Dallas Area
Habitat
for Humanity®

Construction Manual

June 2022

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Foreword

Dallas Area Habitat for Humanity (DAHFH) transforms neighborhoods by engaging families and community partners in creating affordable and sustainable housing. DAHFH participates in the Green Building initiative to improve the overall sustainability and efficiency of homes. This standard of building improves the long-term stability of the home, reduces utility costs for homeowners, and reduces the overall impact on the environment. All new homes are built to Texas Building Energy standards to reduce energy usage.

This manual is intended to only provide guidelines and outline the construction methods used by DAHFH in the construction of homes. This document is divided into 15 chapters and six appendices:

Chapter 1: Being a Volunteer
Chapter 2: Safety
Chapter 3: Wall Shop
Chapter 4: Framing
Chapter 5: Trusses
Chapter 6: Drying In
Chapter 7: Decking
Chapter 8: Roofing
Chapter 9: Exterior Trim
Chapter 10: Siding
Chapter 11: Drywall
Chapter 12: Interior Trim
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CHAPTER 1: BEING A VOLUNTEER

1.1 OVERVIEW

Since 1986, Dallas Area Habitat for Humanity (DAHFH) has served over 1,600 families and revitalized more than 25 neighborhoods. DAHFH has adopted a strategic vision of transforming neighborhoods throughout the most impoverished communities in Dallas County.

- **Mission:** Seeking to put God's love into action, Dallas Area Habitat for Humanity brings people together to build homes, communities, and hope.
- **Vision:** A world where everyone has a decent place to live.

DAHFH serves families with incomes that are up to 80 percent of the area median income. DAHFH is able to provide qualified families a tangible asset at below cost with an affordable mortgage. Homeowners are required to contribute 300 to 350 hours of "sweat equity" by building on their own home and the homes of their neighbors and/or volunteering in a DAHFH ReStore. Principal payments made by current DAHFH homeowners are placed into a revolving fund, the "Fund for Humanity," and are used to build more homes. Additionally, DAHFH homeowners are prepared for homeownership success by attending classes where they learn budgeting and home maintenance skills.

1.2 VOLUNTEERING FOR DAHFH

Volunteers are a critical contributor to helping families achieve their dream of homeownership. A DAHFH volunteer comes in many forms. A construction volunteer is someone who comes out to help build family homes. Generally, volunteers participate in construction Wednesday through Saturday as their schedule allows. The length of the work day varies by the time of the year and house schedule. DAHFH staff will announce seasonal changes in start times and end times.

Volunteer "benefits" can include meeting new people, team building, learning new skills, and enhancing knowledge about construction. All it takes to be a DAHFH volunteer is a desire to make a difference, some time, and enthusiasm to a very worthwhile cause. However, there are build site age restrictions:

- Under 14 years of age: not allowed on site during any phase of construction
- 14-15 years old: allowed to participate in landscaping; must have one adult supervisor over 21 per youth
- 16-17 years old: allowed to participate in construction but cannot get on the roof or operate power tools; must have one adult supervisor over 21 per five youths.

All volunteers are expected to adhere to the Volunteer Code of Conduct included in <u>Appendix A</u>. The code of conduct defines, in general terms, acceptable patterns of behavior that contribute to the overall growth and goal achievement of DAHFH and distinguishes those that are detrimental and may require disciplinary action. Proper behavior and positive attitudes promote a healthy, productive work environment; therefore, volunteers are encouraged to extend common courtesies to staff and fellow volunteers and should act at all times in a manner that encourages the highest level of participation from its ranks.

1.3 OVERVIEW OF BUILDING ACTIVITIES

For most houses, DAHFH maintains an eight-day or ten-day volunteer build schedule. Figure 1-1 lists the typical tasks performed by volunteers. Some tasks (e.g., slab, plumbing, electrical, heating/air conditioning, masonry) are performed by subcontractors.

- Assemble interior and exterior wall units
- Build wall components
- Framing/stand walls
- Sheathing
- Loading/standing trusses
- Subfascia
- Windows
- Roof decking
- Fascia
- Shingling/roofing
- Siding
- Exterior trim
- Soffit
- Exterior paint
- Sod, trees, shrubs, and seasonal color

Figure 1-1. Volunteer Tasks

1.4 ROLES AND RESPONSIBILITIES

On the construction site, a defined chain of command helps ensure a good, quality home is safely constructed. Figure 1-2 shows the hierarchy of the construction side of DAHFH. The first three levels [i.e., Executive Vice President (EVP) of Operations, Construction Supervisor, and Construction Staff] are paid staff working for DAHFH. This team helps manage the overall building process and are key resources.

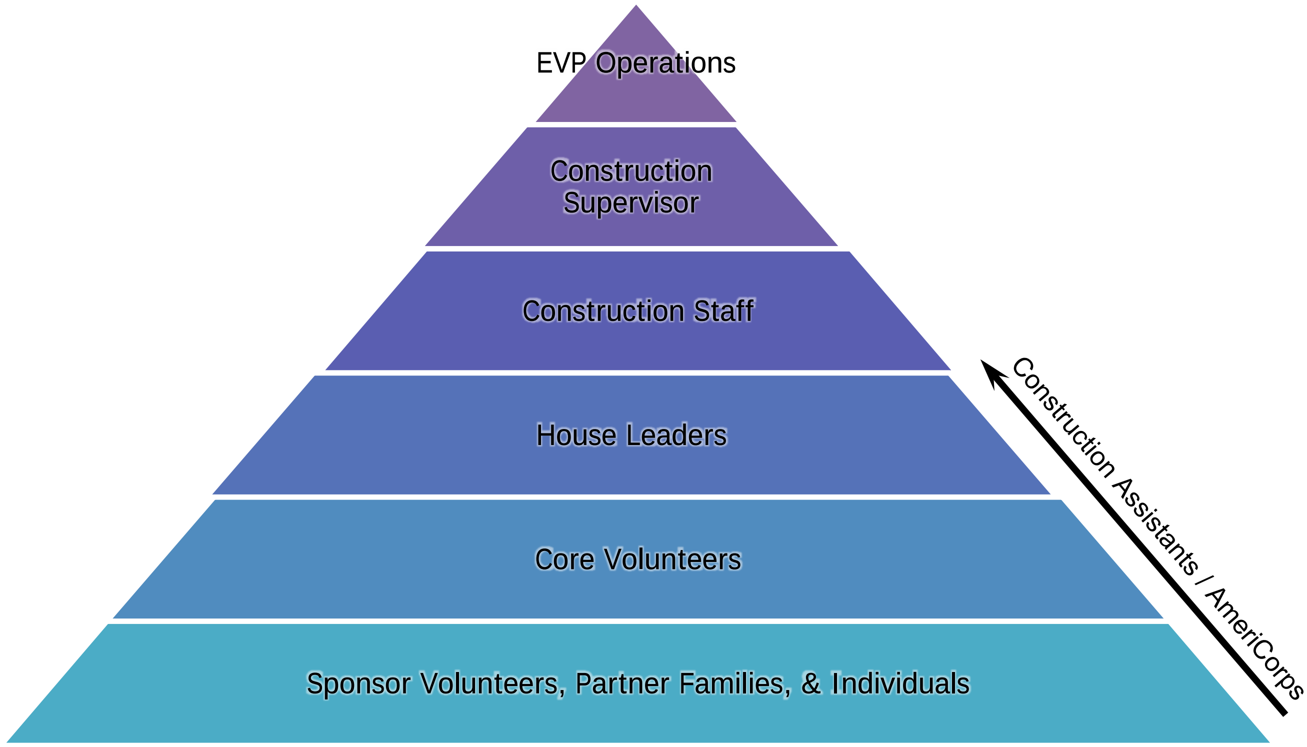

Figure 1-2. DAHFH Construction Hierarchy

The next three levels are persons who volunteer their time and skill. Core Volunteers are people that repeatedly volunteer with DAHFH an average of one day per month. Core Volunteers also can serve as House Leaders on the construction site. The roles of volunteers vary on the work site as shown in Table 1.1. However, there are some basic responsibilities required of all Core Volunteers:

- Adhering to the Volunteer Code of Conduct (see Appendix A).
- Serving as a representative of the DAHFH organization on the jobsite.
- Maintaining a spirit of enthusiasm and encouragement toward less experienced sponsor group volunteers and partner family members.
- Arriving early to help set up tools and divide tasks before the safety talk.
- Being familiar with the current construction practices so they can be consistently applied on a build site.
- Demonstrating basic and advanced construction tasks to inexperienced core and sponsor group volunteers and partner family members.
- Helping lead the completion of construction assignments in accordance with this Construction Manual and instructions from DAHFH Construction Staff.
- Making safety a priority on the jobsite and reinforces this by example (e.g., paying attention to the House Leader during the safety speech).
- Teaching, monitoring, and encouraging safe construction practices on the job site.
- Helping keep the jobsite clean and free of safety hazards.

- Encouraging quality in every aspect of construction.
- Attending DAHFH training sessions.

Table 1.1 Volunteer Roles and Responsibilities

Role	Responsibilities
House Leader	o Verify that the needed build materials are on site at the start of each build day and as needed, work with the DAHFH staff to obtain missing or needed materials. o Coordinate getting the job site set up each morning of each build day (e.g., set out tools and materials as needed). o Conduct the welcome and safety speech at the start of each build day. o Organize the volunteers into teams to perform the house building tasks. o Utilize Core Volunteers to work with the teams of volunteers. o Oversee the house construction including monitoring the safety of all volunteers; recognize unsafe practices and get volunteers to work safely. o Monitor the quality of the construction by the volunteers and as necessary, asking volunteers to fix incorrectly constructed items. o Keep the DAHFH Construction Staff informed of the status and progress of the construction of the house. o Mediate any conflicts between volunteers on the jobsite. o Ensure that the volunteers and partner family/friends have a great volunteer experience. o Thank everyone that came out at the end of each work day.
Core Volunteer	o Maintain general knowledge and basic skills to complete assigned tasks. o Engage sponsor volunteers and homeowners. o Support DAHFH Construction Staff and House Leaders by engaging and leading sponsor volunteers and homeowners. o Monitor safe job practices. o Monitor quality of work being completed as outlines in the Construction Manual. o Gain experience by coming out to build, attending training, and reviewing the Construction Manual and Construction Bulletins. o Appreciate and recognize good work.

Sponsor volunteers are people from a company or organization that are helping underwrite the cost of the home and do not volunteer with DAHFH on a regular basis. Partner families include potential DAHFH homeowners and their family members.

1.5 CONSTRUCTION VOLUNTEER MEETINGS

Construction Volunteer meetings are held once a month, typically the second Tuesday of each month. The purpose of these meetings is to discuss best/changes to construction practices, training opportunities, safety, quality on the job site, and volunteer retention and recruitment to support the goal of creating affordable housing. All Construction Core Volunteers are welcome to attend.

1.6 TRAINING

DAHFH has implemented a continuous training program to help educate and mentor Core Volunteers in all aspects of building and leadership. This program is known as Habitat University (Habitat U) and is intended to provide training both new and experienced Core Volunteers by leveraging the knowledge of experienced Core Volunteers and DAHFH Construction Staff.

1.6.1 HABITAT UNIVERSITY CURRICULM

Habitat U has been designed to provide the following three levels of training both in classroom and field settings.

- Orientation Level – Orientation for individuals interested in becoming a construction Core Volunteer
- Core Volunteer Training
  - Basic Level – Training in general construction tasks and techniques
  - Intermediate Level –Training in specific construction tasks and techniques
  - Advanced Classes – Training in the most technical construction tasks and techniques
- House Leader Training – Initial and refresher training required for volunteers to become House Leaders or maintain their House Leader status (see Section 1.6.3)

1.6.2 ORIENTATION LEVEL

The DAHFH Senior Manager of Volunteer Services engages with prospective volunteers. It is important that individuals interested in becoming construction Core Volunteers become familiar with the mission of DAHFH and the expectations and roles of the Core Volunteer in supporting that mission. A series of general orientation sessions have been established to provide prospective volunteers with hands on experience with the major phases of construction, from building walls in the Wall Shop to landscaping and home dedication ceremonies with the homeowners.

The requirements to graduate to Core Volunteer status are:

- Attend a DAHFH orientation session
- Complete 40 hours on DAHFH build sites
- Attend a DAHFH dedication

1.6.3 HOUSE LEADER QUALIFICATIONS AND TRAINING

Becoming a House Leader is a commitment and requires more than just construction skills and knowledge. The skills of a House Leader need to include visioning, organization, communication, and team building (see Figure 1-3). Leading a house is about 60 percent leadership and interpersonal skills and 40 percent construction knowledge and experience.

Vision

- Able to share mission and motivate others to achieve a common goal
- Models a leadership style that is open and approachable
- Leads quality and process improvement efforts
- Has personal credibilty and integrity

Organization

- Complete thorough pre-build planning
- Demonstrates a method for getting work done that is highly organized and productive
- Organizes time so that priority tasks get done first

Communication

- Demonstrates situational awareness
- Deals with conflict effectively
- Clearly communicates team member roles and responsibilities
- Practices active listening, seeking to understand before reacting
- Applies 10 second rule, remaining calm and composed under stress
- Receives feedback without getting defensive

Team Building

- Understands how to quickly build a work site team
- Works collaboratively with the DAHFH Construction Staff
- Matches team members to the right work and responsibilities
- Creates a team environment with full partcipation and interdependence
- Understands the importance of fun and celebration

Figure 1-3. Non-Construction Skills Required of a House Leader

A candidate for House Leader must be very active in DAHFH. A House Leader must commit the time to keep current with the most recent construction practices as identified in the Construction Manual and DAHFH Construction Staff provided construction bulletins and complete mandatory training. Training for House Leaders can include classroom and hands-on training on topics such as leadership, logistics, and safety; shadowing other House Leaders on site; and co-leading with an experienced House Leader. This training is to ensure a House Leader has the training and experience to be successful.

CHAPTER 2: SAFETY

2.1 INTRODUCTION

Safety is no accident and is everyone's responsibility. All volunteers and Dallas Area Habitat for Humanity (DAHFH) Staff should receive basic safety and health training as it relates to their duties. Compliance with safe practices and those of any applicable regulatory agency will be required of all volunteers to maintain a positive volunteer status.

This chapter is intended to provide an overview of the DAHFH safety policies as they apply to volunteers.

2.2 SAFETY POLICY

DAHFH is committed to providing volunteers and employees with a safe and healthful workplace. It is the policy of DAHFH that volunteers and employees report unsafe conditions and do not perform work tasks if the work is considered unsafe. Volunteers and employees must report all accidents, injuries, and unsafe conditions.

Volunteer recommendations to improve safety and health conditions will be given thorough consideration by DAHFH. Management will give true attention to, and provide the financial resources for, the correction of unsafe conditions. DAHFH promotes and influences safe behavior by establishing and maintaining an effective safety program. This program will include:

- Holding all management and staff accountable for their safety responsibilities in their respective departments, jobs, crews, or work places;
- Providing safety and health education and training as needed; and
- Reviewing and updating workplace safety policies, practices, and performances.

2.2.1 AGE RESTRICTIONS

Volunteers are critical to the building process; however, for safety reasons there are build site age restrictions:

- Under 14 years of age: not allowed to do any work on site at all and will be asked to leave.
- 14 and 15 years old: allowed to participate in landscaping: must have one adult supervisor over 21 per youth.
- 16 and 17 years old: allowed to participate in construction but cannot get on the roof or operate power tools; must have one adult supervisor over 21 per five youths.

2.2.2 RESPONSIBILITIES

On the construction site, a defined chain of command helps ensure a good, quality home is safely constructed. Figure 1-1 shows the hierarchy of the construction side of DAHFH and Table 2.1 provides an overview of safety responsibilities by role.

Table 2.1 Safety Responsibilities

Role	Safety Responsibilities
Field Operations Director	• Ensure that safety is adequately budgeted for the job, etc. • Monitor and implement industry best practices and compliance mandates for safety. • Communicate safe work practices regularly. • Formally recognize outstanding safety performance by any/all workers. • Assist the DAHFH Construction Staff and House Leaders, or any other personnel with the safety process as needed or as requested. This can include formal worksite periodic inspections. • Uphold and enforce all known safe work practices. • Provide resources, tools, and training for DAHFH Construction Staff. • Purchase of new equipment or tools, or the re-working or retrofitting of workstations or equipment so as to ensure that safety and health is considered.
DAHFH Construction Staff and House Leader	• Ensure a safety orientation is given to volunteers prior to the start of work and update safety speech as needed. Appendix B includes an outline for the daily safety speech and activity specific safety information. • Ensure volunteers are given training that includes safe work practices on equipment, tools, machines, processes, etc. • Observe workers performing the work. If necessary, provide a demonstration using safe work practices, or remedial instruction to correct training deficiencies before the volunteer is permitted to do the work without supervision. • Personally conduct--or designate qualified personnel to conduct--regular inspections of the workplace. • Uphold and enforce safe work practices. • If approached by workers who appear to have a true concern regarding a safety or health issue, act accordingly and give attention to the matter. • Investigate all incidents and take immediate corrective action to prevent re-occurrence. • Prepare and submit incident reports for work site injuries.
Core Volunteers, Sponsor Volunteers, Partner Families, and Individuals	• Follow safe work practices, and if they are unsure of what is the correct/safe way to perform a task or a job, they are to ask a Core Volunteer, House Leader, and/or DAHFH Construction Staff. • Immediately report all unsafe equipment or tools to a Core Volunteer, House Leader, and/or DAHFH Construction Staff. • Report unsafe behavior of other workers to the House Leader or DAHFH Construction Staff if these workers are approached and remain unwilling to correct their unsafe actions or conditions. • Uphold the safe work practices this organization has established. • Immediately notify a Core Volunteer, House Leader, and/or DAHFH Construction Staff if injured on the job or become ill.

As stated in the Volunteer Code of Conduct (see Appendix A), all volunteers should follow proper safety procedures as directed by Construction Staff or House Leaders. Refusing to follow directions is grounds for immediate dismissal from the job site and/or suspension. Repeated violations are grounds for permanent dismissal.

2.3 WORKSITE ANALYSIS

All work areas and job sites need to be inspected on a regular basis to ensure safe work practices and safe and healthy conditions. These inspections are to be conducted by DAHFH Construction Staff and House Leaders. Incidents that involve injury and illnesses will be evaluated and analyzed for trends, common causes, and patterns so as to prevent further incidents.

2.4 FIRST AID AND MEDICAL ASSISTANCE

First aid supplies will be available at each work site. Typically, these will be in the storage container associated with each house. Where required, there will be a designated certified first aid and cardiopulmonary resuscitation (CPR) trained person who can assist in first aid emergency cases. Employees and volunteers who receive work related injuries or illnesses will be given immediate attention in regard to the nature of their injury or illness.

2.5 INCLEMENT WEATHER POLICY

Inclement weather occasional occurs in Dallas. Volatile weather can exist any time of the year, and as such, contingencies have been made to deal with such events. Please note that safety is the first priority.

- High winds, rain, snow, or sleet: Typically, DAHFH will continue work during rain as long as there is no lightning; however, some activities such as decking and roofing activities may be suspended until the hazardous condition no longer exists.
- Lightning or tornado: Stop all outside work immediately and seek shelter indoors.

Weather/build status are posted each morning by 5 am during summer work hours and 6 am during the non-summer work hours at: https://www.dallasareahabitat.org/weather/

2.6 SAFETY GUIDELINES

Generally, safety can be divided into four areas: personal safety, ladders, tools, and day specific tasks. The subsequent tables provide safety guidelines and information based on these topics. Additionally, each chapter of this manual includes safety information at the beginning of each chapter that is relevant to the tasks to be performed. Personal power tools and nail guns must be inspected by DAHFH Staff prior to be using on the work site. Some tools, such as framing nail guns, will not be approved to be on-site during full sponsor build days.

- Table 2.2 provides a listing of personal safety guidelines related to general work site conditions, work clothing, eye protection, hearing protection, respiratory protection, heat exhaustion, sun exposure, illness, and injuries.
- Ladders are one of the leading causes of injuries on a build site. Table 2.3 shows both general guidelines and ladder-specific information.
- Tool safety is divided into power tools (see Table 2.4) and hand tools (see Table 2.5).
- Safety information related to lifting and roof safety are shown in Table 2.6.

Table 2.2 Personal Safety Guidelines

Category	Guidelines
General Work Site Conditions	• Watch your step at all times. • Use good housekeeping skills to help prevent trip hazards. • Be aware of traffic on local streets. Walk on sidewalks when possible and check for traffic before crossing the street. • When crossing vehicle pathways or passing through loading areas, keep clear of all moving forklifts, trucks, cars, or jobsite equipment. • Do not block your view by carrying large or bulky items; get assistance from another person. • Obey all posted safety and danger signs. • Do not stand on sinks, buckets, cabinets, or constructed ladders; use a step ladder. • Do not block the walking surfaces of elevated working platforms, such as scaffolds, with tools or materials that are not being used. • Cell phone use, texting or twittering, or use of ear buds is not permitted when working on the build site. • Only DAHFH Construction staff or Core Volunteers can be on the roof without fall protection; these situations should be limited to only when necessary.
Work Clothing	• Hard hats are required at all times. • Closed-toed and closed-back shoes are required, preferably with steel toes and shanks. • Do not wear loose clothing. • Restrain long hair. • Do not wear loose jewelry such as necklaces or bracelets.
Eye Protection	• Eye protection (e.g., safety glasses or goggles) are required at all times. • Do not continue to work if your eye protection become fogged. Stop work and clean the glasses until the lenses are clear and defogged. • Do not use eye protection with scratched or damaged lenses.
Hearing Protection	• Wear hearing protectors in work area's posted "Hearing Protection Required." • Hearing protection is recommended when working with power tools for a prolonged period of time.
Respiratory Protection	• Respiratory protection (dust mask) is available.
Heat Exhaustion/Sun Exposure	• Keep your skin covered to avoid dehydration and sunburn. • Use sunscreen to prevent sunburn. • Drink plenty of clear liquids during your breaks. • Take frequent breaks, in shaded areas where possible.
Illness/Injuries	• Go to your House Leader and request medical help if you feel sick, dizzy, etc. • Seek first aid immediately if bitten or stung by wasps or insects. • Report all injuries and illnesses to your House Leader, no matter how small of an injury.

Table 2.3 Ladder Safety

Ladder Type	Guidelines
General	• Do not use ladders that have loose rungs, cracked or split rails, missing rubber pads, or are otherwise visibly damaged. • Keep ladder rungs clean and free of grease, dirt, and mud. • Never exceed the weight limit of a ladder. See the side labels for rating information. • Only one person should be on a ladder at a time. • Face the ladder when climbing up or down. • Maintain a three-point contact by keeping both hands and one foot or both feet and one hand on the ladder at all times when climbing up or down. • Keep tools/nails in your tool belt when climbing a ladder and have someone below hand up materials/tools. • Do not overreach doing a task (belly button inside outer rails). • When performing work from a ladder, face the ladder and do not lean backward or sideways from the ladder. • Do not stand on a ladder that wobbles or leans to the left or right. • Do not place ladders on blocks, concrete blocks, steps, or other unstable bases. • Do not try to "walk" a ladder by rocking it. Climb down the ladder, and then move it. • Do not move a ladder while someone is on top of the ladder. • All ladders must be placed on solid, level surface before use. • Never allow anyone to climb on the brace side of a stepladder. • Always inspect a ladder for damage before use. If found defective, then tag the ladder "do not use" and remove it from the work area. • Never use an aluminum ladder within 20 feet of power lines. • Do not use electrical power tools while on an aluminum ladder.
A-Frame Ladders/ Step Ladders	• Do not stand on the top two rungs of a step ladder (A-frame ladder) when in the open position. If used in the leaning position, do not stand on the top three rungs. • Step ladders should be fully open, with spreader bars locked in place. • Never leave anything on the top of a step ladder.
Extension Ladders	• When using an extension ladder, extend the top of the ladder at least three feet above the edge of the landing when exiting from the ladder to an upper level. • Swivel feet on the extension ladder must have good rubber pads placed on hard solid surfaces, but the spikes of the swivel feet should be used on soil or gravel surfaces. • Tie off the base of an extension ladder if the base could slide if the surface is slippery.

Table 2.4 Power Tool Safety

Tool	Guidelines
General	• Do not use power equipment or tools on which you have not been trained. • Keep power cords away from the path of drills, saws, and knives. • Do not carry plugged-in equipment or tools with your finger on the switch. • Do not carry equipment or tools by the cord. • Disconnect the tool from the outlet by pulling on the plug, not the cord. • Turn the power switch of the tool to "Off' before plugging or unplugging it. • Do not leave tools that are "On" unattended. • Do not handle or operate electrical tools when your hands are wet or when you are standing on wet floors.

Table 2.4 Power Tool Safety (continued)

Tool	Guidelines
General (continued)	• Do not operate spark-inducing tools such as grinders, drills or saws near containers labeled "Flammable" nor in an explosive atmosphere such as a paint spray finishing area. • Turn the power switch of electrical tools to "Off' and then unplug from the outlet before attempting repairs or service work. Tag the tool "Out of Service" and notify staff. • Do not drive over, drag, step on, or place objects on a cord. • Do not use a power tool to cut wet or water-soaked building materials. • Hold all portable power tools by the plastic handgrips or other nonconductive areas designed for gripping purposes. • Do not use an electrical tool if its housing is cracked. • Do not use electrical tools while working from a metal ladder unless the ladder has rubber feet.
Electrical Cords	• Preferably use only three-wire type cords that are rated "heavy duty." • All cords must be 14 American wire gauge (AWG) or greater in size (preferably 12 AWG). • Do not use cords that have splices, exposed wires or cracked, frayed ends or bad strain relief on either end of the plug caps. • Do not remove the ground prong from electrical cords. Ground pin must be continuously connected and in good working condition. • Do not use extension cords or other three-pronged power cords that have a missing prong. Note that some tools are considered "double insulated" and do not contain a ground pin. Look on the Underwriters Laboratories (UL) Label for the word double insulated or look for a square with a capital D which stands for double insulated. • Do not use an adapter such as a cheater plug that eliminates the ground. • Do not plug multiple electrical cords into a single outlet. • Use approved three-ways power splitters only when necessary. • Keep cords out of water, and out of direct walkways. • Do not suspend cords by any form of metal, i.e., nails, wire. • All cords must be used on a Ground Fault Circuit Interrupter (GFCI). Either on a GFCI circuit breaker, external GFCI, or GFCI receptacle. • Keep cords protected from pinch points, i.e., doorways, windows, driveways use blocking to protect the cords from pinch points.
Power Saws (basic info for all types)	• Wear eye protection, a dust mask, and hearing protection when operating a power saw. • Do not wear loose clothing, jewelry, or gloves. • Disconnect the plug from the power supply before changing blades, when making cutting depth or bevel adjustments, or when inspecting or cleaning the saw. • Never remove or alter the saw guard. Verify that the guard is working properly before beginning your work. • Clean any residue from the blade or cutting head before making a new cut with the power saw. • Do not use a power saw that has cracked, broken or loose guards, or other visible damage. • Remove all nails from the stock before using the power saw to cut the stock. • Do not make measurements to the stock while the power saw is running. Make the measurements before turning the power switch to the "On" position. • Keep your hands away from the exposed blade. • Never let your hand, finger, or thumb cross the cutting line. • When using the power saw, do not hold the work piece against your body when making the cut.

