

## **EZ Treehouse Plans Part One**

**Designed and built by Fred Lundgren**

**C.A.D. by John Gallagher**

First of all, thanks for purchasing our advanced treehouse plans. If you previously purchased the basic treehouse plans for \$9.95, you will find part (1) of the advanced plans to be a primer for the step-by-step C.A.D. plans in part (2). We considered offering our advanced plans without the narrative and pictures included in the basic plans but instead, decided to leave the basic plans intact as part (1) because they give an excellent overview of treehouse construction. Therefore, these advanced plans are comprised of improved basic plans plus 40 C.A.D. drawings with a step-by-step narrative associated with each drawing.

These plans are sufficiently detailed to remove all the guesswork and many of the errors from your project. So, we suggest you read part (1) and then print out the materials list at the end of part (1) and then gather your materials. Hopefully, building your treehouse with the assistance of our plans will be a rewarding project for all concerned.

The first item on your agenda is to pick out the best tree. The tree should have a well defined singular trunk that branches into a limb and branch canopy which is larger than floor size the tree house you are planning to build which will probably be 8 ft x 8 ft or smaller. Alternatively, you can use a tall tree with a single trunk. If you choose such a tree, like a tall pine, you should position the trunk in the inside corner of the treehouse, so it will consume the least amount of floor space. Also, a treehouse with a single trunk which extends above the roof of the treehouse will take on the look of a elevated cabin with a big chimney in the middle, which may be unattractive. The tree you select should be strong. Here is a good rule of thumb. Fast growing trees are usually weaker and slower growing trees are usually stronger. For example, a strong oak is better than a fruit tree. Generally speaking, it's best to choose an old tree that has withstood high winds in the past.

In the first picture, taken from the front porch of the Lundgren home, you can see that the treehouse is really a house on stilts, positioned within the tree and above the split of the main trunk.



{Image One}

**Take a look at the Lundgren Treehouse**

As the vision of your tree house begins to take shape, you should rely on these pictures, C.A.D. drawings and materials list for inspiration and guidance but don't allow our plans to substitute for your creativity.



{Image Two}

**This picture was taken under the treehouse floor**

The second picture was taken under the floor while looking up. You can clearly see the main branches of the tree protruding into the floor. We built the treehouse around several branches and two smaller limbs. This picture was taken within the primary fork of the tree. Notice how the overall floor area remained intact and was not seriously compromised by the branches because the floor was positioned to take advantage of the largest area between the branches.

This picture demonstrates how a floor can be built around primary limbs and branches. Please study the left side of the picture where the tree protrudes through the floor. Note the double floor supports that run on either side of the tree branch under the floor. This design was needed to support the flooring that had to be cut to make room for the tree branches. We also added supports under the floor at the outer edges, and these outer supports are visible on the next picture.

The outer supports are simply 2x6s, laid flat, just under the outside edge of the floor. We ended up with a floor that is supported with six beams, three supporting the actual floor and three more that serve as nailing beams on each side of limbs. The picture below, taken from the ground, shows one of the outside nailing beams (laying flat) under the edge of the floor.



**Picture taken from ground level**

{Image Three}

Now, begin to envision this treehouse on your property. It is designed to adapt to almost any setting but you may need to make some changes in overall size or height from the ground. It all depends on your tree. Look at the trunks of your most suitable tree. Look at the branches and the direction of the limbs. Decide if the tree you choose will need extensive trimming. Try to pick a tree that will allow you to build a structure that is perpendicular to the street, fences, and the main home.

Be aware that a treehouse built at an angle to the street or the home might be less attractive, unless you are lucky enough to have a suitable tree at the rear corner of your property. Generally, a perpendicular setting is important in front of your property and you must be very careful preparing and trimming trees with property frontage. It is all too easy to "gut a tree". Don't trim any more than absolutely necessary. It will take years for the tree to recover from a bad trimming job. Before you trim anything from the tree, look at all of our pictures and drawings. Visualize YOUR treehouse on your property, because your treehouse won't be exactly like the one in these pictures.

Now, lets focus on the frame of the treehouse, the most important part of the project. We call the framework of our treehouse a "Double Goal Post Design" because it looks like a set of football goal posts on either side of a tree. In other words, if you construct a wooden goal post on each side of the tree in the shape of an **H** and then bolt 2x6s between the two **H** frames as floor beams, you will have created the a "Double Goal Post" Frame for the structure.



{Image Four}

### The "Double Goal Post" Frame

For our "goal posts," we used treated 4x4 posts that were 12 feet long. They became the vertical posts of the two **H** frames. We used 2x4s to connect the 4x4 posts together in the shape of an **H**. If you are willing to spend more money, and possibly prevent warping in the long term, you may choose to purchase 5x4 posts, but they are much more expensive.

It was very difficult to level the **H** frames. It was equally difficult to bolt the 2x6s, (the floor beams) to the **H** frames in the air. So, instead of bolting everything together in the air, we bolted the **H** together on the ground. The **H** shape is quite visible in image four. Image five shows one corner of the framework with the 2x4 bolted to the 4x4 and the 2x6 floor beam bolted above the 2x4. Note the carriage bolts. **All bolts should be installed with the smooth side (the head of the bolt) facing out to prevent injury.**

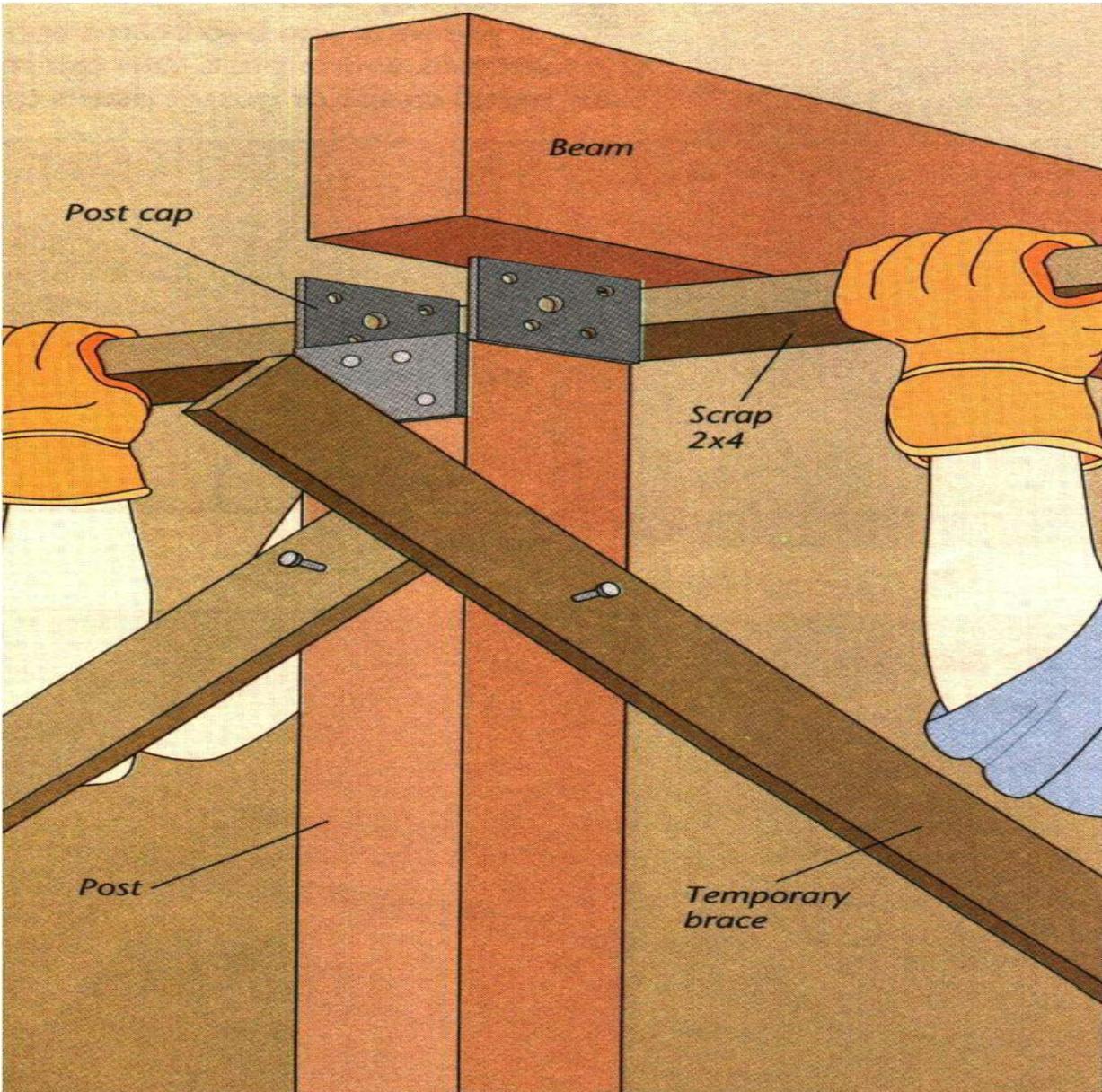


**Close up picture of corner frame**

{Image Five}

Again, the 2x4 is attached to complete the **H** and the 2x6s (above the 2x4s) become support beams for the floor while connecting the two **H** frames together. For added stability, you may also add a second 2x4 about three feet below the upper 2x4. For best stability, add two more 2x4s in the shape of an **X** below the upper 2x4. You can use nails temporarily but replace them with carriage bolts. Use 3/8 inch bolts or 7/16 inch bolts. Use 1/2 inch bolts if you purchase 5x4 verticals instead of 4x4s.

An alternative to the **H** frame design can be seen on the next image. Here, a 4x6 beam is bolted on top of the vertical post. This design should be followed if you are building a larger structure that must withstand more permanent weight. If you choose this system, we suggest 5x4s or larger to optimize strength. The “beam over post” system” will lend itself to attractive under the floor bracing and the overall frame yields a high quality appearance.



### Beam over post design

{Image Six}

As we have already discussed, getting every aspect of the framework level and square is very difficult when you are working on two sides of the tree. So, needless to say, always measure twice and cut once, or measure twice and drill once.

Regardless of the method you choose, take your time. My Dad always said, "slow down Son, Rome wasn't built in a day". That advice will serve you well as you build a treehouse.

The ground on either side of your tree (where the **H** frames will stand) is probably not level, so making each **H** frame perfectly square on the ground is only part of the answer. We found it best to set the **H** frames on leveled concrete blocks.



### Vertical 4x4 Posts Stand On Concrete Blocks

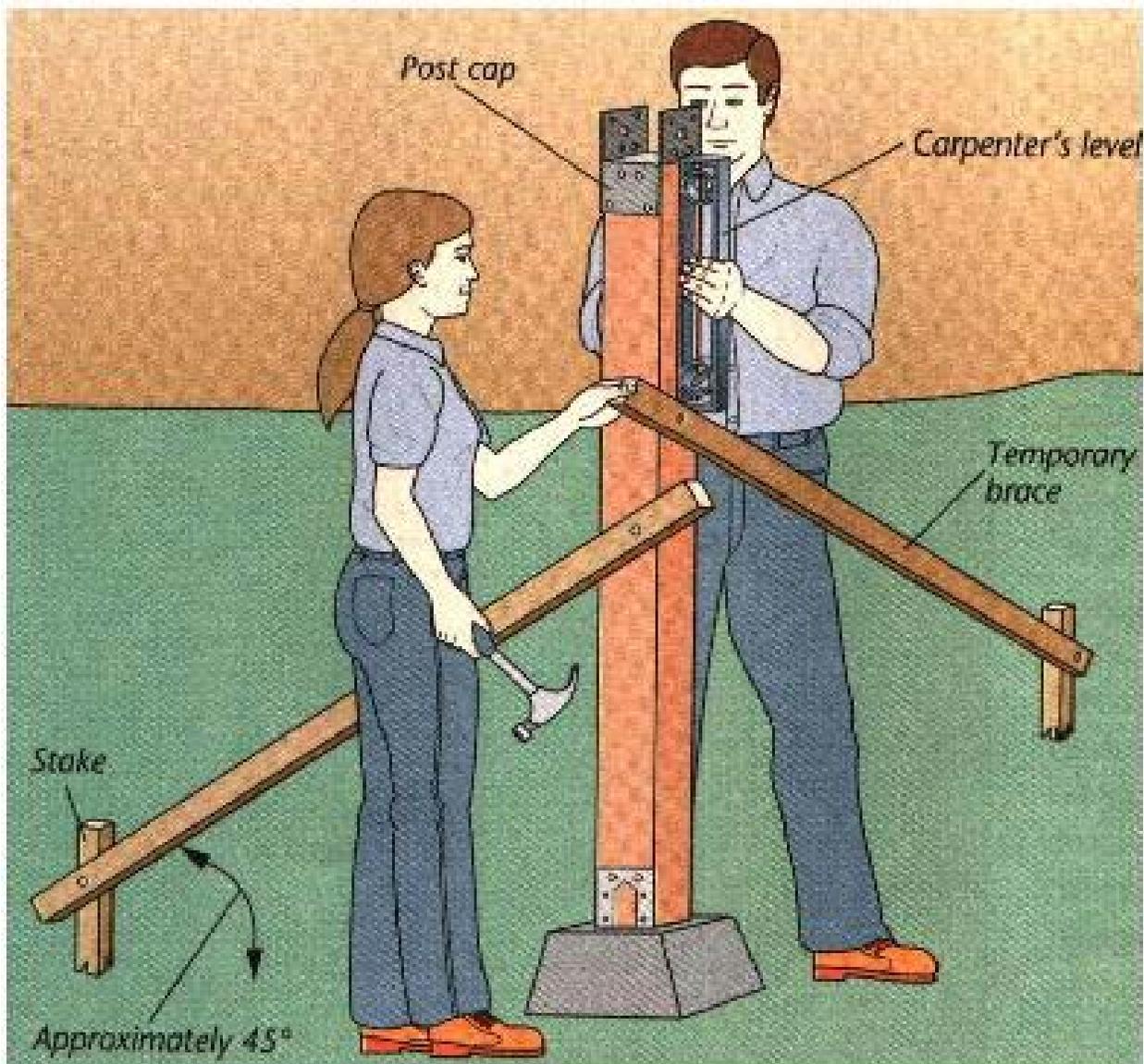
{Image Seven}

To get them level, we placed all four blocks on the ground around the base of the tree. The blocks were placed in the basic rectangular shape of the treehouse frame which is four feet wide by eight feet long. We then hammered wooden stakes (a broken yardstick will do) into the ground on the outside corner of all four concrete blocks and then tied a string between each stake. The string was then adjusted to be perfectly level. The blocks were then adjusted to be level with the string. The best way to get the string level is to use a "monkey level, which is a small level that hangs on the string.

In our project, one of the blocks needed lowering which required some hard digging, and soil had to be added under another block to raise it up a couple of inches. This step is not necessary if you are not interested in having the treehouse perfectly square and level or if you stand and brace each 4x4 individually; using the "professional" system shown in image six and image eight.

Here is a risky but time saving alternative. If you have enough labor and enough safe places to work in the tree, you might try to skip the step of block leveling and bolting the **H** frames together on the ground. Instead, you might try to bolt and level the horizontal 2x6 floor beams to the 4x4s in the air and square the structure as you attach the floor. Don't try this unless you drill all the bolt holes with the lumber on the ground. We tried it in the air and found we did not have enough labor.

After several awkward attempts to bolt, or even nail and level the framework in the air, we found it safer and easier to work from the ground until it was time to connect two **H** frames together across the tree. When we were ready to connect the two **H** frames in the air, we found that no amount of labor was enough. To begin the process, we gently tilted both pre-leveled **H** frames toward each other so they straddled the tree trunk from opposing sides. We then placed one of the 2x6s in the tree and over both **H** frames so the 2x6 was resting on the horizontal 2x4s of both **H** frames. We then bolted the 2x6 to one of the **H** frames, (using only one bolt so it could pivot) and carefully raised both **H** frames into a full and upright and vertical position. We then bolted the other end of the 2x6 to the **H** frame on the other side of the tree. We also suggest a method that professionals might use. This is the most accurate and the safest method, and most carpenters will agree that this is the best way to build the elevated tree house frame.



Best Method of Setting a 4x4  
{Image Eight}

Our professionals, seen on {**Image Eight**} above, place four concrete blocks on the ground and use a tape measure to get them reasonably square in the 4ft x 8ft configuration we described above. Then, our professionals cut some scrap lumber into stakes and bracing material and nail the braces in to the 4x4 vertical posts at right angles to each other at about three feet above the ground. Then, they drive the stakes into the ground behind the braces so the stakes serve as anchors. The braces they nailed to the 4x4 are then nailed to the stakes to create a multi-directional brace that locks the verticals in position from two directions. **Of course, our professionals use a level and a square on each post.**

For stability, they temporarily nail the bottoms of the 4x4 together with any available scrap lumber or use concrete blocks that have a 4x4 hole or attachment strap in the middle of the block.

When this process is complete, the 4x4s can't move in any direction and a ladder can be rested on any 4x4. Needless to say, this process is repeated for all four 4x4s. After this, the horizontal beams can be attached to the (now) stationary vertical posts and leveled with less trouble. This will take longer and require more planning and preparation, but it is safer and it will yield the most consistent result.

If we were to build our treehouse again, we would probably try to use this method. At the time, we thought we needed more flexibility in design and we were probably correct in that assumption. We were actually creating the treehouse design as we built it, with no preconceived view of the finished product. In fact, we moved the entire structure several degrees after the **H** frames were connected across the tree. This would have been almost impossible if the 4x4s had been locked in place.

Regardless of your method, when you finish the frame set up, you should stop and review your progress. Take the time to answer these questions.

Will the floor be high enough in the tree? Will the floor beams rest in a level position at least two inches away from any major branch or limb?

Will the floor space be substantially reduced by branches? Will a different floor level/height yield more usable floor area?

Is the frame relatively square?

If not, can it be squared by shifting the frame? Will the structure be reasonably perpendicular to its surroundings?

*Remember, you are building a treehouse that surrounds the tree with a frame. Don't make the mistake of "hanging" the tree house on the tree at an awkward angle. Allow the vertical posts to hold the weight.*

Have you done enough re-measuring, re-leveling, thinking and taking mental notes? We found that no amount of measuring and reflection is too much. One difficult measurement will be the diagonal measurements in the shape of an **X** that must be taken between all four vertical posts, both at ground level and at the point above the floor. If the diagonal measurements are equal, the treehouse will be square. If your diagonal measurements are different, your treehouse is not square.

If diagonal measurements are impossible due to limbs and branches, you can square the treehouse using the (3-4-5) method which I fully explain later in this narrative. Regardless, take the time to measure and measure again, otherwise the treehouse won't be level or square.

With the framework in place, the tree will appear to be blocking every move you make. You will be tempted to remove limbs or main branches. Don't do it! **GO SLOW!** Try to think your way around the limbs and branches. Look at our pictures. We did it without hurting the tree! You can also work around the natural growth of the tree.

When you have the frame in place, it may be appropriate to “pause and reflect,” so to speak, or even quit for the day, especially if someone in your “free labor” group is pressuring you to remove a major limb to save time on the floor or make the job easier.

In our opinion, it's really not a great treehouse unless a tree branch comes up through the floor. Of course, like Dennis Miller says on HBO, "That's just my opinion, and I could be wrong!"

The next big thing is the floor. If you have sufficient bracing, as we did, you can use one inch deck floor material. **Don't confuse this with regular 1 x 4 material. One inch deck material is actually thicker than a standard 1x4 and much harder and stronger. It is also treated.**

We started attaching our floor installation against the **H** frame on the end that was the most distance from a protruding branch. Also, we notched out the first floor board to fit around the 4x4 verticals, both for strength and for the sake of appearance.

We learned that deck flooring lumber is very hard, and we were forced to drill pilot holes for our wood screws. Do not use nails, except for temporary attachments. The wood screws should be “Deck Mate” by Phillips Fastener Products size 8x 2. “Eight” refers to the size, and “two” refers to two inches in length. These screws are black in color. They are sold in a green and blue box. Make sure they are treated with “EVERCOTE.” This will be written on the front and top of the box.

Be careful to keep the floor square as you add flooring. You will be tempted to go too fast. All too soon, you will work your way over to the first protruding branch. At that point, progress will stop.

When you get to that point, it will be time to stop and think, because a support beam will be needed on each side of the protruding branch before you can attach the flooring around the branch.

**Every floor board that is cut to fit around a branch must be supported on both ends of the cut. Otherwise, you will create trap doors, not a treehouse floor. Outside (outer edge) nailing beams are essential to eliminating the "trap door effect".**

When the floor is fully supported and complete, the treehouse will really take shape and everyone will want to have a picnic in the tree. We found this to be a most dangerous aspect of the project because everyone wants to go up in the tree and stand up and walk around on the open platform with no sides. **We suggest you tie ropes between the 4x4s and insist that visitors stay inside the ropes.**

At this point, the floor will be complete and the vertical 4x4s will terminate somewhere above the floor level, depending upon the height of your floor.

To add sidewalls, you will need to attach four "post caps" and add a second length of 4x4 above each cap.

However, if you have a tree that demands a combined floor and sidewall height that matches the length of available verticals, then go for it, but make sure you can handle the extra length.

A sixteen-foot 4x4 is a terrible thing to drop. A twenty-foot post, (if you can find it at a reasonable price) is much worse.

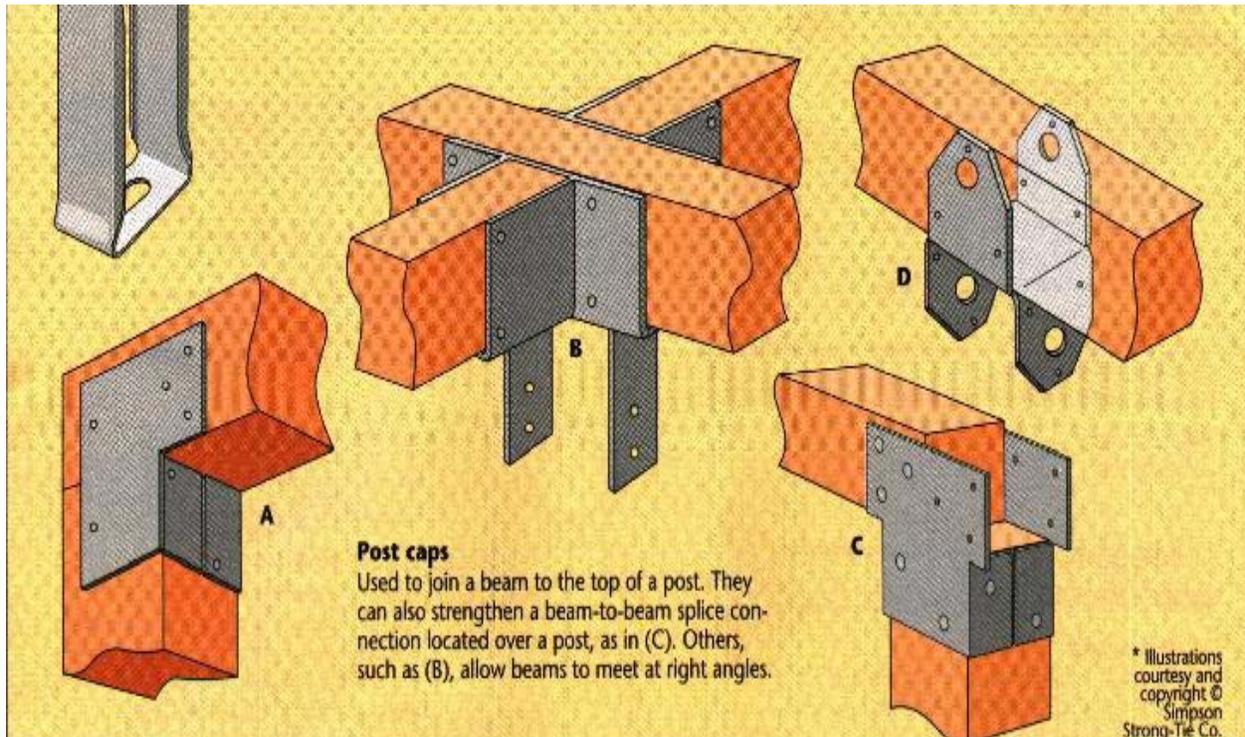
If you use longer posts, you may need to rent a bucket truck or hire the job out to professionals.



**Daughter pointing to a Post Cap**  
**(and the top of a 12 foot 4x4 inside the treehouse)**

{Image nine}

Your situation will be just as unique as ours. However, if you use 12 foot verticals, and place the floor of the tree house at the approximate level of the second floor of a two story home, (as we did ours), you will have about two feet of vertical 4x4 protruding above the floor. Install post caps over them as shown. Take two more 4x4s that are 8 feet long and cut them both in half and add them to the existing verticals, to achieve a six foot high interior wall. If you are going higher, buy 16 ft 4x4s and go up from there. The correct "post cap" is "D" below.



### Post Caps and Beam Joiners

{Image Ten}

We found that making decisions on wall height, roof line, and railings (newel posts) was refreshingly easy and fun after the floor was in place. Image eleven shows our side wall as a completed product. We used a 4x8 sheet of privacy fence as our side walls, and a 4x8 sheet on each side will probably work perfectly for you also.

We live in a neighborhood where the houses are very close together and a sheet of privacy fence on each side of our treehouse allowed us to have a front and angular view of the street and our front yard but prevented the side views into the neighbors front yards.

When you buy materials, especially privacy fence, look for the “damaged bin” at your building materials store. You can save a bundle of money if you buy out of the bin. We found our privacy fence for \$2.00 per sheet and it was almost perfect. The regular price is over \$30.00 per sheet in some stores. We also found some 2x4s and 1x4s that we used as trim. The damaged lumber bin is the first place to shop for materials.

Walk in the store and announce you are building a treehouse and ask directions to the damaged lumber bin before you buy anything! Now, take a look at the lower part of the side wall from inside the treehouse.



#### View Of The Lower Side Wall

{Image Eleven}

After you determine wall height and cut the 4x4 extensions to the desired length, you must square them and level them at the top also, otherwise the roof will be out of square and probably not level. To make the job of leveling and squaring easier, screw a small 1x4 to the outside of the post cap junction while you level and square each 4x4. The length of this 1x4 can be the full wall height as measured from the floor to the top of the 4x4 extension or the exact height of the railing. In Image Eleven, you can see the attached 1x4 on the far upper right with the 2x4 railing attached over it.

