

# CREATING A TIMBER FRAME HOUSE

A Step by Step Guide



Brice Cochran

# **Creating a Timber Frame House**

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by Brice Cochran

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ISBN # 978-0-692-20875-5

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## A Note from the Author:



Hello everyone!

My name is Brice Cochran and I am the creator of Timber Frame HQ, a homebuilder, and owner of a small timber frame design firm. An even bigger part of my life is Christie, my wife of eleven years, and my two children, Maddie and Liam. As you can imagine I am a very busy guy.

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framing after years of doing fun and odd jobs, such as being an auto mechanic, substitute teaching, and most fun, raft guiding. After getting married though, I decided that I really wanted to settle down and do something that incorporated two of my lifelong passions- art and math. I went to a winter wooden boat building class and found timber framing as well. I was hooked.

I first got into timber

Once I came back home to South Carolina, I searched out local timber framers and found Stephen Morrison with MoreSun Woodworking. I soon started off my timber framing career as an apprentice for him. After working in the shop and picking up some good techniques, I decided to design and build my first timber frame house.

It was a smaller house, but good practice nonetheless to take it from the ground up. After the completion of our small house, I started in on the design and cutting of our current house. Before I was able to finish our (larger) house we found out about Maddie and that meant I needed to start working for pay, and the house was going to have to wait. I was about to launch my



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own design business when I was offered a job with Streamline Timberworks. Since our daughter was about to make her appearance into the world, I thought it would be a great opportunity to have work guaranteed and to be able to work with a talented timber frame designer named Steve Arthur. While I learned a lot during my two years there and was able to work on some complex timber frames, I still had the itch to do my own thing. In late 2009, I started Whetstone Designs, LLC. It is a company that focuses on high quality timber frame design for all sizes and budgets.



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In 2011 in an effort to help the timber frame industry as a whole, especially during the slower building climate, I decided to launch Timber Frame HQ. Our main goal is to promote the art of timber framing, and the inclusion of timber frames into renovations and new home construction. Its focus is not on any particular company or individual, rather the trade itself. Its hope is that both future homeowners and timber frame companies alike are able to use the location to share needs and resources and get more timber frame structures built.



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After 8 years of work and saving, our house was finally completed in June of 2012. I get to wake up each morning in a beautiful timber frame home that I cut and created. The road was rough at times, but had many educational moments that will last a lifetime. Will Beemer once mentioned to me that building a house for oneself is one of the largest projects someone will undertake in their lifetime and I agree. While there will be ups and downs, in the end when you can sit back and relax...it will all be worth it.

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## Preface

Building a timber frame home is a dream that probably began as a tiny seed of an idea. Maybe you saw an interesting article in a magazine or website. Perhaps you were taking a Sunday drive and you passed a structure or home that stood out to you. Either way you were struck with its massive, rugged beauty and were left with an impression that just wouldn't go away.

Over time, that kernel of an idea sprouted and began to fill out. You started spending time researching timber framing online and the different companies that construct them. Next, you started looking at specific house plans and layouts that personified your idea of a perfect

home. Then, perhaps you went on to envision interior designs and how you would decorate this awesome dream house.



Now that the daydreaming is over, and you've decided this is the lifestyle for you, it's time to get organized and do something. This book is meant to provide a

guideline with helpful ideas and information for someone who is seriously considering building a timber frame home.

If you're still in the daydreaming stage, it will give you an overview of the kinds of decisions and plans you need to work on. If you've already begun your quest, this book will help you consolidate the work you've done and help you focus on what should be accomplished next.

I used the word lifestyle in a previous paragraph. When you consider the amount of work and planning a timber frame home takes to create, and the amount of time that you are going to spend on this project, it really does become a lifestyle. You may be very fortunate and go from start to finish in a year or so. However, many families spend five years from conception

to final walk-through. So, at least for a period of time, building your home really does become a lifestyle.

That idea of lifestyle carries over when you move into your timber frame home. You've built a home that is incredibly energy efficient, styled with open living spaces and most likely not confined to a 40-foot wide urban piece of land. Your timber frame home is an extension of a way of life that appeals to you and your family.

Let's take some time to get familiar with the realities of building a timber frame home, and see if it's all you thought it would be. I hope this book will clear up some misconceptions, answer some questions and describe the basic procedure that a family will go through in creating the house they can call home for generations.

## **Part One – The Low Down**

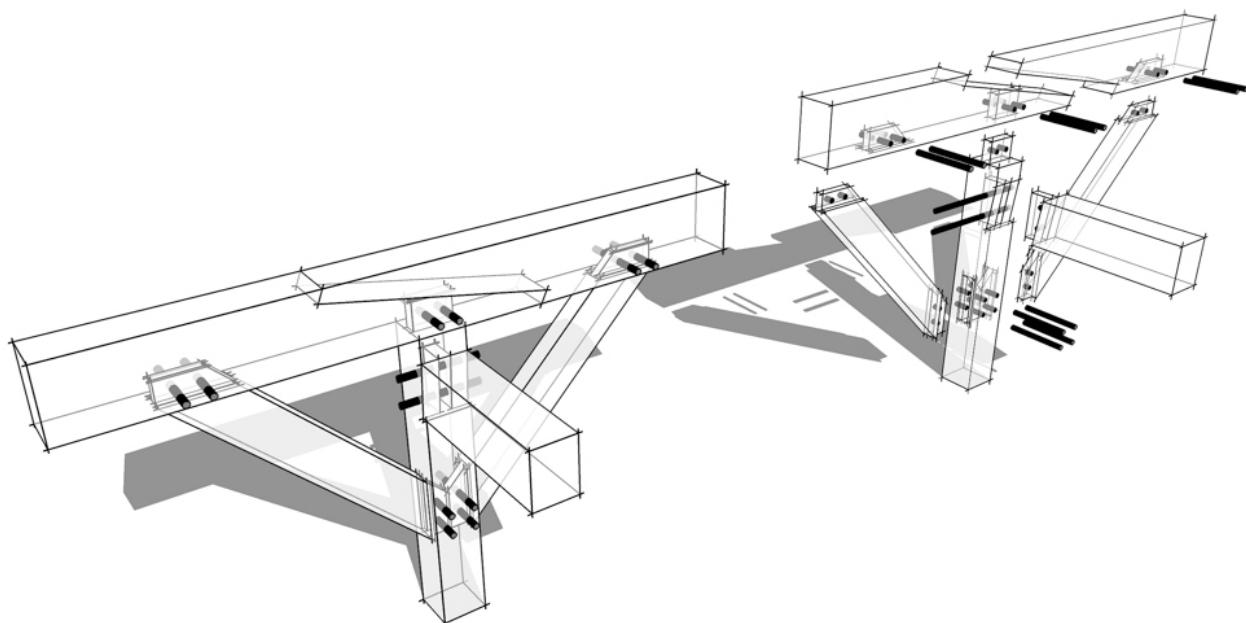
When daydreaming of your perfect dream home, you may envision a substantial, timber-accented manor or a small cabin or cottage. The substantial rustic lines, the feeling of timeless durability and the lure of putting down roots all draw you to this unique vision of your personal sanctuary.

Your vision can become reality, but you need to get an understanding of the basics about just what that dream house entails. Timber frame houses are the ultimate in durability and open space; but, since they are unlike standard construction homes in many ways, it pays to spend time learning as much as possible about the structure that may become your family home for decades.

# Chapter 1 - The Basics

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A timber frame home uses posts and beams with traditional mortise and tenon joinery to create the framework of the structure. Massive posts support equally substantial horizontal beams that then carry joists and rafters. This construction method dictates a high level of craftsmanship to create the skeleton that holds structural insulated panels or the shell that encloses your home.



With the ever-rising cost of energy and the renewed interest in resource consumption, timber frame homes have developed into a current option for high performance and ecology-minded individuals. Advancements in construction materials and technology have made timber frame structures an alternative that is becoming increasingly popular.

## Advantages

As you start to get an understanding about this unique and attractive type of structure, you'll be surprised to learn just how many advantages there are to building and owning a timber frame home.

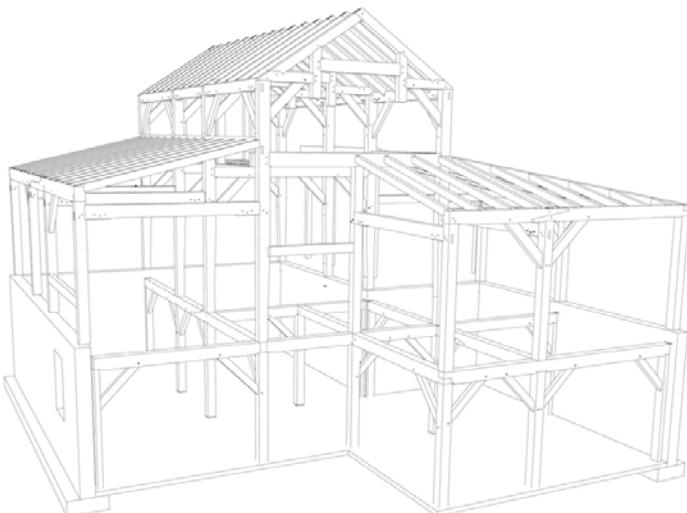
1. Throughout the life of the home it will give you, your family and guests an exciting and interesting structure to be in. The spaces and feelings one gets from a timber frame home are unmatched in comparison to other construction methods. Waking up under a timbered roof is always a great way to start the day.

2. Two features that you'll quickly notice about a timber frame home are the strength and durability of the structure. These buildings are built to last, and there are many examples of timber frame homes that are hundreds of years old.

3. With a well-insulated, airtight structure, HVAC systems outputs can be dramatically reduced.

This lower demand for heating and cooling allows the architect to specify a smaller system, which saves in the initial building cost and over time saves money with reduced energy consumption.

4. Since the post and beam construction uses substantial building components, there are fewer wood members required to erect the framework. This results in less wood required to complete the structure.



### **Full Timber Frames vs. Hybrid Timber Frames**

A full timber frame home uses posts and beams for all the structural exterior walls and interior walls. This allows great expanses of open space and the frame is completely free standing. However, it is becoming rarer and rarer for folks to opt for a full timber frame, and many are choosing hybrid timber frame homes instead.

A hybrid timber frame home is one that uses both timber frame construction with elements of conventional construction in conjunction with one another to create the entire system. However, there is broad room for interpretation of the phrase, and a savvy buyer needs to know exactly what elements of the home are going to be timber framed. Of the vast majority of timber frame homes built today, about 90% are actually hybrids.

You can have just part of your home be timber framed, such as the great room, dining room, kitchen or a combination of all three. It may be that you just have accent timbers in the master bedroom, or maybe you incorporate a timber frame entry porch into your project. All of these are considered hybrid timber frames. As you can see, this term is quite broad, and includes a lot of variation.

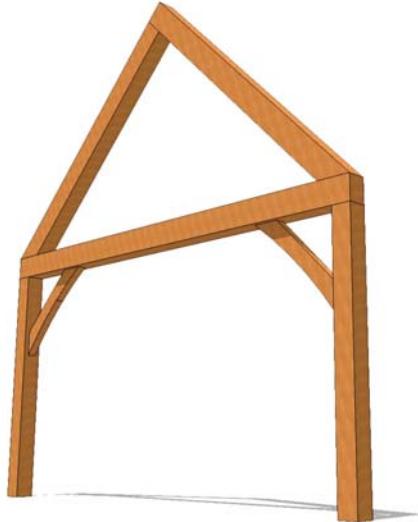


One of the biggest advantages of a hybrid timber frame is a cost savings that you can achieve while maximizing the aesthetics by incorporating timbers in your home. There are some parts of a home that do not necessarily need timbered elements, such as the closets or bathrooms. As the homeowner you can put your money into areas where the most amount of time is spent, such as the great room, dining room and kitchen. When you start talking to

your designer or architect, make sure you talk through all the options with them so you get the right amount of timber not only for your budget but to enhance your home.

## Basic Types of Trusses

### Common Truss

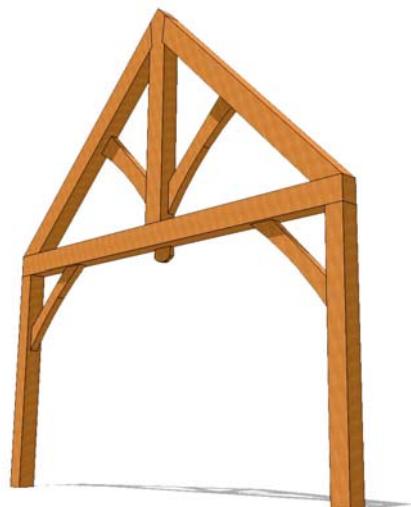
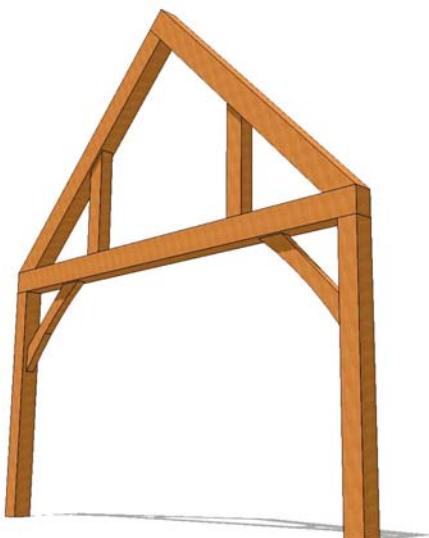


The common truss is the most basic load-bearing truss and is useful in a wide variety of applications. It is a simple triangle and often used as the base of the other truss designs. While simple, the strength and affordability of this design are unmatched. As its name implies, it is the most common truss used in timber framing today and in the past. You can tell it is a common truss by the lower tie beam joining with the two rafters.