Table 2.4 Power Tool Safety (continued)

Tool	Guidelines
Power Saws (basic info for all types) (continued)	• Always operate chop or circular saws at full cutting speed. • Do not alter the anti-kickback device or blade guard. • Do not perform cutting operations with the power saw while standing on a wet or slippery floor. • When using the power saw, do not reach across the cutting operation. • Cut away from your body and below your shoulder level when using a power saw. • Use the pusher stick to guide materials through the saw when cutting short stock. • Turn the power switch of the saw to the "Off' position and allow the blade to stop before attempting to pull out an incomplete cut. • Do not feed the material faster than the power saw can cut it.
Chop or Miter Saw	• Do not use the saw if the lower portion of the blade hood is not adjusting itself to the thickness of the material being cut as the blade passes through the material. • Allow the saw to return to its stored position before removing the cut material from the table. • Lay the material squarely and solidly down before sawing it.
Circular Saw	• Do not use the circular saw if the lower guard does not close briskly and completely cover the saw blade. • Do not wedge or tie the retractable guard of the circular saw "open." • When pocket cutting, raise the retractable guard of the circular saw by pulling the retracting lever. • Finger-tighten the depth and bevel adjustments before using the circular saw. • Do not use a washer or bolt to adjust the arbor size of the blade of the circular saw. • Grip the circular saw only by its handles when operating or transporting the saw.
Table Saws	• Only trained Core Volunteers, as approved by DAHFH Construction Staff, can use the table saw. • Set the saw blade high enough to cut the stock and no higher. • Do not use the table saw to cut long work pieces unless a coworker is standing at the output end of the table saw to catch long work pieces as they leave the saw. • Do not use a table saw blade or cutting head that has missing teeth or is cracked. • Keep your hand out of the line of the cut when feeding the work piece into the table saw. • Use the push stick to guide the stock when there is not enough room for hand movement between the rip fence and the table saw blade. • Use anti-kickback "dog fingers" when a work piece is being ripped. • Use the spreader when ripping to prevent the wood from immediately coming back together and binding the blade. • Position the spreader directly in line with the blade.
Drills	• Always disconnect the power before installing a drill bit. • Always use appropriate personal protection equipment, i.e., mask when drilling concrete products, eye protection. • Do not use dull, cracked, or bent drill bits. • Physically check the security of the drill bit or cutting tool within the chuck prior to operation. • Keep your hands away from rotating parts. • If you can use the "leverage handle" while using the drill, then do so. Do not remove the leverage handle except in tight places.
Pneumatic Tools (and Air Compressors)	• Do not point a compressed air hose at bystanders or use it to clean your clothing. • Attach the pressure-reducing nozzle that is labeled "Reduces Pressure to 30 psi" to the air hose when using compressed air to clean. • Do not pass air-powered tools by the hose from one worker to another.

Table 2.4 Power Tool Safety (continued)

Tool	Guidelines
Pneumatic Tools (and Air Compressors) (continued)	• Disconnect the tool from the air line before making any adjustments or repairs to the tool. • Turn the tool to the "Off' position and let it come to a complete stop before leaving it unattended. • Do not use compressed air for comfort cooling. • Always wear eye protection when using a pneumatic tool. • Nail guns are only allowed for usage by properly trained workers. See Appendix B for the HFH legal paper on nail gun usage. • Keep your hands well clear of the power nailer's plunger head and the hammer. • Do not use a steel hammer to strike the power nailer.
Gas Generators	• Always follow the manufacturer's operating instructions. • Some generators have a built GFCI system. Other generators do not provide GFCI systems and an external GFCI must be used. The user of the generator must determine if an additional ground rod must be installed. See manufacturers book for details. • Whichever system you are using, all GFCIs must be tested before further use to see if they are working properly (trip and reset). • Never use a generator in a closed location. All generators must be used outdoors and away from windows and doors, etc. • Keep generators well ventilated and downwind of the work area to help prevent carbon monoxide poisoning or sickness. • Keep generators away from flammable / combustible materials. • Do not fuel a generator when it is running or hot. Allow several minutes for cool down before refueling. • When fueling a generator keep a 20B fire extinguisher nearby (within 50 feet). • Do not place a hot generator into storage. Allow cool down time.

Table 2.5 Hand Tool Safety

Tool	Guidelines
General	• Tag worn, damaged, or defective tools "Out of Service" and do not use them. Remove them from the area and notify staff. • Do not use a tool if its handle has splinters, burrs, cracks, splits, or if the head of the tool is loose. • Do not use impact tools such as chisels, punches, or steel stakes that have mushroomed heads. • When handing a tool to another person, direct sharp points, and cutting edges away from yourself and the other person. • Do not chop at heights above your head when you are working with a hand axe. • Do not carry sharp or pointed hand tools such as screwdrivers, scribes, aviation snips, scrapers, chisels, or files in your pocket unless the tool or your pocket is sheathed. • Do not perform "make-shift" repairs to tools. • Minimize carrying tools in your hand when you are climbing. Carry tools in tool belts or hoist the tools to the work area using a hand line. • Do not throw tools from one location to another, from one person to another, from scaffolds or other elevated platforms. • Transport hand tools only in toolboxes or tool belts. Do not carry tools in your clothing.

Table 2.5 Hand Tool Safety (continued)

Tool	Guidelines

Hand Saws	• When starting a cut:
	  o Hold the ripsaw at a 60° angle with the board; hold the crosscut saw at a 40° angle.
	  o Place your fingers to the left of the cut mark with your thumb upright and pressing against the blade.
	  o Pull upward until the blade bites.
	• Once the work is started with a partial cut, remove your fingers and thumb from the saw blade, then set the saw to your desired angle.
	• Keep control of the saw by releasing downward pressure at the end of the stroke.
	• Do not use an adjustable blade saw such as a hacksaw, coping saw, or keyhole saw if the blade is not taut.
	• Do not use a saw that has a dull saw blade.
	• Do not carry a saw by the blade.

Hammers	• Use a claw hammer for only pulling nails. • Use eye protection. • Do not strike nails or other objects with the cheek of the hammer. • Do not use a hammer if your hands are oily, greasy, or wet. • Do not use a hammer as a wedge or a pry bar. • Do not use a hammer if the handle becomes damaged or cracked.
Knives/Sharp Instruments	• When handling knife blades and other cutting tools, direct sharp points, and edges away from you. • Cut in the direction away from your body when using knives. • Store knives in knife blocks or in sheaths after using them. • Do not use a knife that has a dull blade. • Do not attempt to catch a falling knife. • When opening cartons use the safety box cutters. Do not cut with the blade extended beyond the guard. • Do not use knives that have broken or loose handles. • Do not use knives as screwdrivers, pry bars, can openers, or ice picks. • Do not pick up knives by their blades. • Carry knives with their tips pointed toward the floor. • Do not carry knives, scissors or other sharp tools in your pockets or an apron unless they are first placed in their sheath or holder.

Table 2.6 Task Specific Safety

Task	Guidelines
Lifting Procedures	• Plan the move before lifting; remove obstructions from your chosen pathway. • Test the weight of the load before lifting by pushing the load along its resting surface. • If the load is too heavy or bulky, use lifting and carrying aids such as hand trucks, dollies, pallet jacks and carts, or get assistance from another person. • If assistance is required to perform a lift, coordinate, and communicate your movements. • Position your feet 6 to 12 inches apart with one foot slightly in front of the other. • Face the load. • Bend at the knees, not at the back. • Keep your back straight. • Get a firm grip on the object with your hands and fingers. Use handles when present.

Table 2.6 Task Specific Safety (continued)

Task	Guidelines
Lifting Procedures (continued)	• Never lift anything if your hands are greasy or wet. • Wear protective gloves when lifting objects with sharp corners or jagged edges. • Hold objects as close to your body as possible. • Perform lifting movements smoothly and gradually; do not jerk the load. • If you must change direction while lifting or carrying the load, pivot your feet and tum your entire body. Do not twist at the waist. • Set down objects in the same manner as you picked them up, except in reverse. • Do not lift an object from the floor to a level above your waist in one motion. Set the load down on a table or bench and then adjust your grip before lifting it higher. • Slide materials to the end of the tailgate before attempting to lift them off a pick-up truck. Do not lift over the walls or tailgate of the truck bed.
Roof Work	• A competent person will be assigned to oversee the roof work safety and its related requirements, i.e., installation of fall protection equipment, overall surface strength for safe working, monitoring of workers safety. • Power line safety must be considered when power lines are active or live. • Proper roof access must be maintained at all times. An extension ladder must be used. If this is the case, make sure you follow safe ladder safety procedures. Remember, aluminum ladders are not allowed near power lines. • The roof surfaces shall be inspected for slipping hazards. The House Leader or DAHFH Construction Staff shall either eliminate any such hazards or take effective measures to have volunteers avoid them. Employees and volunteers must wear appropriate footwear to reduce the potential for slipping. • When adverse weather (such as high winds, rain, snow, or sleet) creates a hazardous condition, decking and roofing activities will be suspended until the hazardous condition no longer exists. • If ladders or scaffolds are used, they shall be erected and maintained in accordance with the requirements of Subparts X and L of Occupational Safety and Health Administration (OSHA) construction standards. In addition, DAHFH employees shall be trained in accordance with the requirements of Subparts X and L. • Employees and volunteers shall not ascend or descend the roofs slope within six feet of the rake edge except where that limitation would prevent the performance of work. • Supplies and materials shall not be stored within six feet of the rake edge or three feet when people are installing trusses, decking, or roofing. • The area below the eaves and rakes shall be kept clear of materials and other objects which could pose impalement or other hazards, or properly guarded.

2.7 FALL PROTECTION

Safety of the volunteers is the number one priority on a habitat build site. DAHFH has adopted the use of fall protection systems for heights greater than six feet. Constant awareness of and respect for fall hazards and compliance with all safety rules are considered conditions of volunteering.

When installing decking or roofing, DAHFH will employ the Horizontal Under-Eave Guardrail Systems (HUGS). This system is compliant with fall protection standards set forth by the OSHA and allows workers to safely perform their various above-ground tasks without compromise. Appendix B includes additional information on the installation of HUGS.

DAHFH has also instituted a fall protection program for truss installation based on best practices. This includes specialized truss bracing to both external and internal truss elements to facilitate the use of Fall Protection Equipment (FPE). The FPE consists of a safety harness with lanyard and interconnecting truss safety bar. DAHFH requires thorough inspection of the FPE before use and training for anyone using the equipment.

Utilization of the FPE begins after the first six common (main/large trusses) are installed and braced to provide sturdy support for use of the equipment. FPE is used for all the remaining truss installation when possible. One exception is when truss spacing is less than safety bar required 24 inches on center. Another exception is when setting smaller trusses. Due to lanyard length (required for large trusses) and lower height for smaller trusses, use of the FPE may not be practical for their installation. Extreme caution should be used when FPE is not in use.

2.8 INCIDENT/ACCIDENT INVESTIGATION

All accidents that result in injury, regardless of their nature, will be investigated and reported. Incidents can include property damage, near misses, and workplace injuries and illnesses and also will be investigated.

- Accident – The National Safety Council defines an accident as an undesired event that results in personal injury or property damage.
- Incident – An incident is an unplanned, undesired event that adversely affects completion of a task.
- Near Miss – Near misses describe incidents where no property was damaged and no personal injury sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred.

As previously stated, sponsor volunteers, and Core Volunteers should report to the House Leader. The House Leader will contact the DAHFH Construction Staff.

2.8.1 INVESTIGATION PROCEDURES

The DAHFH Construction Staff at the location where the incident/accident occurred will perform an investigation. It is an integral part of any safety program that documentation take place as soon as possible so that the cause and means of prevention can be identified to prevent a reoccurrence.

These investigations are to assess the nature and the cause of the incident, not to place blame on personnel. DAHFH Construction Staff or House Leaders need to investigate incidents using procedures that include:

- Implement temporary control measures to prevent any further injuries to employees and volunteers or damage to equipment or property or the public.
- Review the equipment, operations, and processes to gain an understanding of the accident situation.
- Identify and interview each witness and any other person who might provide clues to the causes.
- Investigate causal conditions and unsafe acts; make conclusions based on existing facts.
- Complete the incident investigation report.
- Provide recommendations for corrective actions.
- Indicate the need for additional or remedial safety training, if needed.

Incident investigation reports must be submitted to the designated DAHFH management personnel as soon as possible after the incident. In the event that a person falls or there is some other related, serious incident occurring, the safety plan will be reviewed to determine if additional practices, procedures, or training need to be implemented to prevent similar types of falls or incidents from occurring.

2.8.2 INCIDENT REPORT FORM

The incident report form must be completed by DAHFH Construction Staff at the time of the incident. To correctly assess the nature and causes of the incident, the form should contain questions such as:

- What was the employee / volunteer doing just prior to the incident?
- Were there any witnesses? What were their names? Did the witnesses provide statements of the incident?
- What happened? (e.g., "Ladder kicked out and employee fell to floor," "forklift struck wall, wall collapsed").
- What part of the body was affected by the incident (eye, arm, leg, fingers, hand, etc.)? What was the nature of the injury (object in eyes, fractured arm, sprained leg, lacerated finger, cut in right hand, etc.)?
- What was the object or substance that directly harmed the employee (if substance/object is known)?
- Was the injury fatal?

2.8.3 RECORD KEEPING PROCEDURES

DAHFH will control and maintain all employee and volunteer accident and injury records. Records are maintained for a minimum of five years following the end of the year to which they relate. The data on the injury and illness log and posting of the summary of work-related injuries and illnesses will be in accordance with government regulations. The following will be included in the record keeping process:

- Log of Work-related Injuries and Illnesses (OSHA form 300)
- Summary of Work-Related Injuries and Illnesses (OSHA form 300A
- Incident investigation reports (OSHA form 301 or similar)
- Workers' Compensation Notice of Injury

2.9 CHANGES TO SAFETY PLAN

Any changes to the safety plan will be approved by senior DAHFH Staff. This plan shall be reviewed by a qualified person periodically to determine if additional practices, procedures, or training needs to be implemented by the competent person to improve or provide additional fall protection for DAHFH job sites. Workers shall be notified and trained, if necessary, in the new procedures.

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CHAPTER 3: BUILDING WALLS IN THE SHOP

Tools and Materials

- Hammer
- Measuring Tape
- Nail Puller/Cat's Paw
- Miter Saw
- Ear Protection
- Eye Protection
- 2x4 Lumber
- 2x6 Lumber
- Sheathing, typically Oriented Strand Board (OSB)
- 8d Nails
- 12d Nails

Safety

- Eye protection (safety glasses/goggles) is required at all times.
- Ear plugs and dust masks will be provided if requested (not mandatory).
- Gloves are recommended for handling lumber to prevent splinters.
- Do not wear gloves when operating a saw.
- Be sure there are enough people carrying each wall because some walls are heavy.
- For additional safety information, see Chapter 2.

3.1 INTRODUCTION

To save time, the exterior and interior walls for houses construction by the Dallas Area Habitat for Humanity (DAHFH) are built in the shop and delivered to the build site. Many of the components of the walls are built using pre-assembled components built in the shop using jigs (see Figure 3-1).

Figure 3-1. DAHFH Shop

The majority of components are built using 2x4 lumber. Depending in the house floor plan, 2x6 lumber may be used for walls that will include plumbing lines. Traditional lumber is rarely perfectly straight. All pieces of lumber will have a slight curvature if you look down the length of the piece (see Figure 3-2). The top of this curvature is often referred to as the crown of the lumber. When building a wall, it is important to pay attention to crowns. The curvature or crowns of all pieces of lumber in a wall should point in the same direction. Similarly, the board should be relatively straight. Any curving down the entire length of the lumber is called a bow.

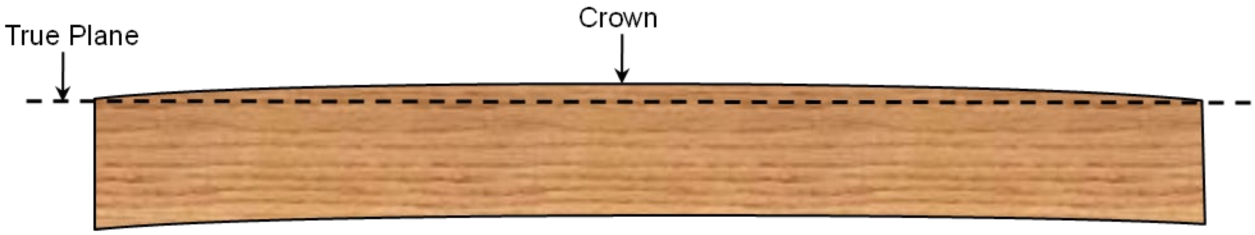


Figure 3-2. Determining the Crown of Wood

For framing walls, 12d nails are used. Typically, the components are built by end nailing or facing nailing (see Figure 3-3). End nailing is the most common form of nailing in construction. Two boards are fastened together at a 90° angle and a nail is driven through one piece of wood into the end grain of the adjoining piece. Face nailing means nailing directly into the face, or flat part of the piece of wood or material, at a perpendicular angle to the material into which the nail will sink. Toe nailing is used to when lumber cannot be end nailed or when a connection needs to be reinforced. The nail is started at an angle or slant in one framing member and driving it through into a second (usually perpendicular) framing piece.

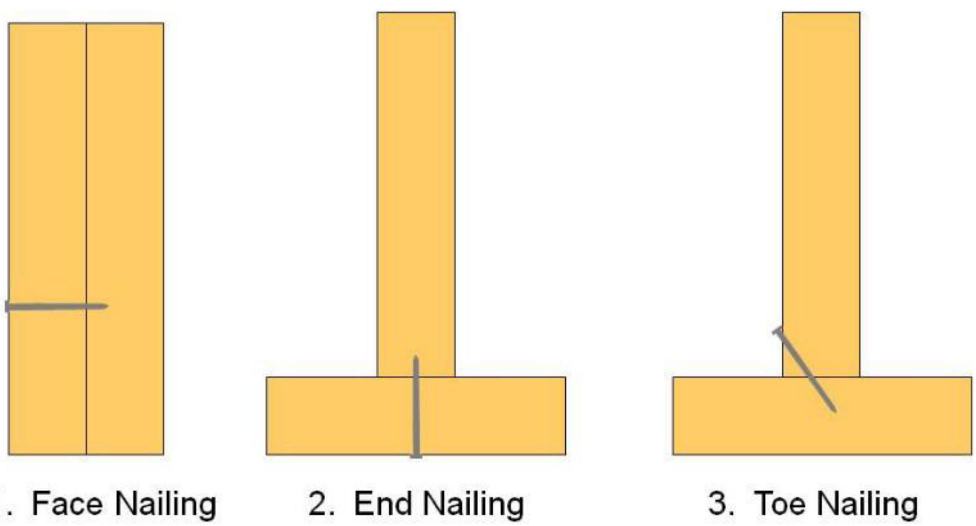


Figure 3-3. Nailing

3.2 FRAMING COMPONENTS

Basic wall components include stud, king-jack, California corner, U component, ladder, XBX, Texas T, beam pocket, doors, and windows. The following is a brief description of these components and their usage. Appendix C shows the dimensions and nailing patterns for these elements.

Stud or King Stud

A full-length pre-cut stud runs continuously from the bottom plate to the top plate. The length of the king stud is 92⅝ inches for 8-foot walls and 104⅝ inches for a 9-foot wall. The king stud is no different from a regular 2x4 full-length stud except that it is the beginning and end of a rough opening for a window or door.

King-Jack

The rough openings for doors and windows are framed out using a combination of a full-length studs (called king studs) and jack studs (denoted as a KJ). Jack studs (or jacks) are less than the full-length of a 2x4 stud. The jack studs provide the primary structural support for a header near the top of the rough opening for a door or window. The length of the jack stud is 81 inches to allow for a 6-foot 8-inch tall door.

California Corner

To create a solid inside and outside corner and increase energy efficiency, DAHFH uses a California corner (CC). This technique provides the same support of a three-stud corner but uses less wood and allows insulation to be installed all the way to the corner rather than creating a void for exterior walls. CCs are typically built from two 2x4s. For 2x6 plumbing walls, a CC includes one 2x4 and one 2x6 and is denoted as a CC6.

U Component

A U component is installed where one wall joins another along the length of another wall. U components are typically built from two 2x4 studs and four 11½-inch lengths of 2x4s.

Ladder (Blocking)

Ladders or ladder blocking is used when connecting an interior wall to an exterior wall. The ladder is formed by using short lumber pieces and attached between two studs. This provides a nailing surface to attach interior walls to an exterior wall. Ladder blocking is not used for interior walls.

XBX

An XBX component is installed at the end of an interior wall. XBXs are typically built from two 2x4 studs and four 11½-inch lengths of 2x4s.

Texas T

A Texas T component is installed where one wall joins another along the length of another wall. Texas Ts are built from three studs.

Beam Pocket

Beam pockets (BP) are used to support the porch beam on the front or side porch. BPs are typically built from two 2x4 studs, two 2x4s cut to 86⅛ inches (for 8-foot walls) or 98⅛ inches (for 9-foot walls), and two pieces of wall sheathing filler.

Doors

For doorways, a KJ is set on either side of the door opening. The jack stud will support the header. For interior doorways, a 2x4 is used for the header. Cripples are also included to provide additional support and stability.

Windows
Similar to doorways, a KJ is set on either side of the window opening. The jack stud will support the header. Windows also include a sill to support the window. Cripples are also included to provide additional support and stability above the header and below the sill.

3.3 ASSEMBLING WALLS

Based on the floor plan, a cut sheet is developed to determine the length of the wall to be assembled. Walls have two plates – the bottom plate runs horizontally along the bottom of the wall and the top plate runs horizontally along the top of the wall (see Figure 3-4). Solid (non-finger jointed) 2x4 lumber is used for the top and bottom plates, window sills, and headers. However, the lumber used for the bottom plate is pressure treated (aka green board) to help prevent rot and insect damage.

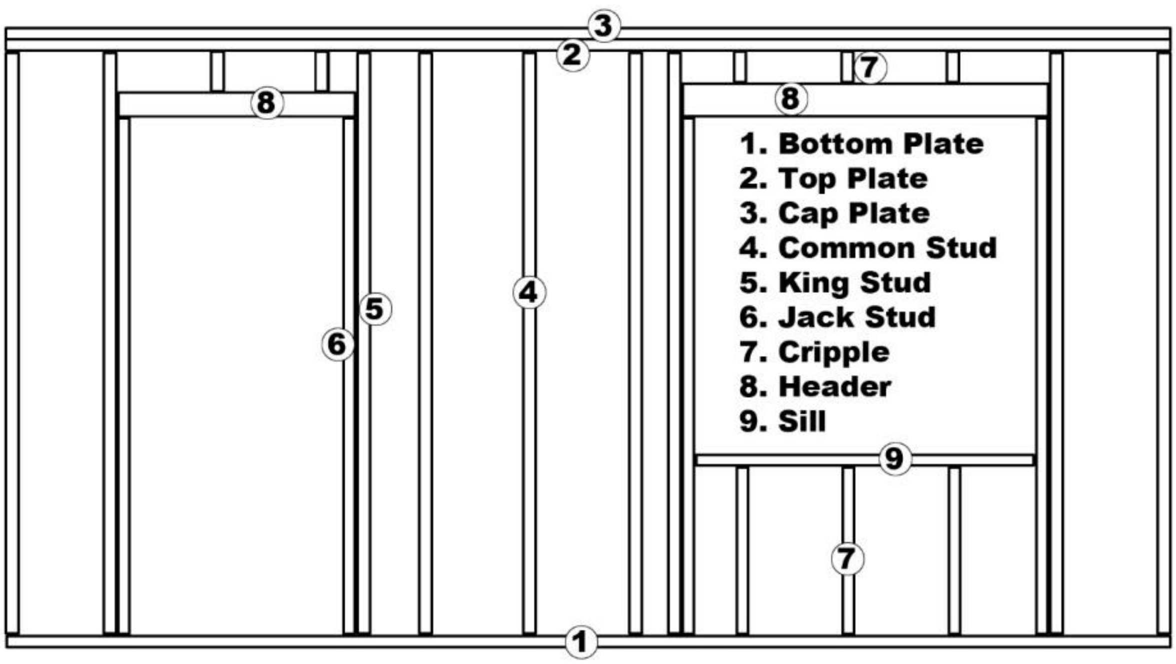


Figure 3-4. Typical Wall Frame Terms

Tack nail the top and bottom plates face-to-face to help ensure both are the same length and the markings match. Measure and cut the top and bottom plates. Using the cut sheet, the locations of the studs and other components are marked on both the bottom and top plate. Separate the top and bottom plates.

Layout all the components needed, lining up the ends of the studs with the marks on the bottom and top plates. Before nailing, make sure all studs and components are flush with the ends and sides of the top and bottom plates. Line up the ends of the cripples with the top plate and header. Always start nailing at the ends. Use two 12d nails per stud or cripple. Double check all studs and cripples are nailed tightly to the top and bottom plates and/or sill or header.

It is important to verify all components are oriented correctly, the wall is complete (e.g., all cripples have been included), and all components properly nailed off before moving to the stack.

3.4 ATTACHING SHEATHING

There may be some instances when sheathing is added to exterior walls while they are being constructed in the shop. Square the wall before fully nailing off the sheathing. Use 8d nails to attach sheathing to the wall sections. The top of the sheathing should be ½-inch above the top plate. Sheathing should be installed with the smooth side (or stamped side) facing out. The nails should be 6 inches apart around the outer edge of each piece of sheathing and 12 inches apart on the interior of the sheathing (the field) (see Figure 3-5). Nail into the studs. The nailing pattern around windows and doorways is the same as for the edges, every 6 inches.

