

## 8.0

# General Instructions and Requirements for Installing L- and U-bent Components

Though it may be a bit late to give notes and hints, you may find that they answer questions that may have occurred to you as read the installation steps. You may want to refer back to these bullet points. There is a fair amount of repetition which is intentional so if you just read about one of the topics below, you won't miss something that ties in with another. That is why it is in both places.

### Retrofit stud installation requirements and hints:

- Fastening of retrofit studs to existing ones shall be done with 3" long fasteners spaced at least 2-1/2" from the ends of the stud and spaced on average 6" from each other, but no closer than 2-1/2". The fasteners should be spaced a minimum of 1/2" from the edge of any retrofit or existing studs.
- Retrofit stud/existing stud assemblies must be no farther than 24" apart. If existing studs are spaced 16" apart, then each one will have to be retrofitted or else the retrofit spacing would be 32" exceeding the 24" maximum.
- Retrofit studs can be placed on either side of existing studs. Once the two are well fastened together they act as a single unit.
- The fasteners should be at least 1/2" from the edges of existing or retrofit studs.
- Retrofit studs do not need to be pushed firmly against the outside wall. However, they should overlap existing studs so that fasteners can be placed a minimum of 1/2" from the edges of existing and retrofit studs.
- Horizontal braces need not be perpendicular to the gable end wall which means they can be run at angles to the wall to avoid an obstacle.
- The size of retrofit studs can be 2x4, 2x6, 2x8, or 2-2x8s depending on the configuration letter A, B, C, D, respectively.
- If a retrofit stud needs to be notched less than 2", then use the next size lumber. For example if a 2x6 retrofit stud is required to be used, you can use a 2x8 so you do not notch it more than 2". The idea is to always meet the minimum depth of the **Tables 5.1 and 5.2** requirements.
- If the attachment of wall sheathing or siding is at all suspect apply a heavy bead of AFG-01 rated construction adhesive on the sheathing where the edge of the retrofit stud will be place. **See page 44 in Section 8 for more details about this best practice.** Push the stud in place against the sheathing and against the existing stud.
- Where to cut retrofit studs? It will probably be easier to cut the studs first and then carry them into the attic.  
You should save the cut off section to use as a compression blocks.

### Horizontal brace installation requirements and hints:

- Horizontal braces are at a minimum always 2x4s but wider ones are fine. Buy 8-foot boards. There is no need to cut them to length unless you need short compression blocks.

- Horizontal braces must be attached to at least three framing members, ceiling joists or trusses, and they must be attached to all framing members at the same elevations over which they cross.
- Horizontal braces must extend into the attic at least 6' plus 2-1/2".
- Horizontal braces can be run at angles to avoid obstacles, but they still must extend far enough that they meet the two conditions above.
- Horizontal braces must be attached to framing members with 3" fasteners at each location. The fasteners should be at least 1/2" from the edges of either piece of lumber and at least 1/2" from each other.
- Fasteners must be at least 2-1/2" from the ends of the braces.
- If you were going to go the extra mile on any of the retrofit measures, probably the most effective thing you could do would be to make the horizontal braces on the attic floor a couple feet longer and fasten them appropriately. Longer braces are much more effective than wider ones and cheaper.
- For L-bent applications you have some flexibility in placing horizontal braces. Horizontal braces can be installed on either side of existing studs as long as that is where a retrofit stud can be installed. Horizontal braces can be run at an angle to avoid obstacles, and they can be fished under some obstacles. If need be, they can be shortened 2' if blocking is added, and they can be shortened even more if a plywood deck is installed that spans the area blocked by the obstacle.
- Braces do need to be secured to each framing member over which they cross, unless the member is near the wall and its only function is to be deadwood to support ceiling drywall.
- For L-bent applications, select which side of an existing stud is the best place to install a retrofit stud. The retrofit studs don't have to be consistently on the same side. So you don't make a mistake by forgetting which side you have decided to use you might consider using a black marking pen to place an arrow on each existing stud. It is okay to angle a brace so it runs at an angle from the wall to skirt obstructions. Just be sure that by running it at an angle that the brace is still long enough to extend at least 2-1/2" beyond the framing member most distant (about 6') from the gable end wall. If you angle them you need not angle the end cut of the brace so that it fully butts the existing stud or retrofit stud. However you do need to make an angle cut on the compression block so that its end pushes against the retrofit stud and fully butts against the existing or the retrofit stud. This is so that the compression function will be fully effective.
- Horizontal braces used at U-strap locations must snugly butt a retrofit or existing stud, and have a contact area with each other of at least 1-1/2" by 1-1/2" or its equivalent.
- When you install horizontal braces onto attic floor framing members you may notice that some floor framing members are lower or higher than the rest resulting in gaps between the horizontal brace and one or more flooring members. Gaps need to be filled with wood shims. Gaps tend to be more of a problem with block walls than frame walls. Start installing fasteners at the wall end to ensure that the brace will be on the correct side of the existing stud and jammed against the existing stud. Attach horizontal braces by installing fasteners that connect the horizontal brace to every framing member over which the brace passes. Fastening to a ceiling joist used