To create the roof, start by bolting 2x4s to the top of the 4x4s in the shape of a rectangle. This will create a flat surface for the rafters. Again, use a level and a square and the 3-4-5 formula we describe at the end of these plans.

The next picture shows CEO standing in front of the side wall with his hand on the **X** brace. The **X** braces shown in the side wall of our treehouse were difficult to measure, cut, and get positioned, but they have proven to be very stable during several high winds. Since the **X** brace terminates against the full thickness of the 4x4s, it is not necessary to cut a notch in the intersecting point of the 2x4s that make up the **X**. Instead, just drill a hole thru both 2x4s where they intersect to form the **X** and bolt the **X** together. The combined thickness of the **X** equals the thickness of the 4x4 so cutting a notch is not necessary.



### **The CEO displays side wall**

{Image Twelve}

At the top of this picture, you can clearly see how we attached the 2x4 top plates and rafters; (directly over the top of the 4x4s). The overall size of our treehouse made this part of design especially easy. We bought 2x4s that were eight feet long and used them in their full length for each rafter. The roof pitch was also easy. We decided on a 10 inch riser because we wanted to copy the roof line of our home. It was a good guess and it worked out perfectly.

A ten to fourteen inch rise will match most homes, (if you stick to our basic overall size structure). The picture below offers another view of the side wall minus the ample girth of CEO.

Look closely at the details here. Notice the 2x4 that forms the peak of the roof. It is standing on edge, not flat. Now, look at the corner, or outside edge rafters above CEO. They are also 2x4s at their full 8ft length.

As you will see in upcoming pictures, the outside rafters are 2x4s but all the others in between are 2x2s to create the trellis roof. Also, look at the privacy fence. Notice the little square openings that form the holes in the grid. This is much stronger, and more expensive than lattice and it should not be confused with lattice. When we screwed these 4x8 sections of privacy fence to our side walls, it made a noticeable difference in the stability of the structure. We strongly recommend it for your treehouse too. Below, (12a) offers another view.



### **Second view of upper side wall**

Image Twelve (a)

This is another view of the roof line. This was a simple and easy way to tie the top of the structure together but you may consider attaching these roofline 2x4s to the upper-outside edge of the 4x4s, rather than the top of the 4x4s when creating your roofline. If you choose the side option, you must brace each 2x4 against each 4x4 in both directions to create stability. We chose the top connection because with only six foot walls, the extra braces would be in our way.

Note the wider board which covers the 2x4 rafter from the outside. We added this feature to cover the raw edges of the 2x2 trellis roof that runs the length of the treehouse. This “trim” is actually a length of 1x6 backyard fencing. You can buy it in various lengths. It’s cheap and it works perfectly as trim.

This view of the upper sidewall shows clearly that the roof is basically a grid of 2x2s, adjusted and positioned to allow the tree limbs to grow through the top.

These 2x2s are hard and they split very easily so, drill pilot holes and as always use Deckmate screws, not nails.

The next picture shows a close up of one of the upper corners. The only thing that required thinking here was the notch that had to be cut in the rafters. This can be penciled, (drawn) against the side of the rafter before the cut is made. If you want to avoid the cut, you can substitute two right angle braces per corner.



### Construction of upper corners

{Image Thirteen}

This is also a good view of the trellis roof. Since we made the decision to allow the tree limbs to protrude into the structure, it was also necessary to allow them to exit through the top. We may amend this and apply cedar shingles to the roof at some point in the future, and surround the limbs with rubber lined roof vents. However, for now, we like the open roof because it allows us to see the top of the tree and the sky above.

The 2x2s were also right off the shelf at eight feet long. They worked perfectly with out any cutting. We were also pleased with the amount of strength and stability that was added to the structure when this part of construction was completed.

We ended up with seven to twelve inch gaps between each 2x2 but every treehouse will be different depending upon the number and size of limbs encountered. We tried to make every gap equal but this was almost impossible.

The next picture shows how we cut the 2x2s around the limbs. The 2x2s were especially forgiving and adaptable. We decided on the distance between the 2x2s after we made a judgement as to the distance that would require the cutting of the least number of 2x2s.



### **The Trellis Roof Of The Treehouse**

{Image Fourteen}

Image fourteen is our best picture of the trellis roof and our most convincing example of how a treehouse can be built in harmony with a tree. Look at the these limbs! All three are less than four inches in diameter and can continue to grow. This is our proof that you don't need to saw away the tree for a treehouse.



### **Newel Posts support rafter**

{Image Fifteen}

Image fifteen shows one of our daughters standing beside a rafter support that was created by combining, or actually stacking, two decorative “Newel” posts that are three feet high each.

We used two, right angle braces to join the newel posts and we found them to be as strong, or even stronger than a single post, but much cheaper. You can buy the six foot length, but be ready to pay.

You can buy these shorter “Newel” posts in bundles and they make a perfect rail height for an open treehouse or for most decks.

Now, please note the small metal brace at the top of the upper Newel post on the image. We point this out for a good reason. Buy these little 'right angle' braces by the dozen and attach them to any corner or connection that is under stress or torque. The strength of these little braces is just amazing. After installation, paint them with a rust preventive primer and then cover them with wood trim if they detract from the “look” of the treehouse. **As always, use screws, not nails to attach them.**

We attached all the Newel posts with great care. This is definitely a two-person job. We drilled pilot holes about one inch into the base of each newel post. A hole must also be drilled down through the floor and through the outer-edge flat beam shown in image (3), (which is a 2x6) at each location of a newel post. Here is a good rule of thumb. **The distance between each newel post should be less than the width of a small human head.** Four inches is best. You don't want a little person to get stuck between newel posts or fall out of the treehouse because you spaced the newel posts too wide. Local codes govern these spacings in urban areas, but four inches is always safe.

As you can see in all our pictures, we built our treehouse with a wider newel post spacing but we strongly discourage this practice, especially for families with small children.

**Don't try to hold the Newel from above while drilling from below. This can cause you can drill through the foot of the person holding the newel post.**

We attached every Newel post with a lag screw and flat washer from under the floor. A lag screw looks like the head of a bolt on one end and the sharp tip of a screw on the other end. It has a hexagon head and looks like an oversized screw. Lag screws are used when only one side of the connection is reachable.

After locking down the newel posts with lags, we then screwed a 2x4 top railing onto the top surface of the Newel posts with two “DeckMate” screws per post. Then, we screwed the top railings to each other in the corners of the treehouse. This locks the upper and lower outer frame down to the floor and to the newel posts at each post location. This allows several people to safely put pressure on the railings while standing on the outer edge of the treehouse. Your goal here is to create a "waist high" wooden cage.

Don't get lazy here or allow a framing carpenter to talk you out of this design. This is not a "frame" where the next crew will come along with a solid wall and brick to add strength and stability. **This is the whole structure where your children will be playing, and it must be strong enough to hang on and push against and do all the things children do without a railing coming off and a child falling out!**

We tried it several ways, but our lag screw design proved to be the best contributor to the stability of the treehouse without adding another 200+lbs of awkward looking bracing. Sure, it took a lot of time and care but it was worth it.

For the record, we tried "toe-nailing" the Newel posts from the upper side and then drilling pilot holes from below (without drilling the pilot hole in the newel post), but it was impossible to keep each post in place, upright, and perpendicular.

You may try drilling nail size angular pilot holes into the lower end of the newel posts and then toe-nail each post to the floor before installing the lag screw from the underside, but only use toe-nailing to stabilize each post. **Do not toe-nail the newel posts and consider them installed.**

You can temporarily attach a backer-board along the surface of the floor so each newel post will have a solid "wall" to rest against for temporary toe-nailing. Regardless, toe-nailing won't eliminate the need for the lag screws because our lag screw design is vital to the strength and stability of the treehouse.

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The balance of the project involves even more subjectivity. Do you want steps? Do you want to restrict access to the treehouse with a removable ladder?

In this series of pictures, we will demonstrate an easy way to build a stairway. Since your stairway is a project within a project, let's start with a general overview. Our stairway consists of two, 2x12 runners that span from ground to the entrance of the treehouse with steps and risers sandwiched between. We finished them with Newel posts and hand rails.



{Image Sixteen}

### **EZ Stairs**

These 2x12 runners are regular 2x12s right off the rack. They are not precut as stairways. The steps and risers fit between these 2x12s. Each step and riser is screwed to the 2x12 from the outside-in with Deckmate screws. These screws are inserted through the 2x12 runner and into the steps and risers. Each step can also be screwed to each riser on the front and rear edge of each step for added strength. Our design allows you to establish any incline by installing one step at a time with a level. Install a 2x12 for the step and a 2x6 for the riser. Use at least three screws per side for each step and riser. Step width should equal the opening to the treehouse.



{Image Seventeen}

### **Side View of EZ Stairs**

This system provides unlimited flexibility. It allows you to establish any incline or width for your stairway. This insures a flat and level step regardless of the angle of incline.

With our flexible incline design, the floor height of the treehouse and the angle of incline from the ground to the treehouse is not carved in stone. You simply cut, install, and level the steps as you go!

Our system provides enough strength in common situations because each step is screwed into the 2x12 runner with “Deckmate” screws and supported underneath as shown below. Hand rails are 1x4s. Side rails are 1x6s. Newel posts are 3ft in length and attached as shown above.



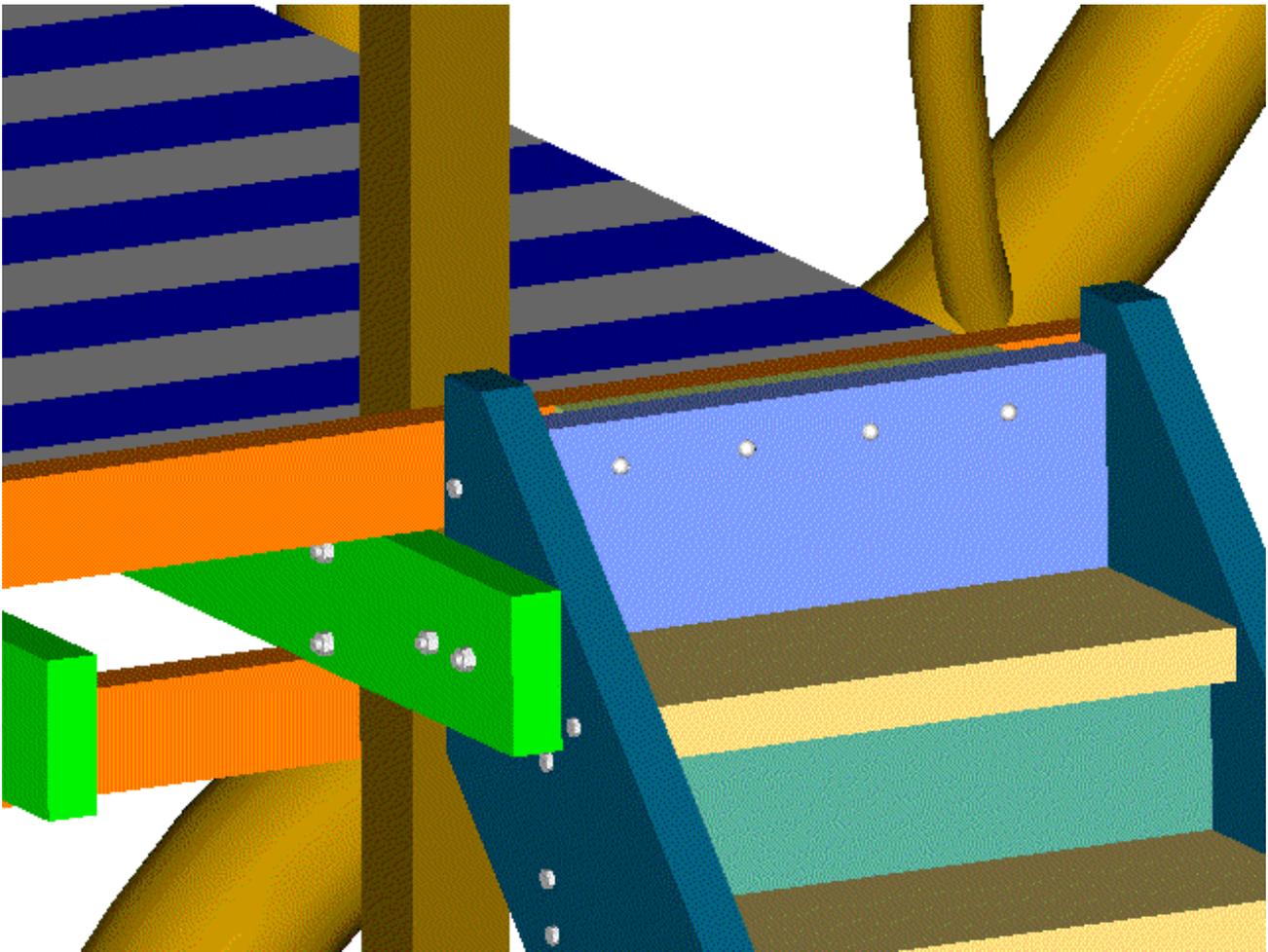
{ Image Eighteen }

### **View under EZ Stairs**

Install a 2x4 block under each side of each step for added support and tie the middle of each step down with a small, right angle brace. This 2x4 support block should be screwed to the runner from the inside-out and, from the outside-in. It should be screwed to the riser from the front of the riser toward the leading edge of the block and, to the step from the top-down. You can also screw the step to the riser at the top side leading edge, but this can create slivers/splinters so, use your judgment here.

For runners, we started with 16ft 2x12s, and due to our treehouse height, we cut them back a little. However, it's only necessary to cut the top edge the 2x12s to match the incline you establish. The top edge of the 2x12s must be cut to be vertical like the 4x4 frames. Reducing the length of the 2x12s increases the incline of the stairway.

We found our design to be as strong, or stronger than conventional stairs and much more adaptable. The image below demonstrates how the floor beam (shown in green), under the treehouse and the 2x4 upper horizontal frame, (shown in orange) can serve as places to attach the stairs.



{ Image Nineteen }

Close View; Top of EZ Stairs

You may eventually want a spiral staircase, which can be custom built by Salter Industries. Contact them at <http://www.salterspiralstair.com/> on the net or call Tom at 1 (800) 368-8280 and tell him Fred Lundgren at EZ Treehouse Plans sent you. This referral earns me a 10% commission.

The least expensive spiral staircase offered by Salter sells for \$695.00 plus shipping and taxes. It has 12 risers and is about 3' 6 inches wide. That gives you an 18 inch wide step with a pole in the middle. That size is fine for small people but an "old bald fat guy" like me would find the 18 inch spiral a bit small.

Their least expensive staircase is made of all steel construction and should be painted to blend into your setting.

More expensive and decorative spiral staircases are available from Salter with wider steps and wood trim.

The half turn staircase in the picture below can adapt to many situations when a traditional spiral or stairway will not fit. According to Salter, the half turn staircase it is not a "code" staircase but, of course, neither is the EZ Treehouse.



{Image Twenty}  
**Spiral Staircase**

**Initially, we chose the removable ladder option for our treehouse, but we don't recommend it for everyone. It can be dangerous to climb, especially for very small children or old folks like yours truly. A removable ladder is especially dangerous in wet weather because your feet can slip and cause you to fall to the ground.**

Another reason to build inclining steps or a spiral staircase is, believe it or not, the family dog. When we built our treehouse, all the kids climbed in and started playing, but the dog could not climb the ladder. It tried a couple of times but never got above the third step. Finally, the dog just sat down and cried continuously until one of the kids carried it up the ladder, which was also dangerous. By the way, we discovered it's even more dangerous to carry a dog down the ladder.

Since the pictures in these plans were taken, we have moved the treehouse to the backyard and built a walkway from the deck to the treehouse, thus eliminating the problem of ingress and egress for all concerned.

While on the subject of animals, you should realize that your treehouse will force all the previous inhabitants of the tree to find another home, with the notable exception of harmful insects.

If you live in fire ant country, we suggest you apply Amdro and a direct contact spray to kill the ants in a thirty foot circle around the tree. If you don't live in fire ant country, you have other insects to fight such as wasps, ticks, and mosquitoes.

Take control of the area around the tree. Use a spray bomb such as Patrol (1) insect fogger. Of course, follow label directions. Spray the area around the tree before you deliver materials to the site. The job will be much easier and safer without insects.

## **A Special Note Regarding the Need for footings!**

The 4x4 vertical frames posts should be buried at least 18 inches deep in a 12 inch diameter hole if you are building on a slope, or where the stairs could be a victim of a washout or mud slide of, if your treehouse floor can't securely hug at least two large branches of the tree.

If you choose footings, set each post in the ground and pour premixed concrete into the hole while you level each post. The 4x4 posts can be set in DRY concrete. Don't pour the concrete wet. Concrete will absorb the moisture from the ground and will set up over time.

We suggest concrete footings where the treehouse would otherwise be balanced by a single branch because without two separated branches to hug, **the treehouse can tilt and turn on its axis during high winds.** If you have a large pine or similar tree with a single 'stove pipe' trunk, you will need footings because even though the tree is very strong, there is nothing to prevent the treehouse from pivoting on it's axis. If you need footings, you will also need to add extra **X** braces across the 4x4s below the floor.

To eliminate the need for lower braces and footings, your treehouse floor should surround (or rest against) at least two primary branches; branches which grow directly from the main fork of the tree. These branches should be larger than six inches in diameter.

Some careful judgment should govern your decision regarding lower braces and concrete footings. Ask this question. Would the treehouse floor remain undisturbed in the tree if all four vertical frame posts were cut from under the treehouse? If the answer is an unequivocal YES, then lower braces and footings are unnecessary. This standard should govern your decision. Use some common sense here. **This is a safety issue.**

In part two, we will show you how to build the regular inclining stairway as seen on the upper right side of the first page of these plans.

Well, that's about it for part one. We assume you have taken some notes and have developed a fairly clear vision of your treehouse. In part two, we will get into the step by step building process. So, we suggest you buy the materials on our list, (below) so we can get started.

## Materials List

<u>Type</u>	<u>Quantity</u>
12 foot 4x4.....	<u>Four</u> for vertical beams.
16 foot 4x4.....	<u>Four</u> to be used for stairs
8 foot 4x4.....	<u>Two</u> for beam extensions
10 foot 2x6.....	<u>Four</u> for floor support beams
8 foot 2x4.....	<u>Sixteen+</u> for reasons stated
8 foot 1x6.....	Buy <u>Twenty+</u> for flooring.
8 foot 2x2.....	Buy <u>Twenty+</u> for roof trellis.
3 foot Newel posts.....	Buy in bundles, check local code
4x8 Privacy fence.....	Buy <u>two</u> or substitute lattice
2x2" metal braces.....	Buy 12+ for strength.
3x3" metal braces.....	Buy 8 for corners under floor
2 1/2" lag screws.....	Buy 24+ for newels
5"x 3/8 carriage bolts.....	Buy 24+ for bolting beams
6"x 3/8 carriage bolts.....	Buy 24+ for bolting beams
2" Deckmate screws.....	Buy 200+ for project.
2 1/4 " Deckmate screws....	Buy one box of 100 or more
2 1/2 " Deckmate screws....	Buy one box of 100 or more
nails.....	as needed
(see narrative for description)	

## Tools List

**14+ ft aluminum ladder for use during construction.**  
*Use same ladder to control access to treehouse.*

**Hand saw**

**Hand held power saw**

**Reciprocating saw**

**Two power drills**

**Two saw horses**

**Two hammers**

**Square**

**Level**

**25' tape measure**

**8" Adjustable wrench**

**Socket set 3/8 " Drive**

**Several Phillips screw drivers**

**Phillips head power drill attachments**

**Pliers**

**Channel locks; (pliers with offset jaws)**

**Extension cords with ground wire**

**Drill bits to make up to 5/8" hole same as bolts**

**Extension Ladder**

**4ft to 6ft folding step ladder with platform**

**Two shovels**

**Several pair of gloves**

**Eye protection**

**50 feet of rope**

**50 feet of string**

**a monkey level, (a small level to hang on a string)**

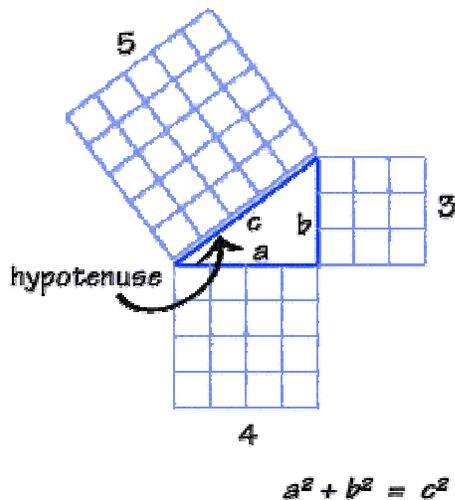


[www.treehouseplans.bigstep.com](http://www.treehouseplans.bigstep.com)

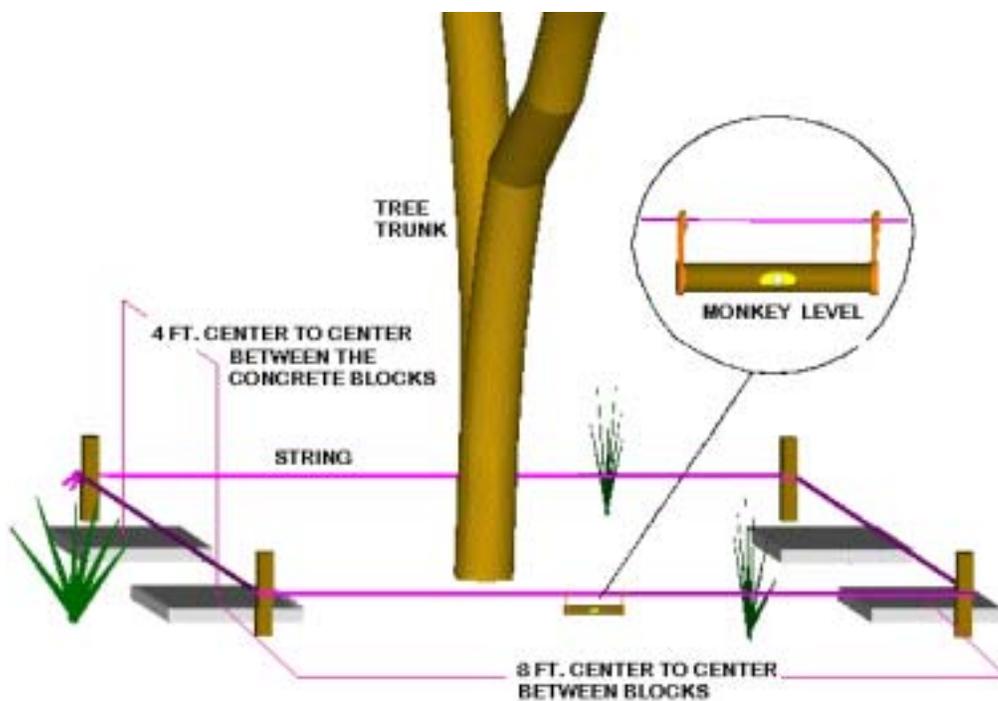
## EZ Treehouse Plans Part Two

Designed and built by Fred Lundgren  
C.A.D. by John Gallagher

Before you begin construction, you should take note of this important building tip. It's the simple formula for making your treehouse square. You will need it repeatedly. It is the formula associated with the [right triangle](#), the most important geometrical figure used in construction for thousands of years.



The Greek mathematician Pythagoras developed the formula, called the [Pythagorean theorem](#), for finding the lengths of the sides of any right triangle. He treated each side of a right triangle as though it were a filled square and discovered that the total area of the two smaller squares is equal to the area of the largest square. We can reduce his formula to a simple 3,4,5 system. Start from any corner of the treehouse frame and measure three feet along the width and four feet along the length. Now, measure the distance between the two points. If the answer is 5 ft, the treehouse is square, if not, adjust it to 5 feet and, you're done!

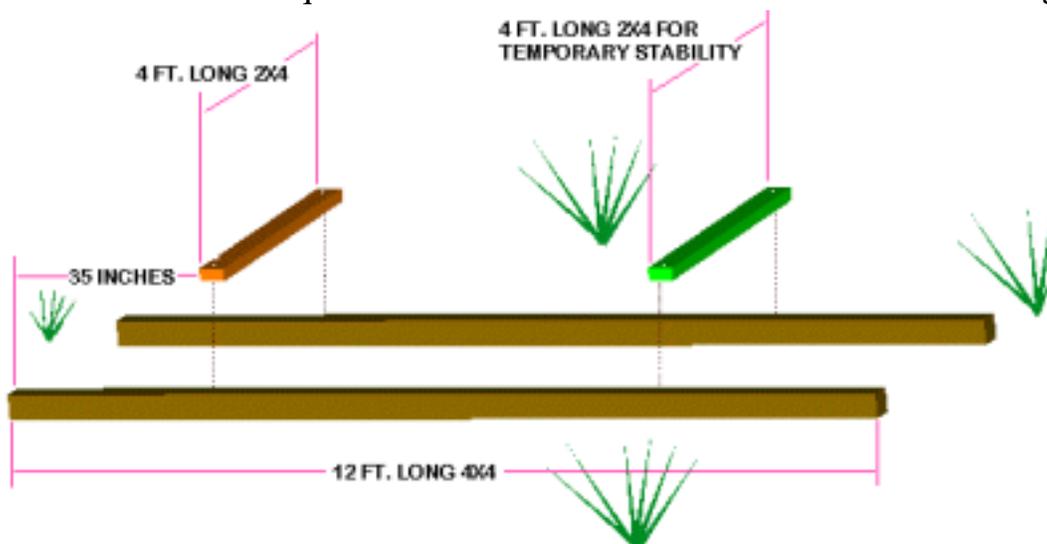


## Now it's time to build your treehouse!

### C.A.D. One

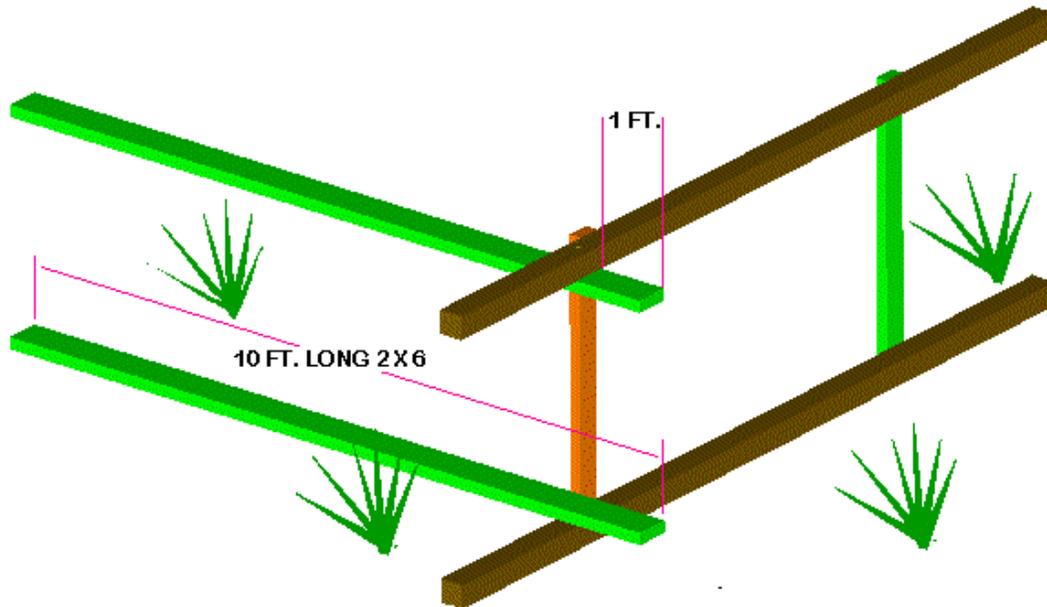
We assume you have materials, tools and labor on site so let's begin with the general setup of your treehouse. Start by setting concrete blocks in a 4 ft by 8 ft rectangle as shown. You can pre level the blocks by laying a straight board across any two blocks and removing soil from under the higher of the two blocks until level.