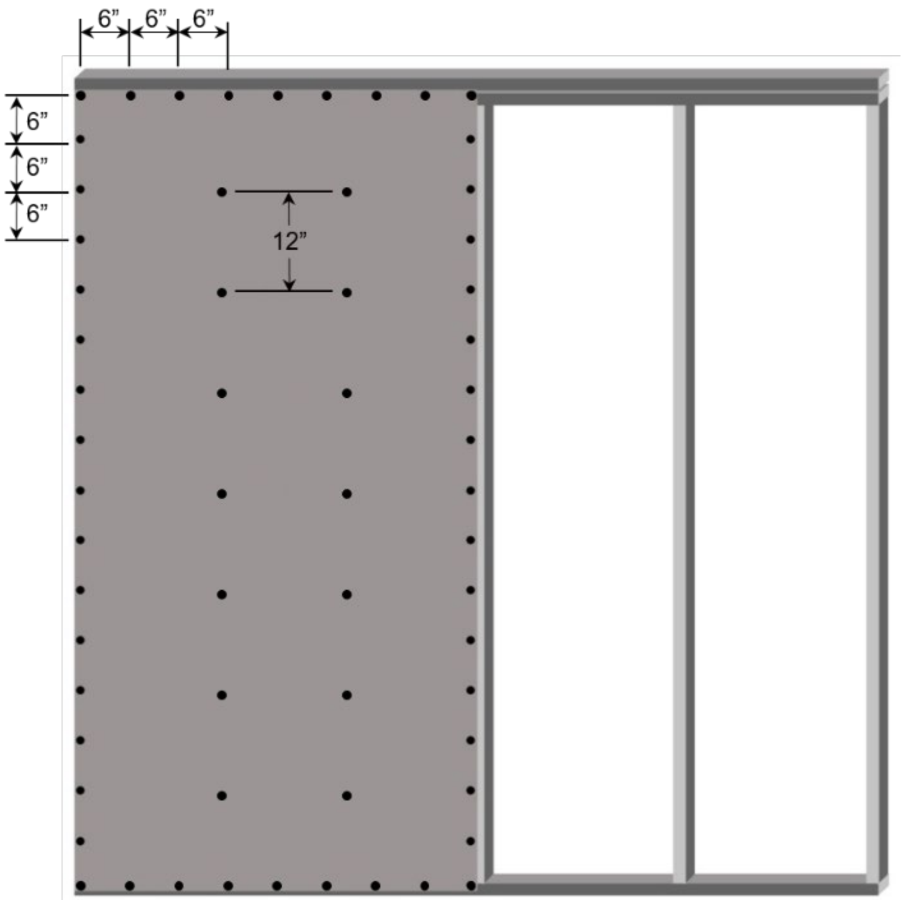


Figure 3-5. Nailing Pattern for Exterior Wall Sheathing

CHAPTER 4: FRAMING

Tools and Materials

- Hammer
- Measuring Tape
- Chalk Line
- Speed Square
- Nail Puller/Cat's Paw
- Utility Knife
- Levels (8-Foot and 9-Foot)
- Miter Saw
- Circular Saw
- Reciprocating Saw
- Drill with ½-inch and/or ¾-inch drill bit
- Impact Driver
- Powder Actuated Nail Gun
- Clamps
- Sledgehammer
- ¾-Inch Deep Socket and Driver
- String Line
- Tack Stapler
- Sawhorses
- Ladders
- Extension Cords
- Broom
- Caulk Gun
- Ear Protection
- Eye Protection
- Hard Hat
- 2x4 Lumber
- 2x6 Lumber
- 4x4 Lumber/Porch Posts
- 6x6 Lumber/Porch Posts
- 2x12 Lumber
- Laminated Veneered Lumber (LVL)
- Sheathing, typically Oriented Strand Board (OSB)
- Pressure Treated Plywood
- Sill Seal
- Poly Barrier
- Concrete Fasteners
- Powder Actuated Loads
- Joist Hangers
- Hurricane Straps
- Porch Post Base Plates
- 8d Nails
- 12d Nails
- Simpson Nails
- Roofing Nails
- Deck Screws
- Washers
- Nuts
- Staples
- Construction Adhesive
- WeatherMate Tape

Safety

- Eye protection (safety glasses/goggles) is required at all times.
- Ear plugs and dust masks will be provided if requested (not mandatory).
- Gloves are recommended for handling lumber to prevent splinters.
- Do not wear gloves when operating a saw.
- Be sure there are enough people carrying each wall to the slab because some walls are heavy and there are trip hazards and other obstacles on the site.
- When standing a wall, do not leave it unattended until it has been fastened to the slab and properly braced so it cannot fall and injure someone.

- When carrying long pieces of lumber, be aware of others, especially when turning.
- Be sure all ladders are properly positioned and stable. Follow all ladder safety rules (see Table 2.3).
- Only certified persons may operate powder actuated nail guns.
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.
- For additional information on safety, see Chapter 2.

Think About This...

- Begin standing walls at the corner farthest from any plumbing wall so walls that require plumbing cuts can be prepared before they are needed. This will prevent a delay in standing the walls.
- Install/build the back of the house, square it, brace it before continuing.
- Check the snap lines against the floor plan for the house. Measure diagonals and width to see if the snap lines are square. If they are not, consult the DAHFH Construction Staff immediately to make appropriate accommodates prior to starting work.
- Start the garage wall as soon as possible—it takes a long time to get everything cut, nailed and ready for installation. Try to find a flat surface, (e.g., slab next door, driveway, side yard) out of the work flow, to avoid interfering with other tasks or creating a big trip hazard.
- Make a 3½-inch mark at the base of the wall on starting corner.
- Do not use screws to connect walls.
- Wall bracing should not be removed until at least 80 percent of the roof decking is in place.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

4.1 INTRODUCTION

The exterior and interior walls for houses construction are pre-built in the DAHFH Wall Shop and delivered to the build site. The basic structure of an interior and exterior wall is the same. Typically, 2x4 lumber is used for framing. Walls have two plates – the bottom plate runs horizontally along the bottom of the wall and the top plate runs horizontally along the top of the wall (see Figure 4-1). The lumber used for the bottom plate is pressure treated (aka green board) to help prevent rot and insect damage. The vertical members of a wall that reach from the top plate to the bottom plate are called studs. Solid (non-finger jointed) 2x4 lumber is used for the top and bottom plate; finger jointed 2x4 lumber may be used for studs. The length of the king stud is 92⅝ inches for 8-foot walls and 104⅝ inches for a 9-foot wall. Studs are usually spaced 16 inches on center (OC). OC is the distance between studs as measured from the center of one stud to the center of the next stud; from a practical standpoint, this means 14½ inches between two studs. By convention, OC measurements go from inside of the one stud to the outside of the second stud; this achieves the same as 16-inch OC. The top and bottom plates and studs are assembled using 12d nails (two top and two bottom). For more information on framing, see Chapter 3.

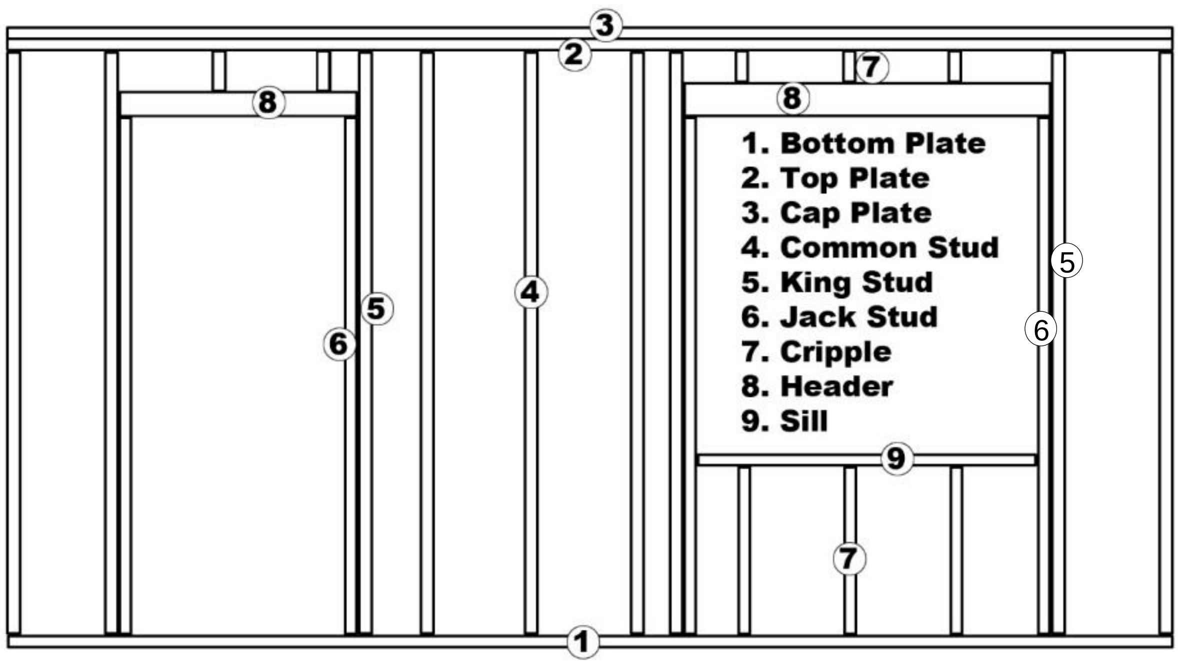


Figure 4-1. Typical Wall Frame Components

4.2 WALL PREPARATION

The layout of the walls is marked on the slab by DAHFH Construction Staff. Prior to installing the walls, the diagonal measurements included in the floor plan (see Figure 4-2) and width of the house (at the back, front, and mid-point) should be verified. Make sure to measure the distance from the exterior wall to the long interior hall snap lines, to confirm the hall snaps lines are correct. Also, make sure the slab is clean and swept if necessary to remove any dirt or debris.

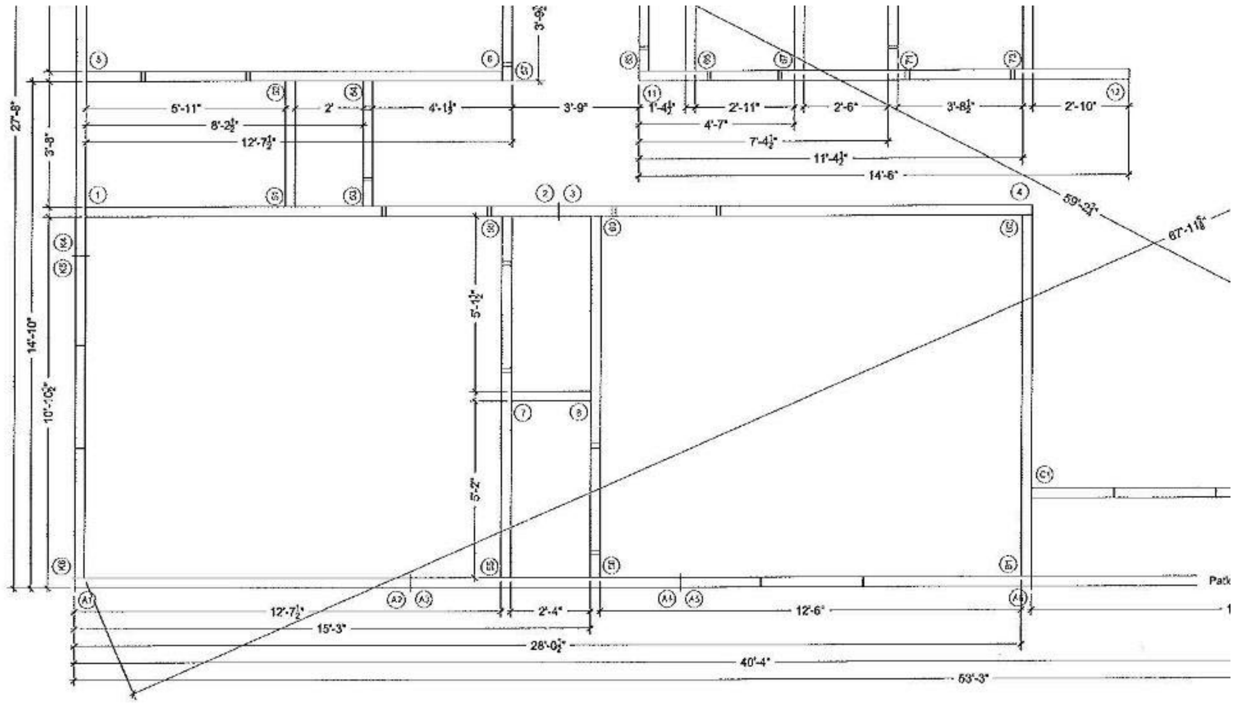


Figure 4-2. Excerpt from a Floor Plan

The ends of exterior walls are marked with a letter and a number (e.g., “A1,” “A2”). The ends of interior walls are marked with numbers only (e.g., “21,” “22”). The markings on the walls coincide with the markings on the slab (see Figure 4-3). All walls are marked in pairs, i.e., A1-A2, G5-G6, 71-72.

Figure 4-3. Wall Location Markings on Slab

Along exterior wall of the garage, the slab will include a piece of rebar extending vertically from the slab. This is known as an Ufer rod and is a grounding electrode for the electrical system for the house. Do not cut the rebar. For safety, use a small piece of 2x4 to create a cap for the rebar. Drill or notch the bottom plate of the wall to accommodate the rod.

4.2.1 SILL SEAL

The sill seal reduces air infiltration and moisture wicking from the concrete foundation wall into the wood sill plate. A sill seal is attached to the bottom plate on all exterior walls, including the interior garage walls (but not on other interior walls). Sill seal is slightly narrower than the bottom plate and should be aligned with the outside end of the exterior wall; this can minimize damage to the sill seal by creating a pivot point for standing the wall (see Figure 4-4). The sill seal is attached with staples or two roofing nails at every stud along the seal. The smooth side of the sill seal should be placed against the bottom plate so the ridged/corrugated side will be in contact with the slab. When moving the wall into place, do not drag the wall to avoid tearing the sill seal. It is important to keep the seal sill lying flat while moving the walls to ensure a good seal once the wall is stood in place. Make sure the sill seal is not broken or folded under the bottom plate.

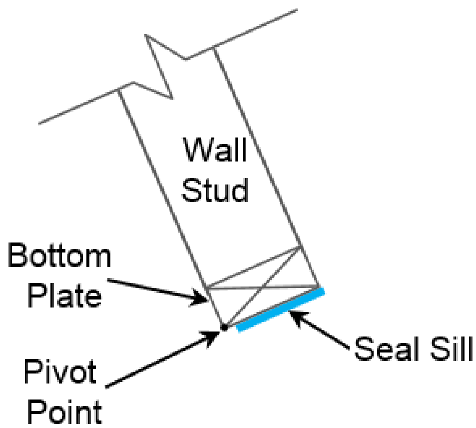


Figure 4-4. Sill Seal

4.2.2 ANCHOR BOLTS

To secure the exterior walls to the slab, anchor bolts are used. As the concrete for the foundation is poured, anchor bolts are embedded in the slab along the outer edge at regular intervals. The exact locations will vary and require a hole to be drilled in the bottom plate of exterior walls.

To help determine the location for the holes, place the wall next to the anchor bolts where the wall will eventually sit. To find where the bolts are located along the length and width of the bottom plate, measure from the chalk lines to the bolt (see Figure 4-5). Pay special attention to measure from the inside edge of the bottom plate when transferring this measurement onto the plate. Drill the hole for the anchor bolt using a ¾-inch drill bit. In situations where a wall stud is at the same location as an anchor bolt, cut off the anchor bolt with the reciprocating saw.

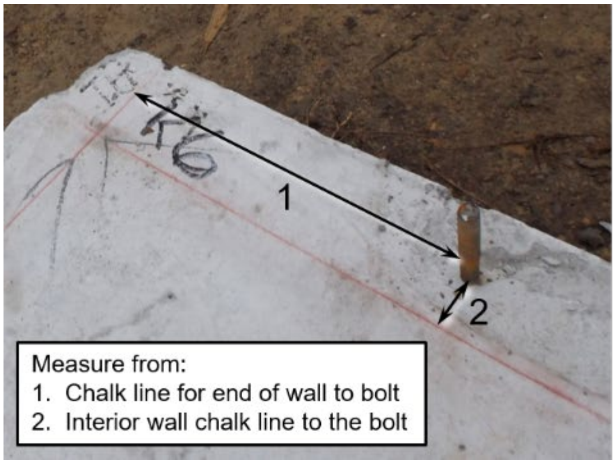


Figure 4-5. Marking Anchor Bolt Location on Bottom Plate

4.3 STANDING EXTERIOR WALLS

Begin standing the exterior side walls in the rear corner farthest away from any interior plumbing walls. At the corner, place a mark at 3½ inches (width of a 2x4) on interior side of the bottom plate of the wall that will form the corner (see Figure 4-6). Aligning this mark with the snap line on the slab for the opposing wall helps create a square corner for the house. This will give another reference point to align the adjoining wall to form the corner.

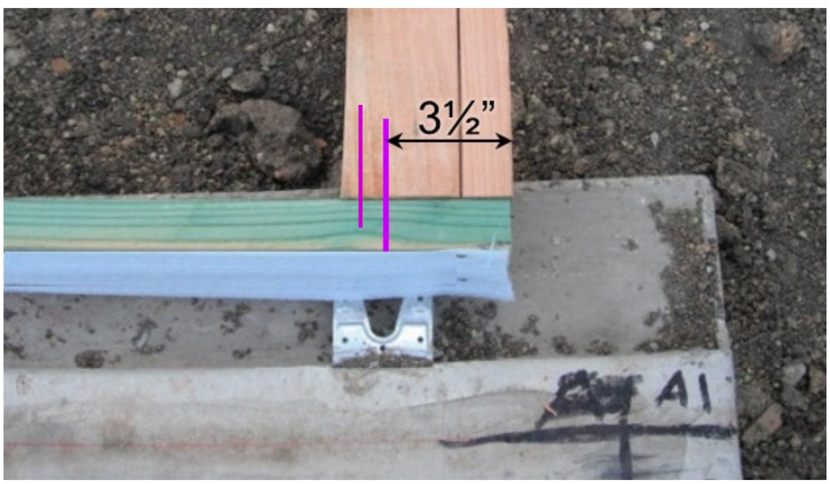


Figure 4-6. Marking Corner

Position the wall according to the lines snapped on the slab. Make sure the end marked A1 is placed on the slab where A1 is written. The end marked A2 goes on the slab where A2 is written. Make sure the bottom plate lines up on the interior snap line on the slab and there is no space where two walls meet.

In addition to the anchor bolts, concrete fasteners are used to align the wall prior to bolting the wall to the slab. Concrete fasteners are set utilizing a powder actuated nail gun (which shoots a nail through the bottom plate into the slab).

Only certified persons may use the powder actuated nail gun.

For exterior walls, concrete fasteners are set at the following locations:

- 6 inches from the stud on each end of the wall,
- Within 4 feet of an anchor bolts, and
- The bay adjacent to a door opening.

Do not set a concrete fastener in the bottom plate of a doorway. At door frames near the end of the wall section or on walls less than 4 feet, the Wall Shop will install a two-piece jack stud. The lower 18 to 24 inches of the jack stud will be tacked in place so it can be easily removed to have a place to set the concrete fastener (see Figure 4-7). After installing the concrete fastener, reinstall the lower portion of the jack stud using 12d nails; two nails at top and two at the bottom.

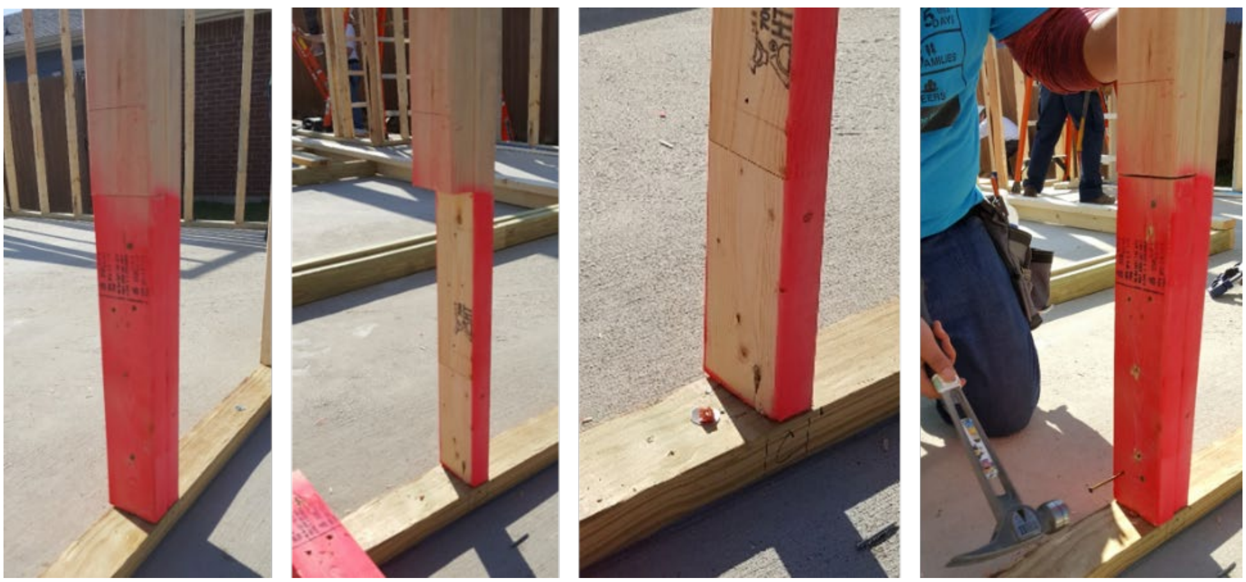


Figure 4-7. Concrete Fastener Near a Doorway

Begin at one end of the wall and fasten the plate to the slab. Continue to make certain the wall is aligned with the chalk line on the slab at the point where the next concrete fastener is being set. Due to bowing and warping of the bottom plate, the wall may have to be "walked into place" by moving the free end of the wall back and forth to properly align the plate along the chalk line. Make sure someone is holding the wall at all times, even after it has been attached to the slab; it is not stable or braced at this point. Complete the wall installation by using a washer and nut to fasten the bottom plate to the slab at each anchor bolt; if the hole is too large for the smaller washers, larger ones are available.

Stand the next exterior wall to form one back corner of the house. Follow the same procedure as with the first wall, attaching the wall to the slab, starting from the corner end, working to the free end of the wall section. Together, these two walls may provide sufficient bracing to each other to allow the next wall to be stood and attached. If the DAHFH Construction Staff or House Leader requests it, add additional bracing at this time (see Section 4.3.1). Nail all connecting walls together using two 12d nails, spaced approximately 24 inches apart (see Figure 4-8). Beginning at the top of the stud just under the top plate and finishing just above the bottom plate, nail both sides of the joint, using the same nail pattern. The nails should be nailed in a downward angle to add further strength and eliminate them going through the other side of the stud. If necessary, use blocks and clamps to pull the walls together so there are no gaps and to keep corners flush and square (see Figure 4-8). Remove clamps after the joint is nailed completely off. When joining walls, it is important that both the bottom and top plates are flush; verify that ensure there are no gaps between the plates and do not assume the studs are correct.

Do not use screws to connect walls together.

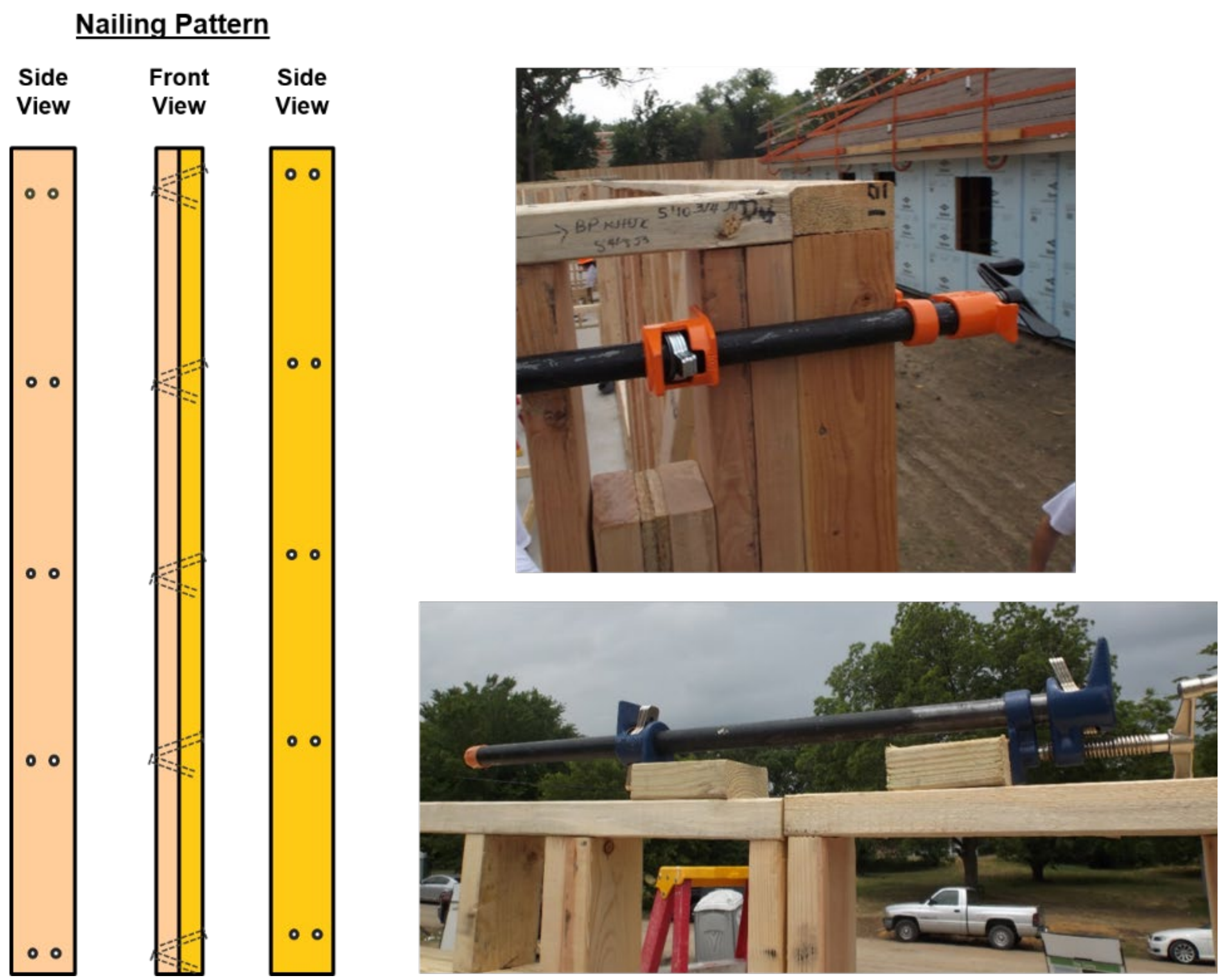


Figure 4-8. Nailing Pattern for Connecting Walls, Clamping as Needed

4.3.1 BRACING EXTERIOR WALLS

As a minimum, exterior walls should be braced at all exterior corners and where two exterior walls meet. All bracing should be done with 2x4 material and be on the inside of the house. When bracing is done from the outside it interferes with sheathing. Minimize interior bracing by standing interior walls as quickly as possible; interior walls can be used as bracing for the exterior walls.

The end of the brace to be attached to the bottom plate should be cut at a 45° angle to allow more contact with the slab and bottom plate (see Figure 4-9). Two diagonal braces (running from the top plate to the bottom plate) should be placed at each exterior corner (see Figure 4-10). Braces should be nailed off with two 12d at the top and bottom. Attaching bracing to anything other than the bottom plate can pull walls out of plumb. Use long level (8-foot or 9-foot to correspond to the wall height) to plumb (vertically level) the walls.

