

A complete guide to timber
frames





Complete guide to building a timber framed structure

All the information you'll need to guide you through the process of building an oak framed house, extension, outbuilding or perhaps a swimming pool.

Your guide

Carpenter Oak & Woodland has made more bespoke hand-crafted frames than any other UK company. Renowned for its design excellence, quality of craftsmanship and customer care, it has been the recipient of many prestigious awards, but more importantly, thousands of delighted customers.

Choosing and specifying the appropriate structural timber frame and the partners you will work with is a critical factor in the success of any building project. Selection of partners for your project will determine not only the quality of the design and the craftsmanship of your frame, but also the smooth running of your project, how much you will enjoy the process, and the value that you receive.

We hope that this document will help you find the right framing company for your project, understand what to expect from a timber frame, and answer some commonly asked questions. However, there is no substitute for talking and we would be delighted to discuss your project with you.

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1. Finding the right frame for your project

All of our bespoke frames have been lovingly hand-crafted to exploit each timber's natural qualities.

Frame design

Getting the look and feel that you want for the frame can appear a bit daunting, but can generally be done if the company provides you with a good CAD (Computer Aided Design) drawing or electronic 'model' as part of the design process. These are usually produced using CAD software which will enable the frame designer to 'walk' you through the frame whilst it's still on the drawing board. CAD modelling has two additional advantages; it allows the architect to ensure the frame fits with the overall scheme and the frame designer to resolve every last detail before manufacturing starts. When comparing frame designs small variations in the length, width and thickness of frame members have very little bearing on cost. However, timber specification does have a significant bearing on cost, as we explain below.

Some timber frame manufacturers produce an 'off the shelf' range of designs from which you may be able to select the frame of your choice. Often they have their own distinctive style, which is normally reminiscent of period manor houses and country cottages. Alternatively, some timber framers will build an entirely unique and bespoke frame to suit your specific needs. Bespoke manufacturers work on a wide range of projects with very different styles, from the very traditional to the very contemporary, and will be able to work with you to create a timber-framed building unique to you.

Manufacturing methods

Different manufacturing methods produce distinctly different results. Some companies have opted for high levels of automation and use CNC (Computer Numerical Control) machines to cut their frames. This method has its place, primarily when a large proportion of the components are identical, and therefore the process can be speeded up with the potential to save costs. However this machinery can only handle straight and square timber. It also tends to produce a rather different look from that a carpenter would create. CNC operators are in themselves often very skilled, but of course these are different to the skills of a carpenter.

By comparison, some companies retain the skills of experienced timber framers. Their knowledge of framing techniques and the material they're working in results in a finely crafted, feature-rich frame that makes the very most of the timber. Much of the lasting quality of a good frame comes from this process. We believe that the eye of a skilled craftsman is still of paramount importance.

Timber specification and selection

Once in service, each part of a frame is subject to different loads and forces. If the frame is going to perform well, both structurally and aesthetically for generations to come (and you should expect it to), then selecting the right material for each frame member is one of the most important aspects of a well-crafted timber-framed building.

Whilst, for the most part, 'green' timber, i.e. recently felled, is used for its workability and cost, there are some parts of the frame that can benefit from being made from air-dried 'steady stock'. Air-dried timber is timber that has been stored for several years, typically one year for every inch of thickness plus a year. Wind braces (in the roof), wall braces (along the length of the building) and cross frame braces (across the building) have some of the smallest sections used in traditional timber framing and, if made from green timber, are more prone to movement. This also has aesthetic implications, as movement may cause gaps to open up where the brace meets other frame members. In addition, curved braces should be cut from naturally curved timber to ensure good structural performance. Many framing companies use green straight-grained timber for curved braces because of the cost of curved timber and the overhead of holding stocks to allow it to air dry. This is one of the greatest false economies that you should ensure you avoid.

All the timber in the frame should also conform to current timber grading standards. In the past this has been a very grey area, however, for the past fifteen years Carpenter Oak & Woodland has been using its own stringent grading criteria and these now form the basis of a set of industry standards published by TRADA (Timber Research and Development Association) which should be the benchmark for all the timber used in a well-crafted timber frame.

Insurance

You should assure yourself that the timber framer carries professional indemnity insurance. This ensures that, should your frame fail to perform to the required structural standards, you have a line of recourse. When evaluating the cost of this, insurance companies consider the experience and qualifications of the frame designer and engineers in the company. Make sure you know where you stand should the structure fail to perform properly.

Environmental responsibilities

Timber can be the most environmentally responsible material for the structural frame of a building, but only if it comes from sustainable and properly managed sources. There are a number of accreditation bodies, such as the Forestry Stewardship Council (FSC), whose programmes enable the timber industry to prove 'chain of custody' to accredited sources. Some timber framers will only use FSC (or similar) timber. In addition, if environmental responsibility is important to you, then look for a company with a robust environmental policy.

Warranty

Buying a timber frame is, for most people, a significant investment and one you may well choose to live with for a very long time. It is worth ensuring that your timber frame supplier offers a warranty that gives you peace of mind. If you have concerns about the structural integrity of the frame at any point in its lifetime, they should promptly arrange to make a visual inspection. If it is determined that the frame is not performing as anticipated, then they should arrange to rectify it in a timely fashion. In addition to a formal warranty, it's reassuring to know how long a company has been established. A warranty only has value if the company is there to honour it. Timber framing is a fast growing industry, spawning dozens of new companies every year. However, a competent carpenter will take many years to become a competent timber framer and neither will necessarily run a sound business capable of lasting the test of time. Knowing that your supplier will be around in several years' time, when you might want to call on their expertise again, may well be important to you.

Reputation

Of course the reputation of a timber framing company will be built on the sum of the above factors. While reputation is, of itself, no guarantee that you will have chosen the right timber framing partner, this is an important factor, not least of all when it comes to the resale value of your property.

It also provides another important indicator which is the regard in which architects and engineers hold the company. In many cases, architects will encourage their clients to work with a particular framer because, quite simply, they know that they can rely on them for quality, programme and value. Similarly recommendations from other customers are worth paying attention to.

Many of the things we've outlined above add to the costs that a professional, well-established timber framing company has to carry; from where they source their timber, to how they protect their clients through appropriate insurance, to how they invest in and train their staff. However, none should mean that they don't offer good value at comparative rates for a truly like-for-like product.