solely to support ceiling material, and located next to the exterior wall below, is not necessary. Nevertheless, fastening needs to be made to at least three primary framing members unless blocking or decking is used.

- Horizontal braces can be attached to plywood on an attic floor if the plywood itself is well secured to framing.
- Rat runs located where you need horizontal braces can be used provided they are structurally sound and can be secured to attic floor framing with three fasteners on at least three framing members into the attic. However, a rat run for U-bent applications is not apt to be made to butt the retrofit stud snugly as is required.
- Rat runs not located where you need them, are still beneficial to the gable end retrofit because they can further distribute the gable end loads to the attic floor/roof ceilings. If practical, install 3" fasteners at each framing member trying to have three at each location yet not splitting the wood.
- Rat runs routed at angles that are in the way of horizontal braces can be cut to allow braces to be routed properly. Again, whenever practical use rat runs to provide additional bracing.
- Where to cut braces:
- Where to cut retrofit studs? It will probably be easier to cut the studs first and then carry them into the attic. You should save the cut off section to use as a compression blocks. The cuts do not have to be pretty except for the cut that butts retrofit studs in the U-bent method. You may want to cut the upper brace at the same time because the length will likely be the same. In fact, while you are at it, you may want to cut all the horizontal braces, both lower and upper unless there is an odd one or two that need to be longer because they need to skirt an obstruction.
- ***Horizontal braces attached to the bottom edges of rafters or bottom edges of the top chords of trusses members:*** Installing upper horizontal braces is not as easy as installing lower ones. It is difficult to hold a 6' brace lengthwise against the roof framing members while trying fastening it. It seems to take three or four hands. That sounds impossible, but actually is not nearly as hard as it sounds. Some hints will be offered in paragraphs below. Aside from having to hold the brace the installation procedure is the same as for the bottom brace.



**Figure 8.1.** Installation of upper horizontal brace by having started screws before lifting the brace up to fasten it.

**Compression blocks installation requirements and hints:**

- Compression blocks must snugly butt retrofit studs or existing studs.
- Where compression blocks butt retrofit studs or existing studs they need only have contact area about 1-1/2" by 1-1/2".
- Compression blocks can be wider and longer than the absolute minimum suggested in Table 5.1 on row 17. There is no need to cut them to the lengths in the table.
- The lengths of compression blocks given in Table 5.1 on row 17 are the absolute minimums and assume two fasteners side by side distributed 2-1/2" from others and 2-1/2" from the ends. Longer blocks are recommended in case fasteners cannot be made to penetrate straps.
- Table 5.1 row 17 tells the number of 3" fasteners required to hold the blocks to horizontal braces.
- Fasteners must be spaced 2-1/2" apart along the length of blocks and 2-1/2" from the ends of the compression blocks.
- Fastener must be at least 1/2" from the edges of the blocks and the horizontal braces.
- It is fine if fasteners penetrate straps.
- Most people place fasteners side by side, one a minimum of a 1/2" from the edges and one similarly located across a compression block. Straps can interfere with this method so longer compression blocks are recommended just in case.

