

# Construction Manual for Paramount Log Homes

## General Considerations

Welcome to the adventure of log home construction. Building with logs was the traditional form of construction used on the American frontier, and has been employed by every culture around the world whenever the resources have been available. While things have changed over the centuries, log homes remain some of the most popular, safe, economical, efficient, and easy to build home styles around. At Paramount Log Homes we believe that anyone with the desire and resources can successfully build their own quality log home and can do so without fancy degrees or years of experience. It is, however, a project that is best suited to individuals who are willing to learn, work hard, sweat, and suffer a few bumps and bruises along the way. And, once you've completed your home and it's ready to be moved into, there's not much that compares to the sense of pride and satisfaction from having a house that you built yourself.

To help make this a successful and positive experience we've put this construction manual together to assist you with your goal of building and owning your own log home. This manual will guide you through the process of building a kit designed by Paramount Log Homes. If you are a novice builder we strongly recommend that you do some additional reading, watch some construction videos and get some experience in order to familiarize yourself with home construction and framing in general. Most libraries and bookstores, as well as many online sites have information on house construction that can help with your understanding of construction techniques not described in this manual. If you have some acquaintances in the construction industry it would be helpful to spend some time with them learning some basic construction techniques. This manual will mostly focus on advance preparations, delivery of the Paramount Log Homes kit (Figure 1), assembling the logs, and tying the other systems into the log walls.

One final thought—log homes are forgiving, and one way or another they will come together and meet your primary criteria, which is to give you four walls and shelter from the elements. However, attention to detail, the quality of workmanship, and your successful implementation of construction techniques will yield improved results with regard to fit and finish, how your log home looks, how energy efficient it is, and what it will appraise for if you should ever decide to sell.



## **Advance Preparations**

Before your **Paramount Log Homes** kit is delivered and you are ready to assemble the log walls, there are a few things you need to do to get ready for it. Let's walk through them.

**Tools.** Log home construction requires some tools that are not typically found in the average person's toolbox. Most of them can easily be either purchased or rented from a local hardware store.

You must have the following at the construction site in order to complete your log kit:

- (2) Heavy duty ½" drills, 1 hole hog if possible (2 would be convenient)
- (1) Chain Saw (14" is adequate, larger is fine)
- (1) long handled sledgehammer (10-12lb)
- (1) generator if utility power is not available
- (1) 4' long level (2' and 8' are also nice)
- (1) hatchet
- (1ea.) 25' and 50' tape measures (100' if diagonal corner to corner measurement is more than 50')
- (2) 8' or taller ladders (must be sturdy)
- (1) chalk line
- (1) 1" auger bit 8" or longer (usually come in 4" or 18" lengths, so get the 18").
- basic hand tools (hammers, screwdrivers, chisels, wrenches, pliers, etc.).
- (1) circular saw.
- (3-5) 30' winch straps and/or Come-Alongs.
- (1) miter/cut off saw.

Nice to have:

- Scaffolding, 1 section 10' tall (required if building a 2-story home).
- boom forklift/telehandler (almost a must—consider renting one for 2 months for logs through roof).
- table saw (almost a must have).
- pneumatic tools: framing nailer, stapler, pin/finish nailer (again, almost a must).
- planer.

**Not tools—but must have available when your log home kit is delivered:**

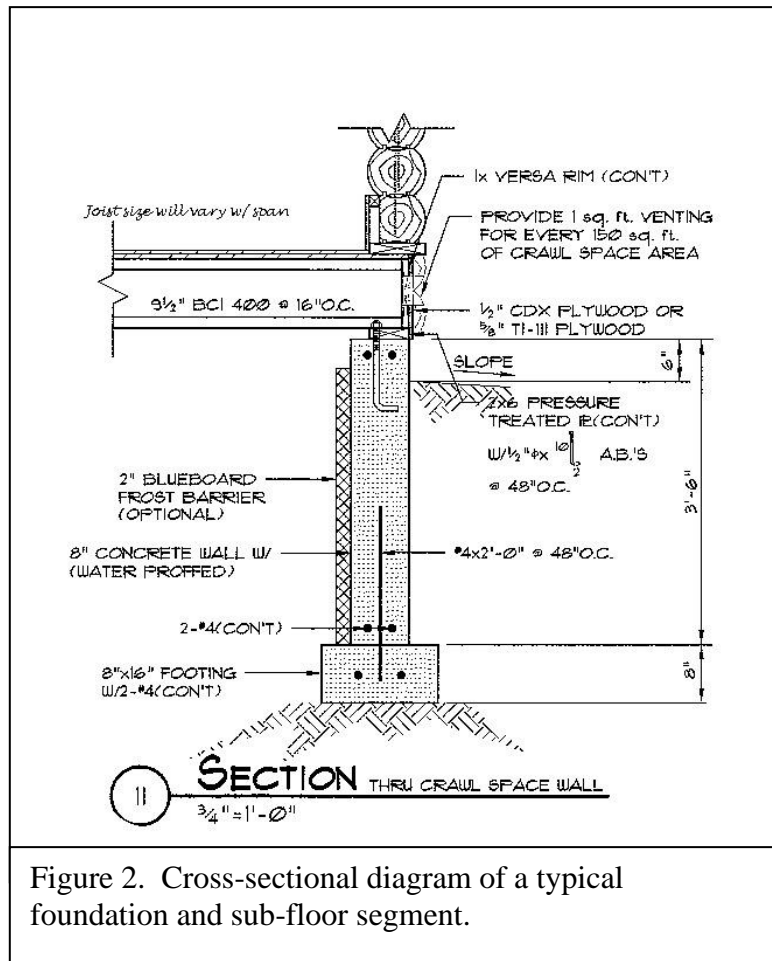
- 10—4"x4"x8' or 6" round posts to set bundles of logs and other construction materials on when unloading with your forklift.

**Foundation and Sub-floor.** Both the foundation and the subfloor should be completed and ready for installation of the log home walls prior to delivery of your log home kit. The only exception is if Paramount Log Homes is supplying the sub-floor materials—in which case these materials will be delivered together with your log home kit. If Paramount Log Homes is delivering the sub-floor materials, it is even more essential that the concrete foundation be completed prior to delivery of the sub-floor materials and your log home kit. There are two reasons why it must be completed:

1. The log bundles are very large and heavy and difficult to move, so either they would be in the way of the foundation work, or it would be necessary to place them so far from the work area that, when it is time to use them, you will find it necessary to move the heavy logs over excessive distances. You can be flexible with this if you have a forklift available for an extended period.
2. It is best to use the logs as soon as possible after they are milled. Logs that sit around for weeks or months tend to start to bow and twist which makes putting them together more difficult. This should be avoided. In addition, if the weather is humid or rainy, moisture can cause your logs to mold or mildew which results in extra effort to sand them down.

The foundation should be built on appropriately sized footings and in accordance with your specific plans (Figure 2 is crawl space).

The sub-floor must be built along the guidelines shown in Figures 2 and 3 and following the specifications provided in your log home plans. Make sure that you include the extra joists on the ends where they are called for. This is very important because log walls are heavy and must be adequately supported. Sub-floor dimensions should be as close as possible to the exterior dimensions of the log walls for everything to fit together properly. Be sure to support your joists with beams or walls as indicated on your plans so your floors don't sag or bounce.



**Scheduling.** Accurate scheduling of each phase of the construction/assembly of your new log home is important. You should make a realistic day-by-day plan for erecting and completing your new log home. The schedule must allow for all activities: clearing and excavating (if required), foundations, sub-floor, assembly of the log walls, assembly of the roof structure, installation of doors and windows, etc. Scheduling and completion of the advance preparations ahead of the delivery of your log home kit will help the whole project run smoother.

Schedule your resources, materials delivery, and labor for each phase. Following delivery of your log home kit try and have your equipment and labor ready to get your shell up as quickly as possible. This does two things:

1. It secures your trusses and logs to avoid any twisting/warping problems.
2. It gives you a secure, weatherproof location for the remainder of your materials.



Figure 3 An almost completed sub-floor, soon to be ready for setting logs.

When your shell is done, you can complete the rest of the project at your convenience; whether it be in a few weeks, months, or years. From the time when your sub-floor is completed and your log home kit is delivered, a 3-person crew should be able to complete the shell in 15 to 20 good working days (this will depend on the home size, the crew's experience and effectiveness, and how carefully the described processes are followed). Again, it is important to get the shell stage completed as quickly as possible.

**Log Delivery Requirements.** Upon delivery of the log home kit to your site you need to do the following to keep them protected:

1. Prior to delivery, prepare a flat, accessible area where the bundles can be off-loaded and set down. This will ensure that the truck can be unloaded as quickly as possible, and additional carrier charges can be avoided.
2. **Do not stack more than one bundle of logs in the middle of your sub-floor.** While this seems to make things more convenient, the floor joists won't support the weight and will break. This will be at great expense and inconvenience, and at risk of injury to yourself and others. Stage the logs in an area close to the building and near a planned doorway so you don't have to carry them far once you start setting them. Be sure to take into account construction site traffic

- patterns so you don't interfere with other activities that might be occurring on the jobsite while the logs are being set.
3. Stack each bundle on 2 4"by4"x8' posts or other supports (the number depends on the length of the bundle) until you're ready to use the materials. **Do not store them directly on the ground.** To do so risks water absorption and dirt and rocks being embedded in them, which will affect how well they fit together. You can stack bundles on top of each other, but try and keep bundles for the lower rows accessible first.
  4. Keep the logs and other materials covered for extended periods of rain (wet logs swell, split, twist, mold, and weigh much more than dry logs). Uncovered is better for dry conditions Don't, however, wrap them too tight or for too long, as that can encourage mold and mildew.
  5. Do not break bundles apart until you are ready for the logs for the next course on the walls. The logs will be bundled together in groups of rows, so you shouldn't need to open the second bundle until you're nearly done with the first, nor the third until you're close to done with the second, etc.
  6. Use caution and good judgement when handling and storing the logs. Avoid climbing on unsecured logs, don't lift logs heavier than you are able (they weigh approximately 12 lbs/foot), don't allow children to play on or near the logs, and be especially careful when working over your head, on ladders, and on scaffolding. 99% of homes are built without accident or serious injury, but a moment's carelessness can result in severe consequences. We really prefer that all of our customers to be in good health to enjoy their log homes.

