

# Roofs

## *Approved Methods*

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## **Introduction to the Roofing Section**

Charlotte HFH normally sub contracts the installation of the trusses and the roofing to sub-contractors. This section is here as a reference.

### **This Section Includes**

- Safety Review

- Tool, Equipment and Material List
- Material Description
- Construction Details and Drawings

## Roofing Safety Guidelines

Review these guidelines with each crew member at the start of the day or as they arrive on site.

**“NO JOB IS SO IMPORTANT THAT IT CAN’T BE DONE SAFELY”**

**Speak up** if something looks unsafe. An observer can spot danger quicker than a worker.

Know where **water & first aid** kit are located. Tell the site supervisor about any injury immediately.

It is critical to **brace the gable trusses** properly.

Habitat **requires safety glasses** not just when using power saws, but at all times.

Habitat **requires hard hats** be worn by **everyone on site** during framing.

**Utility knives** - keep your hand out of the blade’s path. Retract blade when not in immediate use. A sharp blade is safer than a dull one. Safely dispose of used blades.

### Power Saws:

- Only crew members with power saw **experience** can use them. A busy work day is not the time to teach saw skills nor is it the time to learn saw skills.
- Habitat requires that **ear and eye protection** be used when using power saws. Don’t bind the blade of any saw – listen for it. Back off and re-support lumber. Keep electric cords out of the way of the saw and out from underfoot.
- Don’t cross hands over to stabilize material on the miter saw. Find another way or get help.
- **Guards** on saws must be in place & operating.

Keep the entire work area, inside and out, **free of trip and fall hazards**.

Keep **tools not in use in your tool belt at all times**. Select the correct tool for your work. Carry only those you need.

**Remove nails** before discarding lumber. Discarded material must be placed in the designated area.

Keep tools not in use in your tool belt at all times. Select the correct tool for your work. Carry only those you need.

No loose clothing or hair that can get caught in power tools.

Wear appropriate clothing for the task including work boots that protect from falling objects, have a nonskid sole & resist nail penetrations. No open toed shoes allowed.

Tools must be in a safe condition (meet OSHA standards, i.e. no nicks in cords or missing grounding prongs.)

**Think & concentrate** on your task. **If you are uncertain about how to do a task, or how to operate a power tool, ask your crew leader.**

## **Additional Ladder, Scaffolding & Roof Safety**

Use a **ladder** that will reach the work. An extension ladder should reach 3 feet above the step off point. Move the ladder with your work. For every 4 feet of height, move the bottom of the ladder one foot away from the wall. Place ladders on solid footing. Block extension ladders at the top to prevent sideways movement.

**Scaffolding** - See the site supervisor for the numerous safety requirements for scaffolding (i.e. using triple widths of walk boards, placing scaffolding on solid footing, and guardrail requirements).

Keep the entire work area, inside and out, **free of trip and fall hazards**.

**Safety requirements for working on the roof differ according to roof pitch.** See the site supervisor for specific requirements. For a 4/12 or less roof pitch, it will be necessary to have a designated and trained “safety monitor” at all times on the roof. For a 5/12 and over pitch, additional regulations will be discussed. Safety Harness and rope will be required if you are on the roof.

Keep **roof top swept** free of debris and shingle grit and never walk backwards.

Don't leave loose objects on scaffolding, ladders or **roof decks**.

Keep tools not in use in your tool belt at all times. Select the correct tool for your work. Carry only those you need.

**If you are not comfortable working on the roof and/or climbing ladders then you should let the supervisor know and under no circumstance should you feel obligated to engage in tasks that require climbing ladders and working on the roof. There is plenty to do on the ground.**

# Task List - Roof Framing

## Staffing

House Leader  
Framing Task Leader  
4 Crew Leaders  
15 Additional Volunteers

_____	Raise gable trusses and place on walls, plumb, brace & nail	3-4 crews
_____	Set up Guide string for interior trusses	1 crew
_____	Prepare bracing for interior trusses	1 crew
_____	Raise and place interior trusses on walls, plumb, brace & nail	2 crews
_____	Install rear or side door porch roof	1 crew
_____	Install fascia boards	1 crew
_____	Install OSB Nailing Strips	1 crew
_____	Lay-off and install OSB roof sheathing	2 to 3 crews
_____	Install diagonal and bottom chord truss bracing	1 crew
_____	Construct attic floor	1 crew
_____	Install hurricane clips	1 crew
_____	Install roof felt	1 to 2 crews
_____	Clean up site, put away tools and equipment	All crews

## Tasks to Be Completed and Crew Size

### Quality Checkpoints

_____	Trusses braced securely
_____	Gable trusses plumb
_____	Fascia board straight and properly nailed
_____	OSB roof sheathing installed properly/check nailing pattern
_____	2" gap in sheathing at ridge
_____	Wall sheathing installed/check nailing pattern
_____	Drip edge pieces overlapped/locked correctly
_____	Roof felt properly installed and nailed
_____	All materials restacked, site cleaned, tools accounted for and put away

## Task List-Roofing

### Staffing

House Leader

Framing Task Leader

3 Crew Leaders

12 Additional Volunteers

### Tasks to Be Completed and Crew Sizes

_____	Install Drip Edge	1 crew
_____	Lay-off for shingles	1 crew
_____	Place shingles on top of house (as needed)	2 to 3 crews
_____	Install roof shingles	2 to 3 crews
_____	Install ridge cap and ridge vent	1 crew
_____	Remove all temporary bracing	1 crew
_____	Clean up site, put away tools and equipment	All crews

### Quality Checkpoints

_____	Roof shingles laid off with minimum of 1 tab plus 3" at each end of roof
_____	Visible nails on roof tarred (shingle & ridge vent nails)

## **Roofing Tool, Equipment & Material List**

### **Tools Each Roofing Crew Member Will Need**

Hammer (16 oz. Minimum)  
Nail Apron  
Retractable Utility Knife (With Extra Blades)  
Measuring Tape (16' Minimum)  
Square (Speedsquare® or Combination)  
Two Pencils  
Safety Glasses  
Work Gloves  
Hard Hat  
Water

### **Tools and Equipment Needed On Site**

Ear Protection/Glasses/Hard Hats  
100' Grounded Drop Cord  
Drop Light  
3 or 4-Way Heavy Duty Electrical Box/Splitter  
Electric Miter Saw (10" or 12")  
Reciprocating Saw (with Extra Blades)  
16' Extension Ladder  
Two 8' Step Ladders  
Two 6' Step Ladders  
Handy Bar/Crow Bar  
Siding Snips  
30' (Minimum) Measuring Tape  
Nylon String (300 Yards)  
Rope  
Push-Sticks Broom  
Caulking Gun  
Saw Horses (Two Pair)  
Saw Table  
Stapler & staples  
Nail Punch

### **Material List**

#### Lumber

OSB (Roof)  
2x4 Fascia board (Long Lengths)  
2x6 Fascia board  
2x4x12 Attic Bracing

#### Components

Trusses

Nails/Screws/Bolts

16d Nails  
8d Nails including nails with ring shank  
10d Nails  
Roof Nails 1 ½"  
1" button caps nails  
1 ½" Siding Nails (Wall Sheathing)  
Screw Shank Vent Nails  
5/8" 8" Bolts, Washers, & Nuts  
16d Galvanized Finish Nails  
10d hurricane clip nails  
Drip Edge

Other

Plywood Clips  
Felt (Roof and Window/Door Flashing)  
Shingles  
Ridge Vent with Connectors  
Roof Tar or Caulk  
Rubber Roof Boots (for Vents)  
Step Flashing

## **Roofing Material Description**

- Pre-engineered roof framing units that come in two types - Gable Trusses and Interior Trusses

### **Push-Sticks**

- Formed by cutting a “V” notch into the end of a long 2x4. Used to push trusses onto and across the walls

### **Plywood Clips**

- Metal “H” shaped clips used to support the edges of OSB sheathing between the trusses

### **Roofing Felt**

- #15 black felt used for covering the roof and for flashing around windows

### **Roof Shingles**

- #215 Fiberglass roofing shingles

### **Ridge Vents**

- Pre-finished aluminum vents in 8 or 10 foot lengths with connectors, cover straps and special aluminum nails

### **Step Flashing**

- Metal L-shaped pieces used to flash between shingles and siding on small gable roofs

### **Drip Edge**

- Pre-formed aluminum strips that waterproof the framing between the fascia and the shingles.

## Preparing the Gable Trusses

The end gable trusses will need to be sheathed (skinned) with ½" OSB and ladders attached to the pitched part of the gable. Gable trusses that are exposed to the heated part of the house will need to have ½" blue board attached using button cap nails. Gable trusses that cover unheated space will need to have Tyvek house wrap installed using button cap nails (do not place nails where the ladders will be installed).

### Skin the Gable

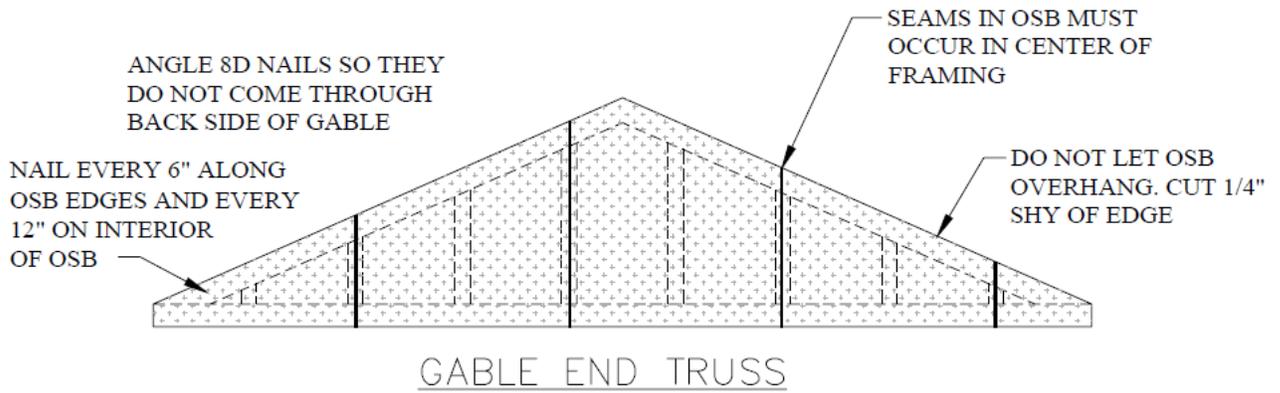
The exposed exterior surfaces of the gable trusses are sheathed with OSB using 8d ring shanked nails. Drive the nails at a slight angle to keep the sharp points from coming through. The nailing pattern for each piece of OSB is 6" on the perimeter and 12" on the interior. OSB cannot extend beyond any edge of the truss. Use a router with a bit to grind off any part of the OSB that extends past the truss. It will be difficult to trim once the gable is raised. Keeping the OSB back from the edge approximately ¼" will avoid this problem. All seams should fall in the center of the framing.