**Strap hints:**

- Strap lengths are specified in Tables 5.1 and 5.2 in row 15.
- The number of fasteners to secure each end of straps is given in Tables 5.1 and 5.2 in row 14.

- Straps can be fastened with 8d nails or #8 x 1-1/4" screws. Do not use drywall screws.
- Fasteners for straps must be a minimum of 2-1/2" from the ends of lumber whether retrofit studs or horizontal braces.
- Strap gauge shall be 20 gauge. Heavier straps are not recommended because of the difficulty of bending them sharply.  
Model numbers include LSTA24, MSTA24, LATA30, LSTA36, MSTA49, and LSTI49 are supplied by both Simpson and USP. The last two numbers indicate the length. LSTA30 is mentioned because it can be used instead of 24" straps.
- Forty-nine-inch straps will probably have to be special ordered.
- You may want to consider ordering 20 gauge strap in coil form. Straps supplied in 25' or longer coils can be used and cut to length as needed.
- Straps cannot be spliced together.
- Longer than minimum length straps can be used.
- Heavier than minimum straps can be used, but are harder to bend to get nice sharp bends while minimizing slack.
- Straps can be bent multiple times, but only once at each location.
- Straps should be kept as taught as practical. Heavier straps are harder to bend sharply to keep taught. Bending straps over a sharp edge or in a vice helps assure a tighter bend. L-bent straps can be bent over the ends of retrofit studs and then made tighter by being hit with a hammer.
- Compression blocks can be fastened down through straps though nails may deflect and screws may break or just stop. This is why using compression blocks longer than the minimum is a good idea so that all the compression block fasteners can be installed while respecting minimum edge and spacing dimensions.
- For L-bend straps, **Tables 5.1 and 5.2 row 16** tells where to bend straps compared to the middle of straps. The distances from center given were based on bending so the leg that will be on horizontal braces will be longer than the leg on the retrofit stud by the width of the retrofit stud (2x4, 2x6, or 2x8 as the case may be) plus about 1/2". The half inch is so you have sufficient space to place the fastener that will be closest to the retrofit stud.
- U-bent straps should be bent symmetrically so they wrap the sides of horizontal braces with approximately equal lengths.

