

14.0 Selecting Materials

Material takeoff, using Tables 6.1 and 7.1: From the worksheets you have developed you know the number of each kind of retrofit you will be doing. With that information you can complete the tables below to help you make up a shopping list. These tables are also available for easy printing in **Section 17**. At the bottom of the table where #= appears, you enter in the number of retrofits stud locations for each of the Retrofit Configurations, A, B, C and D. Then you multiply that number by the number in the Num @ (which is intended to mean `number each') and enter that calculated number in the X # (that means `times the number (#)) column'. Do that for each row and each configuration. Then in the right most column total the numbers in each of the X # columns. Do that for each row. Now you know the number of each item you will need. Because 3" screws are supplied in boxes by the pound, the table has a rough estimate of the number of pounds of screws that will be needed. There is a printable version of these two tables in **Section 17**.

You may want to purchase just the materials you will need for a single gable end because as you work you may find you will make some changes that might affect the lengths of lumber.

Purchasing materials: Everything you need is available at most home improvement supply stores except 49" straps, HGA and HGAM connectors and maybe 30" straps. Read farther down for more discussion about these items.

Fasteners and Tools for Fasteners: **Table 14.1** is intended to help you determine if you want to use nails or screws. Then you can determine which methods of installation you want to use. Most people will find using screws has the most advantages especially if they have a good cordless driver/drill. Experienced carpenters who have pneumatic nailers made for use with straps may well prefer to use their nailers. Last on the list of preference is the use of a hammer. A cord operated drill screw driver is a perfectly good choice especially if it has a clutch. More discussion follows the table.

Selecting fasteners: The table tells you of the advantages and disadvantages of screws and nails. You can mix and match between screws and nails. Most people will be better off using screws. Experienced carpenters may prefer nails for some applications. Care should be taken when using nails on lumber that has brittle or fragile finishes applied to it such as stucco on outside walls or on ceilings, drywall or plaster. Being able to accurately position fasteners is important for the fasteners to be effective and reduce the chance of splitting wood. Screws cost three to four times more than hand driven nails cost. Screws can be easier to install especially when working above one's head and working in very tight quarters where swinging a hammer is difficult. Pneumatic nailers are somewhat bulky and require hoses. The cost difference between nails and screws is about \$25 for a medium size gable end. The extra time and extra cost of screws may well be worth the reduced risk of damaging ceiling finishes.

TABLE 14.1. Comparison of fasteners and tools. This table is intended to help you decide what type of fasteners to use.

COMPARISON OF FASTENERS AND TOOLS

	Precision of fastener placement	Ease of use	Ease over-head	Negatives	Number of hands	Speed	Cost	Risk of damaging ceiling or wall finish
Screws with cordless	Very good	Best	Best	Battery charging	1 maybe 2	Slowest	3 to 4 times nails	Low
Screws with chorded	Very good	Good	Very good	Power chord	1 maybe 2	Slowest	3 to 4 times nails	Low
Nails with pneumatic nailer	Very good to worst	Good	Good, but heavy	Hose and compressor	1	Fastest	Low	Middle
Nails with hammer	Very good	Worst	Worst	Can be tiring	2	Slow	Low	High

Fastener requirements: Only two lengths of fasteners for gable end retrofits are required -1-1/4" and 3". For fastening straps to wood use 1-1/4" and for fastening wood to wood use 3". More fastener requirements are given below in the discussion about nails and screws.

Nails: The 1-1/4" nails for fastening straps to wood must be 8d diameter. 8d refers to nails with 0.131" diameter with typical lengths of 2-1/2". However, for gable end retrofitting, they only need to be 1-1/4" long. The minimum diameter is still required. The most commonly available shorter 8d nail is actually 1-1/2" which is just fine and even better. The 1-1/2" nails are much easier and faster to install compared to the 2 1/2" 8d nail. The extra strength provided by nails longer than 1-1/2" simply is not needed. The 1-1/2" 8d nails are readily available even at home supply stores. The short Simpson model number for these nails is N8. The USP equivalent is N11. Both brands are packed in large economical quantities.

The 3" long nails for fastening wood to wood must be minimum 10d nails with 0.148" diameter. These are not special nails. Just get 10d common nails of the correct diameter and length.

Screws:

Requirements: The screws for fastening straps to wood must be minimum 1-1/4" long #8 in diameter. Longer screws are fine. Screws longer than 1-1/2" will take more time to drive. The next size larger diameter, #9, is fine as well and still screw into the holes in straps. Regular screws should be used and not drywall type screws which are too brittle for gable end retrofits. The 3" long screws for fastening wood to wood also need to be minimum #8 in diameter. Again, #9 screws will also work and provide a little extra strength without splitting wood. The several considerations when selecting screws are discussed below.

Selecting screw head shape: The shape of screw heads is not important when selecting screws. They can be flat under the head or beveled/wedge shape.