### Skin the Gable - Alternate Method

Some site supervisors overhang the OSB on the bottom of the gable by 1 to 1 ¼" (anymore and it will interfere with wall sheathing). This method provides a lip that can easily be nailed into the cap plate, which strengthens the tie between the gable and the wall. If this method is used, care must be taken to plan the overhang so that it does not interfere with porch beams or porch ceilings. Do not use this method on continuous bearing gables. Check with the site supervisor as to the preferred method.



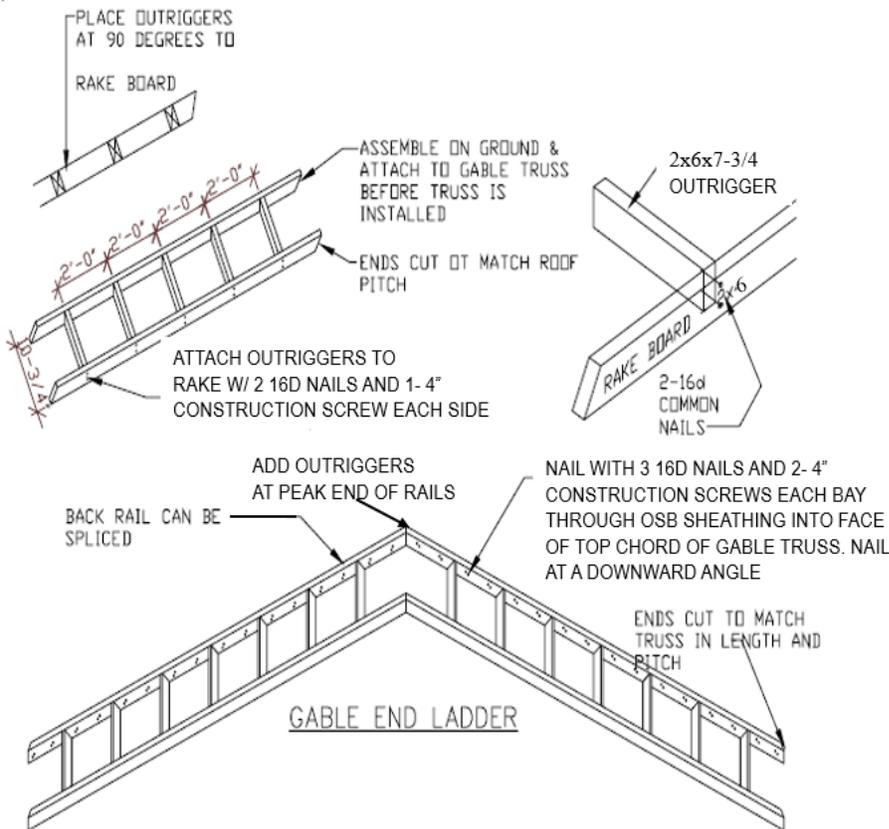
**This is a continuous bearing gable truss so the sheathing should not overhang on the bottom. (Continuous bearing trusses lack diagonal webbing.)**



**Gable Sheathing**

**Gable Ladder**

Construct a gable "ladder" using two 2x4s (or 2x6s) cut to match the top chord of the truss. 7 1/4" blocks of 2x4 or 2x6 are nailed between the "side rails" of the ladder at 24" o.c.. Be sure there is a block on each end of the side rails and if you are splicing a side rail, it will need to have doubled up blocking. Attach the assembled ladder to the face of the truss using two 16d common nails every 12" by nailing through the back rail of the ladder as well as using 3" deck screws, through the OSB and into the top truss chord. Angle these nails slightly toward what will be the ground to prevent sagging.



**End of ladder is cut to match roof pitch.**

# Gable Nailing Boards

When small gable roofs join gable sidewalls it necessary to install a nailing board onto the larger gable. Do this by tracing the shape of the smaller gable into position. Hold the larger gable's ladder  $\frac{3}{4}$ " back from the nailing strip to give room for sheathing and flashing.



Gable ladder stops  $\frac{3}{4}$ " short of the nailing strip.



The large gable has 2x4s in place and ready to support roof's sheathing.



Another example of a nailing board.

## Boxing Returns

Attach Boxing Returns to the bottom of the gable overhang (ladder framing) with 16d common nails and toe nail to the gable wall with 8d common nails. Set the boxing return so the bottom is flush with the bottom edge of the fascia board. Use a Speedsquare® to get it square to the house. A typical boxing return will be 16 ½" wide from the outside of the OSB sheathing.

It is important that the boxing return be ½" shy of the edge of the porch beam framing (or ¼" past the beam's 1x trim). This can be calculated in advance or once the gable is hung, the boxing return can be built out with shims. This placement allows J-Channel to run across the porch beam on the front of the house and straight up the boxing return for an aesthetically pleasing siding job.



Boxing return priorities. The tips can be cut off.

Boxing  
Return



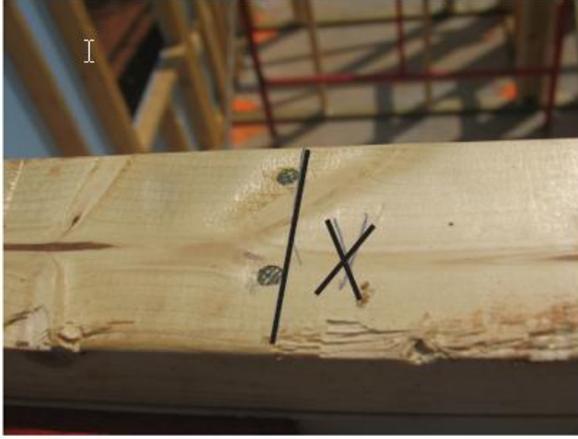
## Lay Off for Roof Trusses (if it has not been done)

Marks for roof trusses are typically added to the top plates during layout and later transferred to the cap plates. If truss layout occurs during framing, the following method is used.

After all the walls are erected, plumbed, straightened and braced, and cap plates installed, lay off for the roof trusses. Beginning at the back of the house, pull a tape from the end of the house on top of the cap plate and make a mark every 24", placing an "X" or "T" on the forward side of the line.

NOTE: If truss plan is other than the normal front-to-back gable plan, refer to the manufacturer's truss plan for lay-off details.

Make a notation on the cap plate to show locations for special trusses. Check the truss order to see if this is necessary (i.e. trusses with extra load bearing qualities for front porches).



Truss Layout Mark Transferred to Cap Plate

## Construction Details - Roof Trusses

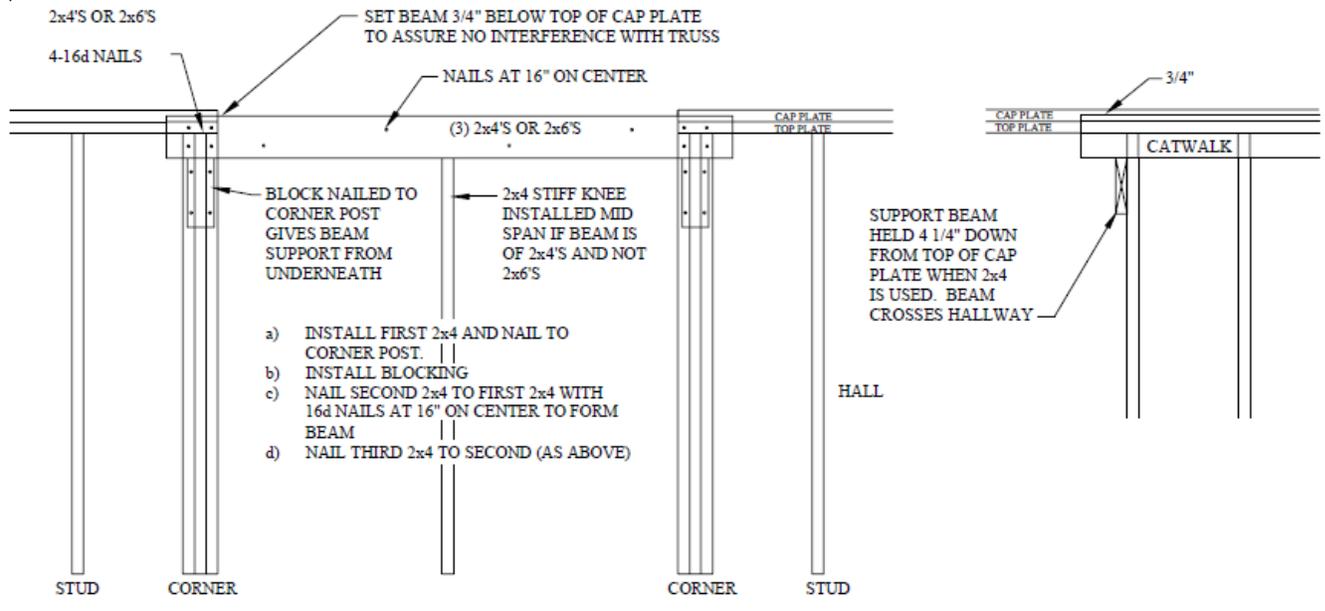
### Prep for Raising Gables

#### Catwalk

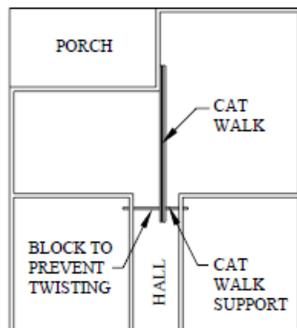
On some plans a temporary cat walk needs to be constructed over the open dining room/den areas to walk on while setting trusses. The catwalk is made of (3) 2x4s or 2x6s nailed together with 16d nails 16"o.c. to form a beam. Adequate support is crucial to safety.

