Build-Zone Warranty
Self-Build Zone Warranty
ABC+ Warranty

A full and comprehensive Customer Guide to STA's membership standards is available online (see below).

WHAT STA MEMBERS OFFER

- They have completed a quality standard assessment – the STA Assure Membership and Quality Standards Scheme.
- They operate to the Site Safe scheme, an initiative to ensure timber construction is both safe and sustainable.
- They are familiar with the latest Building Regulations and legislation, receiving regular updates from the STA.
- They have access to dedicated technical support service, advice notes and technical documents, including a full range of documents in the STA library.
- They fully support sustainable construction and quality standards through adherence to a Code of Conduct.

By providing transparency, credibility and accountability, the STA safeguards the interests of end users, enabling them to partner with a reputable firm that will harness the multitude of inherent benefits that structural timber frame offers.

There is a wealth of information on the STA's website, from advice on timber systems to market reports and top building tips together with an online members enquiry system.

For more information: structuraltimber.co.uk/self-build

In the FRAME

Timber frame is an energy efficient, fast, and convenient building method.

Timber frame is an energy-efficient, fast and convenient construction method to build a home. It is the most widely used construction method in the developed world and tends to dominate in colder climates. In Scotland, more than 75 per cent of self-builds use this method, and around a quarter of new homes in England are timber framed.

Some half-timbered buildings from the 12th century are still in good repair today and a modern timber-framed house is fully recognised for lending purposes by banks and building societies. From the outside, it's often impossible to tell a timber-framed house from a masonry one, because external cladding is unaffected by the choice of internal walls. In a timber-framed house, the outer decorative 'skin' is finished in the same way as any traditional block house, using bricks, stone, timber cladding or render.

The Structural Timber Association (structuraltimber.co.uk), which represents the timber-frame manufacturing industry, believes that no alternative building material offers the combination of sustainability, renewable, natural, recyclable, and low embodied energy.

Timber also performs well in fire, and the rate at which it chars can be calculated in advance – an important factor for designers. Unlike other forms of construction, it doesn't bend or flake at high temperatures, with independent research reporting that timber frame performs as well as other construction methods in fire, and that "life safety was at no greater risk".



A factory-made timber frame can be erected on site and weather tight in a matter of days, allowing internal work to go on unhindered.

OPEN PANELS

When people talk in general about modern timber frames, they are usually referring to building using prefabricated panels. Timber-frame open-panel systems are structurally engineered panels that form the inside load-bearing leaf of the external wall, comprising studs, rails, sheathing on one face, and a breather membrane.

Service runs, insulation, windows and doors are then added later on site. The open-panel system is made from treated softwood timber framing, over which a structural sheet material of either ply or OSB board is fixed. Depending on the system, U-values ranging from 0.26 down to 0.15 W/m²K can be achieved.

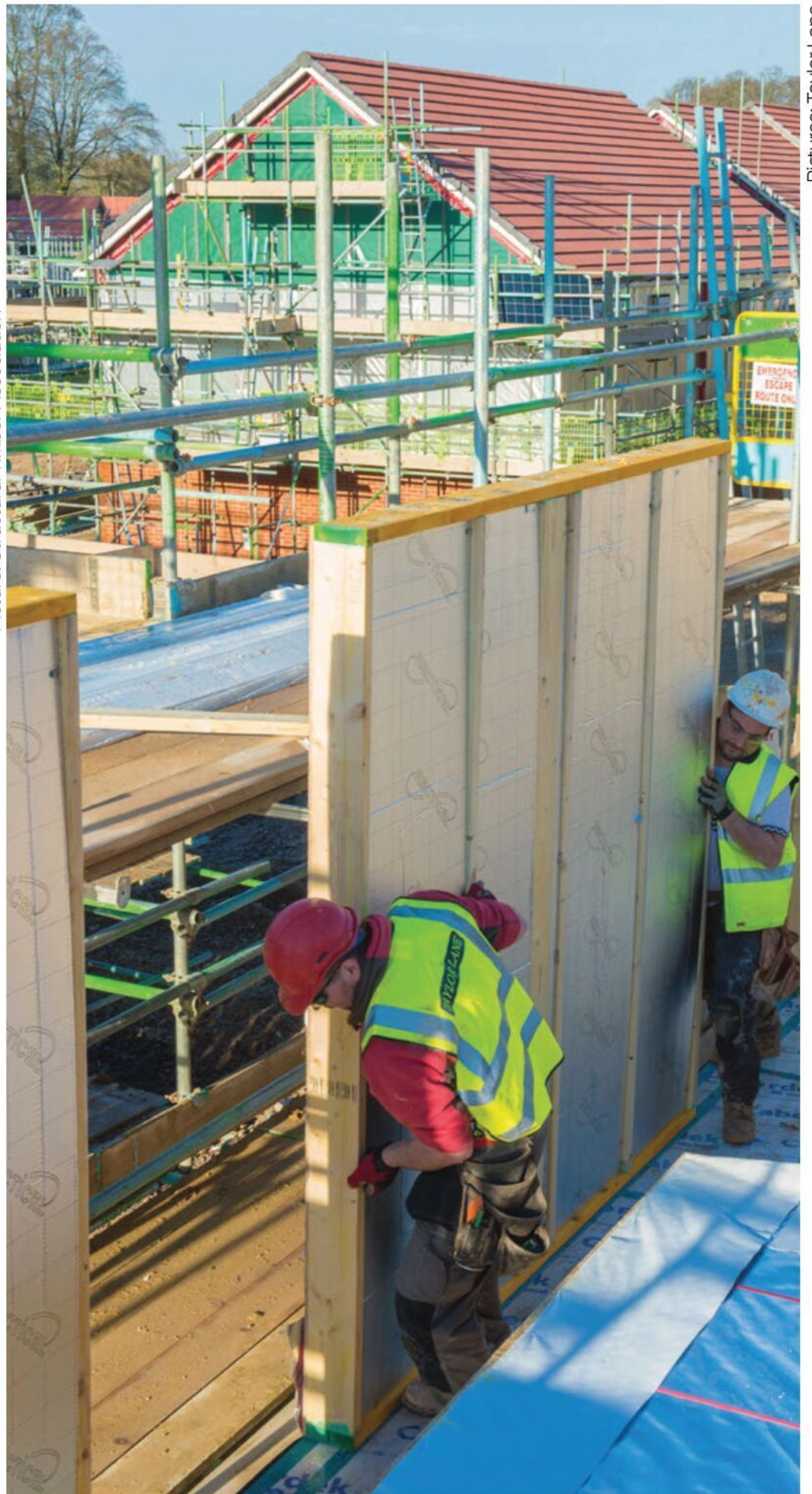
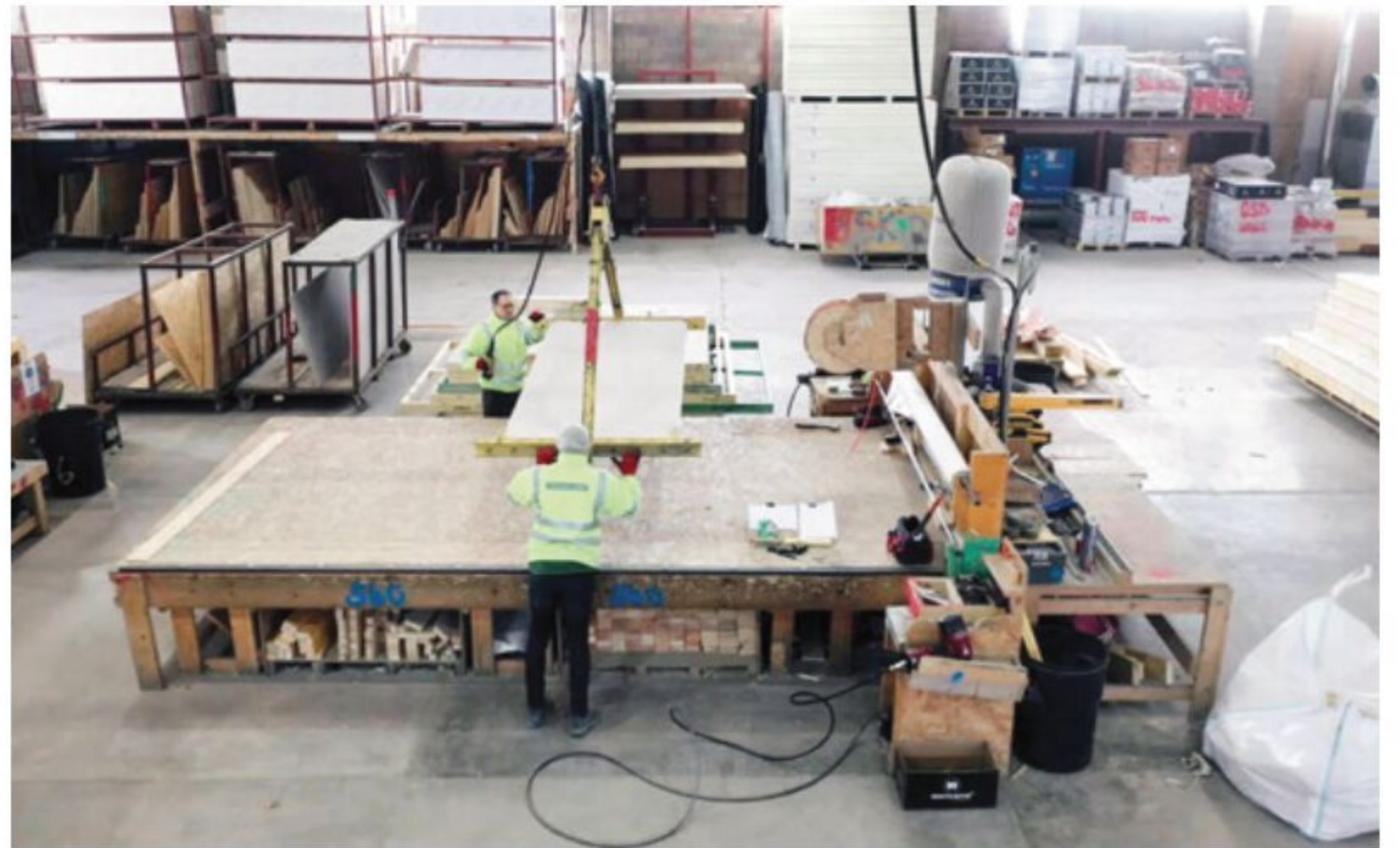
CLOSED PANELS

Closed-panel systems are usually more expensive than open panels, but faster to erect on site. Made from studs, rails, and insulation, with sheathings and/or linings on the faces of the panel, closed panels also incorporate a vapour barrier on the warm side of the insulation and a breather membrane on the outer face of the panel.

If desired, closed panels may also include fitted windows and internal service zone battens, for ease of installation and construction. This will require decisions about positioning services at an early stage.

The walls, floors and sometimes even the roofs of these closed-panel systems are then delivered to site ready for erection, resulting in an airtight building envelope. Closed





Picture: Structural Timber Association

Pictures: Taylor Lane

panels are far heavier to manoeuvre than open panels and will usually need to be craned into position. Popular in Scandinavia, this method has been adopted by some suppliers in the UK, ensuring faster build times and less reliance on good weather conditions.

These solutions have been designed to deliver excellent thermal and airtightness properties and are ideal as the basis of a modern energy-efficient home. U-values from 0.25 right down to 0.10 W/m²K can be achieved.

DESIGN

Designing a timber-frame house is quite different to designing for masonry construction and the structural calculations are usually carried out in-house by the manufacturer. A timber-frame design is carefully engineered, which means that a timber engineer will need to prove the structure can bear the imposed loads.

Although most companies will offer standard designs, which may be adapted to suit, they are also able to produce one-off bespoke houses or to work with plans from an independent architect or other designer.

The package deal is one of the highly seductive elements of buying a timber-framed home, and manufacturers can provide various levels of service depending on your location – offering anything from the design and assembly of the frame right through to a complete turnkey build.



ABOVE & RIGHT This frame was designed to include high levels of insulation. The frame has no internal structural ties with two huge glulam beams providing the required rigidity without the need for supporting posts. A service duct for wires and pipes was created to avoid altering the structural glulams.

TOP RIGHT The ground floor for this timber frame was erected in one day, with the first floor installed the day after.



MANUFACTURE

Unlike a masonry wall, which is built one brick or block at a time, timber panels are lightweight and easy to manufacture and the system lends itself to being prefabricated off site. Factory fabrication ensures precision timber engineering under controlled conditions, with individual lengths of timber cut to size and pressure-treated with preservative prior to being assembled into the various components, ready for delivery to site.