Next, drive four small stakes into the ground adjacent to the blocks as shown and wrap a string around the stakes. Then level the string using a "monkey level". Tack the string to each stake when level. Measure the vertical distance between the surface of each block and the string. Remove or add soil under each block until all four measurements are equal between the surface of the block and the string.



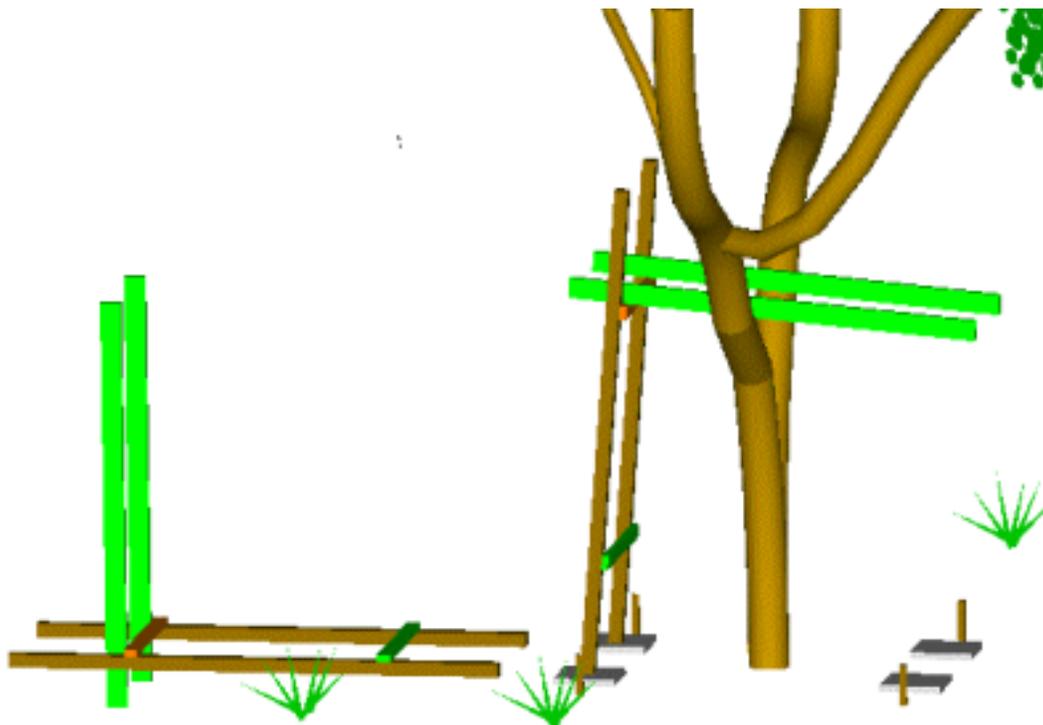
### C.A.D. Two

Lay out two 12 ft 4x4s and drill 3/8 inch holes through each of them 35 inches from each end. Cut a single 8ft 2x4 in half and drill a 3/8 inch hole 2 inches from each end. Bolt the 2x4s to the 4x4s using 3/8 carriage bolts that are 6 inches long. Repeat the process and you will have two completed frames.



### C.A.D Three

Using the same process, drill and bolt two 10ft 2x6s to one of the **H** frames. The holes in the 10ft 2x6s should be 14 inches from each end. Drill two holes but only install one bolt so the 2x6 will pivot.



### C.A.D. Four

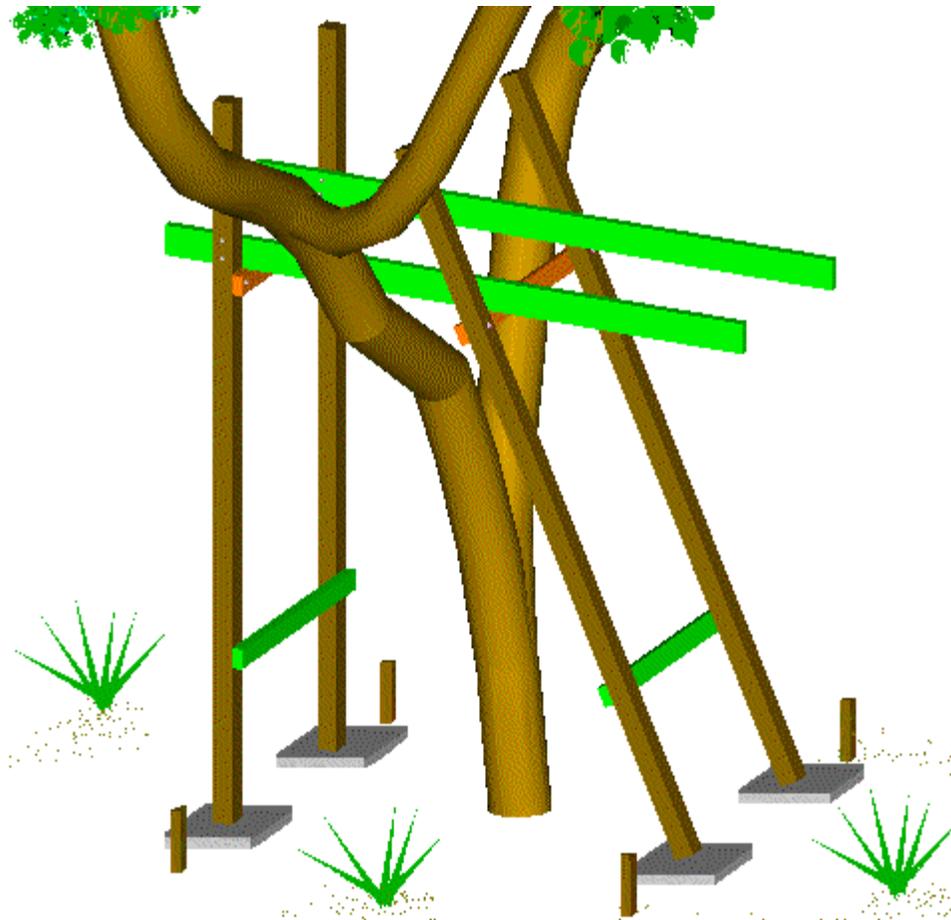
At this point, you are ready to lift and pivot the first **H** frame into the tree.

This process will be awkward and dangerous if you are short on labor. You should have a minimum of three strong adults and preferably four adults on site for this stage of construction.

Alternatively, you should stand and brace each 4x4 separately. Again, we only recommend the lift and pivot method for those with sufficient labor on site.

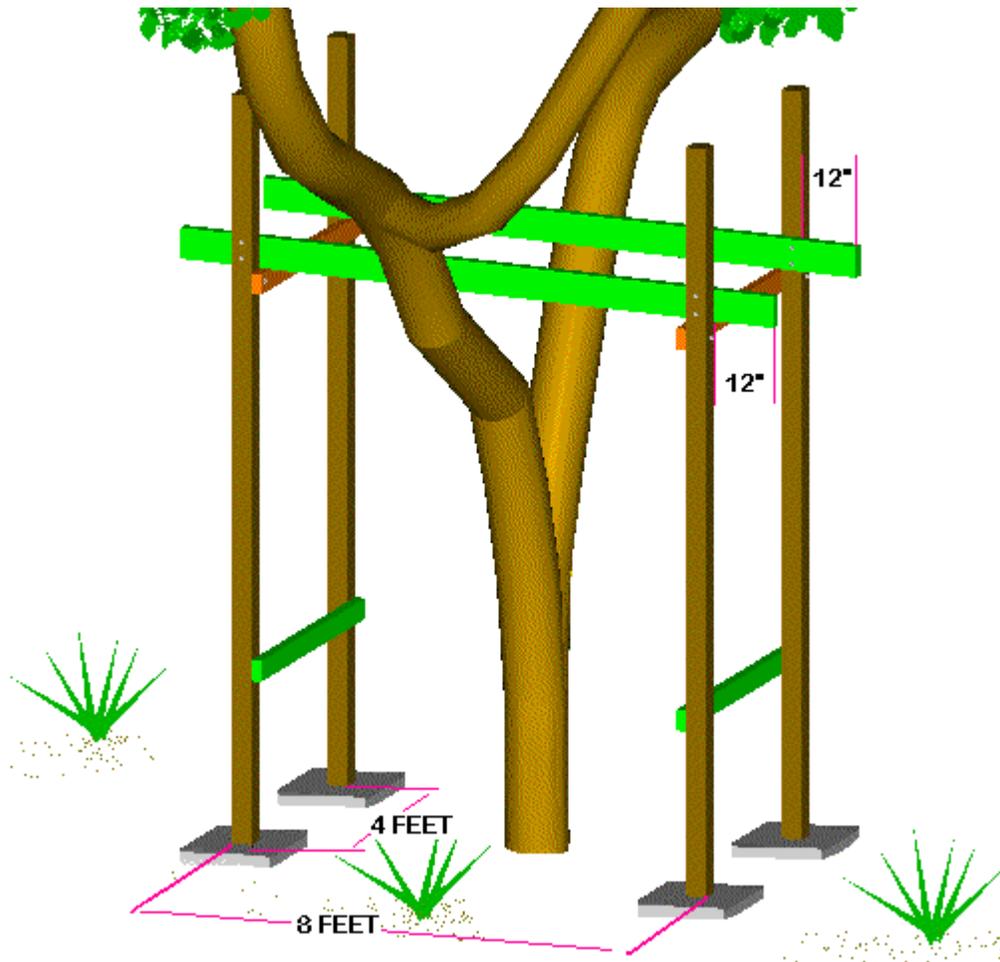
If you stand and brace each 4x4 individually, (using a tapered block designed for a 4x4 insert) the 4x4s won't be able to move in any direction and a ladder can be rested on any 4x4. Needless to say, this process is repeated for all four 4x4s. **Caution! Do not stand and brace 4x4s over a flat concrete block because the 4x4 won't be supported at the base and will pivot over with the side pressure of you and your ladder.** If you use the stand and brace each post individually, the 2x6 horizontal floor beams can be attached to each stationary vertical post and then re-leveled. This will take more planning and preparation, but it is safer and it will yield the most consistent result.

A third alternative is to build the **H** frames and drill holes as shown but don't bolt them together. Instead, place the 2x6 floor beams in the tree and then pivot the **H** frames into place and bolt them together while standing in the tree or on a ladder. **Needless to say, BE CAREFUL!**



#### **C.A.D Five**

The **H** frames being pivoted into place.



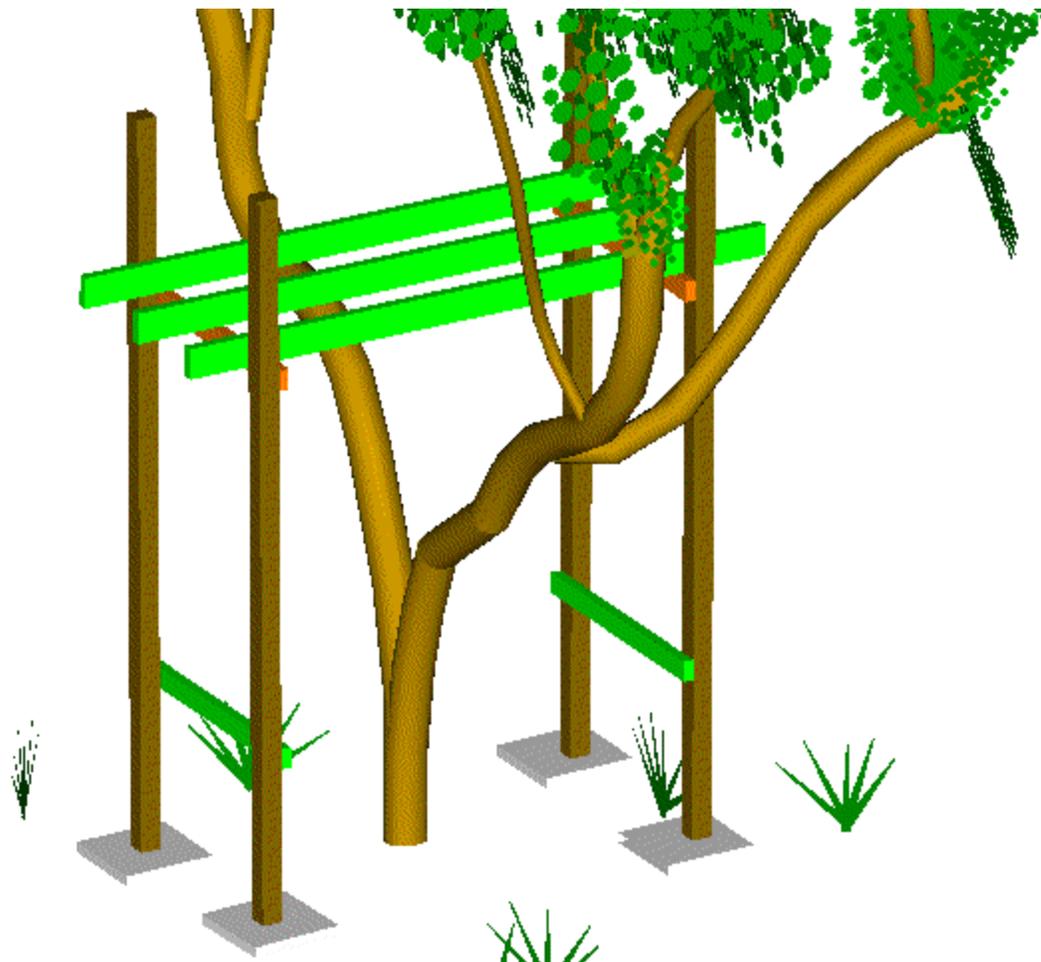
### C.A.D. Six

This image shows the frames in position and properly bolted. The **H** frame in this picture is bolted to the 2x6 floor beams with two bolts in each 2x6/4x4 connection.

At this point, it will be necessary to double check the frame for level and square. In our experience, the 2x6s will be level if all the measurements were correct and the holes were drilled properly. However, the frame will not be square and will need readjusting using the diagonal X measurement system or the 3-4-5 system. Either way, this is the last time you can freely move the frame so take advantage of the opportunity to get it right.

The frame may appear terribly wobbly and unstable. Don't worry. Every thing you do from this point forward will add strength and stability.

At this point you will have a clear indication of how many limbs and branches you face. You will be tempted to cut a big hole into the branch canopy to make the floor easy to build. Don't do it. Look for alternatives. If you have limbs and branches in the floor area, take a second look at {image two} of part one of these plans. There, you can see how we installed floor beams on each side of a main branch so the two beams "hugged" the branch from either side. This stabilized the treehouse in two directions, while the floor above it stabilized the treehouse in the opposite two directions. A two inch space between the tree branch and the treehouse beams and floor is suggested.



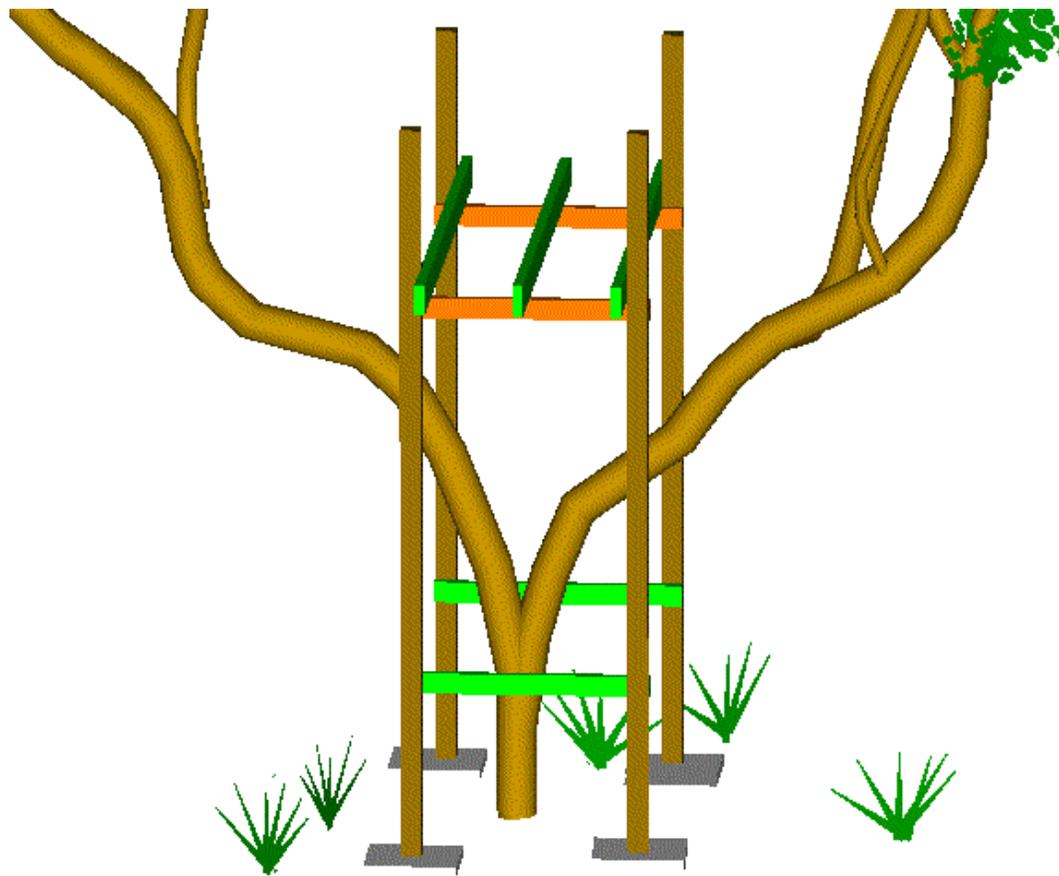
### C.A.D. Seven

In C.A.D. seven (above) you see we have installed a third beam to support the floor, but in our "C.A.D. World" we did not have limbs in our path.

Limbs and branches produce so many floor variables that a bus load of computer geeks could work a lifetime and never calculate every possible floor configuration. Instead, you should depend on your good judgment for a solution. Answer this question. How many beams should support the floor under your treehouse based upon a maximum two feet spacings? Do you need more than three? The width of our treehouse limited us to a practical maximum of six. Note; these floor beams don't need to be perfectly parallel. You may need to add one or two beams at an angle.

If you have a tree with a main trunk that forks around, (not through the floor area), you will find the floor easy to build, but you will also need to add **X** braces between the 4x4s, under the floor and bury the 4x4s in concrete.

The location of lower **X** braces will be dictated by the location of tree branches. If your tree resembles the tree in the C.A.D.s, it will be easy to brace across the 4ft width, but bracing across the 8ft length will require special positioning to avoid the branches.



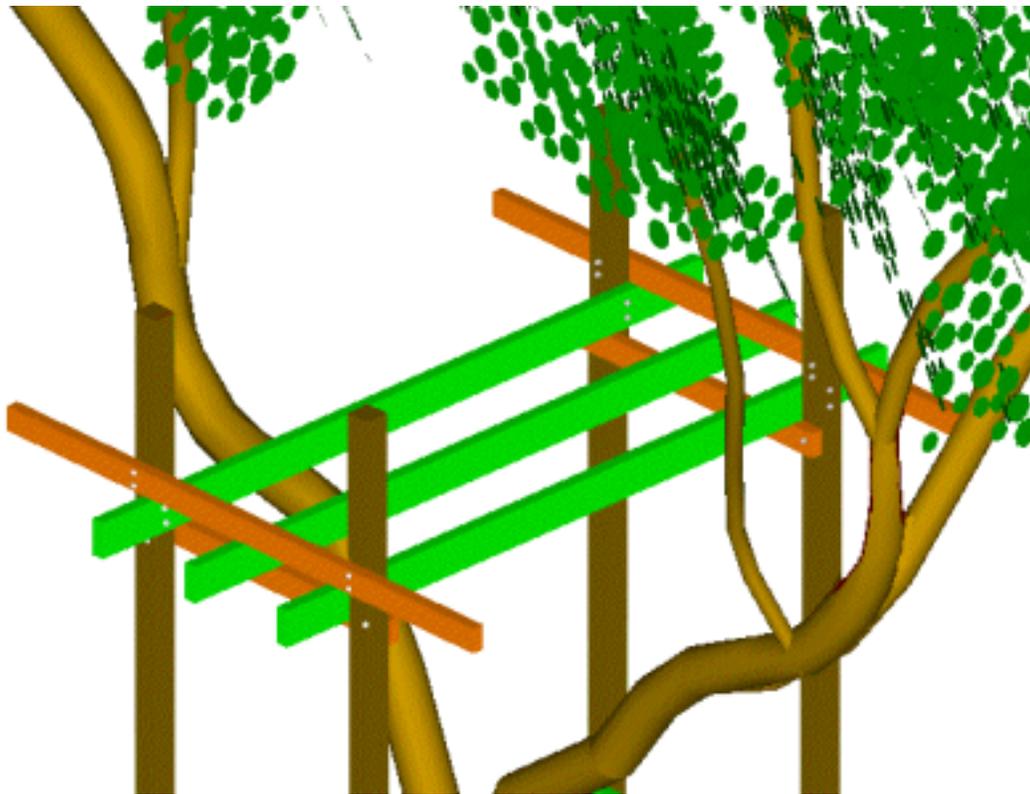
### C.A.D. Eight

As an alternative, you can add 2x4 braces (just under the floor) between the 2x6 floor beams and the 4x4s but it may be a less effective method to stabilize the treehouse. We describe this in more detail at image seventeen where the stand alone treehouse option is explored.

If you build the treehouse floor with no protruding limbs and branches, you must set the 4x4s in cement or the treehouse could literally fall over. Roots may be trouble, but try to dig each hole (footing) at least 12 inches wide at the surface and 18-24 inches deep. Dig deeper in very sandy soils. Dig holes in the shape of a bell, so the bottom of each hole is about 50% wider than the top. Use any pre-mixed concrete.

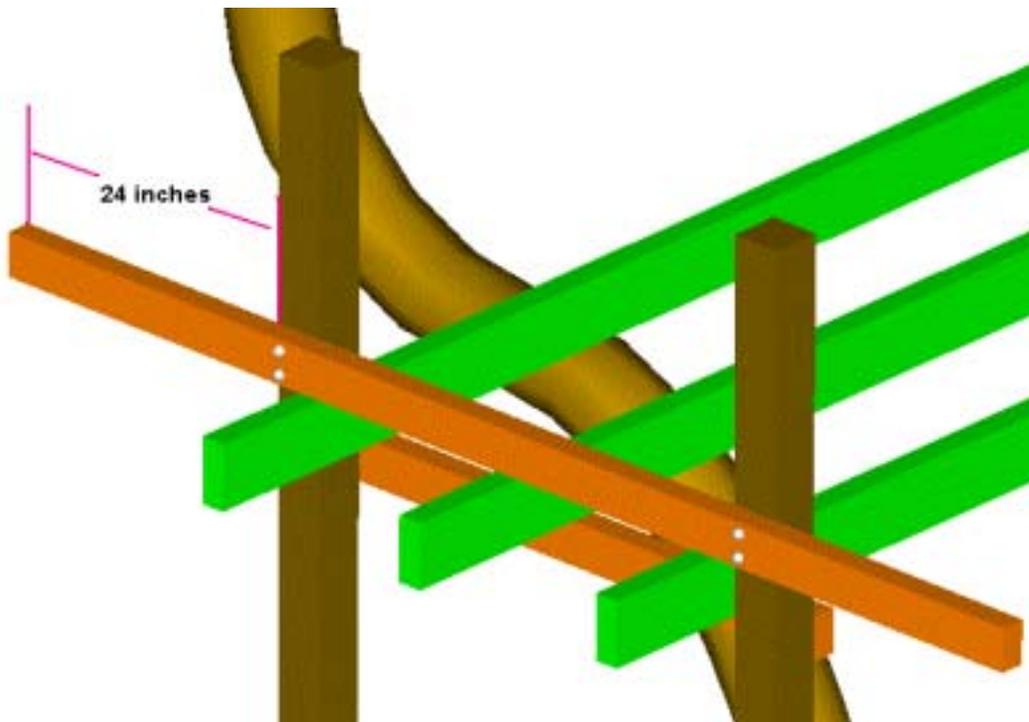
Before you set the posts in concrete, buy four 1ft lengths of  $\frac{3}{4}$  inch all thread. All thread is a bolt with no head. It is literally ALL THREAD. Drill a hole through each 4x4 about six inches from the bottom and put the all thread through the hole and screw a nut to each side. This will tie the concrete to the 4x4s.