2. Common questions answered

Your frequently asked questions answered here.

Question 1: What do you mean by timber frame?

Timber frame is a term used to describe any building system where timber is the primary building material, as typically opposed to masonry construction. There are four main kinds of construction that are all loosely called 'timber frame':

- **'Stick' frames:** individual timber sections are assembled on site with little or no prefabrication. It's little used in the UK, where panellised construction is more widely adopted.
- **Panellised construction:** prefabricated panels which are structural, and when bolted together form the shell. This method is widely used for house kits which use wall panels made from small section, low grade, softwood studs covered with chipped particle board. House kits were developed as an inexpensive method of construction to allow houses to be erected at speed for the mass market. Timber frame house kits require standardisation and are well engineered and fabricated and they certainly have a place in the market.
- **Volumetric construction:** similar to the panellised construction system, except that a number of prefabricated boxes are attached together. This is usually the cheapest method of construction, but rarely used due to the obviously 'boxy' shape and feel of the finished product. It is common, however, for temporary buildings.
- **Post and Beam:** a completely different system from all the above in that the frame is a heavy, large section, structural skeleton around which the building is 'hung'. It allows for endless possibilities of size, shape and building materials and is easily modified and flexible, even after the structure has been completed. Many people think of post and beam as being an American system, where it is indeed extremely popular, but Europe was building like this many centuries before America was discovered! In essence, post and beam frames can be as simple as the historic barns we see around us, and as flexible as a barn conversion. Post and Beam construction is fundamentally different from any other type of construction, and this explains why the structural frame can appear expensive at first glance, but because it reduces the need for other structural materials, the overall project price is favourably comparative to brick and block construction.

When we talk about timber frame we usually mean a building of revealed posts and beams using sections of visible high quality timbers of hard or softwood, so the walls and roof can be lightweight, highly insulated and non-structural. Made generally from green or freshly-sawn timber, over time the frame gently shrinks and moves as it dries, locking the joints, getting lighter and gaining strength and durability. This is why you can still visit 1000-year-old framed buildings today.

Question 2: Can you explain the building process, when using a timber frame?

Below we have illustrated a typical route map from conception to completion of your timber-framed home. We've used a house as an example, but almost every type of building can be built using a timber frame.

- **Engagement of an architect** – you may have already appointed an architect - a good architect will help explore and develop an understanding of your brief and needs . We welcome the opportunity to work with new faces and fresh ideas.
- **Production of architect's drawings** – drawings are required for a number of reasons – initially to show you what your building will look like, later to obtain local authority consents, and eventually to show the builder exactly what it is you want him to build. Integral to and the most significant structural element of the building is the frame design. It is essential to have our expert input at the earliest possible stage.
- **Frame design and costs from Carpenter Oak & Woodland** – as soon as we have some idea of the frame design, we can offer guidance on budget costs. Critically at this stage we can begin to engineer the project to meet your financial requirements – doing this earlier rather than later avoids the delay and disappointment of having to reappraise a project at an advanced stage.
- **Outline costs for the whole project** – the architect will have a good idea of general building costs, so, with the guide price we provide, they can start to put together your overall build budget.
- **Planning permission and building consents** – initially you will be looking for outline consent – can you, for example, erect a house on a particular piece of ground? Assuming consent is granted, you then have to ask for permission to build a particular design of building so that it is compatible with the surrounding buildings in that area. You will then need approval that the proposed construction meets with the Building Regulations.
- **Detailed architect's drawings** – the level of detail the architect's drawings convey is dependent on what they are to be used for; outline planning consent, detailed planning consent, Building Regulations approval, and construction detailing which tells the builder exactly what to build. The higher the level of detail, the more work and time the architect has to put in. There is no point going to the level of detail (and expense) that allows the builder to build if the local authority is going to refuse point blank to allow a house to be built on a particular piece of ground.
- **Detailed frame design and costs from Carpenter Oak & Woodland** – we work hand in hand with the architect. The more detail they require for the task in hand, the more detail we provide as the design develops. Not only from an aesthetic point of view, but also structurally. The more detailed the design gets, the firmer the costs become, and the more certain you will be of your final bill and reducing the need for 'contingency' sums. If we are providing a complete design-and-build service we will at this point have set out a specification, fixed price and programme for the project.
- **Preparation of the site by your main contractor** – when the overall build contractor has been appointed by the architect the real excitement begins. Topsoil capable of supporting plant life is stripped back, drains, electricity cables, gas and water pipes are laid, and the foundations are put in. It depends on the construction, but generally the walls are brought up to just above ground level in concrete block, the concrete slab sub-floor is cast, and everything is ready for the frame.

Question 2 continued...

- **Manufacture of your frame by Carpenter Oak & Woodland** – while the builder is busy on site our carpenters are crafting the frame in the workshops, so as soon as the builder has the site ready we have the frame ready for erection.
- **Erection of your frame by Carpenter Oak & Woodland** – the really exciting bit. Until now all you've seen is mud and concrete and within a few days you have the final building shape formed before your eyes in beautiful natural timber. This stage happens very quickly compared to masonry construction, and allows the builder to achieve a wind- and weather-tight shell in a fraction of the time.
- **Completion of your home by your main contractor** – the frame is clad with whatever construction has been agreed (e.g. brick, maybe oak weatherboarding for the walls, tiles or maybe oak shingles for the roof) to make it wind- and weather-tight, and secure to allow the plumber and electrician to start installing piping and cabling. Finishing trades follow on (plasterwork, finishing joinery, floor coverings, kitchens and bathrooms), and finally you are presented with the keys, usually with a small celebration, and everyone leaves you to enjoy your new home.



Question 3: Do I need an architect?

We are specialists in producing bespoke timber frames, and, as such, do not produce standard plans. An architect should be responsible for the overall building design, deal with planning issues, produce working drawings and even manage the tendering and build processes. You can appoint an architect of your own choice or we can recommend someone to you.

Question 4: Do I need a project manager?

You may need a project manager for the overall build and this role can be undertaken by your architect, a specially appointed project manager, or the main contractor. Your architect will advise you of the best course of action. Many of our customers project manage the construction work themselves and some are very good at it, but do beware. For inexperienced people this will usually end up in a job taking longer, costing more, and giving an extreme amount of stress when you should be enjoying the experience of building your dream home. There are also certain responsibilities under health and safety law that the client takes on in a building project which will normally be dealt with by a suitably qualified project manager. We will work very closely with your architects, other trades and appointed project manager, to ensure our part of the build runs smoothly and seamlessly with the surrounding building elements.