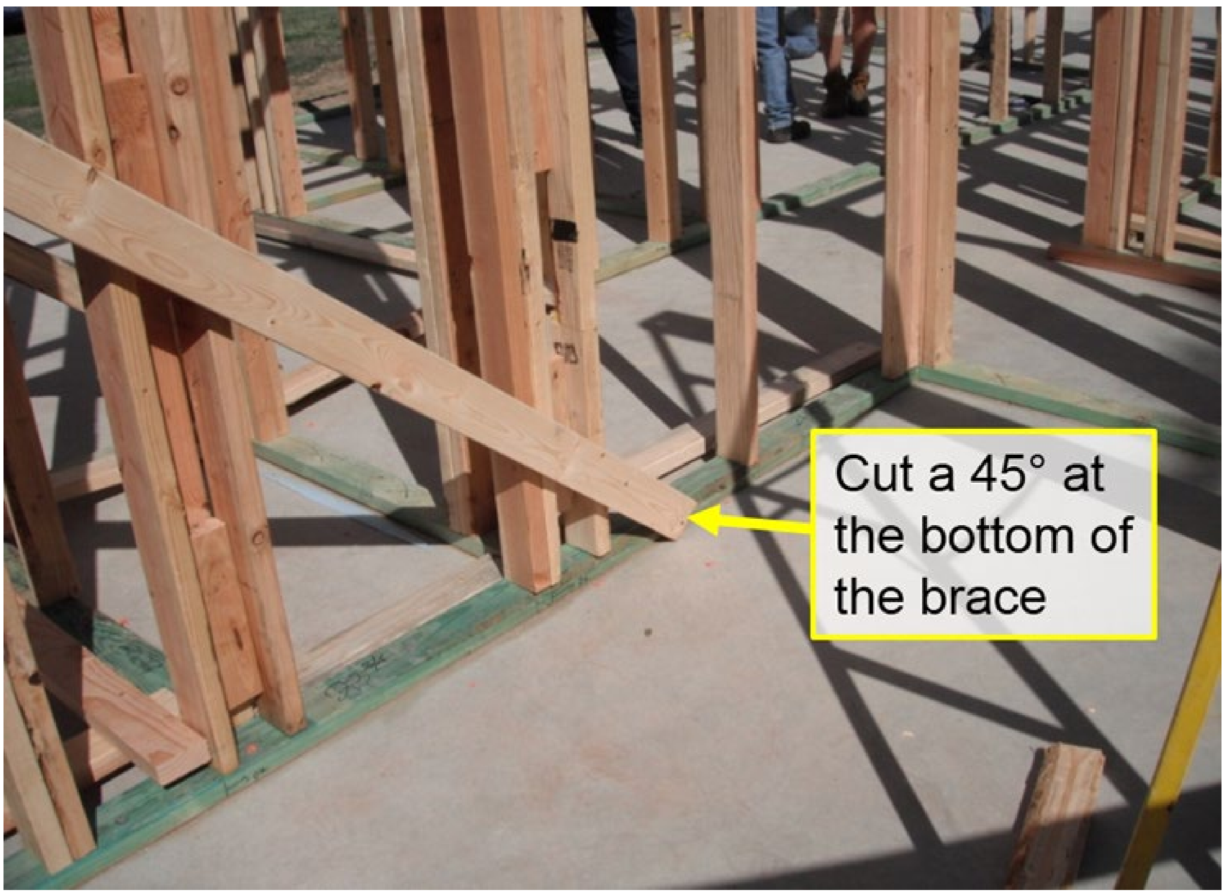


Figure 4-9. Wall Bracing

Figure 4-10. Bracing at Exterior Corner

Place bracing at every joint where two exterior walls connect. Nail a 2x4 diagonal to the top plate using two 12d nails. Then nail the other end to the bottom plate of an interior wall (see Figure 4-9). Place a long level (8-foot or 9-foot to correspond to the wall height) on an exterior wall near the joint to determine if it is plumb (vertically level). As one person checks the wall for plumb, a second person nails the bottom of the brace to the bottom plate, using two 12d nails. Once the brace is nailed, double check the exterior wall to make sure it is still plumb.

If the space between walls is too wide (longer than a 16-foot 2x4 will span), make a brace from two 2x4s. Overlap the 2x4 by at least 24 inches and attach to each other, using a single row of three 12d nails on both sides. Alternately, attach a 2x4 block (minimum 16 inches long) to the slab with concrete fasteners (see Figure 4-11), perpendicular to the exterior wall being plumbed . Make sure the block does not interfere with the placement of other walls. However, never fasten a block to the slab in the garage; the slab is the finished floor of the garage.

Figure 4-11. Do Not Use Blocks to Anchor Wall Bracing

4.3.2 INTERIOR WALLS

An interior wall may be raised as soon as it can be connected to an exterior wall. Work from where the interior wall intersects the exterior wall following the same general procedures as used on exterior walls. Until the house is squared (see Section 4.3.5), check that the interior wall is plumb and attached to perpendicular walls using only one nail near the top plate and one near the bottom plate. Leave the nail heads sticking up by about ¼-inch so it can be easily pulled if needed; this will make squaring the house an easier process.

For interior walls, concrete fasteners are set:

- 6 inches from the stud on each end of the wall,
- Every third bay, and
- The bay adjacent to a door opening and below the short jack of door frames

Do not set a concrete fastener in the bottom plate of a doorway. At door frames on short walls (typically less than 4 feet), remove the lower section of the doorway jack to set the concrete fastener (see Figure 4-7). After installing the concrete fastener, reinstall the lower portion of the jack stud using 12d nails; two nails at top and two at the bottom.

After the house is squared (see Section 4.3.5), go back and nail off all interior walls with 12d nails spaced 24 inches apart on both sides (see Figure 4-8). If necessary, use clamps to pull the walls together so there are no gaps between the walls and to keep the corner flush and square.

Verify the location of the tub with the House Leader or DAHFH Construction Staff. Measure the space between the walls where the tub will be placed. Allow a 60¼-inch clearance for the tub; it may be necessary to furr out the opening.

4.3.3 PLUMBING WALLS

Due to variations in the exact location of rough plumbing, walls with plumbing will need to be modified on site. The bottom plate must be cut to accommodate plumbing pipe and it may be necessary to move a stud and/or add another stud to avoid the plumbing. Measure to determine where to make cuts (notches) in the bottom plate to make room for the plumbing sticking up out of the slab. Prior to cutting the bottom plate, temporarily nail a non-finger jointed 2x4 horizontally across the studs (at least one bay on either side of the cut) to maintain the proper spacing on the studs until the wall is set in place (see Figure 4-12). These cuts can be made with a reciprocating saw or circular saw.

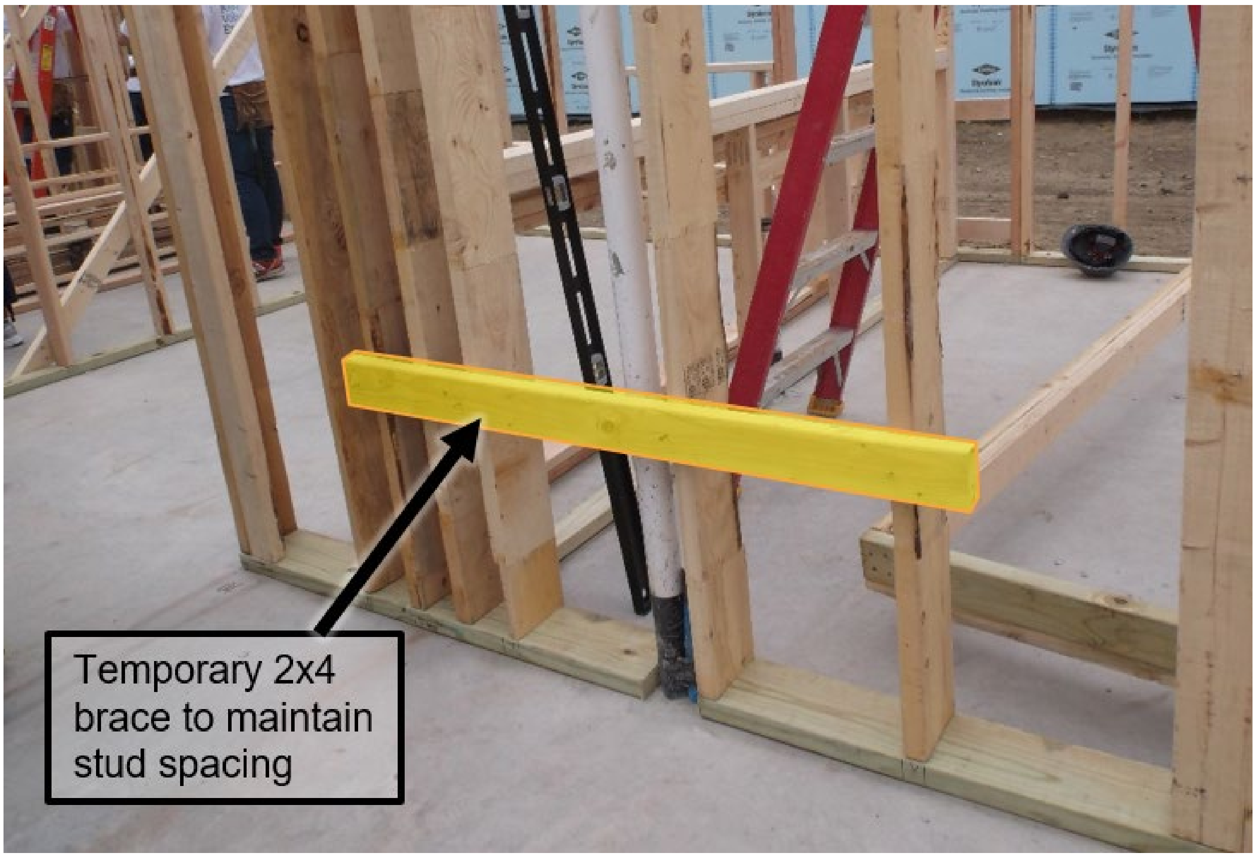


Figure 4-12. Cut Bottom Plate to Accommodate Plumbing

4.3.4 GARAGE DOOR WALL

Variations in the location of the garage door opening in the slab require the garage door wall to be constructed on site. Single-door garage wall components may be included with the wall stack – primarily two king-jack-jack stud sets. If the house will have a single-door opening, the top and bottom plates may also be included in the stack, nailed together. Figures 4-13 and 4-14 show the general framing and dimensions for single and double garage doors for 9-foot walls. For 8-foot walls, the cripples above the header are not needed.

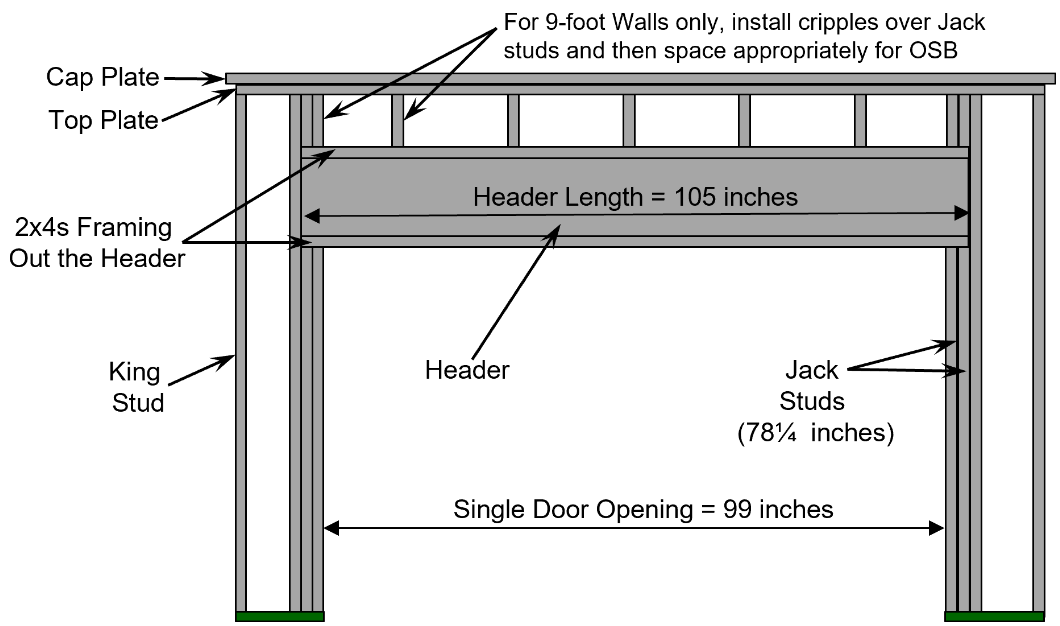


Figure 4-13. Single Garage Door Framing

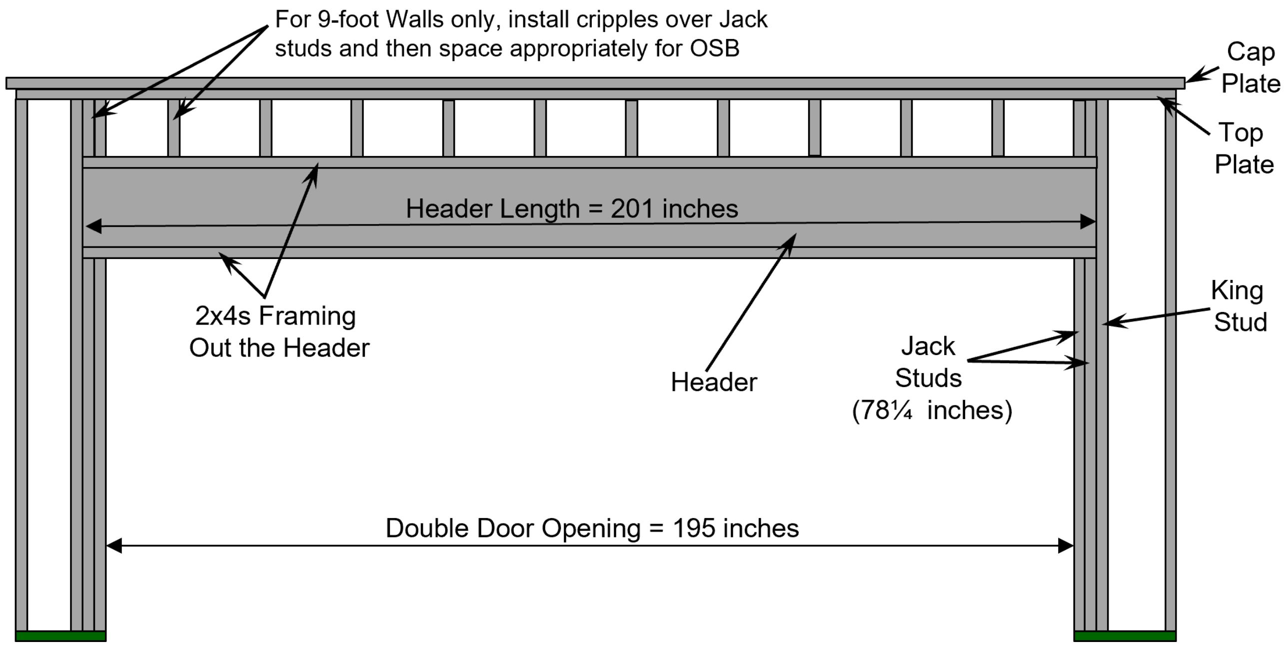


Figure 4-14. Double Garage Door Framing

The curb-to-curb distance on the slab is typically 99 inches for a single garage door (see Figure 4-13) and 195 for a double garage door (see Figure 4-14). The standard height of a garage door is 7 feet; therefore, jack studs for the garage header are 78¼ inches. If the curb-to-curb measurement is outside the typical dimensions, consult with DAHFH Construction Staff. Otherwise, add 6 inches to that dimension for the length of the garage door header. This allows for proper placement of the king-jack-jack stud components which form each side of the doorway and provides support for the garage door header.

Lay the top and bottom plate pair across the garage door opening (first assuring that it fits and has been cut to proper width). Verifying the lines transferred from the curbs are 99 inches or 195 inches apart. The wall needs to be built to these specified rough opening; the concrete opening can be adjusted if needed. Use a speed square to transfer the locations of each curb to both plates (see Figure 4-15). Marking the top and bottom plates as a pair creates a reference line for attaching the king-jack-jack stud component.

Figure 4-15. Marking the Plates for the Garage Door Opening

4.3.4.1 GARAGE HEADER

The header is constructed using two 2x12 boards or two 9¼ by 1¾-inch LVL beams nailed together. Typically, 2x12s are used for both single garage and double door headers; verify with the DAHFH Construction Staff. If using 2x12 lumber, use a spacer of ½-inch engineered-decking material or OSB in between the two beams. The spacer should be slightly smaller than the header; it is critical the engineered-decking material or OSB does not stick out beyond the 2x12 (see Figure 4-16). With the ½-inch spacer, the header is 3½ inches wide; the same width as a 2x4.

Figure 4-16. Garage Door Header Using 2x12 Lumber

The length of the header should be 6 inches longer than the dimension of the garage door opening to account for the two jack studs on either side of the door (4 jacks x 1.5 inches = 6 inches). The header should be 105 inches (99 inches + 6 inches) for a single-door and 201 inches (195 inches + 6 inches) for a double opening. Because there is no spare material on site, remember to use the "measure twice, cut once" method to assure the measurements are accurate before cutting the header material.

Prior to cutting the beams to length, verify the factory ends are cut square (at 90°). If not, use a speed square to make a mark at 90° and cut the end to make it square. Then cut the header to length. Lumber is cut square, to specific dimensions; however, these dimensions change with weather, moisture, and aging. The crown refers to the bowing or rise along the length of the board (see Figure 3-2). Turn each header board so the crown is up (i.e., the high point of the curve of the rings is pointing up) when the header is installed.

Apply construction adhesive on one side of the beam and set the spacer in place; tack the spacer in place with a couple roofing nails to prevent the spacer from shifting outside the beam envelope. Apply construction adhesive to the spacer and then set second beam on top. Align both beams (crown up); all four sides of each beam should be flush with the other beam. Nail together using 12d nails in a two-three-two nailing pattern (see Figure 4-17). These nail patterns are columns of nails roughly 12 to 18 inches apart. Flip the header over and repeat from the other side. For 2x12 headers, finish the header by attaching a non-finger jointed 2x4 to the bottom and top of the header running the length of the header (see Figure 4-13 and 4-14).

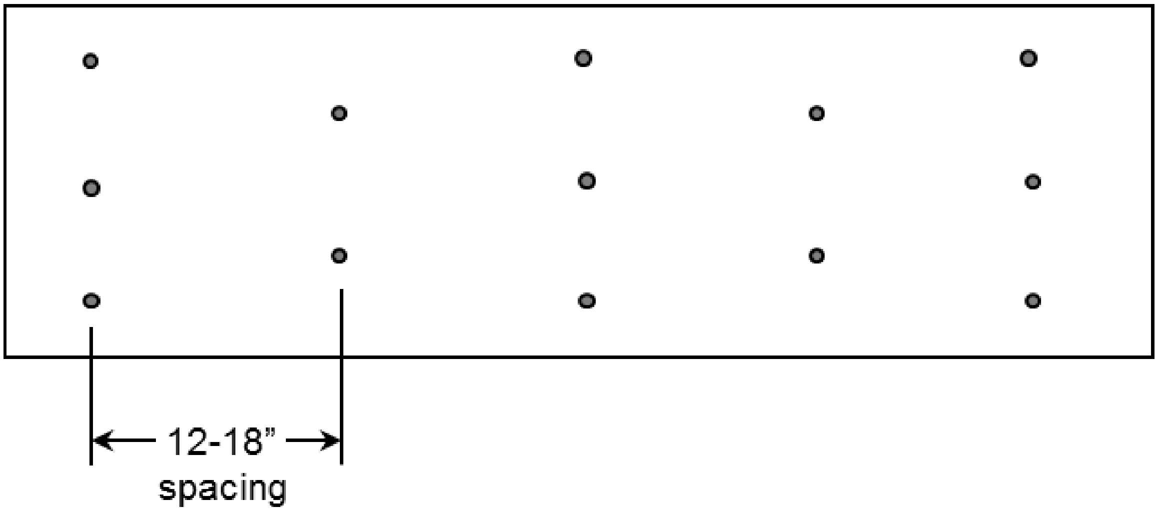


Figure 4-17. Nailing Pattern for Garage Header (not to scale)

4.3.4.2 ASSEMBLY

Locate the lines that mark the garage door opening on the top and bottom plates. Measure 4½ inches from these lines toward each end of the top and bottom plates. This marks the outside edge of the king-jack-jack stud components. Separate the top-bottom plates. Determine the location for the anchor bolts and drill the holes on the bottom plate (see Section 4.2.2). Dry fit the bottom plate to the slab prior to assembling the wall.

Using 12d nails, assemble the wall on the ground by placing the header between the king-jack-jack sets and nailing through the king studs into the sides of the header. Install the king-jack-jack components. Make sure the outer edge of the jack stud falls on the mark for the garage door opening and the king stud falls on the 4½-inch mark. If the spacing between the last stud in the wall (i.e., the end stud) and king stud exceeds 16 inches OC, install an additional stud(s) spaced at 16 inches OC from the end stud. Also, if the garage wall will be clad in brick a stud may need to be added to provide a solid nailing backing for brick ties.

Attach sill seal to bottom plate(s). Square (using the 3-4-5 method or measuring diagonally from opposite corners) and brace the wall using 2x4 diagonals. The brace should be installed on the interior side of the wall to allow for the installation of sheathing/shear walls.

Once assembled, the garage wall can be raised. The wall will be extremely top-heavy and awkward. Find several strong people and instruct them on how to raise the wall. To ensure the garage door wall remains square while stringing the walls and standing trusses, add a diagonal brace from the bottom plate to the header or corner (see Figure 4-18).

Figure 4-18. Completed and Installed Garage Door Wall with Bracing

Four hurricane straps are required on the inside of the garage wall. These straps are installed using Simpson nails in each hole and connect the jack studs, header, top plate, and cap plate (see Figure 4-19). Simpson nails should be flush against the plate.

Figure 4-19. Hurricane Strapping on Garage Door Wall

4.3.5 STRINGING THE WALLS

To help plumb the exterior walls and ensure the house is square, a string line is run around the perimeter of the house. This should only be done once all of the walls are standing and the side porch beam (if applicable) is installed. Stringing the walls requires a crew of three to four people.

At one corner of the house, nail a 2x4 block (approximately 16 inches long) flat on the exterior of the wall (see Figure 4-20), attaching the vertical block through the sheathing into the top plate and a stud or vertical member of the wall. The block should extend at least 4 inches above the top plate. Be sure the vertical blocks that are being used to string the walls are securely fastened the block with 12d nails or deck screws so it will not move under the pressure of the string. Repeat at the other house corner of the same wall. Loop the string around the block at one end of the wall in such a way that the running end comes off the outside of the 2x4 block. Pull the string to the opposite end of the wall, loop around the block, maintaining the same "line" along the block. Pull the string very taut. The line will help determine how far in or out of plumb.

Figure 4-20. Block for Stringing Walls

Always string the back wall first.

From the outside of the house, slide a 4-foot 2x4 board vertically along the wall at every 4 to 6 feet (see Figure 4-21). Verify that the string barely touches the 2x4 at each point. If there is a gap between string and board, loosen the nails holding the wall brace to the bottom plate (or stud or block), pull the wall section in, re-nail, and check again for plumb. Repeat until the 2x4 barely (a $^{1}/_{16}$-inch or less) touches the string. If the 2x4 touches the string, pushing it up, loosen the nails at the bottom plate (or stud or block), push the wall section out, re-nail, and check again for plumb, adjusting existing bracing as needed. If this is not sufficient, add additional bracing to that point to maintain plumb. If the wall is plumb, you should be able to run a 2x4 between the string line and the wall, with the 2x4 just barely touching the string along the entire length of the exterior wall. The sides of the house can be strung at the same time once the back wall is plumbed. After the sides are strung, string the front wall and center hallway walls.

Figure 4-21. Using 2x4 to Help Plumb Exterior Walls

4.3.6 CAP PLATE

The cap plate ties the wall together and supports the bottom cord of the trusses. The cap plate overlaps the top plates where two walls join. The cap plate should completely overlap the joint, flush to the outside of the wall. At intersecting joints, the overlap is approximately 3½ inches, the width of the 2x4 (or 5½ inches in the case of a 2x6 plumbing wall) (see Figure 4-22). At butt joints, where two linear walls meet end to end, the overlap should extend three studs (48 inches) past the joint as a minimum (see Figure 4-23).

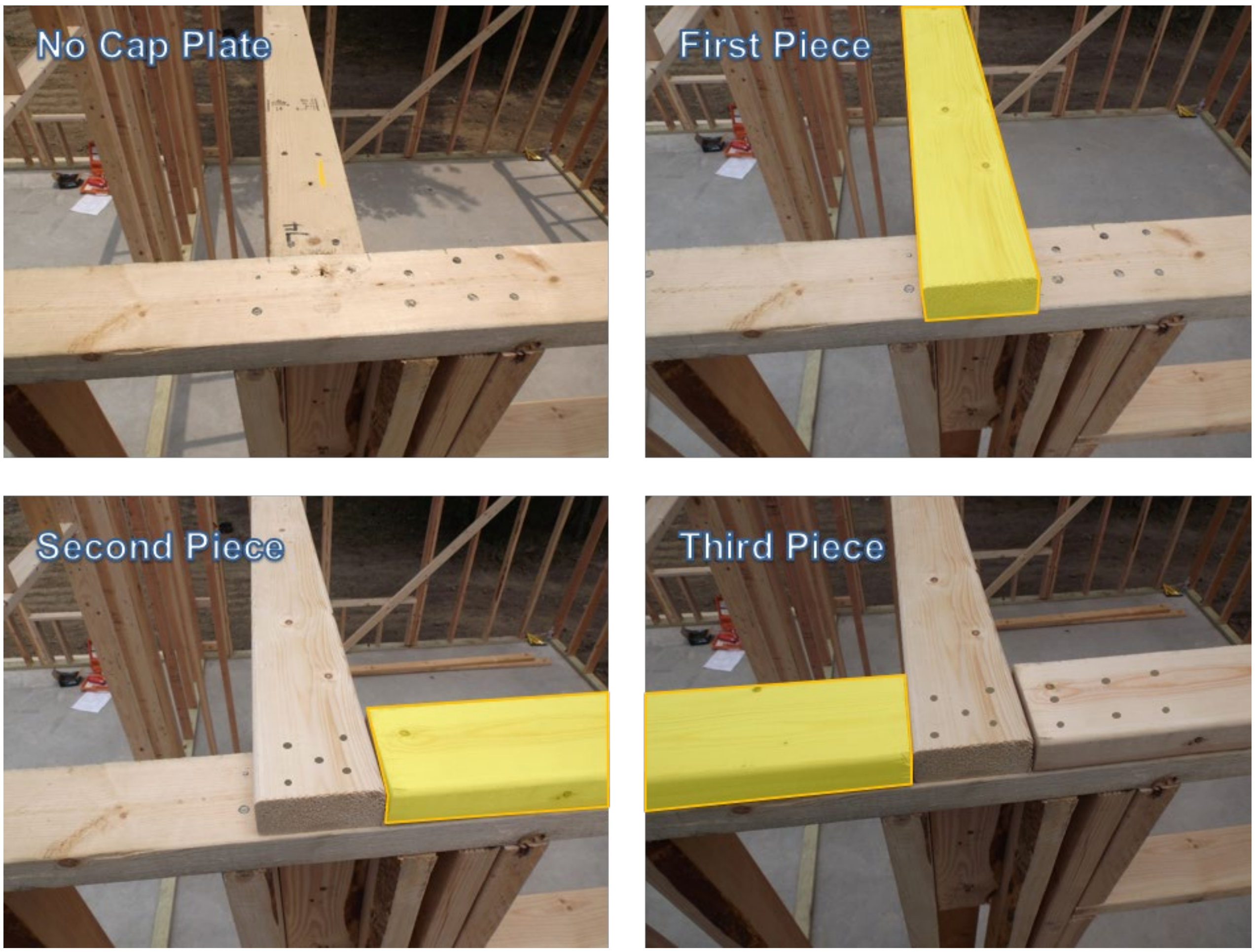


Figure 4-22. Placing Cap Plate at Corner

Cap plate should not be installed until all walls have been strung, plumbed, and nailed off.

Figure 4-23. Cap Plate on Long Wall

Walls should be plumbed and braced before measurements are taken for cap plate (see Section 4.3.5). Create a cut list by measuring the bottom of the walls for the cap plate and mark the bottom plate with the corresponding measurement to simplify installation. Use solid 2x4s for the cap plate (2x6 for plumbing walls, if available); do not use finger jointed lumber for cap plate.

Cap plate is nailed flush with the top plate using two 12d nails driven directly over each stud (three 12d nails on all 2x6 plumbing walls) and five nails at intersecting walls (see Figure 4-24). Nail directly over studs to avoid creating a hazard for plumbers or electricians who may drill access holes through the cap plate. Begin nailing at one end of the cap plate; continue nailing in the same direction to the end of the section of cap plate. "Walking" the board helps keep the cap plate flush with the top plate. Use clamps if needed to keep the top and cap plates flush and tight while nailing if walking does not work. On long sections, it is best to have two people install the cap plate to make sure the cap plate stays flush the entire length of the board.