### King Post Truss

A king post roof truss is a cost-effective design and is particularly attractive when modified with curved braces and webs. The post dividing the gabled space is known as a king post, a bold and intriguing design that is commonly used in conjunction with other truss styles. It also often incorporates

two struts on either side that not only add strength but character.



### Queen Post Truss

The queen post truss is similar to the common truss and king post truss in that it utilizes a bottom tie beam, but it also adds the two posts dividing the gabled space that are known as the queen posts. This works well for highlighting the windows in a great room and adds strength and character as well.

### Scissor Truss

Scissor trusses do not have a horizontal chord. This cathedral-ceiling look has inclined chords, which support the rafters, and tie the members into place. The scissor truss has two



beams that run from the lower part of the rafter to the other opposing rafter crisscrossing each other. While it can sometimes be difficult to figure out the best way to join the timbers in the middle from an engineering standpoint, they do add character to the frame.

### **Hammer Beam Truss**

The last truss  
(and in some

opinions, the most dramatic) is the hammer beam truss. This design is the most complex and deserves an engineer's touch to make sure it holds up over time, but the results are well worth any effort you put into it. It lends a sense of old world architecture to the interior, and the style has a heavier, more massive feel than other truss designs. One advantage of hammer beam trusses is the use of shorter timbers. It does require more components, but you are not paying a premium for long lengths of timber.



There are a number of other truss designs, and many of these designs are modifications of these five basic patterns. Your own personal style, as well as the structural requirements of the building, will influence the final combination of truss styles and sizes used to create your home, but knowing which style of trusses you like is one decision out of the way.

## **How Much Does A Timber Frame House Cost?**

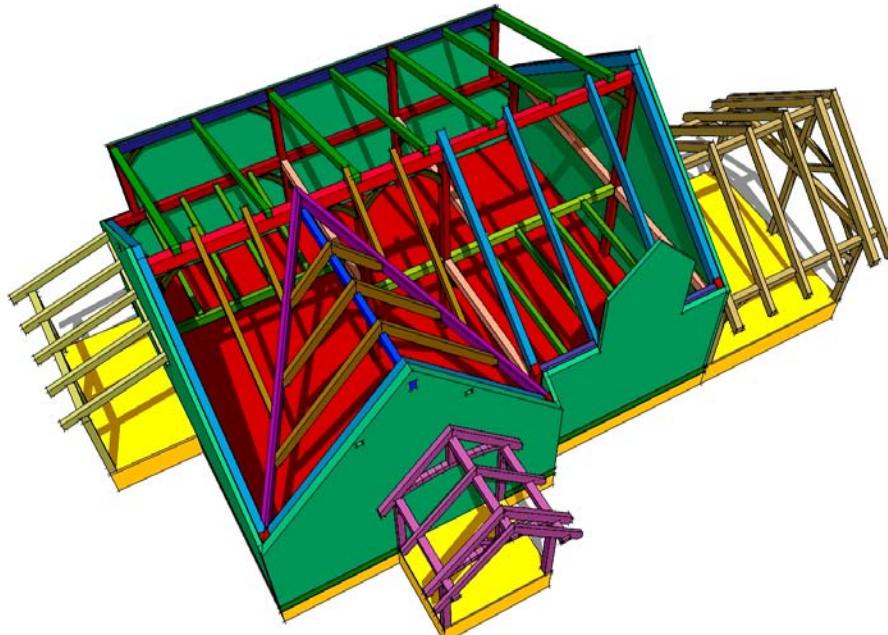


Your dream of owning a timber frame home is so full of questions, but one of the biggest questions that comes up first is, "How much is this going to cost?" This question just can't be answered like inquiring about the cost of a loaf of bread. So many variables and options, as well as customer preferences, must be addressed before a figure can even be

estimated. We will delve into finding out how much everything is going to cost in Step 4 but here are some factors that will affect the bottom line.

1. Your local market, as well as local or regional availability of materials is one factor in determining your cost. The square footage of the house and complexity of your project are also basic issues.
2. The species and type of timber selected for the job have an impact on your building costs. New timber costs less than character-filled reclaimed wood. The intricacy and number of trusses and exposed rafters, as well as the level of finish work to the framing all result in a higher cost.

3. Interior design elements such as flooring, cabinetry, counters, bathrooms and appliances have a major impact on your bottom line. Special detailing like porches, decks, garage, spas and bonus space all are add-ons that may be overlooked in initial discussions.



4. A two-story structure reduces costs (per square foot), as the roofing and foundation requirements are half those of the same square footage in a ranch-style house.

5. Simple designs also reduce the cost of construction. Complex roofing designs are more difficult to engineer, build and erect.

6. A question that you should ask yourself to help determine your cost is whether your project is design-driven or budget-driven. This attitude colors all your decisions and will have a great influence on the final cost for your home, (more on this later).

7. As prices of fuel, labor and materials continue to rise, building as soon as you are able will probably be less costly than delaying your construction.

8. A timber frame house can mean many things when it comes to building a custom home. Spend time learning about this creative and comfortable living space to determine what it really represents to you.

Constructing this type of home is not as simple as calling a builder and asking to look at a few center hallway colonial models. The level of attention to detail, the sustainability and ecologically sound principles used to build your home are all important pieces of the puzzle that need to be discussed and researched. This is not just your new home; it's your new hobby.

## Chapter 2 – Options

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Just like a standard stick frame house, there are many decisions to make and choices to research. In fact, there are more decisions to make with a timber frame house than a conventionally framed home.

In a conventionally framed home, the homeowner's decisions deal largely on the finish work of the house. The style and color of the siding, whether the ceiling will be plastered or sprayed, and which color stain will be used for interior moldings and trims are all decisions that need consideration.

A family that has decided to build a timber frame home has a different set of questions to answer. Designing a timber frame structure requires more research on the part of the potential homeowner. Specifying the requirements for a timber frame home also includes decisions on the structural makeup of your home. That's because so much of the structure of your home is an integral part of the interior design since you see the framework and joinery.



Although a potential timber frame homeowner doesn't need to be a structural engineer, he or she needs to know a few more facts about building than someone that's planning to build a conventionally framed home. Doing your homework when making these choices and knowing their relative costs and what they mean for your home will make working with your designer and builder a lot less complicated.

## **Timber Species**

Now that you've decided on building your own timber frame home, you have countless decisions to make. One of those decisions is which species of wood your timber framer will use in the construction of your home.

A number of varieties of wood are suitable for your home and each has its own strengths and weaknesses. You may also need to consider availability, sustainability, cost, and suitability in making this important decision. The most common species of wood used for

timber frame homes are white pine, red and white oak, douglas fir, cypress, and cedar.



### **Availability**

The part of the country in which you plan to build plays a big part in what building materials you will use for your home. It will be the most economical for you to use locally available

materials as the cost of transporting posts and beams across the country can be exorbitant and cost-prohibitive.

There are a number of species of trees that grow pretty much throughout the country, and a number of types of wood have similar properties, so finding an appropriate, locally available species should not be a problem in most, but not all, areas.

### **Sustainability**

You may choose to use timber to build your home from a logging company that practices sustainable forest management. In very simple terms, this means logged areas of forest are replanted with appropriate trees and vegetation, and the ecosystem of the area is not damaged or destroyed. For more information, check out the FSC Certified wood or buy from a local sawyer that practices sustainable practices.

### **Cost**

The cost of the wood for your timber frame home can vary considerably. You may have



several choices for the wood species to be used to build your timber frame but the cost will always be a factor.

## **Strength and Suitability**

Not just any wood is right for building a timber frame home. Some woods are hard and strong, but tend to twist and check too much for a timber frame. Other species like douglas fir are stable and strong, whereas oak is strong but not as stable. White pine, cypress and cedar do not have the load capacity like douglas fir, but are just as stable.

Another important consideration is whether the timbers will be exposed to the exterior. If so, your choice of species drops to just a few, like douglas fir, cypress, white oak and cedar, as these are naturally rot resistant.

## **What Is Checking, Stability and Twisting?**

When wood dries out, it undergoes physical changes. The grain separates: this is called checking. The timbers also will twist and crown as they dry. This is very common and happens all the time-remember it used to live in the woods. A species that does not shrink and twist much is considered more stable and can be better suited to your project.

Some wood species are more prone to checking and twisting than others are, so this

characteristic is taken into consideration when choosing wood for construction. Checking does not generally weaken the wood, but adds character and an aged quality to the appearance of the timbers that many folks enjoy including myself.

*Hint: Using a humidifier and keeping the temperature lower the first winter in your home can help to minimize the amount of checking your wood will develop.*

## Wood Species Types

### Douglas Fir

Douglas Fir is known for its structural strength and stability, so it is a popular species for post and beam construction. It is prevalent in the Pacific Northwest, although it can be found in many other parts of North America.

It ranges in color from a yellow or orange-brown shade to a deep, reddish brown. One outstanding characteristic is that it checks minimally when dried. Large timbers may be designated FOHC, which means that the beam does not have the typical bulls-eye heartwood in the center.



### Eastern White Pine

Eastern White Pine grows from Minnesota through Newfoundland and south along the Mississippi Basin and Appalachian Mountains to Georgia and Mississippi. As it is a soft wood,

it generally costs less than oak. It has multiple sizes of knots and is a blond wood with occasional red streaking. It cracks and checks as it dries, which gives it a rustic, weathered appearance. It is easy to work with and does not twist or have a high shrinkage rate. However, it is not as strong as douglas fir or white oak.



## **Red Oak**

This hardwood grows from the Great Lakes to Nova Scotia and as far south as Georgia. For a hardwood, it is a fast growing species and is very popular as a framing choice. However, it is not resistant to decay or as strong as white oak and has just as high of a shrinkage rate as white oak.



## **White Oak**



This species grows from Texas to Quebec and from Minnesota to the Eastern seaboard. White Oak is very decay resistant and is hard, but it has a high shrinkage rate and checks at rates that make it more difficult to work with for timber frame construction. It still remains a popular option for homebuilders because of its strength, rot resistance and great looking characteristics.

Other woods can be used in timber frame home construction, and each has its own characteristics. Southern yellow pine, spruce cypress and cedar are also good choices for your home, depending on your location and the features you want in your building material.

## **Green vs. Dried Timbers**

The majority of the frames that go up are cut and raised without going into a kiln or going through the process of being air-dried. The engineers consider anything over 19% moisture content to be green timbers. Having been in the shop for a numbers of years, I can remember having to dry off my chisel after cleaning a mortise because there was so much moisture in a timber. It is common to use green wood for a couple of reasons such as cost and extended lead times.

Drying a timber can be done in several different ways and can produce a really stable wood if done correctly.

Air-drying is by far the cheapest and easiest way to dry timbers. You are not using energy except for what the sun gives you. However, the catch is that on average, it takes about a year per inch to dry. So if you have an 8x8 post it would take 4 years to all the way dry through

and depending on where you are, it may not be able to get below the 19% range.

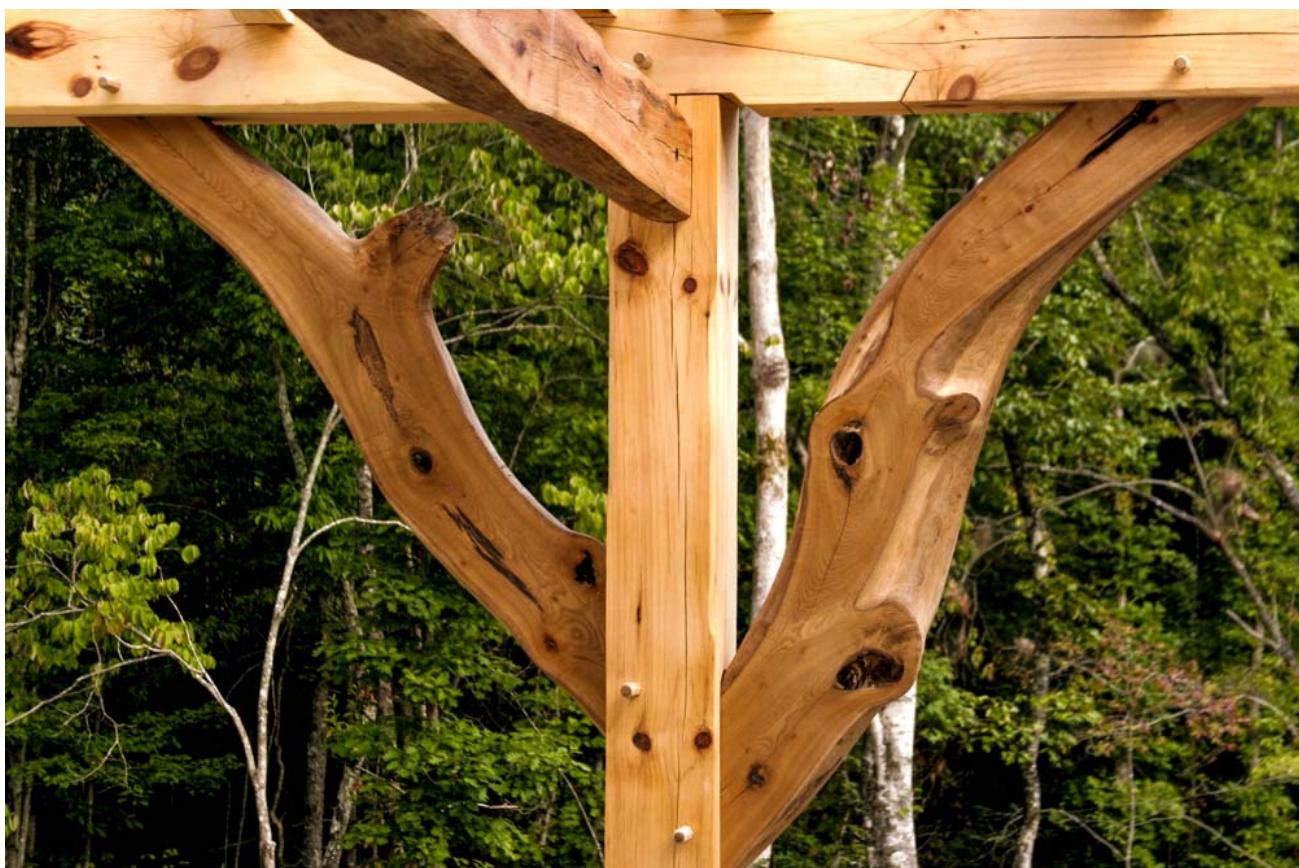
Traditional kilns that dry the majority of the convention framing, siding and trim that we will use through the home can be used to dry timber effectively. However, they have to be used at a low temperature for weeks on end to really do an effective job. Unfortunately, this uses quite a bit of energy and therefore costs money. If done too fast, it may cause the outside to dry too fast leaving the inside with too much moisture.