Selecting the type of screw head driver: The two important issues for selecting the type of screw head are 1) that they are easy to drive; and 2) that they have the same type of drive (Phillips, square or star) so that one does not have to change driver bits when going from one length to the other.

Most people that use screws with a star head drive or a combination Phillips-square head are convinced that they are easier to install than screws with just Phillips heads. Don't get confused by the term Phillips-square head. It means that either kind of driver bit can be used. Experience with some brands of Phillips-square heads has shown them to be just as good as square head screws. A significant advantage to screws, especially square and star head ones, is that they can be placed on the tip of the driver/drill and stay there while starting a screw into wood. For the last several years, the drive style of deck screws has evolved so that they are getting easier to drive. For shorter screws this makes installation really easy by freeing up a hand. Driving three inch screws may well require two hands, one for the driver/drill and another to keep the screw from wobbling until it gets started into wood. It is still easier than a hammer and nail. If you have a choice select the drive type for both 1-1/4" and 3" screws to be the same because it will save you time changing drive tips. However, using 3" screws with just Philips head drive so that you do not have change tips to drive 1-1/4" screws is probably not a good tradeoff. Simpson now has #9 by 1-1/2" screw (SD9112R100) with a hex head. The hex head would probably be a good head to drive albeit it would mean changing tips. The advantage of using a deck screw for the 1-1/4" fastener is that you might be able to match head drive types with the 3" screws. The catch is that these screws might only be available in lengths longer than 1-1/4". It is OK if they are longer. It will just take longer to drive them, but not having to change drive tips may make it worthwhile. Incidentally, #9 screws are just fine. They do fit into the holes in straps. They don't fall into the holes, but they do drive through quite nicely.

Shape of screw tips and chisel type shanks: Try to find screws that are sharp and fairly small diameter for the first 1/8" inch or so because these screws will start driving much more easily than fat ones with dullish tips. When trying to start screws in hard wood or the hard grain, using screws with sharp points will save time. Screws that have sort of a chisel deformation that extend up from the tip about 1/4" seem to drive more easily than regular screws. This is not nearly as much of a consideration as the sharpness of the tip and having screw with good driving heads.

Buying screws: The best deals and the best types of 3" screws are those used for wood decks. Purchasing 3" screws in 5 pound quantities will usually result in significantly better pricing. Usually, the boxes that 3" screws come in give just the weight. This is why the tables include weights for screws. Be warned that the weights are just a first approximation because the weights of these types of screws vary so much from brand to brand and style of screws. Three-inch screws are not always available in the #8

diameter but #9 size works just as well. The smallest screws that can be used are #8 diameter.

Straps:

Straps used for hanging plumbing pipes are absolutely not acceptable. The straps must be those manufactured for making structural connections. Straps must be at least 20 gauge, although using lower gauge straps (which are thicker) is acceptable. You may find that some stores do not stock 20 gauge straps but only the heavier and stronger 18 gauge ones. That is fine. They don't cost much more. Heavier straps are harder to bend sharply. It is recommended that 18 gauge straps be bent out of the attic so a vice or other means can be used to make nice sharp turns. Sloppy turns create slack that makes them less effective.

Straps are available as both precut flat strap form and in coil form. Coil straps have to be cut to length and straightened out.. Flat straps and coil straps have different hole spacing for fasteners. Holes in flat straps are spaced 1-1/2" along the length whereas the holes for coil straps are spaced in groups of two that are 2" apart. Flat straps have an extra hole for fasteners at each end. This explains why the suggest strap lengths for flat and coil may not at first make sense.

Splicing Straps. Straps used to connect members can never be spliced for gable end retrofits.

Bending Straps. There are two issues related to bending straps. One is where to make the bend and the other is how to make the bend. U-bent straps are installed nearly symmetrically so they can be bent in the middle, but to be perfectly symmetrical they need to be bent 3/4" from the middle. For L-bent you can't just make the bend in the middle of the strap unless you use one that is considerably longer than you actually need. Since part of L-bent straps wrap under retrofit studs and you can't effectively install fasteners in this area you need a longer length of strap. L-bent straps need enough length to accommodate the number of fasteners needed on the back of retrofit studs. That is 2-1/2" end of retrofit distance, under retrofit stud (the depth), about an inch of length on horizontal braces so one get fasteners attached, and finally enough length to accommodate the same number of fasteners on horizontal braces as on the back of retrofit studs. **Tables 5.1** and **5.1** have done all this arithmetic for you as you can see in rows 16.