Almost all wood in UK timber-frame construction is sourced from well-managed European forests, and benefits to the environment include the fact that wood is effectively a carbon-neutral material – even allowing for transport – as living trees absorb carbon dioxide and produce oxygen. Factory-manufactured timber frames guarantee high levels of accuracy and quality, significantly simplifying on-site construction, which can often take just a few weeks. There are usually long lead times of around eight to twelve weeks between ordering the frame to delivery, however, which will need to be factored into the project schedule.

In addition to manufacturing internal partitions, roof trusses and floor and ceiling joists, suppliers are often able to provide doors, windows, staircases, and other joinery as



part of the overall package, but make sure you study the small print carefully to be certain about exactly what is being provided in your quote. Frame manufacturers will usually require a deposit and pre-payment for the frame – sometimes for the entire amount.

ON-SITE INSTALLERS

Putting up a timber frame is best handled by the experts and preferably someone already familiar with the chosen system. Most kits are sold on a supply-and-fix basis, and a major benefit is that both kit and labour are zero-rated for VAT.

Timber-frame suppliers usually insist that their own people, or a builder recommended by them, erect the frame, and to do otherwise may affect the warranty. Some of the larger manufacturers have teams on their permanent staff, but most employ subcontractors as they are needed.

STA represents more than 700 members supplying quality structural timber systems. Under their audited STA Assure scheme, manufacturing members can only use STA accredited erectors (structuraltimber.co.uk/professional-development/timber-frame-competency-award-scheme-for-timber-frame-erectors).

BUILD PROCESS

One of the main benefits of building with timber frame is reputedly the fast build speed which, it is claimed, can be



Picture: Potton



Pictures: Taylor Lane

LEFT Timber panel sections are craned into position. The assembly and erection of the frame is usually the task of a skilled team, supplied or recommended by the frame manufacturer.

as much as a 30 per cent less than traditional masonry construction times using standard format blocks.

Frames arrive in panel form and can be stored easily, and with less risk of damage, resulting in reduced handling of materials. Also, as structural elements are factory engineered, there's less need to keep excess materials on site, which reduces waste and potential loss through theft, resulting in a tidier, safer site.

Factory-made frames can be difficult to modify once complete and need to be perfectly aligned with the ground-floor slab. Timber frames require accurate, level slabs with only a few millimetres of tolerance and foundations are best left to experienced groundworkers.

During construction, the frame is usually built up storey by storey and exterior wall panels are nailed together. All other components are added on site once the weatherproof shell has been erected and the exterior of the building may be finished using bricks, stone, timber or rendered blockwork.

Once the foundations are complete, the panels can be assembled on site, the roof put in place, sheathed and battened, and finally windows and external doors fitted into their openings if these are not already in place. A kit can take anything from just a few days to several weeks to erect, depending on its size, the site and weather conditions.

INTERIORS

With the walls and roof finished in waterproof membrane and left watertight by the erection crew, internal trades can start work quickly. In most cases, the internal dividing walls of a timber-frame house are stud partitions, insulated and finished in plasterboard, with no internal load-bearing walls, the floorplan may be open plan and may be reconfigured relatively easily in future.

As the entire inside of the house is formed by a wooden frame, the installation of internal services is very straightforward, with fewer 'wet' trades involved. Careful detailing in timber-frame houses can reduce the impact of airborne sound transmission and there are numerous acoustic insulations on the market, as well as heavier wall linings, which will give impressive results – although the additional cost of materials should be taken into consideration when making your budget calculations.

As timber frames are largely hollow, it is relatively easy to

WHY CHOOSE TIMBER FRAME?

It's eco friendly

Timber is not only a 'green' construction material, its high thermal insulation means that a timber-framed house is energy efficient, with low heating bills and a low carbon footprint.



It's light

Timber frame is a light construction method compared with masonry and therefore requires comparatively less expensive foundations. It also enables larger buildings to be constructed on difficult sites.

It doesn't require good weather

The structural weatherproof shell can be erected quickly, allowing the internal fit-out team to carry on regardless of the weather. With less dependence on the weather, site planning is more predictable. Other trades can also begin work before the outer brickwork is completed.

It needs less drying-out time

Internal finishing can be completed sooner with less risk of shrinkage cracks.

Factory quality

Prefabrication technology ensures the quality is consistent and accurate. The highly engineered units are precision made in the factory, before being assembled on site, meaning less dependence on the skills of on-site contractors.

Less wastage and theft

Because the structural materials are all quantified in the factory there is less wastage. The size also makes on-site theft less likely.

Accuracy

Precision engineering means that all walls are vertical and flat, and rooms are true and square, making decorating and installing carpets and fitted furniture easier.

It's easy to store on site

The kits are delivered on site with individual sections labelled, enabling materials to be unloaded and stored in the correct order for erection, optimising use of site space.



HEAT RETENTION

Despite its lightweight construction, a timber-frame home is not prone to fluctuating temperatures if it is airtight and well insulated.

insulate them to a high standard while maintaining a clear cavity between the frame and the external walling material. A timber-frame house, by its very nature, has less mass than a pure block home and will therefore heat up and cool down more quickly – making it prone to fluctuations in temperature. Heat retention will therefore be a major consideration. Timber is a naturally insulating material, however, and technology has developed so that properties can be designed which require no space heating systems at all – eliminating heating bills.

An increasing number of selfbuilders want to build ultra low-energy homes that perform well above the levels required by current Building Regulations. Unlike masonry houses where there is limited capacity for cavity insulation, timber frame homes can have thicker wall sections to accommodate more insulation between the studs.

COSTS

Timber frame is often perceived as being a more expensive option than traditional construction, but any additional outlay should be recovered thanks to the time savings. Project costs are reduced not because timber frame is cheap, but because factory fabrication allows for greater predictability and a faster pace.

One of the main factors to consider before going down the timber-frame route is cash flow, as manufacturers will usually require pre-payment for the frame. Selfbuilders are always taught never to pay for anything up front, but in this instance, it may be unavoidable and there are mortgages available which take this into account.



Five top tips for selfbuilders

Consider in-house design services

Wood is light and strong. It's a highly versatile building material that lends itself to innovative design and stunning architecture, so a Grand Designs-style, architect-designed house is not a problem for timber frame. But if you're planning to build a typical family home, you can save money by choosing a manufacturer with an in-house design service. Some offer standard design packages while others can help you design your dream home for a fraction of the cost of an architect. Some in-house design services will even work out free should you proceed with a timber frame kit order. This can save up to 12 per cent of your total build cost.

Stick build versus prefabrication

It may be tempting to see whether a local joiner can 'stick-build' your home for less than the price quoted from a recognised manufacturer but remember that one of the main benefits of a timber frame is its off-site manufacture. Prefabrication allows for controlled, precision engineering, so the frame is produced to exacting standards and in line with quality assurance procedures. It will also be designed and manufactured for speed of erection. In contrast, a carpenter is unlikely to have a quality assurance scheme in place; ultimately, it will be their individual skills and their commitment that will determine the quality of the build and timescales. Bear in mind that delays will have a knock-on effect and could mean additional costs.

Low running costs

High levels of thermal insulation are relatively easy to achieve with a timber frame, mainly because the core insulation layer is housed within the structure. In addition, multiple layers of insulation can be added to the structural fabric to increase thermal performance. Most timber frame companies will offer a range of U-value options. The better ones will be happy to create a panel to meet your specific U-value requirements.

Speed can deliver dividends

A timber frame kit can be manufactured concurrently rather than sequentially, enabling it to be delivered to site 'just in time' upon completion of site foundations. With just a couple of weeks required to erect the house to the wind and watertight stage you'll have more control over your build schedule allowing you to factor in follow-on trades soon thereafter. A reduced construction programme also has the potential to deliver cash-flow benefits if your project is designed to generate income.

Finding a good manufacturer

The Structural Timber Association (STA) is the 'go to' trade association for information on structural timber systems in the UK. Its Quality Assure Scheme can help you choose a timber frame supplier confident in the knowledge that they will have been subject to a rigorous independent audit process. A list of STA members can be found at: structuraltimber.co.uk.

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IN WITH THE NEW

Pip and Steve Gunn have built a timber-frame barn-style home with spacious interiors.

Story: Louise Parkin Photography: Potton

Having grown up in New Zealand, Pip Gunn was no stranger to the idea of self build. She has lived in the UK for more than 30 years, and together with her husband Steve had long dreamed of completing their own self build. So when their daughters had both left home and the time was right, they decided to pursue their long-held ambition.

They initially searched for plots in their home county of Surrey, but it soon became clear that they were too expensive and they needed to look further afield. "Plots around here cost our entire budget, so we knew that we needed to broaden our horizons, and it took six months of searching on PlotBrowser and one or two other plot websites, before we found this site," explains Pip.

They were fairly open-minded – their only requirement being close proximity to a motorway, as Steve's work as a rowing coach takes him all over the UK. So when they found an entire street of self-build plots in Peterborough, they made an immediate offer on one of them.

The design for the contemporary-style home was inspired by a New Zealand mountain lodge. The timber frame is clad in ochre-coloured render, with a steel roof.

Part of The Hamptons development, the large estate is full of developer-built houses, with an area reserved for self builds thanks to local council policy. Pip and Steve's home is one of 12 self-build houses in a street that celebrates diversity in house design.

As a designated self-build site, outline planning permission was already in place, though during the design process it became clear from the planners that a contemporary scheme would be preferred over anything traditional. Pip says: "I'd seen a lovely cottage on a hillside near Queenstown in New Zealand, and it looked like it belonged on a Welsh hillside, but inside it was open and spacious.

"We wanted something like that but the planners said it had to be contemporary. So we passed the photo to Potton architect Vicky Corbett, together with a mood board we had compiled, and she came up with a stunning design that incorporates elements of that cottage but in a contemporary style that we absolutely love."

Despite being a new build, the strikingly modern house has echoes of a barn conversion, with a rich, warm brown render and a steel roof. "I was adamant I didn't want white render so we took a bit of a risk," says Pip.

Potton had been on Pip's radar for around 30 years, ever since she had been impressed by their designs at a homes show not long after arriving in the UK. Pip and Steve visited the company's show home village in St Neots in Cambridgeshire several times and were convinced that Potton was the perfect fit to provide the home they were looking for. "The people at Potton were really helpful, nothing was too much trouble, and the bespoke design included acquiring planning permission, which was very appealing for us," says Steve.

Planning consultants advised on orientation and other key issues that would make planning approval more likely, and permission was granted within the eight-week timeframe, with just a few conditions such as



showing material choices and the landscaping scheme.

Potton recommended a building company from Kent which was hired without any other firms being approached. They looked after the entire project from foundations through to the dark grey steel roof.

Piles were required for the foundations, with 16 piles driven 12m into the soft clay. Kingspan's Logic PLUS closed panel system was used for the walls, insulated with Kingspan Kooltherm. The timber frame was erected in a matter of days, and Pip and Steve were on site daily throughout the entire project, renting a three-storey townhouse on the other side of Peterborough, which meant that they were able to choose materials and had easy access to the site to monitor progress.