In some cases, and particularly on larger projects, a main contractor will be appointed who will then sub-contract all the specialist trades. We are used to operating as a sub-contractor to a main contractor and are happy to do so; although we should point out that the cheapest route for the client is to contract directly with us to avoid paying the main contractor's management fee.

Question 5: Can you erect timber framed buildings anywhere?

Geographically we have shipped and erected timber framed buildings in the USA, Japan and Holland. There are no geographical boundaries. As regards remoteness, we've erected frames on an uninhabited Hebridean Island for a television programme called 'Castaway', where all the lifting was done by helicopter. We've built frames on not so remote islands, transporting the timber by boat and raising the frames using blocks and tackle. However, we normally erect the frames using a crane for speed and economy, but, where a crane can't get to the site, there is always another way of doing the job. We haven't yet been defeated by a challenge!

Question 6: How long does it take to design and build our house or extension?

This very much depends on size and complexity and whether planning is straightforward or not. To generalise, having selected an architect, the design of your building might take a couple of months.

Question 6 continued...

Starting with a detailed list of your requirements, we and your architect would work together on sketch designs with you until you have a design which you are happy with. At this stage you'll have plans of the layouts, elevations and sections through your building.

Either we or your architect can then submit a planning application and a decision should be given within two months, if it is straightforward. Detailed drawings showing the construction, such as drainage, insulation and damp proofing, and the whole structure are then checked by a structural engineer before a submission for Building Regulations approval can be made. Depending on the area of the country you live in, the local authority can take three months to approve the application.

In summary:

Drawings for planning	2 months
Planning approval	2 months
Building Regulations drawings/engineering	2 months
Building Regulations consent by local authority up to	3 months

All going well, you could be ready to build six to nine months from your initial conceptual idea. Build time is typically nine to twelve months for an average-size house, but remember this is for the total building project. The timber frame will take anything from two weeks to two months to build in our yard and will typically be erected in four to five exciting and rewarding days on site.

Question 7: How much will it cost?

This is quite rightly one of the most commonly asked questions and one that is very difficult to answer. Every frame is individually designed and largely dependant on the amount of time it takes the carpenters to craft the frame in the workshops. This depends on the number of individual timbers in the frame and the number and complexity of the joints. Essentially, this means that size isn't terribly important; a small intricate frame with lots of features and character may well cost more than a simple frame twice its size. This does mean that we can usually design a frame to suit a budget. Our skill and experience means we can work with you to meet both your aesthetic and budgetary needs.

The timber frame itself can be a significant component of the overall price of the project, however, in practice, it may affect the total cost less than the specification of the interior and exterior finishes and things like the kitchen and bathrooms. By way of illustration, think of the price differential between a cheap flat-pack kitchen and a bespoke designer kitchen – this can easily amount to a difference of many hundreds of pounds in the finished cost per square metre. It is worth bearing in mind that a frame is an essential structural element, as well as a beautiful thing making small spaces feel larger and large spaces more dramatic.

Question 7 continued...

As a guide, for a bespoke architect designed house, you should allow for between £1,300 and £2,100 per square metre of floor space created. This is a total build price, excluding land and fees. Of course, sums much higher than this can be spent if desired, and simple living can reduce the bill! The framing element of this will be entirely dependent on the amount of framing in the building and its design. Sometimes the whole building will be timber framed, other times just key features like the entrance hall and living areas, Conservatory or kitchen. When we have some idea of the frame concept, we can advise on the likely cost.

Question 8: How much value will a timber frame add to my completed house?

A very pertinent question, so, when considering the cost, you should also consider the value for money if you are building to sell. Again, it is difficult to say, as it very much depends on the site and the value of the housing in the particular area.

If a key aim of the frame is to add the maximum value to the overall project, there are a number of items that we do know clearly add value; large areas of timber and glazing and specifically sun rooms, double height areas, and exposed roof trusses.

What is clear is that the extra value one of our frames delivers will depend on what specifically is designed and, of course, on view. Although it may be structurally valid to use oak for the common rafters in the roof, for example, they will only add value if they are exposed. However, as a real life example one of our customers, a developer, commented that he had spent £57,000 on the frame and glazing for three-bed house. When prompted to say how much value it had added, he was non-committal. When a figure of £100,000 was suggested he commented “oh, easily”! We do also know that our clients have reported that an impressive oak frame has enormous commercial value to venues such as restaurants and golf clubs in attracting clients and new members.

As well as the absolute value, a factor to bear in mind is the fabled ‘wow factor’ which may not actively add to the value of your property on resale, but will undoubtedly enhance your ability to differentiate from other properties in the same price range, and allegorically increases your chances of achieving a quicker sale at the asking price.

Question 9: How long can I expect my frame to last?

The honest answer is that we don’t know. There are a great many examples of oak and elm frames that have lasted many hundreds of years. Their often gnarled appearance is due to the original presence of sapwood in the timber, which is prone to insect attack and rot, so has since disappeared to leave the only the heartwood.

Question 9 continued...

When we build a frame, we do not use timbers with any substantial amount of sapwood (unless you specifically want it in your frame), so it is probably reasonable to conclude that our frames should be capable of lasting at least as long as their historic counterparts. As the frame dries out, the members get lighter and lock together making them stronger, so that it could be said to be at its most vulnerable when new.

Key to the longevity of the frame is the environment it is kept in. Frames can really only rot and degenerate if they get, and remain, wet. If kept in a dry state therefore, we could expect all of our frames to last indefinitely.

Question 10: Are those oak pegs strong enough to hold the frame together?

We get asked this a lot! We use a number of differently sized and shaped pegs for different applications, most of which are handmade by craftsmen. These pegs have been used for centuries as the only means of securing some pretty large structures. More latterly, we have provided drawn peg samples to Bath University for stress testing, and their innate strength and appropriateness have been scientifically proved.

Framing pegs are essential to the way in which a frame behaves and settles, and to the way that the tenons are locked in to make the frame stronger as it dries. Increasingly today, joints are being made with steel connections where there is a need, however, using traditional fixings on a traditional frame makes good sense.