#### Scaffolding and Step Ladders

Place two sets of scaffolding along the side of the house, next to the exterior walls. Place scaffolding inside the house. Ladders alone are not adequate for inside the house.



IF TWO CORNER POSTS ARE NOT ON LINE, IT MAY BE NECESSARY TO BUILD A SUPPORT BEAM ACROSS THE HALLWAY TO SUPPORT THE CATWALK. HOLD THIS SUPPORT BEAM LOW ENOUGH TO HAVE CATWALK 3/4" BELOW TOP OF CAP PLATE. (FOR 2x4 WALK, TOP OF SUPPORT WILL BE 4 1/4" DOWN FROM TOP OF CAP PLATE)

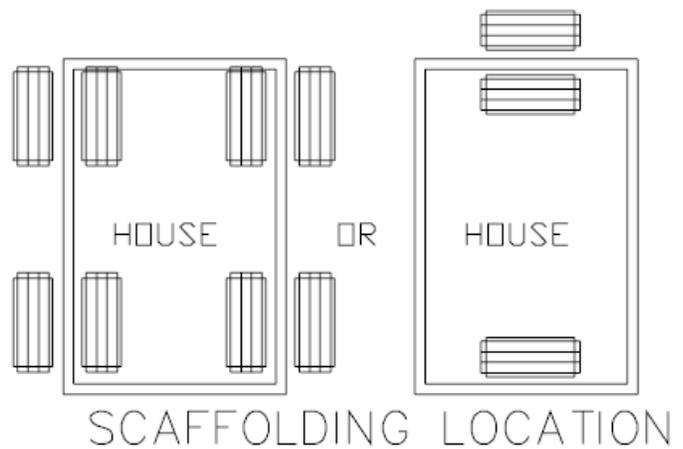


FLOOR PLAN

### Catwalk Details



Catwalk in place and being used



## **Temporary Gable Bracing -Strongbacks**

Before the first gable truss is raised and nailed to the cap plates, install a temporary brace, (“strongback”), to hold the truss in a plumb, upright position. The height of the strongback is the wall height plus the gable height less about one foot. Measure at the location the strongback will be raised. The strongback is placed against a stud. Double the stud if winds are strong or if the gable will be left for even a short time without roof sheathing. Place a layer of OSB and ½” Foam Insulating Sheathing (blue board) as a shim behind the strongback, for the entire length of the strongback, if the wall sheathing and blue board is not installed. Install securely with 16d nails every 16". A weak strongback is very dangerous.

## **Temporary Gable Bracing - End Bracing**

Install two shorter 2x4 temporary braces, about 3’ long, near the outer edges of each end wall before the gable is put into place against the strongback. These two blocks will prevent the gable ends from slipping off the cap plate.

## Strongback's Brace

This is most useful on windy days or when the gable stands without roof sheathing for an extended amount of time. Install a diagonal brace for the strongback from a stake in the ground to the top of the strongback, making sure that its end will not interfere with the raising of the gable. Overlap two long 2x4s and nail them securely together to get the needed length for the brace. Using a 4' level, check the top of the strongback for plumb and nail securely at the top.



Strongback in Place



Strongback Holding Gable in Place Note Box Beam Bracing and how Strongback is braced to interior wall.



Strongback on Rear Gable (end braces missing from photo)



Gable End Bracing (which was installed prior to raising gable)



**“NO JOB IS SO IMPORTANT THAT IT  
CAN’T BE DONE SAFELY”**

It is critical to **brace the gable trusses** properly.

Habitat requires **hardhats** be worn by everyone on site during framing.

**Bracing the Strongback**

## Raising Gable Trusses

Stand the gable truss to an upright position. Line up the bottom chord of the truss with the outer edge of the end wall cap plate, with each end of the truss uniformly extending beyond the side wall cap plates (approximately 9 ½"). It is recommended that three people work from the top of the walls. These three people, with help from those on the floor, will raise the gable truss to a vertical position resting carefully against the strongback. People with the notched push sticks provide stability as the truss is raised into position.

The two shorter temporary braces nailed to the ends of each end wall should already be in place. These two blocks help prevent the gable ends from slipping off the cap plate. The gable is placed between the strongback and temporary end braces and the deadwood that was installed along the capplate.

Check that the overhangs are uniform and that the outside of the gable truss is flush with the end wall (sheathing to sheathing or framing member to framing member) and slip the gable into place along the edge of the cap plate. Nail from the outside of the gable truss through the 2x4 deadwood using 16d nails every 12".

Repeat this process for the remaining gable truss (es).



A temporary diagonal brace is used on the inside of the house. Place it so that it will not interfere with setting the trusses.



Interior Gable Diagonal Bracing (front gable)



Gable End Bracing

### “NO JOB IS SO IMPORTANT THAT IT CAN’T BE DONE SAFELY”

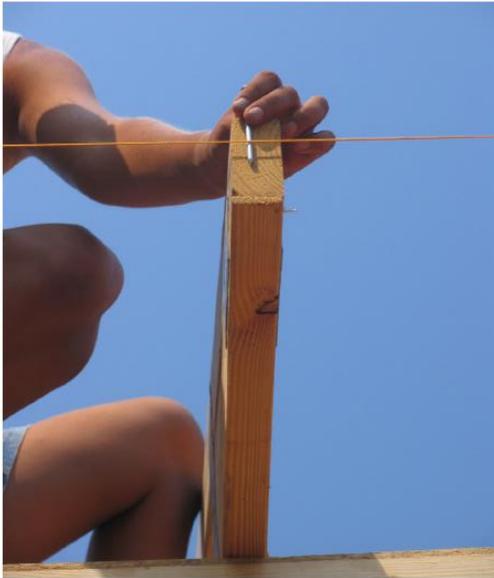
Placing the trusses on top of the walls is a difficult and potentially dangerous task that requires the **cooperation** of several crews working together under the direction of very experienced crew leaders overseen by the task leader. This is particularly true of gable trusses, due to their **enormous weight**. It is imperative that the deadwood, strongback and end **bracing be in place**. Scaffolding and other prep should be in place and secure.

## **Interior Trusses**

### **Guide String for Truss Overhangs**

Before raising the interior trusses, attach a string line around the end of the front gable truss to the end of the rear gable truss. Use this string line to line up all the other trusses, being careful not to let any truss actually touch the string. Place the string opposite the side of the house where the trusses will be handed up.

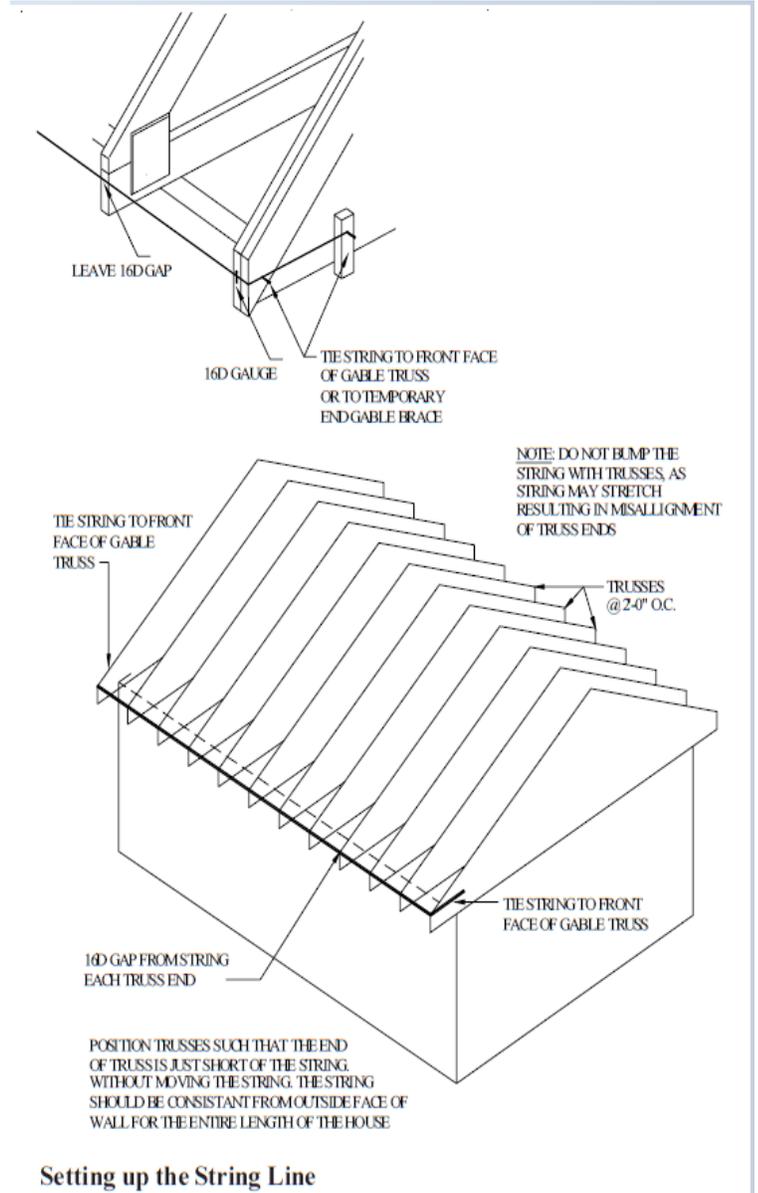
Hint: Place (don't nail) a vertical 16d nail between the end of each gable truss and the string. The tension on the string will keep the nail in place. As trusses are put into place, hold them off the string using a 16d nail as a gauge. This insures that no truss will touch the string, which would create a situation of compounded errors.