If you set footings, we suggest you dig the holes and raise the first **H** frame into place, and with the **H** frame upright, pour a sack of the pre-mix concrete into each of the two holes DRY. Use a level to square and level the **H** frame. Repeat the process with the other frame, slowly adding premix while checking for level and square. Fill the holes to the surface with premix. Do not add water if moisture is present.

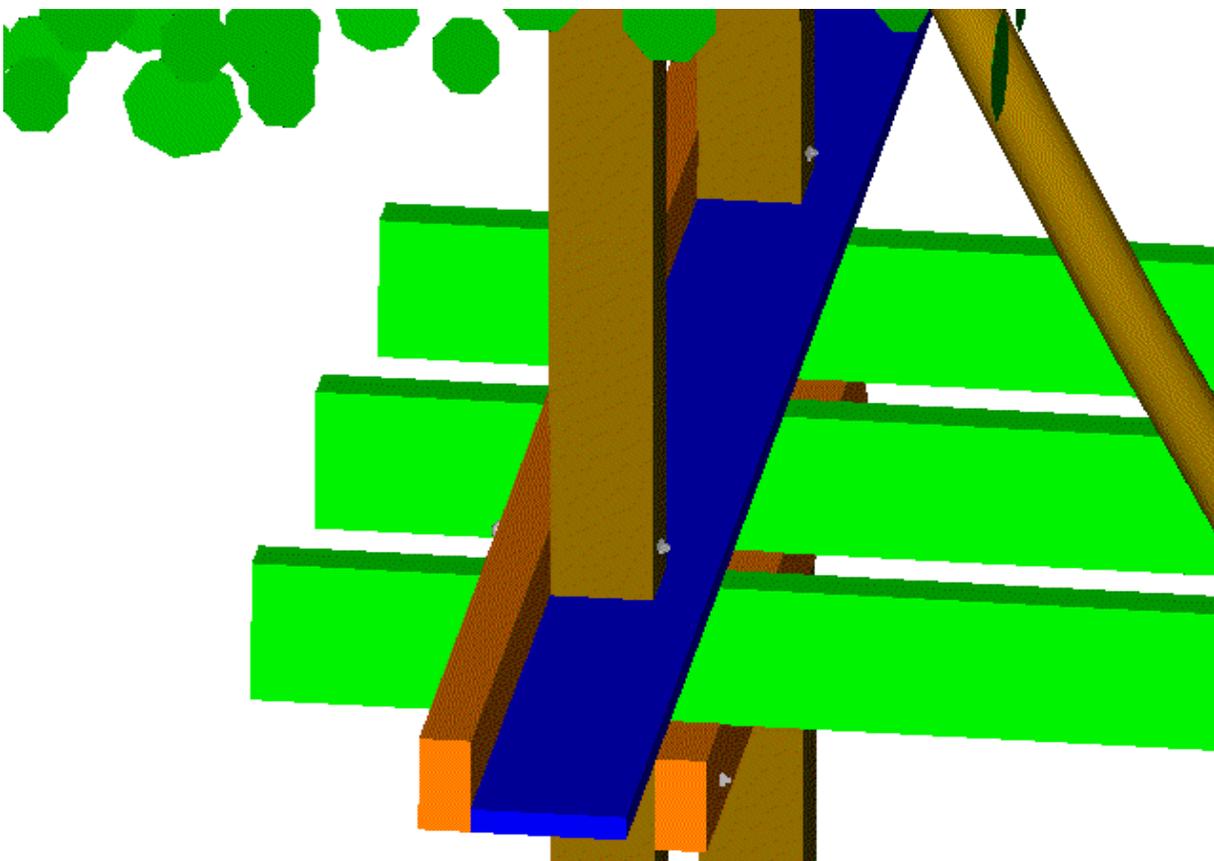


**C.A.D. Nine**

With both **H** frames and the 2x6 floor beams in place, bolt 8ft long 2x4s on to the 4x4s over the 2x6 floor beams as shown in **C.A.D. Nine and Ten**. These are the long orange colored 2x4s which are bolted to the 4x4s. These 2x4s are not optional braces. They are an essential part of the frame that can't be omitted without seriously compromising the structure of the treehouse.

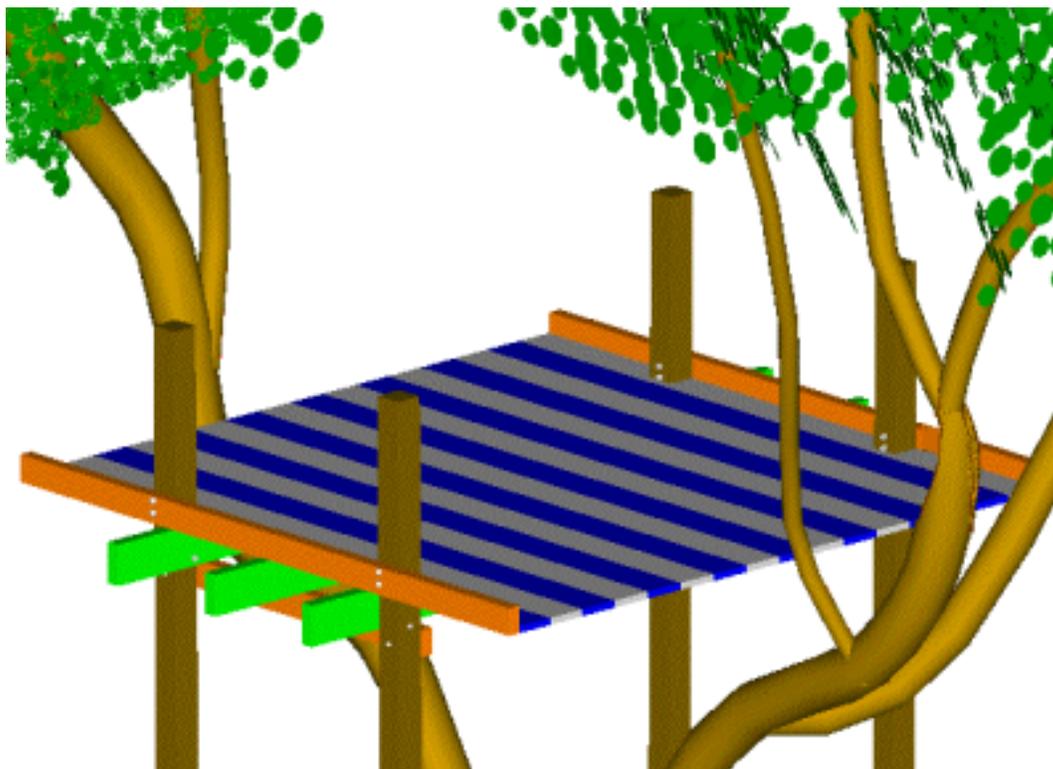


**C.A.D. Ten**

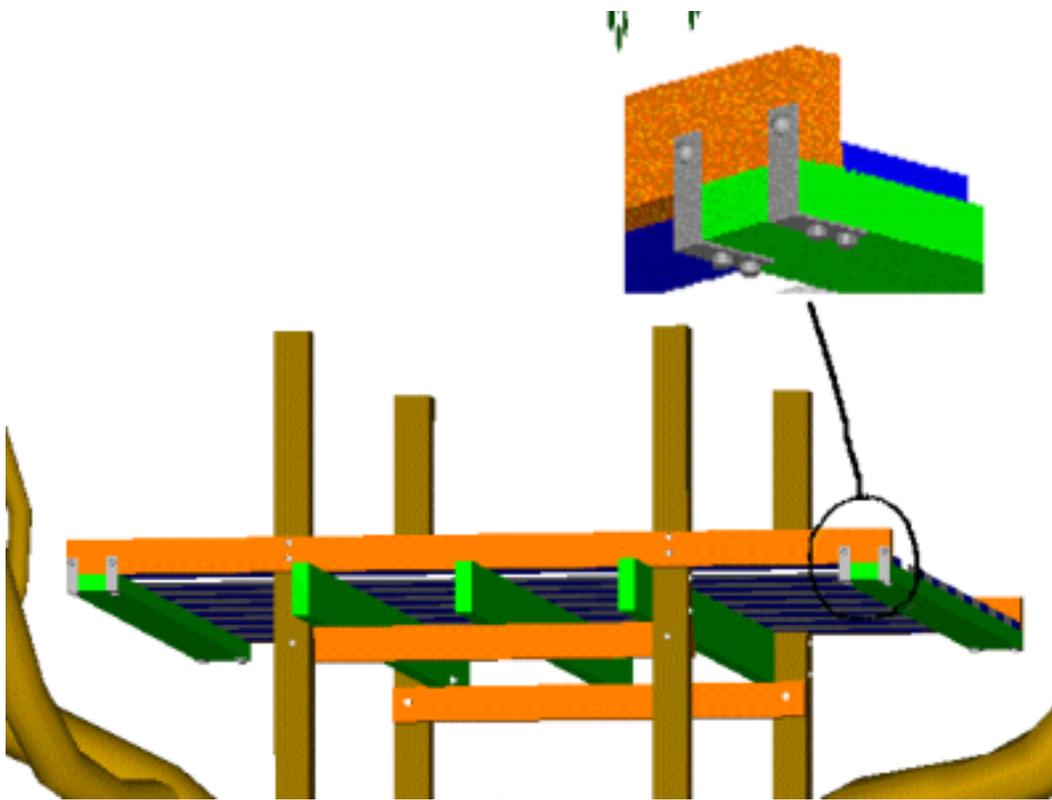


### C.A.D. Eleven

The next step to begin installing the floor. Start by resting the first board, (seen here in blue at image eleven) against the 4x4s. Using a pencil and a small square, draw the cut-outs to accommodate both 4x4s as shown. Cut the notches using a reciprocating saw. Attach the notched board as shown. Screw the board to all 2x6s (and the 2x4 from the outside-in). Use Deckmate screws. See completed floor.

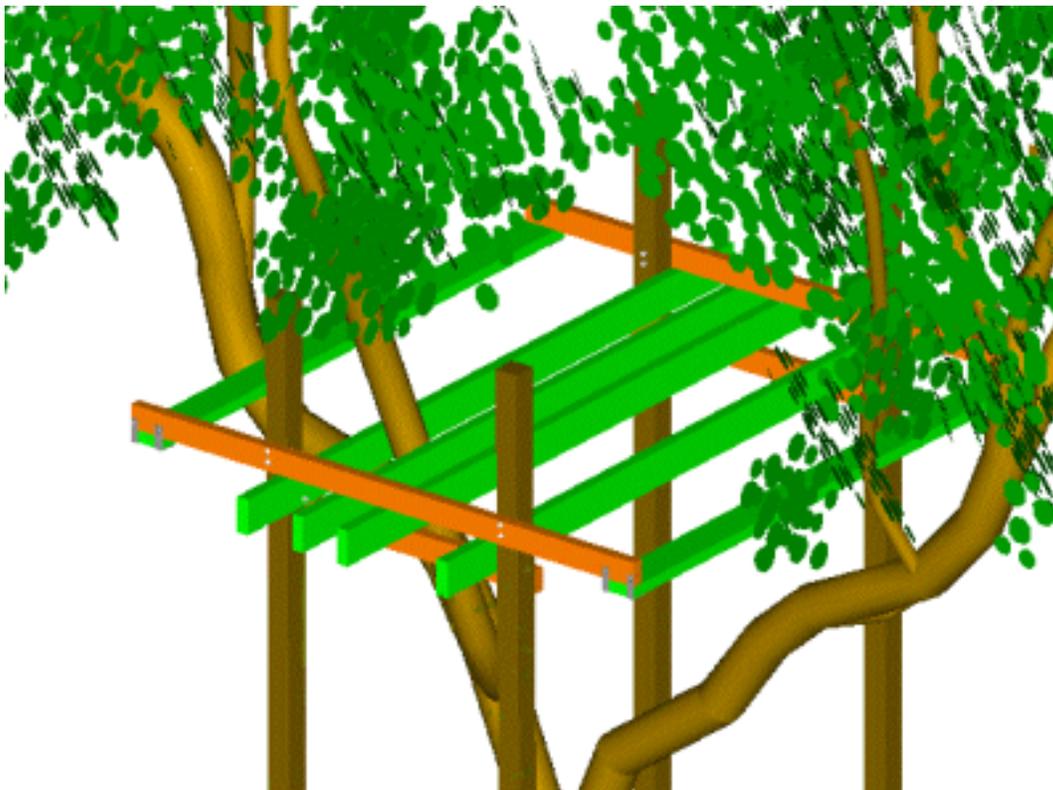


### C.A.D. Twelve



### C.A.D. Thirteen

With the floor attached, the next step is to lock the perimeter of the structure together with 2x6s, laid flat, and attached under the outside edges of the floor. The small image shows one of the 2x6s attached at the corner with right-angle braces. Use 1 1/2 inch lag screws to attach the braces to the 2x4s and use 2 1/4 inch lag screws through the 2x6s underneath. You may use bolts **if the sharp end of a bolt is not exposed**. Cover bolts behind wood strips to prevent cuts and bruises.



### C.A.D Fourteen

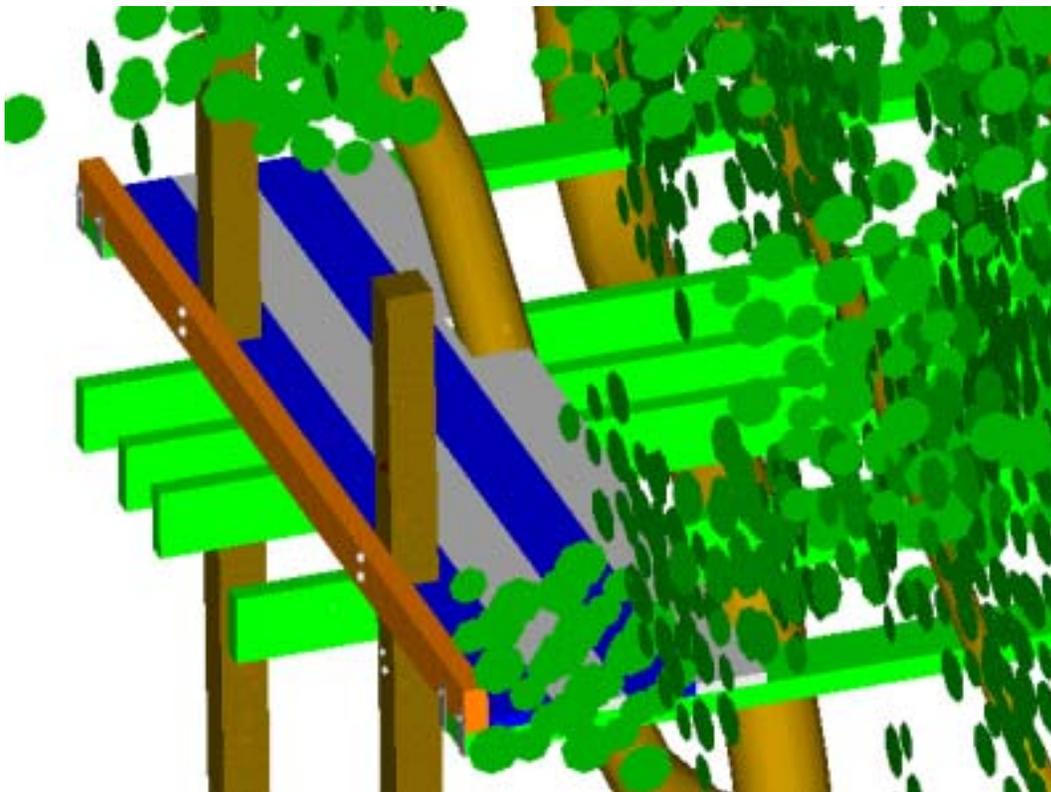
C.A.Ds fourteen through sixteen will feature treehouses with branches through the floor.

As we mentioned earlier, it's impossible to show every picture of every variable involving floor construction when a tree is growing through the floor. Instead, we will do what economists do and, make some assumptions regarding the subject.

In our case, we "assumed" a large branch about 20 inches from the edge of the floor. Our branch protrudes at a 15 degree angle and is about 6 to 8 inches in diameter.

C.A.D. Fourteen demonstrates the changes to floor design made necessary by the assumed branch. As you see, we have also assumed one additional 2x6 floor beam adjacent to the branch.

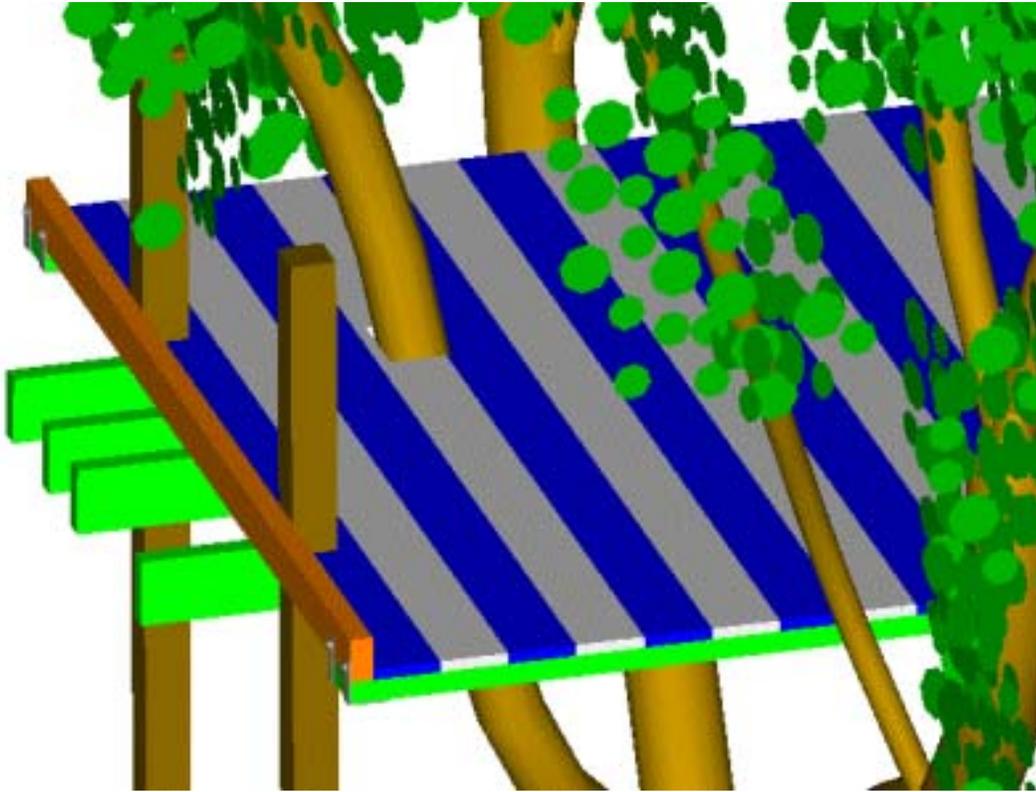
If other branches had been protruding through the treehouse floor, the extra 2x6s could have been inserted at different angles to create the "hugging effect" on additional branches.



#### **C.A.D. Fifteen**

C.A.D. Fifteen shows a floor board cut to fit around the branch. A second floor board will also be cut and installed from the opposite side. This produces the hugging effect whereby the tree balances the treehouse. Our real world treehouse existed in perfect harmony with the tree even though two branches and one smaller limb protruded through the floor.

Generally speaking, the treehouse floor can be successfully built around a number of branches by adapting our design. In the case of our first treehouse, (the real treehouse featured in Part One of these plans), we successfully navigated around two large branches and one smaller limb. The results were excellent. Floor space was not compromised.



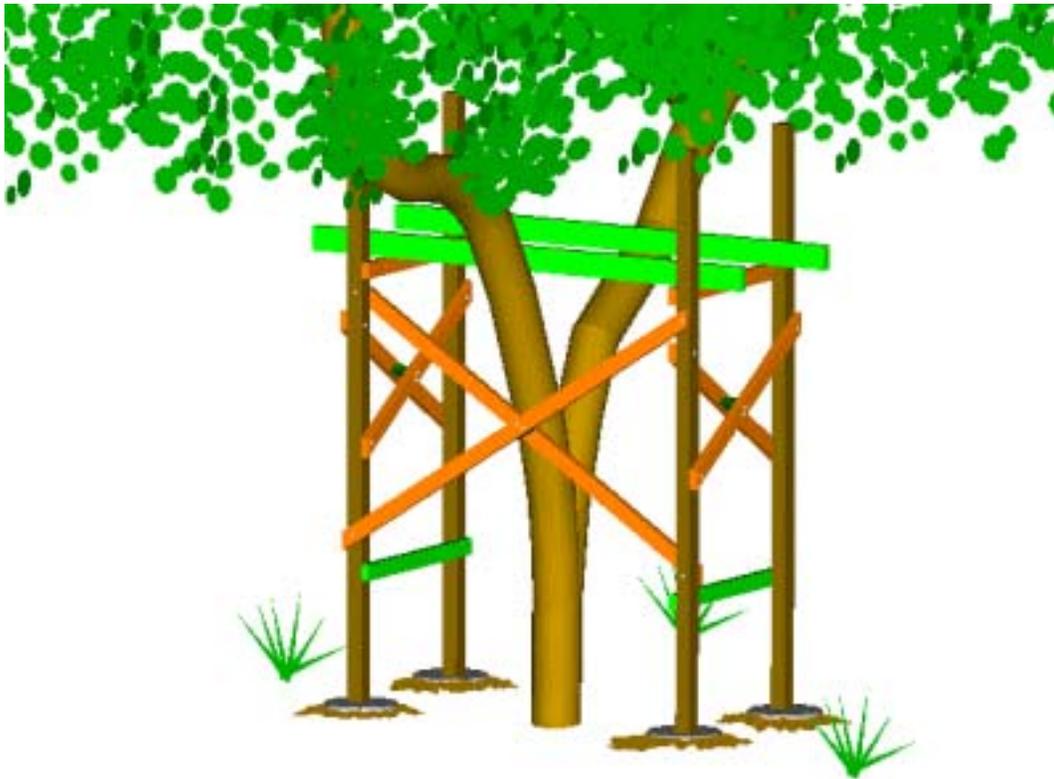
#### **C.A.D. Sixteen**

As stated earlier, we suggest concrete footings where the treehouse would otherwise be balanced by a single branch because without two separated branches to hug, **the treehouse can tilt and turn on its axis during high winds.** If you have a large pine or similar tree with a single ‘stove pipe’ trunk, you will need footings because even though the tree is very strong, there is nothing to prevent the treehouse from pivoting on it’s axis.

To eliminate the need for lower braces and footings, your treehouse floor should surround (or rest against) at least two primary branches; branches which grow directly from the main fork of the tree. These branches should be larger than six inches in diameter.

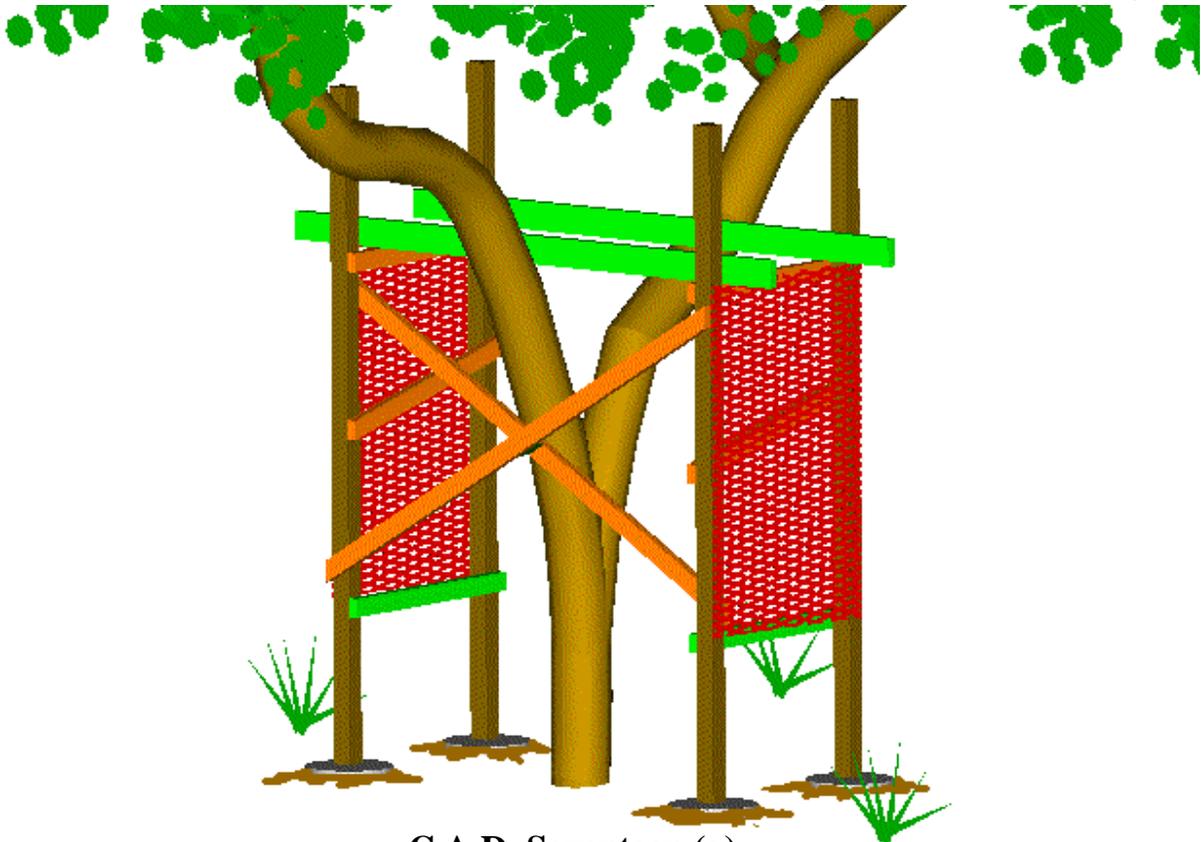
Some careful judgment should govern your decision regarding lower braces and concrete footings. Ask this question. Would the treehouse floor remain undisturbed in the tree if all four vertical frame posts were cut from under the treehouse? If the answer is an unequivocal YES, then lower braces and footings are unnecessary. This standard should govern your decision. Use some common sense here.