All our frames are checked by a suitably qualified engineer who provides certification (and calculations if required), and obviously the pegs form a major part of the certification process.

Question 11: What maintenance does a frame need

Basically, there is no requirement for any maintenance other than what you may want to do for aesthetic purposes.

You can, however, help the frame to settle in by being gentle with it when completing your build. The frame is built in green timber which will shrink over time, but the length of the shrinking process will be affected by the temperatures it is exposed to. If large industrial heaters are used to dry out the new building, this harsh and sudden heat is likely to increase the shrinkage splits. Similarly, suddenly high levels of central heating will increase the chance of the splits being pronounced. While this won't damage the structural strength of the frame, it will make the frame look more 'rustic'.

Question 11: Can I combine methods of construction?

Absolutely. You can incorporate as much or as little timber framing as you want, from the timber frame being the primary structure for the entire building, from ground to roof top, to a couple of simple roof trusses in one room. Our design team will help you marry your ideas and aspirations to your budget. Timber frames work well with most modern building materials and we work hard to ensure that the detailing at the interface with the frame is carefully thought through to ensure trouble-free performance.

Question 12: Are timber framed houses difficult to insure?

As far as we can tell, this is an urban myth. It did appear to be the case that insurers were nervous about some types of timber frames when panellised construction technologies were becoming popular in the 1980s, and stick frames in particular were thought of as being 'non standard construction'. We have never known our customers encounter a problem in obtaining insurance at a reasonable price.

Question 13: Aren't timber frames a fire risk though?

While it is true that poorly detailed and constructed frames using small section timber could represent a risk, post and beam construction is very different and the opposite is true. Large section timbers perform very well in fire, as the outside of the timber quickly chars thus protecting the inner timber. The frame is engineered to take into account the necessary timber to allow for charring. For this reason it is not uncommon following a fire to see a building where all the fabric has been destroyed (including bricks and masonry), leaving only the skeleton of the frame.

We are often asked if our frames should be treated for fire resistance, and to this, the answer is no. Not only does it increase your costs unnecessarily, but we believe that it is unhealthy to introduce unnecessary chemicals into your living space.

Question 14: Will I be able to get a mortgage for a timber frame?

The straight answer is yes. For a completed building there is no issue, but you will have to do more homework to obtain a mortgage for a build project where you are looking for a staged release of funds during construction. Mortgage providers are now used to self-builders and there are many suppliers to choose from. All of these are entirely comfortable with timber frames since, unlike the mass produced market, in fact they account for a huge proportion of self-build projects.

We have never known of any of our customers having problems obtaining a mortgage, but would be very happy to provide some suggestions on request.

Question 15: How do you glaze a frame that is going to shrink and move?

Large chunky timbers clad with glass are highly aesthetic and much sought after. Many years ago we developed a system, along with Pilkington Glass and a local glazing company, which has proved to be highly successful. This has since been developed into a double-seal, pressure-equalised system using similar principles to those used in the glazing of multi-storey office blocks. Rather than trying to completely exclude rainwater, which will always find the tiniest flaw, the system allows a certain amount of water to penetrate the outer seal and then out through a series of drainage channels. Nothing is allowed to penetrate the inner seal. Pressure equalisation means that, at the same time as allowing water to escape, air is allowed into the drainage channels preventing the build up of water within the channel through surface tension. It is very important to prevent water being held through surface tension, as the buffeting of the glass in strong wind can set up a pumping action, allowing the water to penetrate the inner seal and enter the building.

The timber used for direct glazing is specially chosen for its straighter grain and is therefore more predictable when drying out. However, timber is a natural material and cannot always be entirely predicted, but we understand the system and we understand how to remedy an air leak causing a draught without fuss. Water leaks are extremely rare. Ventilation openings in the walls and roof are created by glazing in standard weather-rated door and window units.

Glazing green frames, however, is a specialised job requiring not only a good system, but also skilled fitters. The knack is to get the frame with its own unique characteristics working in tandem with the glazing, so beware of glaziers who don't understand how the frame works, and framers who don't know how the glazing will work!

Question 16: Can a building be timber framed and contemporary?

Definitely! While we are involved in projects from the very traditional to the ultra modern, in practice the vast majority sit somewhere in-between and take the benefits from both.

At Carpenter Oak & Woodland we love anything that's new and exciting using natural wood. Working alongside architects and engineers to push the boundaries of design in timber stimulates new interest. The more complicated geometry still draws on traditional carpentry skills and techniques, but no longer relies entirely on pegged mortice and tenon joints. It introduces stainless steel plates and brackets, pins, bolts, cables and rods. These modern technologies open up the possibilities of increased spans, of reducing movement where desirable, and of creating a simpler and 'cleaner' aesthetic by removing the visible bracing.

The real benefit of post and beam heavy timber structures, though is that they effortlessly and efficiently create the blank canvas to which the ideas of the clients and their architects can be added.

Question 17: Is there enough oak to make all your buildings?

The simple answer is yes; with the proviso that trees are finite in their size and so larger pieces sometimes take a bit of finding. Traditionally in this country we have not grown hardwoods for building, so nearly all the timber planted in the UK has been grown for some other end purpose. We often source oak from France, which has a history of growing tall straight trees of exceptional quality specifically for building purposes. This is still *quercus robur*, the same species of oak that's grown in the UK – but it's specifically managed to produce excellent construction timber. Sometimes it is a client specification that only 'English', 'Welsh' or 'Scottish' timber is to be used in the frame and we will endeavour to find the timber from the desired location.

It is commonly thought that frames must be built from oak and Douglas fir, but the UK has many other species that are also suitable. We believe that despite replanting of the commonly used species (and we plant up to ten trees for every one we use), the other varieties could be utilised more. We have built frames in elm (and yes, it can still be found despite the Dutch elm disease), chestnut (which has many similarities to oak) and larch. If you are interested in looking at other alternatives, we would be happy to discuss options with you.

Question 18: why is it okay to cut down oak trees?