Radio frequency kilns are the best choice for kiln drying timbers. There are only a couple of them around and therefore drying timber this way is very expensive. They work like a microwave oven which basically dries the timbers from the inside out.

In the end the choice will be up to you to decide on whether or not your timber is dried or left green. Timber frames have certainly stood the test of time before the advent of the kilns, which is something to consider.

## **What Is The Difference Between Fresh Sawed And Reclaimed Wood?**

Fresh sawed timbers are produced from living trees. These newly-harvested trees are taken to mills for processing. They can be used green, air-dried or kiln-dried.

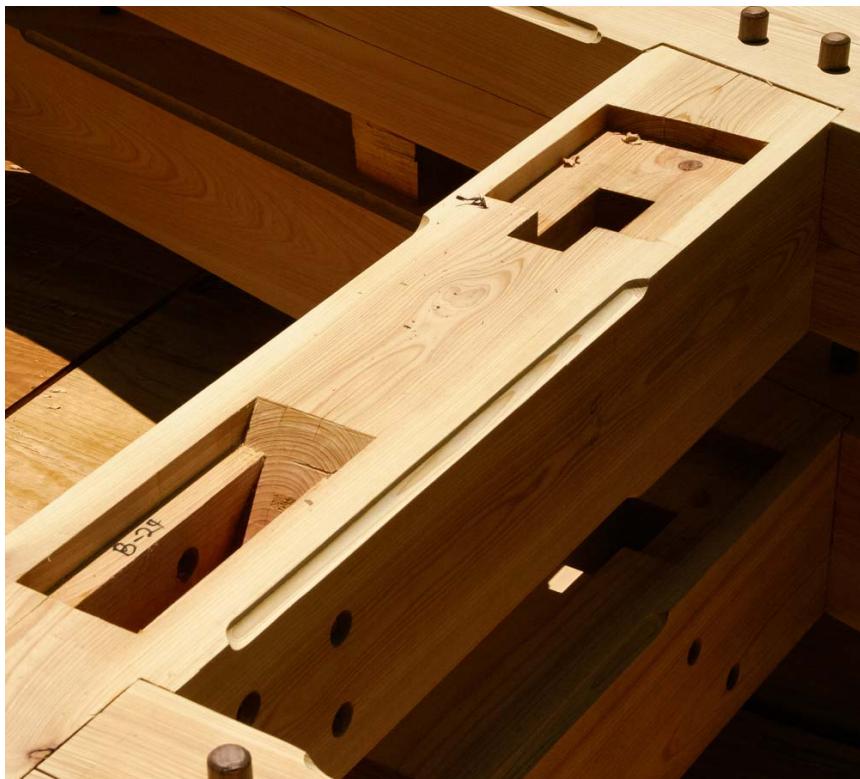


Reclaimed wood was cut many years ago and has dried and stabilized over time. This wood will have minimum checking or twisting if it is used in new construction.

When selecting the wood for your timber frame home, you should research which woods are available locally and select a species that is harvested in a sustainably responsible manner. This not only saves you money, but it is an ecologically sound choice as well. Several different woods can be used in the construction of your home, as different wood characteristics are required for various components of the structure.

## **Organic or Live Edge Timbers**

Having even just one of these in your frame may turn out to be the focal point of the house simply because of the uniqueness of the piece. They are timbers that have just had two sides sawed off or have been left in the round and scribed into place. It has always amazed me how people walk up to these special timbers just to feel them. It reminds people that the timbers that have created the house actually came from trees and they make a special connection with people. Whether one or many, adding organic pieces is something that you may want to consider doing.



## **Chamfers and Radius Edges**

The edge detailing of your home's timbers fulfills several purposes. Of course, it's a decorative element that finishes the wood. Rounded radius edges give a feeling of softness to the room, while the flat-surfaced chamfer lends an added linear sense. For a unique and varied look, a drawknife chamfer is nice as it produces an authentic and organic look.

However, that's not the only function of this finish detailing. Your timber is likely to suffer many bumps and unexpected falls, or the wood beams may experience abuse as they are hoisted and moved throughout the building process. The

chamfer protects the edges from undue damage. The removal of sharp edges is also a safety feature for those living and working within the structure.

The size of the chamfer or radius is proportional to the dimensions of the lumber and typically varies from 1/8th inch to 1-inch.



## Pegs

While there are a couple different species of wood that pegs are made out of, the predominant one is white oak. The other ones are locust or Brazilian cherry. You can also always stain pegs to have a more contrasting color with your frame if you would like to achieve different looks.

The other aspect about the pegs is how far they stick out from the timbers. Some folks like them flush with the timbers, some like them sticking out only an inch. My personal choice is for them to stick out 2 inches. This decision is personal because it can create a more rustic or refined look and therefore affects the overall feel of the timber frame.

*Hint: You can add pegs wherever you'd like after the frame is raised to hang a plant, coat, or piece of art. Just make sure to consult the timber frame company and/or engineer before drilling extra holes in the timbers.*

## Finishing Choices

Timbers can be finished in a number of different ways with great success. The real key is to use high quality materials and follow the directions that come with the products. You will also want to remember that timbers both inside and outside will need to be treated differently and that a timber will always move and contract over the different seasons, so having a finish that breathes with the wood is vital.

A simple oil finish is the most common method used today and has been for some time. It is easy to put on and allows the timbers to darken naturally over time developing their patina. There are several natural products on the market like Landark and Heritage Natural Finishes that are used by timber framers nationwide. These are both recommended and even smell like oranges.



A semi-transparent or opaque stain can be used to give a little color and contrast to the frame in various timbered elements, rooms, or the entire frame. Make sure you get a sample timber and test things out before you finalize your colors and products. If you are putting a timber frame up that has green wood, remember that it will check, leaving gaps that will show the interior wood and its original color.

The exterior takes some extra care and different products than the interior timber frame elements but the results can really set your house apart. One concern to think about is how often an exterior finish will have to be reapplied, as some are an every year event, which costs money and time.

Learning the basics of timber frame home construction is a matter of research, discussion, and understanding what your

choices mean to the bottom line of your construction budget. When you understand what your builder and designer are talking about, you can make decisions without relying on advice from people and businesses that are more concerned with their own profit than your best interests.

## Chapter 3 - Enclosure Systems

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After the frame is up, you are going to have to enclose it and there are quite a few different paths that you can choose. A couple overriding considerations need to be taken into account when choosing a system, as well as the details about each system. This will affect your budget and you need to understand the options to make the best decision for your project.



### SIPs

Structural insulated panels, or SIPs, have been around since the 1970s and have been growing in popularity ever since. They are basically a 1/2" layer of OSB, a layer of foam, which varies in thickness depending on your insulation needs, and another layer of 1/2" OSB. The layers are glued together making them excellent in structural applications such as creating roof over-hangs and shear walls. Your engineer will work with your designer and architect to apply the panels' structural benefits to the timber frame engineering. They may possibly reduce the need for knee braces and other timbered elements, saving you some money.

These panels are produced off-site and shipped to your site by the manufacturer when you need them. They come in sizes up to 8' wide by 24' long with all the angles, windows, and doors openings cut out and ready for installation. They get screwed to your roof and wall timbers. They can be also used in areas that are not timber framed in place of conventionally framed wall and roof systems.



There are several different types of foam, each with different pros and cons with factors like cost and insulation values. Where you live and the local building code requirements for insulation R-value in your walls and roof will affect this decision.

SIP homes also have extremely low levels of air infiltration because there are fewer gaps to seal. This airtight characteristic makes heating and cooling your timber frame home more economical in both your monthly energy bill and the smaller size HVAC units your home requires. Homes built with SIPs are able to keep a consistent temperature and have fewer drafts and less noise infiltration than standard construction buildings. When properly installed, they maintain a higher whole-wall R-value than stud walls of similar proportions.

## Types of Foams Used

### **Expanded Polystyrene (EPS) 1" of foam = 3.8 R-value**

This is by far the most popular type of foam used for SIPs. EPS foam is basically a high grade of



Styrofoam. It is extremely stable and has been used in many other applications. It costs the least, but also gives the lowest R-value compared to the other foams, which can mean thicker roof or wall panels. These are easy to modify on site for electrical work and window and door changes.

### **Neopor (NEO) - 1" of foam = 4.5 R-value**

This is a newer product that uses graphite to enhance the EPS foam. It gives it a grayish color and you get a better R-value than with standard EPS foam.

### **Polyurethane (PUR) - 1" of foam = 5.0 R-value**



The second most popular panel is the polyurethane-based panel. It offers a higher R-value per inch, which means that it will cost more than the EPS foam but you may be able to use a thinner panel. The extra cost with a thinner panel can be made up somewhat in window and door jamb extensions, trim details and eave details. One side note is that it is harder to modify these panels on site and your electrical system has to be figured out completely before the panels go into production.

Using SIPs on a timber frame home makes sense and has quite a few benefits like speed of installation, reduced site waste and long-term savings in energy cost in having a top notch envelope system around

your house. The biggest disadvantage is the additional cost that it gives you over using standard 2x material for your enclosure system.

### **Conventional Framing**

Oddly, conventional framing overtook and made timber framing all but disappear from standard building practices until it was revived in the 1970s. It consists of the standardized 2x4 and 2x6 pieces of lumber for the wall framing and using 2x8, 2x10, 2x12 or premade roof trusses out of 2x material to create the roof. This all gets sheathed in a plywood or OSB layer

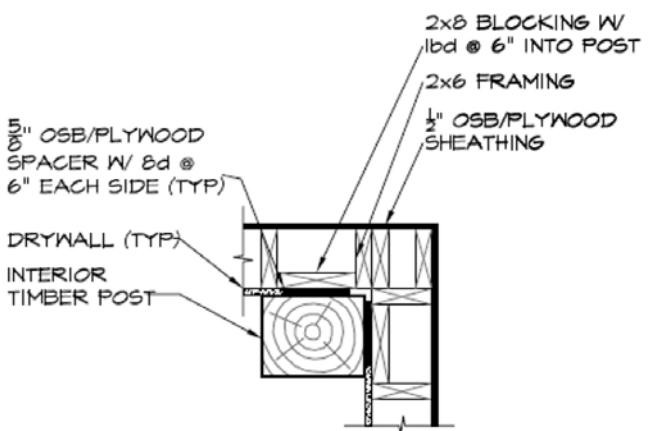
that ties everything together structurally. This method is the way that at least 99% of the homes in this country are built.

In the case of incorporating them in a timber frame, the walls are constructed and stood up around the timber frame. The walls need to be spaced off the frame to the outside whatever distance the inside finish walls will be. For example, for a  $\frac{1}{2}$ " drywall finish putting a  $\frac{5}{8}$ " spacer behind the timbers will allow you to slide the drywall behind the post or plates, creating a clean look.

Some folks like to use the infill system, putting the conventional wall inside the timber frame. This is not recommended for exterior walls. As the timbers dry and move through the seasons, you will certainly get air infiltration through the gaps that are created between the walls and timbers. This will increase your energy costs as well as potentially giving you moisture problems in the future.

Electrical wires and insulation work can be completed as usual and you will have the choices of standard insulation types that you can put in the walls. To match the tightness and to get the insulation value of a SIP, you will need to use a spray-in polyurethane-based foam for your walls and your roof. After all factors are considered cost-wise, you will get a small cost saving if you choose to go with conventionally-framed walls instead of opting for the SIP wall panels.

Using conventional lumber to frame out your timber frame or create a built-up roof system with foam certainly has its place and warrants discussion. There are other ways and techniques out there



that I will not mention. The two that I see the most are the following:

## Built-up

In a built-up roof system, one uses foam boards stacked on the roof around a 2x band board. You control the R-value of the roof by the thickness of the foam, similar to a SIP panel. You then attach 2x4s flat with long screws through the foam into the timber frame tying everything together. You will need to add lookouts to the gable and eaves to create all the overhangs; care should be taken here. All of that is then covered with your sheathing material and then underlayment. Please note that this is a vented roof system, whereas a SIP roof is unvented.