In the next two pictures, we will examine some optional bracing below the floor.



### C.A.D. Seventeen

This picture shows how the frame can be **X** braced below the floor with a small 4x4 block at the intersection of the **X**. This is only one of several options. You can also add stability by bracing between the 4x4s and the 2x6 floor frames. However, this does little to remove the torque from the lower legs.



### C.A.D. Seventeen (a)

**C.A.D. Seventeen (a)** shows how to brace along the lower width of the treehouse with a single 2x4 brace on the inside face of the 4x4s. This works great if you cover them with a 4x8 section of privacy fence. Privacy fence looks like lattice but it is more dense and stronger. Adding this lower section of privacy fence produces a sitting ‘arbor’ at the base of some trees which is really quite handsome.

Notice how the angle of the single brace matches, or is parallel with, the angle of the privacy fence. If you match the angle of the brace to the angle of the fence, the brace will blend into the background and become less noticeable.

Two more tips regarding the floor. If you install moist, pressure treated decking, do not insert any spacer (such as a nail) between the boards.

The boards will dry and shrink enough to make their own space. I have seen more than one builder make this mistake, even on National cable television. If you add any space between the boards, it will grow into a monster that, in two years, will eat high heels, ball point pens, eating utensils and eventually chair legs!

Another thing, it makes no difference if you set the boards with the grain of the wood up or down, or if you alternate. I have done it both ways and I’ve had the same amount of warping either way. The boards will warp toward the dryer side first, which is always facing up toward the sun.

With the floor complete, it’s time to consider a stairway.



### **C.A.D. Eighteen**

In this series of pictures, we will demonstrate an easy way to build a stairway. Since your stairway is a project within a project, let's start with a general overview. Our stairway consists of two, 2x12 runners that span from ground to the entrance of the treehouse with steps and risers sandwiched between.

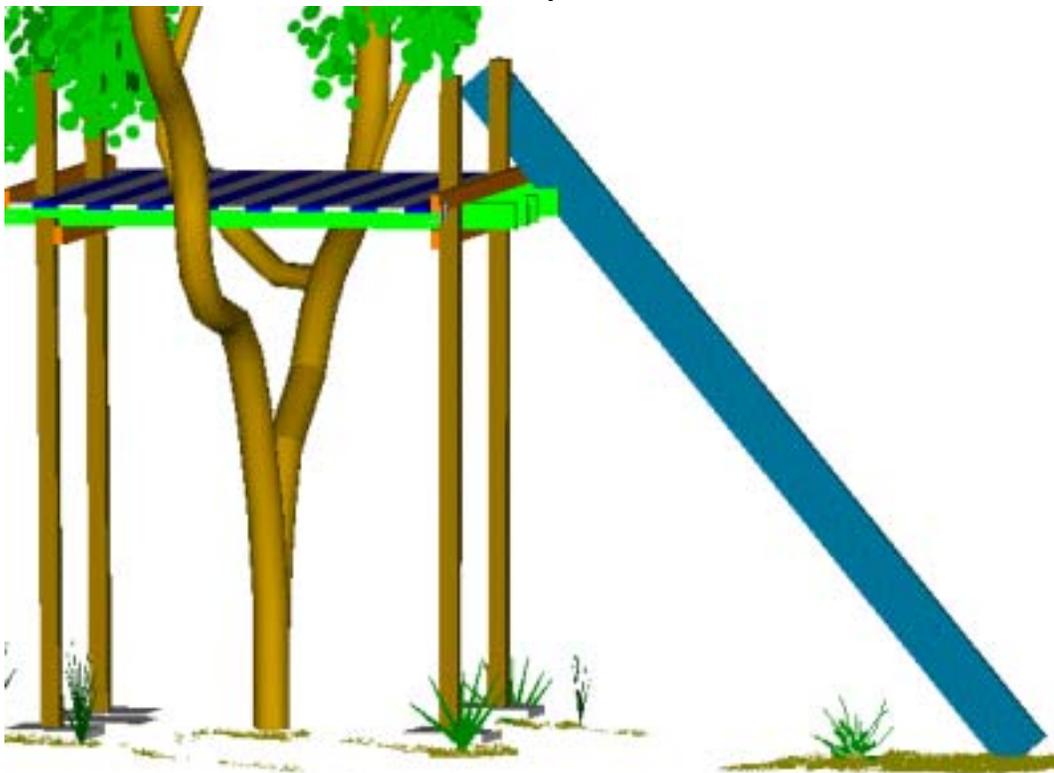
These 2x12 runners are regular 2x12s right off the rack. They are not precut as stairways. The steps and risers fit between these 2x12s.

Each step and riser is screwed to the 2x12s from the outside-in with Deckmate screws. These screws are inserted through the 2x12 runner and into the steps and risers. Each step is further supported underneath with a small 2x4 block. Each step can also be screwed to each riser on the front and rear edge of each step for added strength.

This system provides unlimited flexibility. It allows you to establish any incline for your stairway. This insures a flat and level step regardless of the angle of incline.

With our flexible incline design, the floor height of the treehouse and the angle of incline from the ground to the treehouse is not carved in stone. You simply cut, install, and level the steps as you go!

Now, let's look at the detailed picture below. We started with a 16ft 2x12, and due to our treehouse height, we cut it back a little. However, it's only necessary to cut the top edge the 2x12s to match the incline you establish. The top edge of the 2x12s must be cut to be vertical like the 4x4s. Reducing the length of the 2x12s increases the incline of the stairway.



### C.A.D. Nineteen

Our incline was approximately 45 degrees. Your treehouse may be different. You can cut the angle of the stairs by resting one of the 2x12 runners over the entrance of the treehouse and marking and cutting the 2x12 where it rests against the leading edge of the 4x4. You may cut both ends in this manner and set the lower surface of the 2x12s on concrete blocks, or cut the tops only, and dig a hole in the soil for the lower ends.

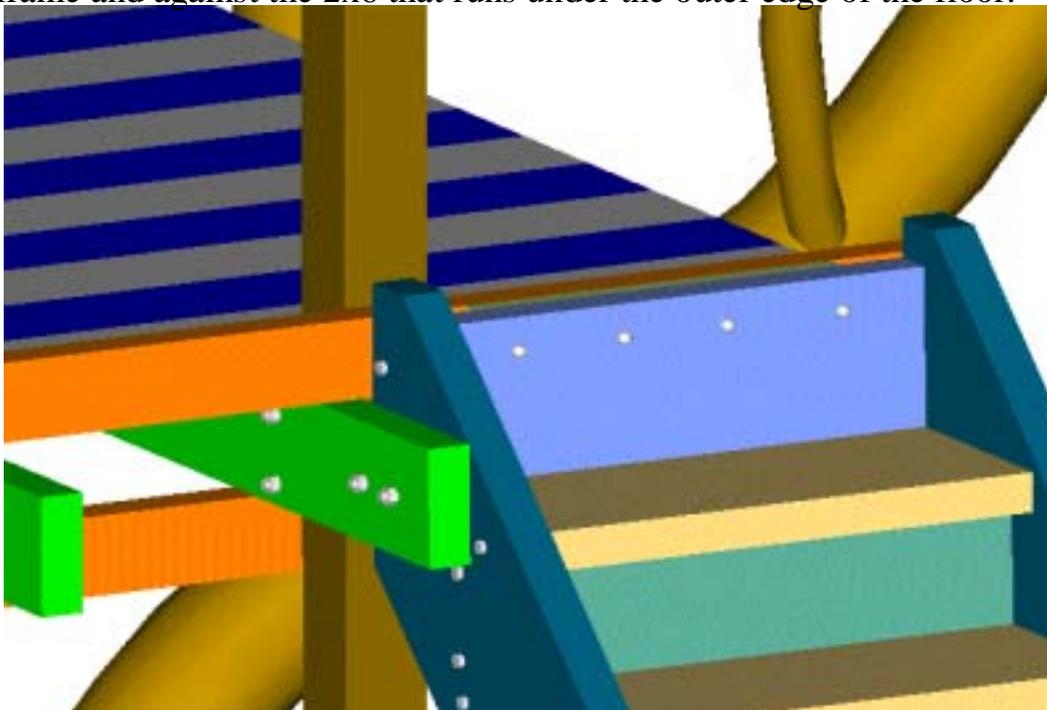
**Standard stair step  
14 needed**



**C.A.D. Twenty**

Install the bottom step first to stabilize the 2x12 runners and complete the lower frame of the stairway. As shown in **C.A.D Twenty**, the steps will be 2x12s, about 2 ft long. The width of the steps is product of the distance between the 4x4 vertical frame of the treehouse and the outer edge of the treehouse floor. This area will be the entrance to your treehouse and it controls the width of your stairs. Cut the steps to match this width after subtracting the thickness of two 2x12 runners.

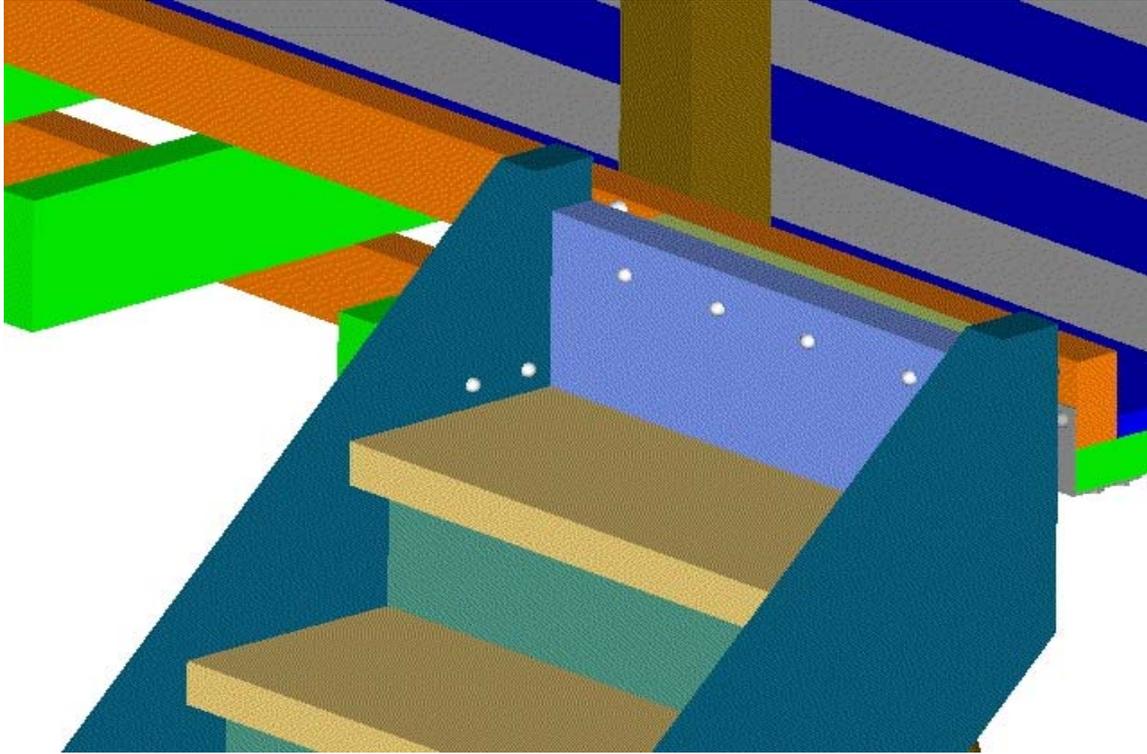
The next picture shows the entrance to the treehouse with the stairway mounted against the outside frame. One of the 2x12 runners is bolted against the side of 2x6 floor beam and over the 2x4 upper frame. The other is mounted against the same 2x4 frame and against the 2x6 that runs under the outer edge of the floor.



**C.A.D. Twenty one**

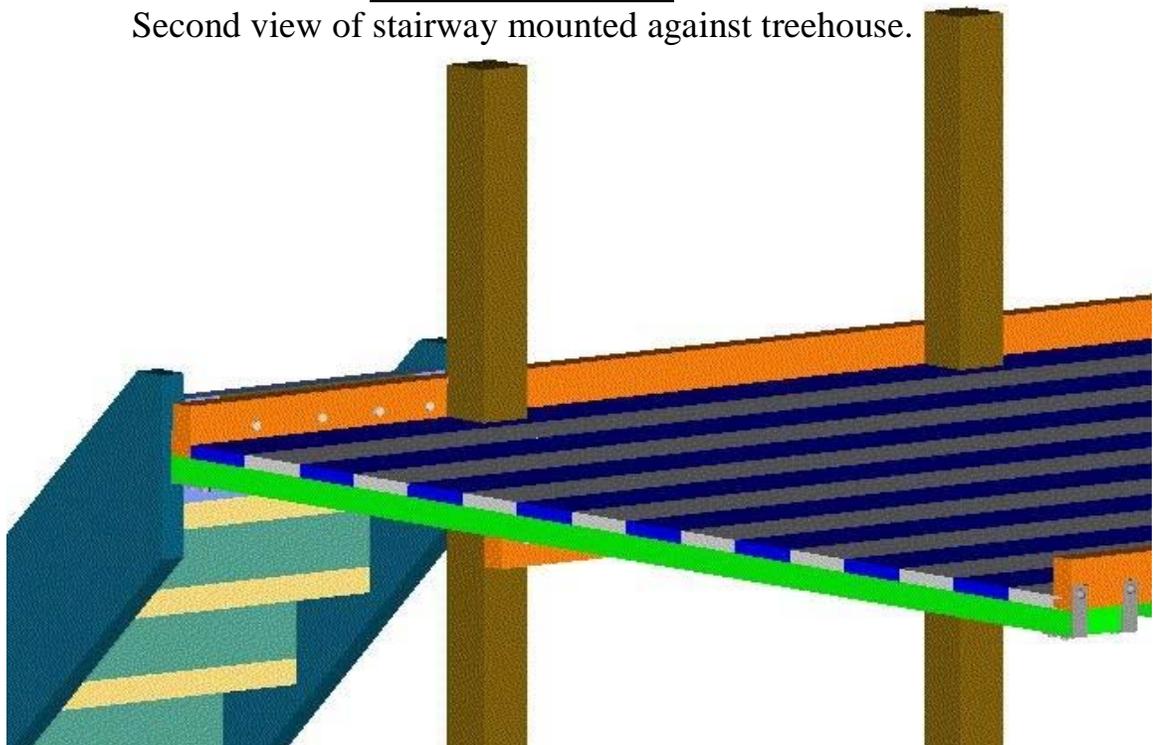
**Look closely at the top edge of the 2x12s. They were trimmed to remove the sharp edge on top. Remove all sharp edges so the children can play safely.**

In this view, the stairway is mounted against the treehouse and the left corner of the 2x12 runner, (in dark blue) is bolted to the 2x6 floor beam, (in green). The top step (in lighter blue) is screwed to the upper orange 2x4. Use 3 inch lag screws for top step mounting. Do not use bolts unless you cover the sharp edges.



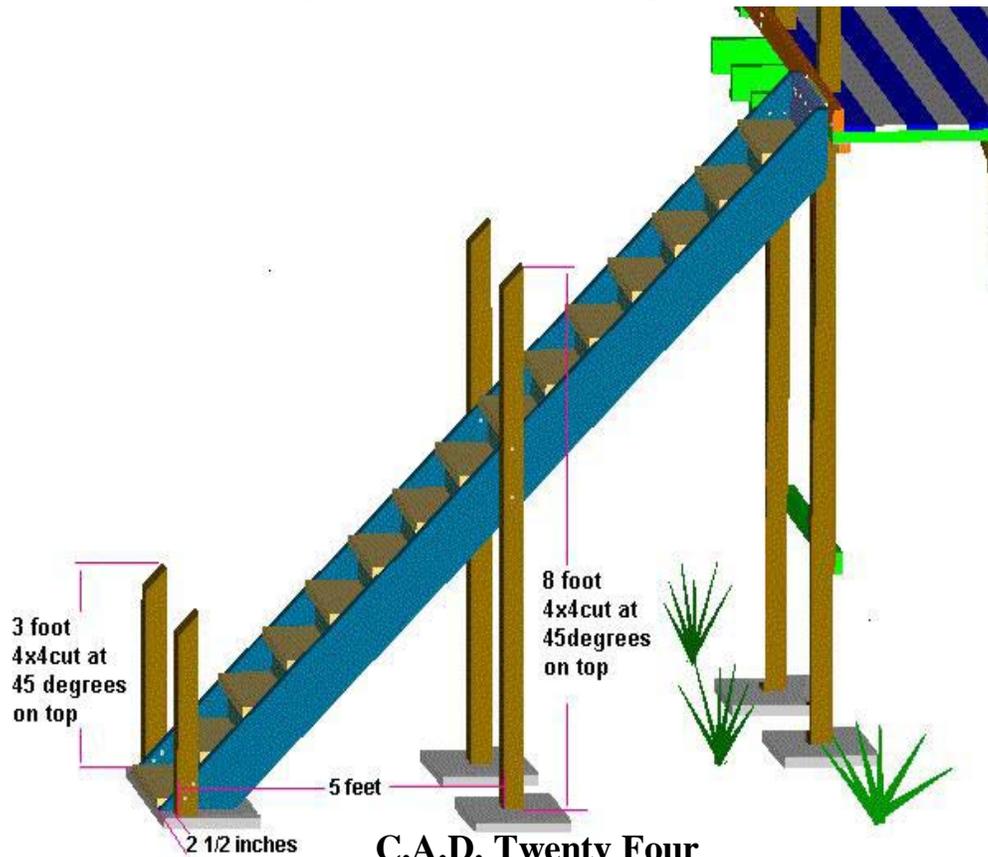
**C.A.D. Twenty two**

Second view of stairway mounted against treehouse.



**C.A.D. Twenty three**

C.A.D. Twenty three is the third view of stairway mounted to the treehouse. If you trim the lower ends of the 2x12 runners so they rest flat on the surface of the ground, you might add 4x4s or some sort of decorative post on each side of the 2x12 runners and cut these posts at the desired height of the hand railings.



However, if you are building on a slope, or where the stairs could be a victim of a washout or mud slide, the 4x4s should be buried at least 18 inches deep in a 12 inch diameter hole.

If you use the 4x4s as footings, set each post in the ground and pour premixed concrete into the hole while you level each post. These 4x4 posts can be set in DRY concrete.

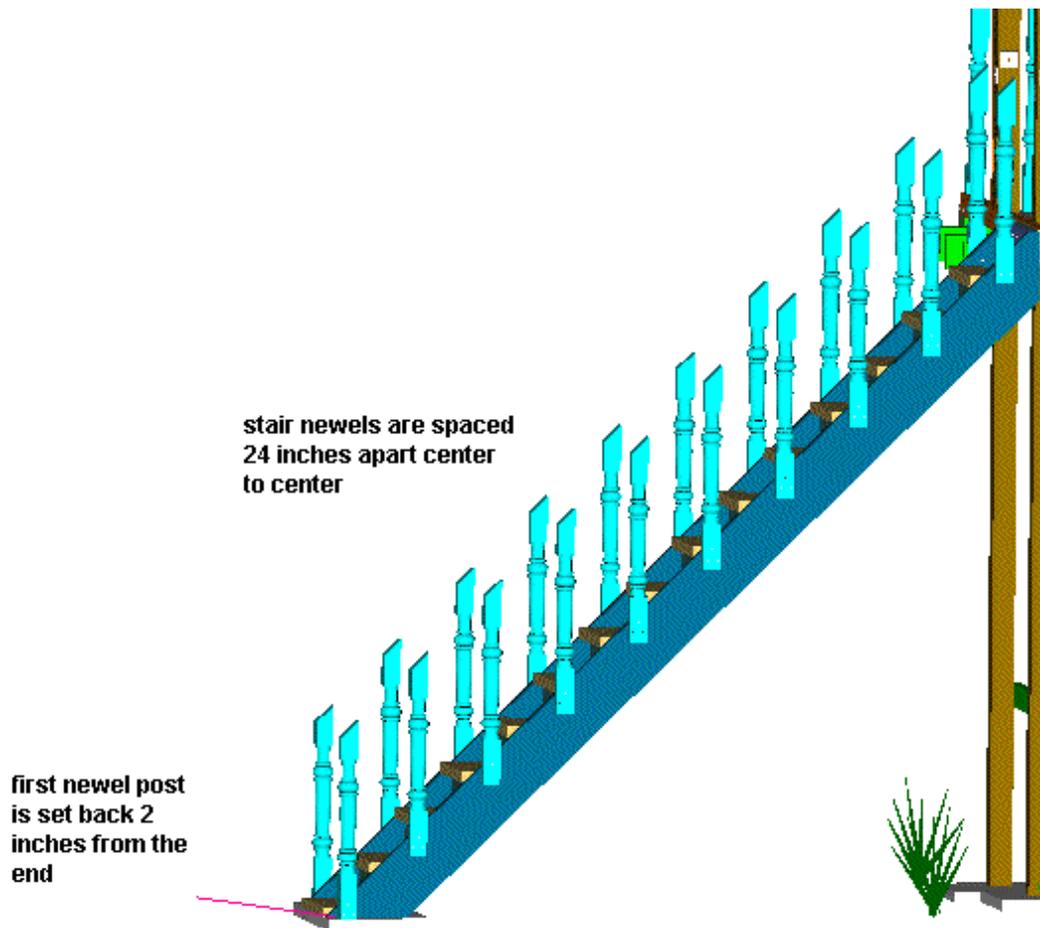
Don't pour the concrete wet. Concrete will absorb the moisture from the ground and will set up over time.

**Obviously, you have many alternatives to gaining access to your treehouse.**

Allow us to list a few.

- (1) You can build a stairway and set the base of the stairs on blocks as shown.
- (2) You can bury the 4x4s in concrete and eliminate the blocks.
- (3) Newel posts can be used rather than 4x4s where stability is not an issue.
- (4) You can purchase a spiral staircase, or
- (5) You can eliminate the stairway altogether and use a removable ladder.

**Your decision is very important because it's a decision on safety.**



### C.A.D. Twenty Five

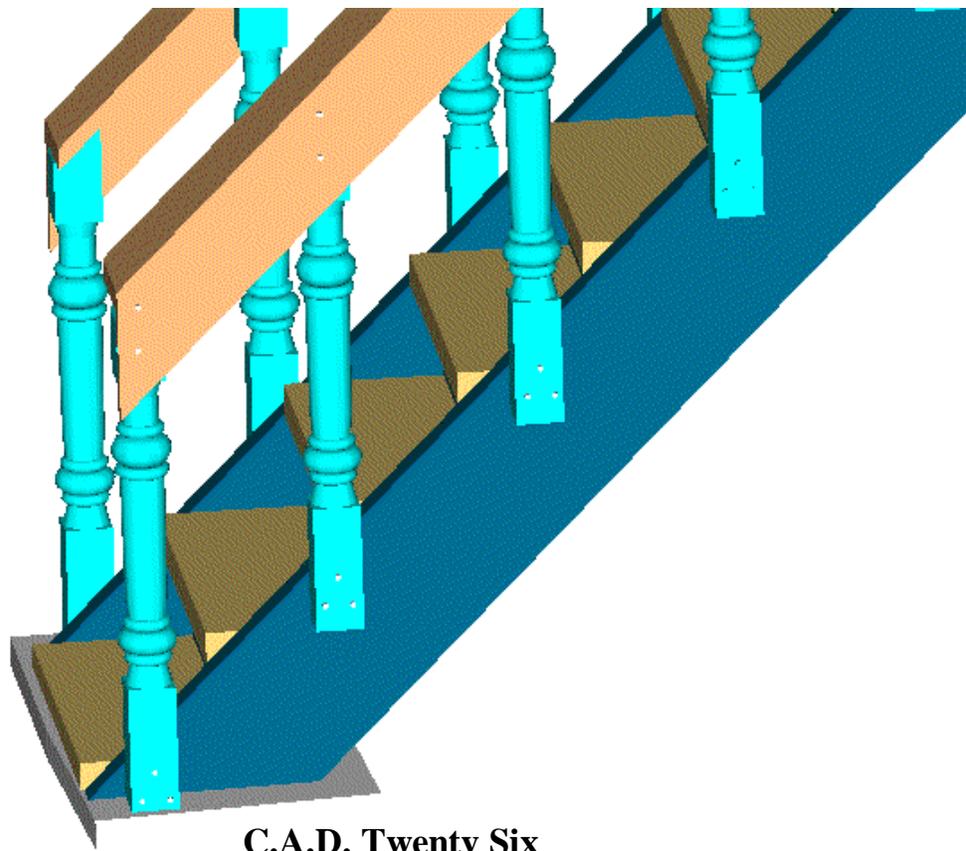
If you choose newel posts as shown here, their spacing and their height (the height of the hand rails) should be carefully considered.

Newel posts should be spaced wide enough for a small person to climb around and through or so close together that a small person can't get stuck between them. Twenty four inches is ok for the "wide" choice and four inches is ok for the narrow choice. **Remember, newel post spacings should be narrower than a small human head or so wide that a child can't get stuck in them.** We strongly suggest the four inch spacing if you have small children. Your insurance company and local government will probably agree.

As shown on the image, these newel posts are fastened to the outside of the 2x12 runners. This is really quite attractive. This is much easier than cutting each post on both ends and building them above the runners within an elevated frame.