Bend in attic or out? Ideally the bends would be sharp and not too rounded. You may find it difficult to make sharp bends in heavy gauge straps without using a vise or something to safely bend the strap over. One suggestion is to bend them out of the attic where you can make the bends more carefully and sharper using a vise or a substitute. Another suggestion is to apply them to the retrofit stud and then bend them using a hammer to make the bend sharper. NEVER make a bend and then undo it. If a strap cannot be used because the bend is at the wrong place the strap cannot be re-bent. That weakens the strap too much. Thin straps are pretty easy to bend over the ends of retrofit studs after they have been fastened. After bending with one's hand, a

hammer can be used to make a sharp bend. **Figure 18 illustrates the installation of the retrofit stud.**

How many times to bend straps? The answer is both once and any number of times. It depends. At any one location straps can be bent only once. That means you cannot bend a strap back and forth at the same place because that weakens the metal. However, you can bend a strap at as many locations along its length as you need to. The only caveat is that more bends means more slack which does not make for tight connections. Loose connections are more easily weakened by gusts associated with hurricanes. L-bent straps at the tops of retrofit studs need a right angle turn and one that follows the roof pitch. You can make a nice right angle turn and then when fastening a strap to the horizontal brace twist it as needed. That is fine.

Flat straps: Flat straps are available at most home supply stores. Model numbers for flat straps used by several manufacturers are LSTAx or MSTAx where xx is a number that indicates the length. Some manufacturers add Z to the end of the model number to indicate that the connector is more rust resistant. The width of these straps is 1-1/4". They have properly spaced punched holes for fasteners.

Factory made flat straps are available at most home supply stores in most of the sizes needed except for the 49" length required for Retrofit Configuration C. For these retrofits you can either order (MSTA49) 49" long straps or use coil strap. When you need to retrofit using configuration C, you will need to make an analysis of whether to order 49" flat straps or to buy off the shelf or order coil strap. Part of the decision will be based on the number of those straps you need.

Some stores carry 30" straps that are wider and stronger than 24" and 36" straps, BUT they do not have enough holes so longer straps would be necessary to install all the necessary fasteners. So if you can't get regular 30" straps, buy 36" ones.

Coil straps: The minimum thickness Simpson coil strap is model CS20 (20 gauge). It is available only in 250' coils. Simpson does supply coil strap in shorter lengths, but it is heavier gauge, some so heavy as to be impractical for these retrofits. USP supplies 20 gauge coil in 250' foot coils and 25' with model numbers RS250 and RS20-R, respectively. Heavier than 18 gauge is too hard to bend in the attic. A vise would almost be a necessity for making sharp (not rounded) bends. Remember that the lower the gauge the thicker the metal. The strength of thicker straps simply is not needed. Straps of gauge heavier than 20 may require a hacksaw to cut because most snips won't cut steel that thick.

A 250' roll of Simpson CS20 coil strap costs about \$130. That would bring the cost for each 49" strap down to about \$2.10 each assuming you used them all. For contractors who will be retrofitting several houses, this might well be a good way to go. Bear in mind that regular LSTA and MSTA strap have an extra hole at each end and that holes on flat straps are closer together than the holes on coil strap. You may have to cut coil straps to longer lengths than regular flat strap in order to get the number of holes for

fasteners that are needed. One has to be careful to count the number of holes that are needed along with allowing strap length in the no man's land span where fasteners are not installed.

Lumber: The lumber that was specified by the engineer for these retrofits was assumed to be at least as strong as Spruce Pine Fir (SPF) and that its quality level or grade was No. 2 or better. This means that ordinary studs of 'Stud' grade are not acceptable because they are weaker than #2. Southern Yellow Pine (SYP) or Southern Pine (SP) is stronger than SPF and is fine to use No. 2 is better than No. 3 and stud grade. No. 1 and Select grades are stronger than No. 2 and so better. The grade and wood species are stamped on each piece of lumber. Because some lumber comes from other countries the SPF designation for the species of the wood may not be used. Instead the identifications may be on the price label. Select lumber that is not excessively twisted, cupped or crowned. The easiest way to judge this is to look down the length of each piece of lumber because that tends to reveal all the flaws. Because wood is a product of nature one cannot expect perfection. In conclusion it is important when buying lumber that you make sure it is at least as good as SPF and has a grade of No. 2 bearing in mind that No. 2 is better than No. 3.

HGA and HGAM connectors: Home supply stores do not stock HGA or HGAM connectors. In high wind areas, suppliers to contractors may well stock HGA and HGAM. If not they can get them in two or three days in most areas. These connectors along with their fasteners are solid in kits of 10 connectors each. The precise model numbers are HGA10KT and HGAM10KTA. A kit of 10 cost about \$60. Both connectors are about the same price. In the discussions of **Sections 9** and **10** mention was made of the use of different length 1/4" diameter wood screws, namely 1-1/2" for use on some deadwood situations and 4-1/2" long screws for penetrating both deadwood and double top plates. You may find these screws in stock at places that stock HGA and HGAM connectors. Otherwise, you can order them. Their Simpson model numbers are SDS25112 and SDS25412, respectively. Corresponding USP models are WS15 and WS45. They are packed in reasonable sized containers.