Trees are a crop. With few exceptions, all the forests in the developed world have been planted and managed by man and cutting is highly regulated. By managing, cutting and using the timber, the money is generated to provide the incentive to replant what has been cut and also to extend the cover with new growth. It is the new growth that is the key to sustainability. The European forest cover is increasing by 3,500 square miles every year – an area the size of Cyprus or 100 football pitches every hour. As the tree grows and provides oxygen, it soaks up huge amounts of carbon dioxide emissions that would otherwise contribute to global warming. The accelerated growth rate of new timber means that a tree will absorb more carbon in the first 20 years than in the rest of its life. So, if we don't manage the forests and don't cut down and use the trees, then they will eventually die and decay, releasing back the carbon locked in the timber. So, providing we are cutting down and replanting, using trees has a positive effect. In addition to the replanting programmes necessary to get a felling licence, Carpenter Oak & Woodland plants up to ten trees for every one we use in our frames.

It is worth bearing in mind that it is not necessary to have perfect knot- and sapwood-free timber; these features add character to buildings. To specify knot- and sapwood-free timber would add hugely to the cost and, in many cases, it would be impossible to find trees big enough. Our carpenters ensure that the individual piece of timber is suitable for the structural purpose it is to perform. The familiar rounded features of many old oak barns come from the sapwood depleting over the years. The heartwood is not easily touched by pests and becomes harder and harder with time.

Question 19: Do you do conservation/repair work on old frames?

Yes. This forms a significant part of our work and we employ carpenters skilled in the conservation of historic timber framed buildings. Indeed, these unparalleled conservation skills and understanding of historic frames are part of the reason for the quality of our new builds. We can prepare joint-by-joint surveys of repairs on buildings, ranging from tiny sheds to large aisled barns.

We often save buildings which others write off as beyond repair. The most famous conservation projects we have carried out are the reinstatement of the lantern roof at Windsor Castle after the great fire and reinstatement of the medieval hammer beam roof in the Great Hall at Stirling Castle.

Question 20: Is the frame insulated?

A timber frame building may be insulated to any standard you choose, provided that it meets or exceeds the Building Regulations in force at the time. We recommend installing all the insulation to the external face of the frame. This has several benefits:

- A continuous thermal barrier, without breaks, wrapped around the frame eliminating 'thermal bridging'.
- The building is then weather-tight from the outside and work can start inside.
- The frame is protected from weather and deterioration.
- Water ingress and draughts can be easily eliminated.

Vapour barriers, insulation, breather membranes and cladding are installed in the correct place and sequence.

Carpenter Oak & Woodland is keen to promote the use of environmentally friendly materials and to this end can advise on the suitability of sustainable materials and design. We can also advise on the use of breathable materials to aid a healthier internal environment for you.



Question 21: Do timber frames need special foundations?

The quick answer is no. In fact, because timber-framed buildings are lighter than their masonry counterparts, they often require less substantial foundations. A thickening of the floor slab at post foot locations can eliminate the need for a mass concrete strip footing normally required for heavy masonry.

For outbuildings or cabins you can simply rest the frame on oak 'feet' or 'sleepers' on paving slab directly on the subsoil. The pegged frame is flexible and, providing the building is not extensively glazed, minor movement or settlement is unlikely to affect it. However, a normal foundation, whilst being more expensive, will provide the most durable solution.

Question 22: Can you build on sloping ground?

There are numerous ways of building on sloping ground and a timber frame is particularly suited to this. The posts can continue down to the lower ground level, like stilts, providing useful space underneath. You can also enter your house at the higher level, which gives exciting design possibilities. The timber posts rest on a concrete pad to the appropriate depth.

Question 23: How long can I expect my frame to last?

Externally, timber will generally take on a silvery-grey lustre as the tannins in it are exposed to the elements. Internally, it retains its honey colour and mellows over the years. We've mentioned shrinkage which is sometimes a controversial subject that needs explaining. As the timber dries the wood changes, lightening and increasing in strength and stiffness. You can't practically dry large sections over about 3 inches thick unless you have 25 years to wait and, if you did use it dry, you would lose the benefits the drying process has on the frame itself.

The cells of the timber shrink in diameter but not in length, so the timber length won't alter, only the cross-sectional dimensions. Wood is like a bundle of straws which twist up the length of the tree. Interestingly, the direction of twist depends on which hemisphere the tree grows in. As the wood dries, the straws tend to untwist slightly, locking the mortice and tenon joints in the frame. The wood will shrink twice as much around the girth as it will in diameter. The tension created around the outside of the timber eventually 'gives' and the cells part, causing the shrinkage cracking you see on the dry timber. The cells are not broken, so there is no reduction in the structural strength of the timber. As a very rough rule of thumb, the timber will shrink by between 6 and 8 per cent, so a 200mm by 200mm post will shrink by about 6mm on each face over about 10 years, so it is a very slow, easily managed process. However, the degree and direction of shrinkage is very dependent on what part of the log the post has been cut from. Design detailing is important to manage the shrinkage and this is where our designers can help. Specialist designers in green timber understand how the material behaves and can explain to the client what is going to happen.

Question 23 continued...

The timber will move, shrink, crack, and some joints will open slightly. This is completely natural and gives the frame the unique character of a natural material used in its purest and most beautiful form, setting it apart from the sterile perfection of 'manufactured' timber using small pieces of wood glued together, such as laminated pine beams, or particle boards.

Careful timber selection is an essential part of our quality control to ensure the piece is suitable for the structural purpose it is being asked to perform.

Question 24: Do you have to treat the timber frame?

Rot and insect attack will only occur when there is dampness in a house. Without the right conditions they will not survive. Green timber with a moisture content over about 22 per cent is vulnerable to insect attack. If it is in a centrally-heated house the moisture content will soon fall below this level and the risk reduces. Oak heartwood is naturally extremely durable and resistant to insect attack, even above 22 per cent moisture content. If there is any sapwood, it is generally in small quantities and even if it is attacked it is extremely unlikely that the structural strength of the timber will be affected. Local treatment, should an attack occur, is an option, but not essential.

We use timbers that are highly durable without treatment. And indeed, as long as the building envelope remains sound and the timber is able to breathe and dry, a structural timber frame has an indefinite life expectancy.

Pressure treatment with toxic chemicals is widely used in the construction industry for low durability timbers, generally fast-grown softwoods, at risk of attaining a moisture content above the vulnerability threshold. These low durability timbers are generally used on economic grounds where they will be concealed. In these cases there are more environmentally acceptable chemicals, but it should be remembered that all chemical treatments are toxic (to pests and humans), otherwise they wouldn't do the job, so the use of treated timbers should be kept to the barest minimum.