Place a 16d nail between the string and each gable truss. Keep interior trusses off the line by the width of a nail. Do not let trusses touch the string.



String Line in Place. Trusses Being Set.

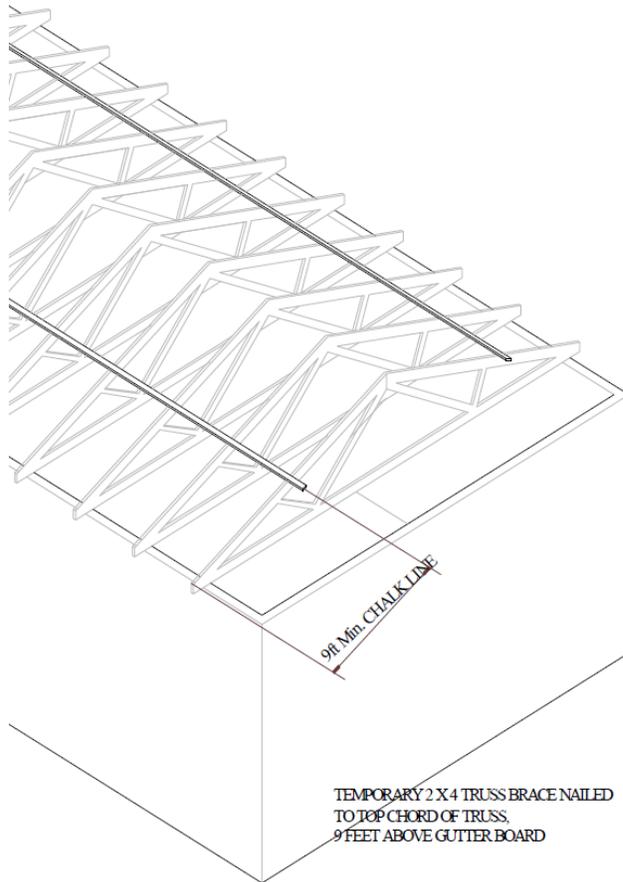


Setting up the String Line

## Truss Bracing Prep

Mark about twelve 12' 2x4s at 24" o.c., starting with the tape at the end of the board. These will be needed on the roof as soon as the trusses start going up. Accurate marks will keep the trusses plumb until the OSB is installed and will later be used in the attic for bracing the bottom truss chords.

While the trusses are in a stack, mark a line on the top chords 9' up from their ends. Placing the braces along these marks will keep them straight and level and keep trusses plumb.



**Temporary Truss Bracing**



**Temporary Truss Bracing**

## **Raising Interior Trusses**

After the gable trusses have been installed, the remainder of the trusses can be placed on top of the walls using the same procedure as for the gables.

**CAUTION:** Trusses should not be stacked directly on top of one another. They can slide or become unstable and may cause an injury. Do not let the trusses interfere with the string line. When a truss is on its side, do not walk where it does not have a wall directly beneath it for support.

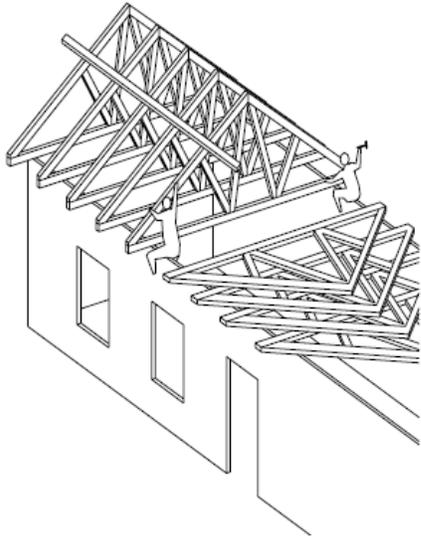
Because crew situations vary crew to crew and job to job, there are several methods generally accepted for raising trusses.

- Evenly distribute all the trusses on the house before raising. Stack the trusses like a splayed deck of cards. Do not create a situation where trusses are in the way of the one needing to be raised. (Or)
- Evenly distribute a portion of the trusses on the house, raise that portion, and repeat. (Or)
- Place trusses on the house at the same pace they can be raised.

Position the first interior truss on the layout marks and check the overhang. Nail to the exterior walls, toe nailing to the cap plate with three 16d nails, two on one side and one on the other (three for each side of the house). Do not nail at the interior walls.

### **Temporary Truss Bracing**

Temporarily brace each new truss to the previous trusses by nailing 12' 2x4s (pre-marked at 24" o.c.) across the truss top chords, along both sides of the house, using 16d common nails at each truss. Leave the heads exposed for easy removal. Nail this temporary bracing at least 9' up from the bottom edge of the trusses to allow space for two rows of OSB sheathing to be installed before the bracing is removed. Keep the bracing level and straight so the trusses will go up plumb.



**Trusses Stacked and Ready to Raise**



**Handing Up Trusses**



**Toenail with two 16d nails on one side and one on the other side**

## Bowed Trusses

If an interior wall is un-level and causes the truss to bow, check to see if the wall framing can be tightened up with a sledge hammer. If not, it will be necessary to remove a portion of the cap plate. This is best done before the truss is nailed down. Take several passes with a skill saw set to the depth that will alleviate the bow, and then use a chisel to clean the cut. If the truss is already installed, a reciprocating saw can remove a piece of the cap plate. Nail the loose ends of the cap plate to the top plate. Never modify a truss.

## Temporary Interior Diagonal Gable Brace

Immediately after the gable is raised, attach a 2x4 brace from the highest point of the gable down at an angle to an interior wall, nailing it in place when the gable is rechecked for plumb. Brace the front gable as well. Place the brace such that it will not interfere with subsequent trusses. This should insure that the gable truss, and therefore, the interior trusses, remain plumb during subsequent operations.



Relieve a bowed truss already installed by removing cap plate. If not installed, chisel out only a portion of the plate.



Temporary Interior Brace on front gable.

**“NO JOB IS SO IMPORTANT THAT IT  
CAN’T BE DONE SAFELY”**

**Think** & concentrate on your task.

**Speak up** if something looks unsafe. An observer can spot danger quicker than a worker.

## **Rear and Side Door Roofs**

### **Porch Roof for Side Door**

Leave a square cut on the end of four truss extenders (stud length 2x4s). Using 16d nails, attach these to the sides of the top chords of the trusses. Center the roof extension over the door. The extenders extend 25 inches from the end of the truss. The 25" extensions will insure that shingles with a 5" overlap on a 5/12 pitch will blend in with the rest of the roof.

If the truss layout does not center the porch over the door then it will be necessary to make a ladder for the end truss extension. Cut blocks to the length that centers the overhang and install them as bridging.



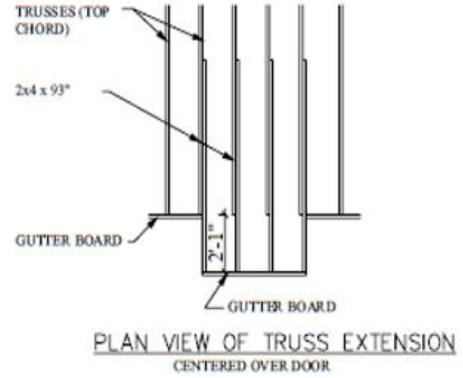
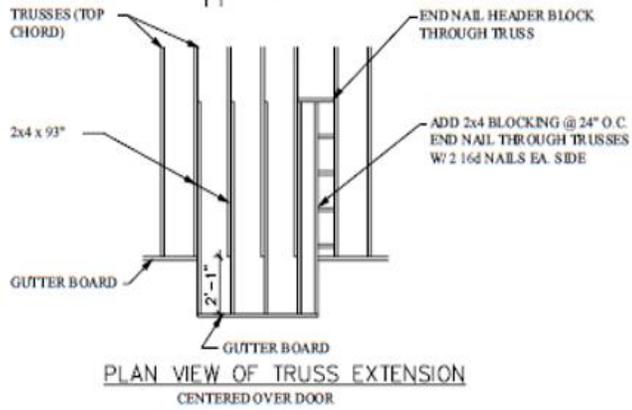
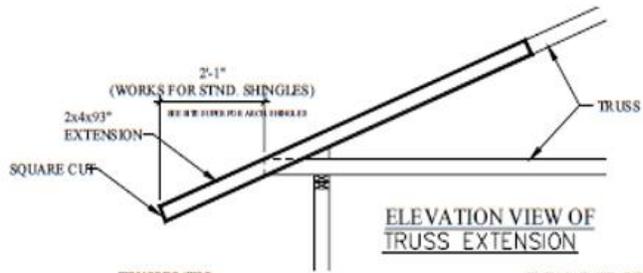
**Bridging and bracing.**



Place a wedge under the additional 2x4 to give it support similar to a truss. Block next to the wedge over to the next truss.



**Side Door Porch Extension**



## Porch Roof for Gable End (Shed Style)

A shed style porch roof, including posts, goes over the back door if the door is on the gable end of the house. The structure is pre-built and will come as a component.

### Fascia Boards

Before installing the fascia board, sight the outer edge of the truss bottom chords to insure that they are in line with the string line. If there are minor variations, use shims behind the fascia board to make an adjustment as this will affect the appearance of the aluminum fascia when it is installed later.

The fascia board is a 2x6 nailed to the outer edge of the truss bottom chords forming a continuous band along the edge of the roof. Hold 2x4 fascia boards flush with the bottom of the truss chord and nail to the end of each truss with two 16d common nails. All joints should occur over trusses.

When a fascia board on the front gable joins the side wall of the larger gable, leave a space  $\frac{1}{8}$ " between the wall and the fascia board. This will allow room for flashing to install between the house and the end of the fascia board.



Porch Roof at Gable End



2x6 Fascia Board installed with smaller truss heel  
Leave a  $\frac{1}{8}$ " gap between fascia board and side wall for siding crew to install flashing.