## Framed

A framed system uses 2x material laid perpendicular to the timber frame roof system and then insulation is installed. Any type of insulation can be used from the high tech spray-in foam to fiberglass insulation. The denim jeans factory waste insulation has always been an



Photo by AirTight Insulation of NE Georgia, Inc

interesting solution. All that is finished with sheathing and the underlayment readied for the final roofing. Creating the overhangs is a bit easier with this method.

With either the built-up or the framed system

you are basically creating a panel-like product, just in place and on site. To factor in the additional labor, time on the roof, delays for weather, speed and materials, I would really recommend that you consider the SIP solution for the roof over the timber frame. Integrating a SIP roof and conventionally framed roof is easy if planned out. Of course, the option to

conventionally frame your walls around your timber frame and using SIPs over the roof is a great combination.

## **Part Two - The Steps**

## Chapter 4 - Step 1 – Prep Work

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You're really getting excited with this whole timber frame construction concept. There are ideas zipping through your mind and half-understood theories are luring you online. With so much to learn and so many styles and options from which to choose, you need a little structure to put your ideas into a clear and useful form.

You don't have to have professional R&D skills to whip your dreams into shape. Think of all your ideas as pieces of your dream home puzzle. Put them together one by one and let

them slowly grow into the shape of your future home.

Nothing is written in stone, so don't worry about changing your plans or altering your strategy. That's the development part of R&D. Opinions change as new information is gathered. Don't worry about changing your mind at this stage of the game. Have fun while you're learning all about your future timber frame home.



### Research and Organization

When you started this quest, you were drawn by certain features of timber frame construction. Whether those are energy conservation, durability, ecology or stylistic preferences, they are building blocks to start the organization of your home. Consider what it is that

impresses you about timber frame homes, and make a list of the types of things that appeal to you. This will be the backbone of your research.

Not only will you have categories to research but they will hold different ranks of priority during the phases of your investigations. For example, in the beginning stages of your research, SIPs construction and energy efficiency take priority over the finish used to protect your timbers. Later, when all the technical issues have been decided and ironed out, you'll set a higher priority for the debate between finishes and the way it affects your decorating style.

## Create a Notebook of Ideas



I suggest purchasing a large 3" binder with folders and dividers with tabs. This will prove helpful for the paper items you acquire from magazines, papers and brochures from realtors, architects and designers. Label each tab with one of the general areas of inquiry, rooms in the house and additional items of interest as you encounter them.

This is a useful tool to take with you on outings to visit local dealers, suppliers and builders. These folks often have websites to augment their literature, but it's nice to have a notebook to browse through when a computer is not convenient. Later, you can check their websites for additional information and ideas.

## **Visual Aids**

Gather photos of everything you like about timber frame homes or things you think may fit with your ideal dream house. Use your folder system matching the binder system to categorize your ideas. You can always cull out rejects as your knowledge increases and your concept of timber frame home living changes.

Don't forget to take photos when you're out on expeditions to other homes that you visit. A pocket digital camera or Smartphone is a simple and efficient method of capturing all the things that interest you. There are so many facets to this that you can't remember all the things you see. Upload your pictures onto your computer. You can add them to computer folders, Evernote, or print them out to add to your notebook.

## **Web Sites**

There are commercial web sites as well as educational and industrial sites to provide information on the various aspects of this unique type of housing.

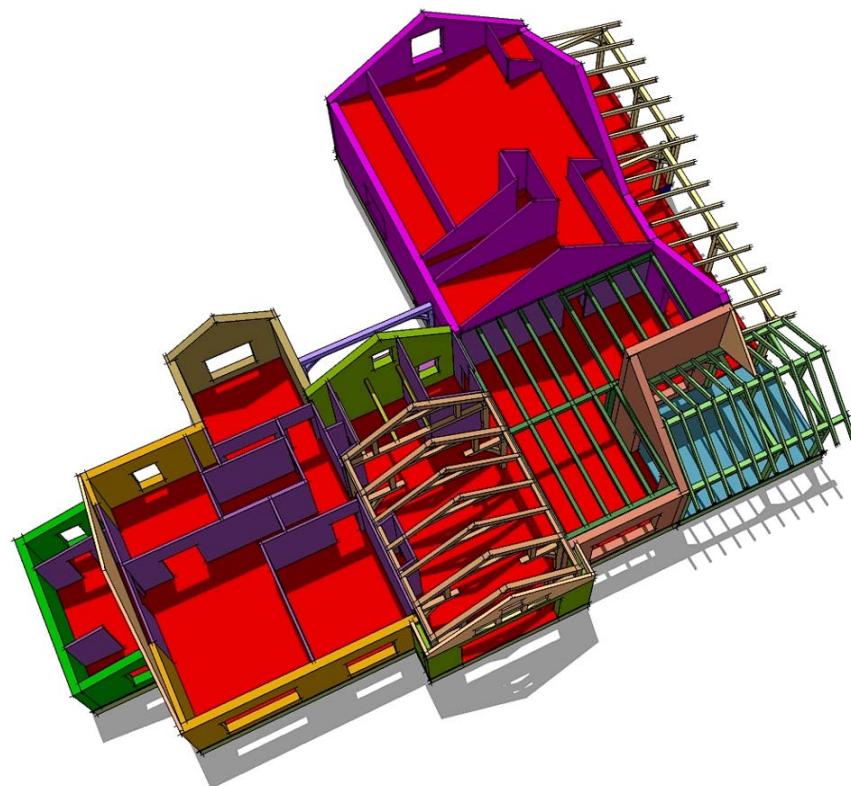
Use your favorite internet search engine and see just how many sites pop up. You may

want to make a separate folder in your web browser favorites bar for collecting shortcuts to interesting and informative web sites.

There are also various types of web sites that deal with timber frame construction. Many are in the business of selling their services and products. They have a vested interest in their particular approach. Certainly use these sites for learning, but be aware that they may have a monetary agenda.

Other educational web sites inform and explain the intricacies of timber frame

home construction. Sites like timberframehq.com are not in the building or design business. They just provide information and resources to make reaching your home goal easy and enjoyable.



## **Virtual Idea Boards**

Another interesting internet based tool is an online inspiration board. These sites allow you to set up an area in which you can find and capture things that you may want to incorporate in your new home. Using an online inspiration board is a great way to keep all



your internet finds in one easily accessible location. With this tool, you can show anyone your plans and ideas without dragging around a cluttered notebook. You can share with friends and relatives or potential builders, architects and designers helping you convey your ideas clearly and quickly.

Places like Houzz.com and Pinterest are virtual bulletin boards that you can use to save all your favorite decorating and building ideas. These are fun and easy to create, and they allow you to build unlimited idea boards to plan your dream home. You can even share your ideas with your family, friends, architect, designer and builder.

## **Books**

There are many books, like this one, dedicated to the design and construction of timber frame homes. If you're a real bookaholic, you may want to purchase a text or two that leans in the direction you're heading. These vary from author to author in scope and direction. Check out your local library for what's available, or have your librarian arrange an inter-library loan if there are few selections in your neighborhood branch, county or regional library.

## Too Much vs Too Little Research

Some timber frame home concepts are just common sense, while others require some specialized research. While you can never have too much knowledge, there may be a point at which you are just over-thinking an idea.

You need to be knowledgeable enough to discuss and understand concepts with your designer, architect and building team. However, you're not going to engineer this thing yourself. You're paying the experts well to determine your needs and supply you with a package that fits your budget and provides the features you want.

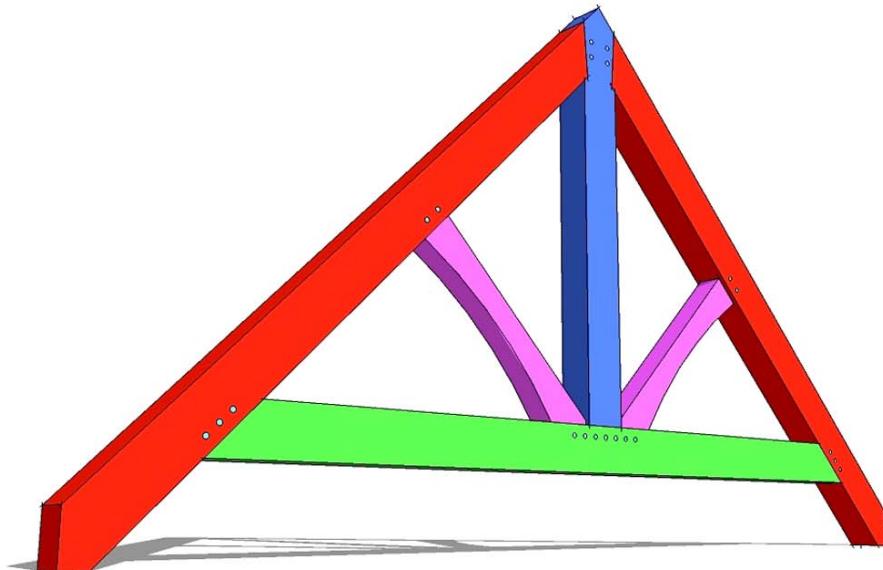
Get a good grasp of all that goes into this style of construction and understand why certain products and techniques are used. If there are several different options that are suitable for your situation, pay attention to the differences and talk with the experts about which option is best for you.

Details that are cosmetic, and not structural in nature, are a matter of personal preference. These are things over which you may agonize and waver. Don't let them become so overwhelming that they keep you from making a decision and bog down your progress.

There are so many resources available today, that you can make timber frame homes a full time avocation. Keep in mind that this technology has advanced over the years.

Don't rely on a 10-year old publication as a reliable resource. Products continue to advance and the experts' understanding of building principles evolve. What was considered cutting edge a few years ago may be sorely outdated today. Consult with the latest findings to ensure that you're building a home that is as energy effective and as durable as our modern technology can provide.

Research and planning should be a fun and enjoyable endeavor for you and your family. If this is an idea that has been bouncing around for some time, it's an enjoyable hobby. If you're getting serious about that someday dream home, it's an activity that you and your family can share and develop together.



If you've moved onto the fast track and are ready to start serious preparation, then there's no time like the present to begin firming up your goals and come up with concrete ideas that you and your design and construction teams can translate into your future family home.

Approach your dream with a common sense attitude and a simple game plan. Breaking the components down into pieces makes the whole idea less overwhelming and certainly more enjoyable.

## **Chapter 5 - Step 2 - Finding Your Team**

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You've daydreamed, researched, planned and saved to get to this next step. You're ready to assemble the people necessary to help you live your dream. With all your research, this still may look like a real challenge.

Choosing a team to build your home isn't like selecting doors and windows. You need to select a team of people upon whom you can rely. Basically, you're putting a good deal of your finances and your future lifestyle in their hands. You will need to find a company and group of individuals that you can trust to work in your best interest.



Plan your team just the way you've gone about planning your new home. Research, ask questions and keep investigating until you're satisfied that all members of your team are knowledgeable, meet your standards and are trustworthy as a company and as individuals.

### **Finding Your Team ASAP**

The companies and crew that will design and build your timber frame home must work in tandem to be efficient and cost effective. By having your team ready as the project progresses,

you are able to communicate between the various team members and avoid costly errors, miscommunications or overlapping of responsibilities.

Some timber frame construction companies provide turnkey services that alleviate the need for a prolonged search for team members. Architects and designers often have established working relationships with the various trades necessary to complete your home and can be a resource for finding a crew as well as the website Timber Frame Directory

Once you've contracted with your architect or designer and timber frame company, you will be able to move ahead with your project.

## Your Team



Your team will be composed of an architect and/or a timber frame designer, a timber frame company and a general contractor. The house must be designed, the timber frame designed, fabricated, and raised; and finally, the remaining components need to be installed and completed.

Some timber frame companies provide an all-inclusive package. Others offer design and fabrication services and the contractor installs the frame, while some design, fabricate and erect the timber frame. In the last two cases, you will need to hire a contractor or take on the

job of general contractor yourself. It is vital that you question and get in writing everything that they are providing.

## Selecting an Architect or Designer

Of course, your designer or architect must be familiar with timber frame construction and design. Many timber frame companies either have designers on staff or can recommend architects and designers who are experienced in this type of design.

Many companies also have pre-designed plans available, so you can avoid a high designer's fee if you are happy with a choice in their portfolio. Your architect or designer should work directly with the timber framing company right from the start to be sure that there is no duplication of services and to integrate all the components of the timber frame structure with the finishing details of your home.

There is the case where you may need to hire both an architect and a timber frame designer. The architect designs the home and directs the overall project and the timber frame designer then focuses only on the timber frame proportions of the home. Some timber frame companies will have in-house designers, but an independent designer may allow you to shop the frame around to get the lowest bid.



## How to Choose a Timber Frame Company

After completing your research, you should have an idea of what kinds of services you need from a timber frame company. Each company has its own style and scope of services and products and this will be your primary focus.

Once you have determined the level of service, spend time with different company representatives. Check their ratings with the Better Business Bureau, membership in the

Timber Framer's Guild and the Timber Frame Business Council. Find out how long they have been in business and the crew's experience in this field. Make an appointment to see examples of completed or in-progress projects and don't forget to visit their shop.

Discuss the type of enclosure system they prefer, as well as the type of wood they use. Also, ask to see any warranties they provide for their products or services. Make sure they are available to consult with your designer and contractor if they do not provide turnkey service, and they are fully licensed and insured. Finally, ask for references and follow up with a visit or call to former clients.