Fire treatment is unnecessary, as explained above.

Question 25: Do you have to treat the timber frame?

To give a bit of background to our trade, we hand-craft heavy section timber in its raw form. When a log goes through the saw at the mill it naturally bends and twists as the tension is released in the timber. We rely on the saw miller's skills to identify where the tension and compression zones are in the timber and to cut where the effects will be minimised. There are tolerances we work to, but it is fair to say nearly every piece of timber will have a certain amount of acceptable natural bow and twist in it. Our philosophy is that the best frame comes from working with nature, not fighting it.

Question 25 continued...

In a machine-manufactured product the machine automatically straightens the timber before cutting the joint, so you theoretically get a perfect fit (in practice it is our experience that our hand-made joints fit tighter and more accurately than any of the machine-made ones we've seen). Machines are used to increase the volume of work that can be produced, however, the necessary standardisation inherent in this process does not allow for particular characteristics of each piece to be taken account of.

Our carpenters use their skill to 'scribe' the two naturally-shaped pieces together and this gives the frames the charm that we, and the majority of our customers, are looking for. One can liken it to hand-made furniture versus the clean sterility of something from Ikea where the slightest blemish offends the eye.

When the carpenter is faced with the challenge of bringing a number of naturally-shaped components together, he takes a view on the 'best fit'. He works with the timber in front of him (assuming it all comes within the tolerances of our specification to the mill). It is the carpenter's skill that makes this possible and it has been practised since the early Middle Ages. If you look very closely, you may notice that not all the joints are exactly central and some are further out than others, depending on the amount of bow or twist in the particular pieces. When the frame is erected, some of the joints may be very slightly 'gappier' than others. Providing they are working structurally and within our own crafting tolerances, with the shrinkage in the timber over time ultimately the appearance at the end of the day of all the joints will not be appreciably different. We, and our customers, think that these small, barely noticeable, idiosyncrasies make the frame unique and give it its hand-made charm.

Question 26: What makes your frames different?

Carpenter Oak & Woodland has over 25 years' experience, during which it has created more hand-made bespoke timber frames than any other British company. Over the years we have won numerous prestigious awards for our work in all aspects of our business, giving us the name and reputation that we enjoy today. Our reputation is based on our three key values below:

- 1. Design excellence.** We do not just produce a frame that is good enough, but is the optimum frame for the overall building, the environment it sits in, and the clients' requirements. A key to this is that we work alongside our partners to explore how the frame should look and perform, and we welcome being involved in the process of the overall design from the earliest stages. We never build a frame simply to comply with a plan, but a frame which will sit in its environment; this means taking into account the aspect of the building, its situation, and the positives and negatives of each plot.
- 2. The highest standards of manufacture.** We invest heavily, and have always invested heavily in training the finest craftspeople. As a result, we have excellent people; recognised by the industry and, most importantly, our clients.

Question 26 continued...

3. We don't just sell a product. We offer a warranty on our frames and on our glazing. We are an ethical company striving for the highest standards of behaviour in everything we do. We have a strong commitment to environmental responsibility. We care about you and your project; whether you want advice, have concerns, or just want to chat, we are delighted to help out.

It is these values that, in short, ensure that we produce the finest hand crafted product money can buy. Guaranteed.



3. Timber fact sheet

In this section we outline the natural characteristics of timbers and the various finishes available on our frames.

Which material?

The vast majority of our frames are built in two types of timber; oak and Douglas-fir. Both these materials will provide many years of service.

Oak (*Quercus robur*) is a native hardwood, graded as durable. There are actually many types of oak, but this is the one to build with. It is difficult to ascertain exact length of life, as it is for all timbers, since the selection and the application of the timber has a massive impact on its life. If oak is kept dry, it can last indefinitely, and many surviving medieval structures stand testimony to this. When freshly cut and 'green' it has a golden yellow colour. Kept indoors, it softens and pales, but when used outside and exposed to the elements it will turn to a silver-grey.

Douglas-fir (*Pseudotsuga menziesii*) is a moderately durable softwood, again common in buildings. Like oak, it is widely available and relatively cheap. A big advantage of this timber is that the tree grows large and straight, making large sections easier to find. When freshly cut it has a decidedly pink appearance – loved by some and hated by others! This fades to a much lighter reddish colour over time. Like oak, when exposed to the elements it takes on a silver-grey hue.

Other timbers can also be used. Historically, elm was a common material, but due to the ravages of Dutch Elm Disease is now difficult to obtain. It has a characterful and warm appearance with irregular grain and makes lovely frames, although the heartwood is susceptible to decay and insect attack if not kept dry.

It's worth mentioning that there are differences in the timbers from different locations – warmer climates encourage faster growth with growth rings further apart and therefore such timbers have lower strength and a slightly 'coarser' appearance.

Timber seasoning

As timber dries, it changes its looks and characteristics. The more it dries, the lighter and stronger it gets. Our joints are designed so that, as the timber dries, the joints lock together to increase that strength. This drying process does produce some issues that need to be considered both in the design of your structure and for the aesthetics of the finished frame – initially, and as it changes over time.

Timber seasoning continued...

Timber contains two types of water; 'free' water that sits in the cell cavities, and 'bound' water that is contained within the cell walls. Freshly-felled oak is high in both, but will lose water from the time it is felled. At the point where it has lost all its 'free' water, but still retains its 'bound' water, it is at its 'fibre saturation point' (FSP) - in the case of oak, this is at a moisture content of 30 per cent. Timber, when freshly felled, is often referred to as 'green', but we define 'green' as being where the moisture is above the FSP of 30 per cent. Below the FSP, the timber is losing some of its bound water, and could be said to be to some extent dry. Below the FSP is when the timber will shrink, and possibly distort.

Oak will naturally air dry down to 18 per cent, but to achieve below this the timber will need to be kiln dried. The drying process causes 'movement' in the timber, and it is this that gives timber frames their distinctive characters that develop over time. The three main effects of this drying process are:

Shrinkage: The cells of the timber, as they lose their moisture, shrink in diameter, but not in their length. This means that, by the time a piece of oak has settled down, it will have lost up to 10 per cent of its width, but its original cut length remains the same. This is why frame detailing is important – shrinkage will cause gaps between the frame and other materials, such as glazing and wall sections. Skilled designers and carpenters understand this and take this into account during the build.