Now to get started building!

## **Log Assembly Process**

**Background and Basics.** Log assembly is a simple process that is easily learned and soon mastered, but it can cause grief and headaches (as well as back aches) if rushed or not done in accordance with the instructions. Before starting the assembly process please read through the entire instructions a couple of times until you have an understanding of how everything fits together. There are also videos on our website that show most of the steps involved in putting the logs together. If you have questions as the process advances, you can feel free to call us, but please make sure you have made every effort to read and understand the instructions before placing the call. The instructions are broken down into groups of courses that deal with similar issues, but the general methods stay the same from course to course.

Let's clarify a few procedures that you will need to follow closely and concepts you will need to understand before you begin the assembly process:

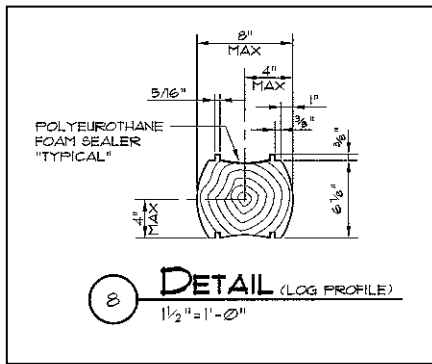
**Logs:** Each log you receive in your package will be labeled on both ends. This label will always have a number and sometimes a letter or letters. The number is the length of the log, and the letter (or letters), if present, has to do with the placement of the log in the wall. If there is no letter on the log, it is a strait log with not special cuts or application

and can be used interchangeably with any log that same length. All logs are cut in 6” increments, and range in length from 1’6” to 16.’ Logs could be cut in lengths longer than 16’ but handling them would be very difficult due to weight so we limit our log lengths to 16’.

The letter codes are as follows:

- R** (or RF) Log with a socket cut for a right corner junction
- L** (or LF) Log with a socket cut for a left corner junction
- B** Base log. Base logs are flat on three sides and make up the entire 1<sup>st</sup> course. The flat side must be installed facing the interior of the home and facilitates the installation of electrical wiring.
- Spec** This is a special cut, and placement will be indicated on the plans. Often it has extra notches to hold beams for lofts or second levels, but can be for a number of different situations.
- S** Indicates a “short tail” for an inside corner or a “short corner”. This is always used in conjunction with another letter or letters (for example RS for right short corner) and on a home model that has “inside” corners; such as in the Montana or Liberty models produced by **Paramount Log Homes**.

Logs have a double set of tongues and grooves running their full length (Figure 4). The tongues are on the top and the grooves are on the bottom of the log. Try and stack your logs “top up” to prevent damage to the tongues as this could prevent the logs from fitting together tightl



During the process of laying out each course of logs, the tongues on top of the logs should be inspected for damage and any damage should be either removed or repaired. If you experience problems with logs fitting together during assembly be sure and check the grooves to make sure no debris has become stuck in this channel. Any rocks or debris that is discovered must be removed in order for the logs to fit and seal properly with the underlying course of logs.

Figure 4. Standard Log detail: flat top with tongues, bottom with grooves and rounded sides. intersecting logs to slide into them (Figure 5). The corner log is the “female” or “pocketed” log. The adjoining log is a standard log (male) that slides into the pocket. To determine if it is a right or left corner, stand on the inside of the home and face the wall in question. If the corner is on the left end

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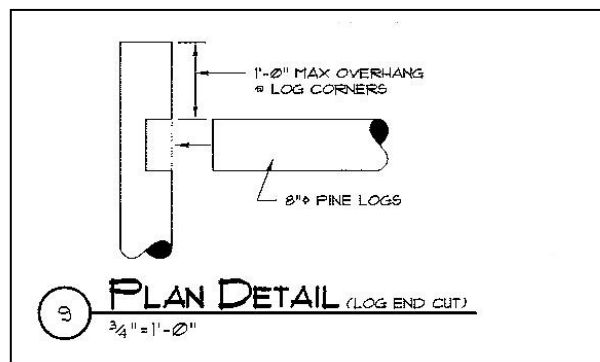


Figure 5. Log corner details: pocket/female log end with overhang to a maximum of 1 foot and male log end.

of the wall, then it is a left corner or “L” log (it seems simple now, but you will likely get confused).

**Foaming.** To help maintain the structure’s air/water/insect-tightness, polyurethane foam is used between each course of logs on the exterior walls. This is a simple process that will make a huge difference in your home’s energy efficiency. An appropriate number of cans of foam spray will be delivered with your log home kit. To “foam” the logs, a bead of foam approximately 1” in diameter must be sprayed under each log before it is lagged to the lower layer. The process is simple: tip back the log that needs the foam (it can be held by someone or propped with a block of wood). Spray the bead of foam, remove the block and lower the log back down. The foam will be compressed and spread by the seating of the top log and the tightening of the lag bolts (this will make more sense when log assembly is described below). It is important for the person who is applying the foam to not to get too far ahead of the people who are installing the lag bolts because the foam sets and hardens in 15-20 minutes. Applying foam even 10 to 15 minutes ahead of the lag bolt installers can make it difficult to move the logs if needed and could prevent them from seating properly, so try not to get too far ahead.

**Pre-drilling.** Each course of logs must be secured to the structure below it. To do this, 10” long screws are used. A 1” diameter hole about ½” deep must be drilled in the log for each screw that will be used for that log. The oversized holes are used to allow the screw to get a little more bite in the lower log and so the screw head doesn’t hold the log above it up. Try not to drill these holes more than an inch deep.

**Lagging.** As stated above, each course of logs needs to be secured to the course beneath it, and this is done with the previously described log screws. These need to be set-

- 6” from a corner.
- every 30-36” along the length of the log.
- 3” from a butt joint on the current course of logs (where two logs “butt” together-not at a corner).
- 6” from a butt joint that occurs on the course below the course currently being set (this is to keep the lower joint from shifting).
- As needed to pull a difficult log down to seat properly

Lagging binds the wall into a single unit and, together with the corners, locks it in the vertical position.

We also supply 6” lag screws that are helpful to manipulate the logs. We use these, when needed, prior to the 10” screw to help position the log prior the permanent log screws. Most of the time the 10’ screws seat the logs and get them in position. Every now and then you’ll find a log with a little twist or curve that needs a little extra work. Use the 6” screw to pin the log at the butt joint or to the row beneath. Drive them at an angle to move them as needed. Once the log is set with 10” screws, remove the 6” screw(s) and use it again as needed.

**Doweling.** At every joint (corner and butt) a “dowel” or wooden peg must be inserted vertically. This is done by drilling a 1” diameter hole vertically through the center of the joint (this is where the third drill is convenient), filling it with spray foam, then driving a short wood block (included in the log home kit) into the hole. The dowel is a 7” long by ¾” square wooden peg. Driving the dowel into the joint forces the foam out into the joint and seals it. This must be done before the next course of logs is set in place. It has two purposes:

1. It prevents leakage of air or water through the joint. This is the most important function.
2. It gives the joint added stability.

**Keeping the walls square.** After the installation of each course of logs, it is important to check the logs to make certain that the wall is straight and vertical. Provided that the first course was set correctly, you can simply use your level to make sure things are going up straight and vertical. Also, check the “squareness” of the building by measuring both sets of diagonal corners after setting the first course and every couple of courses thereafter and compare the distances between opposite corners. If all of the corners of the structure are square (as they should be), these distances will be equal (or quite close) on each course checked. If these distances are not the same, adjustments may need to be made to square the corners over the next few courses in order for the balance of the structure to fit together properly.

**Dimensions.** Note that when measuring dimensions for a log structure the dimensions are based off of the corresponding outside edges of the 6” wide flat surfaces (either top or bottom) of the 8” wide log. Thus when the home is built, the actual outside dimensions are 2” wider than the dimensions that were on the plan. The actual measurements will include an additional 18” if they are taken where the tails stick out on the corners.



## Assembly Instructions

**Verifying dimensions of the foundation and sub-floor.** Don't assume that the foundation and sub-floor were installed correctly—check them! Use the procedures described above to verify the lengths of all of the sides and the accuracy of the corners. The foundation and sub-floor should be checked, also, to ensure that they are flat and level. If there are adjustments to be made, now is the time to make them.

**Installing the drip ledge.** Prior to setting any logs in place, a drip ledge must be installed around the perimeter and on top of the sub-floor. The drip ledge consists of a redwood 2x4 on the outside and a fir 2x4 on the inner side (laid flat to give a combined width of 7") (Figures 6 and 7). Or it can be done with a 2x8 redwood or treated piece of lumber. Provided that the foundation and sub-floor have been built accurately the outside edge of the drip ledge should overhang the rim joist 1½". If measurements are off it will affect how much redwood overhang there is.



When it is done perfectly, the measurements from the outside edge of the redwood on one side (or end) to the outside edge of the redwood on the opposite side (or end) will be 3" greater than the lengths shown on the building plans. These measurements should be precise. They "center" the footprint of the redwood/fir drip ledge over the foundation. Any variance of the above must be compensated by ensuring that there are equal amounts of drip ledge overhand on each side of the sub-floor.

From my experience, it usually seems that the concrete is not quite exactly square. Unless it is really off it's not a big deal. I build my subfloor to match the concrete, then I put the 2x drip ledge on as square as I can make it. Usually this means one corner is a little less than an inch, and another corner is close to 2", and another corner is right at 1 ½". Not a big deal. If the foundation is quite off, it may require some adjustments at the sub-floor level, then more adjustments at the plate level, then more adjustments at the log level, but that is pretty unusual. Most concrete guys hit the mark pretty good.