If you've decided to work with a turnkey timber frame company and have found one that you feel comfortable with and are confident in their abilities, your quest is complete. However, if you've decided to put together your own team, you need to do some further work.

## Selecting a General Contractor

Your general contractor is responsible for constructing your timber frame home. From the excavation of the foundation to the final walk-through, they are in charge of all aspects of the building process. Before signing your name on the dotted line, make sure of what the

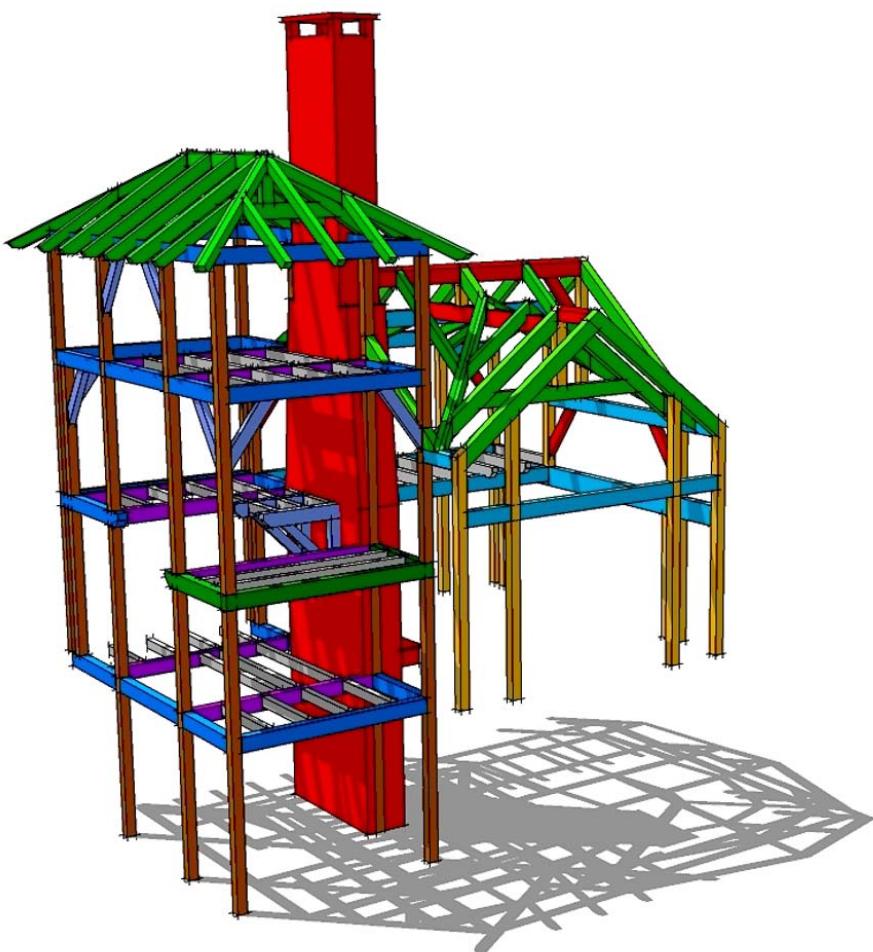


company is providing. The services a contractor provides can vary, and each company has different views on the extent of their services. Most contractors coordinate the labor and see

to assembling all the required materials in a timely fashion. Their job is completing your home within the set budget and on time.

The contractor manages the job site and supervises the work and the workers. This includes the timber frame company, plumbers, electricians and roofers, as well as carpenters and general labor workers. Workers may be in the employ of the contracting company or they may be sub-contractors.

A general contractor that is experienced with timber frame construction is a great asset. They maintain records, coordinate payments, develop and maintain a construction schedule and monitor the work to ensure everything is completed properly and in a timely fashion. In addition, their familiarity with timber frame construction methods can be of significant value in the design phase of your home. Although timber frame construction experience is definitely helpful, it is not mandatory. The most important thing is that the architect, designer and timber framing company are able to communicate well with the general contractor so that he understands the unique facets of this building project.



If your timber frame company does not have a list of contractors in your area, you can consult your local builders association for references or our online directory at [timberframedirectory.com](http://timberframedirectory.com). When interviewing potential contractors, you should find out how long they have been in business and if they have experience with timber framing. If so, which companies have they worked with? Make sure they are willing to work with the architect or designer in the design stage. Ask questions such as how they handle change orders and how long they estimate the time for completion. Make sure to get references and check them.

## **Building a Relationship**

Don't rush into a commitment to any of your contacts until you have a chance to compare the work, style and demeanor of several companies. Make sure their services fit your needs, and the people you will be dealing with are in tune to what you are looking for.

Every company has its own personality, so try to build a group whose style matches your own. This is not a two-week project. You'll be spending a number of months working with these people, and a cold or inattentive attitude is hard to deal with. In the end...

## **Go With Your Gut – This Is a Personal Decision**

During this stage of your project, you may be a little overwhelmed or at least weighed down with all the choices you have to make. Sales staff will try to impress you with their facts, figures and shiny brochures. A visit to a builder's model will tempt you, and you may be blinded by all the wonderful upgrades and features that only add a small percentage to your budget. Remember, these people are there to make money as well as to help you fulfill your dream. Don't let all the hype and the beautiful luxurious model homes cause you to lose your good judgment. When it comes down to it, go with your gut and trust your feelings.

# Chapter 6 - Step 3 - Design and Engineering

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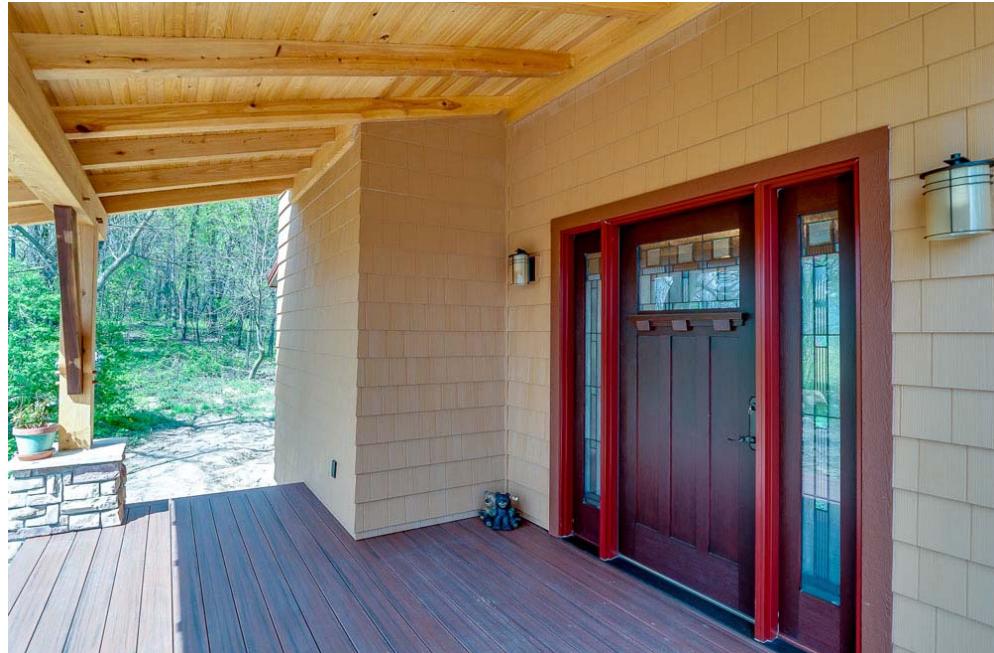
You probably came into this quest with a shadowy idea of your perfect dream home. As you researched what goes into a timber frame home and learned about its strengths and weaknesses, you've undoubtedly developed solid visions of what you want in your dream home.

Now it's time to put those visions down on paper. Whether you are designing a home from scratch or modifying plans that have already been engineered, you must be able to communicate clearly your ideas and goals to your design team. Since there are very few mind readers in the building trades, it's your job to make your expectations clear.

Not only does this make their job easier, but it saves you money in the long run. Change orders down the road can be very costly and time consuming, so get everything you want down on paper and be prepared to discuss all aspects of your home with the design team.

## Basic Rundown of the Process

You're going to put all the wonderful ideas and plans you've come up with into the hands of a design team. You'll spend time discussing different aspects of your dream home and come to an understanding of what is possible for the kind of budget you have.



Your design team will produce preliminary conceptual drawings so you can visualize your timber frame home. Next, you and your team will work to revise it to meet all your requirements and develop the drawings for the next phase.

The drawings will be reviewed, adjusted and approved. At this point, a preliminary budget can be presented.



The timber frame and enclosure are then engineered. When the overall design is approved, the details will begin to take shape. This structural engineering allows the architect to set the timber size, placement and create a more accurate budget.

## Detailed Design Process Steps

### The Kick Off

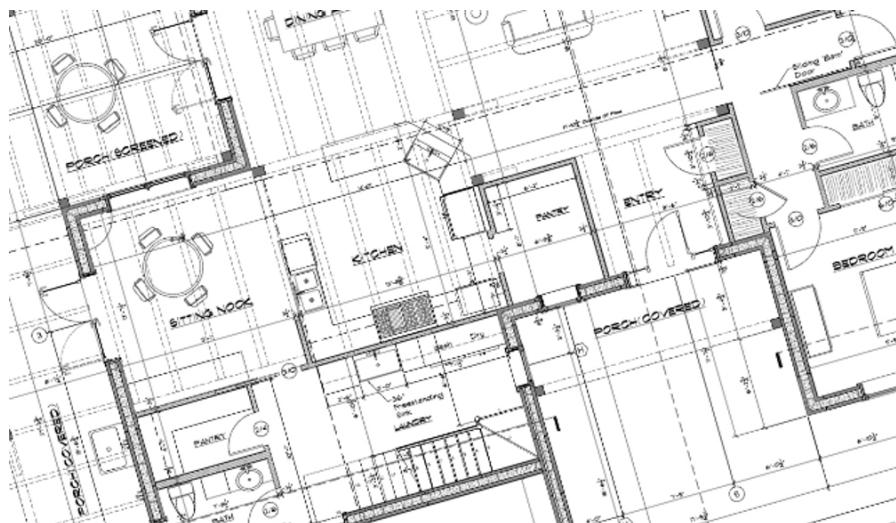
Start gathering up all your ideas from step 1-all those pictures out of magazines and brochures or sketches of ideas you have in mind. Regardless of how rough it is, or how insignificant it may seem, assemble everything to show to your designer.

The architect or designer will sit down with you, visit your site and work with your concepts to develop the conceptual drawings.

### Conceptual Design

Incorporating your ideas, the creative team will draft a preliminary design. They incorporate a layout with your architectural taste and personal style. The team will also create a package that fits your budget, taste and the location of your home.

Not only will your design team take into consideration the square footage and layout of the house, but it will take into account the level of architectural complexity required for your ideas and how it will affect your



budget. If you are interested in green design elements, those facets will be included in this stage.

## **Sign off Phase**

Once you and the design team have come up with a final rendition of your dream home, and everyone is in agreement with all aspects of the project, you will sign off on the drawings so the construction documents can get underway. At this point, you will have a very rough idea of your budget, drawings and the necessary information to begin the process.



## **Construction Documents**

The basic drawings that include the floor plans and elevations blueprints are only one aspect of the drawings. You will also need specialized blueprints for the various trades that will work on your home.

You might have and need drawings and plans for the following:

- Foundation plan and floor framing plans
- Detailed and dimensioned floor plans
- Dimensioned elevations

- Plumbing, electrical and schematics
- Floor and roof framing plans
- Window and door schedules
- Building sections

## **Timber Frame Drawings**

Along with all those other drawings, your design package will include shop or timber frame drawings for the engineer, architect, timber frame company, and the SIP manufacturer.

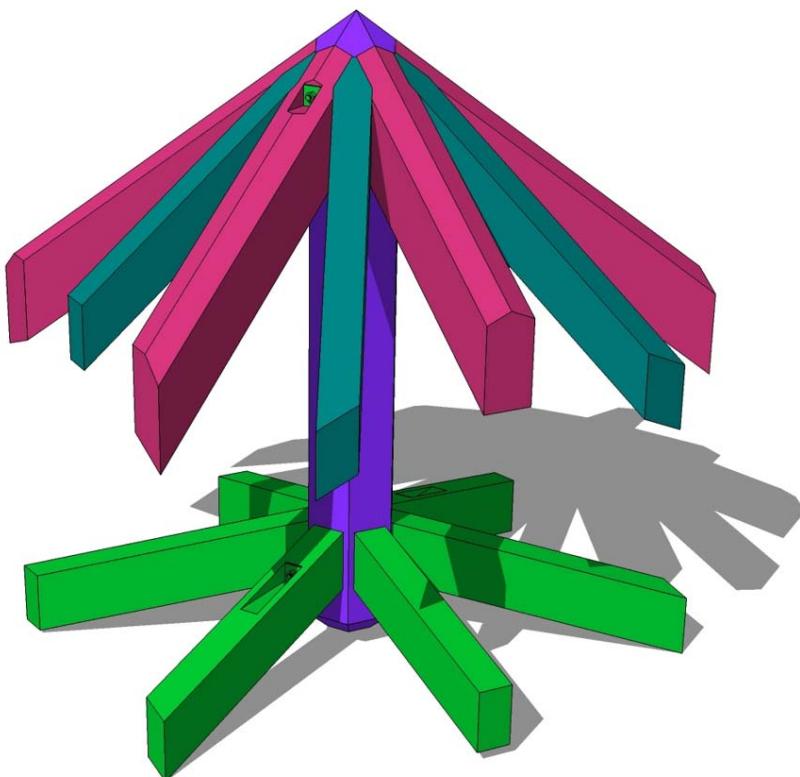
Every part of your home's timber frame and enclosure is unique. Unlike standard construction homes, every beam, post and SIP panel is carefully constructed to fit a specific place in your home. This ensures a weatherproof, airtight construction that will provide a well-insulated and reliable enclosure.