Shakes: A shake is a crack, either very small, or in some cases substantial, that appears in the timber as the grain separates, and is very common in a drying frame. Sometimes they can look quite alarming, but surprisingly do not alter the structural integrity of the frame (unless, of course, inappropriate timber was used). These shakes add enormously to the character of the frame, but are an important consideration to the aesthetics and well worth taking into account if, for example, you are looking for a planed finish (see later).

Twisting: This is largely dependent on the straightness of the grain and the application of the timber. The chances of this happening are minimised in one of our frames, because of good timber selection and considerate craftsmanship.

Where any of the above factors are of concern, for example where the frame interfaces with glazing, these factors can be eliminated, or at least reduced, by using straighter grained timber and/or dried timber.

Timber is often dried before use. Most softwood purchased from timber merchants is poor quality whitewood which has been kiln-dried and pressure treated – leading many people to expect that we build with the same.

Our frames can incorporate any of the three stages of seasoning, each having its own particular uses and values. As a general rule, the drier the timber, the more expensive it will be, and the more difficult to work and to find the larger sections.

Timber seasoning continued...

Green timber: We use green timber for the majority of the frame construction – we'd never be able to find the big pieces significantly dried, and if we did, it would be likely that only the outside 75mm or so would be dry. Remember that, when incorporated in the frame, this will be subject to shrinkage and shakes (see above).

Air-dried: A fair proportion of our frames incorporate air-dried material because we prefer to use stable timbers in some critical areas. The most usual components that require drier timber are the wind braces, wall braces and other curved members, as well as arch braces (which, perhaps surprisingly, need to be from dry but straight stock. Ask us to explain this if you're interested!). Quality air-dried curved stock is nigh on impossible to buy commercially, so we source them when we can and keep them in stock until suitable for incorporation into our frames.

Kiln-dried: This is not often used in the structural frame itself, although is incorporated into features such as glazing bars, cover boards, and so on. In these cases, the extra cost of this expensive material can be justified because of the need to minimise movement.

Of course, the moisture content in the wood will always gravitate to the level of the moisture content around it; drier when the central heating is on full blast and variable and wetter where exposed to the elements. A key consideration for how a frame will behave as it dries out is the rate of drying. Timber that is subject to extreme fluctuations in temperature, or particularly hot circumstances, will dry out faster, and, as a result, more movement in the frame will occur, and shakes may be larger as a consequence. Causes of this may be:

- Putting central heating on full blast, or introducing commercial heating elements, in order to dry out the shell following construction.
- Timber elements exposed to south-facing elevations, or being behind glazing where solar gain is particularly strong.

As previously said, this is highly unlikely to cause any structural problems, but the aesthetics may be of concern to some.

Finishes

The vast majority of our frames are built in green oak which have been band-sawn; the cheapest and most widely accepted style of finishing. A band-sawn finish leaves a series of fine lines on the timber, which many people choose to keep because they appreciate the rusticity.

Unless one of the specially commissioned finishes below applies, the frame will be supplied with some of the following marks on it:

Finishes continued...

- **Carpenters' permanent marks:** an historical feature that identifies which joints are crafted together (remember that each joint is individually crafted to maximise the strength and efficiency of each different piece of timber – machine-made frames will treat all pieces as the same, so they don't need to be matched and therefore may not have these marks). We use a system of Roman numerals or curly marks, but each carpenter is free to use his own 'trademark'. So, you might see a pair of VII marks carved into the timber either side of the joint.
- **Carpenters' setting-out marks:** these will be pencil calculations or ink lines, and are easily removed.
- **General site dirt:** e.g. the boot print of one of your plumbers (our carpenters are too proud of their craft to put their boots on it!), or perhaps staining where the oak has been exposed to ferrous residue leaving a blue/black mark.
- **Natural staining:** of which there are two main types:
 - **Tannin run-off:** where the naturally-occurring tannin in the timber (oak in particular) is washed out, leaving a dark brown 'tide-mark' stain.
 - **Blue stain:** softwoods, and sapwood on hardwoods, may attract 'blue stain' fungus if left damp for a period. This is completely harmless to the timber and will fade over time.

Because the frame is erected relatively early on in the build, it is safest to clean it, or to give some final finishing, much later on in the process and after our carpenters have left site. For this reason, we leave the final finishing to the client to organise themselves.

In the past we have had customers that were so delighted with the craft elements of the frame that they chose to simply wash down the frame and to leave all the carpenters' marks on, chalk lines and pencil trigonometry included!

The largest proportion of our customers choose to use sandblasting, and a few select one of the other following finishes.

Sandblasting

This is the most common finish to oak frames, which is carried out once the building is wind- and weather-tight, but before plasterboard or other vulnerable finish material is applied. This is done by specialist companies using silver sand or a pale coloured stone dust, free of any contamination with ferrous compounds or residues which can turn the frame grey.

Sandblasting helps smooth sharp corners, raises the grain a little and cleans mud and other marks. Some stains may remain which should become less obtrusive with time. Sandblasting is also often the most economical way of cleaning the frame.

Finishes continued...

When selecting a sandblasting contractor we recommend you have a sample test panel carried out to ensure you are happy with the finish prior to starting on the frame itself. If you need a small block of oak for testing purposes please let us know and we'll supply it along with the main frame.

We cannot stress strongly enough that it is important to choose a contractor whose work you are happy with – sadly, like timber framers, not all sandblasters are equal. Because the aesthetics of the finish is so subjective, it would be unwise for us to recommend any particular contractor, however we do know of many companies that have satisfied our clients, and we are happy to pass on their names to you on request.

Pressure washing

Like sandblasting, this will clean the frame, but, being less strident, removes surface dirt rather than the surface of the timber with all that is on it. For that reason, it cleans less well, but is worth mentioning because it gives two potential benefits; it leaves the temporary carpenters' setting-out marks (in the unlikely event that you want to keep it!), and that it does not alter the band-sawn finish (if you liked that). Washing the frame leaves a more subtle and natural-looking grain pattern than sandblasting it.