## OSB Nailing Strips

While the scaffolding is in place for the fascia board installation, it is a good time to install OSB nailing strips between the trusses. These strips serve the purpose of nailing strips for the top piece of siding under the eaves. If time does not allow for installation, store the material on site for siding crew.

Cut scrap OSB sheathing strips between 22" wide by 3-½" tall to 22" wide by 6" tall. (Tall enough to use as a nailer, short enough to allow soffit to vent.) Count the bays, usually about forty, for an accurate count. Strips install between the trusses at the top of the exterior sidewalls of the house. 16" tall pieces, cut in widths of either 22" (between trusses), 4' and 8' pieces (for walls parallel to trusses) are for porches, where the OSB strips serve the additional role of keeping the insulation in place. (Strips on porches extend 12" above the cap plate and will serve as baffle boards for the insulation.)

## Extension Ladder Setup



OSB Nailing Strip

**“NO JOB IS SO IMPORTANT THAT IT CAN’T BE DONE SAFELY”**

Use a **ladder** that will reach the work. An extension ladder should reach 3 feet above the step off point. Move the ladder with your work. For every 4 feet of height, move the bottom of the ladder one foot away from the wall. Place ladders on solid footing. Block extension ladders at the top to prevent sideways movement.

**Scaffolding** - See the site supervisor for the numerous safety requirements for scaffolding (i.e. using triple widths of walkboards, placing scaffolding on solid footing, and guardrail requirements).

Keep the entire work area, inside and out,



**Ladder Blocked to Protect Shingles. An Extension Ladder should reach 3' past point of step off and be secured to prevent sideways movement.**

## Roof Sheathing

Prepare the OSB for nailing by chalking lines on the rough side of each sheet of OSB at 24" o.c. before placing them on the roof. Manufacturer's lines are often inaccurate.

**SAFETY NOTE:** Saw dust can cause the roof to become slippery; therefore all cutting must be done on the ground. One or two people from each crew should remain on the ground to cut panels and pass them up to the crew members working on the roof.

To begin each side of the house, measure up 47" from the end of the truss and strike a chalk line the full length of the house across the top chords of the trusses. (47" insures that the sheathing does not extend beyond the edge of the fascia board, which is not yet installed.)

### Sheathing Basics

- Have each row of sheathing started before continuing across the roof. (See "Establishing Stagger Pattern")
- Lay off remaining 4x8 sheets of OSB so that the end or butt joints are staggered, with each full sheet of sheathing beginning on a different truss, 4' apart.
- Nail with 8d common nails at 6" o.c. on edges and 12" o.c. on interiors.
- Center every truss on the chalked 24" o.c. lines.
- Install plywood clips halfway between every truss on every row. This prevents sagging.
- Do not let any OSB extend past the ladder framing or it will interfere with the drip edge. (Do not use a saw on the roof to modify the edge but pass it down to be recut.)
- Only the first row is installed to a line, the rows above will rest on the H-clips.
- Keep a hairline joint ( $\frac{1}{16}$ " maximum) between adjacent pieces of sheathing. This allows for expansion and it makes the next sheet easier to adjust if necessary.
- As sheathing is installed, the 2x4 bracing is removed and passed to the attic to be used for permanent bracing.
- The first and last 3' of the top row of sheathing is solid to the ridge. The remaining sheets stop one-inch (1") below the ridge of the roof. This allows heat from the attic to escape through 2" at the ridge vent. ( $1\frac{1}{2}$ " is the maximum gap on each side.)



H-Clip Between Trusses



Chalk for OSB 47" up from end of truss



Placing OSB into H-Clips



Center OSB on the truss and nail at an angle

## **Establishing Stagger Pattern for Each Row**

Have all rows of sheathing started with the stagger pattern before continuing across the roof. This insures that the layout will go smoothly across the entire roof. Do this on both sides of the house. The more experienced crew leader(s) should be utilized for this job.

If the gable ladder width is 16 1/2" and it is installed over OSB, and if the trusses are 24" o.c., the first piece of sheathing in each row will be either 41 3/4" or 89 3/4".

## **Sheathing Square and to the Line**

Set the first sheathing piece in place only after the roof crew checks it top and bottom for an accurate and square cut. Place the factory edge on the inside truss and the cut edge on the gable ladder's edge. Line the top up with the chalk line and the side square to the edge of the ladder. If adjustments have to be made due to a poor cut, either recut (if long) or make allowances for it being short when setting it on the ladder's edge. It must sit square and center on the interior truss.

Any mistake with the first of a row of sheathing will be compounded down the length of the house. This remains true for starting all rows.

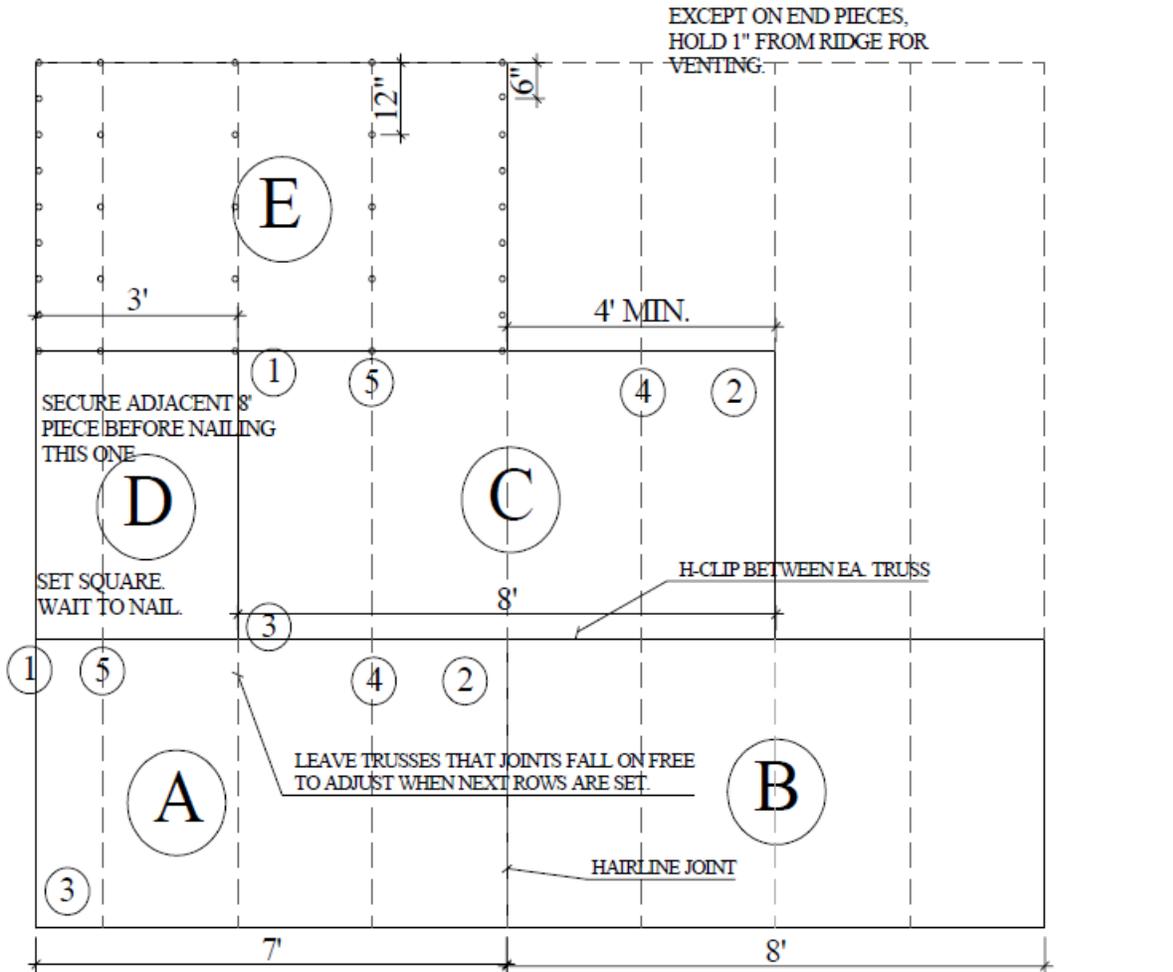
Here are some tips to keeping trusses plumb and sheathing square.

## **Nailing Sequence for Staggered Starter Courses**

- Start at the back of the house.
- Confirm that the gable is plumb as the starter rows of sheathing are installed.
- Nail the upper corner at the gable's ladder. Confirm square and to the 47" line.
- Center the opposite upper corner on the far interior truss and nail, moving the truss over if necessary.
- If not already chalked, mark OSB's top edge at 24", 48", 72", moving back from the interior truss. (Do not depend on manufacturer's markings.)
- Nail in the top edge at one truss back, again, lining up the OSBs 24" mark and the center of the truss.
- Hint: Do not nail where the next row of OSB will create a joint. Leave that truss free, so it can be adjusted with the next row of OSB. This will remain true for all sheathing in the first two rows.
- Install an adjacent 8' piece in the same manner.

Start the next row with a piece that was checked by the roof crew for an accurate and square cut. Do not nail the piece until the adjacent 8' piece is tacked into place. (Small pieces are too small to be accurately square and straight.) Set the piece in place by lining it up with the chalk line and squaring it to the edge of the ladder. Place the adjacent 8' piece square and to the line. Go back and nail the piece at its top two edges. Nail the 8' piece.

When the starter sheets are in place on the next row up, go back to the lower row and add additional nails every 12" along each interior nail line and every 6" along each edge.



LEGEND:

Ⓝ NAILING SEQUENCE FOR STARTING EACH SHEET

Ⓧ SHEATHING SEQUENCE FOR STAGGER PATTERN

----- CENTERLINE OF TRUSS

**Sheathing Details - Stagger Pattern**



Checking 3' OSB for square



Sheathing Stagger Pattern Complete



Marking OSB for 24" o.c. before tweaking interior truss position

**“NO JOB IS SO IMPORTANT THAT IT CAN'T BE DONE SAFELY”**

Keep the entire work area, inside and out, **free of trip and fall hazards.**

Keep **roof top swept** free of debris and shingle grit and never walk backwards.