## **Engineering**

Engineering is extremely important for a timber frame home. The concept of these homes is based on an open architectural style and wide expanses of clear space. This means that you need a really big piece of wood to hold up a really wide ceiling. That may be a bit simplistic,

but basically, you are using the fewest building members necessary to provide an open living space that will last not for decades, but perhaps for hundreds of years.

A timber frame structure can have a span up to 60 feet. A typical home may have a span of 24 feet or more. This requires some fairly heavy-duty engineering. Things like shear, moment about a point, and loading factors such as snow and wind take this kind of design out of the hands of hobbyists and into the



hands of skilled engineers.

As well as being structurally sound, an engineer and designer will create a frame that is aesthetically pleasing to the customer. They will also engineer the joints and the details of how the timbers will connect. These connection details include where and how many pegs will be used in each joint. They will also determine if there will be steel connectors or brackets. These may be surface mounted, or they can be hidden if the customer chooses a more natural appearance. Timber frame construction is considered non-standard, and local code may require some special consideration for approval of your home's design.

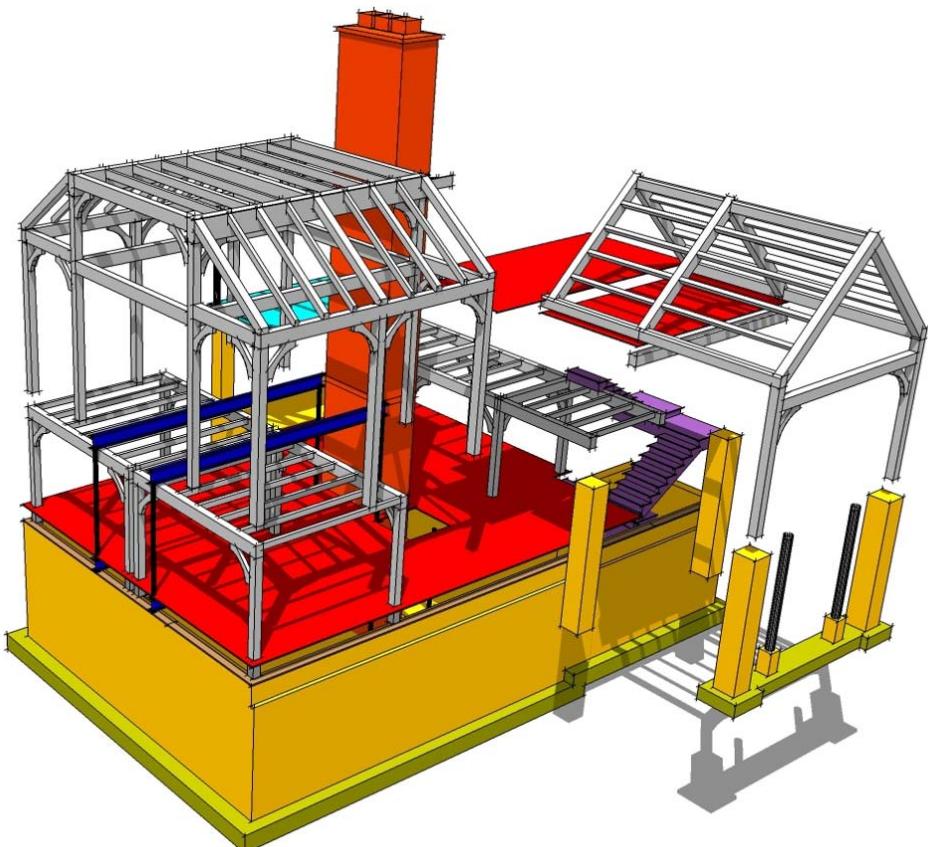
The type of wood used for the structure may play a part in the engineering calculations, as well as the construction of the SIP enclosure. All of these variables require engineering.

Finding an engineer for your project is usually easily done through your timber frame designer or company. They know and have worked with engineers before. If you are working on a "do it yourself" (DIY) project you can head to the Timber Frame Directory or search for the Timber Frame Engineering Council in your favorite browser to find one that works in your area.

## **Design Support Work after Construction Begins**

The level of support you can expect from your design team after the job begins will depend on the company with whom you are contracted and the manner in which you have written the contract.

Make sure that the terms of assistance after the project is underway are spelled out so there are no surprises down the road. Do not assume anything. If it's not in the contract, don't count on it.



## **Local Code**

If you own a piece of a mountain that takes a

two-hour drive in an SUV to reach, local codes may not be a big issue. However, if you're like most homeowners, you live within the confines of a community or county that has a specific building code for all construction.

These folks have your future in your hands, so it pays to be honest, pleasant and forthcoming with the people who are going to approve or disallow your permits. Remember, they are on your building team.

This process of acquiring permits can take some time, so start early and be patient. It's also wise to come prepared. Check to see if your community has an online presence so you can go into this portion of your project prepared. If you cannot find what you need online, then stop by and introduce yourself and talk through your project with them. I think you will find they will be more than helpful.

The building department is really there for your safety and the safety of those who will own your house in the future. Treat them as a resource potential and not as an adversary.

### **Make Sure Your Home Stands The Test Of Time**

Timber frame homes remain standing for centuries. You have seen photos of timber frame structures built hundreds of years ago that are still substantial, strong and continue to be used as homes, churches and places of business.

Using the best materials and best practices to construct your home maintains the tradition that builders and craftsmen have respected for centuries.

You are following not only a style of building construction, but also a tradition of quality, craftsmanship and pride.

# **Chapter 7 - Step 4 - Finding Out How Much It Costs**

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You've got all your ideas tucked in a folder, and you've researched as much as you can about the costs of different options and features you want in your home. Now comes the big question: How much will my dream home cost?

Of course, you want all the high-end options and only the best in materials. What your budget tells you may be another story entirely. Now you need to do the math, and come up with a figure that you and your budget can live with for the next couple of decades.

## **How Do You Approach The Cost Of Your New Home?**

A "design-driven" or "budget-driven" project will affect where your building costs lie within the spectrum. You may have a very specific budget that is not negotiable and you will have to cut corners to get all the features you wish. If you are working on a design-driven project, you have determined the features that will make the house your dream home and will adapt your budget to accommodate those elements.

When price is not the main issue, a design-driven house tends to be in the upper stratosphere for pricing. You have set your sights on a particular house and amenities, and your budget will fluctuate to incorporate those design features.

A budget-driven house will have some features that are non-negotiable, while other desired features may be downplayed or eliminated altogether for the sake of the budget. Many houses are built as a budget-driven project. The homeowner winds up with a lovely new



dream house and a list of future improvements, upgrades and additions that will add to the beauty and value of his house over the ensuing years.

### **It's Difficult to Estimate Costs without a Complete Set of Drawings**

Trying to plan how much your timber frame home will cost without obtaining a complete set of drawings is much like cooking for a Thanksgiving dinner without a menu. You really need to know exactly what's going into your home to arrive at a dollar amount that's more accurate than just guesstimating.

A stick framed home uses a standard method of erecting the shell. One can determine the number of two-by-fours, pounds of nails and sheets of drywall with little problem. When you are estimating the cost of a timber frame home, the design components can significantly alter the price. This makes it very difficult to come up with reasonable pricing without a set of good construction drawings.



### **Building Site**

Your geographic location will have a definite impact on the cost of your home. Some parts of the country have much higher material and labor costs than other areas. Local building codes vary and can influence your bottom line. In addition, the actual lot on which you build

is a factor. If you have a flat, backfilled site, your crew will have far less trouble and take less time than if they are working on a steeply sloped property that has not been backfilled yet.



## **Building Design**

Generally, the per-square-foot cost of a large home is less than a comparable small home. A small home still requires work such as the foundation, plumbers, electricians and framing crew of the larger home. A two-story house costs less per square foot, since a smaller roof covers more of the space and the foundation footprint is smaller.

A simple building design, with fewer angles, roofline intersections, and dormers is more economical to build than one with complex roofing, hips and valleys.

## **Building Material and Design Detail Choices**

The actual timbers you choose for building have an impact on the cost of your home. Recycled wood is more costly than new timbers. Different species of wood will vary in price, based on local availability and species. Using locally grown woods will be less costly than shipping in timbers that are not indigenous to your area.

The intricacy of the truss designs you choose, as well as the use of exposed rafter tails, floor joists and beam ends, can add to the final price of your home. This is something that

needs to be looked at during the design process so you do not go through the entire design process just to find out that you cannot afford it.

## **Interior Details**

Your choices for floor coverings, cabinets, countertops and appliances dramatically affect your total cost. Granite counters, professional-grade appliances and high-end custom

cabinetry are things you may want, but those features may be better left for future improvements and upgrades if your budget is tight.



## **How to get Apples to Apples Pricing Request for Proposals (RFP)**

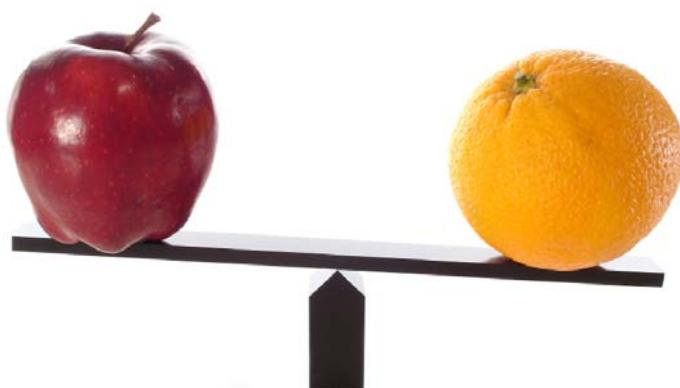
A Request for Proposal is an invitation for timber frame companies and contractors to provide bids on work to be done in constructing your home. This competitive bidding process allows you to compare a number of different

companies before making a decision and gives the best chance to get apples to apples pricing.

Some of the aspects to consider include pricing, the company location relative to your building site, the timber framer's ability to deliver the products or services, the prior performance of the company and the timeliness in which they are able to complete their jobs and deliver their products.

## **Research and Define the Scope of the Project**

A good understanding of your project makes it easier for you to answer questions. Defining exactly what you want in your home and what you expect gives the potential team information to write proposals that address all your needs and concerns. If the contractor or timber frame company understands the project, they can tailor their proposals to your specifications.



## **Identify the Information Required From Applicants and Specify the Proposal Format**

Your package will include construction drawings and any specifications that are pertinent to the completion of your home or timber frame kit. Some packages for specialized work or materials like a timber frame will need to contain additional information related to that trade. Make sure to include this in your proposal.

If you don't ask for specific information, you may wind up with a jumble of information that may or may not be useful in your decision-making process. On the other hand, you may receive a boilerplate proposal that doesn't address the specific needs and requirements of



your timber frame home. By providing complete design documents and other specifications, you will insure that you don't end up with an apples to oranges proposals.

An RFP is a very useful tool that you should take time to compile. Don't just jot notes down on a cocktail napkin, but devote time to formulate and develop a Request for Proposal that succinctly and clearly states the information you wish to impart and expect to receive in return.

After comparing those apples to apples, talking with knowledgeable and straightforward company representatives, and doing your own research, it's going to come down to a gut-level decision with whom you will be comfortable.

## **How Much It's Actually Going to Cost**

Whew! At last you've arrived at a dollar figure for your timber frame dream home. What a relief it is to know your final cost. The anxiety over wondering about the cost is gone, but now the reality of the whole project is sinking in. Now it's time to get down to the actual work.

You may have more budget busting to consider. Shifting priorities, tweaking detail options and planning payment schedules will now replace the mind-boggling research you just completed. It looks like you're really going to build that dream home.

Building now is less expensive than building later. If you've gotten this far, don't backslide. Your new dream home is no longer just a dream. It's a reality waiting to happen.

## **Chapter 8 - Step 5 - How Is A Timber Frame Created?**

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Timber frame construction is really quite impressive and has always given me positive feelings when I am in those spaces. The sheer size and volume of those massive frames certainly do leave one with an impression of substance, stability and comfort.

Putting together one of these houses is a job that melds technical skill and a lot of manual labor. No, the craftsmen don't usually use axes to shape the mortise and tenons any longer, nor do they whittle the pegs by hand, but some still do. However, this is labor intensive, and skilled craftsmen are required to create your framework and erect your home.

There are a lot of processes that go into creating the individual members, trusses, bents and auxiliary components of a house. If you're lucky enough to take a tour of a timber frame construction facility, which is recommended, you'll be impressed with the time, manpower and detail that go into creating the beautiful wood timbers that will one day be a part of your home.

### **Getting the Timber to the Shop**

The timbers used to build your timber frame home are not cut by hand. They are processed at a sawmill and cut to standard sizes. When your timber frame company purchases the raw materials, the mill individually cuts the wood to precise dimensions. Each piece of the frame is individually cut and numbered. The timbers at this time can either head to the planer to smooth and dimension each, and/or head into the kiln for drying and then get planed smooth on all four sides (S4S).