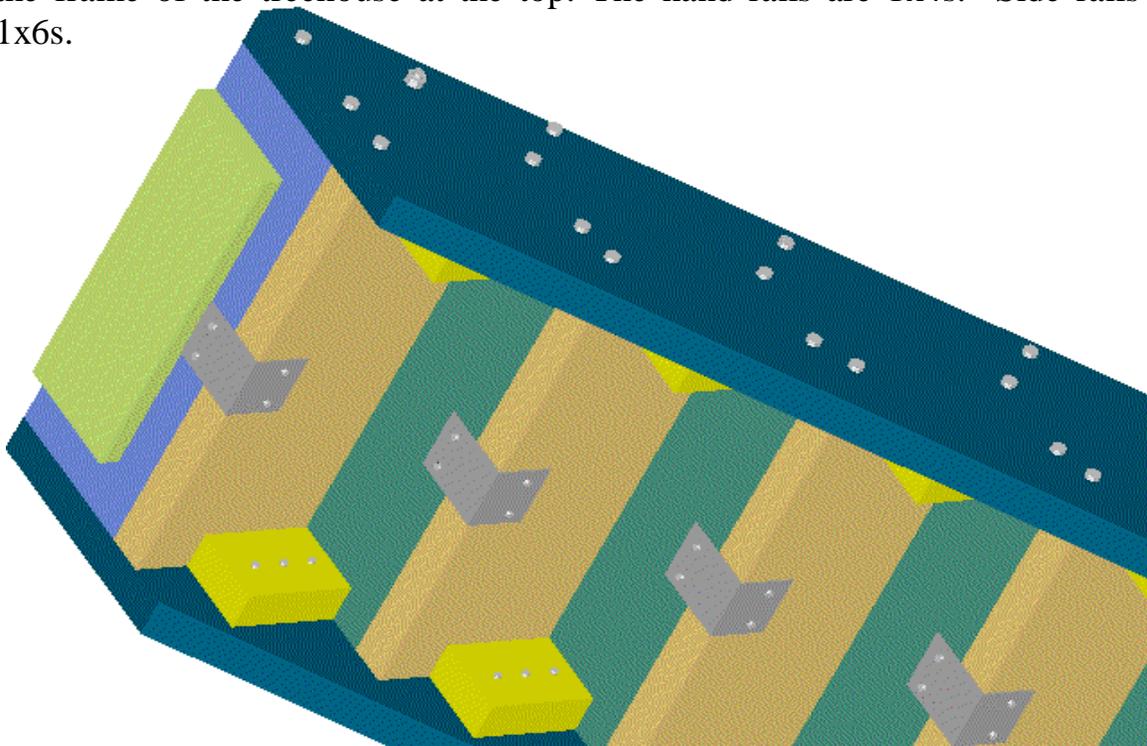
Experience tells us the most stability and strength can be achieved by burying two 4x4s in concrete on each side of the base of the stairs and using newel posts from there to the top of the stairs.

We have shown the newel posts installed out of sequence to provide an pictorial overview, but newel posts should not be installed until after the treehouse walls and roof are completed because the hand rails and side rails must be attached to the frame at the entrance to the treehouse.



### **C.A.D. Twenty Six**

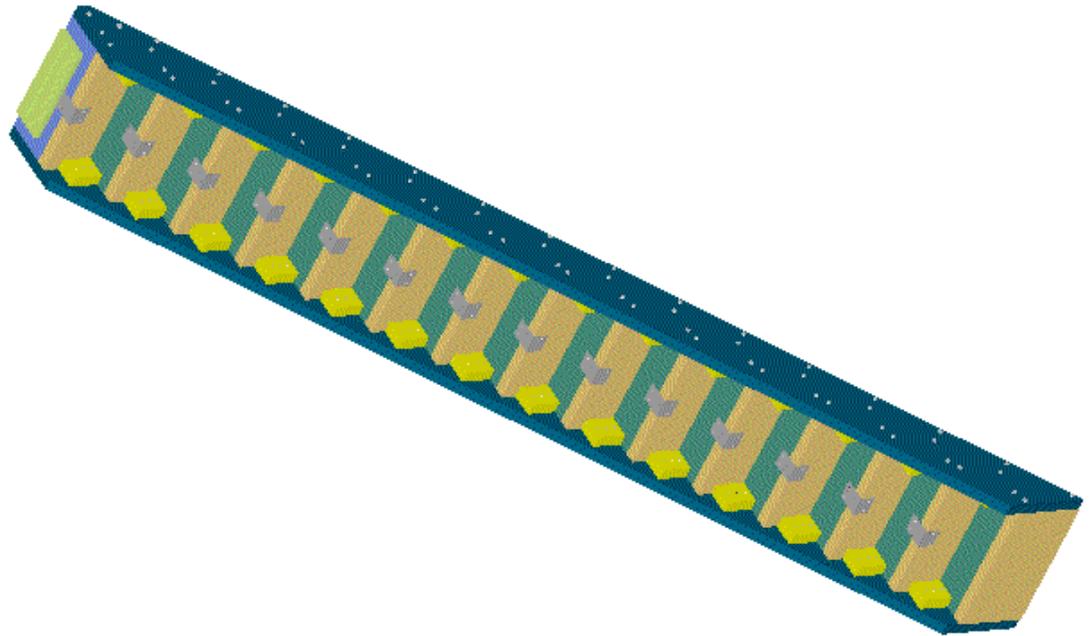
Here is a closer view of our stairs with newel posts all the way. This provides enough strength in common situations because each newel post is screwed into the 2x12 runner with “Deckmate” screws and the railing is tied to the frame of the treehouse at the top. The hand rails are 1x4s. Side rails are 1x6s.



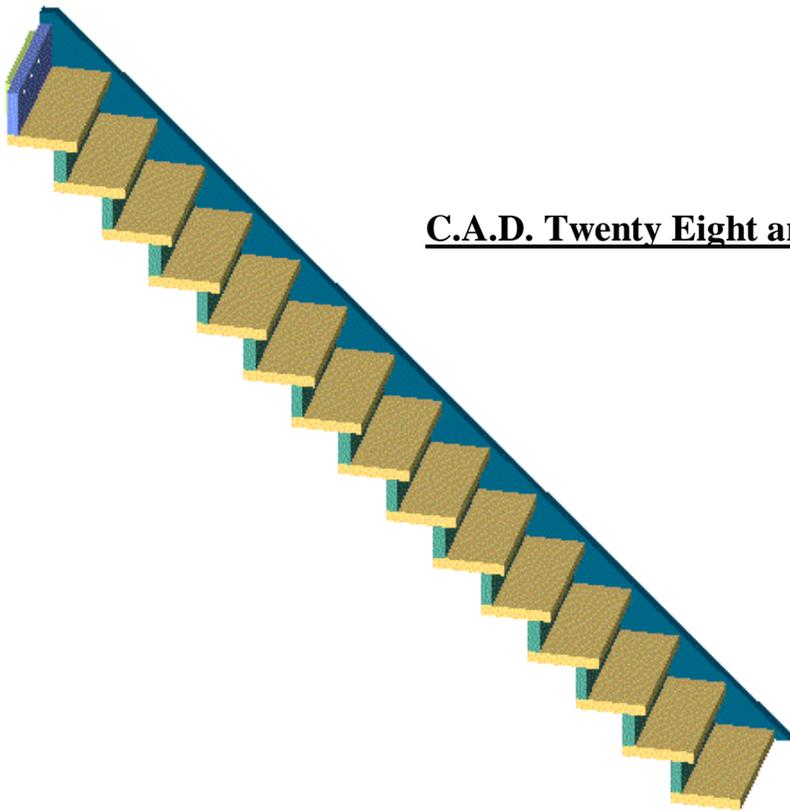
### **C.A.D. Twenty Seven**

C.A.D's. twenty seven through twenty nine show the underside of the stairs from several angles. We found our design to be as strong, or stronger than conventional stairs and much more adaptable.

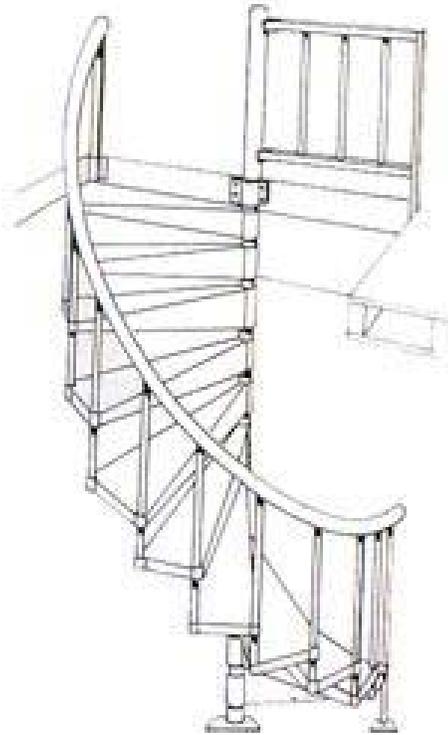
As already shown, our design allows you to establish any incline by installing one step at a time with a level. Install a 2x12 for the step and a 2x6 for the riser. Screw the steps and risers to the 2x12 runners from the outside. Use at least three screws per side for each step and riser. Install a 2x4 block under each side of each step for added support and tie the middle with a right angle brace. This block should be screwed to the runner, the riser, and the step. You can also screw the step to the riser at the leading edge of the step, but this can create slivers/splinters so, use your judgment here.



C.A.D. Twenty Eight and Twenty Nine



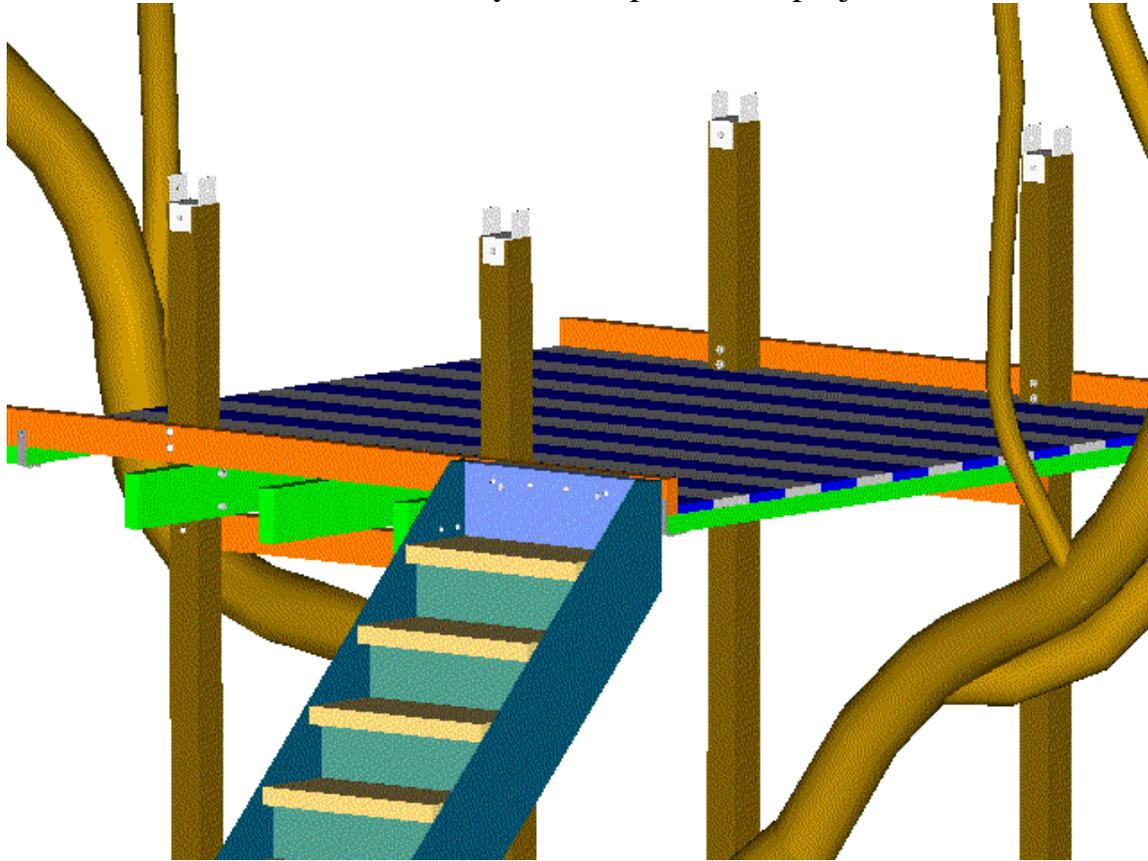
If you have enough money, we suggest spiral staircases. They are absolutely perfect for a treehouse. However, they are not cheap. Prices start at about \$700.00. As previously stated, if you choose to build a spiral staircase instead of a stairway, you can have it custom built by Salter Industries. Contact them at <http://www.salterspiralstair.com/> on the net or call Tom at 1 (800) 368 8280.



The half turn staircase in the picture can adapt to many situations when a traditional spiral or stairway will not fit. According to Salter, the half turn staircase it is not a “code” staircase but, of course, neither is the EZ Treehouse. This is a picture of a conventional Salter staircase.

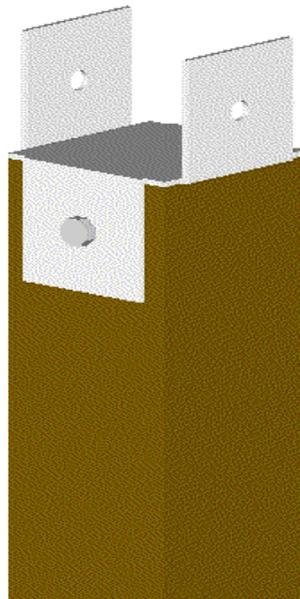


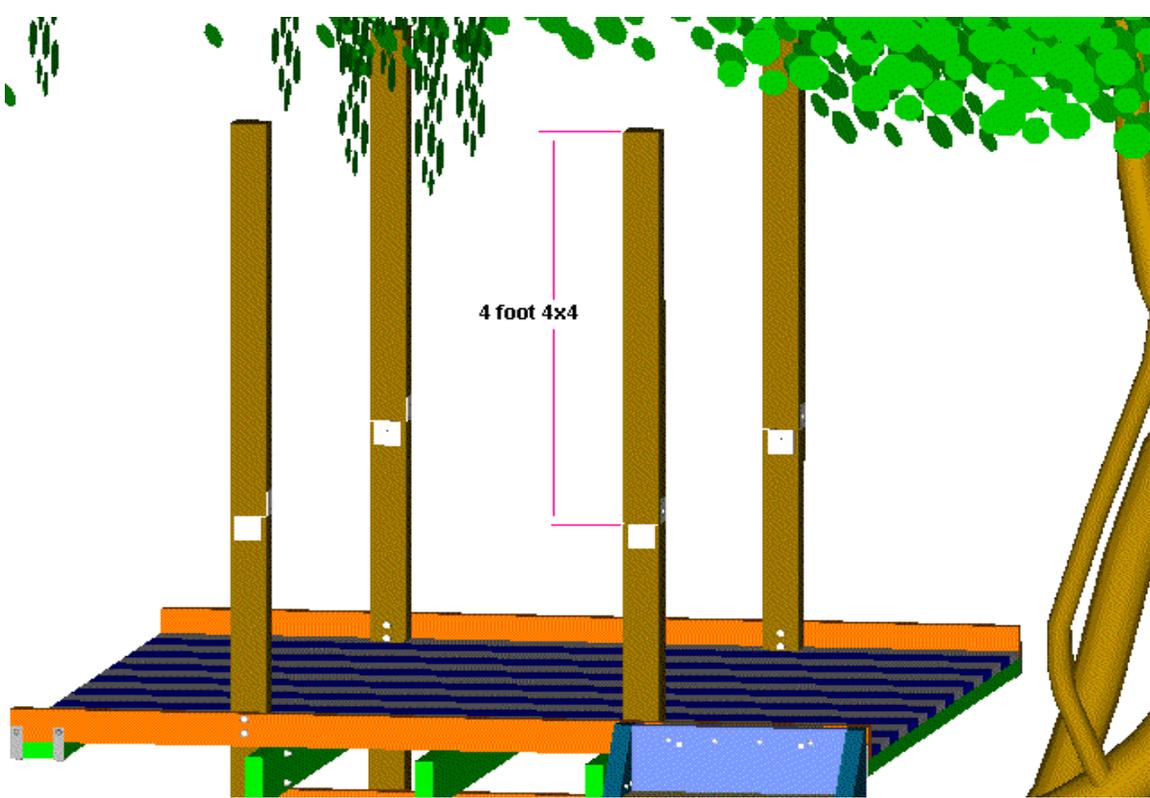
Since the issue of stairs has been addressed, it's time to construct the sides and roof of the treehouse. This is truly the EZ part of the project.



### C.A.D. Thirty and Thirty One

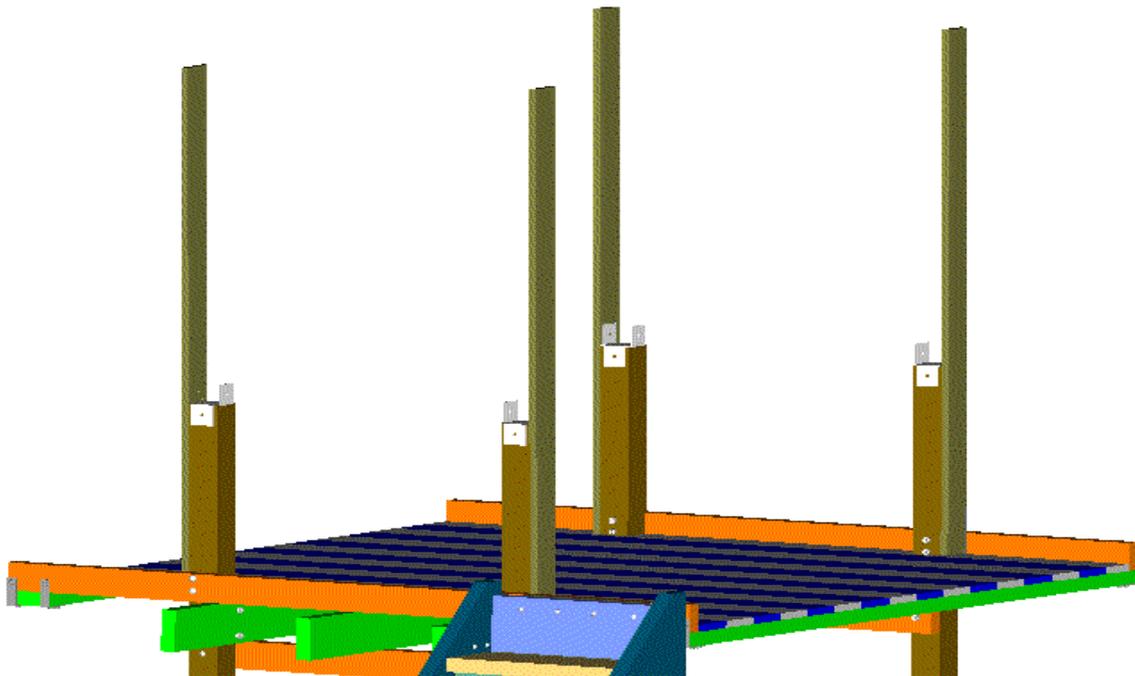
C.A.D. # Thirty and Thirty One show the steel “post cap” that should be screwed or bolted into the tops of the 4x4s. Use lag screws or, drill a hole through the 4x4 and bolt on the post caps. **If you use bolts, use smooth head carriage bolts and install them with the bolt facing the outside of the treehouse to prevent injury.**





### **C.A.D. Thirty Two**

You can now set wall height by adding length above the post caps. We added 4ft. Since the 4x4s already extended 2 ft above the floor, we ended up with a side wall of about six feet. Before adding the extra length, screw a 1x4 to the lower 4x4s as shown. Then, bolt on the extensions and finally screw the upper part of the 1x4 to the 4x4 extensions while correcting for square and level. This is also a good way to stabilize the joint and, as you will see, it adds a finished look to the outside corners of the frame.



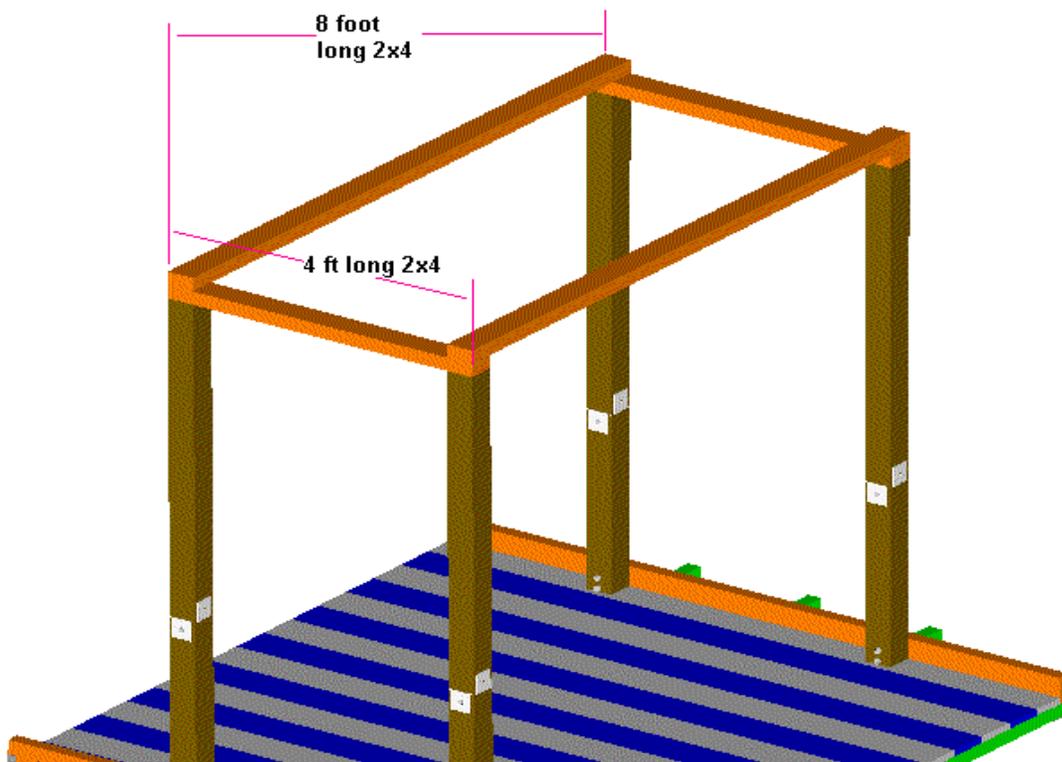
### **C.A.D. Thirty Two (a)**

At this stage, the treehouse begins to fit together like a set of children's building blocks.

The 2x4s added in **C.A.D. Thirty Three** (below), screw on top of the 4x4s frames with ease. **The 8ft 2x4s must be attached over the 4ft 2x4s so the rafters can rest on a level surface.** You will be tempted to pull the 4x4s frames around to match the length of the 2x4s. Don't do it. Instead, get the 4x4 frame square and vertical by following our instructions surrounding **C.A.D. Thirty Two (a).** You must get all surfaces square and level before you attach these 2x4s so your walls and roof line will be square and level.

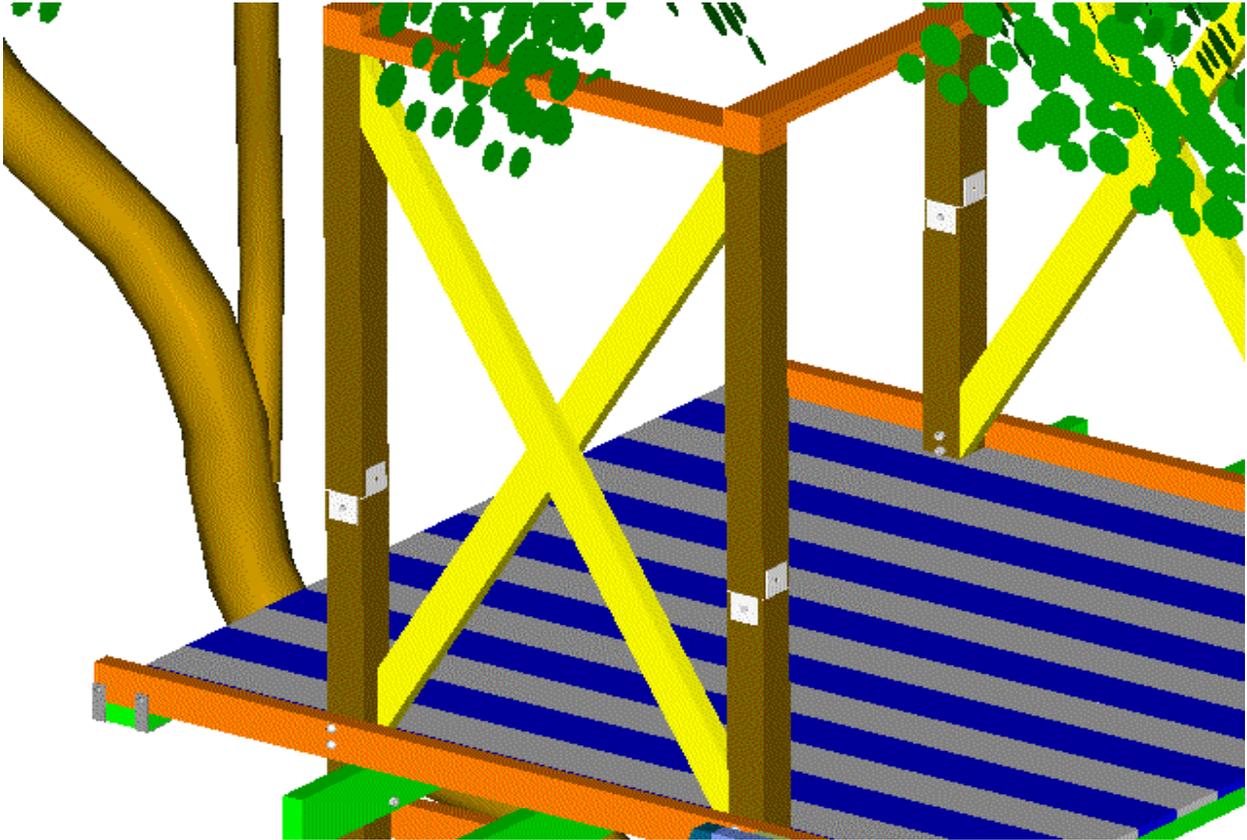
You will need three 8 ft long 2x4s to connect the top of the 4x4 frames. Cut one of these 2x4s in half and use the two pieces for the 4ft 'widths'. Use the other two 8ft 2x4s for the "lengths".

You may need to trim the 2x4s to length or even use longer lengths, depending upon the exact size of your treehouse frame.



### **C.A.D. Thirty Three**

With this step complete, it's time to stop and measure again. Use the 3-4-5 method to square the roof line. Use a level to make sure the roof line is flat. Any mistake here will be magnified in the finished product. If anything is out of "plum", fix it NOW!