Because the outside edge of the drip ledge will remain visible after the home is completed, it is important to keep any damaged sides of lumber to the inside of the house to improve the final appearance.



Figure 7. Properly installed drip ledge from another perspective.

When the redwood drip ledge has been properly installed, the fir 2x4 can be installed next to it around the perimeter of the floor. Both the redwood and the fir 2x4s can be **installed using** deck screws or nails. This combined redwood/fir base (their combined width should be 7") is what your log walls will be assembled on, so keep them straight and square. When this base has been completed correctly, the inside edge of the base logs should sit nearly flush with the inside edge of the fir 2x4 (depending on the finished dimensions of the redwood and fir 2x4s). If the base log will need to sit more than 1/4" inside of the fir, leave a gap between the redwood and fir 2x4s when placing the fir 2x4 so the 1<sup>st</sup> course of logs can sit squarely on this drip ledge. This will make it possible for the base logs to sit squarely on the fir and redwood. Foam must be applied under both the redwood and fir 2x4s prior to securing them to the sub-floor. This is to prevent any possibility of air or moisture seepage under the drip ledge. The fir will not be visible in the finished home, so placement of any rough edges is not important. (due to the rising cost of redwood, we've recently switched to treated 2x8, but the principles are the same).

**Reading the Log Plan.** With your log shipment will be your most important document: your log plan. This plan will show each of your walls and what size log fits in each position. Be sure and watch for indications of left and right corner logs so that things fit together correctly. Follow your plan and everything should go smoothly. When looking at the plan realize that the view of your walls is from an exterior standpoint. This will probably need some getting used to, as most of your work will be done from the interior. Just be sure and double check things before securing logs until you feel confident in your plan reading ability.

**Log Course 1 (Base Course).** At this point, you are ready to start setting an actual log. Congratulations! If the preceding actions have been completed, then setting logs as described the next stages should go quickly and you will see good progress at the end of each day.

The first, or base course, is the most important course on your log home. Set it right, and the rest of the walls and roof should go up easier. Set it wrong and you will be doing a lot of work to correct whatever errors were committed.

Mark the outside perimeter for your logs by marking the building corners on the redwood drip ledge then snapping a chalk line from corner to corner. This line will be your guide for the placement of your base row. As you place each log, the outside edge of the bottom of your log should line up around the entire perimeter of your house precisely with this line (with the exception of the tails on the corners). If this does not occur within about 1/16" then check to make sure that they are done correctly. Ultimately the actual logs will determine the dimensions of your base, so if they don't line up exactly with your chalk line try and have a consistent space between your logs and lines on opposite sides.

While looking at the plan for your first wall, find the log or logs that match the length and corner configurations on your diagram. Remember that the logs for the first course will not be rounded on both sides. One side has been cut flat to allow for an electrical "chase". When setting these logs, be sure to have the flat side on the inner side of the wall. You will notice on your plans that for a given wall each row/course of logs alternates longer and shorter. The longer logs are notched with corner pockets and the shorter logs will insert into the pockets of the logs on the adjoining walls. The corner logs will be labeled either right or left based on viewing the inside face of the log from the interior of the home (because the plans show the walls from the exterior R and L will be reversed). When looking at the logs interior face, if the corner is towards the left end of the log it is and will be labeled a left corner log.

As you locate the logs for the first course, proceed around the building, one wall at a time, placing each log in its correct position according to the plan. **Do not fasten the logs down yet.** When all of the logs have been placed in position, go back around and make sure that all of the corners are correctly aligned and snug and that the outside edges line up with your chalk lines. Check the doorway openings and make sure that the required space is there. There should be a 42" (approximately) space for a standard doorway (6" more than the width of the actual door; whatever size it might be). At the doorways pencil in a line on the drip ledge to mark the opening width so you'll know the correct placement in case the logs shift after the tape measure has been put away.

After the logs for the base course have been laid out on top of the drip ledge and their positions have been verified you will start a fastening routine that you will become very familiar with. In a nutshell the routine is:

- \*foam under the first log you are going to secure
- \*pre-drill holes for your log screws at the proper spacing/joint locations
- \*drive your lag bolts through the logs to secure them to the layer below
- \*proceed to the next log.

Once all the logs for each course have been secured you then:

- \*drill a 1" hole at each joint (both butt and corner)
- \*fill this hole with foam
- \*drive in the dowels
- \*chip off the tongues at the corners where the next layer of logs will pass across them
- \* use a brush/broom and sweep off any wood chips or other bits of debris that might keep the next row of logs from sitting down snugly.

This process is described in more detail below.

As much as you are able, log screws for the first course of logs should be sunk into the floor joists to provide the most secure attachment possible for this row of logs. If the joists are set 16" or 19.2" on center, lag into every other joist. For the ends of the structure, the first course will be positioned directly over the tops of the end joists. Lag bolts for the base course of logs need to be set at:

- 6" from a corner.
- at 30-36" intervals along the length of the log (into floor joists where possible).
- 3" from a butt joint (where two logs "butt" together-not at a corner).

On every row, I like to start at a corner. Usually the tightness of the joint holds the two logs together, but on the base row, where the logs are cut back, this is a loose connection. Typically I'll use a 6" screw to hold the two corner pieces together. Be sure that the connection is good and level, or else re-do it. Corner pieces on row one can also be set separately, just make sure that you make sure to land on the chalk line.

With all of the pieces in place it is time to start foaming. Tip your starting log back far enough so you have room to place the tip of your foam under it. Spray a bead of foam approximately 1" in diameter the length of the log (or logs if doing the corner). On the first course this is most easily done with 1 or 2 people holding the log back, and 1 person spraying. It is recommended that this be a 2 or 3 person job because the first course is so important and it doesn't have the tongues of a log below it holding it in place. On higher courses one person can tip the log back, brace it with a chunk of wood, then spray the foam. The tongue and groove of the logs will hold them in this position while the spraying is done. After the foam has been sprayed, lower the inside edge of the log slowly back down into position while keeping the outside edge of the log lined up with the chalk line. As the log lowers it will spread out the foam to form the required seal. Once lowered, begin pre-drilling for your lag holes and then lag bolt the log to the floor. When screwing this row be careful not to overtighten, as these lags can strip out, especially if you miss the floor joist.

Once the first log is lagged into place, work your way around the perimeter of the home following this same procedure. Make your butt and corner joints as tight as possible and keep an eye on your chalk line as you go. Work your way around the house from your starting corner, don't jump from location to location.

At the corners log foam both sections (the male and female) before lagging either one down. To do this simply lift the end of the male log that is not in the corner pocket approximately 2' to 3' high. This will cause the female log to roll back and give you adequate space to spray in the foam. Start foaming the female log at the end away from the corner and work toward the corner (don't spray under the log's tail beyond the house perimeter). When the female log has been foamed, start foaming under the male log. Start from the corner and move to the end that is being held. As you work away from the corner, have the person holding the log begin to lower it so that the foam tip has a gap of

about 1”to 2” between the log and the floor. This helps to keep the foam from expanding too much and from blowing away if there is any wind. Once the length of the log has been foamed, let the log sit back down in position. When putting them in place again, make sure that the logs stay lined up to the chalk lines then begin lagging the corner sections as previously explained. Be sure to lag your corner pieces approximately 6” from the corner junction.

Each straight log must be lagged 3” from where it butts up against the next log. If this causes you to miss a few joists or use a few extra lag bolts that is acceptable as long as a decent number of your lag bolts are driven into joists. As you foam and lag each log in place, be sure to keep the end of your log snugly against the end of the log that has already been lagged down. There should not be any air space between the logs.

When all of the 1<sup>st</sup> course logs have been foamed and lagged down it is time to go back and dowel each joint. With the 1” auger bit drill a vertical hole into each junction. This should be done both in corner joints and in butt joints (where two logs meet other than a corner). When you drill into corner joints be sure to avoid any lag bolts that have been put in horizontally from the outside, as hitting one of these will cause damage both to your tools and your arms. After each hole has been drilled, fill it with the same foam you use between the rows of logs and then hammer one of the supplied wooden dowels into the hole. This forces the foam into any spaces in the joint and seals it to prevent air and moisture penetration.

The final step to complete the 1<sup>st</sup> course is to remove a section of the tongue at the corners to allow the corner log of next course to extend out over the wall. Remove the section of tongue that would have been cut out had the corner pocket extended through the whole log at each female corner section. This can be done with a chisel or hatchet. Removal of this tongue allows the next course of logs to seat snugly to the course below. If you forget to remove this section of tongue the next course of logs will not seat and seal properly. If you are not sure which parts of the tongues are to be removed, place a couple of small logs on a corner mimicking how the next course of logs will sit then observe where the logs don’t sit properly. These are the sections of tongues that need to be removed.

After removing the section of tongue and before beginning to install the next course, use a broom, shop vac or blower to sweep off all of the wood shavings and any other debris that may have accumulated on top of the first course of logs. Failure to do so can prevent the next course from seating properly. When the base course is cleaned off, you are ready to proceed to the next course.

**Log Courses 2 through 4.** Courses 2-4 will proceed fairly rapidly, and most of the techniques needed have already been discussed. Courses 2-4 will all be very similar in that the only openings to deal with involve the exterior doors.

Using your log plan, find the logs for course 2 and set them in place (or close to it) without securing anything down. Everything should fit snugly in the corners and at the

butt joints if the plans are followed. Once your logs are in place begin the process of foaming, pre-drilling, and lagging as previously described. Start at one corner, and, as before, don't foam too far ahead of the drillers as the foam may dry and glue the logs out of position and prevent them from seating. In this row the lag bolts should be put every 30-36" as you don't need to worry about joists. In addition to lagging 6" from corner joints and 3" from butt joints, pay attention to the course below the one you are working on. When you are over a butt joint in the lower course, lag down into the current log 6" on each side of the lower joint. This will help prevent the lower logs from twisting at this location.