Don't leave loose objects on scaffolding, ladders or **roof decks.**

**Keep tools not in use in your tool belt at all times.** Select the correct tool for your work. Carry only those you need.

## Sheath Remaining Roof

The rest of the roof can be sheathed now that there are starter sheets in place on every row. Continue along the length of the house with 8' OSB panels.

Check the front gable for plumb as the first two rows reach the end. Measure at the bottom corner of the sheet and a square cut piece will help plumb the gable if the house is square. Measure for sheathing to be flush with the outside edge of the gable ladder.

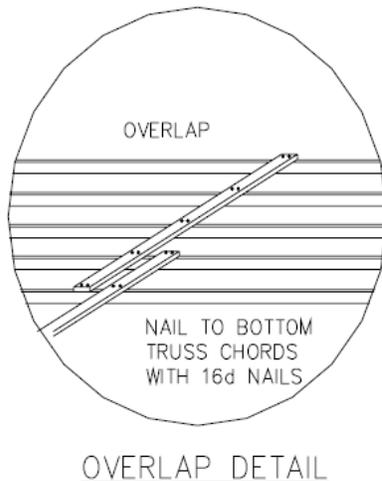
Except on end pieces, hold the OSB sheathing 1" from ridge for venting.

## Bottom Chord Bracing

After the sheathing has been completely nailed, and the used temporary braces passed to the attic, install two rows of permanent truss bracing on the bottom chords of the trusses. Place bracing on either side of the center bay of the truss, within a few inches of the webbing.

Install the first brace by nailing a 2x4 across the top of the bottom chord of the trusses for the full length of the house, making sure that the trusses maintain 24" o.c. and that the joints of these braces overlap by one truss bay (no butt joints). This ties the truss chords together and to the end walls and becomes part of the attic floor. Keep the trusses at 24" o.c. for strength, to accommodate drywall, and to frame the attic floor.

A strong connection between bottom chord bracing and the gable truss is very important.



## Brace Gable per Truss Manufacturer

The truss manufacturer may require additional bracing of the gable truss. See the site supervisor for details. A common requirement is to add a permanent strongback to the gable's vertical members. In this example, 3 of the longest vertical members need to be made into strongbacks with 90% of the each vertical member braced.



Gable bracing per manufacturer. See site supervisor.



Bottom Chord Bracing on each side of attic bay

**“NO JOB IS SO IMPORTANT THAT IT  
CAN’T BE DONE SAFELY”**

Habitat requires that **safety glasses** be used at all times.

**Keep tools not in use in your tool belt at all times.** Select the correct tool for your work. Carry only those you need.

## Diagonal Bracing

A second type of bracing is a 2x4x10 that is nailed to the bottom or top side of the truss webbing. It is sometimes referred to as “Wind Bracing”, “Web Bracing” or “Diagonal Bracing”. (Webbing is an integral part of the truss system used to tie the bottom and top truss chords together.)

Each piece of diagonal bracing starts at the top of the gable and runs down the webbings at a 45- degree diagonal, ending near the bottom chord and spanning at least four trusses. Each side of the truss receives this bracing at each end of the house for a total of 4 boards (plus those in the center of a house for those with three gable trusses). Be careful that it does not interfere with the disappearing attic stair opening or the attic floor. (See house plan for stair location.)

It is important to have a strong tie between the interior trusses and the gable. To do this, connect the gable truss to the first interior truss near the peak by using a 2x4 approximately 26" long securely nailed to the underneath side of both top chords. Proceed with diagonal bracing starting on the first interior truss.



**If gable and truss webbing does not match it will be impossible to tie them together with diagonal bracing. Secure the gable to the first interior truss as shown above. If in doubt, add this short brace.**



**There must be a firm connection between diagonal bracing and Gable Truss. Do this by mitering the end of the 2x4 for full contact with the webbing (flush with sheathing).**



**Diagonal Bracing**



**Diagonal Bracing in Place**

## Roofing Felt

Roll the felt out along the lower edge of the sheathing. Nail securely to the roof sheathing using 1" button caps. So that drip edge can be slipped under the felt, place the lowest nail 3" up from the bottom of the roof. However, drip edge installs over the felt up the rake.

Use a pattern of at least four button caps vertically at 24" o.c. plus nail every 6" at the ends and 12" along the bottom to prevent the wind from getting under the felt and blowing it off before the shingles are installed. Care should be taken to insure that felt is laid-out as flat as possible, without wrinkles, since they will show after the shingles are installed.

Cut each end of the felt so that none of the material extends beyond the OSB sheathing. Continue rolling out strips of felt until the roof is completely covered. When rolling out the felt, take care to make the necessary adjustments that will keep it free of wrinkles. Lap each succeeding piece a minimum of 4" over the previous piece and nail securely along the lap. Insure that code's 2" minimum is met should the rows become uneven.

**CAUTION:** Crews working on the roof should be careful walking on the newly installed felt in case it works loose, in which case re-nail.



**Button Caps** - For drip edge installation, keep them up from edge 3".



**Felt Securely Nailed, Straight, No Wrinkles**

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Keep the entire work area, inside and out, **free of trip and fall hazards.**

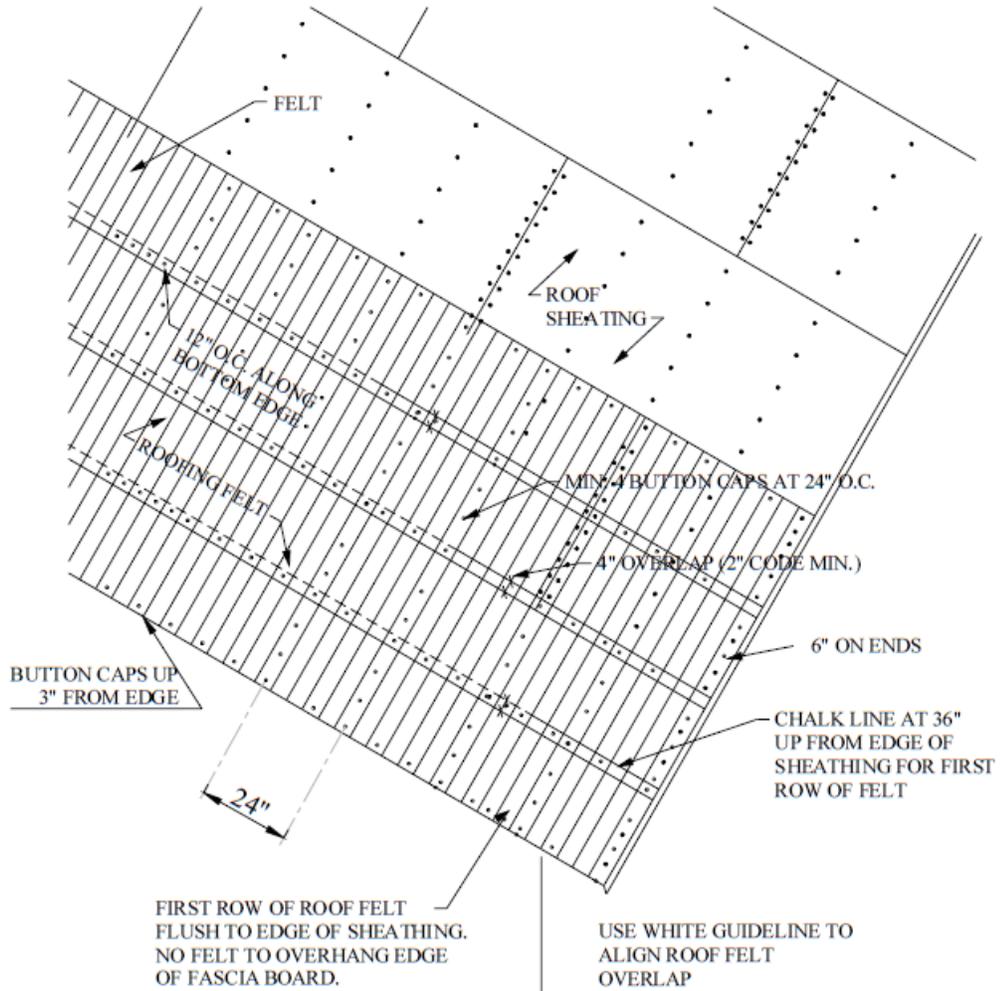
Keep **roof top swept** free of debris and shingle grit and never walk backwards.

Don't leave loose objects on scaffolding, ladders or **roof decks.**

**Keep tools not in use in your tool belt at all times.** Select the correct tool for your work. Carry only those you need.

## FELT NAILING PATTERN

- MIN. 4 - BUTTON CAPS PER ROLL WIDTH
- NAIL IN VERTICAL ROWS 24" O.C. ON TRUSS CENTER LINE
- 12" O.C. ALONG BOTTOM EDGE OF FELT
- 3" UP FROM BOTTOM EDGE OF ROOF



Roofing Felt Diagram

# Construction Details –Shingles

## Drip Edge

Install metal drip-edge by nailing the wide flange to the roof sheathing using roofing nails or siding nails at 24" o.c. The narrow flange extends over the edge of the roof sheathing and the gutter board. Each piece of the material is designed to overlap and lock into the preceding piece. At each corner of the roof the ends of the drip-edge are mitered and lapped to form a 90 degree joint. Bend a single piece of drip edge at the ridge. Do this by making a single cut, only through the face of the material, at the roof's pitch (i.e. 5/12).

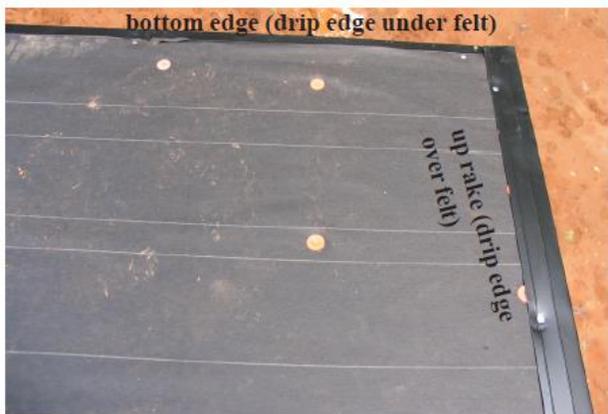
To divert water away from the roof, drip edge is placed under the felt along the bottom of the roof and over the felt up the rake. The logic behind this method is that water blown in from the rake side is channeled over the drip edge onto the felt. Any water on the felt can escape over the drip edge.