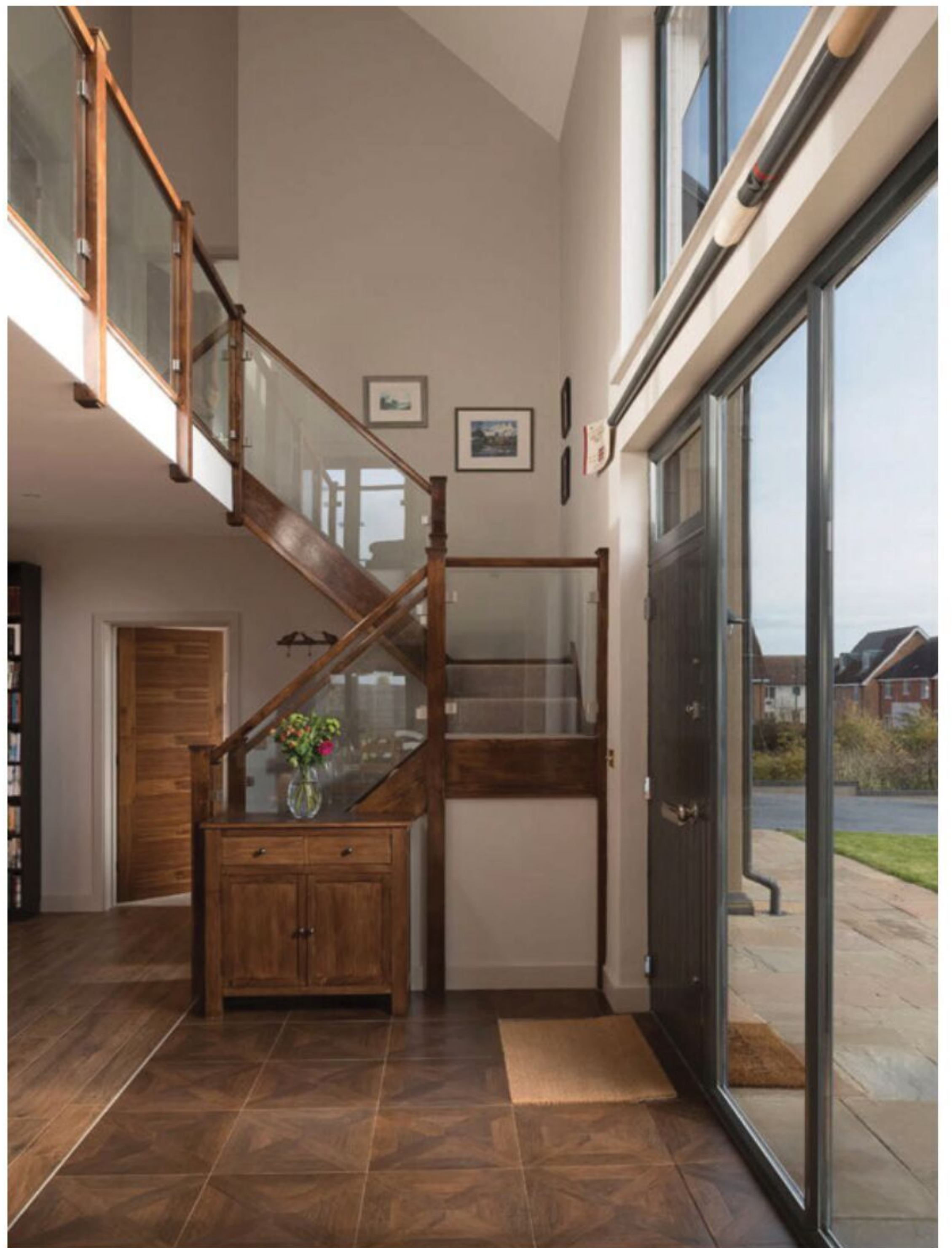
"Andy from GPML, the builders, would often call to ask us to go to the site when there were decisions to be made, but we were there much of the time anyway because it was so interesting and exciting watching our house being built," says Pip.

Because of the soft clay ground conditions, it became clear that a 67m retaining wall was needed to prevent clay heave, which was an unexpected expense. "It was an awful moment discovering that such a large wall was required, but the builders took it in their stride, and we had a healthy contingency fund so we could afford it," says Steve.

SERVICES CONNECTION

Connecting up to the services proved problematic despite them being nearby. This caused significant delays to the project. BT initially quoted £9,000 to lay the required cables, which came as a shock to Steve and Pip, but this proved incorrect and the eventual bill was just £300. "We had been speaking to the wrong department, and so a friend of Steve's who works in the industry got on the phone and sorted it out for us, which was a huge relief!" says Pip. There was also a delay of several months for the water connection. Fortunately a neighbour allowed them to access his water supply during the build.

The open spaces and high ceilings of the completed house give the impression of a much larger interior than its relatively modest floorplan of 200 sqm. Large banks of glazing on the southern elevation provide ample solar gain, as well as affording views of the Hampton Reserve,



The interiors are brightly lit with natural sunlight flowing through the double-height windows.

a 300-acre nature area. Above the kitchen/diner is a prominent overhang, providing shading and preventing overheating in the summer months. Roof windows can be opened on hot days to release trapped heat, further regulating indoor temperatures when needed.

"We love being outside so there are lots of sliding doors with access to the garden, including one from our bedroom, plus a more conventional french door on the west leading from the kitchen," says Pip. The northern elevation has one sliding door but otherwise a very small number of windows, which improves the building's thermal performance. A double-height atrium opens out into the living room, with a galleried landing above leading to a mezzanine lined with bookcases. The entrance





hall also leads to the kitchen/diner to the left, and to the ground floor master suite to the right. This has a walk-in wardrobe and en suite bathroom, and there are two more bedrooms upstairs sharing a family bathroom.

"We future-proofed the house from the outset by locating our bedroom on the ground floor. That way if we end up in wheelchairs when we are older we won't have to move out!" says Pip, a retired PE teacher.

THE INTERIORS

Battleship grey kitchen cabinets run along two walls to form an L shape, with a 2m x 1m island and a bank of appliances and cupboards to one end. The kitchen was chosen from Ikea but their long lead times for installation meant that another company was employed to install it. "We needed the kitchen to be fitted in June but Ikea couldn't do it till August. We wanted granite worktops but we had to get them from another company, because Ikea would only supply granite if they fitted it themselves. So we got some from another company, in a lovely matt finish, and I think we got a really good price," says Pip, who had firm ideas about how the kitchen should look.

The couple chose brass cup handles, tiles from the USA and stylish brass pendants to go above the island, with a striking floral shade for the dining room light, and an industrial-style floor that is porcelain but designed to look like a Brooklyn sidewalk.

Wood-effect porcelain tiles are used in the lounge and also in the hallway where they are laid in a different design that mimics parquet. This acts as an effective demarcation for the two spaces.

A double-sided fireplace, which goes through to the kitchen, gives the effect of logs but is in fact ceramic. The efficiency of the house means that it's rarely used but creates an authentic warming effect of crackling logs.

Steve and Pip moved in just six months after work started, commissioning tilers and decorators themselves which reduced the cost. "It was a real high point moving in, and we love it here," says Pip. "It's everything we hoped it would be. And now we have all this knowledge, we may well do it again eventually!"





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Oak-look rural home

This traditional-style country cottage was built using modern methods of construction.

Tori and Jason Dutton had always dreamed of having an oak-frame home in the paddock next to Tori's parents' house, but didn't think they would ever get the chance to build there, until changes to planning laws gave them hope. Working with a planning consultant, the couple drew up proposals for a 149-sqm home, and permission was duly granted with few conditions.

"We were the first to have planning permission granted in our village," says Tori, an interiors retailer. "My mum and dad bought the house with a few acres in 2005. After being advised by a planning consultant that there was no hope due to strict rural development regulations, we were thrilled when the Housing Strategy began as it gave us an immediate opportunity to put in for planning."

Visiting a local oak-framing company, the couple found what they were looking for in a 249-sqm house design, more than 50 per cent larger than their initial plans. The Duttons then took the unusual step of buying the

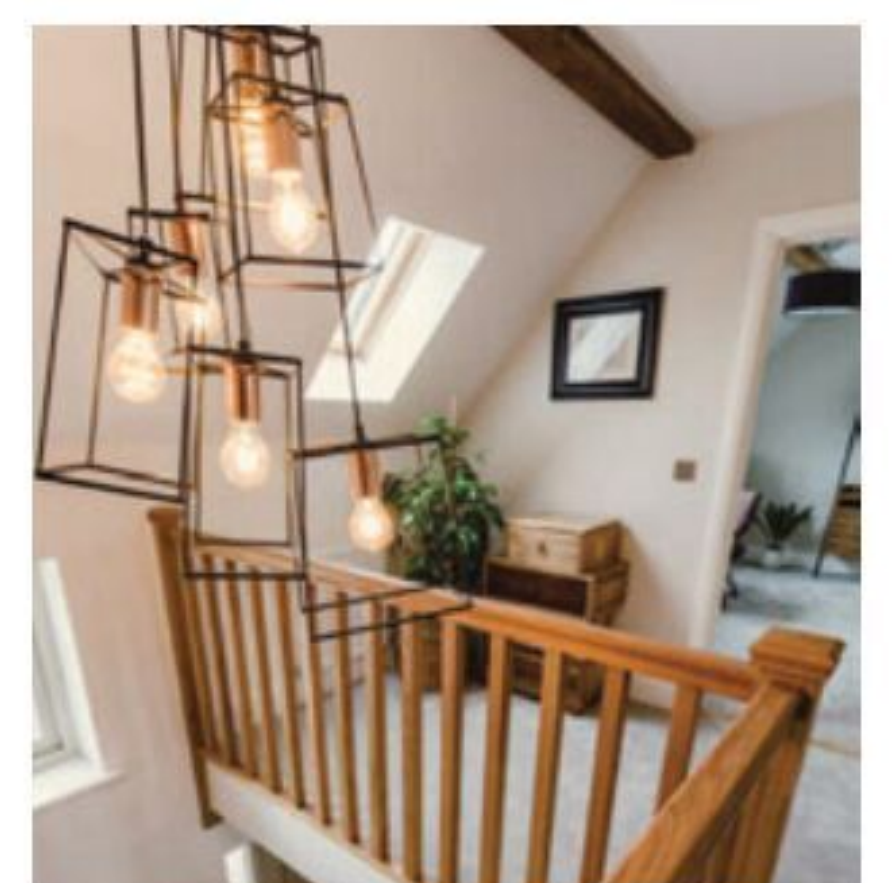
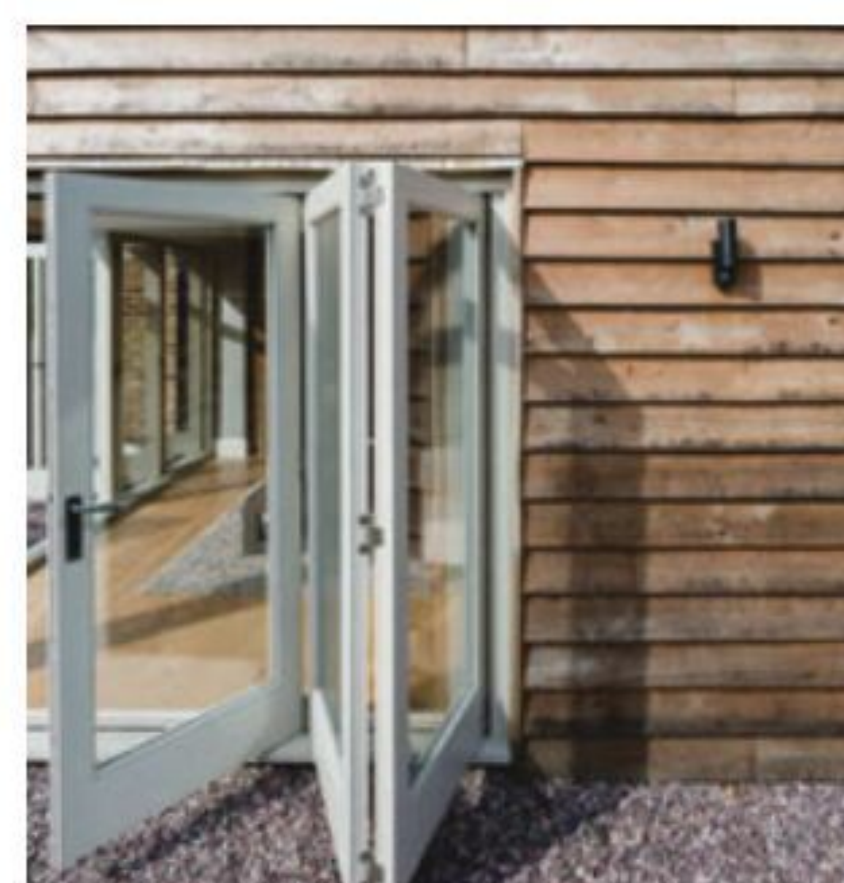


EXTERIOR
The timber-frame home is clad in a combination of brick, render and larch, with the oak porch and detailing imitating the look of a traditional oak frame.

design rights from the company, and following a different construction route. "We loved the design but after further research into timber-frame builds we knew that with some clever features, we could replicate a similar look and feel using modern building methods," Tori explains.

The couple spent many hours researching timber-frame suppliers before opting for Hereford-based Taylor Lane Timber Frame to supply their 140mm timber frame kit which has 100mm rigid polyurethane insulation between the timber studs to achieve high levels of energy efficiency and thermal performance.

The frame is precision engineered in a controlled environment to ensure consistency and accuracy. It can then be erected rapidly on site. A typical three-bedroom house can be wind- and watertight within a week, a huge



INTERIOR
Non-structural oak beams in the main rooms add instant character to the new home.

benefit for those working to a strict build schedule. Novice selfbuilders Tori and Jason both work long hours in busy jobs, so they decided to appoint a project manager.

"This was the part we were most nervous about," says Tori. "We asked Pdraig Hurley, Taylor Lane's self build manager, if he could recommend any builders and we were fortunate to meet Ian Harris, who not only oversaw the build but was a great help and support with recommending reliable local suppliers and trades."

Externally the house is striking, with its traditional combination of oak, timber cladding, brick and render. The two-storey home has two dormers, with brick and timber cladding on the ground floor, while the first floor is clad in timber and render. Decorative oak detailing adds interest to the main gable, with the timber frame forming the structural element. A timber-clad garage and oak-framed portico add to the rustic appeal of the property, tying in with the timber-clad gable.