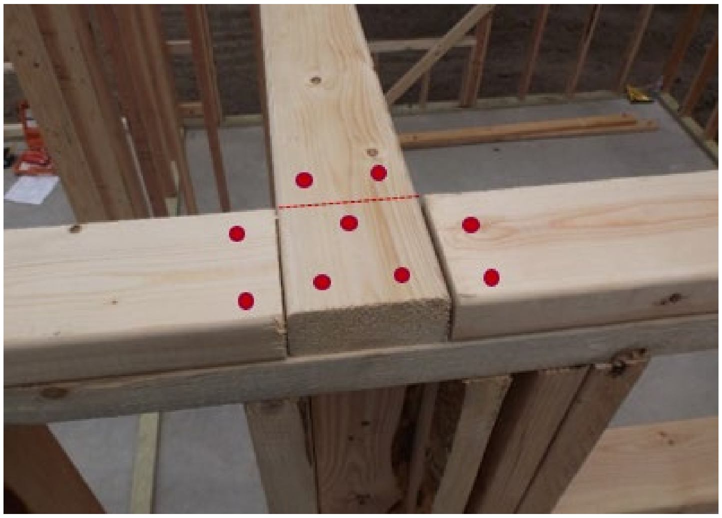


Figure 4-24. Cap Plate at Nailing Pattern

4.4 PORCH BEAMS

The porch beams needed for each house vary by floor plan. All porch beams are constructed using two 2x12 boards or two LVL beams nailed together. Verify the material to be used with the DAHFH Construction Staff. If using 2x12 lumber, use a spacer of engineered-decking material or OSB in between the two beams (see Section 4.3.4.1). For porches with sides beams, the front and side beams interlock at the corners for strength and to ensure a square corner (see Figure 4-25). Once the beam is assembled, apply WeatherMate tape along the top to prevent rain from saturating and expanding the spacer.

Figure 4-25. Porch Beam Interlocking Corner using LVL (left) or 2x12 Lumber (right)

Prior to cutting the beams, verify the factory ends are cut square (at 90°). If not, use a speed square to make a mark at 90° and cut the end to make it square. Make sure the piece cut off the end is at least 2 inches long – this scrap can be used to help stagger ends correctly when assembling the beams. Due to the limited amount of LVL or 2x12s on site, it is a good idea to cut the longest pieces first (typically the front beams). If the dimension a beam exceeds 16 feet, the beam will need to be spliced. If the front beam will be supported by more than two porch posts, the splices should be adjusted to align with the post. The minimum length of the splice is four feet and the splices should be placed on opposite ends of the beam.

At the Wall Shop, the walls are built to include a beam pocket component at the appropriate locations. The beam pockets may by covered with sheathing and Blue Board. If necessary, use a reciprocating saw to remove only enough of the sheathing and Blue Board to reveal the beam pockets and the top and cap plates above the beam pocket. Prior to installing the front porch beams, verify the house has been strung (see Section 4.3.5) and the front wall is properly braced.

Check the floor plan to verify the locations of the beam pockets are correct. Verify the height of the beam pockets are correct.

4.4.1 PORCH WITH NO SIDE BEAMS

Most the porches located along the side of the house do not have side beams. To determine the length of the beam, measure from the distance between the king studs that form the beam pockets (see Figure 4-26). Cut the beams ¼-inch shorter than the measured length, this allows for "play" when installing. Both pieces of beam material will be the same length.

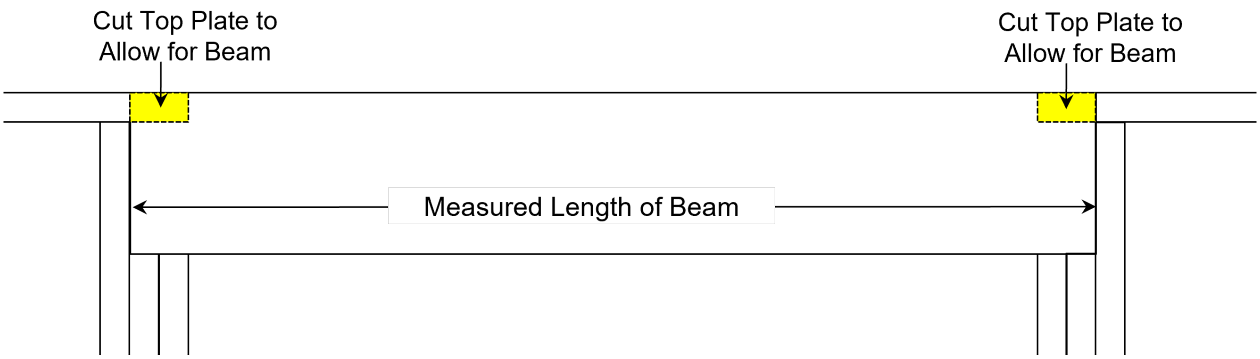


Figure 4-26. Measuring for Side Porch Beam

The beam should be assembled on the ground before raising into place. Using 12d nails, nail the two beams (and sheathing spacer if using 2x12 lumber) together using the same three-two-three nailing pattern used for the garage door header (see Figure 4-17). If not already cut, cut the top plate at the beam pocket so the beam does not have to be notched (see Figure 4-27). To install, place one ladder at each beam pocket. Raise the beam, one side at a time and insert into the beam pockets. It is a good idea to have someone in the middle of the beam to help support the beam. Secure the beam into the beam pocket using four 12d nails.

Figure 4-27. Installed Side Porch Beam

4.4.2 PORCH WITH ONE SIDE BEAM

Measure the existing framing that forms the sides of the porch. Measure from the inside corner of the porch to the outside beam pocket to determine the length of the front and side beams (see Figure 4-28). Measure from the framing, not the sheathing. To allow for the length of beam to sit inside the framing, add 3½ inches to the measurements.

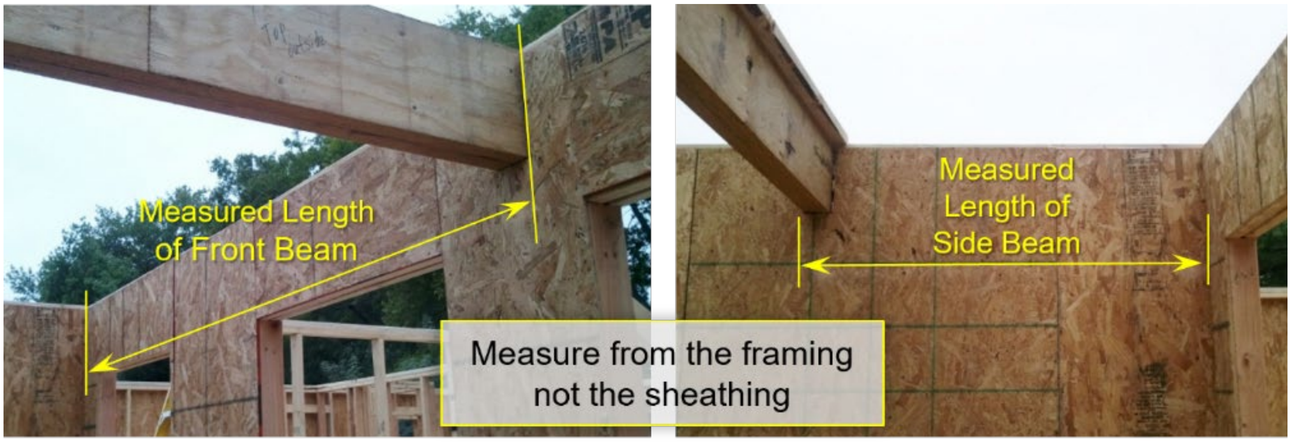


Figure 4-28. Measuring for Porch Beams (One Side Beam)

Remove the sheathing and Blue Board at and above the beam pockets before measuring and installing the beams. The beams should tie to the framing.

For side and front beams, the second (interior) piece will be shorter than the first (outside) (see Figure 4-29) to create an interlocking corner. To assure the corner will fit together properly use the 2-inch scrap of the beam material as a guide to confirm the proper length and spacing.

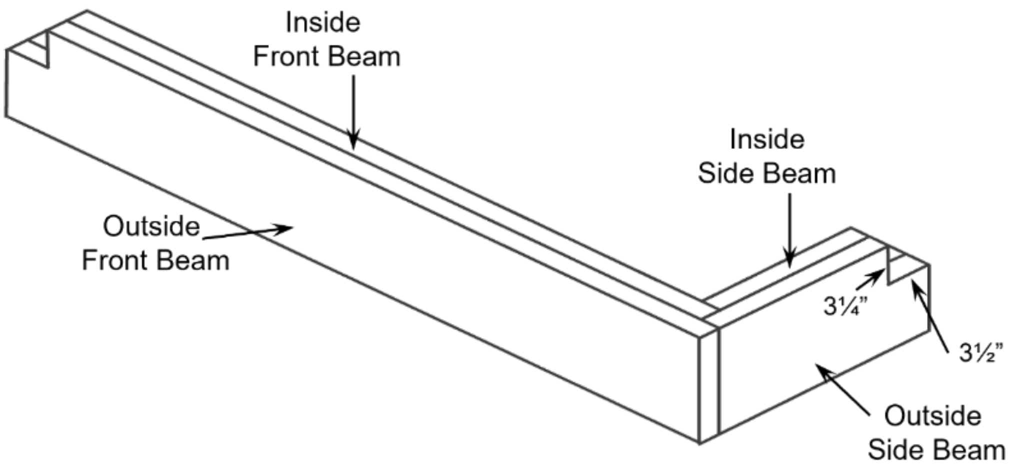


Figure 4-29. Front and Side Beam Layout for a Porch with One Side Beam

Each beam should be assembled on the ground before raising into place. Figure 4-29 shows the staggering of the beams to create the interlocking corner(s). Again, use the 2-inch scrap cut off to stagger ends the proper distance. Nail the two beams (and sheathing spacer if using 2x12 lumber) together using the same three-two-three nailing pattern used for the garage door header (see Figure 4-17). Then measure and cut notches in beams; the notch should be 3¼ inches high and 3½ inches long (see Figure 4-29). Also, start four 12d nails and three deck screws along the outside front face and outside side face of the beams and then remove prior to lifting; this will have the nails/screws easier to drive when lifted into place. If hurricane straps/plates will be used to connect the porch post and beam, trace the outline of the hurricane strap/plate on the beam to avoid placing the nails/screws in the same location (see Section 4.5). Attach a temporary block to the underside of the side beam using two to three deck screws (see Figure 4-30). This temporary block should be long enough (16 inches +/-) to extend beyond the corner to provide a rest/stop for the front beam until the beams can be secured together.

Figure 4-30. Temporary Block to Rest Front Beam During Installation

Prepare a temporary post for the side beam. The temporary post is a California corner which will be attached to the beam (see Figure 4-31). Using deck screws, attach a temporary post to the side beam before raising. Deck screws allow for easy removal once the permanent porch post is installed

Figure 4-31. Temporary Post for Porch Beam

Prior to raising beams, set three 8-foot ladders in position – one at the side beam pocket and the other two at the location of the corner of the front and side beam. Raise the shorter, side beam first. Insert the side beam into beam pocket, level, and install the temporary post. Securely nail the beam into pocket using four 12d nails.

Once side beam is secure, the assembled front beam can be lifted into place. Move the ladder from the side beam pocket to the front beam pocket. Similar to the side beam, insert the front beam into the beam pocket, level, and set on the temporary post. Using the pre-established holes, secure the front beam and side beam together with three deck screws and four 12d nails on each side of outside corner of the beam (eight nails and six screws total). Place the temporary post to support the front beam 6 to 12 inches away from the corner to provide enough support for the beams but will not interfere with the installation of the permanent porch post. Use the 3-4-5 method or measuring diagonally from opposite corners to square the beams. This assures each beam is square and all corners are at 90° angles. Use two to three 2x4s to diagonally brace the corners between the side and front beams. Install the brace on the bottom of the beam so it does not interfere with standing the trusses. Securely nail the beam into pocket using four 12d nails.

4.4.3 PORCH WITH TWO SIDE BEAMS

To determine the length of the front beam, measure from the outside beam pocket to the outside beam pocket (outside/outside measurement) (see Figure 4-32). In general, if the porch post will be covered in brick or stone, the location of the beams needs to allow 5½ inches for brick around the porch posts. For the side beams, measure the depth of the porch from the framing of the exterior wall (i.e., from the studs) to the edge of the porch (see Figure 4-33). Verify the length of the side beams with the House Leader and/or DAHFH Construction Staff and confirm the length includes the 3½-inches to allow for the length of beam to sit inside the framing.

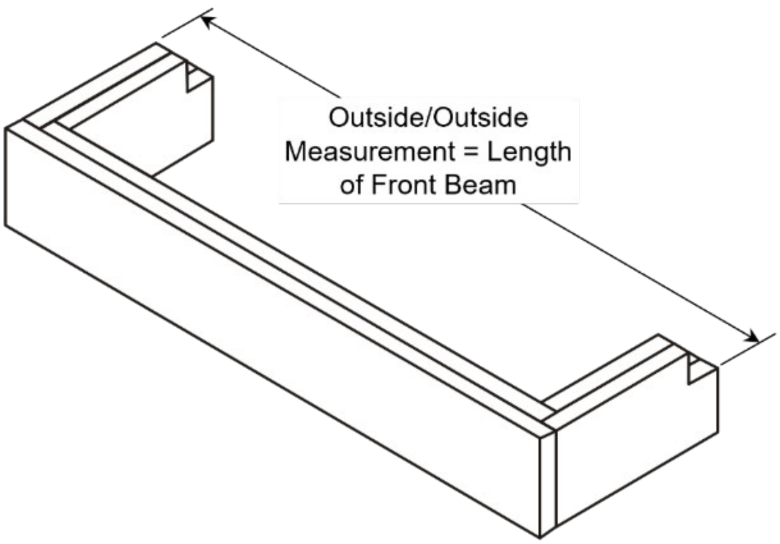


Figure 4-32. Beam Length with Two Side Beams, Top View

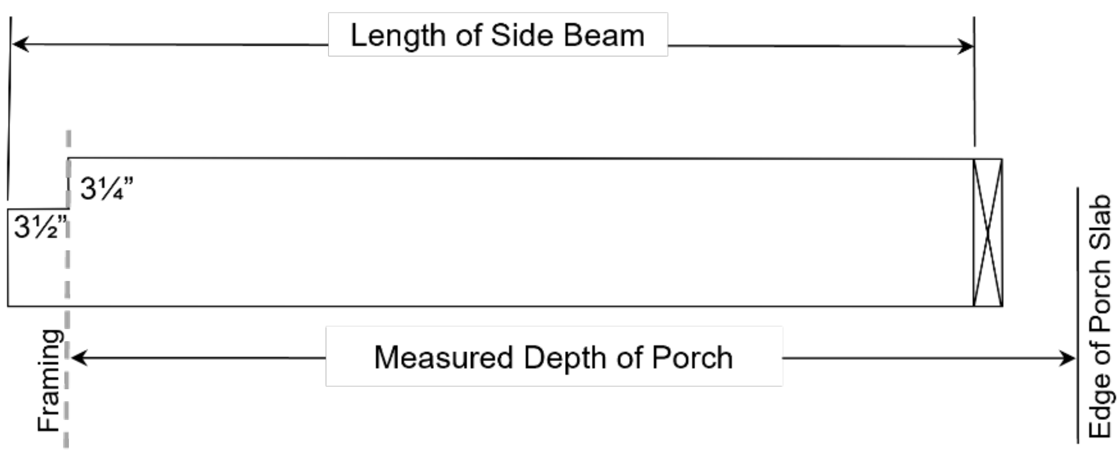


Figure 4-33. Side Beams, Profile View

Remove the sheathing and Blue Board at and above the beam pockets before measuring and installing the beams. The beams should tie to the framing.

Each beam should be assembled on the ground before raising into place. Figure 4-32 shows the staggering of the beams to create the interlocking corner(s). The side beams will be mirror images of each other. Use the 2-inch scrap cut off to stagger ends the proper distance. Nail the two beams (and sheathing spacer if using 2x12 lumber) together using the same three-two-three nailing pattern used for the garage door header (see Figure 4-17). Then measure and cut notches in beams; the notch should be 3¼ inches high and 3½ inches long (see Figure 4-33). Also, start four 12d nails and three deck screws along the outside front face and outside side face of the beams and then remove prior to lifting; this will have the nails/screws easier to drive when lifted into place. If hurricane straps/plates will be used to connect the porch post and beam, trace the outline of the hurricane strap/plate on the beam to avoid placing the screws in the same location (see Section 4.5).

Attach a temporary block to the underside of the side beam using two to three deck screws. This temporary block should be long enough (16 inches +/-) to extend beyond the corner to provide a rest/stop for the longer beam until the beams can be secured together (see Figure 4-30). Prepare temporary posts for side and front beams. If the front beam is longer than 8 feet, use two temporary posts to support the front beam. The temporary post is a California corner (see Figure 4-31). Use deck screws, attach a temporary post to each side beam before raising; do not attach the temporary posts to the front beam. Deck screws allow for easy removal once the permanent porch post is installed.

Prior to raising beams, set three 8-foot ladders in position – one at the side beam pocket and the other two at the location of the corner of the front and side beam. Raise the shorter, side beams first. Insert the beam into beam pocket, level, and install the temporary posts. The temporary post should be set 6 to 12 inches away from the corner to provide enough support for the beams but will not interfere with the installation of the permanent porch post. Securely nail the beam into pocket using four 12d nails.

Once side beams are secure, the assembled front beam can be lifted into place. Place 8-foot or 10-foot ladders at the end of the outside of the side beam and two 6-foot ladders on the porch, parallel the front beam location. Because of the weight of the beam, it is best to raise the front beam and set it on top of the 6-foot ladders first. Then lift into position from the 6-foot ladders with two volunteers guiding the front beam onto the temporary blocks (see Figure 4-30) from the 8-foot/10-foot ladders. Using the pre-established holes, secure the front beam and side beam together with three deck screws and four 12d nails on each side of outside corner of the beam (eight nails and six screws total). Attach the temporary post(s) to the front beam. Again, make sure the temporary post will not interfere with the installation of the permanent porch post. Shim the temporary post to level the entire porch beam component. Use the 3-4-5 method or measuring diagonally from opposite corners to square the beams. This assures each beam is square and all corners are at 90° angles. Use two to three 2x4s to diagonally brace each front corner between the side and front beams. Install brace on the bottom of the beam so it does not interfere with standing the trusses.

4.5 PORCH POSTS

All porches will have a post at the corner(s). Some larger porches may have two or more posts. Never locate a porch post in front of a window. If near a door, leave enough room for Americans with Disabilities (ADA) clearance (minimum 36 inches), including the brick facing. Consult with the House Leader or DAHFH Construction Staff for the location of the post(s). Typically, solid 6x6 cedar posts are used on the front porch and solid 4x4 cedar or pressure treated posts are used on the back porch. The 6x6 posts will sit on a powder-coated base and can be attached to the cedar-clad porch beam with ornamental L-straps (see Section 9.8). If the beam will be clad in cedar, remember to allow for the thickness of the material on the exterior of the beam when locating the base. A 4x4 post will sit on a galvanized base and be attached to the porch beam with two hurricane straps/plates; trim is added to the base and top to conceal the galvanized base and plates (see Section 9.9).

To determine the height of post, temporarily set the post on the base and set against the outside of the front beam at the corner (see Figure 4-34). Plumb the post, using an 8-foot level or plumb bob. Then mark the bottom of the beam on the post. Cut the post to length.

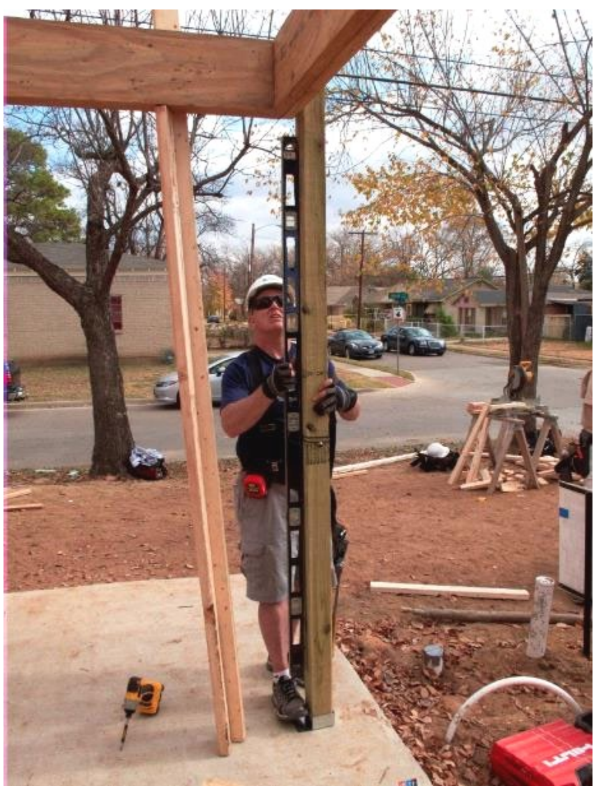


Figure 4-34. Locating Porch Post on Slab

Set the post on the base and then position under the beam at the approximate location. Plumb the post using an 8-foot level. Then trace the location of the base plate on the porch slab (see Figure 4-35). If using an ornamental base plate, the vertical sides the plate should face the street.

Figure 4-35. Marking Location of Porch Post on Slab

Using the base plate as a guide, trace the exterior of the base plate. Then use a speed square draw a line from corner to corner creating an X in the exact center of the base plate (see Figure 4-36). This is where the bolt will be installed. Drill on this mark using a hammer drill. The hole in the base plate allows for some play before final installation of the plate and post. Make sure the hole is deep enough so the bolt seats properly leaving about ½-inch of the bolt above the concrete. Thread the nut onto the bolt to just below the top of the anchor bolt prior to driving the anchor bolt into the concrete; this will ensure there are no issues later with getting the nut on the bolt. Set the bolt in the hole and drive the bolt into the hole using a framing hammer or sledge hammer. Use a scrap piece of lumber as a block, strike the block with a framing hammer of sledge to seat the screw into the hole. Attach the post base to the bolt, tightening so the head of the screw does not sit above of the post base. If this is unavoidable, cut the bolt with a reciprocating saw with a metal blade.

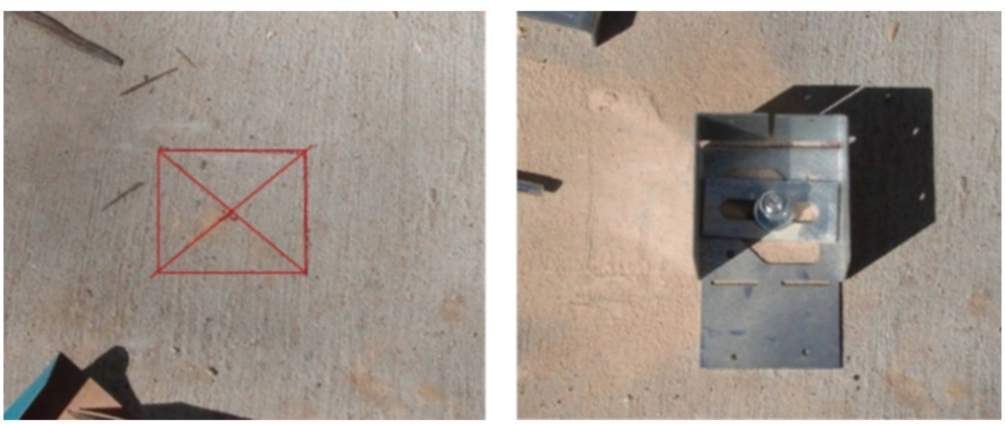


Figure 4-36. Marking and Installing Porch Post Base

Set the post on the base. For 6x6 front porch posts, attach the post to the beam by driving two deck screws from the porch beam down into the post to hide the screws. Once the porch beam is clad in cedar trim (see Section 9.8), ornamental L-straps can be installed to provide a more secure connection at the top of the post (see Figure 4-37).

Figure 4-37. Installed 6x6 Porch Post

For back porch posts, attach the post to the beam with one deck screw and two hurricane straps/plates. The straps/plates are installed using Simpson nails in each hole. If possible, chisel or router out the area (both on the post and beam) where the Simpson nail plates mount. This will allow the trim on the beam to it flush. Secure the post to the base using Simpson nails to complete the installation (see Figure 4-38). Simpson nails should be flush against the plate.

Figure 4-38. Installed Porch Post with Simpson Nail Plate

4.6 MISCELLANEOUS FRAMING TASKS

In addition to standing the walls, framing tasks include poly barrier; temporary truss support; gable nailers; heating, ventilation, and conditioning (HVAC) closet; attic access; deadwood; kitchen blocking; bathroom blocking, doorplates, and adding and marking stud locations.

4.6.1 POLY BARRIER

The corners of the house are wrapped with poly prior to sheathing. The poly should extend from the cap plate to slightly below the bottom plate. Before installing, cut the poly to proper length. To get a good sharp corner, fold the poly in half lengthwise and crease using a scrap piece of wood. The poly should be placed tightly against the framing and at least 9 inches of material to wrap around each corner (see Figure 4-39).

Figure 4-39. Installation of Poly at Corners

4.6.2 TEMPORARY TRUSS SUPPORT

To load the trusses, trusses are laid flat on top of the cap plate and pushed to the proper location with push sticks. To provide support for the trusses in the middle of the house during this process a temporary wall called a truss support is built.

To save time and lumber, the truss support should be built from the pallet used to deliver the walls. The wall needs to be made the length of the gap. Be sure the top plate is equal in height to the cap plate with no vertical gaps (see Figure 4-40). The studs should be no more than 24 inches OC. Make sure the temporary truss support is nailed off completely with 12d nails into the walls of the house. Make sure it is stable and secure before trusses are loaded.

Relocate the pallet inside the house before standing the front exterior walls.

Figure 4-40. Temporary Truss Support

4.6.3 GABLE END NAILERS

All gables require nailers (aka deadwood) to provide framing and a nailing surface for gable trusses. The nailers need to be installed before any trusses are loaded on top of the house. A 2x4 is laid flat on top of the cap plate and fastened with 12d nails every 18 inches at an offset of 1½ inches (see Figure 4-41). To set the 1½ inches offset, use a scrap 2x4 block and hold it in place as a spacer before sinking each nail. The nailer must be fastened at one end and "walked" to the other end while using the 2x4 block to ensure the correct spacing along the entire length. Leave the nailers about 2 inches short on the corners of the house, so a tape can still be hooked on the cap plate to mark the truss layout (see Section 5.2.1).

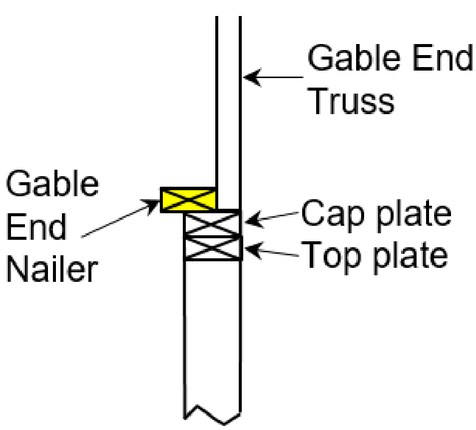


Figure 4-41. Placement of Gable Nailer (Side View)

4.6.4 HVAC CLOSET

The HVAC closet is typically in the main hallway of the house. This closet accommodates the HVAC unit. The interior space is framed out with a platform or deck for the HVAC unit to sit on (see Figure 4-42).