When the logs are all foamed and lagged, proceed to drill out the joints and foam and dowel them. Then chisel the corners, sweep the wood shavings from the top of this course and move on to the next course. After each course use your level to confirm that the walls are going up vertically, and every couple of rows use your tape measure to verify wall lengths and square corners (comparing diagonal measurements). If problems are observed make plans to start adjusting on the next row.

Repeat the above routine for courses 3 and 4.

**Log Courses 5-12.** Beginning with course 5 openings will start to appear for the windows and will continue through course 12. This makes for shorter logs and easier handling of material, but also increases the chance of walls getting out of square or corners shifting, so care should be taken to prevent this from happening.

In courses 5-12 the procedure for setting logs is the same as for the others. Set your logs in place, foam, pre-drill, lag, dowel the joints, clean the top, and repeat. Some procedure changes are necessary for dealing with the window openings, however, these changes are for the most part intuitive and involve paying extra attention to alignments and other details. For doors, you typically have only two openings, so there is limited chance for your logs to creep or shift as long as you keep your corners tight. As you build in courses that have windows, there is a chance for things to shift because logs can extend into window openings and corners can become "loose". As far as shifting goes, due to the tongue and groove pattern of our cut, the amount each course can shift is limited to about 1/8<sup>th</sup> of an inch, but if each course shifts this amount, you can be a couple of inches off by the time you reach the roof, and this will cause problems.

To minimize the chances of shifting out of alignment, start at a corner and work from there. Place your corner logs in place, foam and lag them, then measure the distance of the opening from the end of the log and mark it. Once marked, set the next log, keep it lined up and foam and lag it, then proceed around the building measuring openings as you go. You can set all of your logs in position before you begin to lag, but be sure to measure each opening as you go so your windows will fit. Watch for smaller windows for bathrooms and kitchens to begin around the 8<sup>th</sup> course.

The primary problems that occur in courses 5-12 are in the corners. Because of the openings, the logs don't always stay as tight as they should. Take additional precautions

to ensure, when you tighten the lag bolts, that they are fully seated and tight on the course below. Also, at the corners, make certain that the logs are fully/tightly set into the corner pockets. Don't forget to install the horizontal lag bolt from the outside through the corner pocket and into the male end of the corner joint. This will pull the log tight into the pocket. Also watch the logs between window openings as they are "free" and can shift. This is corrected with a chainsaw, so not a massive issue, but makes for more work.

As you work through these courses, you will probably begin to use ladders or scaffolding. To limit how much you have to move these items it is fine to set all the logs in each section (for example a corner or section between windows) before moving on to the next section, just be sure to do each step: set, foam, drill, lag, dowel, sweep.

**Some comments on rows 1-12**—The biggest thing to watch is keeping your corners plumb. I like to dry fit the logs and put a level on the outside and see if I'm leaning in or out. If it's leaning, I note which way on the logs, then foam them. Once foamed I'll try to manipulate things to get them in the proper position. When doing this, always measure off the base log, so there is a common reference. If you do this on each row, there shouldn't be big adjustments needed, usually just body weight against the logs should do it. If you need a little more a 6" screw can do it. Worse case, if it's really off, remove the tongues on the lower log so you can make a bigger adjustment, but be more vigilant going forward.

In addition to the corners, try to keep the free ends on window and door openings as plumb as possible as well. Again, awareness and body weight can often be all that's needed, but sometimes a 6" screw pushing in or out on a log is needed. It may also be necessary to brace with a 2x4 to hold it in position. As with a corner, removing the tongues is kind of a last recourse to allow you to move things even more.

Other than plumb, getting a good, tight seating for the logs is important for the finished look. The log screws usually pull things down good, but we've found that a second person using a sledgehammer to give two or three strikes as the screw head begins to pull the log tight helps to give a nice clean finish.

**Log Course 13.** Try not to delay installing course 13 any longer than necessary after course 12 has been completed. Allowing too much time between these courses can result in shifting or warping of the earlier elements and making it difficult to complete the installation of course 13. **Do it as soon as possible!**

Course 13 will likely be the most challenging of all the courses you put up. The reason for this is that this is the first course that has no openings (in most plans), so if things are not square or measurements are off you will really notice it here. In addition, you will be reconnecting sections that have been "free" for the past few courses due to window and door openings. Unfortunately they have been free to twist or lean, and if you eyeball from corner to corner you will see the challenge you have: all these sections will have to come back into alignment for course 13 to seat properly. If you have been careful and attentive to details in the instructions to this point, there shouldn't be any major problems

during the installation of course 13—the problems will be minor, but there will be challenges. Either way you will need to break out the winch straps, a strong 2x4 or steel bar, lots of 6” screws, and apply a liberal amount of muscles to adjusting the alignment and seating the logs for this course.

Course 13 installation can best be accomplished by starting at a corner and installing the two corner logs first. As the logs (corner or otherwise) are installed, foam under the logs on both sides of any opening that they span. Put at least two lag bolts in each log on the corner side of any opening and maintain the normal lag bolt spacing pattern over the remaining length of the log when there is log below to lag into. Ideally the course 13 logs that span the openings will align properly on top of the logs of course 12 on both sides of the opening. When this is the case; drill, foam and lag it down and start working your way around the building one log at a time (On this course, don't set all of the logs in place, just work one or two logs at a time.) If the logs don't line up you need to make them line up. If the difference is not too great, use the 2x4 or steel bar by placing it through the opening from one side to the other near the top, and force the logs back into alignment. When the top log lines up with the wall section, pre-drill, and lag it down in at least two places on each side of the opening in order to maintain the alignment that you've achieved.

If you are dealing with major twisting, or if the sections twist in opposite directions it may be necessary to use the winch straps or Come-Alongs. Find something strong to anchor one end to (the far wall section, a tree, a vehicle, etc.) and attach the other end to the side of the wall you are trying to move. The top of the walls will be the most flexible, so anchor to lower wall sections and hook towards the top of the wall that needs to be moved. You may find that you need to use two or more straps; one inside and one outside, pulling each end of a section in a different direction to line it up. Like before, as things line up lag down with at least 2 lag bolts. Proceed around the structure following the same pattern: anchor one end and then manipulate the other to get things to line up. If you have enough straps or come-a-longs, leave them in position until the 14<sup>th</sup> row is in place. Don't forget to foam or dowel joints, as focus can get lost with this row. If you follow this process you should be able to get everything lined back up.

Be careful on this section not to get too aggressive on pulling walls into position. You may need to get creative and try something unique, but remember that log walls are not indestructible and can be snapped if pulled too hard. If you are going to pull with a moving vehicle you assume full responsibility for what happens. Also, be careful as straps can break or come unhooked, potentially resulting in a snap back that can cause injury. Remember leverage can help. Before doing a wall, I like to try and line things up so I know what I'm dealing with. If lower walls just don't want to straighten out it might be necessary to remove tongues from sections of row 12 so at least the log seats nicely, even if not perfectly lined up. Don't get too frustrated, but also don't pull too hard, things do break, and walls can pull out of the floor.



**Log Course 14.** Course 14 is actually fairly easy since you will have gotten everything lined up while installing course 13. You can set all of the logs in their positions, foam, drill, lag and dowel fairly quickly.

Logs cut for floor plans that have a loft system will have a series of pockets cut into the inside face on some of the logs. It is essential that these logs are placed in the correct positions in order for the loft system to work. They will be clearly marked on the plans, and are to be secured with a lag bolt between each pocket.

When course 14 has been completed, a final check of the walls and corners must be made to ensure that the walls are straight and vertical and that the corners are still 90°. If it is found that a long wall curves in or out and it is more than a couple of inches, use a winch strap to pull that section in or out and brace it with a 2 x 4 anchored to the sub-floor. If it is relatively minor, it can be adjusted for when the roof trusses are secured. The wall can be pulled in or pushed out just before the trusses are secured. Do not forget to do this if it is needed. Otherwise, the walls should not require any bracing during the construction process due to their inherent strength.

**Log Courses 15 and up.** If your new log home is taller than the standard 14 course wall, the same pattern should be followed during installation of the additional courses. If there is to be power on a second level the 15<sup>th</sup> course will have the interior face cut flat to accommodate the power chase for the second floor. Depending on window placement and other factors, the log courses will not follow the exact same pattern as the first floor courses, but installation procedures will remain the same. For the additional courses use your experience from the lower section to guide your log assembly.

**Gable Ends.** If you have a log gable end (Figure 8) for your structure, you need to proceed with it once your standard walls are set. Find the center of the gable end and mark it on the wall, then find the length of the combined logs that will be going on it. For example, if you will be putting on a 16' and a 12' section of log for your first gable row (a total of 28'), 14' will be the center point. Mark 14' in on the longest log and then place that log on the gable end, lining up that mark with the mark you previously placed on the wall for the center point. Use a level to make sure the center marks are lining up. Be sure to follow your normal process (foam, drill, lag, etc.) when setting these logs, as they need to be secure and weather tight as well.



Figure 8. Log gable end under construction.

Here are some things to watch out for on a gable wall:

As you proceed with installing the gable ends, calculate a rough roof line and mark it on your logs. When you lag, make sure that you stay a few inches inside of this line because during the roofing process you will be cutting off the excess log with a chain saw in order to follow the truss line. Hitting a lag bolt with a chainsaw during this process can be a very dangerous and damaging event.

As you proceed up the gable, line up the center of the course of logs with the center of the gable wall, until you reach the top. This should be accomplished using a level to make sure that the line is straight and vertical (perpendicular to the top full log course).

Each course will be shorter than the preceding course, and as you work higher, your working area will get smaller. This may create some stability and safety issues. Use scaffolding and appropriate safety equipment at these heights. Avoid leaning an extension ladder against the gable sections due to the danger of pushing them over.

Do one gable at a time to minimize the moving of equipment. If your gable end has irregular shaped windows requiring their stair stepping in, as in the picture in Figure 6, be sure to brace the overhangs after a few rows to help support the weight.

When the gable is fully constructed, the outer edges will have a stair-step pattern that should have a fairly consistent look (Figure 8). This will be trimmed off to a straight edge to match the roof line (Figure 9) at the beginning of the roof construction phase.