Drip Edge at Ridge



Example of Drip Edge Cut for a Corner



Drip edge installs over the felt up the rake, and under the felt along the bottom edge of the roof. Water blown under the shingles is channeled onto the paper up the rake, and over the drip edge and off the roof at the bottom.



Drip Edge around Corners at bottom edge of the roof.

## Extension Ladder SetUp



**Ladder Blocked to Protect Shingles. An Extension Ladder should reach 3' past point of step off and be secured to prevent sideways movement.**

**“NO JOB IS SO IMPORTANT THAT IT CAN’T BE DONE SAFELY”**

Use a **ladder** that will reach the work. An extension ladder should reach 3 feet above the step off point. Move the ladder with your work. For every 4 feet of height, move the bottom of the ladder one foot away from the wall. Place ladders on solid footing. Block extension ladders at the top to prevent sideways movement.

**Scaffolding** - See the site supervisor for the numerous safety requirements for scaffolding (i.e. using triple widths of walkboards, placing scaffolding on solid footing, and guardrail requirements).

Keep the entire work area, inside and out, **free of trip and fall hazards.**

## Place Shingles on Top of the House

When all the felt has been securely nailed and all of the layout lines chalked, carry the shingles up to the roof. Lay the bundles of shingles across the ridge of the roof to prevent them from sliding off the house, and over a truss to prevent damaging the OSB sheathing. Dropping a bundle of shingles across the ridge between trusses will break the OSB sheathing. Place no more than three bundles at each truss.

**SAFETY NOTE:** Each bundle of shingles weighs 80 lbs. so care should be taken to avoid back injuries. The safest way to handle shingles is to carry one bundle up the ladder at a time. Place the bundle on the shoulder and balance it with one hand, leaving the other hand free to hold onto the ladder. Carrying less than a full bundle is an alternative.

## Set Up Roofing Crew

Six to eight people can be used effectively on each side of the roof installing shingles. If more people are available for this task, it is better to rotate crews than to have a crowded roof. One to two hour shifts per crew allow some to be working on less strenuous tasks on the ground while others are on the roof.

Cut ends of shingles should always be placed at the edge of the roof. Factory edge to factory edge is a good way to remember this. When starting the first row, make sure the shingle joints are offset from the

starter strip joints. Starting on the “Y” line should accomplish this.

## Prep for Architectural Shingles

### Starter Shingle Lines

For maximum wind resistance along rakes, install any GAF starter strip shingles containing sealant or cement shingles to underlayment and each other in a 4” (102mm) width of asphalt plastic cement

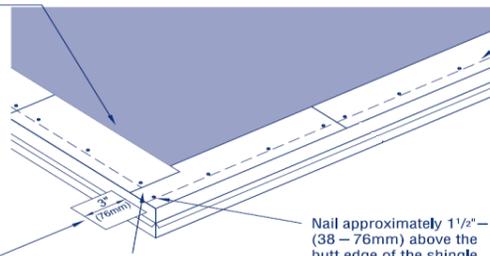
Para máxima resistencia al viento a lo largo de las inclinaciones, instale cualesquiera tejas de hilada inicial de GAF conteniendo sellador o cemento las tejas a la capa base y entre si en un ancho de 4” (102mm) de cemento plástico asfáltico

Pour une résistance maximale contre les vents le long des inclinaisons, installez des bandes de départ GAF avec scellant ou collez les bardeaux à la feuille de protection et l’un à l’autre dans une largeur de ciment plastique asphalé de 102mm (4po)

Trim 3” (76mm) from end of first shingle if using 39 3/8” (1 m) field shingles.

Recorte 3” (76mm) del extremo de la primera teja si va a usar tejas de campo de 39 3/8” (1 m)

Découper à 76mm (3po) du bout du premier bardeau si vous utilisez des bardeaux de champs de 1m (39 3/8po)



Overlap eave edge starter strip at least 3” (76mm)

Traslape la hilada inicial del borde de alero por lo menos 3” (76mm)

Chevaucher la bande de départ du rebord de l’inclinaison par au moins 76mm (3po)

Nail approximately 1 1/2”–3” (38–76mm) above the butt edge of the shingle

Clave aproximadamente a 1 1/2”–3” (38–76mm) por encima del borde de empalme de la teja

Clouer à 38–76mm (1-1/2 à 3po) en haut du rebord du bardeau

Continue with full size starter strip shingle

Continúe con tejas de hilada inicial de tamaño completo

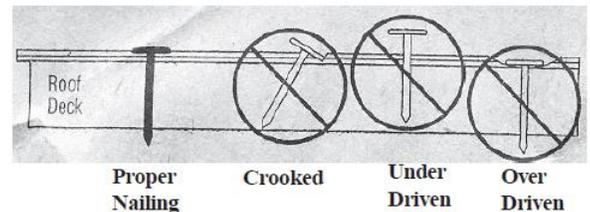
Continuer avec un bardeau de bande de départ de pleine taille

Place chalk lines around perimeter of the roof to mark where the edges of the starter strip will be placed. Chalk Lines should be placed the height of starter shingle minus 1/2” from the outside edges of the rake and eave drip edge.

Review manufacturer instructions on the package of the starter, hip and valley, and roof shingles carefully. Procedures below may need to be adapted to the dimensions of the shingles or manufacturer recommendations.

### Proper Nailing:

Nails must be properly nailed into shingles to ensure good results. Nails must be perpendicular to the roof deck and must firmly contact the shingle. Do not “overdrive” nail into shingle or drive nails at an angle.



Remind crew members to nail only as fast as they can nail properly. Crooked nails are Habitat’s second largest service issue.

### Starter Shingles:

Install the starter shingles on the eaves of the roof with the bottom edges even with the edge of the starter strip starting with the left hand side of the roof. The Starter shingles shall extend 1/2” inch past the edge of the drip edge on the rake and eave edges. Remove a 3 inch portion of the left side of the first starter shingle at the eve to ensure that any “butt joint” between roof shingles will be 3 inches away from butt joint between starter shingles. Ensure that adhesive strip is toward the eve of the roof. Place 4 nails nominally 2 inches from the bottom edge of the starter shingle.

Install starter shingles on the rake edges with the “top” edges on the chalk lines and with the adhesive edge of the starter shingle at the edge of the roof with the specified 1 inch overhang over the edge of the rake drip edge. The starter shingle nearest the eave shall overlap the eve starter shingle by at least 3 inches as shown in figure. Each starter shingle shall be attached with 4 roofing nails.

## Roof Shingles:

Different architectural/shadow shingles require different layouts, and often with a different exposure (i.e. 4 <sup>3</sup>/<sub>4</sub>" ). Read the manufactures recommendations from the package and review with the site superintendent before commencing shingle layout. This graphic shows a typical architectural shingle manufacturer layout, but **yours may be different!**

Start installation of roof shingles starting with a full width shingle

lower left side of roof. The left side of the shingle shall match the ½" inch overhang of the starter shingle and the bottom edge match the edge of the starter shingle at the eve. Continue shingle installation across bottom of roof until you reach the far end. Trim excess length of shingle to achieve the desired 1/2 inch overhang. Use "scraps" cut from left side of shingle where possible to conserve materials.

Review manufacturers instructions for trimming length of subsequent courses of shingles to achieve the desired archetecural effect. It is recommended that a chalk lines be placed after every 6 courses of shingles to be sure shingles are evenly spaced. Continue to run additional courses of shingles until the shingles are close enough to the peak that the Hip and Ridge shingles will extend over the top row of shingles with only the normal reveal showing. Any excess shingle, extending beyond the peak of the roof may be cut off either at peak (for ends of roof) and 1 inch down from peak where the ridge vent is placed.

## Cut End Shingles

Station another person at the end of the roof to trim the end shingles with a utility knife (a hook blade may be helpful). Trim the /shingles prior to installation and leave 7/16 overhanging the rake's drip edge. (From below you want to see the factory edge of the starter shingles and not the cut shingles. Keep them back from edge of starter shingles 1/16".)

It is easiest to cut a shingle from the backside with a utility knife and straight edge. Do not cut after nailing shingles as this gives a rough edge to the shingles.

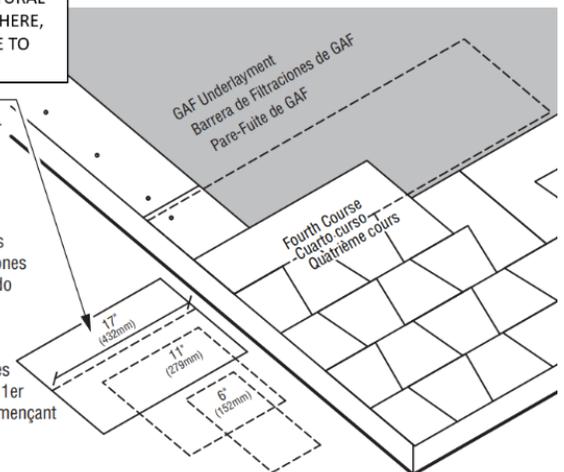
Position each shingle so it butts the edge of the preceding shingle and so the top of the shingle lies on the next 5" chalk line. Nail each shingle with four 1" roofing tacks, one at each end (approx. <sup>3</sup>/<sub>4</sub>" from the

TYPICAL INSTRUCTION FOR ARCHETECURAL SHINGLES. NOTE 5<sup>TH</sup> COURSE, SHOWN HERE, STARTS WITH A FULL SHINGLE. BE SURE TO REVIEW INSTRUCTIONS ON PACKAGE!