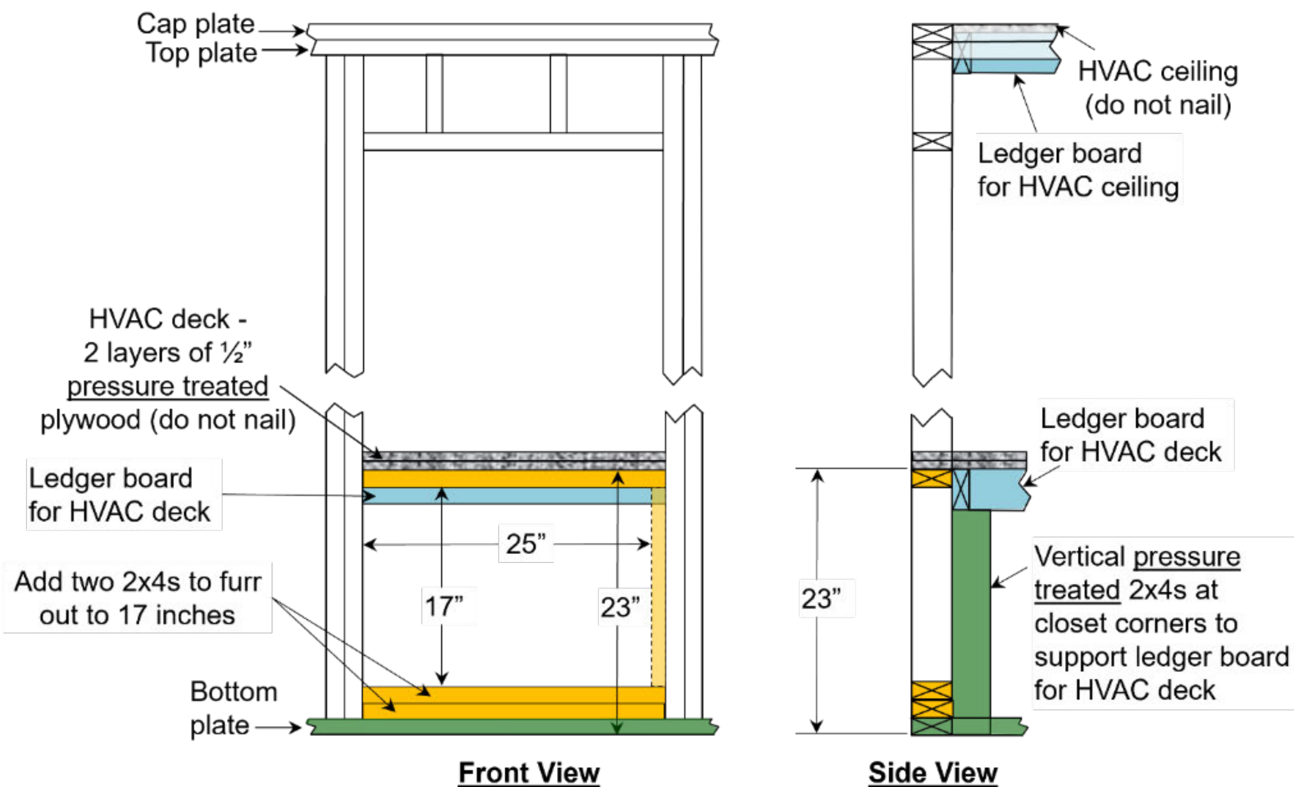


Figure 4-42. Framing Diagram for HVAC Closet

Do not cut the bottom plate (threshold) out of the HVAC doorway.

The entire inside of the HVAC closet is sheathed, including the ceiling. The sheathing should not sit on slab. Place scraps of sheathing on the slab and rest wall panels on the shims before nailing to wall studs (see Figure 4-43). Prior to installing the walls, mark the stud locations on the slab to help provide a guide for nailing. Additionally, if the HVAC is position against an external wall, place batt insulation (paper side to the exterior wall) between the studs of the exterior wall prior to sheathing the HVAC closet. Install sheathing in the interior of the HVAC closet using 8d nails. Nail every 6 inches on the edges and every 12 inches in the field into the studs.

The HVAC closet should not be sheathed until all of the walls in the house are plumbed and nailed off.

Figure 4-43. Shim HVAC Walls to Prevent the Walls from Resting on Slab

Once the interior walls of the closet have been sheathed, build a deck for the HVAC to sit on. Using pressure treated 2x4, cut four supports at 19½ inches. Install the supports in the corners and sides using 12d nails, nailing into studs. Install a ledger board on all four sides of the closet using non-finger jointed 2x4 lumber (see Figures 4-42 and 4-43). The top of the 2x4 ledger boards should be at 23 inches above the slab (i.e., 19½-inch support plus 3½-inch width of ledger board equals 23 inches) (see Figure 4-44). Install the ledger boards at the front and back first, then the sides, using two 12d nails to attach to each stud. Furr out the opening with a 2x4. For the HVAC deck, cut two pieces of ½-inch pressure treated plywood to fit on top of the ledger boards (see Figure 4-45). The HVAC deck should extend to the front face of the closet. Do not nail the plywood in place; the HVAC trades need to be able to remove the deck to install the HVAC equipment.

Use pressure treated 2x4 for HVAC ledger supports.

Figure 4-44. Supports and Ledger Boards for HVAC Unit

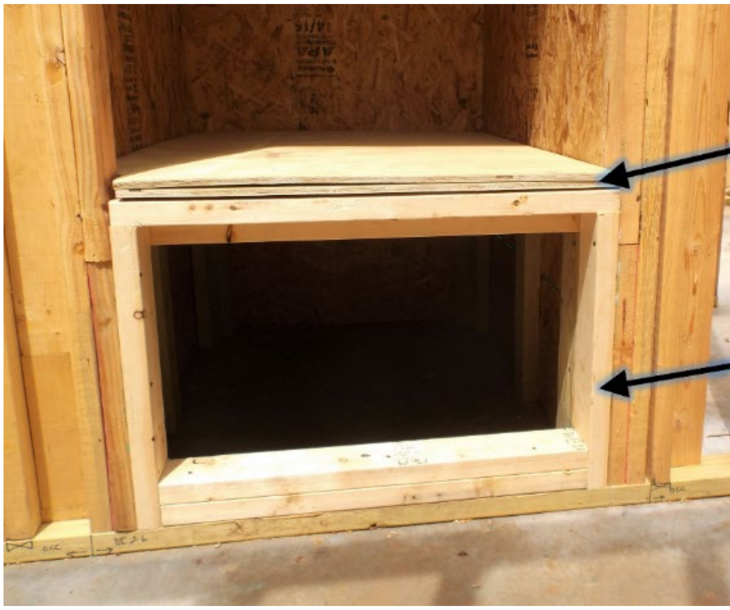


Figure 4-45. Furr Out Opening and Pressure Treated Plywood for Decking

The space below the decking needs to be furred out to approximately 25 inches wide by 17 inches tall for the return air grate. Add two 2x4s horizontally on top of the bottom plate (see Figure 4-42) and then add additional 2x4s vertically as needed for the width. The width of the HVAC can vary based on the floor plan.

For the ceiling, measure down 3½ inches from the top of the sheathing at each corner (see Figure 4-46). Use a chalk line or a 2-foot level to draw level lines on each wall at these marks. Install two 2x4 ledger boards with the bottom edge of the 2x4 at this mark running perpendicular to the trusses; do not install ceiling ledger boards parallel to the trusses. Install using two 12d nails into each stud. For the ceiling, cut one piece of sheathing to fit on top of the frame. Do not install or nail the ceiling in place; the HVAC trades will need to move this ceiling to install the HVAC equipment.

Figure 4-46. Ledger Boards for HVAC Closet Ceiling

4.6.5 ATTIC ACCESS

Each house requires two attic accesses; one in the garage and one in the house. The access point in the garage should be at the third truss bay from the interior wall and should not be in front with the door to the house. Consult with the House Leader to confirm the proper locations. Make sure the opening is positioned so there is 3-foot of vertical clearance into the attic and there are no obstructions above it (e.g., ductwork, bracing, wires). The opening should be located 4 to 5 inches from the wall to allow space for trim.

The depth of this opening must be at least 30 inches (measured from inside to inside) (see Figure 4-47). The width will be determined by the spacing between the trusses. Typically, this is 22½ inches but measure to verify. Using solid, non-finger jointed lumber, cut two 2x4s the measured width.

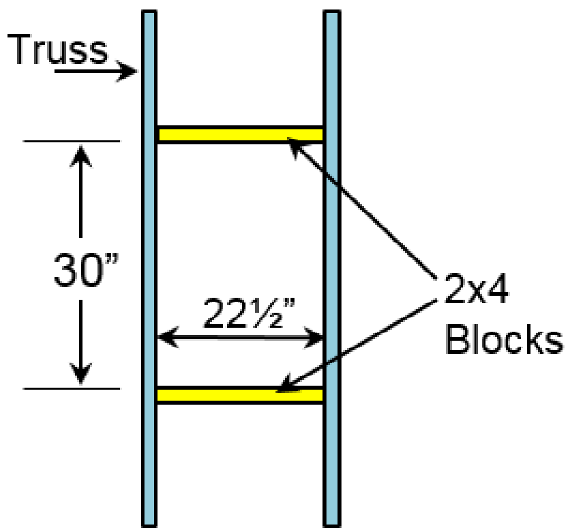


Figure 4-47. Attic Access, Top View

Install the 22½-inch 2x4s (30 inches apart) between the trusses using two 12d nails, <u>end nailing</u> through the truss into the end of the 2x4. To further strengthen the attic access, install joist hangers using reinforce the blocking attached to the trusses (see Figure 4-48). Use Simpson nails in all holes in the joist hangers; Simpson nails should be flush against the plate.

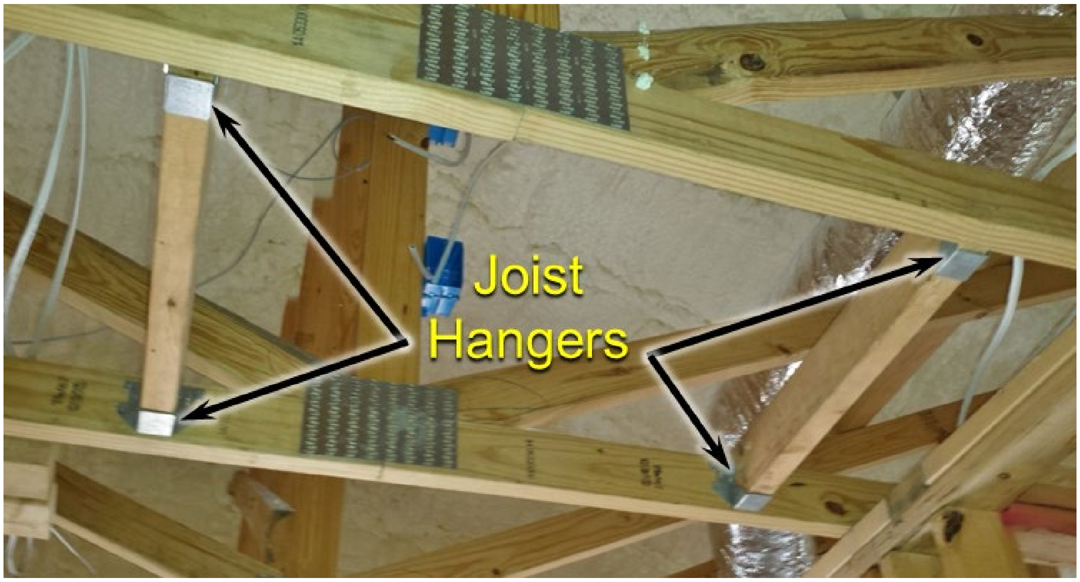


Figure 4-48. Attic Access

4.6.6 DEADWOOD

Deadwood is the term used for blocking nailed to the cap plate and is placed on walls running parallel to the trusses to provide a nailing surface for drywall. Deadwood can only be installed after trusses are loaded and installed. Trusses are not deadwood; install deadwood on all interior walls, including those within 3-inches from a truss.

Typically, 2x4 lumber is used, but 2x6 lumber can be used. Use solid lumber only (e.g., non-finger jointed). Set the lumber along the tops of the wall so the 3½-inch side (or 5½-inch side, if using 2x6 lumber) lies partially on the cap plate with the remainder hanging over the cap plate (see Figure 4-49). Make sure all corners of each room or closet have deadwood. Install deadwood using 12d nails every 8 to 12 inches. The maximum space between two pieces should be three inches or less. The deadwood can be a board the full-length of the cap plate or shorter scrap blocks (at least 12 inches long) spaced along the cap plate. Keep 2x4 and 2x6 scraps longer than 12 inches for this task.

Figure 4-49. Deadwood

4.6.7 KITCHEN BLOCKING

Blocking refers to spanning the spaces between studs with a solid board (i.e., non-finger jointed wood). This is done to provide a solid and sturdy backing for the installation of kitchen cabinets. Blocks are 2x4 or 2x6 lumber turned so the wide side of the block is flush with the interior face of the studs. To help minimize splitting of the wood when nailing small pieces of blocking, dull the point of the nail with your hammer before nailing (the nail will then be crushing wood fibers instead of driving a wedge).

The walls requiring blocking will vary depending on the house plan, but the vertical placement is the same for all houses. All measurements are from the slab to the bottom of the block (see Figure 4-50). The block is set with the 3½-inch (or 5½-inch) side placed vertically, nailed between studs. Attach the blocks using two 12d nails on each end of the blocks, three if using 2x6 material. Typically, the first block can be nailed straight into both studs. The remaining blocks will require toe nailing to attach to studs.

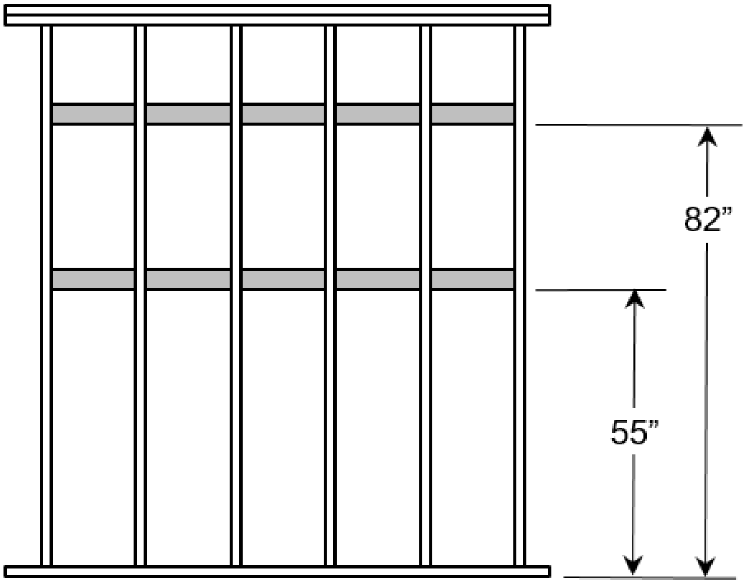


Figure 4-50. Kitchen Blocking Location, Profile View

4.6.8 BATHROOM BLOCKING

In bathrooms, blocking is installed to provide a solid and sturdy backing for Americans with Disabilities Act (ADA) grab bars. To comply with ADA requirements, a 2x12 or two 2x6 blocks (stacked) should be installed at each required stud bay. The middle of the blocking should be 36 inches from the slab (see Figure 4-51). ADA blocking is required around all tubs and commodes. Additional blocking may be required depending on the house plan, or if special accommodation is being made for the homeowner. Attach the blocks using five 12d nails on each end of the blocks if using 2x12, three if using 2x6 material. The blocking in the tub area should be completed by the third build day to ensure it is in place before the tub is installed.

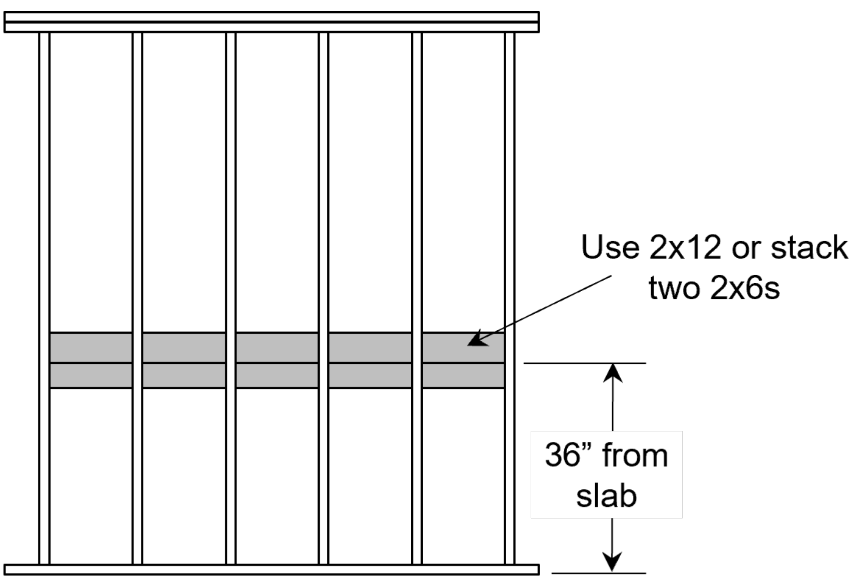


Figure 4-51. Bathroom Blocking Location, Profile View

Additionally, 2x12 blocking is installed for the towel bar. DAHFH Construction Staff will provide location/measurements for each bathroom based on the floor plan.

4.6.9 DOOR KNOB BLOCKING

Similar to bathroom blocking, blocking should be installed near exterior doors openings to prevent door knobs from breaking a hole in the drywall. Verify exterior door locations and potential blocking locations by reviewing the floor plan. Use a 2x12 or two 2x6 blocks (stacked) between the studs near should be installed at each required stud bay. Attach the blocks using five 12d nails on each end of the block if using 2x12, three if using 2x6 material. The middle of the blocking should be 36 inches from the slab (see Figure 4-51).

4.6.10 DOORPLATES

Using a reciprocating saw cut out all doorplates (except HVAC closet). Do not cut out the door thresholds until after the 80 percent of the decking is in place.

4.6.11 ADDITIONAL STUDS

On the sides of all closets and the pantry, verify there is at least one stud that can be used to support the shelving bracket(s). If the framing does not include one, add an additional stud in the middle of the wall, approximately 12 to 14 inches from the back of the closet or pantry.

Some house elevations include an exterior wall that will be clad in both brick and siding, e.g., siding wall to brick wall transition is not at a corner of the house. At the transition point (end of the brick ledge) verify there is a stud at this location to allow a solid nailing surface for the exterior trim. If the framing does not include a stud, add a stud or blocking at this location.

4.6.12 MARKING THE LOCATION OF STUDS

During the installation of Blue Board, brick ties, and siding, it is essential that these elements are nailed into studs. It is easier to mark the studs while the framing is still exposed. Stud locations can be marked an 8d or 12d nail on the bottom and/or cap plate.

4.7 COMMON ISSUES AND SOLUTIONS

- Wall Too Short or Too Long

Do not assume that the wall is too short or too long because it does not line up with the snap lines. Before making any adjustments, measure and compare the length of the wall to measurement shown on the snap line diagram or floor plan (usually in the House Leader package or available from the DAHFH Construction Staff). The snap lines on the slab may be incorrect. If the wall measurement is equivalent to the diagram/plans, proceed to install the wall. Whether the lines or wall are incorrect, ask the House Leader to make note in the Job Site Report, citing the wall numbers (e.g., A1-A2, 55-56), so that corrective actions can be taken.

If the shortfall is less than ½-inch and the shortfall is between two walls (i.e., not at the end of a wall run):

- Check with the House Leader or DAHFH Construction Staff. It may be possible that you can leave a small gap. Make sure to properly nail off the adjoining walls and fully cover the gap with sheathing.
- If that shortfall happens in the first of a run of three to four walls, leave small (¼-inch or less) gaps between each wall joint, until back on plan.

If the shortfall is ½-inch +/- and the shortfall is between two walls (i.e., not at the end of a wall run):

- Rip (cut from scrap or a full sheet) a piece of sheathing the same length as the end stud on the wall in question and no wider than the width of the stud.
- Nail this piece of sheathing flush to the stud in the wall you are installing using 8d nails; the nailing pattern should be two at the top and bottom, one every 16 to 24 inches down the length.
- Install the next wall, making sure to clamp the butt joint between walls to minimize any space between the two walls, before nailing.

If the shortfall is greater than ½-inch and falls at the end of a wall <u>or</u> is greater than ½-inch between walls:

- Before installing the wall, lay it down on the slab. If there is sufficient bottom plate material on site, cut the bottom and top plates back at least two studs (three including the end stud, California corner, etc.), making the cut OC to the stud, so the remaining plate extension and can be affixed to that stud.
- Before cutting, measure and mark using a speed square to make an exact cut on both the top and bottom plates.
- If there is not enough bottom plate material available, cut back to the first interior stud and proceed.
- Measure and cut both the bottom plate and top plate together, so that they are the same length. Attach the new piece to the stud(s) making sure that the end stud or component is flush with the end of the top and bottom plate (i.e., do not make a new problem, a wall that is too long).

If the wall is ¼-inch or less too long:

- Do not worry about it; install the wall.

If the wall is really too long:

- Standing the wall in place on the slab, measure the bottom plate against the snap lines. Also check the measurements against the plans. Using a speed square and measuring tape mark this measurement on the bottom plate; transfer this same exact measurement to the top plate.
- Remove the end stud or component, pulling all the nails. Do not use a reciprocating saw to cut the nails between the plates and stud.

- If an exterior wall, pull back the sill seal to make the cut. Do not trim the sill seal until after the plates are cut and reattached to the stud.
- Using a circular saw, cut the bottom and top plates following the measured mark.
- Reattach the plates to the stud/component, end nailing the plates to the stud.
- Reattach the sill seal using roofing nails.
- Raise and install the wall.

CHAPTER 5: TRUSSES

Tools and Materials

- Hammer
- Measuring Tape
- 100-foot Measuring Tape
- Chalk Line
- Speed Square
- Nail Puller/Cat's Paw
- 8-Foot Level
- Miter Saw
- Impact Driver
- Clamps
- Ladders
- Extension Cords
- Eye Protection
- Hard Hat
- Fall Protection Equipment
- 2x4 Lumber
- Sheathing, typically Oriented Strand Board (OSB)
- Trusses
- Clear Spray Lacquer
- Push Sticks
- Hurricane Ties
- 12d Nails
- 16d Duplex Nails
- Simpson Nails
- Deck Screws

Safety

- DAHFH has also instituted a fall protection program for truss installation based on best practices. This includes specialized truss bracing to both external and internal truss elements to facilitate the use of Fall Protection Equipment (FPE). The FPE consists of a safety harness with lanyard and interconnecting truss safety bar. See Section 2.7 for more information.
- Be sure all personnel involved in loading and standing trusses understand their role before work begins.
- Only extension ladders are used to access the roof. Ladders should extend at least three rungs beyond the edge of the cap plate. Never use an A-frame ladders to access the roof.
- Ladder access to the roof must not be removed as long as anyone is working in the trusses.
- Be sure all ladders are properly positioned and stable. Follow all ladder safety rules (see Table 2.3).
- Do not lift the truss up until the truss pushers are ready. There should be one person to lead this group, so everyone lifts together in a coordinated effort.
- When working up in the trusses, always be aware of your footing and those working below. Know where it is safe to step.
- When handling trusses, be cautious of the metal gusset plates. The plates may extend beyond the wood and can be sharp.
- Ear plugs and dust masks will be provided if requested (not mandatory).
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.

- For additional safety information, see Chapter 2.

Think About This...

- The temporary truss bracing boards need to be ready before setting trusses to prevent any delays in setting the trusses.
- Begin installing permanent bracing after eight trusses are set.
- If a truss does not sit evenly on each bearing wall, check with the DAHFH Construction Staff before taking any corrective action.
- Ladder panels should be started as soon as possible so the panels can be installed when the trusses have been set.
- Wall bracing should not be removed until at least 80 percent of the roof decking is in place.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

5.1 INTRODUCTION

A truss is a wooden triangle that sits on the walls of a house to form the roof (see Figure 5-1). Trusses are typically produced in factories and shipped by truck to the site as a stack of completed units. Trusses are engineered to handle the various loads a roof will experience. Trusses are usually made out of 2x4 framing lumber fastened together with metal gussets. Because trusses are engineered-components, trusses should not be modified without permission of the DAHFH Construction Staff.

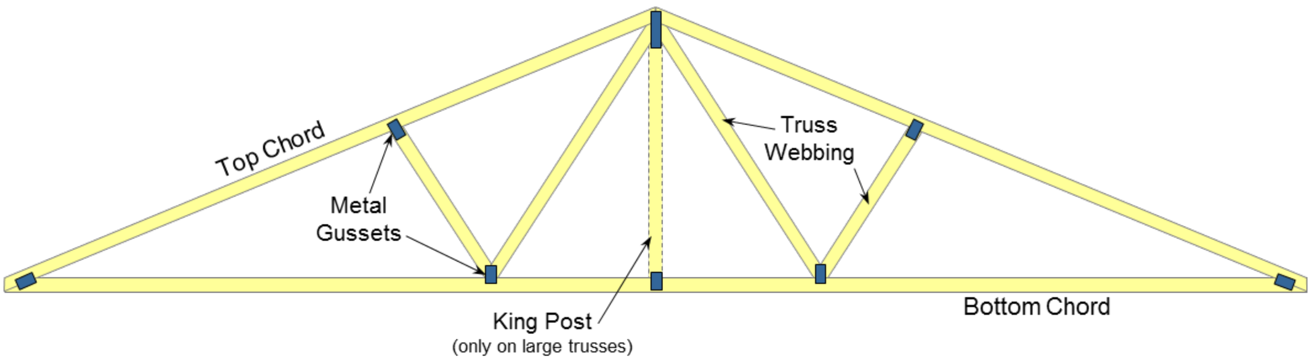


Figure 5-1. Basic Design of a Common Truss

Two types of trusses are used – common and gable end. Common trusses have the same pitch on each side. Gable end trusses are used at each end of the house and at transitions in the roof lines. Gable end trusses have more vertical members to support the gable end sheathing. Additionally, the top chord of the gable end may be 3½ inches shorter (dropped down) to accommodate the ladder panels (see Section 5.6) that will form the rake overhang.

Because each truss is constructed out of 2x4 framing lumber, each truss will have a thickness of 1½ inches (see Figure 5-2). This thickness needs to be appropriately incorporated into measurements. Typically, trusses are set 2 feet apart or 2 feet on center (OC). OC is the distance between trusses as measured from the center of one truss to the center of the next truss; from a practical standpoint, this means 22½ inches between two trusses. By convention, OC measurements go from inside of the one truss to the outside of a second truss. This achieves the same as 2-foot OC (or 24-inches OC) (see Figure 5-3).