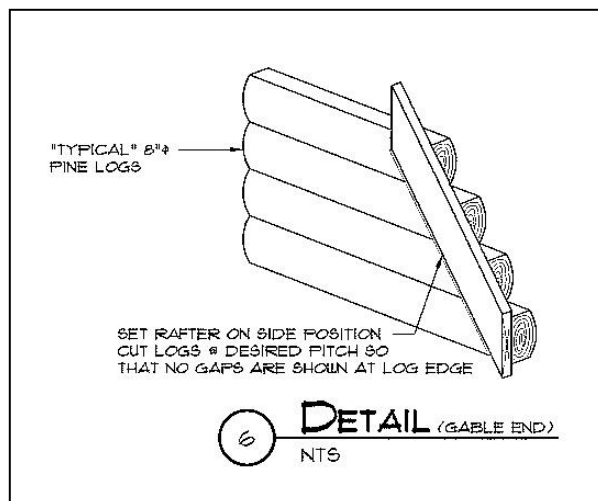


Figure 9. Details: marking the gable log ends with a rafter set in place; in preparation for trimming them to accommodate the roof structure.

When each gable wall is completed, it must be stabilized and secured by bracing it with 2x4s, rope, straps or other appropriate materials. This bracing needs to stay in place until the gables are secured to the trusses. The gable end walls are very heavy, and they don't have the strength or rigidity of corners to support them. Unless they are braced, a strong wind could cause them rock back and forth, and possibly break off. At best this would ruin your gable, at worst it would put a hole in the floor and someone in the hospital.

## **Tricks of the Trade**

Occasionally, issues arise that don't fall into a specific instructional category or that have been learned through trial and error. This section includes a number of lessons

**Paramount Log Homes** has learned over the course of time. If you read this before you set any logs, it may not make a lot of sense, but if you re-reading it after setting a couple of courses of logs it may contain some useful information.

**Watch log lengths.** Our equipment mills logs within 1/8<sup>th</sup> of an inch of tolerance. While this rarely becomes an issue, on a long wall it could mean being 1/2" long or short (cumulative for up to 4 logs in a wall) and might require shaving a log's end with a chainsaw, or setting a corner with a shim to fill in the extra space.

**Use the corners.** Your corner pockets are 4" deep. If the walls at the corners seem to be leaning in then set your male log with a lag or two, then hammer a shim in the pocket joint and set the female log. If you do this, don't attempt to gain too much from one joint because the log will not seat correctly if it is moved/shimmed to far back.

**Sledgehammers.** There will be occasions when a log doesn't want to sit down quite right. First check to see if there is something keeping it from seating properly. If not, it might need to be "convinced" to get into position. When trying to move a log end in or out, try to strike the face of the log on a knot, as this is a harder surface and will not show the impact as much. If a log seems to be positioned properly, but doesn't want to seat, have a person strike the top of the log while a second person sets the lag bolt. The person lagging should try to set the bolt in pulses timed to the impact of the sledgehammer to get the best results.

**Log Screws.** Avoid running all the screws down the center of the log. I like to alternate, doing one towards the inside, then towards the outside, then inside, etc. This helps prevent the log from twisting as it dries. If there appears to be a twist in the log, do the first half of the screws towards the side lifting up, then the other half on the opposite side, so the high points are pushed down. If needed, use 2 or 3 lags to pull down a lifted log corner, getting a little bit of pull from one screw, then the second, then the third, then the first, etc., or two people setting screws simultaneously.

**Shaving the tongue.** On rare occasions it may be necessary to shift a log more than 1/8” to straighten out a wall. If this is the case you may need to shave the tongue off of a section of the lower log in order to position the top log correctly. If it is necessary to resort to this process, do not shave any more of the tongue than absolutely necessary. This is important because shaving could impact the weather seal tightness in that section. If you are checking the vertical alignment on a consistent basis you should rarely encounter a situation this severe. A wall can gradually be moved back into alignment over a few courses, so major single course shifts should be very rare. Also, be aware that a major realignment in one course will be noticeable when the home is completed and should be avoided. **Never shift more than 3/8” on a single row.**

**Lag the ends.** If you need to move a corner in or out, set your corner logs in place, foam them, then lag both ends with a single lag bolt. At this point you can use the sledgehammer to strike the end of the log to force it one direction or the other. When using this procedure, it is advisable to place a short piece of 2x4 or 2x6 against the end of the log and between it and the sledge hammer to avoid damaging the log end. Even with the lag bolts in-place, it will be possible to shift the problem log gradually and not impact the alignment of the rest of the wall as the log shifts.

As with any straightening effort, don’t let things get too far out of alignment, and don’t try to fix too much at one time. To help determine how much you have moved the log, once your ends are lagged, draw a short vertical line across the log you are trying to move and the one below it before striking with the sledgehammer. Then, as the top log shifts, you can see how much it has moved.

**Chainsaws.** If your wall is leaning out and other techniques are not working, or if logs just seem too long, don’t be afraid to cut some length off a log, **if you are sure that this is the problem** and everything else is going correctly. If you do this, cut a saw blade’s width at a time and test the fit of the log in its designated position after each cut. Remember: wood cannot be added back onto a log if you cut too much off. If you must cut, make your cut in end that will be inserted in a corner pocket because a chainsaw cut will not be rougher than the original cut. Whenever there is a gap in a corner joint, put extra foam in the joint to seal it and block air and moisture from passing through it.

**Dealing with twisted logs.** On occasion a log will have a twist to it, making it difficult to seat. Usually it is not too bad and can be dealt with by predilling your holes towards the edge that is lifted up, so when it is lagged it gets pulled down flush. As you pre-drill, watch the logs and drill your holes to help deal with any issues like this that may exist. On occasion, logs may have a serious twist. If this is the case, you have two courses of action. The first is to split the log length wise to give the log more flexibility so it can be lagged down tightly. If doing this, only cut about 4” deep into the log, don’t cut it in half. When you lag use a few extra lag bolts and lag both sides securely. When placing the row above this section, be sure and fill the void with foam, and try and lag diagonally from the top log into both side pieces so the lags help hold this together. The other option is to use one of the extra pieces of log sent with your kit, just realize there are a limited number of extra pieces.

If a situation arise that can't be dealt with by any of the techniques previously described, please feel free to give us a call. We want you to succeed in the construction of your new log home, and we'll do every reasonable thing to assist with solving your problem. It is likely that we have had to deal with the same problem before and will have a solution waiting for you. We are confident, however, that the majority of issues can be corrected using the techniques described in this manual. Please keep us in mind, also, if you develop a technique or system that results in an easier or more accurate construction process. Give us a phone call or send us an email describing your process so we can share it with other log home kit builders.

## Things That Tie Into the Log Walls

**Roof Systems.** Your roof is the most critical system that will tie into your log walls. If you keep your walls strait and square this will be a simple process to complete. Most of our roofs are constructed using manufactured truss systems. If you are not familiar with the process of installing trusses, we encourage you to do some reading on working with trusses before receiving your kit. In this section, we will simply identify what you need to do to put trusses on a log wall system.



Figure 10. Gable log ends with trusses being installed for a cathedral ceiling.

The trusses and top course of logs must be prepared in the following manner before the trusses can be installed.

1. Seeing as truss clips can't be used, we use either the 6" or 10" screws to secure the trusses. It may be helpful to pre-drill the truss, as fir is a little harder to drive the longer screws through.
2. Mark every 2' on the top of your walls where each truss will be sitting, then remove about 4-5" of the tongues in those areas so the truss will sit flat on the top log.
3. On gable ends where a drop truss is to be used remove the tongues of the top log for the entire length of the wall. Secure a 2x6 the full length of the wall laid flat and 2" in from the outside edge. This will be used to help brace the base of the gable truss, and also as a backer to secure ceiling boards to when finishing the interior. Or attach the 2x6 to the truss before setting it, being sure to foam underneath to seal things up.

When the prep-work has been completed you are ready to raise and brace the trusses (Figure 10). As you work the roof system, be sure to work safely and brace your trusses often. The roofs on **Paramount Log Homes** are designed with a 24" overhang to give the logs good weather and sun protection. Remember this and **do not cut your truss tails too short.**

With a log gable end the log wall will take the place of your gable truss, so the processes for preparing and installing gable trusses will not be followed in those cases. You will, however, will need to cut slots for 2x4 outlooks to pass through the log gable to support the roof overhang. You will also need to trim the ends of the logs to match the roofline. To do this set a truss in position against the gable wall and trace a line along the top and bottom of the top chord of the gable. This line will give you your cut lines for your logs and the depth of cut for your lookouts. Marking of the log gable wall for cutting can also be done using a level, square, and straight edge after all of the trusses have been set in position by spanning across the top of your trusses to mark your cut line.

Trimming of the gable end logs is done using a chainsaw. It is recommended that a new blade be used to make this as easy as possible since you will be in awkward positions making this cut either on ladders or lifts or standing on trusses. It was stated earlier in the instructions that it was important to verify that the lag bolts installed in the gable end logs were kept clear of the portions of the logs where they would be trimmed. You may want to mark on your logs where your lag bolts are on the ends of gables so you have some warning as you cut. If you didn't do so then, you will reap the consequences now and will have to cut slowly and carefully. If you are unsure of lag bolt positioning you may be better served to leave the old blade in and hope for the best, just be sure to cut slowly and safely so you can avoid serious kickback or injury.

Once your roof trusses have been installed and gable ends trimmed you can complete your roof as you would on any other type of construction.

**Windows.** As you build your walls, the openings for your windows will emerge. These openings will be 4½” taller, and 4” wider than the actual window unit you receive. This space allows a wooden window buck to be installed in the opening. The buck will be attached to the log walls and the window will be attached to the buck. The use of the buck allows for the window to be attached more securely, insulated better, and accommodate log shrinkage without binding the window. The bucks should be built of 2”x8” material, and the inside measurements (rough opening) should be ½” wider and ¼” taller than the window unit itself. When measuring and cutting the buck material, the sides should sit on the bottom plate and support the top plate (Figures 11 and 12) to give the window the most support. Assemble the buck with screws, so adjustments can be made if needed. Once constructed set the window inside to ensure it will fit snugly. Adjust the buck if it is too tight or too loose.