#### **C.A.D. Thirty Four**

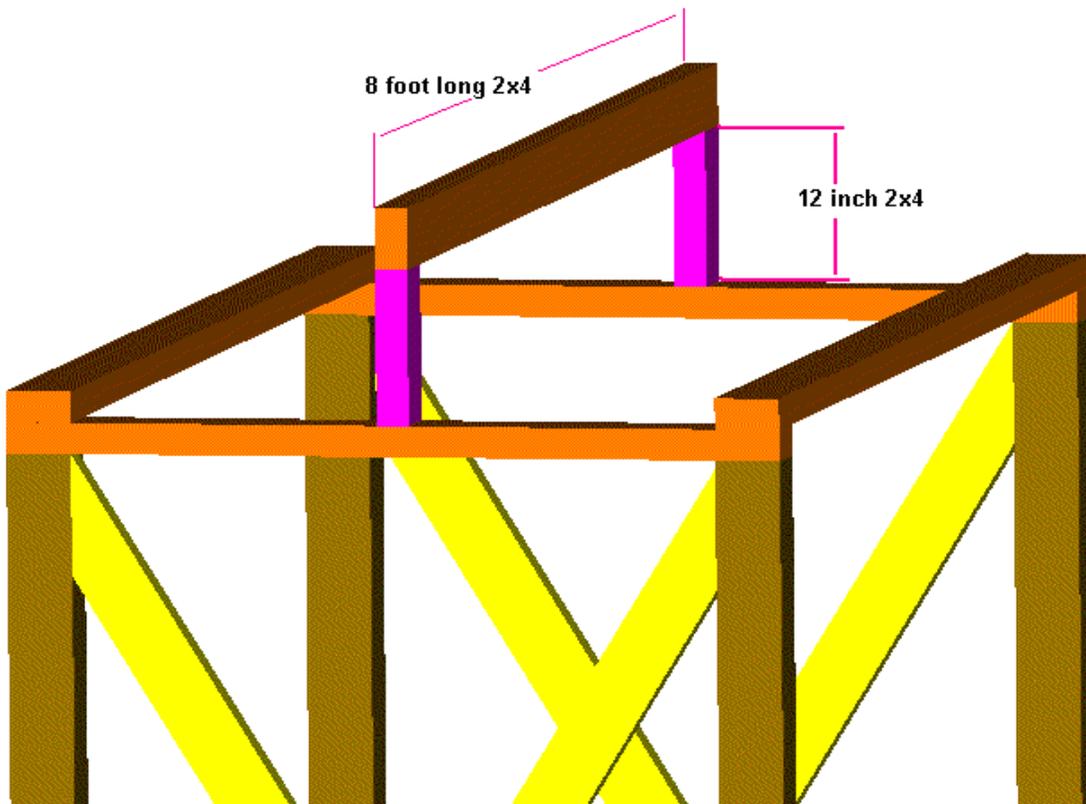
The next picture shows the **X** braces in the side wall of our treehouse. Since the **X** braces **equal** the thickness of each 4x4, it is not necessary to cut a notch in the intersecting point of the 2x4s that make up the **X**. Instead, cut the 2x4s larger than the **X** shape shown.

Six foot high walls with four foot wide **H** frames result in 80 inch long **X** legs. It is not necessary for the top of the **X** to reach to the top of the 4x4s. Shorter **X** braces will work also.

Next, drill a hole thru the 2x4s where they intersect in the middle to form the **X**. Install a carriage bolt through the intersection from the inside-out. Place the **X** against the respective **H** frame and draw lines on the **X** to mark your cut where it rests against the 4x4. Make your cut along these lines to insure a perfect fit.

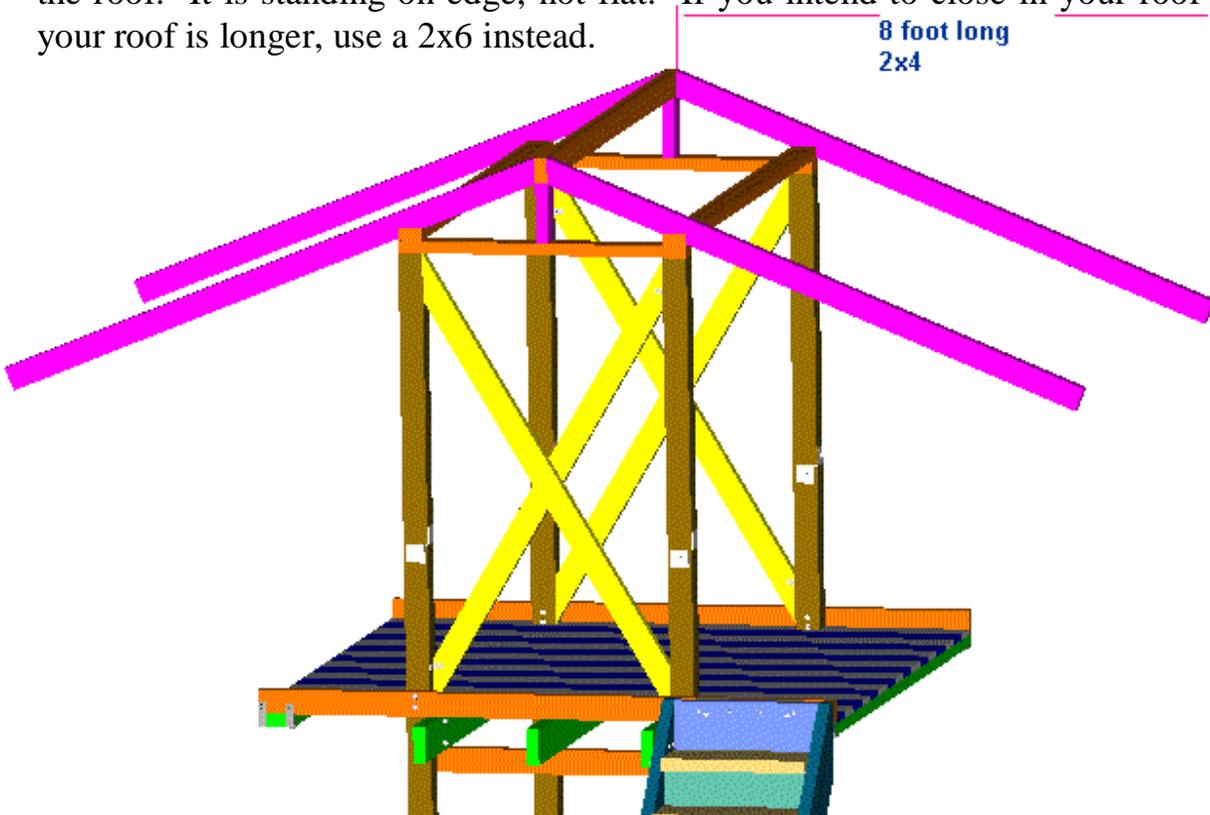
The 4x4s must be square and **PERFECTLY** vertical before you make your cuts on either **X**. Again, the combined thickness of each **X** equals the thickness of each 4x4 so cutting a notch at the intersection is not necessary.

Bolting on **X** frames is logical. After you cut the top and bottom of the **X** at the correct angles, set the **X** in place so the lower corners rest on the floor and wedge against the 4x4s. Since the **X** is has no notch at the intersection, one of the 2x4s will form the outer half of the **X** and the other will form the inner half of the **X**. To compensate, add a small 2x4 block behind lower inner corner of the **X**. Drill and bolt both lower legs of the **X** to the orange 2x4. Bolt them with the smooth side of the bolts facing in. Use Deckmate screws to attach the top sides of the upper **X** to the 4x4s.



**C.A.D. Thirty Five**

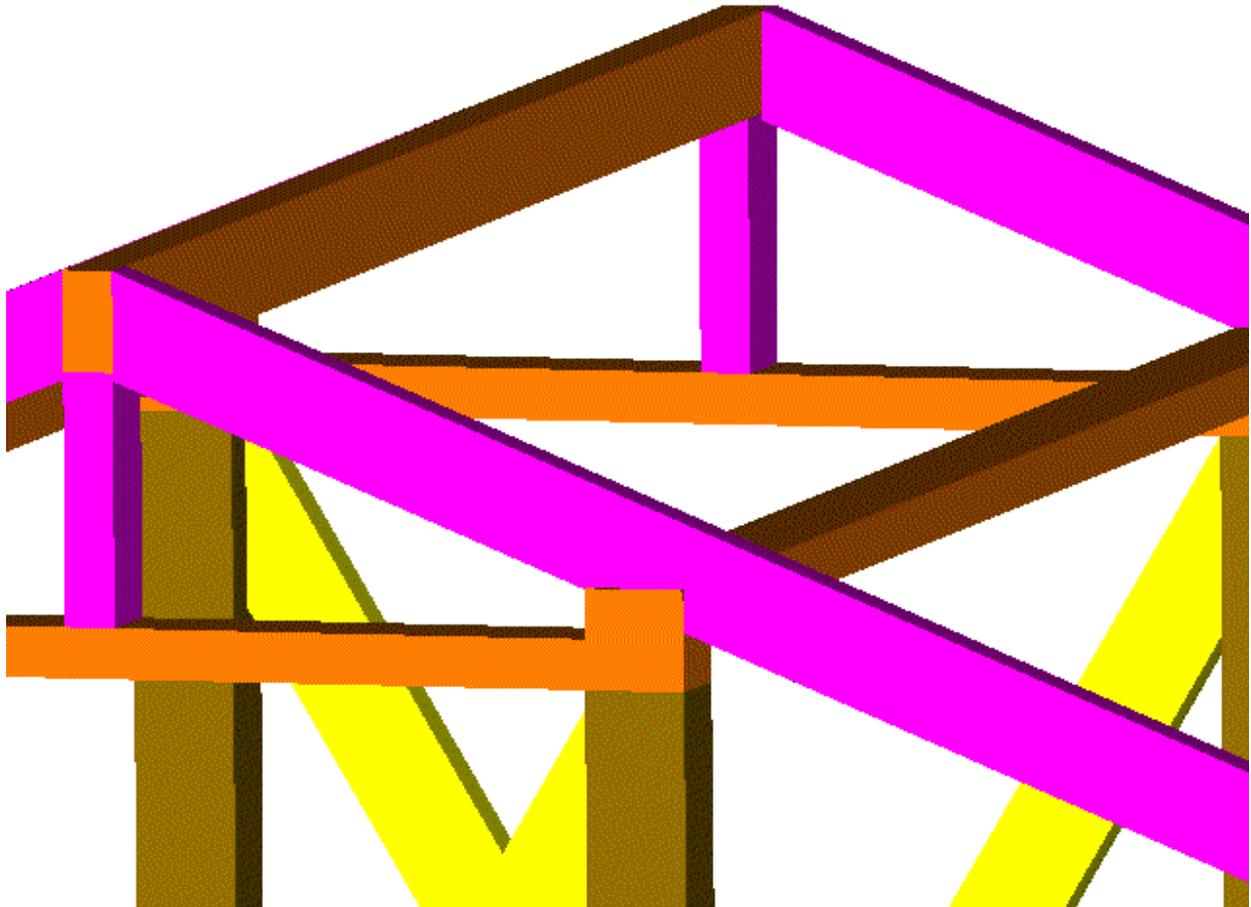
The roof pitch was also easy. We decided on a 10 inch rise because we wanted to copy the roof line of our home. It worked out perfectly. A ten to fourteen inch rise will match most homes, (if you stick to our basic overall size structure). Look closely at the details here. Notice the 2x4 that forms the peak of the roof. It is standing on edge, not flat. If you intend to close in your roof or if your roof is longer, use a 2x6 instead.



**C.A.D. Thirty Six**

This is another view of the roof line. This was a simple and easy way to tie the top of the structure together but you may consider attaching the 2x4s, which create the rectangle where the rafter rest, to the outer-upper edge of the 4x4s, rather than the top of the 4x4s when creating your roof.

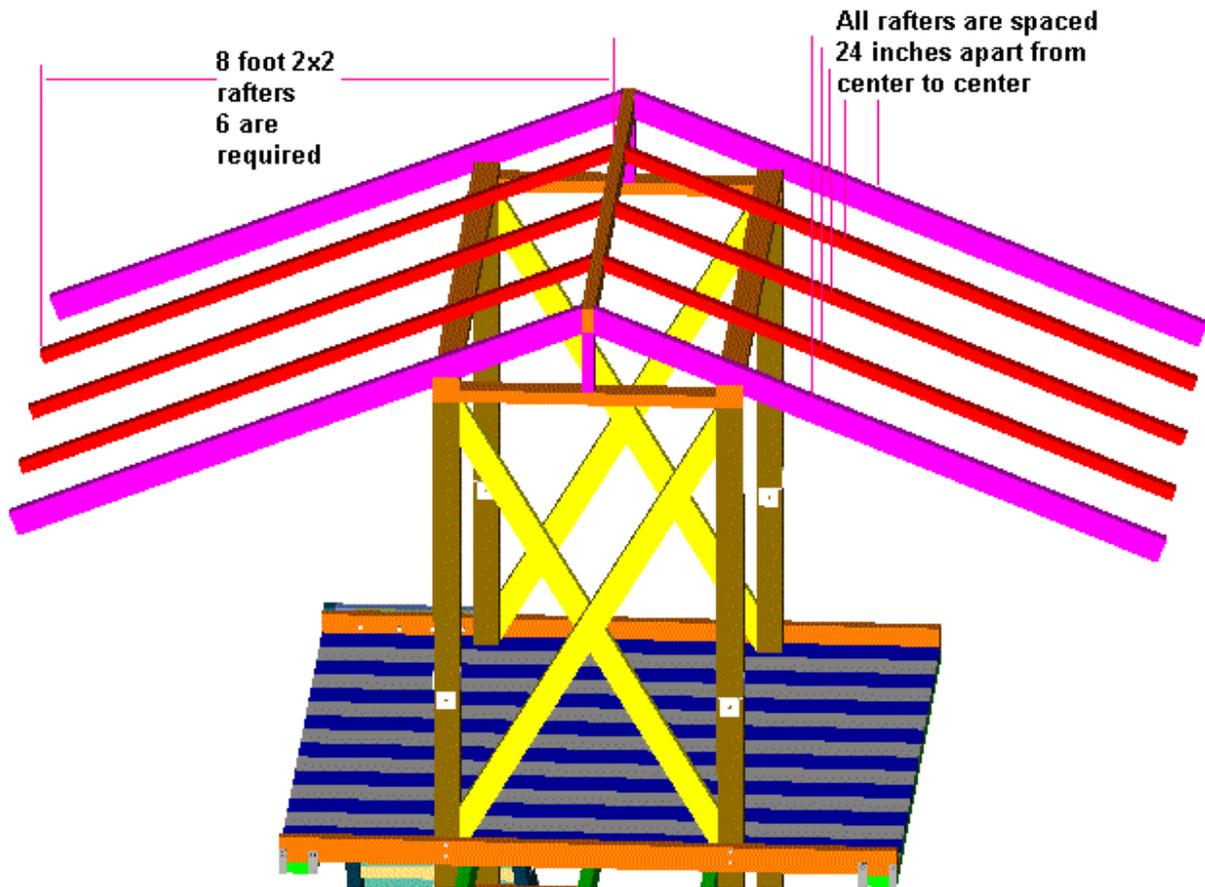
If you choose the side option, you must brace each 2x4 against each 4x4 in both directions to create stability. We chose the top connection because with only six foot walls, the extra braces would be in our way.



### **C.A.D. Thirty Seven**

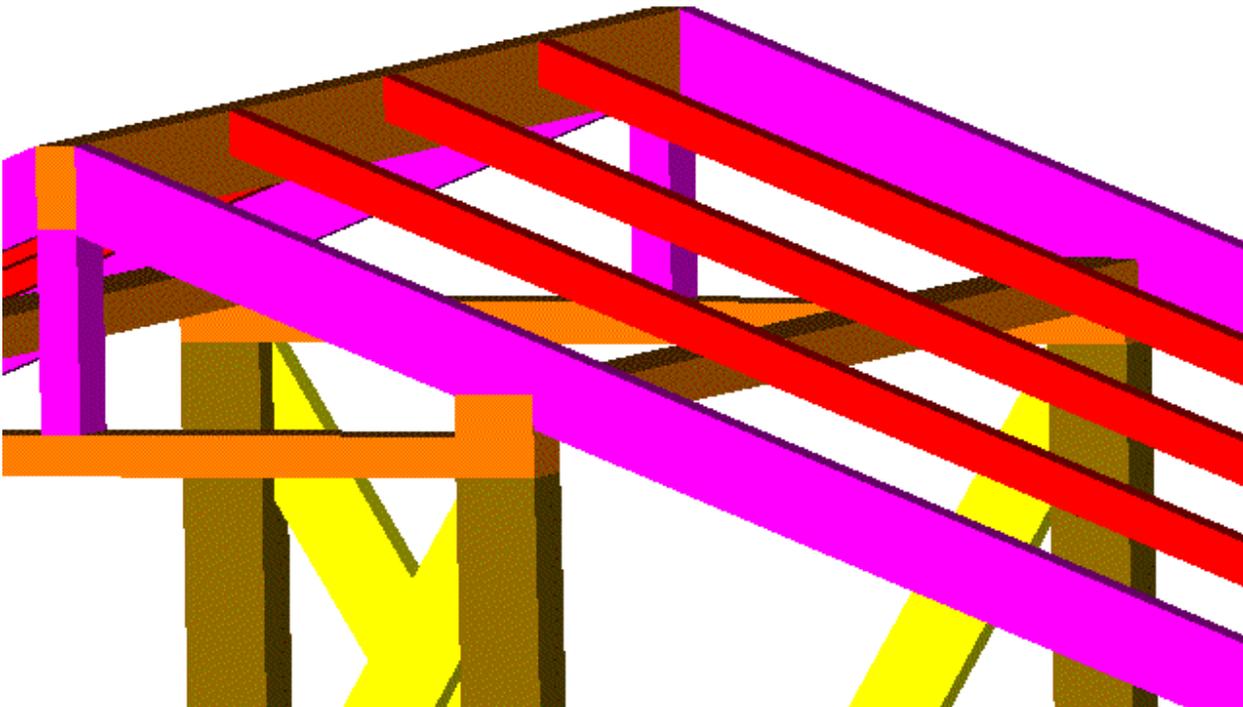
This picture shows a close up of one of the upper corners. See the notch that we cut in the approximate middle of the rafter and the angle we cut in the upper end of the rafter along the top-center ridge. Both of these cuts can be penciled, (drawn) against the side of the rafter before the cut is made. If you want to avoid the notch, you can substitute two right angle braces per corner.

These primary outer rafters must be cut to fit the top ridge beam, which in our case is just another 2x4. You might use 2x6s for rafters and the center ridge beam if you are building a larger treehouse or intend to close in the roof.

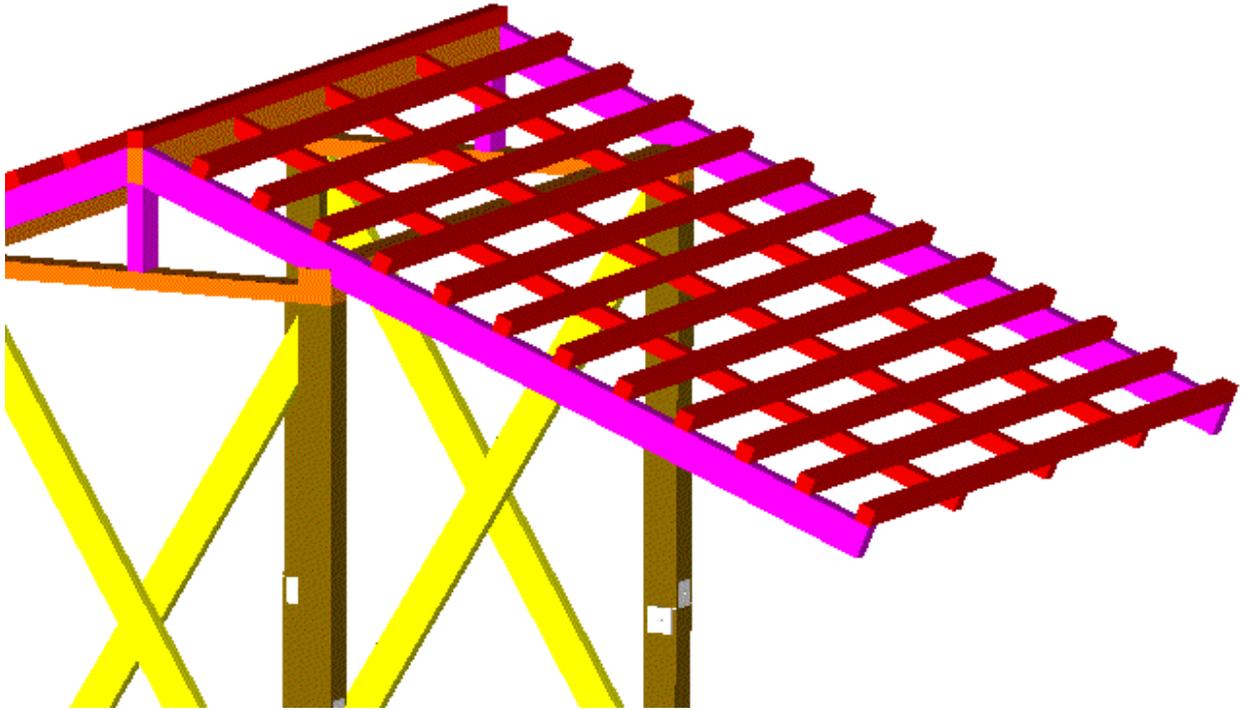


### C.A.D. Thirty Eight

C.A.D Thirty Eight and thirty Nine provide more views of rafter and roof line installation. You will need six 2x4s for this part of the project. Use four as outer corner rafters, one for the ridge beam, and the last one will be cut for risers unless you have two scrap 2x4s of the same/proper length, which is 10 to 14 inches.



### C.A.D. Thirty Nine



### **C.A.D. Forty**

C.A.D. Forty shows the completed trellis roof. As you can see, the rafters, except for the outside corners are all 2x2 trellis. You should use some judgment here. If you choose the full eight foot roof as shown, the 2x2s may need the extra support over time. Consider substituting 2x4s as center rafters, so you would have a 2x4 on the outer edges and a 2x4 in the centers with 2x2s between. You might add a 1x4 along the lower drip line to resemble a finish board because it will add some strength and it will help resist sagging in the center.

The design we show here is our suggestion and it is based on our personal experience. These suggestions, just like the actual size of the treehouse, are suggestions only, and are not carved in stone.

You may find it necessary to adjust all aspects of the roof from the pitch, (the rise) to the length of over hang, to the size of rafters and certainly the spacing between the trellis.

Part of the fun of this project is to explore aspects of your own creativity and the creativity of your children or grandchildren. So, when you get to this phase, be open to suggestions from the kids.

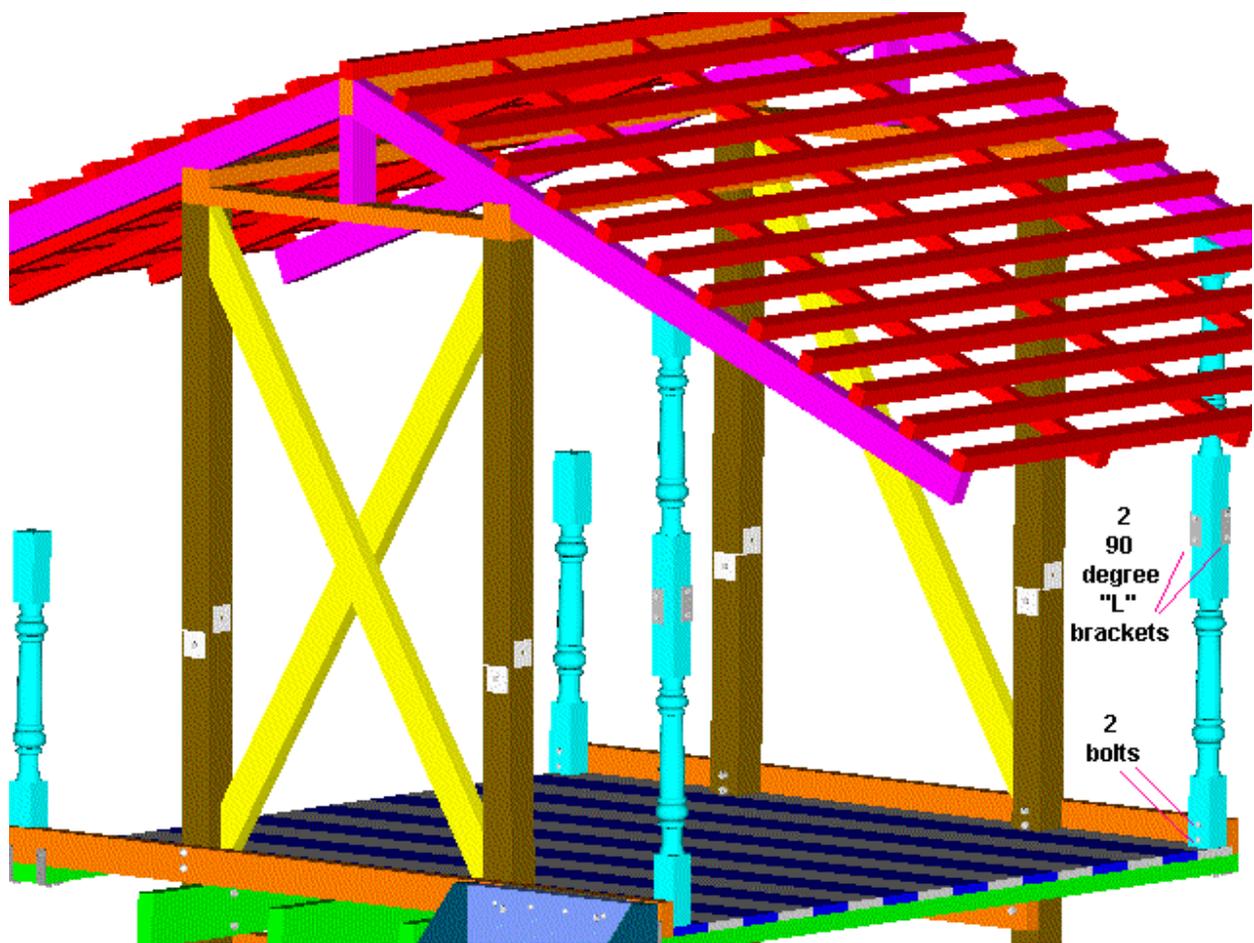
The length, pitch and overhang of the roof will make a tremendous difference as to the “Cave effect’ created. A long roof and overhang offers a “closed in’ sense of place for the children but appear awkward in some settings.