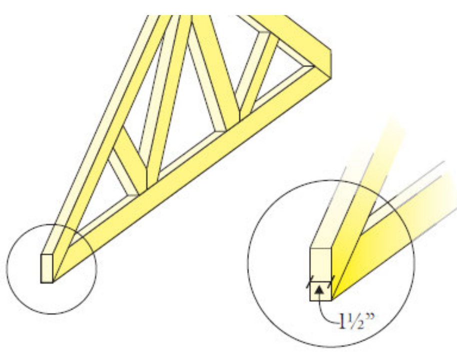


Figure 5-2. Thickness of Truss (1½ Inches)

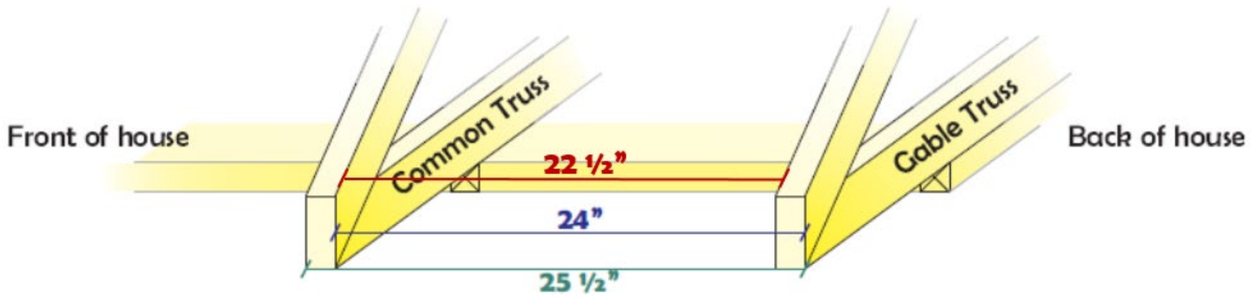


Figure 5-3. "Inside-to-Outside" is Equivalent to "OC"

Trusses must be securely braced, both during installation and after permanent installation. Truss bracing can be broken down into two categories - temporary bracing and permanent bracing. Temporary bracing is used as the trusses are being installed to prevent the trusses from buckling and/or falling until permanent bracing is installed. Temporary bracing is external to the trusses (see Figure 5-4) and includes three types:

- Temporary gable bracing (aka strongbacks) (Section 5.5.1) – Supports the first truss, typically the back gable truss.
- Temporary laterals (Section 5.5.2) – Maintain truss location (2 feet OC) and provide additional stability until decking is installed (see Chapter 7).
- Temporary diagonals (Section 5.5.3) – Provide additional stability for Fall Protection Equipment.

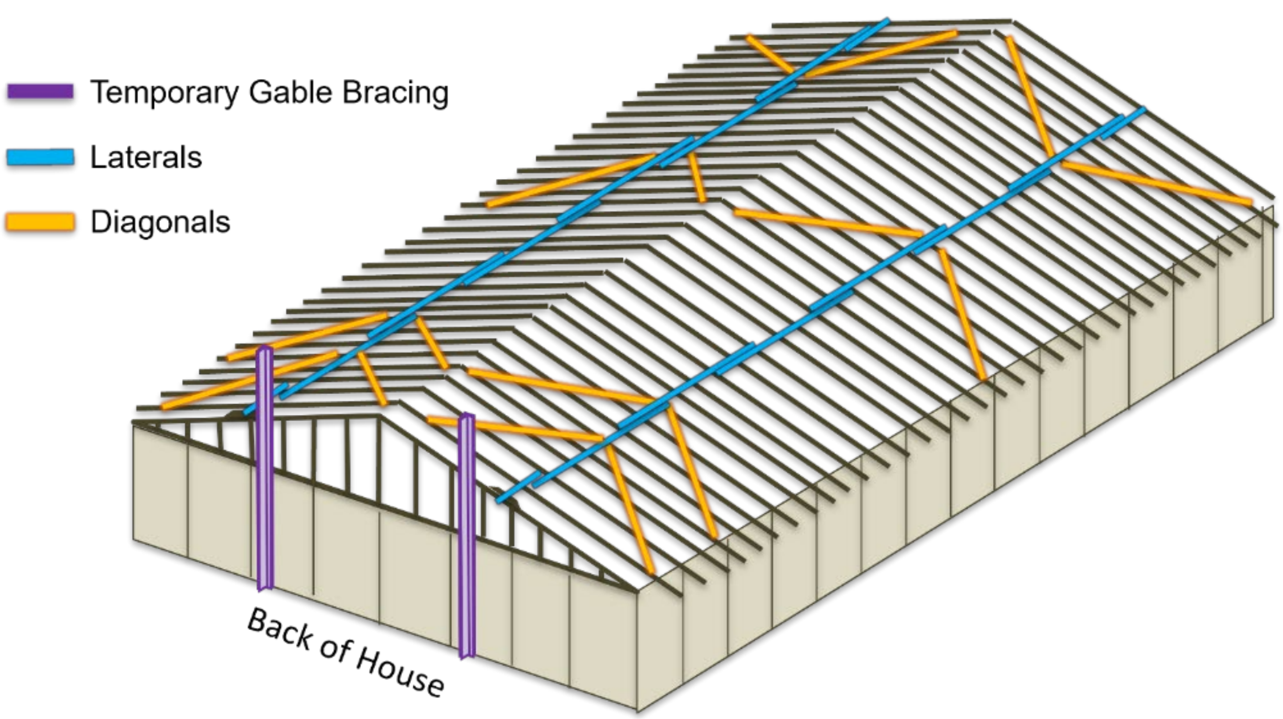


Figure 5-4. Temporary/External Truss Bracing

Permanent bracing provides the overall stability of the structure by making the truss components an integral part of the roof and house. Permanent bracing is internal to the trusses (see Figure 5-5) and includes:

- Permanent laterals (Section 5.5.4) - Maintain truss location and provide stability against unintended forces/movement (e.g., gravity, wind, seismic).
- Permanent diagonal laterals (Section 5.5.5) - Maintain truss location and provide stability against unintended forces/movement (e.g., gravity, wind, seismic).
- K-braces (Section 5.5.6) - Provide vertical support to gable trusses.
- Rat runs (Section 5.5.7) - Provide internal lateral bracing to bottom truss chord and makes the bottom of the trusses more rigid which is needed for ceiling drywall.
- Subfascia (Section 5.5.8) - Maintain truss location and provide stability against unintended forces/movement (e.g., gravity, wind, seismic).
- Back gable horizontal brace (Section 5.5.9) – Ensures the plane of the back gable stays flat.

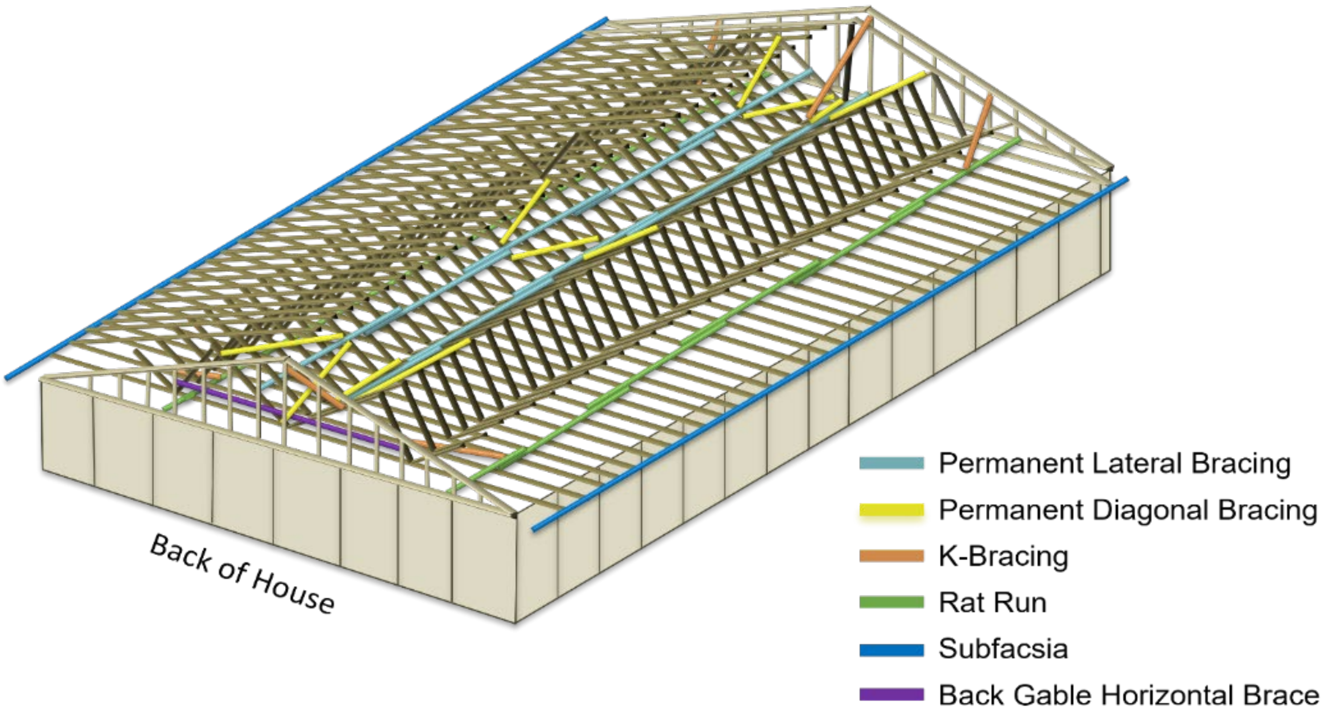


Figure 5-5. Permenant/Internal Truss Bracing

Section 5.5 provides more details on the installation of truss bracing.

5.2 PREPARATION

The process of loading and setting trusses goes smoother with proper preparation. Prior to loading and setting trusses the following tasks need to be completed to be "truss ready."

- The trusses should be counted and type verified against the truss packet to make sure there are enough trusses for the layout plan being used.

- Check the walls for alignment/plumb and re-string walls if necessary (Section 4.3.5). Verify the walls of the house are properly braced.
- Cap plate (Section 4.3.6), porch beams (Section 4.4), temporary truss support (Section 4.6.2), gable end nailers (Section 4.6.3), HVAC closet ceiling (Section 4.6.4), and shear walls (Section 6.1.1) must be in place.
- Mark truss layout (Section 5.2.1)
- Determine the truss overhang and prepare block to transfer overhang measurement to trusses (Section 5.2.2).
- Prepare temporary gable bracing (Section 5.5.1), block assembly (T-block) for drop-down gable trusses (Section 5.5.2), and stage 2x4 lumber for bracing.
- Prepare ramps/sleds (Section 5.2.3)
- Stage trusses (Section 5.2.4)

5.2.1 TRUSS LAYOUT

Prior to loading and setting the trusses, the truss locations need to be marked correctly. The House Leader or DAHFH Construction Staff will have the truss layout plan to be used. Truss layouts are also included in Appendix D by house plan but verify with the House Leader and the truss packet. The truss layout is marked on the top of the cap plate of both exterior walls as well as long interior walls based on the truss layout plan included with the trusses (see Figure 5-6). To mark the locations of the trusses, use a 100-foot steel tape to the cap plate at the back of the house. Using one continuous tape prevents cumulative error. Check that there is never more than 22½ inches between two trusses. Also, number the marks on each side to help with verify the number of trusses and location (see Figure 5-7).

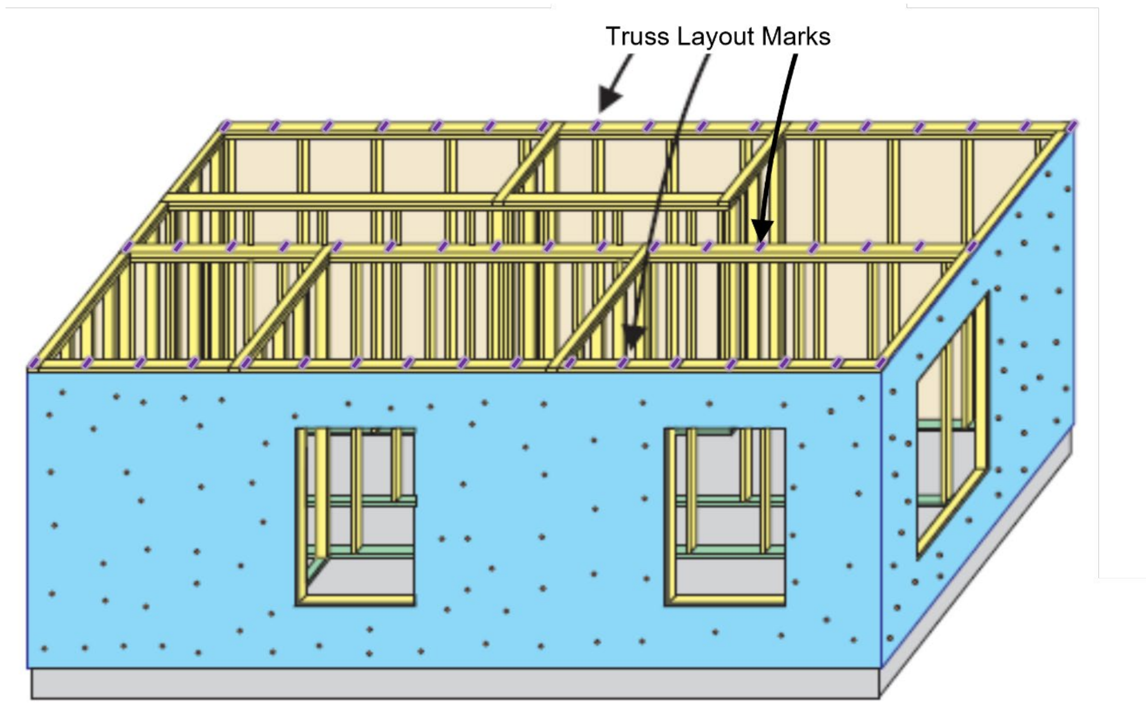


Figure 5-6. Mark the Truss Layout on Top of the Cap Plate

Figure 5-7. Truss Location Labeled on Cap/Top Plates

Mark the front and back of the remaining truss locations according to the truss layout, typically this is every 2 feet. In rare cases, this general pattern will have exceptions. The two main exceptions are for the ladder panels at the front of the house and for the heating, ventilation, and air conditioning (HVAC) closet. Consult with the DAHFH Construction Staff before changing the truss layout.

To ensure a consistent overhang, snap a chalk line 1-inch from the outside edge of the cap plate along longest exterior wall of the house (see Figure 5-8). Spraying the chalk line with clear spray lacquer is recommended so the snap line will remain visible through any activities or weather. This 1-inch is then added to the calculated overhang.

Figure 5-8. Chalk Line on Top of Cap Plate

5.2.2 DETERMINING TRUSS OVERHANG

To determine the truss overhang, measure the width of the front and back of the house and compare to the house plan. Then measure the bottom chord of a common truss. Subtract the width of the house from the width of the truss and divide by two [using the example shown in Figure 5-9, (360 inches - 330 inches)/2 = 15]. This is the overhang value that ensures the truss is centered on the house. In the example, the true truss overhang is 15 inches but the measurement to the chalk line is 16 inches (see Section 5.2.1). Therefore, in this example, all truss tails need to be marked at 16 inches. Always verify the correct overhang value for the house. The style of soffit (flat versus sloped) will determine how the overhang is marked on the trusses.

Never assume the overhang is the same for every house.

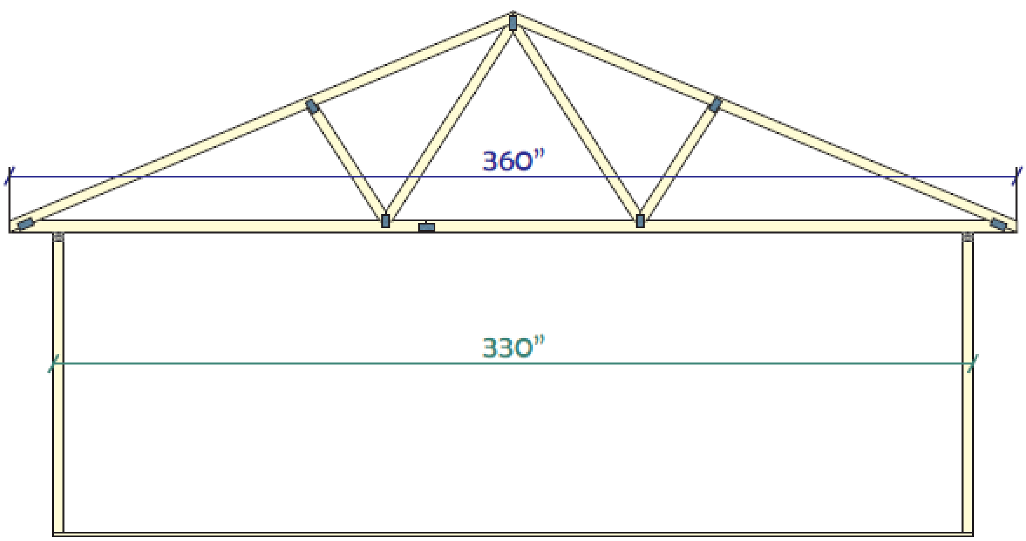


Figure 5-9. Determining Truss Overhang (Example)

5.2.2.1 MARKING TRUSSES FOR FLAT SOFFIT

Using the calculated truss overhang plus 1-inch, measure and mark the overhang on one end of each truss (the same end for all of the trusses). Cut a 2x4 template the desired length of the mark and use that for consistent marking. Make the marks on the face of the truss tails (see Figure 5-10) using a sharp pencil or pen (not a Sharpie), not on the bottom edge, so it can be easily seen from the top. Alignment of the trusses is maintained by lining up this mark with the snapped line on the cap plate (see Figure 5-8). If the trusses are not straight, then the soffit and fascia will not be straight.

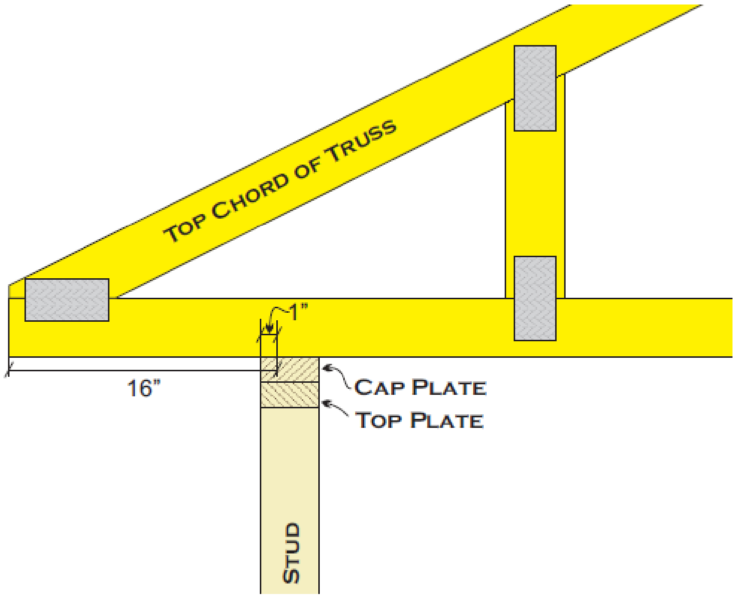


Figure 5-10. Marking Truss for Overhang for Flat Soffit (Example)

5.2.2.2 MARKING TRUSSES FOR SLOPED SOFFIT

For sloped soffit trusses, measure in 1-inch from the nub on the bottom chord (see Figure 5-11). Use a speed square draw a line along this mark. This mark will be aligned with the 1-inch line established on the cap plate (see Figure 5-8).

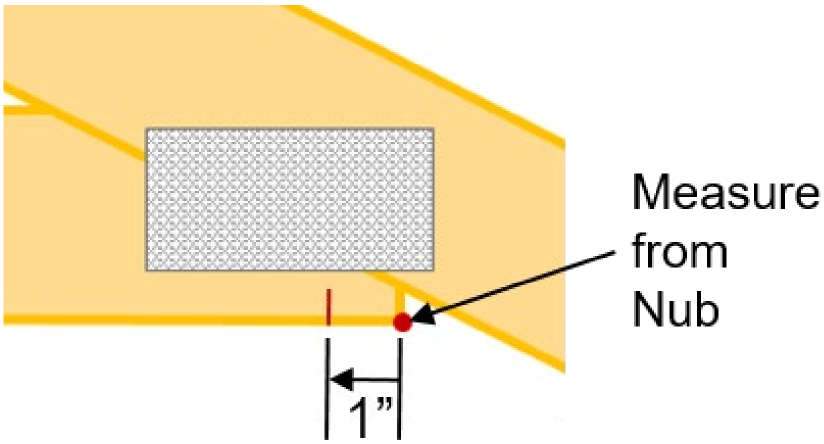


Figure 5-11. Marking Truss for Overhang for Sloped Soffit

5.2.3 RAMPS

If room allows, building "ramps" will assist in loading the trusses on top of the walls, particularly for 9-foot tall walls. A minimum of three ramps a should be built (each side and middle); wider houses may need four. Ramps are built out of solid 2x4 lumber and consist of a long 2x4 extending from the cap plate to the ground, staked with a 2x4 (see Figure 5-12).

Figure 5-12. Ramps to Assist Loading Trusses

5.2.4 STAGING TRUSSES

Sort and stack the trusses near where the trusses will be loaded. For example, stack all main house trusses near the house, front porch trusses near the porch, garage trusses near the garage, and separate gable trusses from common trusses. Standard practice is to load most of the trusses from the back of the house. Most trusses will require four or more volunteers to move. Eliminate trip hazards from planned path before starting the process. Ideally trusses should be carried vertically and laid on level ground to prevent damage to the trusses. Note, some trusses are asymmetrical; verify with the House Leader or DAHFH Construction Staff. Identify these trusses to make sure they are oriented and loaded correctly.

Inspect trusses as they are being loading. If any trusses are damaged, cracked, or broken, contact the DAHFH Construction Staff for corrective action. Do not attempt to alter or install the truss.

The truss overhang should be marked on trusses when moving house trusses (see Section 5.2.2). Even if the truss package is dropped in the back of the house, most of the 20 plus stack of commons must be moved, as there a limit as to how far the trusses can be safely fanned to mark. Be careful not to place the stack of common trusses too close to the house. Volunteers need some room to escape in case a truss is dropped during the loading process.

5.3 LOADING TRUSSES

Using the truss layout plan that comes with the delivery package, determine the correct order to load the trusses. Assign volunteers to do specific jobs during loading process.

- Lifters – Numerous volunteers are needed to lift the truss and lay it on top of the cap plate (see Figure 5-13). Stronger volunteers will be needed at each corner on ladders to lift the trusses the last few feet and sit the trusses on the cap plate. Volunteers are also needed to hold ladders. Designate one person to lead this group so everyone lifts together in a coordinated effort to ensure the bottom cord of the truss stays level.
- Pushers – Three people per truss with push sticks are needed inside the house to push the truss to the front of the house (see Figure 5-13, right). Two to three teams are typically needed.

Figure 5-13. Loading Trusses

Once the load order is ready, pushers inside the house need to be ready. Do not lift the truss up until the pushers are ready. It is important to have the peak tilted slightly toward the house and bottom truss chord always kept level while lifting. The team lifting the trusses needs to be spread evenly along the length of the truss and lift together.

Because of limited space at the front of the house, several trusses will have to be stacked tightly near the front of the house. After that, align each truss to the corresponding numbers on the truss layout (see Figure 5-7).

5.4 SETTING TRUSSES

5.4.1 FIRST GABLE TRUSS

If using strongbacks, fasten the brace into the framing members prior to raising the back gable truss. It is essential that strongbacks are fastened through the sheathing into a wall stud and the bottom and top plates.

Stand the gable truss up vertically. The overhang mark on the truss tail must line up on the 1-inch chalk line marked on the wall (see Figure 5-14). Setting the gable trusses correctly is critical. The gable truss should be flushed up to the nailer and lie in the same plane as the wall. Using 12d nails, nail along the bottom chord of the gable truss every 18 inches, and alternate between straight nailing through to the nailer and toe nailing into the cap plate. Use an 8-foot level to plumb the gable, immediately brace the gable truss.

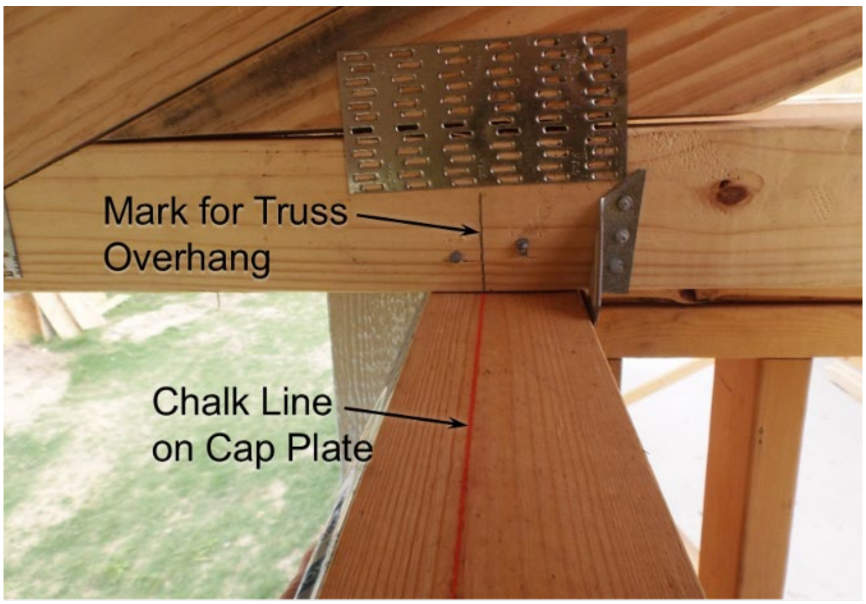


Figure 5-14. Align Truss on Chalk Line

Remove strongbacks once all permanent bracing is complete on the gable and when ladder panels are being installed.

5.4.2 COMMON TRUSSES

The crew should then proceed to the first common truss after setting the back gable truss. Optimum crew is nine volunteers, four nailing the tails to the cap plate, three lifting trusses, and two placing/nailing the temporary lateral bracing. The key part of setting trusses is matching the mark on the truss tails to the chalk line marked on the cap plate. Three 12d nails are used at each truss end to secure the truss (one on one side and two on the other side). Use an 8-foot level to check the top plane of the trusses during installation (place level near the tails, mid-point and up near the peak/as high as can be reached). Also, make sure the top chords of the trusses are spaced 24 inches OC and secured with the temporary lateral bracing. It is easier to correct problems with truss position before hurricane ties and permanent bracing are installed.

5.4.3 FRONT MAIN GABLE TRUSS

Once raised, line the front gable truss up with the marks on the cap plate. Starting at the marked end, alternate toe nailing into cap plate and straight into the nailer. Plumb with an 8-foot level using temporary lateral bracing started from the back to hold in place. Install K-bracing as soon as possible.

5.4.4 FRONT PORCH TRUSSES (INTERIOR AND GABLE)

Setting porch trusses (both common and gable) should be similar to the rest of the house, only smaller. The main challenge is that a new chalk line will be needed for the truss tail overhangs because the porch beam does not line up with the exterior wall of the house. A new chalk line can be marked on the porch beam that adds the porch beam difference to the existing overhang.

Before setting the smaller trusses, slide the first common up against the front main gable and trace the top of the truss onto the larger gable end truss. This will provide a guide to install a decking nailer that will support the roof decking (see Figure 5-15 and Section 5.8.1).

Figure 5-15. Mark for Decking Nailer Before Setting Smaller Trusses

5.5 BRACING

Truss bracing includes temporary gable bracing, temporary laterals, temporary diagonals, permanent laterals, permanent diagonals, K-bracing, rat runs, subfascia, and back gable horizontal bracing (see Figures 5-4, 5-5, and 5-16). Use solid 2x4 lumber for bracing.