Planed

This is a more refined finish and some customers feel it is a bit incongruent with the heavy and robust nature of a timber frame. Because we're using entire trees to build some of the frame members, knots at branch locations do tend to tear out a bit where the grain changes direction. There may also be some minor planer marks left on the timber. Unfortunately, it is not possible to select out tiny pieces of perfect timber, as is done for furniture, therefore it doesn't resemble a polished, joinery standard surface associated with dry timber. As the timber dries over time, the finish may become slightly coarser and the inevitable drying 'shakes' or cracks will highlight this.

Planed timber can be sandblasted which results in a coarser finish and enhanced grain due to the removal of summer growth. Clearly though, this loses some of the reasons you wanted the frame planed in the first instance.

If you want the timber planed, and do not want to sandblast it, you will need to make careful arrangements to protect the timber during the entirety of your build. In our experience, it is highly unusual for timbers to come through entirely unscathed by the end of the build, and you should expect to have to do some form of finishing.

Finishes continued...

Sanding

To enhance the planed finish some of our customers opt to have the planed frame sanded. This is best done after the building is wind- and weather-tight and the surface of the timber has had a chance to dry out a bit.

Hand-hewn

Historically many timbers were hand-hewn, i.e. faced with an axe, and today this finish has become popular again. Hand-hewing imparts an incomparable subtle finish with a delightful undulating surface. Because of the conservation work Carpenter Oak & Woodland undertakes, our craftsmen are excellent at this, but beware, as it is very expensive and will add substantially to the cost of your frame. It is also possible to find timbers machined to give a 'hewn appearance', but frankly these never look anything other than obviously fake.

Waxing

We recommend leaving the timber untreated on the surface, but you can add pale wax if you wish. This usually makes the frame yellower and it tends to darken more over the years.

Oiling / staining

Because the timbers are already durable, they do not need preservatives, so the only real reason to oil or stain would be to achieve a certain aesthetic appearance. There are a number of different oils you could apply, should you wish to – OSMO oils and generic Danish Oils have been used. Like any decorating advice, it is important to apply the oil to a test patch prior to large-scale application. Not only will this give you a good view of the colour (and even the 'neutral' or 'clear' finishes will actually change the appearance), but it will also allow you to see how it affects the appearance of the surface of the wood.

Other aesthetic details to bear in mind

Timber is a natural material and there will be a degree of variation in colour between finished pieces (especially once they have been sandblasted). Where we use timber that is more seasoned (curved timbers, braces and some glazed members), these timbers may turn out darker than average green timbers, a little more grey than the golden of the green timber. This difference will lessen in time, but will remain noticeable for at least a couple of years. This is well worth it for the enhanced performance of these members (and, for the purists and those technically-minded, it helps to show the quality of the construction). If a frame is put into storage or left on site for a period before erection, there may be a possibility of some timber turning darker as a result.

Other finishes

All our band-sawn timber is supplied as square-edged. On request we can shape any of the timbers as required. Rebating can be incorporated into the design, and will obviously be as specified by the client.

Although most people want the square edge, common finishes are:

- **Chamfering** for a more sculpted finish, which also has the effect of making timbers seem less imposing. There are a number of different ways the chamfer can be finished at its end and, of course, the depth of the chamfer gives different effects
- **Arris removal** which just takes off the sharp edge, leaving a barely noticeable chamfer, which some find a little neater, and some think is a little safer

We also supply timber that is largely heartwood. Sometimes, and particularly in the larger sizes, some sapwood may be unavoidable. As an option, frames can be built with waney edge, i.e. using timber with some sapwood at its edges. This can be seen in period frames where the sapwood has long since disappeared, leaving a softer, more curvy timber. While the sapwood is less strong than the heartwood, frames can be designed to take the sapwood into account so that there are no structural or engineering concerns. It should also be noted that sapwood is vulnerable to insect attack (see Timber treatment below), which, while not a problem, has an aesthetic impact.



Timber treatment

Timber treatment is commonplace for softwood timber, and, as such, is often expected as the norm. In reality, timber does not necessarily need treatment since it is the environment that dictates if, and how fast, it will decay.

Rot and insect attack will only occur when dampness is present and, without the right conditions, they will not survive. Timber with moisture content over about 22 per cent is vulnerable to insect attack. If the timber is in a centrally-heated house the moisture content will soon fall below this level and the risk rapidly reduces. Carpenter Oak & Woodland uses timbers that are durable without treatment. And indeed, as long as the building envelope remains sound and the timber is able to breathe and dry, a structural timber frame has an indefinite life expectancy.

Oak has its own natural preservatives. Its heartwood is naturally extremely durable and resistant to insect attack, since it provides little in the way of nutrients, even above 22 per cent moisture content. If sapwood is present on the timber it is generally in such small quantities that even if it were attacked it would have no effect on the timber's structural performance.

Summary

We would strongly advise that, before making any purchase, potential buyers look at the various options and satisfy themselves that the timber they specify will meet their aesthetic and durability needs.

Carpenter Oak & Woodland has built over 1000 frames over the years, with many species and finishes, and is always happy to provide information, images or otherwise, and to offer advice in making sure that you make the optimum decision to meet your needs.



4. Useful websites and resources

We've compiled a list of links to useful Web sites, to help you plan your project.

ASBA Architects – the national network of local architects

If you've not yet appointed your architect, then this can help you to find the right one for your project. There is a form to complete on the Web site that will help you to find an architect near you.

www.asba-architects.org

BRE

BRE is focused in sustainable building and innovations in building. The site contains a great deal of information on many related topics.

www.bre.co.uk

Carpenter Oak & Woodland

Examples of the timber-framed homes built by Carpenter Oak & Woodland – including lots of images of each home.

<http://www.carpenteroakandwoodland.com>

Natural Building Technologies

One of the UK's leaders in sustainable building materials, the NBT site can be a source of inspiration for those seeking to specify building frames, roof systems, floor systems, wall systems – and many other building components.

www.natural-building.co.uk

Self build

This Web site contains a wealth of information to help people who are building their own house – including information about finding and buying land, planning permission, timber frames, building materials and mortgages.

www.selfbuild.co.uk




Carpenter Oak & Woodland

Hall Farm
Thickwood Lane
Colerne
Chippenham
Wiltshire
SN14 8BE

T: 01225 743089

E: info@carpenteroakandwoodland.com
www.carpenteroakandwoodland.com

[f](#) [t](#) [p](#) [in](#)