Trim 17" (432mm) from rake end of first shingle. Continue with whole shingles. Repeat the 1st - 4th course instructions on the remaining courses, starting the fifth course with a full shingle.

Recorte 17" (432mm) del lado que va al borde en la primera teja. Continúe con tejas completas. Repita de la 1ra a la 4ta instrucciones de hilada en las hiladas restantes, comenzando la quinta hilada con una teja completa.

Découper à 432mm (17po) de la fin de râteau de premier bardeau. Continuer avec des bardeaux entiers. Répéter les instructions du 1er au 4ème rang sur les rangs restants, en commençant au cinquième rang avec un bardeau entier.



**"NO JOB IS SO IMPORTANT THAT IT CAN'T BE DONE SAFELY"**

**Think** & concentrate on your task.

**Speak up** if something looks unsafe. An observer can spot danger quicker than a worker.

**"NO JOB IS SO IMPORTANT THAT IT CAN'T BE DONE SAFELY"**

**Keep roof top swept free of debris and shingle grit and never walk backwards.**

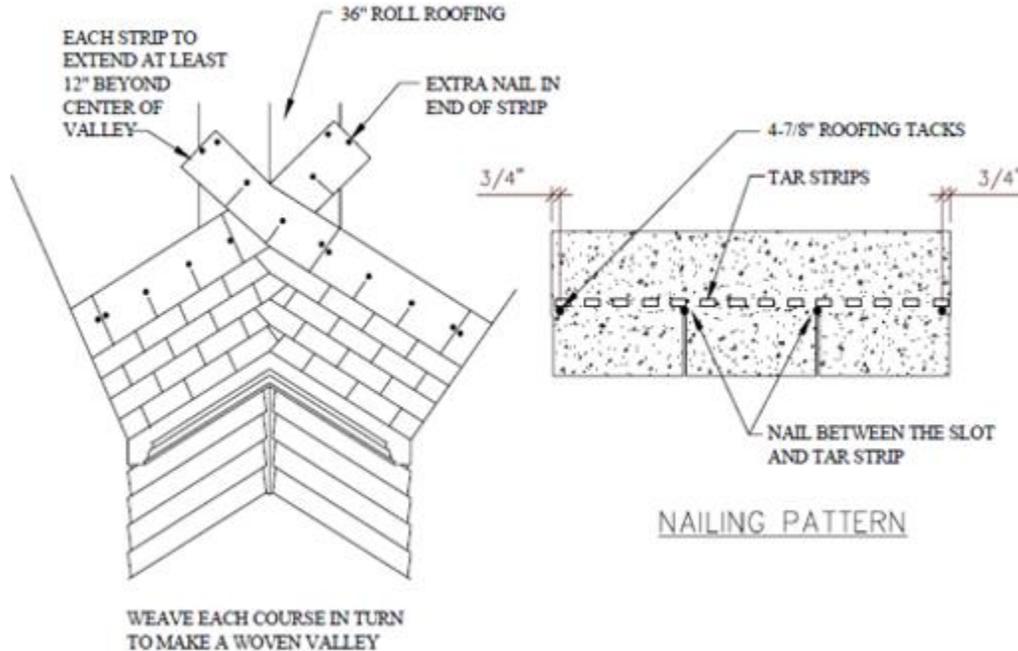
**Don't leave loose objects on scaffolding, ladders or roof decks.**

end of the shingle) and two more equally spaced along nailing line. To avoid “wrinkling” the shingles, begin nailing at the end touching the preceding shingle, then nail, in order, across the shingle, flattening the shingle as you go.

Continue installing shingles, moving up toward the ridge of the roof until the entire roof is covered.

## Weaving Valleys

- A. Begin woven valley by centering 36" wide mineral surface roll roofing in the valley. NOTE: Fasten only with enough nails to hold in place. DO NOT nail within 6" of center of valley. Press roll roofing firmly into valley to put it in firm contact with the roof.
- B. Lay first course across valley joint extending 12" onto adjoining roof surface.
- C. Lay first course from adjacent roof 12" over the valley joint on top of previously applied course.
- D. Repeat steps b & c up the valley
- E. To keep the shingle splice out of the valley, it may be necessary to add a section of shingle earlier in the row. Be sure to match up architectural features of shingles so inserted piece does not show on completed roof.



## Step Flashing

If shingles come into contact with the sidewall of the house, install step flashing. Weave the flashing and the shingles into the corner created by the roof and the wall. Step flashing has a narrow and wide side. The wide side goes against the roof, the narrow side against the wall. Place one siding nail through the flashing at its upper corner into the sidewall of the house. The next piece of flashing will cover the nail head. The top of the step flashing installs flush with the top of the shingle.



**Step Flashing - ready for next piece**



**Step Flashing - ready for next shingle**

## Vent Boots

Set the rubber boot in place after the shingles have reached the pipe. Caulk under its top and sides, but not the bottom. Nail the boot in place along the top and sides so weather will not cause it to curl and lift. As courses run into the boot, lay them over the base and cut them tight to the molded part. Tar the edges of the overlaying shingles. If installed correctly, any water getting on the boot will run out of the bottom and over the shingles.



**Vent boot installed on 3-tab  
Same procedure for Architectural**

**“NO JOB IS SO IMPORTANT THAT IT  
CAN’T BE DONE SAFELY”**

**Think & concentrate on your task.**

**Speak up** if something looks unsafe. An observer can spot danger quicker than a worker.

## Ridge Vent and Ridge Cap

Ridge vent typically comes to within 4’ of the edge of the roof. The exact location can be determined only after the ridge vent is measured.

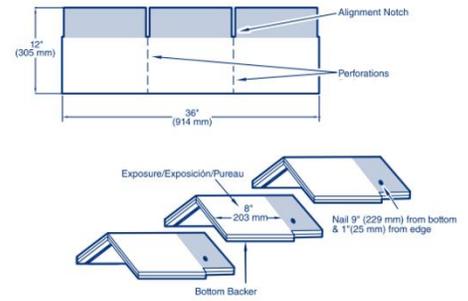
Strike a chalk line on both sides of the roof 6" down (for a 12" tab) from the point of the ridge to help keep the vent and cap shingles straight. Mark for trusses before the ridge vent is installed.

Beginning at each end of the roof, install cap shingles to a point one foot underneath where the ridge vent will be installed. Ridge cap may consist either specific Hip and Ridge shingles or modified 12" shingle tabs laid perpendicular to the other shingles, lapping over the ridge of the roof. The cap shingles also overlap each other, leaving a 5" exposure. Nail with 1½" siding nails. Then, cut away the remaining top

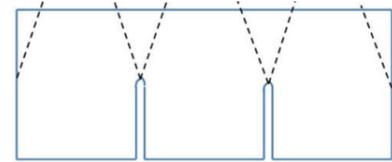
portion of the several rows of shingles and paper to expose the 2" opening at the ridge of the roof.

Lay each section of the metal ridge vent in line, making connections as you go. The ridge vent will consist of several pieces of vent that overlap 6-12". Try to get the pre-drilled holes to line up with the trusses. Center the ridge vent on the roof by placing it on the chalked line. Both ends of the vent overlap the ridge cap by at least one foot.

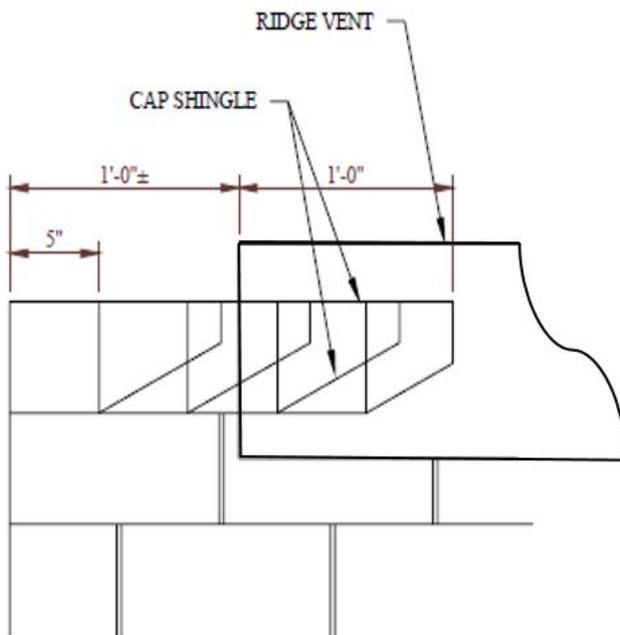
As soon as all the pieces have been connected, begin nailing from one end of the roof using screw shank vent nails that have rubber seals. Nail only into the trusses, regardless of where the pre-drilled holes occur (ideally it would be both). If these nails are not available, use siding nails and roofing tar to seal all the nails completely. When the ridge work is complete, tar should be used to cover any visible nails on the entire roof.



**Typical Hip and Ridge Shingle Installation**



**Cutting Ridge Shingles from 3-Tab Shingle**



**CARRY CAP SHINGLES 12" UNDER RIDGE VENT**

### Roofing in Hot Weather

Be cautious in very warm weather that the shingles are not damaged from crews walking on them. In hot weather it will be necessary to start earlier in the morning, before the shingles are hot and soft. It may be necessary to end the day early. Instruct the crew members not to “twist” on the balls of their feet, which will damage the shingles. Once the shingles have heated up, ask the crew to work “from above”. If scuff marks are visible on the shingles, then they have taken too much abuse.

### Quality Checkpoints for Shingling

- Drive Roofing Nails Straight! Extra care should be taken to drive roofing nails straight into the roof

so that the heads sit squarely on the shingles. Crooked nails slice through shingles when they are driven in, and if not then, in 6 months to a year after the sun and weather has softened them.

Crooked roofing nails are Habitat's second largest service issue.

- Check occasionally to insure that the 5" exposure has been maintained.
- No nails placed within 6" of the center of a valley.
- Check to ensure that no roofing nails are exposed.
- Request that the crew not twist on the balls of their feet or walk on the roof more than necessary as this significantly reduces the life of the shingles.
- Check to see that and even ½ inch overhang is maintained at the rake edge of roof.