The timbers are then bundled up, loaded on a flatbed trailer and delivered to the timber frame company.



### **Prep and Layout**

When the timber arrives at the shop, it is unloaded and sorted according to size and stacked in an order that makes the most sense for the process of laying out the joinery and cutting. Before the wood arrives, the timber framers in the shop have already had a chance to study the plans. They have looked at both the timber frame design and the architectural drawings. It is important for those cutting to understand the particulars of the project and how the timber frame interacts with the rest of the home. They will put thought into what timbers will carry the most load, which timbers will be the most visible and any important engineering notes.

Now they are ready to start selecting timber to cut first. Most frames are cut in a particular order such as posts first, beams second, rafters third. This order varies from project to project. The first sticks are brought into the shop and selected for their spot in the frame.



The first joiner will orient the timber in the frame in his mind and picture how it will interact with the other timbers. He will then go through the wood in great detail and draw all of the lines on the timbers that indicate the joinery and cutting process. Once he is satisfied with the layout, he will sign his name to that piece on the cut list. The next joiner will then double check, again in great detail, every single line on the timber. Once he is satisfied that it is all correct, he will sign off on the cut list. This “double check” helps to insure that the timber will be cut correctly and fit into its spot in the frame just right.

### Roughing out Joinery

The timbers are now ready to be cut. The first step in cutting is to score all of the layout lines. This is done with a razor knife and is meant to keep the cuts smooth, crisp and clean. Next the joinery is roughed out with large skill saws, mortisers and routers. This is just getting the bulk of the wood out of the way to make the next stage as easy as possible. This is a dusty and messy wood chip producing process.

Some frames are cut by hand tools and portable power tools by individual craftsmen, while others are cut at this stage using the latest in CNC (Computer Numerical Control) technologies to cut a frame. The CNC machine is called a Hundegger and having watched several in action, they are quite impressive. However, regardless of how the frame was roughed out, it still has to move on to the really fun and rewarding stage.

## Cleaning up the Joinery

Cleaning up the joinery is where a keen eye and expert skill with hand tools come into play. The edges must be chiseled into neat, square corners so the complementary parts fit squarely. The natural shrinkage and checking must be taken into account at this stage to ensure the joinery remains as tight as possible after the frame goes up.

Hand tools are used for each joint, one at a time. The craftsman will go from joint to joint with very finely tuned chisels and planes to “clean” the joinery. This is a painstaking process that allows a nice tight fit of each joint. When that joiner is finished cutting, he will paint all of the end grain of the joinery with a wax paint or oil that seals the wood and protects it long term. Now that piece is ready for the assembly and the joiner can sign his name to the cut sheet.



## Test Fit and Assembly

Since all the wooden members are individually made, your timber frame company will be test fitting and assembling all the components to ensure that they fit properly before they are moved to the construction site. Because of the massive size of the beams and the height at which some assembly takes place, it is far easier to test them on the ground. There will always be some fieldwork modifications that will occur, but if your timber frame company is particular about its product and the skill of its craftsmen, the alterations will be minimal. There's so much technical skill and craftsmanship that goes into creating the basic

framework of your timber frame home. It's part technology, part experience and a lot of wisdom that are acquired by working with the wood.

# Chapter 9 - Step 6 - Raising and Site Work

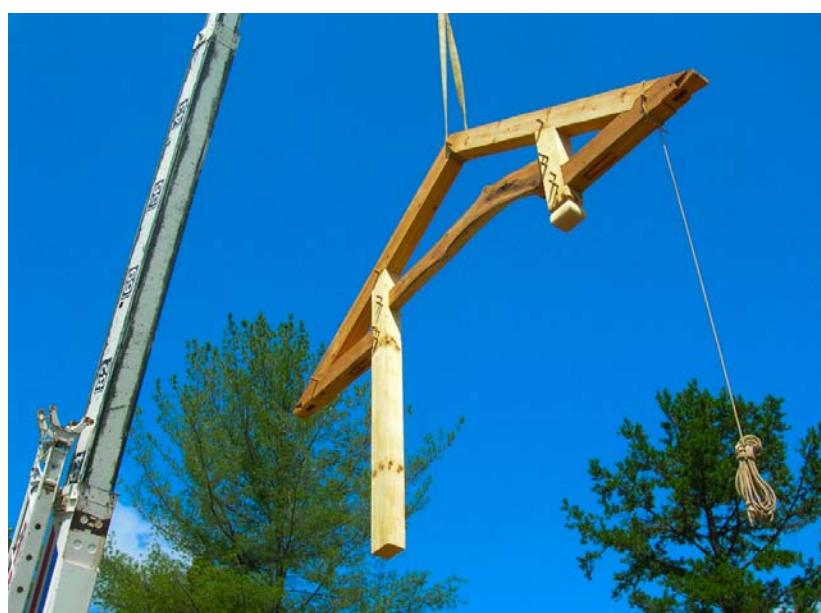
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It's finally happening. Your dreams are about to become reality. After all the agonizing, discussions and re-assessment, you've finally gotten everything together. Now it's time to build your home. This is pretty exciting for everyone, and there's a lot going on. Understanding something about this next phase should set your mind at ease and make some of the hustle and bustle a little less intimidating.



## The Process

After all the timber has been delivered, sorted and inventoried, the crew begins the job of assembling the bents. Some components are pre-assembled at the shop, but most are reassembled on-site.



The timbers are all marked for their exact location in the bent, walls and roof trusses. Except for the fact that it may take a forklift or a crane to accomplish the job, it's a little like putting together a do-it-yourself furniture kit (Insert tab A into slot B), but a lot more fun.

The crew starts by constructing the last bent to be raised and finishes the procedure with assembling the first bent that will be put into position. When all

the bents are complete, it's time to bring in the crane.

## Using a Crane

Unlike an Amish barn raising, most timber frame homes are erected with the aid of a crane. This significantly reduces the need for manpower, makes it safer and more efficient, and it allows the bulk of the assemblies to be completed on the ground.

The crane flies each set of timbers to the proper location and holds it in place until the ground crew has it stabilized with connecting girts and pegs. As the timbers are put into place, the crane will also fly in the ridge beams and purlins.



movement of the crane operator and the ground crew.

## Raising Day(s)

Depending on the size and complexity of the house, the raising can continue for several days or be completed in a single day. It's a hectic time, and lots of people will show up to see the spectacle.

Most crew bosses will have a morning safety meeting with the teams to ensure that everyone knows what to be aware of and any potential problems that could arise. This is a big, heavy job that requires a lot of bodies, so safety is a first priority.

Raising the frame of your home is a blue-denim ballet. Everyone on the team needs to be able to anticipate other team members' needs, know what the next intended move is, and be right on cue with the subsequent step of the dance. Crew chiefs call the shots and orchestrate the

## Topping Out With a Whetting Bush



Ancient Scandinavians placed an evergreen tree atop a newly completed structure to placate the tree-dwelling spirits of their ancestors. At the time, the observance was religious in nature and continued for hundreds of years as the immigrating Scandinavians

migrated to other areas of Europe. The tree-worshipping religious connotation faded over the centuries, and it has become a symbol of thanksgiving, good luck and a dedication ceremony.

Today, we carry on this tradition by nailing an evergreen bough to the highest point of the frame. This symbolic act marks the completion of the raising and is a time for everyone to stand back, appreciate all the hard work that's gone into the project and congratulate each other on a job well done.

## T&G Decking Installation

After the raising is complete, the next step is installing the decking. Timber frame homebuilders often use 2 X tongue and groove decking for the floor and ceiling. T&G decking is both an attractive component to your timber frame house as well as a cost efficient method of construction. It saves both labor and material, since the decking is



the floor of the upper level as well as the ceiling of the lower level.

There are a number of choices in the width and thickness of the lumber as well as options in the variety of wood used and the final finish.

## **Installing the Enclosure System**

You have a frame and decking, so now it's time to enclose the structure. Whether choosing SIP, conventionally framed or a combination of the two, this is the time it gets installed.

Since panels are constructed and shipped ready-to-install, enclosing your timber frame home goes very rapidly. In a matter of just a few days, your home is enclosed and protected from the elements. If you go with another type of system, it may take a bit longer to enclose the frame.

Stand back and take a look. Then pinch yourself just to make sure you're not dreaming. Isn't this incredible? This will be a remarkable time for you and your family. Make the most of every minute you have during this phase of construction. It's something most people will never get to experience, and it's an event you'll remember the rest of your life.



## **Part Three – After it is up**

There stands the house you've been dreaming about and planning for years. It's actually sitting on your property, and it looks as awesome as you thought it would.

At least, from the outside it looks awesome. There's just one little catch. You now need to complete the inside. After the excitement of getting the timber framing in place, the hubbub of workers, machines, tools, onlookers and that big crane, you probably felt a great sense of relief and maybe a bit of postpartum letdown.

Now it's time to move on to making your house livable. The plumbing, heating and air conditioning, electrical system, drywall and painting aren't nearly as glamorous as everything that's taken place so far, but here's where your house is taken from an imposing shell to an impressive home.

# Chapter 10 - The Mechanical Systems

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After the house is fully enclosed, your team will begin on the interior. The first things to be installed are the plumbing and HVAC system. Then the wiring will be completed, and local inspectors will approve the work before the drywall is put in place and the finishing work is completed.

## Plumbing

The plumbing is typically PVC for the drain lines, and pex, CPVC or copper piping for the interior. The lines are all enclosed in the walls on each level of the house and along the joists of the basement ceiling and the other floor systems. Your plumber will position pipes for all the water lines, waste lines and vents in the house. These are now ready to be hooked up when the kitchen and bathrooms are ready to be finished.

If there is piping that must be placed in exterior walls, the SIP panels can be ordered with the proper modifications to accommodate plumbing without degrading the energy efficiency of the panels, but it is always better not to run the piping in the exterior walls.

Interior plumbing is designed for efficiency and cost effectiveness. Your architect has designed your space to use common walls



for as much of the plumbing as possible. The walls that contain the pipes are called wet walls. They are constructed with 2"x4" or 2"x6" lumber to accommodate the supply, waste and vent system. This will all be set in place before the drywall covers the framework and will be inspected to ensure that everything complies with local code.

A unique situation with timber frame home construction is the flooring on the upper levels of the house. Often, 2 X tongue and groove decking is used, which forms the floor of the upper story and the ceiling of the lower level. Unfortunately, this leaves no cavity to run

horizontal piping. For these situations, a false 2x8 floor system layer sits on top of the beams and the flooring is built up to create a void that will accommodate plumbing, wiring and ductwork.

## HVAC

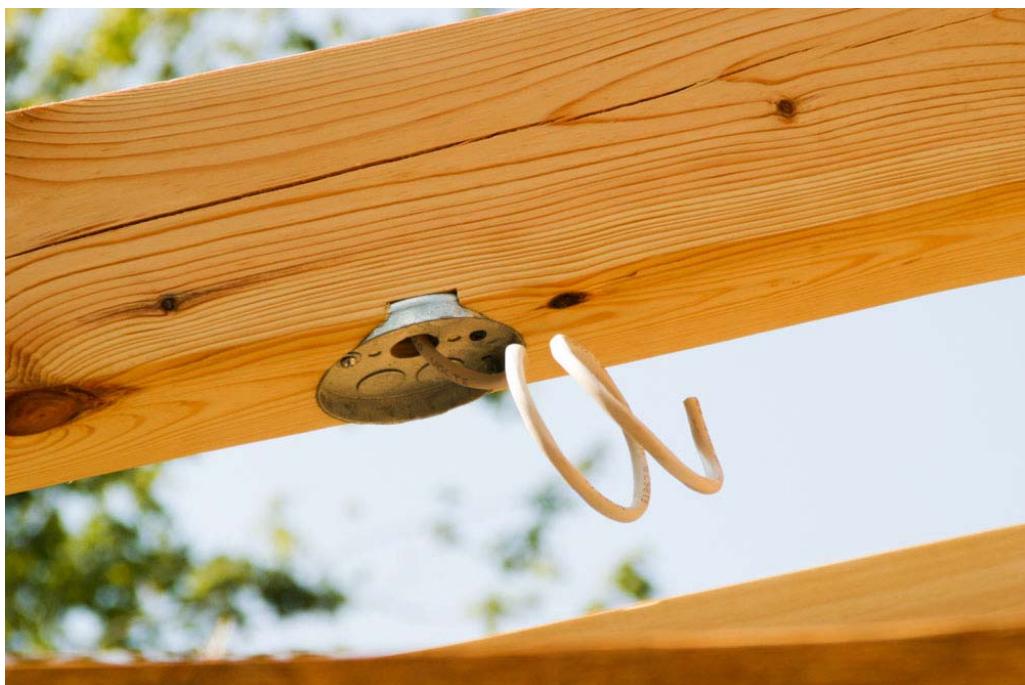
The specific HVAC system you choose will depend on the climate in your area, but generally, it consists of a furnace and air conditioning unit that is attached to insulated ductwork. This ductwork runs throughout the house behind the walls and under the flooring.

If you have a very large home, it's possible that you have more than one furnace and air conditioning unit to efficiently heat and cool your home. However, most typically sized houses don't require zoned HVAC units.

A SIP home is extremely energy efficient and airtight. When sizing your HVAC system, you may find that you require a much smaller unit than a home that is made with standard construction methods. It is highly recommended that you get a Manual J Load Report on your home to insure you get the right size system for your home.