THE BUILD

A concrete slab forms the foundations, with a damp-proof course above, fixed into place with a soleplate that provides the template to support the frame. Timber panels are factory-made using structural-grade Scandinavian white wood, with external wall panels made using 140mm studs. The internal load-bearing wall panels have 140mm studs, with 90mm or 63mm studs used for the non-load-bearing wall panels. Lightweight 240mm timber I-beams were used on the floor. These are incredibly strong in relation to their size and weight. They can span six metres or more and can be installed in around half the time of a traditional soft wood joist. A combination of standard, attic and stub kiln-dried timber trusses were used for the roof.

Timber is celebrated both externally and internally, with non-load-bearing oak beams spanning lengths of the internal ceilings, adding warmth and rustic appeal to the breezy neutrals of the colour scheme. This was designed and styled by Tori using furniture and accessories from her interiors and furnishing company Meyer & Marsh.

"This is our first build, and we absolutely love it," Jason says. "Every day we benefit from the thought and detail we put into each decision. We spend a lot of time in the kitchen/diner and garden room. It's an amazingly open and light space, and although the locally sourced oak beams and columns aren't part of the structural frame, they still give the feel we were looking for."



SIPsational

A GUIDE TO STRUCTURAL INSULATED PANELS



Structural insulated panels, better known as SIPs, are a pre-engineered building system, long established in Scandinavian countries, which was developed in America in the 1930s and first introduced to the UK in the 70s.

The panels consist of two parallel faces – usually oriented strand board (OSB), sandwiching a rigid core of expanded polystyrene or injected urethane. Other variations of facing materials and cores exist, but these are the most common in the UK. The nature of the stressed skin panel makes it exceptionally strong, and high levels of insulation can be achieved in thinner wall thicknesses than other forms of construction.

SIPs can provide a fast way of building very efficient walls, which require no additional frame or skeleton to support them. They offer extremely good thermal performance and form a strong, lightweight structure which is fast to erect, thanks to the large components.

SIPs cost anywhere from 35 per cent more than timber frame with insulated walls and uninsulated roof trusses, but increased build speed, reduced waste, less manpower and a reduction in site machinery help to offset this extra expense. Energy-saving benefits should also be considered.

HOW ARE THEY USED?

SIPs can be used as the inner skin of a cavity wall, as a self-

PICTURES

SIPs offer a fast and efficient build, with excellent levels of insulation and airtightness.

supporting single skin structural wall, in place of timber frame or blocks, and as a pre-insulated roofing structure. They may be used in floors, walls, and roofs, creating ecologically friendly and energy-efficient buildings.

Suitable for new builds and home extensions, SIPs are commonly used for garden buildings and garages, as well as making ideal infill panels for other structures, such as oak, steel, or concrete frames.

Due to the unique way that SIPs work they are perfectly suited for roof construction for new builds, extensions, and replacement roofs. They arrive pre-cut, with insulation already fitted, and span from wall to ridge beam – usually without any further support. This means that the roof space can be left completely open to be used as further accommodation, storage or as a vaulted ceiling.

SIPs are very flexible and can be used with any external cladding, including brick, render, weatherboarding, and aluminium. They can also be roofed with slates, tiles, or metal coverings. Internally the panels may be simply finished with plasterboard and a skim coating (with service cavities where needed) so wet trades are kept to a minimum and build times reduced.

Any heating system is suitable for a SIPs house but may need to be downsized due to the airtightness and efficiency of the building. SIPs are also ideally suited for air source heat pumps, and the airtight



Architects are increasingly aware of SIPs and should be able to modify designs to suit the system.

They can also include service ducting, which makes wiring extremely easy but does mean that the electrical layout will need to be planned at an early stage. Alternatively, services can be run through internal partition walls, with wiring passing through the cavity between the panel and internal plasterboard, or through a double layer of plasterboard.

Once the design has been used by the manufacturer to produce the required panels, these will then be erected on site – often by the same company. Some SIPs companies offer a full build package while others rely on the selfbuilder or project manager to take responsibility for the foundations and fitting-out stages.

Be sure to follow the manufacturer's recommendations for sealing joints properly. Edge openings, such as window reveals, are lined with inset timber to allow frames to be easily fitted, and floors may be sandwiched between upper and lower walls or attached with joist hangers.

Most types of foundation are suitable, but the slab should be accurate and level, within tolerance, and on-site access should be available for a suitable crane or telescopic handler if required. Panels are joined together, and window and doors are installed on site.

Lightweight wall finishes like cedar, render, rainscreen and brick slips need no additional support, while finishes such as brickwork and stone will typically require foundations to carry the increased weights.

THE BENEFITS

As a method of construction, SIPs offer high levels of insulation, structural strength, and airtightness, with thinner wall sections. They also increase the available roof space, thanks to their truss-free construction, enabling rooms to be created in the roof. This can provide an additional 25 per cent of floor space, maximising a building's size at no additional cost.

By combining the stages of conventional timber-frame construction – framing, sheathing and insulation – into a single unit, a structure can be erected much faster and with less specialised labour. This can



nature of SIPs construction means that mechanical ventilation is strongly recommended.

THE PROCESS

Architects and designers are increasingly aware of SIPs and should be able to modify designs to suit the system. Ideally, choose a designer who has experience of working with SIPs and understands the structural implications of a panel system, or use a package company which can provide a design and SIPs-build service.

Manufactured off site as blank 1.2m-wide panels, with various standardised height options, the panels are cut to size and the openings formed. Designing a house using standard SIPs sizes – usually 1.2m by 2.7m – will be the most cost-effective use of the system. Utilising a 1.2m grid will reduce the number of cut panels and limit waste, as well as minimising the cost incurred when a fabricator needs to cut panels to fit.





SIPs are an ideal candidate for Passivhaus construction

mean lower labour and loan expenses, and quicker occupancy. A crew of two, with no special equipment, can easily install smaller panels, while larger panels may be quickly erected with the use of a crane.

SIPs are relatively lightweight, at approximately 25kg/m², and can have a reduced foundation specification. Being fabricated offsite in a factory means they can be delivered pre-cut and pre-insulated, and the shell of a typical house can be erected within a matter of days.

SIPs don't require good site conditions and the quick speed of erection can have significant savings on skip hire, scaffolding and finance costs. The size of the panels also makes them less likely to be stolen from site than more conventional building materials.

The nature of the stressed skin panel makes it exceptionally strong, and high levels of insulation can be achieved in thinner wall thicknesses than other forms of construction. In timber-framed buildings the spacing of vertical timber studs within walls is usually at 600mm centres, whereas with SIPs panels these are at 1,200mm, which drastically reduces cold bridging. Choosing deeper panels will increase energy efficiency, and potentially U-values as low as 0.10W/m²K can be achieved.

This makes them an ideal candidate for Passivhaus construction, where buildings need to meet stringent energy-efficiency requirements. A typical Passivhaus home would be airtight, equipped with a high level of insulation, and designed to use a bare minimum of eco-technologies for heating and cooling.

The OSB creates a continuous surface onto which radiators, kitchen cabinets and light fittings may be easily fixed, with little or no additional support, and the OSB and insulation core are resistant to attack by mould and microbes and provide no food value to vermin.

Because there is no service cavity the walls have a very solid sound when struck, and the jointing techniques used in SIPs buildings mean that the sound transmittance through the joints is reduced, which helps to dampen sound transfer between rooms.



IN BRIEF

PROJECT New home

LOCATION Cambs

BUILD SYSTEM SIPs Eco Panels

MATERIALS 169mm kit with 254mm web joists, 89mm x 38mm internal studs

SIZE 312 sqm

BUILD TIME Five months

Fast, efficient

The Glebe, in Cambridgeshire, is a stunning five-bedroom house built to modern, energy-efficient standards using lightweight expanded polystyrene SIPs and other innovative build technologies, whilst fitting in with its traditional village surroundings.

Sips Eco Panels had initially been approached by builders Inti Construction who wanted to create a highly energy-efficient, luxury modern home in the sought-after village of Ickleton. Despite its modern feel, the house also had to be in keeping with the traditional aesthetic and characteristics of the village, so were looking for a house that would incorporate local materials such as flint, slate and oak.

Having researched a number of building methods, Inti chose SIPs Eco Panels due to their energy efficiency and the fact they could be used to build their custom-designed open-plan home in a short timeframe.

SIPs Eco Panels engineered and designed the full SIPs superstructure using HSB CAD to provide 3D and 2D fabrication drawings for manufacture. As well as installing SIPs on site, its off-site team also provided support to assist the clients through the development.

For the build, SIPs Eco Panels provided the full super structure using its 169mm SIPs kit, 254mm metal web joists, all internal partitions, all special timbers and steelwork, and all sundries, leaving it wind and watertight ready for the follow-on trades.



SIPS
BUILD



and green

The cladding materials were chosen to fit in with the local village vernacular, and included flint walls, oak cladding and a slate roof. The street-facing elevations were deliberately modest, and all faced with locally sourced flint. The rebated, feather-edge oak cladding was treated with SiOO:X (wood treatment) to accelerate the ageing process and give it a uniform finish, whilst integrated solar panels and a 5,000-litre rainwater harvesting system add to the home's impressive eco credentials.

By using the SIP structure for their build project, Inti Construction were able to design and create a spacious, energy-efficient home with vaulted ceilings that didn't require structural beams, and allowed for windows to stretch from the floor to the tip of the roof. The overall effect is a light and spacious interior that is flooded with natural light.

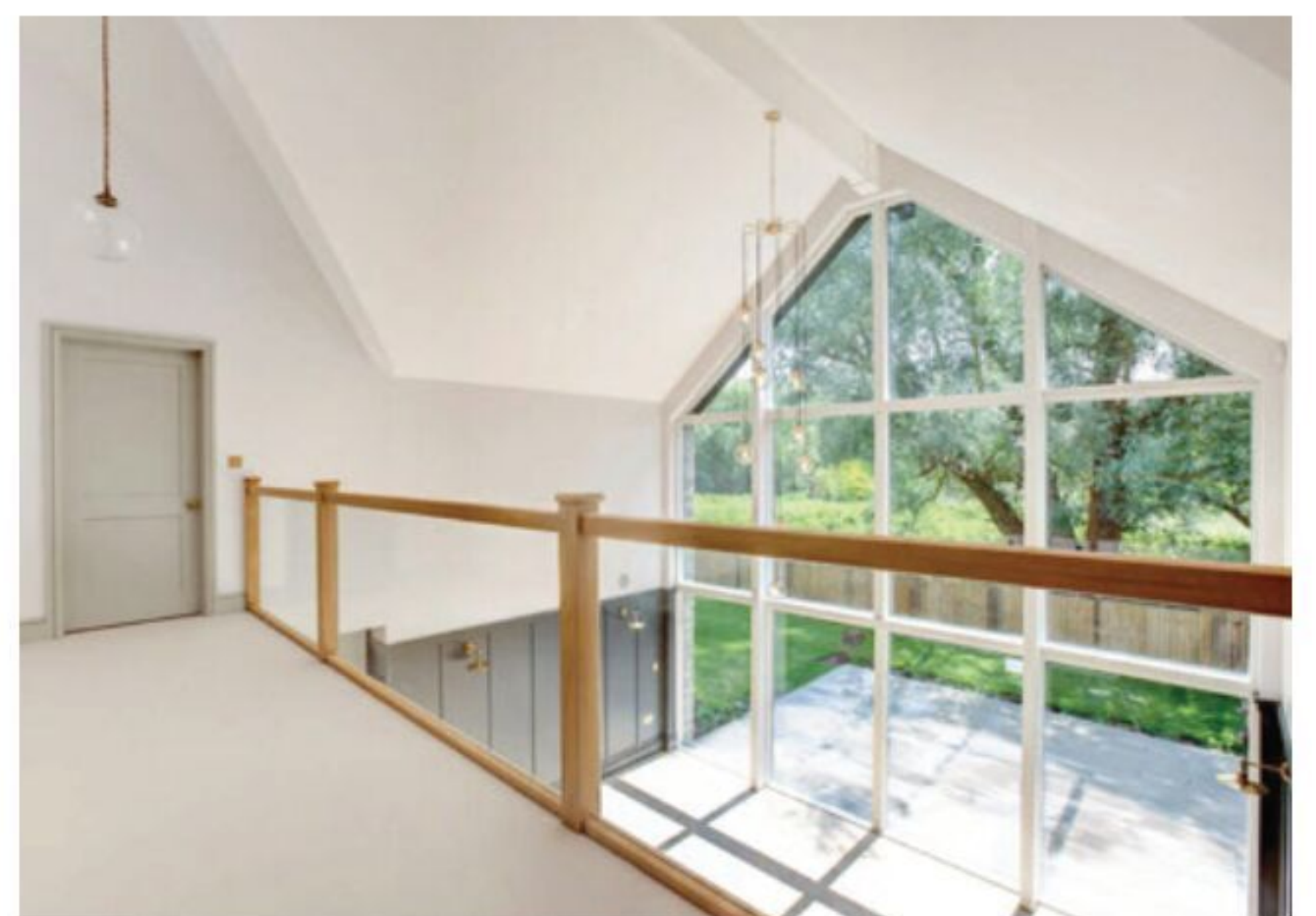
The project was quick to build, with the super structure taking just two and a half weeks. "We chose the Sips Eco Panel system for its speed of construction and outstanding energy efficiency as well as its environmental properties. The project was built to exacting modern standards whilst maintaining a wholesome village feel. The excellent results speak for themselves," said Inti's Julian Vargas.