Sometimes the logs protrude into the opening and prevent the window buck from fitting. If this is the case, use the chainsaw to trim off these ends. Once the buck is the correct size, cut a pair of slots into each side brace towards the top. To do this simply plunge a circular saw into the board so that a vertical cut is made (plunge slowly). If the window is taller than 48” do 2 more slots in the center portion. When cutting make sure the saw won’t cut into the floor or anything of value underneath the buck, such as a hand or leg. Also make sure to hold the saw securely so it won’t run away on you as you plunge into the wood. These cuts are to allow for the shrinkage of the logs when you secure the buck.



Figure 11. Window buck and window that have been secured in the window opening.



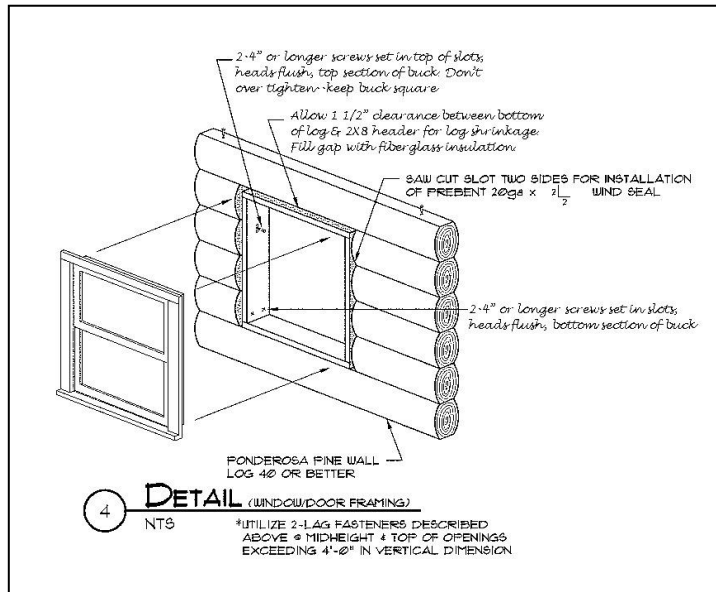


Figure 12. Diagram of the window buck and window being secured in the opening.

Once the slots are cut it is time to mount the buck. This is best done by two people to make sure things are straight. They will need: a level (4' is best), screws, a driver for the screws, and a very straight 2x4 approximately 6' in length. One person should be inside and the other outside, if possible. The person on the outside should hold the 2x4 diagonally across the opening-- from about midway across the bottom to about 2/3 of the way up one side. The person on the inside should push the buck out until it presses up against the 2x4. You do this so the buck is flush with the outside edge of the logs. Once the buck is pushed against the 2x4 center the buck and put one screw into the base towards the side being braced with the 2x4. Once secured, brace the 2x4 against the other side of the window opening, make sure the buck pushes out to the brace, and place another screw in the base of the buck to secure the bottom. It is suggested to foam under the window buck before securing it to make sure air won't leak through.

After the base of the buck is secured the sides need to be plumbed and attached. With the outside person continuing to hold the exterior brace in place as before, drive one screw through one of the top slots and into the logs on the side being braced. Insert the screw towards the top of the slot so that as the logs settle the screw can slide downwards in the slot. Drive the screw in until the head makes contact with the buck. Repeat this process on the other side. Again, be sure to brace the buck so it is flush with the exterior of the wall. Once each side has a screw inserted the process is to plumb the sides and adjust the screws so that they are snug to the buck but not pulling it sideways. Use the level to check for plumb, then tighten and loosen screws on each side as needed to secure the sides and keeping the buck square. Once the sides are plumb, put 2-3 more screws in the buck base, and one screw in the top of each slot. Do not put any screws into the top of the buck.

Make sure that the side screws aren't so tight that they bow out the sides of the buck as this will affect the ability of the window to fit. When the buck is installed you should have a square buck with plumb sides, secured on each side and the base with at least 4-6 screws or nails, and no screw heads protruding or sunk into the wood.

Once the buck is installed, from the exterior, measure 4" from the inside edge of both legs and mark it on the logs. Then, using a level so the line is straight and plumb, draw a vertical line over the mark you just made, extending from three inches below the bottom of the buck to 3" above the top of the buck (this will give you two vertical lines, one on each side of the window, 4" from the inside edge of the buck). Next, take a circular saw and cut a slot approximately 1 3/4" deep along both of those lines. Try to keep the cut as straight as possible.

Once both slots are cut, find the brown drip edge supplied with the kit (shell/builder's kits) and cut a piece for each side of the window. This piece should be a little shorter than the actual slots. The flat side of the drip edge pieces will be inserted into the slots, but because the saw blade is round, you'll need to cut a triangle piece off of both ends so it can insert all the way into the slot. Insert it so that the flat side is in the slot, and the other side is towards the window opening. Use 2 or 3 roofing nails to secure the metal against the logs so it is nice and flat.

When both pieces of drip edge are installed cut two pieces of window seal tape 8" longer than the width of the window rough opening, and two pieces of tape 8" longer than the height of the window rough opening. Then install the bottom piece of tape, starting it 4" from the side (where the slot is) along the bottom of the buck and spanning over onto the log the buck is sitting on. Press the tape on so it sticks to the buck and the log firmly. Next do the same on the sides, running the tape up so it spans and covers the drip edge and window buck sides. Lastly, attach the top piece of tape to the top of the buck and the log above the window. Because there is approximately a 1" gap above the buck, I start the tape so it is about 3/4" high in order for it to be able to attach to the logs. The purpose of the tape is to seal the outside of the window and keep wind from working its way through the opening.

Now that the window is all taped up, we take clear silicone and run a thin bead down along the slot that the drip edge is inserted into. Before doing this you'll want to clean off any sawdust so the silicone attaches securely to both the log and the tin. This helps keep wind from blowing through and water from collecting in the cut. Use your finger and run it down over the silicone, forcing it into the slot. Have some paper towels handy to clean up, and try not to get the silicone more than about 1/2" away from the slot, as it will affect the stain.

Next dry fit the window into the opening of the buck and make sure that it fits. Ideally there will be 1/4" gap on the top and both sides between the window and the buck, but it can vary. If it fits as it should, remove the window, set it somewhere safe, and then silicone around the edge of the window buck opening (on the outside face, so it will be under the nail fin). You want about quarter inch bead of silicone, maybe a little less,

enough to be sure there is a good seal, but not so much silicone that it oozes out and gets all over everything. Once the silicone is applied, grab your window and carefully set it in the opening, being careful to avoid getting silicone on it. A second pair of hands helps with this step. Once in place, and with equal spaces on both sides, secure it with roofing nails in every other nail hole. Don't drive the nails so deep they crack the vinyl, but you do want them tight enough to hold the window snug against the buck.

Remember, the goal of this process is to give you as tight a window opening as possible. One of the challenges of log homes, due to their nature, is keeping them nice and tight. You want to be sure the window tape is attached securely, and that the silicone is adequate. Better to buy extra silicone at this step, if needed, than to have a drafty window.

Once the window unit is installed you are ready for the trim. We use 1x6 cedar to do this. Our method is to cut the bottom piece the same width as the window, the side pieces 6" longer than the height, and the top piece 12" wider than the window. We then install the bottom piece flush with both sides, the side pieces flush with the top, and the top piece centered. We use a 7/16" stapler to attach the cedar, but cabinet screws can be used as well. Once the top piece is installed, we put a half inch bead of chinking across the top of the trim piece, filling the gap between the log and window trim. I prefer to push the top trim piece back against the logs in order to have a minimal gap for the chinking to fill. Lately the vinyl of the windows at the corners has been a little pinched, which keeps the trim from fitting tight, so we've been using a grinder or oscillating tool to shave this off. If you do this, be careful not to take too much off as it can make an opening in the window casing.

When doing windows, I like to do it in a production line sort of method. I measure all of my windows and calculate all the cuts I'll need to make my bucks. Then I cut all the pieces at once so I can minimize material waste. I then build all my bucks, then install all my bucks. Once the bucks are installed I cut all my exterior trim pieces (again, using the windows to get my measurements). Once trim is cut I do each window—cutting slots, doing tape, silicone, window install, trim, and chinking—before moving on to the next unit, so as to minimize set up and moving.

One note on this process. Before installing the buck, be sure and measure the opening, and make sure that things are the right size. It is really frustrating to have the buck installed, taped and siliconed, only to find that it's too small or too big for the window. At least that's what I hear.

**Doors.** Doors have similarities to windows, but a few key differences. The first thing you need to do is make sure the wall on each side of the door is straight. Sometimes walls at the door opening will develop a slight bow or even an “s” shaped bow. This must be remedied by pulling them straight. When the straightening process, as described below, is completed, two lengths of 2”x3” angle iron will be used to stabilize the logs and prevent them from bowing again.

If the walls by your door are “warped” to any significant extent (any more than 1/2”) you will have a difficult time trimming your doors. It is important to prevent and/or correct any such miss-alignment during the earlier stages of construction. In theory and by design, the 13<sup>th</sup> and 14<sup>th</sup> courses of logs will prevent any significant leaning away from the vertical on either side of the door opening, but won’t eliminate all issues.

To determine if you need to straighten the walls at a door opening, use either a long straight length of wood or 8’ level and brace it vertically against the wall close to the door opening. From the side look at the wall to see how close it is to being in line. Ideally the face of each log should touch the straight edge (but they won’t). If any of the logs are more than ½” away from touching your guide you will have to do some adjusting. If any bowing is less than ½” you have an okay wall and can proceed with installing the angle iron brace.