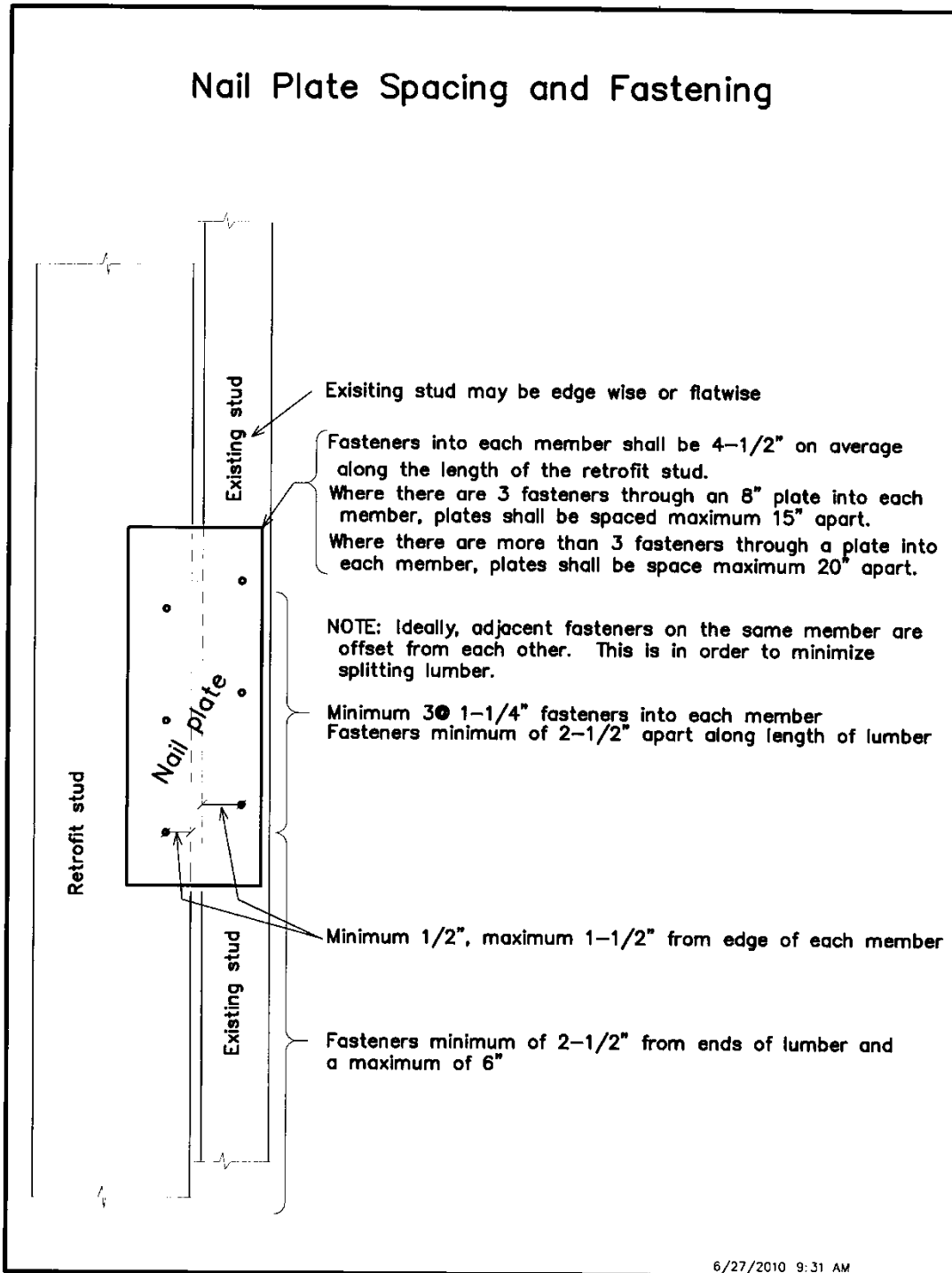
#### **Fastener hints:**

- Easy to remember hints: make strap-to-wood connections with fasteners 1-1/4" long, and make wood-to-wood connections with 3" long fasteners.
- Strap-to-wood fastenings must be made with 8d nails or 1-1/4" #8 screws. Although 8d nails are usually 2-1/2" long, for gable end retrofits they need only be 1-1/4" long. 8d nails must have shanks 0.131" in diameter and must be at least 1-1/4" long. Drywall screws cannot be used because they are too brittle.
- Wood-to-wood fastenings must be made with 10d nails or 3" #8 screws. 10d nails must have shanks 0.148" in diameter and must be 3" long so that they fully penetrate both pieces of lumber. Drywall screws cannot be used. Deck screws are a good choice because of their availability and pricing plus some have heads that

are particularly easy to drive. #9 diameter screws can be used equally well and may be all that is available at reasonable price in 3" lengths.