### **C.A.D. Forty One**

This “closed in” effect becomes apparent in C.A.D Forty One. Even with a trellis roof and no newel posts, the tree canopy and the roof combine to offer a real sense of “place”. This is one of the reasons to give careful consideration to the position and height of the treehouse.

Our design offers the needed flexibility to integrate the treehouse into the tree and the surrounding environment. This integration is especially important for adult visitors who will use the treehouse for reading and peaceful reflection.



### C.A.D. Forty Two

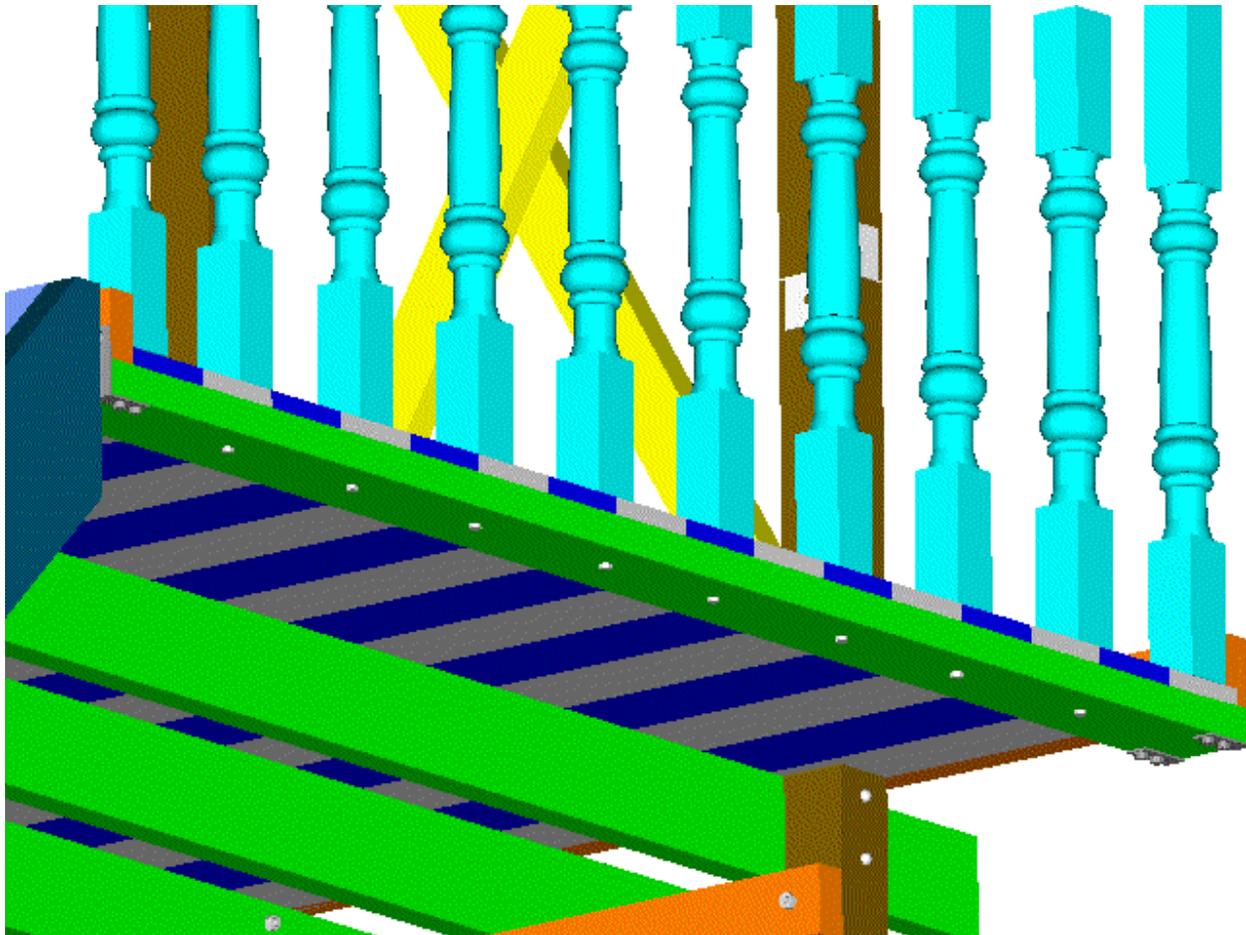
It's now time to install the newel posts, which we freely admit, it not very easy. The rafter supports were created by combining, or actually stacking, two decorative "Newel" posts that are three feet high each. We cut the roof line back on the far side of the treehouse so these newel posts were only needed on the front. The newel posts on the far side became the corner posts for the railing. In our cases, we only needed to "stack" two posts for the front side of the treehouse. If you don't cut your roof back to a shorter over hang, you will need stacked newel posts on every corner.

We used two, right angle braces to join the newel posts and we found them to be as strong, or even stronger than a single post, but much cheaper. You can buy the six foot length, but be ready to pay.

Attaching these Newel posts is definitely a two-person job. We drilled pilot holes about one inch into the base of each newel post. Another hole must be drilled down through the floor and through the outer-edge flat beam (which is a 2x6) at each location of a newel post. Here is a good rule of thumb. The distance between each newel post should be less than the width of a small human head. Four inches is best. You don't want a little person to get stuck between newel posts or fall out of the treehouse because you spaced the newel posts too wide. Local codes govern these spacings in urban areas, but four inches is always safe.

We built our treehouse with a wider newel post spacing but we strongly discourage this practice for families with small children. **Don't try to hold the Newel from above while drilling from below. This can cause you can drill through the foot of the person holding the newel post.**

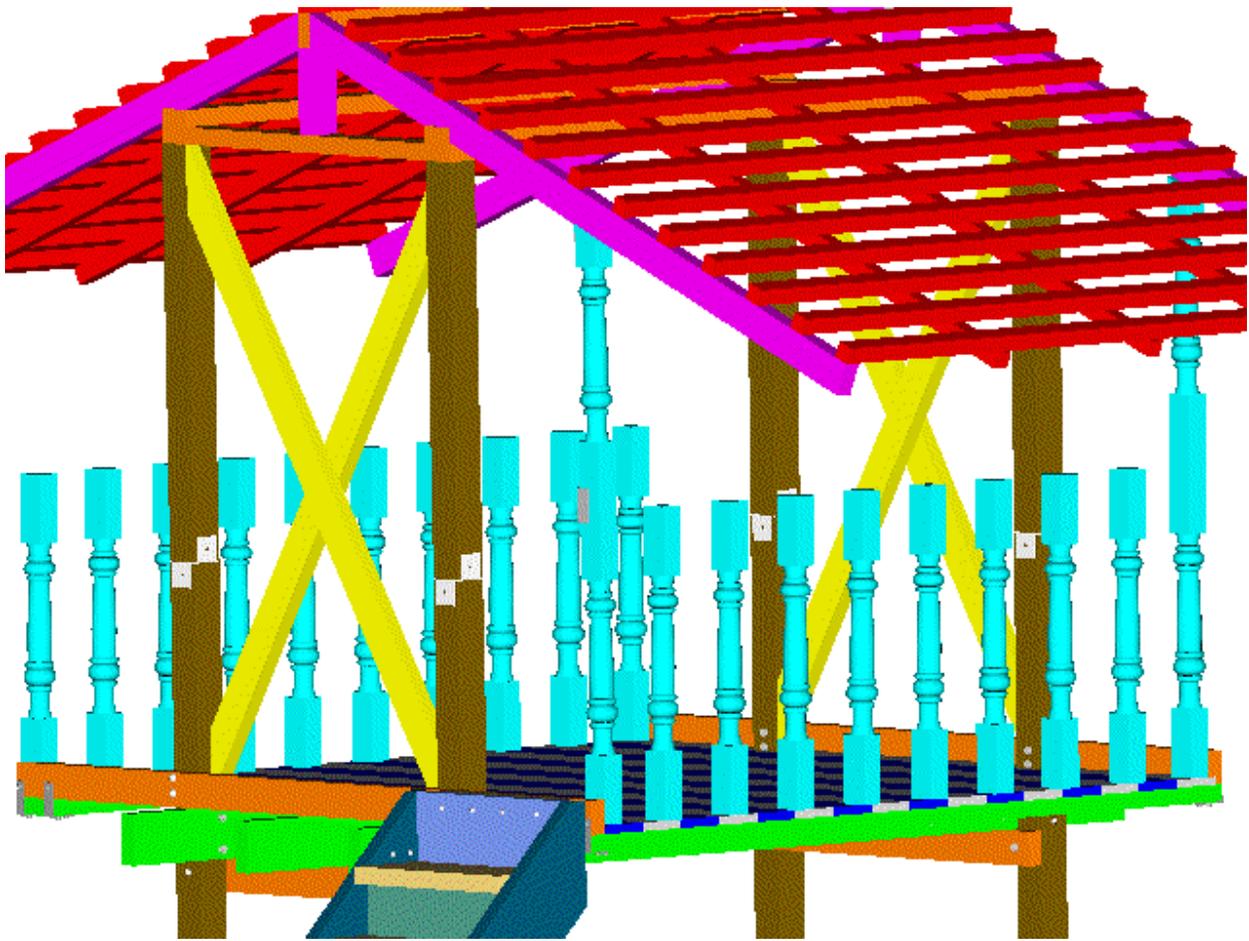
We attached every Newel post with a lag screw and flat washer from under the floor. A lag screw looks like the head of a bolt on one end and the sharp tip of a screw on the other end. It has a hexagon head and looks like an oversized screw. Lag screws are used when only one side of the connection is reachable.



### **C.A.D. Forty Three**

We tried it several ways, but our lag screw design proved to be the best contributor to the stability of the treehouse without adding another 200+lbs of awkward looking bracing. Sure, it took a lot of time and care but it was worth it.

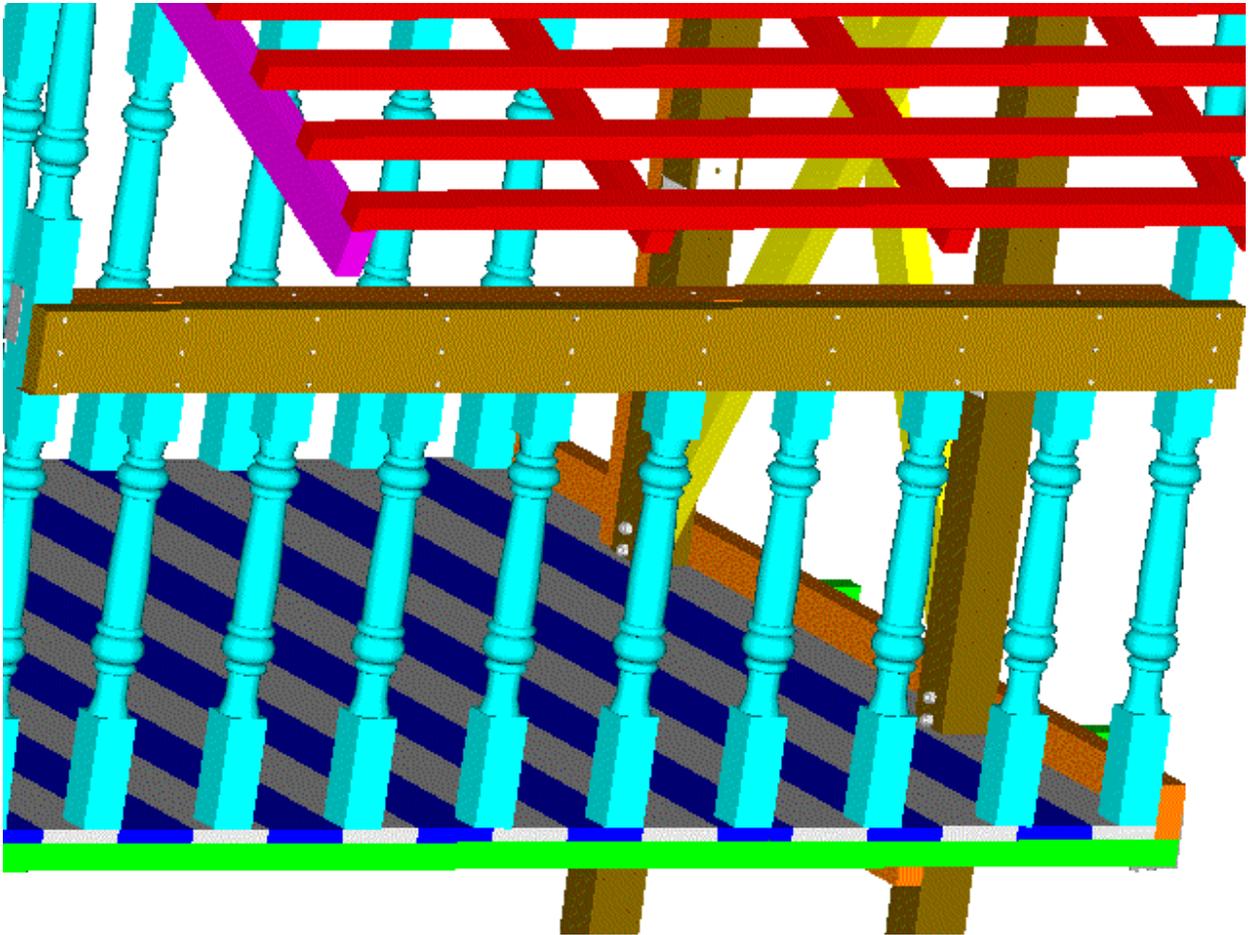
For the record, we tried “toe-nailing” the Newel posts from the upper side and then drilling pilot holes from below (without drilling the pilot hole in the newel post), but it was impossible to keep each post in place, upright, and perpendicular.



#### C.A.D. Forty Four

After locking down the newel posts with lags, we then screwed a 2x4 top railing onto the top surface of the Newel posts with two “Deckmate” screws per post. Then, we screwed the top railings to each other in the corners of the treehouse. This locks the upper and lower outer frame down to the floor and to the newel posts at each post location. This allows several people to safely put pressure on the railings while standing on the outer edge of the treehouse. Your goal here is to create a "waist high" wooden cage.

You may try drilling nail size angular pilot holes into the lower end of the newel posts and then toe-nail each post to the floor before installing the lag screw from the underside, but only use toe-nailing to stabilize each post. **Do not toe-nail the newel posts and consider them installed.**



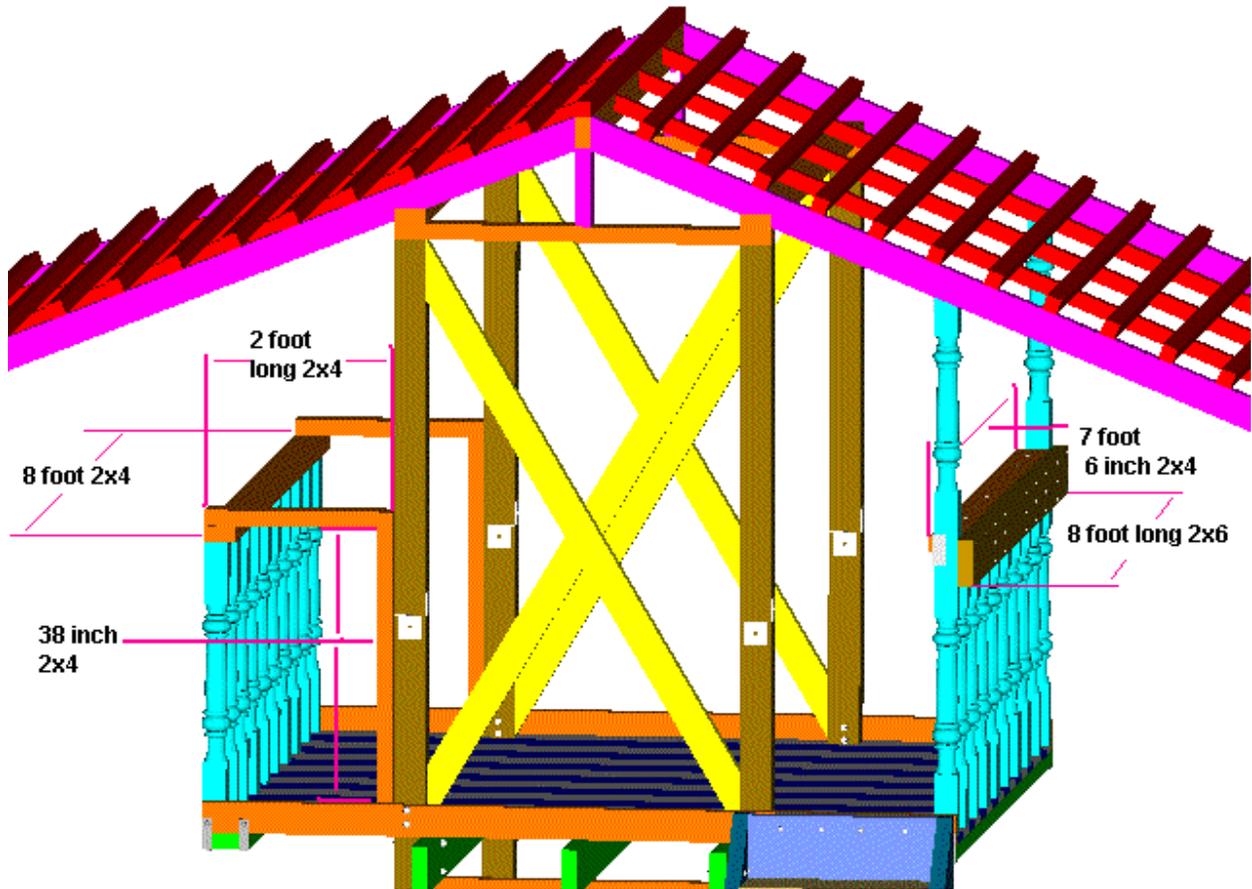
### **C.A.D. Forty Five**

This is a view of the newel posts with top railing attached. Railings are screwed onto the top and sides of the newel posts.

Use a 2x4s for the top railing and 1x4s or 1x6s for the side railings. Attach as shown with Deckmate screws.

The 2x4 top railing will need to be notched or cut back to match the thickness of the newel post. Otherwise, the edges of the top railing adjacent to the corner newel posts will stick out and have sharp exposed corners. You can saw away these sharp corners, but this may be less attractive.

If you find some 1x4 and 2x4 materials in the 'damaged bin' of your building materials store, you can put the railing together from available pieces.



### C.A.D. Forty Six

In this picture, we added 2x4 railings over the newel posts at the “back side” corners, (the left side of this picture).

We also added 2x4s between the corner newel posts and the 4x4 frames at each back corner.

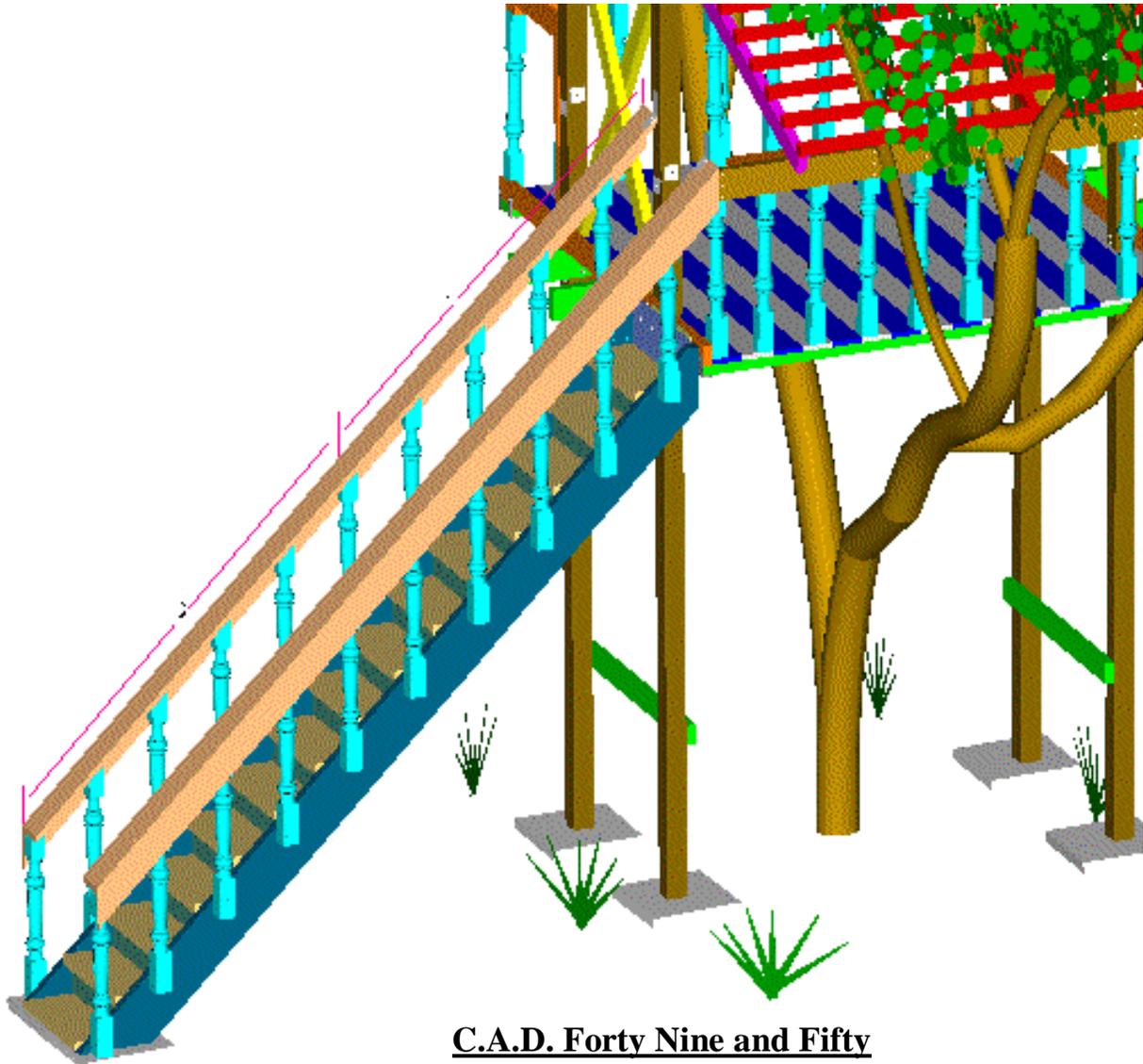
All this can easily adapt to your situation. If you screwed vertical 1x4s to the outside edge of the 4x4s above the floor, which we suggested as a way to help square the walls seen at C.A.D. Thirty Two (a), then this measurement will be different.

In the next image we show the privacy fence installed. These are standard 4ft x 8ft sections of fencing with a  $\wedge$  cut at the top to match the angle of the roof.

You may want to substitute lattice which has the same general appearance but is much lighter and less costly.

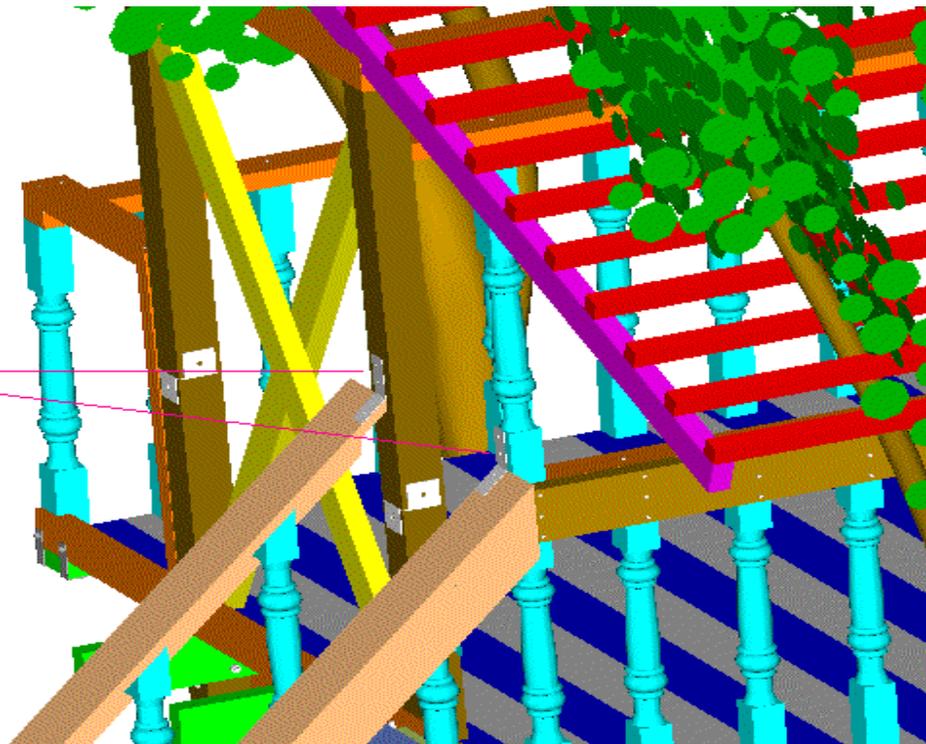
As always, use Deckmate screws to attach the fencing.





**C.A.D. Forty Nine and Fifty**

Steel brackets  
used to anchor  
rails to frame



In C.A.D. images forty seven through fifty, we attach the newel posts to the sides of the stair runners with Deckmate screws and secure them at the top with more screws and metal braces as shown.

We used 2x4s for the top railing and 1x6s for the side railing. Use something wider if you like, but most importantly, make it strong so the kids can climb on it and hang off it when you are not looking!

When you finish this treehouse, or one inspired by our combined visions, will have a real prize. However, your greatest prize will be the boundless love and appreciation of the children or grandchildren in your life.



Have fun and be careful!