Sips Eco Panels are STA Assure Gold Members and are the UK's largest award-winning independent SIPs manufacturers.



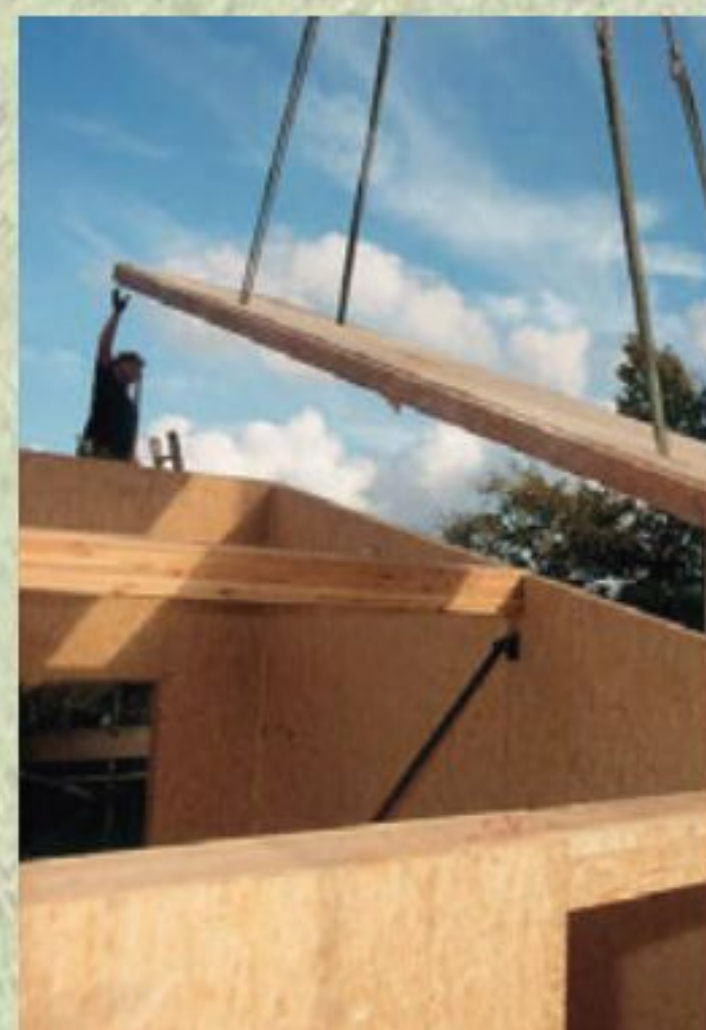
PICTURES

Flint, oak and slate have been used to give the house a traditional look. Inside, the home has a distinctly modern feel with vaulted ceilings and floor-to-ceiling glazing.



The STA defines the standards for the use of timber building systems in the UK

- Self builders choosing and STA member will be backed by a members' quality standard assessment – the **STA Assure Membership and Quality Standards Scheme**.
- Offsite manufactured structural timber systems have advanced greatly in recent years, and they can offer genuine cost, programme and performance assurances for self-builders – especially when backed by STA Assure.
- **STA Assure** reassures customers that our members meet or even exceed current legislation and regulatory requirements.
- STA Assure is formally recognised by six of the industry leading structural warranty and building control bodies including: LABC Warranty, Premier Guarantee, Protek Warranty, Build-Zone Warranty, Self-Build Zone Warranty and ABC+ Warranty
- STA members operate to the **Site Safe scheme** – an initiative to ensure timber construction is both safe and sustainable
- STA members fully support sustainable construction and quality standards through adherence to our **Code of Conduct**





STRUCTURAL
TIMBER ASSOCIATION
Building offsite solutions in timber

STAVASSURE
Defining the standard for structural timber



By providing transparency, credibility and accountability, the STA safeguards the interests of customers, enabling them to partner with a reputable firm that will harness the multitude of inherent benefits that structural timber frame offers.

There is a wealth of information on the STA's website, from advice on timber systems to market reports and top building tips together with an online members enquiry system.

For more information go to:
www.structuraltimber.co.uk/self-build

SIPS
BUILD

IN BRIEF

PROJECT New home
LOCATION Northumberland
BUILD SYSTEM SIPs
BUILD SIZE 500 sqm
BUILD COST £2,000/sqm

With a view to the future

Richard and Ros Maudslay's dream home in rural Northumberland is not only highly energy efficient, it is designed for future generations.



Richard and Ros Maudslay purchased their plot in the picturesque Northumberland town of Rothbury with the aim of creating a unique, modern and sustainable home that provides an enjoyable living space, while maximising the stunning views across the rolling hillsides of the Northumberland countryside. The couple wanted a sustainable home that reduced energy consumption without compromising the enjoyment and well-being for them and future generations.

The plot enjoys an elevated position and the main challenge for Model Projects, the designers, was to

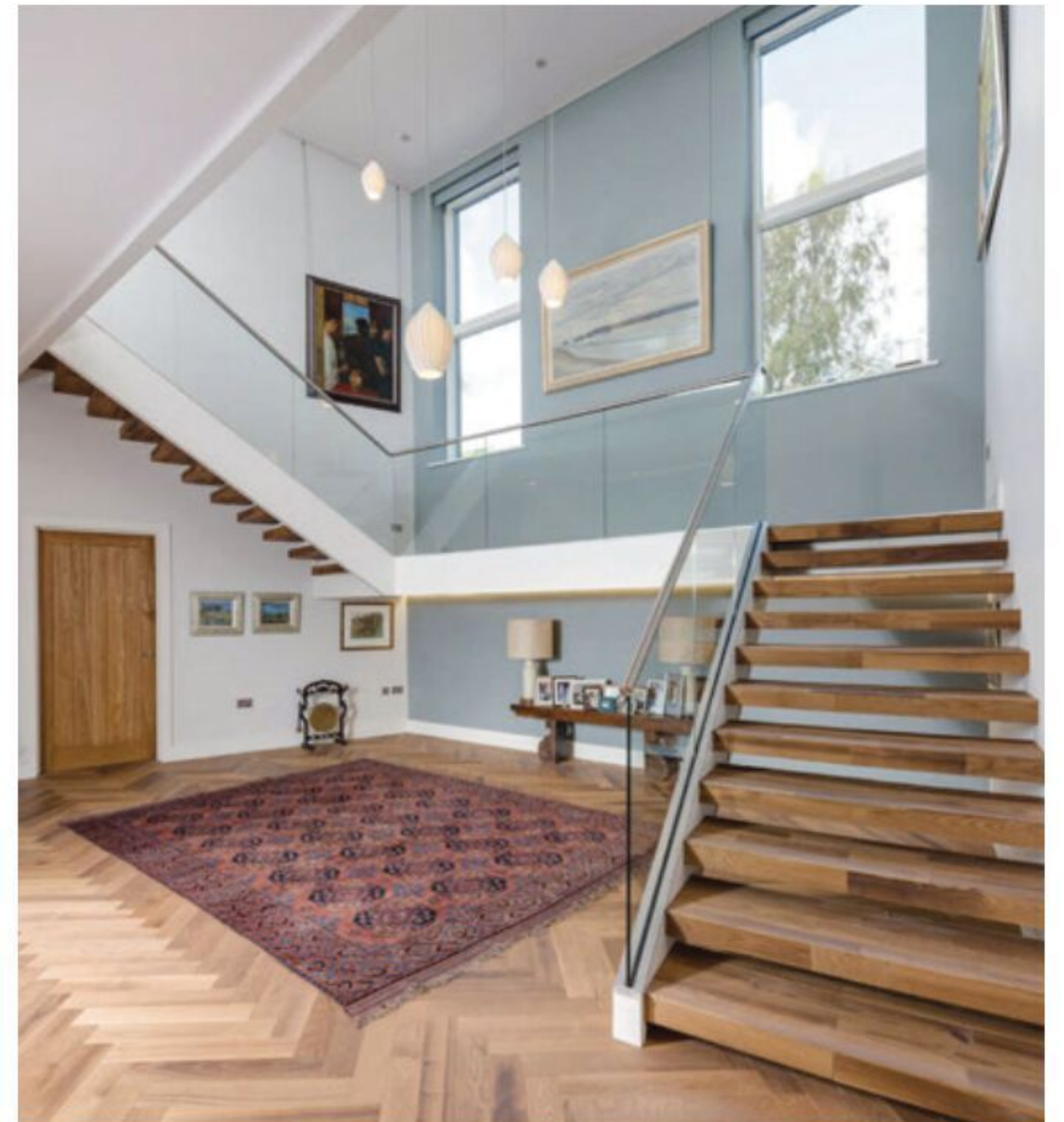
EXTERIOR The house is built in an elevated position using SIPs, with the facade clad in brick. The design includes extensive glazing to maximise the views.

capitalise on the panoramic views in three directions, whilst flooding the house with daylight. The house has been built to include all aspects of sustainable design using the latest construction methods such as SIPs along with the integration of renewables. The combination of a highly thermal, airtight fabric along with the installation of MVHR, air source heat pumps and a stand-alone PV array, has helped the property to achieve an EPC of 97 per cent and an 'A' SAP rating.

The house is cut into the top of a slope with a four-metre-high retaining wall holding and sculpting the land to form a free-flowing garden following the natural topography. The striking, one-off design pays attention to detail both externally and internally and includes features such as a large overhang roof, bespoke staircase and curved kitchen, all using quality materials.

The choice of SIPs was made at the initial design stage. The panels provide a highly efficient fabric that is super airtight. Careful planning and collaboration with suppliers SIPs@Clays and engineers helped overcome the many structural challenges of the project, including the large overhanging roof and the substantial internal open-plan spaces. The solution was a combination of an internal steel frame with glulam beams.

The SIPs for the house were manufactured off site which reduced the construction time of the superstructure, an



INTERIOR
Curved red library shelving and herringbone timber flooring add a warm feel to the downstairs living area. Upstairs, the south-facing drawing room offers spectacular views of the countryside.

important consideration when constructing a house at the top of a hill during the inclement Northumberland weather.

One of the critical elements for the project's success was the use of building information modelling (BIM). This was used from the initial concept stage through to planning, technical design and on-site management. This allowed for efficient on-site working and the close collaboration between Richard and Ros, Model Projects, based in London, and the main contractor, Smailes Construction, working on site in Northumberland.

Another key aspect for the success of the project was the modelling of all the details of the house from the superstructure through to the MEP (mechanical, electrical, plumbing) such as for the ductwork for the MVHR, which reduced potential issues on site.

THE BUILD

SIPs helped to speed up the build process, as the panels were manufactured off-site by Yorkshire-based SIPs@Clays for an easy on-site build, despite the complexity of the design. The home was designed to cut into the sloping site, with a trapezoidal floor plan over two levels, a complex 4.5m SIPs roof overhang and a monopitched roof which partially wraps down the rear elevation of the house.





Taking on the challenge

A hybrid timber-frame solution was required for this unusual bespoke home in Sheffield.

The Hen House is a two-storey home with a difference in Sheffield. Like every self-build project, it is unique and required a bespoke design to meet the owners' requirements. And like many self-build projects, it presented its own challenges. When the project couldn't be achieved within budget using traditional building methods, the owners consulted the team at specialist timber frame supplier Frame Technologies, who reviewed the design and proposed a hybrid solution that could be delivered within budget.

THE CHALLENGE

The site of the new home was challenging to say the least – a steep, wooded plot with a gradient of around 50 degrees and a large proportion of the site covered by a Tree Preservation Order. Paul Testa Architecture decided to position the foundations on the lower portion

The Hen House is built on two levels on a steep 50 degree site. Modern methods of construction, including the RechVantage E timber-frame system, were employed to overcome the structural complexities of the project.



of the site in the spot where the hens used to live, hence the name of the property – the Hen House. From the road, the house appears to be single storey. However, because it is built on a steep incline, the true scale of the property can only be appreciated from the rear.

Initially, the owners were not committed to achieving the highly regarded and challenging Passivhaus standard. That position changed when they visited some completed projects during Passivhaus open days. A fully functioning Passivhaus became their aim.