If there is a space larger than ½” it will be necessary to apply pressure to the miss-aligned section to straighten it. The following procedure will work with walls that have a little curvature. To pull things straight, place a brace (a sturdy 4x4, 2 or 3 2x6’s nailed together or an extra log that is about 8’ long) on the inside of the wall. The objective is to (1) lag through the brace and into the wall at the points where it needs to be pulled in, and (2) (if needed) position spacers/shims between the brace and the wall at the places where it needs to be pushed out. Gradually tighten the log screws to pull the spaces closed and to push the humps out with the spacers.

Examples follow: (1) If the wall has a “C” shape, put the brace on the side where it touches at the top and bottom of the “C” and use a series of lags in the middle to pull the gap closed. (2) If the wall has an “S” shape and a line between the edge of the base and the edge 2/3rds of the way up is vertical, brace on the side where the brace contacts the base and 2/3rds up and then pull in the gaps above the base and the top 1/3 of the wall using log screws at those points. (3) If the base and 2/3 of the way up are not on a vertical line, the preceding example may be used together with a spacer applied at the contact point 2/3rds of the way up. Another method of your own (or a combination of the above methods applied sequentially) may need to be devised if none of the above are working. The end result should be a more or less straight wall for your door to fit in.

Similar procedures should be used on **both sides of each exterior doorway** to verify that both sides are vertical and straight or to bring them into alignment. When lagging into the face of the logs, try and lag fairly close (about 4”) to the opening so the door trim will cover the holes.

When the wall is straight the next step is to insert the 6' piece of angle iron you received in your kit to hold the logs in that position. To do this, mark a vertical line down the log ends from the top to the bottom on both sides of the doorway 3 1/4" in from the outside face. When the vertical lines have been marked, cut a 2"-deep slot down this line with your chainsaw. This will give you a slot into which a length of 2" x 3" x 6' angle can be inserted. Before inserting the angle iron, check the depth of the cut with a ruler or other gauge to make sure that the entire slot is at least 2" deep. The 3" side of the angle iron must rest flush against the logs and it can be difficult to pull it out if there are some shallow spots in the cut.

Insert the 2" side of angle iron into the slot with the 3" side towards the outside of the home. You will probably need to use the sledgehammer to get the brace to seat all the way. There will be approximately 5" of space on the top and bottom of this piece once it is inserted. Drill one hole into the angle iron and attach it with a screw to the logs to hold it in place. This metal piece will keep your walls straight and prevent your walls from shifting and binding the door. You can now build and install your door buck.

Any braces used to straighten the walls can be removed once the angle iron is in place. Any braces that are near that door can be removed before the door is installed so you have an uncluttered area to work in.



Figure 13. Inside view of the door buck and door mounted in the door opening.

Use 2x8 material to build the door buck. The door buck does not require a bottom piece, although I like to cut a 2x4 the same size as the top board and attach that on the inside of the bottom of the logs in order to keep everything nice and consistent when I'm setting

the buck. As with the windows, the buck's rough opening should be ½" wider and ¼" taller than the door frame. You need to make sure that the door buck will fit in the doorway opening, will accommodate the door unit itself, and have a 1-1½" gap between the top of the buck and the bottom of the log above it. If this gap is not there you will need to cut away part of the log over the doorway to give you this space. The purpose of this gap is to allow for the logs to settle without binding the door. Failure to accommodate this settling might result in problems down the road.

For a standard 3' door, the door buck pieces are usually 41 ½" for the top piece, and 82" for the legs, but they can vary, so verify what the door you have calls for. The door opening in the logs will be approximately 42" wide, but this is not enough for the buck to fit in along with the pieces of angle iron, so you'll need to cut the opening a little wider with a chain saw. I try and get it to 43", so that involves removing about an inch of log on one side of the opening. Between cutting your opening wider, as well as the 2" deep cut for the angle iron, you'll want to be sure when setting your logs that you keep any log screws about 6" back from openings for doorways, to avoid hitting screws with your chainsaw.

Use 6" lag screws to attach the buck. This stronger attachment (as compared with the windows) is required because of the weight of the door and the constant opening and closing. Cut vertical slots for the lag bolts by plunging the tip of the chainsaw into the sides of the buck. At least four slots must be cut in both sides of the door buck; towards the bottom, a couple in the middle section, and one towards the top. Use more lags if your door is especially heavy. Each of the slots must be parallel with the sides of the buck and positioned a little towards the inside of the house so the lag bolt won't hit the steel brace that you just installed. I find that 4" from the outside edge is usually good.

The buck will be installed flush with the outside wall (similar to the window bucks) (Figure 13). Countersink around the edge of each of the slots to create a pocket that the lag bolt heads can recessed into so that they are flush with the surface of the buck. If this is not done, the heads might prevent the door from fitting properly in the opening, but do not overtighten them. They must be snug but loose enough to slide in the slots as the logs settle. This will also prevent the sides of the buck from pivoting on the angle iron and becoming distorted.

With the door buck centered in the opening and flush with the exterior logs on both sides, toenail 2 or 3 screws through the 2x4 that you've attached to the inside of the buck's legs and into the floor. These will secure the legs in place as you set the lag screws on the sides. With the legs secured, make sure one leg of the buck is plumb (not leaning in or out) and use a 6" lag screw to secure that side to the logs. Now do the same for the other leg. Once you have a screw in both sides, check the plumb left to right and adjust it as you did the window bucks. Once you are done the buck should be plumb left to right and inside to outside, secured with one lag on each leg, and the 2x4 attached to the floor.

With the buck plumb, carefully attach a 6" screw through each of the slots, being careful not to overtighten so you don't bow the legs, but tight enough there is a little pressure on

the buck. At this point use a can of the red Great Stuff foam and spray 2-3" around each lag screw between the buck and the logs. The foam will expand and harden, acting as a shim, but if the screws weren't snug enough it can bow the buck outwards. Ideally the lag screws have just enough pressure to hold the buck and not let it move. You will want to wait about 60 minutes for the foam to harden up before proceeding, so maybe do another door buck, or a window, take lunch, clean, etc.

Once the foam is fairly solid, you need to install drip edge and window seal tape, similar to what was done on the windows. Cut 2 pieces 4" longer than the buck legs, 1 piece 8" wider than the top board of the buck, and 2 pieces a couple of inches wider than the buck opening. Once the tape is cut, clean the floor area really good, and attach the two shorter pieces to the floor, going about 1" down the outside, and 1" up the legs. Overlap the tape about 1" to give you a nice wide space for the door to set on.

Next, cut slots in the logs 4" from the inside edge of the door buck, parallel to the buck legs. The slots will extend from the bottom edge of the treated plate to 4" above the top of the door buck. Measure the slots, cut drip edge to match, trim the ends, and insert the drip edge into the slots, securing with 2 or 3 roofing nails. One on each side of the door. Once the drip edge is secure, attach the window tape, extending from inside edge of the buck to the drip edge. Next apply the window tape to the top, then run a bead of silicone down the slot to seal that cut. You are now ready to install the door unit itself.

The door should install without too much effort provided the buck has been installed correctly. I use shims to plumb on the hinge side at hinge locations and install it much as you would install an exterior door in a standard framed wall. Do a bead of silicone around the outside edge where the brick mold will contact the door buck, and a lot of silicone or glue on the floor where the door will sit. You should dry fit the door in the opening and mark the floor where the door threshold reaches to be sure and not overdo it with silicone, but you will want to use a lot of silicone on the floor where the door makes contact to prevent water penetration. I recommend watching 2 or 3 videos on youtube to see how a door is installed, as there are a lot of steps that can be difficult to explain.

When attaching the door frame to the buck, you'll want to use 2 1/2" screws, as longer screws will hit the angle iron and not set all the way, causing you grief. You can use longer screws, but will need to angle them to avoid the steel if you don't want the shorter ones.

### **Door trim.**

After the doors have been set installing the trim is pretty easy. As with windows, we use 1x6 Cedar to trim the doors. Measure the length of the brickmold on the sides of the door and cut 2 pieces of cedar that length and install them flush with the top of the door trim. Measure the top brick mold and cut a piece 12" longer than that measurement. Center it over the door and attach. Do a 1/2" bead of chinking above the door trim to avoid any moisture getting in behind the door.



Figure 14. Completed window with trim.

### **Interior door and window trim**

Interior trim is similar to that of exterior trim, although windseal and buck tape will not be used, and extension jams will be installed.

Extension jams will be made from the 1x8 pine T&G.

(1) Measure out from the window to the interior plane of the log walls (it may help to place a straight edge vertically across the logs beside the window opening to get the plane, similar to how the buck was installed). Cut the pine to that width with a table saw. I find that if I have 10 windows, I'll end up with 3 or 4 different widths for the extension jams. This is not unusual, just do all the jams that are the same length at the same time so you don't have to keep adjusting your table saw. Also, when measuring a single window use the largest number for all pieces. For example, when measuring the depths of window A, you may get measurements of 6", 6 1/4", 5 7/8". Use 6 1/4" for all extension jam pieces for that window

(2) Measure the width of the inside of the window bucks and cut 2 pieces to that length minus 1/4".

(3) Install these on the top and bottom of the window opening, nice side facing out. Use finishing nails because the extension jams will be visible when the process is complete. Use only two nails on the top piece initially. After the top and bottom pieces are installed:

(4) Measure the space between them on each side.

(5) Cut pieces for the sides to that length minus 1/16"

(6) Install them tight to the bottom (again using finish nails). If you find there is a gap between the top piece and the side pieces, use shims to adjust the top piece down so all joints are tight and square

(7) Finish nailing the top and side pieces with 2-3 more nails (I try to find small knots or irregularities to hide my finish nails in).



Trim around the window interiors using the cedar trim boards in the same style and manner that was used on the outside, just cutting your lengths to match the extension jam openings. We install the interior trim rough side out, but sand it lightly to remove the fuzz but retain the texture.