Since a timber frame home is generally far more airtight than a stick home, mechanical ventilation is required to bring fresh air into your home and to remove stale air. This is called an air exchange system. In a standard construction home, air exchanges freely between the interior of the house and the outdoors through cracks and voids in the construction. A SIP construction house is very airtight, so air does not enter and exit the building and you must mechanically vent your home. Depending on where you live, you will need either an ERV (energy recovery ventilator) or HRV (heat recovery ventilator) unit.

An additional feature that manufacturers include with some models of air exchange systems is a whole house air purifier. This removes gases that are emitted by carpet, furniture and drapery, as well as the pollutants that are found in some cleaning products.



## **Electrical**

When you're building a conventionally framed home, you don't think much about preplanning the electrical system. Sure, you may talk about having enough outlets in the kitchen, or that your hobby room has ample power for your various lights and equipment. However, it's generally a non-issue when building a standard  $2\times 4$  house.

Folks who are building timber frame homes with SIPs need to be a little more pro-active than those building stick homes. The reason for their concern is the enclosed panels used to create the exterior walls of their home are made of solid foam. While you can modify the panels on site to accommodate new wires and chases it is far easier to complete these in the factory and not onsite.

Think about your future needs while you're planning your electrical plan. It's far easier and more economical to add access for future needs now than later. Don't shortchange your future goals by scrimping on your current budget. Plan well and plan wisely.

Since the electrical system is more flexible than the other systems, it is generally installed last. For electrical wiring that must be installed in exterior walls, the SIP panels have wire chases prefabricated into them. This can be all sorted out during the design phase, but the electrical wiring will mainly be installed behind your interior walls in a normal fashion.

Ceiling lights, chandeliers, fans and drop pendant lights typically hang from the exposed beams of the ceiling. The top of the beam is routed to form a channel to run the wiring. This can be done in the shop when your framing is being cut, or it can be done on site after the structure is built.

# **Chapter 11 - Scrapbook Your Homes Construction**

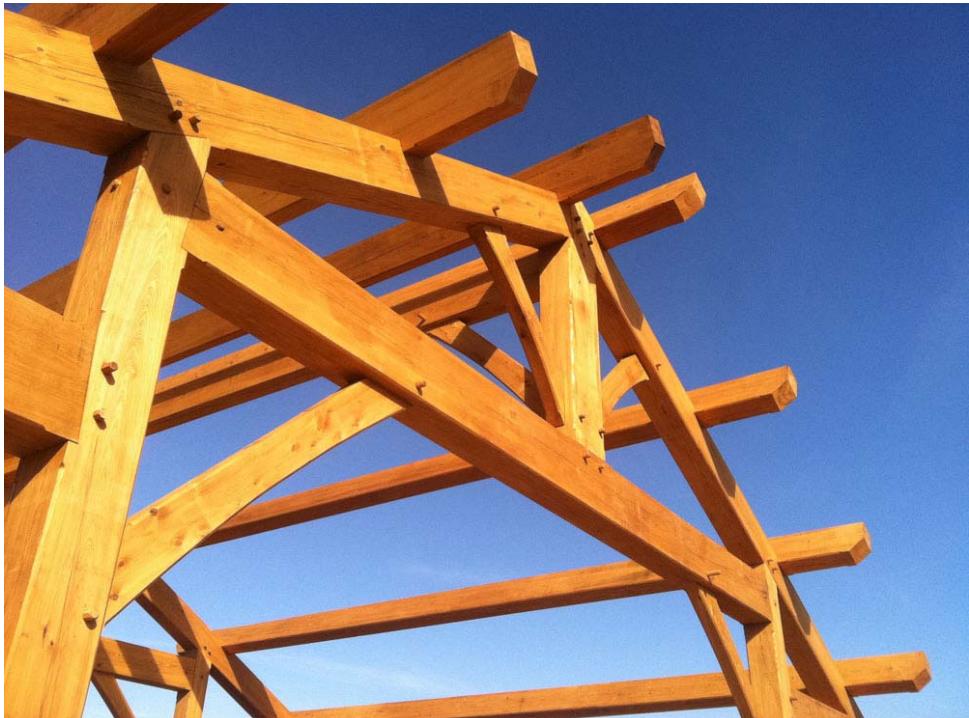
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You have probably heard about people making colorful scrapbooks to keep their memories alive and to document significant events in their lives. The end result is always a delight to hold and one cannot help but appreciate all the details and work that goes into making one.

Creating scrapbooks involves placing a lot of details together to generate a neat overview of an event. It is also an effective way of documenting the building process of your home. However, for this unique scrapbooking project, you will include all the important documents, photos, warranties, plans, and permits into an organized timeline along with details on your contractors and contact persons. Read on for a detailed list of items to use for your home's very own scrapbook.

## **Photographs**

Nowadays every single gadget and phone seems to have a built-in digital camera, which is a good thing when it comes to building a house. You should document your progress from the very beginning and continue snapping pictures as often as possible, but at least before and after each major segment of construction work is complete.



These photos will not only help you recall fond memories of your home building exercise, but also save you a lot of time and money down the road. Imagine you come home from work one day to find a huge water leak in your kitchen. Now that your paneling is up, it is difficult to remember the exact place of your pipes. Luckily, you can quickly find the photos you took right after all the plumbing was done and before you closed up the wall, so now you

know exactly which panels to remove in order to get to the leaking pipe. Make sure you always document on the stud level before the insulation is in place. You will have a nice set of blueprints for your electric, plumbing, ventilation and studs that will come handy in repairs and alterations.

Take a quick shot of your measurements and projects before you head to the store, so you will not need to second-guess yourself during your purchase. Photographs are useful when you are trying to find just the right piece for your building puzzle



## **Plans and permits**

Even homes start out as a simple plan on a piece of paper or a computer screen. Most of the time, these plans shift and change as the construction proceeds, but you still need to save the original blueprints in case of a dispute or remodeling project.

While you are at it, make sure to include a copy of your property's surveyor's records as well. If you had to request permits for your building project or for your alteration, save copies of those in your scrapbook for future reference. I also highly recommend saving all computer files, emails, correspondences, bills, and receipts.

## **Names of contractors**

It will be immensely helpful to dedicate an entire section of your scrapbook to listing the names and contact information for all your contractors and subs. You should also include the time you originally contacted them and the quote you received before the project began. Attach a copy of the contract you signed, and keep a running tab of the estimated time of completion.

## **Warranties**

Unless you are using only salvaged and recycled materials, you will end up buying items that come with warranties. This can include anything from your windows to your chimney. Pay attention to these warranties and save a copy of them, along with corresponding receipts in your scrapbook. Also, write down the name of the store they came from and the date of the expiration of the warranty. Hopefully most of your investments will work well. You never know—you may be the unlucky one with the faulty washing machine or disintegrating kitchen cabinets. If your contractors are in charge of making these orders and purchases on your behalf, tell them at the very beginning that you wish to save these warranties yourself.

## **Documenting your materials**

You will probably spend a considerable amount of time obsessing over paint colors or trying to decide between the different varieties of laminate flooring. Once in a while, you might get lucky when you instantaneously feel drawn to a product, and other times, you will have a difficult time making up your mind. Either way, make sure to document your selections. Swatches of material and tiles, the computerized color code of your mixed paint, the label from the box your flooring came in, etc... are all important pieces of information you might need at one point during your homeownership. Perhaps you have to deal with some humidity in your basement and part of your carpet has to be re-done. Would you like to pay for new carpeting for the entire floor, or merely for the replacement of the damaged area? If you do not have the information on hand, you might not have a choice in the matter.

Building your home is a process, and even when you get done with the construction, there is plenty of information to add to your scrapbook. Property assessments, home insurance documents, additions and new installations are all events you should make a note of in your home's scrapbook. Perhaps the best way to look at house ownership is as a process that only begins with drawing up a plan, and continues until you move on to your next home.

## **Afterwards**

When the last worker has stowed his tools into his truck, and the final walk-through is complete, you can sit back and take a deep breath. Don't try to hide that big grin that just won't go away. You did it and it's yours. You've taken a dream and made it into a reality with a lot of planning and hard work.

There's just one more project that needs your attention. Now it's time to plan that housewarming party to welcome all your friends and family to your new timber frame home.



## Glossary

You're really intrigued with this massive, striking construction method and seriously considering a timber frame home in your future. However, talking intelligently about the subject and using the proper terminology is a little like learning a new language. The words may sound familiar, but you're not quite clear on what they mean exactly.

Getting a handle on what some of the terminology means and understanding what a potential builder is talking about is important to help you negotiate this new terrain. Once you're comfortable with the jargon and have a basic understanding of how a timber frame home is constructed, you'll be in a far better position of deciding whether a timber frame home is right for you.

**Bay:** The area created between two opposing bents and walls in the timber frame structure.

**Beam:** A horizontal timber used in the structure's framework. They are supported at the ends and can be either load bearing, supporting joists or non-load bearing.

**Bent:** A roof truss and the vertical posts that support a structural network of timbers. They run 90 degrees to the ridge.

**Cantilever Beam:** A timber that projects out from a wall or post and supports an overhang.

**Chamfer:** A decorative cut or rounding made in the corners of the posts and beams.

**Checking:** Drying or tension placed on a timber that causes the wood fibers to separate. This is very common in timber frame construction and should be expected.

**Collar Tie:** A horizontal timber between two rafters that ties the two rafters together to resist spreading in the rafter tails. These pieces are constantly in tension.

**Common Purlin Roof System:** Includes any frame type that consists of a series of purlins bearing on principal rafters and often spanning from bent to bent at uniform intervals.

**Common Rafter Roof System:** Includes any frame type that consists of roof rafters that span from the eave walls to a ridge beam, principal purlin or opposing rafters

**Draw Boring:** Offsetting of the holes in mortise and tenon joinery that allows the joints to be pulled together when a peg is driven in.

**Dutchman:** A wooded patch used to cover defects, previous joinery, or other errors when restoring or cutting a timber frame.

**Girt:** A key horizontal timber or beam used to connect posts or sills. A girt running in the wall direction is called a wall girt and a girt running in the bent direction is called a bent girt.

**Green Wood:** Any timber/wood that has not been dried or with a moisture content above 19%.

**Gunstock Post:** A post that is wider at the top that allows extra space for the intersecting joinery that can happen when the post, rafter and plates all join at the top of the post.

**Joinery:** This word can have two different, but related meanings. It is the craft of connecting timbers with wooden pegs, mortise and tenons. It can also refer to the fasteners used in connecting the wooden components.

**Joint:** In the simplest form, it is where two timbers meet.

**Joists:** Timbers that support a floor system; they generally run parallel to each other.

**King Post:** A vertical post that runs from a girt or tie to the ridge. The rafters join with the posts to form a king post truss.

**Knee Brace:** A knee brace is a timber that is placed diagonally between a post and a beam that makes the timber frame structure more rigid.

**Mortise and Tenon:** A fastening method for two pieces of wood. One piece of wood has a slot, while the other component has a projecting member that fits in the slot.

**Peg:** A piece of wood shaped into a dowel. The piece is normally 3/4" to 1" in diameter. The wood typically used for pegs is oak or locust and can be either round or octagonal.

**Plate:** Horizontal timbers that support and tie together vertical posts. An Eave Plate supports the base of the rafters and sits on top of the wall. A sole plate sits beneath the wall and is used to secure the walls to the foundation.

**Post:** A vertical timber.

**Post and Beam:** This is a type of construction that is composed of horizontal and vertical timbers like timber frames; however, they utilize exposed steel brackets and plates instead of traditional mortise and tenon joinery.

**Purlins:** These timbers run perpendicular to the rafters that support them connecting the principal rafters of trusses together.

**Ridge:** The ridge is the uppermost point of the triangle created by the rafters of a roof. This may be the joining point of a pair of rafters, a ridge beam or a ridge purlin.

**Ridge Beam:** A beam that supports rafters and other roof timbers at the ridge.

**Roof Pitch:** The angle of incline or slope of a roof. It is determined by the number of inches a roof inclines in the space of one foot. This is also known as inches of rise per foot of run. A 45-degree roof rises 12 inches for each foot of run, so this is called a “12-12 pitch” roof. A roof that rises 9 inches per 12 inches is called a “9-12 pitch” roof.

**Structural Insulated Panels:** These are also known as SIPs. They are an option for enclosing your timber frame. They are made by sandwiching a layer of foam to two layers of OSB forming a structural panel.

**Stub Tenon:** Tenon that stops within the timber it joins.

**Summer Beam:** A timber that connects girts or plates. It is generally used in a floor system.

**Tenon:** The projecting end of a timber that is inserted into a mortise.

**Through Tenon:** A tenon that passes through the mortise it joins giving one more relish and a decorative flair. It is sometime wedged on the opposing side.

**Tie Beam:** A tie is a horizontal beam that is placed at a point along the rafters, which creates a smaller triangle. This adds strength to the roof and rigidity to the rafters.

**Timber Frame:** This traditional method of construction uses large size lumber to create a framework that is left exposed. Traditional woodworking methods such as wooden pegs and mortise and tenon joinery are used in lieu of nails, screws or other metal fastenings.

**Trunnel:** Another terms for pegs and fasteners used in joinery.

**Truss:** A framework of timbers based on triangular shapes. In timber framing, they are generally designed to support a roof. Trusses are used for many applications in other forms of construction.

There are certainly many other words and phrases that you'll hear as you talk with timber frame professionals and aficionados, but this list will give you a good start in understanding the components and technology that are used to build a timber frame home.