OFF-SITE APPROACH

A true off-site manufactured timber system was not initially specified for the structure. However, it soon became apparent that using modern methods of construction was the only way this project could be delivered.

Frame Technologies designed, manufactured and installed all the structural timber elements. The structural system was designed to spread the load more evenly, in a uniform way. This would be more efficient, eliminating big point loads with a fully vaulted spread, and saving on the costs of the groundworks. The lighter superstructure saved around £10,000 on the cost of the foundations.

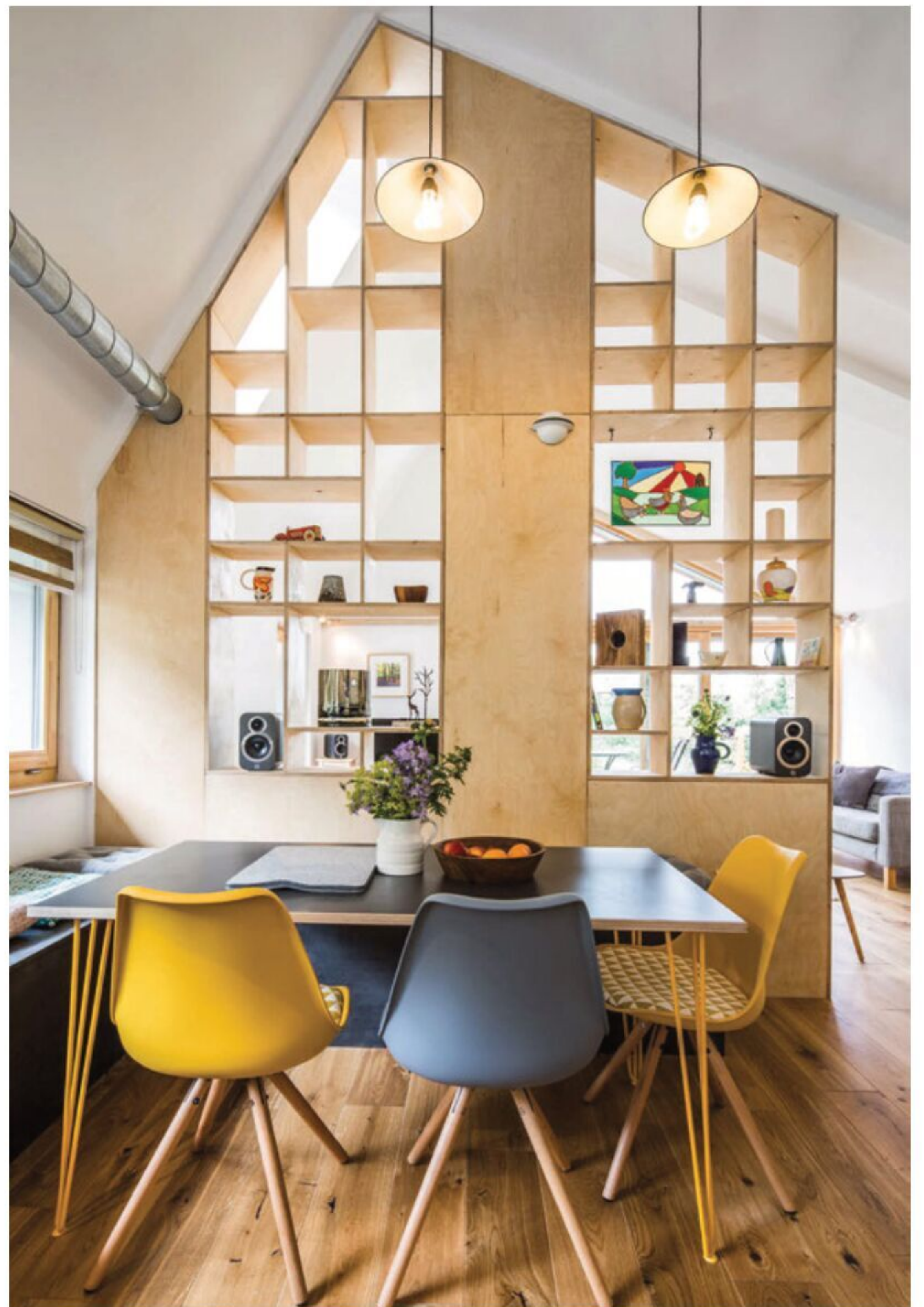
Frame Technologies also offered guidance on the building fabric performance and sourcing sustainable materials to achieve an energy-efficient home built to Passivhaus principles.

The TechVantage E timber-frame system, which uses 140mm panels containing rigid urethane insulation, was chosen to achieve the desired performance standards. Manufactured in Frame Technologies' factory, TechVantage E is a closed-panel system available in a variety of depths to meet specific U-value requirements – from 0.09 W/m²K to 0.23 W/m²K. The closed panel has a 9mm OSB outer sheathing and either a vapour control layer or a 20mm to 110mm layer of extra insulation on the inside of the panel with taped joints to meet the specified U-values. There are service zones between the insulation layers.





The Hen House has been built to Passivhaus principles.



PARTNERSHIP APPROACH

Frame Technologies took control of the entire process, working in collaboration with Paul Testa Architecture, the engineers from Jon Carr Structural Design and M&E consultants to design, engineer and manufacture all the structural timber elements, delivering the frame on site and erecting the structure.

This end-to-end service helped to achieve consistency throughout the process. By using the advanced TechVantage E system, U-values are easier to predict. Airtightness is factored into the energy performance equation and can be achieved with simple detailing. Frame Technologies meet and can even surpass current regulation requirements, achieving airtightness of less than $1\text{m}^3/\text{h}/\text{m}^2$.

ACHIEVING OPTIMUM PERFORMANCE

Off-site prefabricated structural timber provides a faster speed of build than traditional methods of construction – typically 30 per cent quicker. The frame for the Hen House took just eight days to erect. And because timber-frame construction is not weather-dependent, due to most of the work being completed in the factory, project planning can be more predictable, reducing the risk of setbacks. For the Hen House, the follow-on trades started work much earlier, which meant that the build could be finished ahead of the predicted schedule for a traditionally constructed home.

THE SPEC

The lower floor was panellised, with metal web joists used to create a timber deck running across the full storey. A steel A-frame was incorporated into the design to form the offset ridge of the roof to create a clear internal ceiling with no tie wires or beams.

The fabric-first approach adopted by Frame Technologies creates a high-performance, thermally efficient building envelope that can achieve Passivhaus Standards without the need to rely on expensive bolt-on technologies such as solar panels.

The Hen House achieves high levels of energy efficiency.

Using timber allows for more accurate budgeting, essential when selfbuilding. The finished building is well insulated and thermally efficient, providing a lifetime of lower costs and energy bills, and delivering a true fabric-first, fit-and-forget ethos. “Our mission is to add value to drive down overall project costs throughout the build and beyond, creating a highly energy efficient home, and reducing ongoing costs for the lifetime of the building,” says Frame Technologies MD Simon Orrells.



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For self and custom build mortgages, we charge a fee of £295. £95 is payable on application and £200 on offer. For all other mortgages a separate fee policy applies.



PICTURES: Most lenders will offer mortgages on structural timber homes but may be less receptive to those clad in timber. It is essential to take advice on your mortgage options at an early stage.

Mortgage considerations

As the UK's leading distributor of self-build finance, Buildstore has helped more than 25,000 selfbuilders realise their dream home and over that time we have seen the constantly growing popularity of structural timber as a construction method.

The combination of speed of construction, certainty of costs and stringent quality control makes it easy to see why structural timber is an attractive choice, not only for selfbuilders but for lenders too.

Mortgage lenders have historically viewed self build as higher risk than lending on a ready-built house. They therefore appreciate that structural timber reduces the risk of delays, overspends and quality issues – so much so that every one of more than 50 self-build mortgage products available from Buildstore is suitable for a project using a structural timber system.

CHOOSING A SELF-BUILD MORTGAGE WHEN USING A STRUCTURAL TIMBER SYSTEM

It's vital that you know your budget and design your house to fit. You need to understand when your mortgage lender will release funds throughout the build programme and make sure that you can meet the payment terms for your structural timber frame, suppliers and trades. Usually you will need to pay for most of your timber frame before it is delivered to site. This means you need to have a greater proportion of your build costs available earlier in the build programme than other types of construction.

MORTGAGE OPTIONS

ADVANCE STAGE PAYMENTS (COST-BASED)

Many selfbuilders using a structural timber system will choose an advance stage payment mortgage. Funds are released based on both the value of the plot and the cost of each upcoming stage of work. This means that a selfbuilder can draw money to fund the plot purchase and to make a payment towards the cost of the timber frame before it has been delivered or erected.

The advance stage payment mortgage was designed by Buildstore over 20 years ago and, because funds are released



Tom McSherry is the National Relationship Manager at Buildstore, the UK's leading mortgage provider for selfbuilders.

linked to the cost of work rather than a valuation of your site, the risk of a 'downvaluation' of your site preventing you receiving the funds you were expecting is eliminated.

ARREARS STAGE PAYMENTS (COST- OR VALUE-BASED)

An arrears stage payment mortgage may be suitable where you have a high level of savings available to fund the cost of each stage and meet your suppliers' terms, with the lender releasing funds once each stage of work has been completed. Most of the arrears products available from Buildstore allow releases based purely on build costs, however some mortgage products do rely on a valuation of the site at each stage to determine how much can be released. Where a valuation-based product is selected it is even more important to ensure you have sufficient contingency funds to pay suppliers and contractors in the event the lender doesn't release the amount you were hoping for.

OTHER CONSIDERATIONS

Whilst nearly all lenders will lend on a structural timber system, the material used in the outer cladding of the property may reduce the choice of mortgage products. Generally, lenders are happy where the property will be clad in masonry, but may be less receptive where the property uses a significant proportion of timber or other non-masonry materials for the outer skin. It's vital that you take advice on the financing of your project at an early stage, even before finalising the design. Whilst there are borrowing options for most cladding options, the choice of external finish could impact on the number of lenders that will support your project and therefore your choice of mortgage product.

TYPICAL STAGE PAYMENTS

- STAGE 1: Purchase of land (unless already owned)
- STAGE 2: Frame deposit and foundations
- STAGE 3: Timber frame delivery and erection (most or all of the structural timber frame requires payment in advance of delivery)
- STAGE 4: Wind and watertight
- STAGE 5: First fix and plastering
- STAGE 6: Second fix to completion.

The charm of oak

Oak framing is a traditional building method that has been adapted for modern construction.

Oak framing is a time-honoured building system that has never really gone out of style and is a firm favourite with selfbuilders, thanks to recent innovations designed to improve energy performance. Traditional half-timbered black and white houses have long been admired for their beauty and structural integrity, having survived for centuries, with some dating back to mediaeval times. Building a new oak-framed house offers the perfect compromise – the chance to combine modern building materials with the instant character provided by exposed beams and timbers. Modern technology enables designers to utilise the beauty, strength and integrity of the frame to its full effect, creating open-plan living spaces without the need for internal structural walls. Oak is a slow growing wood with a tight grain which makes it

From initial sketches through to the finished house, an oak frame can usually be adapted to a selfbuilder's wishes and ideas. Early consultation with a supplier is advisable.
(Pictures: Oakwrights)

durable, strong and a natural insulator. In a fire, a protective layer of charcoal forms around the outside of an oak beam, delaying damage to the core, and most oak frames are sturdy enough to withstand the ravages of a tornado. At least a 200-year lifespan is achievable for a well-designed oak frame and, even then, there is the chance to continue the tradition of reusing the timber for other purposes when a house has had its day. Ultimately, oak will biodegrade when eventually redundant, making it the perfect natural building material.

MODERN TECHNOLOGIES

While the design and carpentry of oak frames was already highly developed by the mediaeval period, modern technologies such as insulation, glazing and frame infill techniques now far outperform their historic counterparts. Oak's versatility can be exploited in great open-plan spaces, soaring vaulted ceilings, galleries and atriums, adding to the sense of drama.

If choosing to build in oak it is important to use an architect who is familiar with the method, or at least to consult an oak-frame specialist early on. Traditional oak-frame homes are created around a series of rectangles (bays), which make up the base structure (box frame). A good designer will help you to recognise how to make the most of your structure, the best orientation and the size of the bays and spans. They will also work out the loads, as well as the scale and proportion of the rooms. The design will also be affected by roof pitches – between 42.5 and 52.5 degrees – with the most common being 45 degrees.

It is worth noting just how flexible the design services offered by oak frame companies can be. Many selfbuilders assume that they will have to build one of the standard house types shown in their brochures but these tend to be a sales aid designed for guidance rather than an indication of the available options. Many standard designs can be





adapted to create individual houses, and in-house designers and architects can produce bespoke plans and elevations, including detailed drawings for Building Regulations.