Around doors, the extension jam will extend from the existing door jam to the interior log wall plane (see the instructions for the window jams), and there will not be any pieces installed along the bottoms; otherwise the process is the same. You may also need to remove some wood or plane thickness to accommodate hinges and latches to allow the door to operate properly.

## Ceiling Boards.



Figure 15. Unfinished cathedral ceiling showing trusses, log wall gabel and roof underlay.

Ceiling boards are the first paneling items to be installed. On flat ceilings they need to go up before walls are framed, and timed carefully with the insulator and trades. For cathedral ceilings (Figure 15) you will need to wire and insulate prior to installing the ceiling boards, however in areas with a flat ceiling you will want to install the ceiling boards first. Install a vapor barrier (6 mil clear plastic) on the bottom side of the trusses before installing the ceiling boards. In addition to blocking unwanted moisture in the interior, the vapor barrier will prevent air from traveling up or down through the ceiling. Paneled ceilings are not as tight as drywall ceilings, and so a vapor barrier is needed to prevent air from moving through the ceiling into the attic and your heat escaping your living areas. After the vapor barrier is installed, the ceiling boards can be installed. Use a heavy plastic or visqueen as your vapor barrier. It is recommended to tape the seams to make this barrier as tight as possible.

The ceiling boards we supply are 1x8 pine paneling with a tongue and groove cut in the sides, and a pattern on one face. They are installed perpendicular to the trusses and with the pattern side facing down. They need to be kept as straight as possible, and should be installed so that the joints are as offset. A snapped chalk line across the joists will provide a guide for the initial course of ceiling boards. Typically the boards are 16' long although we occasionally receive some batches of 14' boards. Since the trusses are installed 2' on center all of your ceiling board cuts will need to be in 2' increments so the ends can attach to a truss and not be loose. First, install a 16' piece, beside that (not at the end of it) install a 14' piece, beside that a 12' piece, and so on until you get to a 2' piece. This will give you a stair-step pattern with those 8 pieces attached. Use 16' pieces to complete the runs if your ceiling is that long, or else cut boards to fit the remaining space. Do not to let your cut pieces pile up. As you cut a 14' piece, use the 2' piece to complete a run or as the last piece, use each cut end in a similar manner. Following a good consistent pattern will have the most pleasing appearance. Using this method will give you a stepped look with the joints, but this is much less noticeable than a joint

pattern repeating every 3-4 rows. On the last row of paneling on a ceiling it may be necessary to use a table saw to rip off the back side of the groove or trim the width so the board can be fit in place.

In vaulted areas, install a 2x2 on the log gable even with the bottom of the trusses to which you can nail your ceiling boards. This is so that the ceiling boards can be attached securely as there will not be a truss there to nail to. To do this, mark a line along the gable even with the bottom of the trusses, using a straight board or level and the bottom of your trusses as a guide. After the line has been drawn, cut a 1½” slot the length of the line and then insert lengths of windseal into this slot with the angled piece extending into the attic (the same material used on window exteriors). The windseal helps prevent air escaping your living areas in this difficult to seal part of the wall. Against the windseal, and flush with its bottom face (and hopefully even with the bottom of the trusses), attach a 2x2 (a 2x4 ripped in half is fine) to the gable wall. This is the brace that the ceiling boards will be nailed). For the easiest results, the windseal and board should be installed prior to the insulation.

## **Interior Framing**

Interior framing should be completed the same as in a traditionally framed house (Figure 16). If tongue and groove pine is to be used on the wall, 24” centers are strongly encouraged for your studs. This does not apply to load-bearing walls which should be framed 16” on center with a double top plate. There are a few differences in how framed walls are attached to the rest of your structure.



Figure 16. Interior walls showing the gap between the wall and the ceiling.

Interior walls must be framed 1” to 1 ½” shorter than the ceiling to allow for the ceiling to drop as the walls settle (this gap will be covered with trim). The height should be the only difference in your interior framing. The remainder of your framing should proceed with the same techniques used for framing doors, corners and so forth as you would with conventional construction.

Because your exterior walls will settle, the interior framed walls must be attached to the exterior logs in a manner similar to that used to attach your door bucks. Cut three vertical

slots with a chainsaw (top, middle, bottom) in each stud that will be attached to your exterior walls, then attach them to the wall with 7” lag bolts. Put the lag (with a washer) in the top of the slot, and tighten it only until the bolt head makes contact with the stud. To make this easier, do not install the stud next to the end stud until after the framed wall is attached. Toenail this stud into position after the wall has been bolted in place.

After the interior walls have been bolted to the exterior log wall or extended from another interior wall, they will need to be secured to the ceiling and floor over their entire length. This can be accomplished by nailing the base to the floor and securing the top of the framed wall to the ceiling using long deck screws (you want a minimum of 1” of the screw biting into the ceiling). Where possible, the screw should be positioned to extend into the bottom of the trusses and should be flush with the bottom of the framing.

Once electric and plumbing have been installed, the 1x6 pine paneling can be attached to your framed walls. This is very similar to your ceiling boards, with the exception that the pattern is a little different. Start at the bottom of your wall and install with paneling with the tongue on the top. Pin nail into the base of the tongue angling down so that the next board will cover the nail head but will not be kept from seating by the nail. As with the ceiling, try and minimize waste and avoid stacking joints as this doesn’t look good. As you work up your walls you will need to cut openings for electric boxes and plumbing lines, so be sure and measure and cut carefully. Do not install wall board beyond the top of your framing as your ceiling will settle as your walls do and buckle your wall boards if they are installed all the way to the top.

## **Electrical and Plumbing**

Plumbing will be installed using the same procedures as are used in non-log homes. Plumbing lines will not be run through the log walls, so no accommodations need to be made for plumbing in or through the logs.

Electrical wiring in the interior walls and ceilings will be installed (before the insulation is installed in the ceiling) using the same procedures, methods, and local codes that are applied to other types of construction. As explained earlier, the base logs on the exterior log walls are to be used to run wiring and locate your outlets. A 1x10 pine board will double as a fascia board and chase cover when the wiring and outlets are in place.

Recesses to fit each electrical outlet and junction box can be carved into the base log. The easiest and fastest way to create this recess is to use a 3” Forstner bit (a specially designed bit for drilling holes) and drill a series of overlapping holes into which the electrical box will fit. Typically you will need 4 holes for a 4” box, and 2 for a 2” box. Drill or chisel an angled relief channel on each side of the recess to allow for the electrical wires to connect into the electrical box. Measure the required depth before drilling and do not drill too deep (the worse case scenario would be drilling completely through the log). Drill deep enough to accommodate the box and allow the fascia board to seat properly. Experiment with the first box, then mark with a marker on the drill bit to indicate the proper depth to drill to. To help with this process, mark on the base course

of logs the location of each lag bolt before installing the second course of logs, then avoid those areas when installing the electrical boxes.

Cut a bevel on the top wall side edge of the previously mentioned fascia board so it fits flush with the angle of the log above it. This will be important in order to achieve a good fit and finish for the fascia/chase cover board. To hold the bottom of the fascia board in a vertical position it will be necessary to cut and nail a spacer board to the bottom of the base log. To do this, hold the beveled 1x10 against the wall, position it vertically, measure the gap between the base of the wall and the board. Rip some scrap 1x boards down to that measurement and attach them around the base of the wall. Be sure not to use too tall of a piece of wood to brace the fascia so that it doesn't interfere with the wiring or electrical boxes.

## **Trim**

Exterior and/or interior trim can be installed to suit the new log home owners' tastes and preferences. Many of the methods and techniques described above for the basic assembly of the log home will apply to the installation of trim. Our typical trim is a ¼" by 1½" piece of cedar lattice. This is installed on outside framed wall corners, along the top of walls, around interior doors and other places as needed.

An additional place this is installed is at framed wall/log wall unions. What we do is cut with an undercut saw a slot into the logs using the framed wall as a guide (once the wall board has been installed). We then reset the depth on the undercut saw and re-slot the logs so the the slot is wide enough (about 5/16") for the trim to insert into the slot and hide the gap between the logs and framed wall. This allows the logs to settle without binding, and saves your from having to scribe a trim piece to fit the curves of the log wall.

Another option we sometimes use is to use unfinished 3" round poles for trim. We rip them to make ¾, ½, or ¼ pole pieces, and then apply them in a similar manner as the lattice trim. For example, ½ pole pieces around interior doors, ¾ pole pieces around corners, ¼ pole pieces between ceilings and walls, and so forth. We have also seen some customers use their creativity and come up with some unique trim ideas. There is certainly not a right or wrong way to do it, as long as you like the results you achieve.

## **Interior doors**

Due to the tongue and groove wall board being thicker than drywall, most interior doors will need to have an extension jamb installed to give an good looking finish. Use a similar technique to trimming out your windows, although the extension jamb will be much smaller than around your windows, and you can use an extra piece of wall or ceiling board from which to cut the extension jamb. The actual installation of interior doors should be done the same way you would with conventional construction.

## **Materials**

With each kit we provide the materials you will need to complete your home according to the agreed upon plan and according to the listing provided with your contract. With each kit we try to provide a little more than we expect you to need, in order to save both parties headaches. We do ask that extra materials be treated as the property of Paramount Log Homes, and that you notify us once you have completed your project in order that we can decide whether to come and pick up the excess product. This allows us to continue to provide economical log home packages for our customers in the future. Should you need more material than what is shipped, you may purchase it at a local lumber yard or contact us to have it provided. If it is determined that the material was undershipped, we will provide it at no cost or re-imburse you for any costs incurred. If the material is extra, we will charge a fair price for material and delivery if needed.

### **Conclusion**

While the process can seem a little overwhelming, remember that you only need to work on one thing at a time, not everything at once. Additionally, you are working for yourself, so won't have someone standing over your shoulder critiquing every thing you do or pushing you to go faster than you are comfortable. As stated at the beginning, the rewards of completing your own home are significant, and the equity built by providing your own labor and ingenuity are substantial.

Finally, realize that we are just a phone call away should you run into problems or situations that we haven't addressed in this manual.

Good luck, and happy building.

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