- Fasteners spaced closer than specified are apt to split the wood.
- Screws have the advantage of not causing impacts when they are installed.
- Short screws require only one hand when they are being driven.
- Screws cost more than nails.
- Screws take longer to install than nails.
- Screws with sharp points especially those with chisel or cutting type points are easier to start than duller ones. It can make a big difference when working overhead.
- Using the same head drive type for the 1-1/4" and 3" length screws will save you time because you won't have to change drive bits.
- Screws with square or star heads tend to stay on the driver tip better than Philips and they do not strip out as easily. Combination heads seem to work fine and best when not used with Philips drivers.
- Nails are cheaper and sometimes faster to install than screws.
- Driving nails has the potential to damage drywall or plaster ceiling and stucco ways.
- Nails driven with a hammer require two hands.
- Nails driven with pneumatic drivers can certainly be installed fastest, but in some attics dealing with compressor hoses can make pneumatic drivers not worthwhile. Using a palm type pneumatic nailer that feeds nails is a great alternative.
- **Table 8.1** below illustrated nicely the minimum distance for placing fasteners.

## Nail Plate Spacing and Fastening



**Figure 8.2** This shows the plated spacing and fastening requirements.

### Lumber hints:

- Retrofit studs can be 2x4, 2x6, 2x8, or 2 2x8 depending on the load conditions as shown in **Tables 5.1 and 5.2 on row 12.**
- Retrofit fit studs can be spliced if necessary to get them into the attic.

- Horizontal braces are always 2x4s at least 6' long. Lumber must be stud grade or better. #2 is good. Terms like choice and select are not well defined in terms of strength characteristics so they should be avoided. Likely, they are softer and will not hold fasteners as well.

### **Installation hints:**

- Lighting from two directions eliminates shadows.
- Headlamps provide good lighting where you need it.
- Making a permanent or temporary walkway out of 2x4s laid on the attic floor can be a worthwhile investment in materials and time when an attic is particularly difficult to navigate.
- On hot days do all the cutting and prep work you can outside of the attic. All the work can be done by one person. The most difficult aspect is holding the horizontal braces to the roof structure while attempting to fasten it. That is why the horizontal brace jig is so handy.
- Making a horizontal brace jig mentioned in **Section 15** is a worthwhile investment in time. Short of the jig you can temporarily hold the brace in place and mark where it crosses the roof framing member closest to the gable end and a second framing member about 4' farther away from the gable end wall. Start one fastener at each mark. Position yourself so that you can reach each of these fasteners and then lift the brace into place and drive the fasteners into the roof framing members starting with the fastener closest to the gable end. This will minimize the time required to hold the brace in place and allow anchoring the brace without having to hold the fasteners in addition to the brace and fastening tool. Usually one can hold the brace into place with one hand especially if fasteners have been started. If the brace is particularly heavy or long you may want to devise some help. One suggestion is to hang the far end from the last framing member with a rope by installing a fastener to the framing member.
- Using the L-strap method at least on the attic floor makes working easier. Horizontal braces can be installed first giving you a 3-1/2" surface to walk on that is at right angles to just the 1-1/2" edge of the ceiling framing. Another advantage where the ceiling below is fragile is that the braces being at right angles distribute your weight over more than just a single framing member lessening the risk of cosmetic ceiling damage.

### **BEST PRACTICE**

It is safe to assume that wall sheathing installed on houses not built to high wind standards is inadequately fastened to the wall. Adding nails on the outside is usually not an aesthetically acceptable solution. Applying construction adhesive on the attic side of sheathing might help. One of the unanswered questions about adhesive is how long it lasts in hot attics. It is bound to help for several years. The large tube shown in **Figure 8.2** is clearly the cost effective way to buy it. It is recommended to apply a good size bead on the wall sheathing where retrofit studs will be butted to the wall. If one is concerned about the attachment of their sheathing they can go the extra mile by applying a bead of adhesive along both edges of all studs that butt the sheathing.





**Figure 8.2** Applying construction adhesive where retrofit stud will make contact with the sheathing because it was assumed the sheathing was not sufficiently nailed. An L-strapped retrofit stud is shown about ready to be installed.