It is possible to build a very contemporary home around an oak frame, and if a structural engineer specifies additional steelwork to reinforce the building this can be concealed within an oak beam. Alternatively, traditional frames are based upon the design and style of the vernacular oak frames found in English towns and villages. There is no county in England without examples of oak framing and this can be extremely useful in persuading local authorities to grant planning permission.

A popular option is the barn-style oak frame, which combines the contemporary and the vernacular. The essential difference is that the beams are not generally exposed externally. These buildings invariably have a more open-plan feel, with fully vaulted roofs, and the heavy oak frames are well suited to accommodating large areas of glazing.

Some package companies will undertake everything from gaining planning permission and erecting the frame to organising subcontractors and completing the entire project on your behalf. Others will simply design, supply and erect the oak frame, leaving the selfbuilder responsible for organising everything else.

FRAMING

Some oak-framing companies continue traditional framing techniques, passed down through generations, with hand tools still very much in evidence. Others favour fast, computer-controlled cutting machines.

The oak is used soon after it is felled so that the green timber is easy to cut and work into the desired shapes. Green, unseasoned oak is traditionally assembled with classic wooden pegged mortise and tenon joints, and the

The oak frame is usually made and assembled in a factory or framing yard before being dismantled and re-erected on site.

timber continues to contract – tightening the joints to give a uniquely strong structure which will last for centuries.

Most companies make up the entire frame at their framing yards prior to dismantling it ready to be delivered and re-erected on site. The finished building will also need to incorporate modern materials such as air barriers in order to meet Building Regulations.

It is important to find out the lead-in (waiting) time for an oak frame because these can vary enormously depending on how busy the suppliers are, frame size, design complexity and other issues.

CONSTRUCTION

Like all timber-frame construction, the foundations must be accurately completed before the frame can be delivered, so ensure you leave plenty of time for unforeseen problems at this stage. Oak frames need a level surface, and poorly built foundations are a frequent problem for all types of timber frame, so it pays to employ experienced groundworkers.

Make sure that site access will not be a problem for a crane, which may be required to lift the huge trusses and cross sections from the lorry. Erecting the frame will then usually take between a few days and several weeks to complete by a specialist team.





Once the frame has been built the timber stud infill panels and insulation can be fixed in place, and the shell clad with materials such as brick, stone, weatherboarding or render. Structural Insulated Panels (SIPs) are a modern alternative to a timber stud wall, manufactured in a controlled environment and shipped to site ready for erection. They consist of an inner insulating core of expanded polystyrene (EPS) sandwiched between two outer skins of oriented strand board (OSB), and provide excellent thermal efficiency.

Whether renovating or building from scratch, it is recommended that traditional materials are used such as lime mortars and plasters, which allow for minor building movement. Hydraulic lime mortars are particularly useful in timber-frame buildings because their excellent vapour exchange properties minimise rot and damp while providing good weather resistance.

It is possible to build externally exposed oak frames that meet and exceed Building Regulations. Additionally, encapsulation systems have been developed which completely insulate the frame externally, minimising the cold bridging effect of the timbers and providing a draught-free environment. Several oak-framing companies have developed their own prefabricated encapsulation systems and most well-made, exposed oak frames – with the proper detailing – perform exceptionally well on airtightness tests.

Oak, unlike many other timbers, does not require preservative because the wood is naturally resistant to insects and weathering, although the frame can become marked from the natural tannin in the wood. These marks and other stains from the building process can be removed by sanding or using oxalic acid once the frame has been built.

MAINTENANCE FREE

Untreated oak weathers to a silver-grey colour externally, while remaining deep golden inside. As the oak seasons it hardens to a nail-bending density, so carpenters tend to work the wood while it is fresh and unseasoned. Oak is described as 'green' when it has been felled only a couple of years and the timber still has a high water content and is not dry in the middle.

It then takes between five and 10 years for an oak beam to dry out completely and season, and this process often results in shrinkage and movement – a factor which can alarm home owners. As the oak dries and shrinks, the process creates minor splits or 'shakes', which are all part of the building's charm but can cause a few creaks and groans to emanate from the timbers. Oak can be exposed externally without any need for artificial coatings and is extremely resistant to insect attack. For wood to rot there must be a

PICTURES
Oak beams create a real wow factor in a modern home. They are usually left exposed in the main living areas.

serious damp problem, as moisture passes through wood unless covered in materials such as cement render.

COSTS

Oak framing is often seen as an expensive building option, with oak costing at least one-third more than other timbers. In general, though, oak construction will only increase the overall cost by between five and ten per cent and the simpler the design the less expensive the frame. Resale values are high and there are ways to reduce costs and ensure that you get maximum value from the exposed frame without breaking the bank.

One option is to combine this form of building with a less expensive alternative, such as blockwork and areas of softwood framing. By building just one section of a house using an oak frame you can benefit from all the advantages of the wood in prominent areas like vaulted hallways and sitting rooms. Known as 'hybrid', this method is ideal for those on a more limited budget who wish to feature some oak within their home.

OAK FRAME RESTORATION

Timber-framed buildings are totally functional. Every component part of the frame serves a purpose in taking a load or a stress to keep the whole structure in equilibrium, which is why the members of a frame should never be removed or cut through.

Apart from destroying the completeness of the structure this disturbance will set up new stress patterns and may cause settlement, cracking of finishes or infill panels, failure of other members and serious instability. It's therefore essential to understand how your building works and to remember that it is a framed structure, with its forces and loadings carried on the comparatively slender timber members of the frame. If you are repairing a timber-framed building you are strongly advised to seek professional help as it is not a job for an amateur. The Society for the Protection of Ancient Buildings advises that it is only necessary to disturb the timbers of an old oak-framed building if it is absolutely vital to ensure the survival of the building. Gentle, sensitive repairs will ensure that the oak timbers retain their character.



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Dream new oak home

Steven and Helen James have built their new oak-frame home in their old garden.

For more than 20 years, Steven and Helen James owned a five-bedroom family home nestled in a charming Warwickshire village. The one-acre property was the perfect place to bring up their three children. The couple always thought the long narrow garden had potential to be subdivided. Steven even planted trees at the bottom of the plot in a semi-circle in the hope that one day it would be the site of their new dream home. However, at the time Steven and Helen were too busy working and raising their family to take their idea any further.

However, the couple continued to discuss the potential of their garden, and it was their three-year stint in Australia that really sparked their self-build plans. Some of the family's neighbours in Sydney had purchased large plots and had subsequently built homes in the back garden. Aussies call these 'battleaxe' plots. "I remember thinking we could

PICTURES

The oak-frame is complemented with timber cladding and extensive glazing.



"What really appeals to us about our home is the combination of the traditional craftsmanship and the new technology."

build in our garden at home," says Steven. After their return to the UK, Steven was offered early retirement and the family decided the time was right to build their own home.

The couple met Oakwrights sales director David Grey, who invited them to visit the company's oak-frame show home in Hereford. "I really liked the look of it," recalls Steven, who also spoke to a few other oak framing companies in the area. "But we liked how Oakwrights saw their projects through the whole process, from the design to the finish, limiting the number of contractors involved." They discussed their ideas



with one of Oakwrights' regional architectural designers, Pete Tonks. "Planning was potentially tricky as most of the village is designated a Conservation Area and also there were a number of Grade II-listed buildings in the vicinity," explains Pete. "Developing rear gardens had also proved difficult in the area previously."

In May 2016, Steven and Helen submitted a full planning application. However, despite what the planners considered a good design, the application was refused as the Council considered it to be a 'back-land development'. Undeterred, the couple took their case to appeal and three months later in March 2017, planning was approved for a bespoke, three-bedroom oak-frame home with a three-bay room above the garage. "The inspector recognised the development was in a rear garden but could support the proposal due to the high level of design and appropriateness, together with the fact the oak-frame build was eco-friendly and represented sustainable development," says Pete.



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From the outset, Steven and Helen knew they wanted their home to include as much glazing as possible, and worked closely with Pete to achieve this. "Three-quarters of the ground floor is glass," says Steven. "Our garden is all trees, hedges and lawn and we wanted to have that view everywhere we looked." To blend in with the woodland surroundings, the glazing is offset with timber cladding on both the home and the bespoke outbuilding, and a rustic tile roof extends over a covered porch area.

Inside, the open-plan oak-framed living rooms are light and airy thanks to the extensive glazing. Sunlight bounces off the impressive beams during the day while clever lighting ensures that every angle can be appreciated even in the evenings. "We wanted to create a big, open-plan space for our family to enjoy," says Steven, who specified two particularly large rooms on the ground floor, along with three smaller rooms, where they can hide things away, such as the washing machine and coats. One of these spaces is Steven's office which is designed as a sunroom at the front of the house.

Originally Steven and Helen had planned a spiral staircase to the first floor but changed their minds when they realised it would take up too much space. "Essentially it's a free-floating tube of metal that is heavily bolted and cemented into place," explains Steven. An antique light fitting, handpicked by Helen, hangs elegantly down into their double-height, vaulted living area.

All three upstairs bedrooms have double-height, vaulted ceilings and in the master bedroom, oak purlins draw the eye to the glazed king post truss with sling braces. On the landing, a doorway, cleverly disguised as a bookcase, leads onto a gallery landing which is also bathed in natural light from a glazed gable and overlooks the open-plan downstairs area.

It was essential for Steven and Helen that their new home



PICTURES

Three-quarters of the ground floor is glass, something that Steven and Helen wanted to include from the outset.

was low maintenance. They chose underfloor heating instead of radiators, a mechanical ventilation with heat recovery system (MVHR) and an air source heat pump instead of a gas boiler, which all work in conjunction with Oakwright's WrightWall encapsulation panels which were designed and constructed alongside the oak frame at the Herefordshire workshops. The groundwork was carried out by local builder Andy Keogh, who returned to complete the rest of the build once the Oakwrights' team had erected the frame, encapsulation and glazing. "I only really had two contractors working on this project, Andy and his team, and Oakwrights," says Steven, who oversaw the project.

"What really appeals to us about our home is the combination of the traditional craftsmanship of the oak frame and the new technology, such as our underfloor heating, not forgetting the space and light. Helen and I still find ourselves reflecting on this house, and it certainly has not lost its appeal," says Steven.



PICTURE: PETER LANGDOWN PHOTOGRAPHY



CLT construction

Cross-laminated timber, known as CLT, is a relatively new kid on the block when it comes to timber construction. The cross-layered engineered wood, which can be used for walls, roofs, floors and even stairs, was pioneered in Europe in the 1970s and is imported to the UK, mainly from Austria, Germany and Scandinavia. One of the most exciting aspects of CLT panel construction is its potential to overcome the height limitations of traditional timber structures. Mjøstårnet, a tower block in Norway built using CLT, has been verified as the world's tallest timber building, standing at an impressive 85.4m high.

CLT structures are typically built using a 'platform frame', where walls are temporarily braced with raking props before floor panels are lowered onto them and fixed. The completed floor structure provides the 'platform' for the erection of the wall panels to the following storey.

For those with more modest aspirations, CLT panels have practical applications for the housebuilding sector too. For example, pre-insulated wall and roof cassettes are suited for room-in-the-roof construction where there is a simple arrangement of continuous ridges and gable ends. A breathable roof underlay and rigid insulation is usually installed above the CLT panels for a warm roof construction which can be prefabricated as an insulated cassette.

So what gives CLT panels their inherent strength and

PICTURES
Cross-laminated timber panels are a quick and energy efficient building method.

stability? Basically, it is the way they are formed. Multiple layers of cross-bonded timber, typically 20mm to 45mm thick, are glued together. The number of layers is always odd, with a minimum of three, and these layers may be of varying thicknesses, arranged symmetrically around the middle layer. The panel's strength is achieved by having the grain of each layer at right angles to each other. The overall thickness, as well as the load-bearing performance of the panel, is determined by the build-up of the individual laminates.

The benefits of CLT over conventional softwood wall framing and joisted floor constructions include its large axial and flexural load-bearing capacity when used as a wall or slab, its high inplane shear strength (resistance to wind and seismic forces), and its fire resistance. As a solid wall panel, rather than a framed construction with load-bearing post elements, CLT panels also distribute their weight evenly as in-line loads at foundation level, which reduces the requirement for localised pad foundations.

Other pros include good acoustic performance and excellent thermal insulation which can be used to achieve good U-values, typically 0.13W/mk for the building envelope.

The UK's Evolved Group has partnered with German company FHS Holzbau to import CLT made with formaldehyde-free polyurethane glue. Using its system, a typical home can be erected and weatherproof in two to three days, providing a healthy, comfortable interior without requiring plastic vapor barriers. By cross bonding the longitudinal layers, the three-layer CLT becomes naturally airtight. When used in combination with wood fibre insulation and gypsum fibreboards as wall cladding, moisture is absorbed and released to naturally control indoor air humidity.

Standard wall panels 100mm to 120mm thick with 200mm of wood or rock fibre insulation applied to the outside can achieve U-values of 0.18 W/m²K or better.



CLT used for contemporary home

Architect Ruth Butler and her husband Julian Sutherland chose cross-laminated timber panels to build their contemporary-style passive house in Hampshire, with the shell erected in just four days. The panels were imported from a factory in Austria, which the family visited to see them being fabricated. The CLT panels are inherently airtight, helping the build to meet the stringent Passivhaus requirements.



Glulam

Glued laminated timber, or glulam, may be considered a modern building alternative to concrete and steel, but its origins date back to the late 19th century. A Swiss patent in 1901 heralded the true beginning of glulam which consists of layers of timber glued together with a moisture-resistant adhesive.

The timber is manufactured in a factory where the laminated layers, usually made from softwood such as spruce, larch or fir, form

a larger, single element which can be used for a range of applications, from beams for large spans, to lintels and posts. Glulam can be made to virtually any shape, and its light weight makes it practical to handle.

Because of its natural good looks, glulam is often left exposed and can frequently be spotted in sports hall roof structures and in numerous commercial buildings such as supermarkets, serving as both a decorative and structural component.

Glulam is often used in place of concrete and as an alternative to RSJs or a steel frame. Surprisingly, it can outperform steel in a fire where the latter distorts in high temperatures. The timber surface of glulam may become damaged, but the integrity of the shape remains intact.

Glulam has similar structural qualities and looks to CLT (see opposite) but on a smaller scale. It is considered a greener alternative to concrete as it has a 60 per cent lower carbon footprint. In house construction it is often used to span large open-plan spaces, creating a striking contemporary feature in the process.





Labour of love

Terry and Isabel Cross realised their self build dream with this barn-style timber-frame home in Cambridgeshire.

Terry and Isabel Cross are in their 60s, and with both of their sons having moved out with children of their own, the couple were looking for a new home that suited their needs. "We read all the self-build magazines, and had our hearts set on timber frame. We looked at a few different timber-frame companies, eventually choosing Potton, for their reputation as well as their location," explains Terry.

The half-acre plot in a Conservation Area is a former paddock close to the Crosses' previous home in a Cambridgeshire village, and they were keen to stay nearby having lived in the area for more than 20 years. It was only when they attended every academy course at Potton's show centre and met other would-be selfbuilders that they realised how difficult plot finding could be. "We thought at the time how lucky we were, as others were looking for land with outline permission. We had to go through the planning process ourselves. As it transpired we possibly had the longer journey," recalls Terry.

"It was reassuring to find other practical and enthusiastic people and that they were no more experienced than us," says Isabel.

The planning application was made by architect

The four-bedroom timber-frame home has been clad in brick and timber under a clay tile roof to achieve a barn-style facade.

Adrian Bussetil, and conditions from the planning office were difficult and protracted. The site is within the village boundary, but because of its Conservation Area status, in addition to the usual surveys, biodiversity and arboricultural reports, an archaeological dig was also required. "We got conflicting advice from individual officers, and so in the end we involved our local councillor to mediate, as there were no local objections at all. This brought a swift resolution, but there were some unnecessary and irritating adjustments such as a few centimetres in roof height and the removal of a gable window from the design," says Isabel. Conservation Area status also meant that solar photovoltaic panels were not permitted.

Moving in with their son's family, who live two miles from site, enabled both Terry and Isabel to focus on sourcing, budgeting and project management without the pressure of running a home.

They enlisted the help of a project manager for the initial stages of the build, but once the structure was watertight they took it on themselves. "We were nervous about groundworks, but with hindsight we knew more than we thought, and with a good contractor we need not have worried," says Terry, a carpenter who handmakes bespoke rocking horses. Being self-employed, he was able to take three months off to be involved in the project, and was on site much of the time, available to make decisions and keep the site tidy. He used an old barn as a workshop during the build, while Isabel continued to work full time as a senior manager for a local mental health charity.

The Crosses moved in sooner than planned, living in one completed bedroom and bathroom, with the rest of the house having bare plastered walls and concrete floors, while work went on around them. They survived for several months with a temporary kitchen, completing the interior one room at a time.

Connecting to services proved frustrating, costing far more and taking much longer than they had anticipated. "A major factor was the distance from the





IN BRIEF

PROJECT Timber frame
new build
LOCATION
Cambridgeshire
TOTAL SPENT £550,000
WORTH £600,000

Wooden floors reflect the light in the airy and stylish living room, which has a feature inglenook fireplace.



road. We budgeted more than average but completely underestimated the cost of the power connection,” explains Isabel. “Other utility charges were more modest, but it was important to coordinate installation, as laying them meant digging up the neighbours’ drive. This proved to be a test of patience and the house was almost entirely completed using just an extension lead from a neighbour and a 50-gallon water bowser.”

The couple hired the main contractors, roofer, bricklayer and plumber, but undertook other work themselves. They hired equipment and labour to dig trenches and lay the loops for the ground source heat pump, completed much of the second-fix carpentry and internal decorating, and Terry also built the stairs and balustrade, incorporating Arts and Crafts style mini-inlays in handrails and newels.

Adapted from Potton’s Oakwell barn design, the single-height brick facades are met with a cat slide roof covered in Imerys Pamphelin clay tiles, bisected at the front with a double-height facade clad in pale green fibre cement weatherboarding and topped with an intersecting clipped gable, a shape replicated to the ends of the main part of the house. The chimney is in the centre to allow the heat to radiate throughout, while large expanses of timber double glazing flood the house with light. A triple garage/workshop has also been built in the same style. “Our vision was a country contemporary finish, where a mixture of old and new would sit well together,” explains Isabel.

Terry skilfully installed the Shaker-style cabinets in the generous dining kitchen, which has an island unit, rounded breakfast bar and tiled floors, while wooden floors in the dining area continue into the spacious, well-lit lounge. A large inglenook fireplace provides an attractive focal point, and double doors both here and in the dining room open onto landscaped gardens.

There is a ground-floor bedroom and shower room too, so that the Crosses can remain living in the house. Upstairs, three bedrooms, an en suite and a family bathroom are connected by the mezzanine galleried

landing, which has oak balustrades with one glazed section replacing spindles to prevent interruption of the view through the double-height windows.

Working gradually through the house to complete each room in turn, the Crosses have worked hard to create a cosy, comfortable home with a sense of warmth and filled with natural light. “It has been a labour of love, and means we have had a very personal investment in our home,” says Terry

A-Z MEMBERS



Picture: Taylor Lane

It is important to note that it is not always feasible, possible or necessary for a member to achieve a Gold level membership. Specific quality requirements differ for each type of member and customer activity depending on the nature of a company's business; therefore, a Bronze or Silver member may be the most appropriate company for your project requirement.

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01772 780175



MULTI-FRAME OPTIONS

Flight Timber Products Ltd

flighttimber.com

01787 222336



Scotframe Timber Engineering Ltd

scotframe.co.uk

01467 624440



Kingspan Timber Solutions Ltd

kingspanoffsite.com

01767 676400



Lowfield Timber Frame

lowfieldtimberframes.co.uk

01743 891922



OTHER MEMBERS

Olive Modular Ltd

07930 025583

jonathan@olivemodular.com

olivemodular.com

CLT

ABC+ Warranty

0161 9288804

info@architectscertificate.co.uk

architectscertificate.co.uk

All services

Protek Group Ltd

07584 039 194

simon.middleton@protekarranty.co.uk

protekselfbuild.co.uk

Warranty provider

Point1 Building Systems Ltd

01743 460066

garry.dyke@point1buildingsystems.com

point1buildingsystems.com

Installer

Sennocke International Insurance Services Limited

01732 742102

peter.richardson@sennocke.co.uk

sennocke.co.uk

Warranty provider

Neat UK Ltd

0141 297 1927

colin.taylor@neat-living.com

neat-living.com

All services

Mary Riley Solutions Limited

01794 399966

mary@maryrileysolutions.co.uk

maryrileysolutions.co.uk

Mortgage & Funding

MD Insurance Services Ltd

07771 918321

daniel.hughes@mdwis.co.uk

premierguarantee.co.uk

Warranty provider

Buildstore Mortgage Services Limited

0345 2234888

tom.mcsherry@buildstore.co.uk

buildstore.co.uk

Mortgage & Funding

Evolved Design Ltd

01691 778846

sue@evolved-design.co.uk

evolved-design.co.uk

Designer

The Homebuilding Centre Ltd

01506 409464

philip.wilson@nsbr.co.uk

nsbr.co.uk

Self Build centre

Allan Corfield Architects Ltd

01383 737101

allan@acarchitects.biz

acarchitects.biz

Architect

Thomas Carter Ltd

01892 724710

gerry@thomascarter.co.uk

thomascarter.co.uk

SIPS installer

To find a member, including supply chain companies for insulation and membrane, use the STA search engine: structuraltimber.co.uk/members





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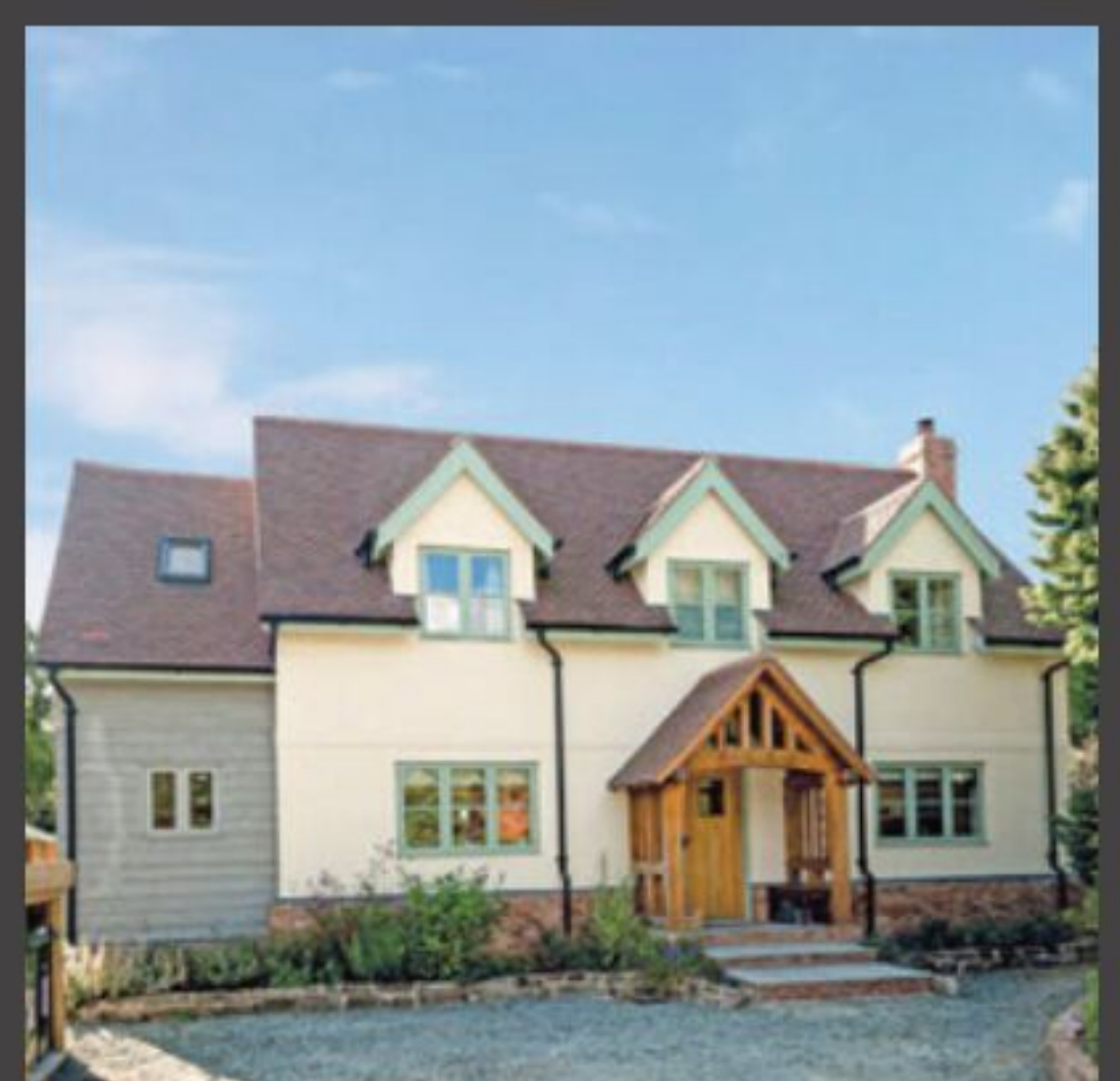
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