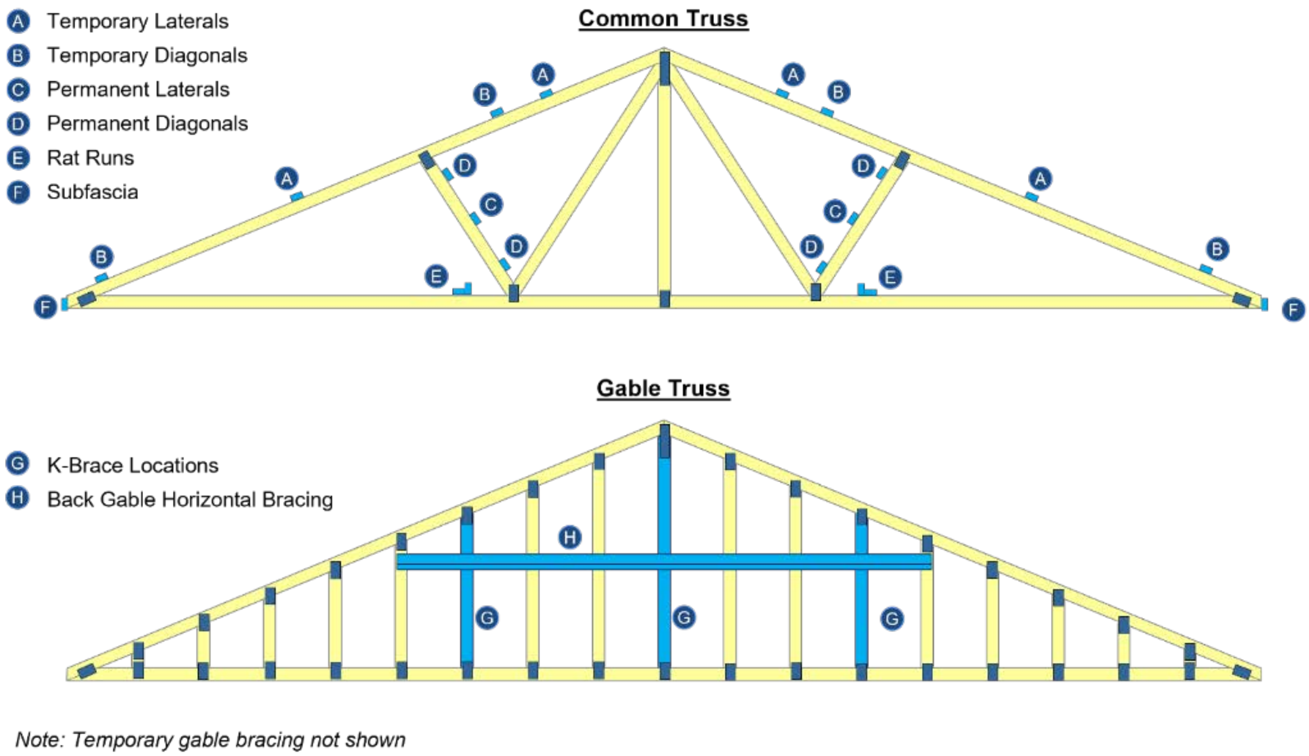


Figure 5-16. Typical Truss Bracing Locations

Truss bracing will vary based on truss type and house floor plan. Truss layouts and diagrams are included in Appendix D by house plan but verify with the House Leader and DAHFH Construction Staff.

Prior to loading and setting the trusses, the truss locations need to be marked correctly. Temporary laterals are installed as the trusses are being set. Once eight trusses are set, begin installing permanent bracing.

5.5.1 TEMPORARY GABLE BRACING

To supports the first truss, temporary gable bracing (aka strongbacks) is used. Strongback bracing requires building at least two braces using 16-foot 2x4 lumber in a California corner configuration (see Appendix C). Braces should be long enough to extend from the slab to near the top of the gable (see Figure 5-17). It is essential that strongbacks are fastened through the sheathing into a wall stud and into the bottom and top plates using deck screws. If Blue Board if present, cut back to allow the strongback to be in contact with the sheathing. Fasten the strongback at two points along the gable stud, one as close to the top chord as possible and the other between the top plate and top chord attachments. When attaching the strongback to the gable, use sheathing scrap as a spacer (at about the 8-foot level), to keep the strongback vertical (plumb).

Figure 5-17. Strongback (Highlighted in Purple) Bracing of Back Gable Truss

5.5.2 TEMPORARY LATERAL BRACING

Temporary lateral bracing is positioned on the top chord of the trusses to maintain a truss spacing of 2-foot OC until the decking is installed. The bracing should be placed about mid-way up the top chord of the truss, parallel to the ridge. Temporary lateral bracing is attached to the top chord of each truss using two 16d duplex nails.

At gable trusses, block assemblies (aka T-blocks) are needed for attaching temporary lateral bracing to the drop-down gable truss. A minimum of two block assemblies are needed per gable truss. An 8 to 16-inch 2x4 block should be cut with opposing 45° angles as shown in Figure 5-18. The 45-degree cuts allow the block assembly to be nailed into the top of the truss. A second 2x4 should then be cut and the two blocks are fastened together using three 12d nails to form a T. Install nailed 16d into both to the face of the truss and top chord of the truss.

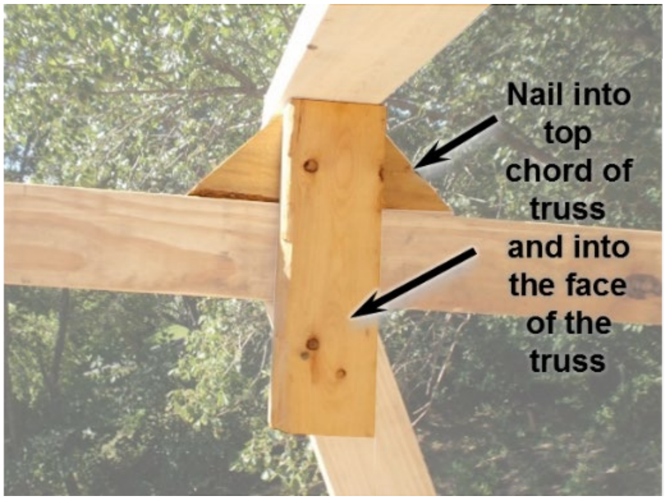


Figure 5-18. Block Assembly (aka T-Block) for Temporary Lateral Bracing

The first section of temporary lateral connecting the block assembly to the first common truss (maintaining 2 feet OC) should only be 3-foot in length; this allows the temporary lateral to be easily removed so the ladder panel can be installed (see Figure 5-19).

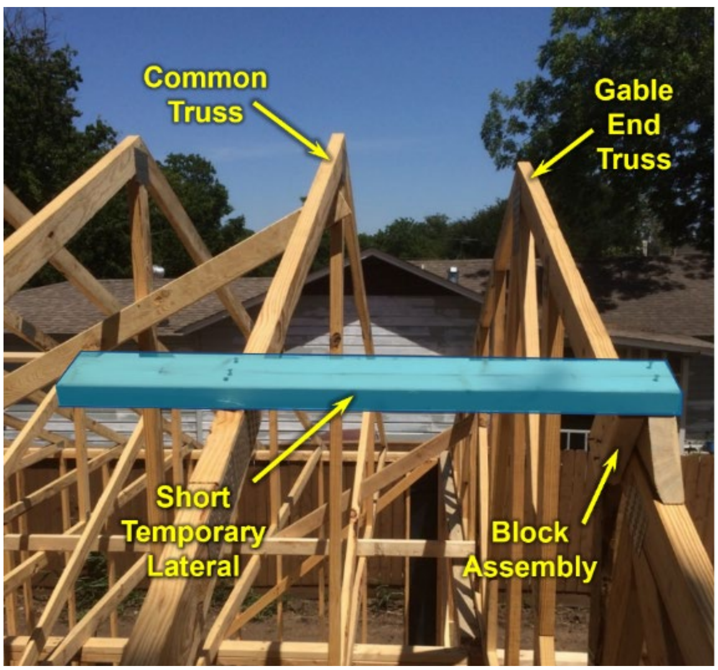


Figure 5-19. Short Temporary Lateral Between Gable and First Common

Beginning at the first common truss, place longer temporary laterals along the top chord to secure the truss (see Figure 5-20, temporary laterals highlighted in blue). Use a speed square to make sure the brace is parallel to the truss and secure with two 16d duplex nails. This process is repeated for each common truss. Check that the 2-foot OC is maintained. Also check to see if the peaks and tails of the trusses are lining up in a straight line. At the end of a lateral brace, lay another brace, and overlap at least two truss bays.

Figure 5-20. Temporary Truss Bracing

5.5.3 TEMPORARY DIAGONAL BRACING

Temporary diagonal braces along the top chord of the trusses are used to reinforce the truss structure for FPE usage. Temporary diagonals are attached to the top chord of each truss using two 16d duplex nails. Using 12 or 16-foot lengths of 2x4 lumber, start at the first common truss and angle the brace towards the temporary lateral bracing (see Figures 5-4 and 5-20). Two sets are required at the back of the house. The temporary diagonal bracing should be installed every 10 trusses or 20 feet max; longer houses may need another set in middle of the house. Temporary diagonals always point to the inside of the house, i.e., the diagonals at the front of the house will be in the opposite direction than the ones at the back of the house (see Figure 5-4).

5.5.4 PERMANENT LATERAL BRACING

This bracing in placed internal to the trusses on the web (see Figure 5-21). At the end of a lateral brace, lay another brace, and overlap at least two truss bays/spaces. The permanent laterals should be installed at least three to four feet up from the base of the vertical member. Secure with two 12d nails per truss.

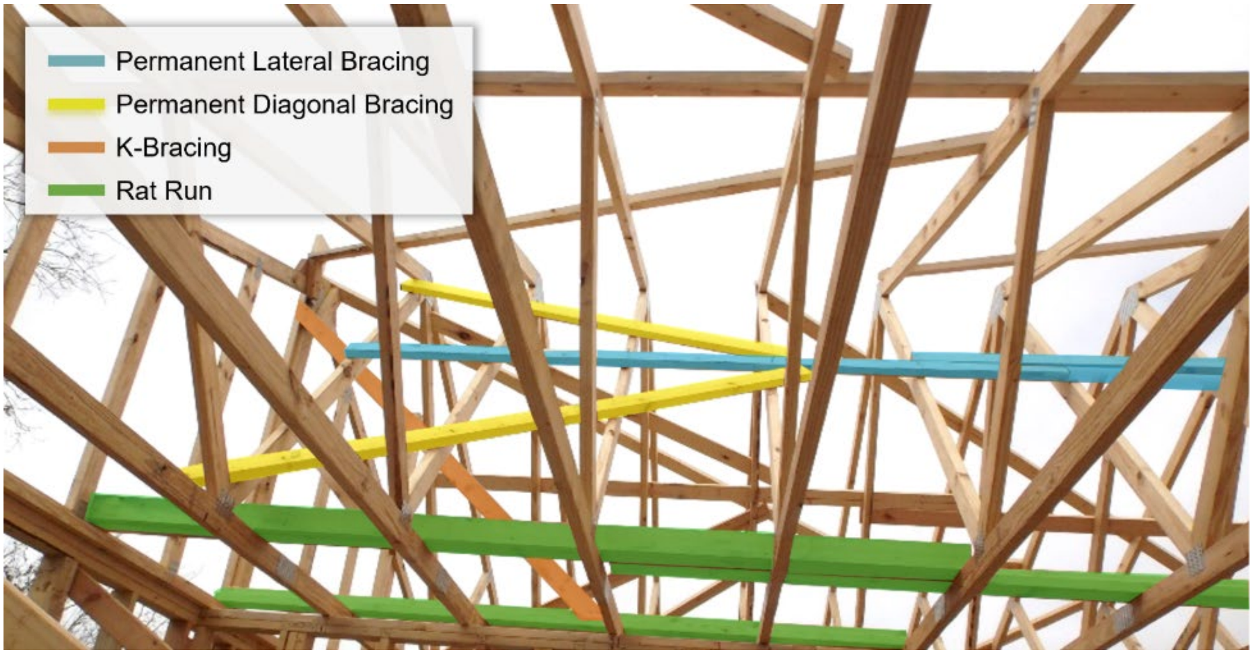


Figure 5-21. Permenant (Internal) Truss Bracing

5.5.5 PERMANENT DIAGONAL LATERALS

Permanent diagonal braces are attached to the interior webbing of the trusses using two 12d nails. Using 12 or 16-foot lengths of 2x4 lumber, start at the first common truss and angle the brace towards the permanent lateral bracing (see Figures 5-5 and 5-21, permanent diagonals highlighted in yellow). Permanent diagonal bracing should be installed every 10 trusses or 20 feet max; longer houses may need another set in middle of the house. Diagonals always point to the inside of the house, i.e., the diagonals at the front of the house will be in the opposite direction than the ones at the back of the house (see Figure 5-5).

It is recommended that 16d nails be used to attach the bracing at common adjacent to a gable truss until the ladder panels are installed. This allows for the bracing to be adjusted, if needed. Once the ladder panel is installed, replace the 16d nails with 12d nails.

5.5.6 K-BRACING

After eight common trusses have been raised and set, install the permanent gable bracing called a K-brace. Large gable end trusses (over 30 feet) require three K-braces; one in the center and two on the third vertical post from the center of the truss (see Figure 5-16). The brace itself is a 2x4 cut to the required length with opposite 45° cuts made on either end. The length will vary with each different size of trusses. The top of the K-brace should be placed as close to the top the truss as possible. One end of the brace is fastened to the side of the vertical member of the gable truss with two 12d nails (see Figure 5-22). The other end is fastened to a rat run (see Section 5.5.7) or the king post (see Figure 5-23).

Figure 5-22. K-Bracing Connection at Truss

Figure 5-23. K-Bracing Attached to King Post (right), California Corner (left)

5.5.7 RAT RUNS

Each common truss is attached and connected with lateral and diagonal bracing, leaving the bottom chords free to move. Rat runs are long California corners that secure the bottom chord. Ideally rat runs can be started after about eight common house trusses are set. Lumber for rat runs must be in the attic before gables are covered with sheathing.

Measure in (towards the middle of the house) 10 feet from the exterior wall (see Figure 5-24). Larger trusses (bottom chord longer than 38 feet) require an additional rat run near the middle of the house. The rat run should be positioned so it can serve as a base of the K-brace (see

Section 5.5.6). The long 5-inch side of the California corner should sit on the truss. Use a speed square to make sure the brace is perpendicular to the truss. Use two 12d nails to fasten one end to the bottom chord of the gable truss, and then align each common truss bottom chord with its 2-foot OC mark and fasten. At the end of a 16-foot brace, overlap the next brace by at least two truss bays/spaces (see Figures 5-24 and 5-25).

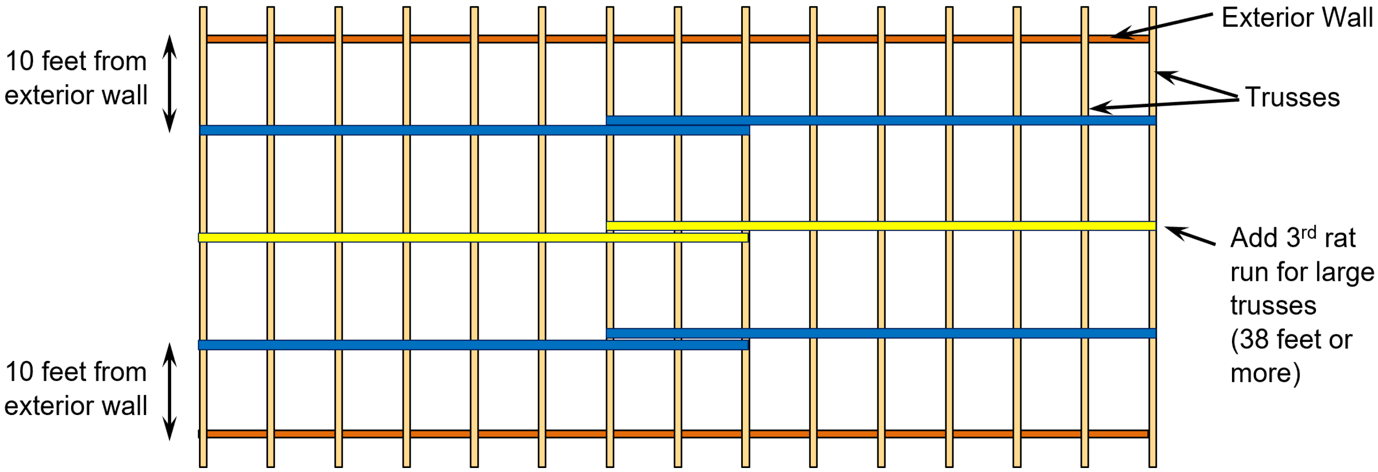


Figure 5-24. Rat Runs (in Blue) (Top View)

Figure 5-25. Photo of Rat Runs (Highlighted)

5.5.8 SUBFASCIA

The subfascia is permanent bracing for trusses tails and also provides the nailing surface for the fascia boards. For eaves longer than 16 feet, make sure to check the ends of the subfascia will end at a truss and leave enough room to attach the next piece of subfascia. The minimum length of subfascia to be installed is 8 feet.

It is crucial the subfascia is straight along its entire length and worked from one end to the other when nailing so any waves in the board can be taken out. Sight down the subfascia or use a string line or an 8-foot level to check. Make corrections as needed using shims or wood scraps to ensure a straight subfascia. Use a speed square to position the subfascia in the correct plane (see Figure 5-26). Aligning the bottom of the subfascia with the bottom of the truss is not correct. Secure with two 12d nails into each truss tail.

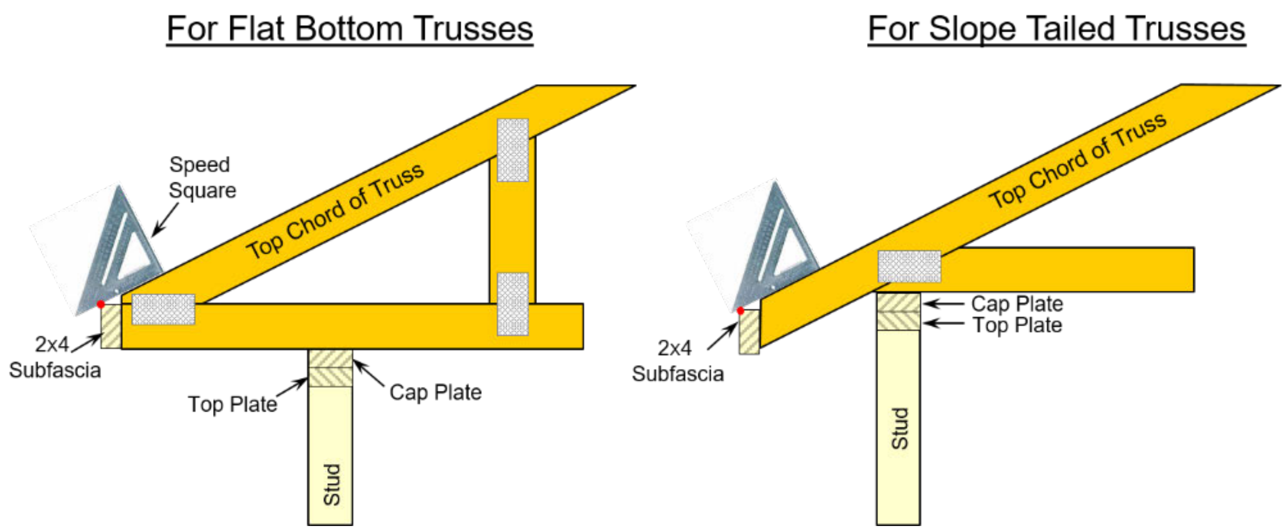


Figure 5-26. Installing Subfascia on the Correct Plane

When nailing subfascia to the ladder panel rafter, make sure the corner is square. Have someone sight down the outside ladder rafter to ensure it is straight and not pushed out of plane. It is also helpful to measure and confirm that the distance between the house side (inside) of the gable truss and the outside of the ladder is 19 inches. If not, it should be adjusted to that measurement and the subfascia nailed to it at that point.

If truss tails are not aligned in a straight line, the subfascia will have to be shimmed to come out with a straight, finished fascia. Running a string line can help determine where subfascia needs to be knocked out. If the correct gap is greater than can be corrected by two opposing shims, then a scab should be sistered onto the short tail. The scab should be 16 inches or longer and installed with 12d nails.

5.5.9 BACK GABLE HORIZONTAL BRACE

The back gable horizontal brace is a 16-foot California corner (see Figure 5-27). Install this brace after the K-braces are in place and before setting the permanent laterals and permanent diagonals. The back gable horizontal brace should be centered on the back gable and placed as high as possible; avoid placing where the braced where it will interfere with ladder panels. Attach using two 12d nails, nailing into the verticals of the truss from both the inside and outside.

Figure 5-27. Back Gable Horizontal Bracing

5.6 LADDER PANELS

Ladder panels, or lookout ladders, are the assemblies that create the overhang at the gables of the house (see Figure 5-28). Ladder panels are preassembled into a unit that resembles a ladder and then positioned into place. The unit consists of two parallel rafters connected by rungs. Use solid 2x4 lumber for all ladder panel components.

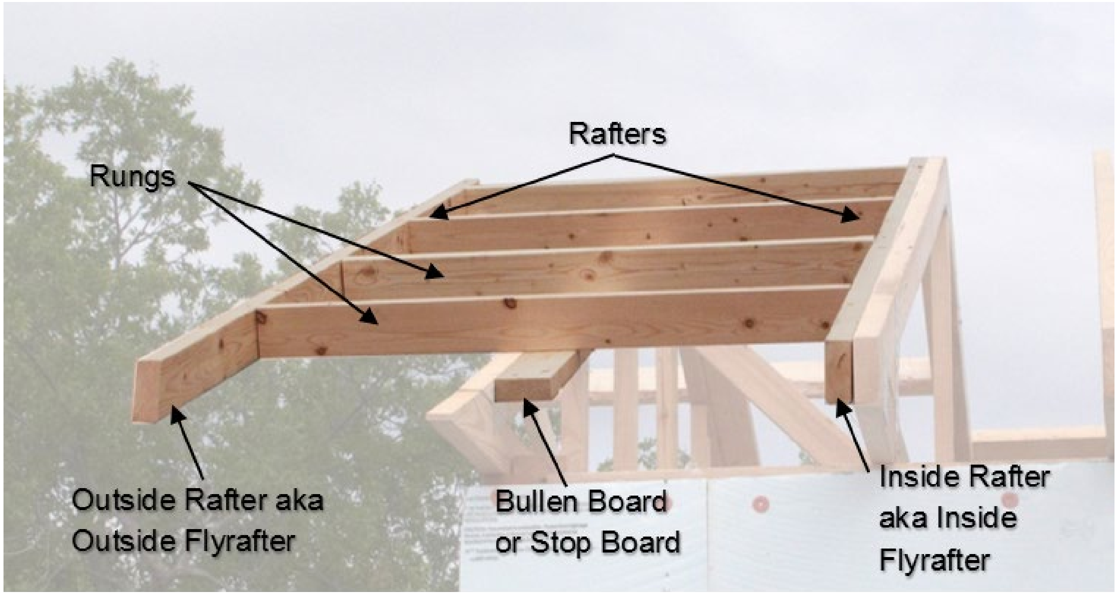


Figure 5-28. Assembled and Installed Ladder Panel

> **When assembling the ladder panels, use the straightest lumber available.**

Clearly mark on the ladder panel the peak, tail, inside and outside rafters, and location (e.g., front/back, left/right, east/west, north/south) where the panel will be installed (see Figure 5-29). This makes it easier for the team installing the ladder panels to identify the correct panel.

Figure 5-29. Mark the Ultimate Location on the Ladder Panels

5.6.1 BUILDING LADDER PANELS

If the space between the gable end truss and first common truss is 24 inches OC, the length of the rungs should be 38½ inches. If not, determine the length of the rung by adding the spacing between the first common truss and the gable truss, the thickness of sheathing and Blue Board (1-inch), the gable overhang (16 inches), plus a little breathing room (½-inch) (see Figure 5-30).

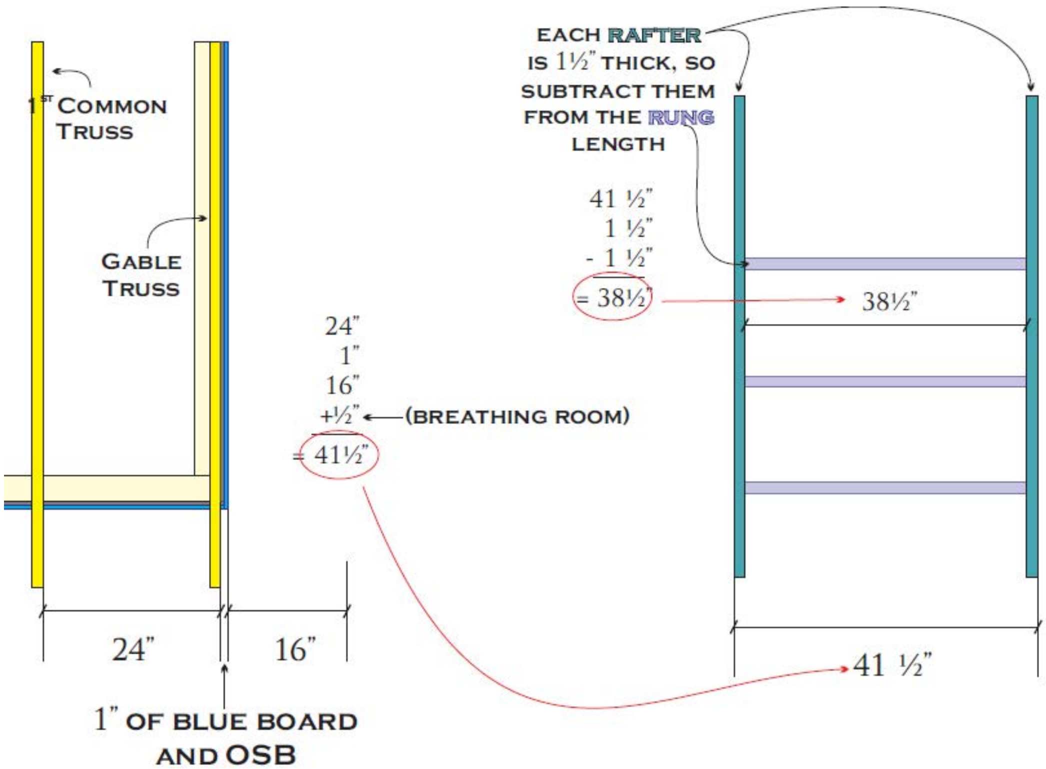


Figure 5-30. Determining the Length to Cut Ladder Rungs

The rafters are the same length as peak-to-tail of the common truss. The rafters also have the same pitch as the common truss (see Table 5.1). The ladder panel rafters match the top chord of the common truss for both length and pitch.

Table 5.1 Angles for Cuts

Roof Pitch	Tail	Peak
4	18½°	18½°
5	22½°	22½°
6	26½°	26½°

5.6.1.1 LADDER PANELS LESS THAN 16 FEET

Cut the inside and outside flyrafters to length with the appropriate angle at each end. Most gables will have a matching pair of ladder panels, so all four rafters can be clamped together to mark the rung layout. Start marking the placement of the rungs at the peak of the rafter and work towards the tail. The first rung should be placed 4 inches from the peak. The remaining rungs are laid out 24 inches OC; however, the lowest rung should be at least 20 inches from the bottom (see Figure 5-31). The inside flyrafter (the one to be attached to the first common truss) should be shortened by 12 to 16 inches to allow for a HUGS hook to be installed. The components can now be assembled on a level surface. Attach the rafters to the rungs, using two 12d nails and a deck screw on both ends.

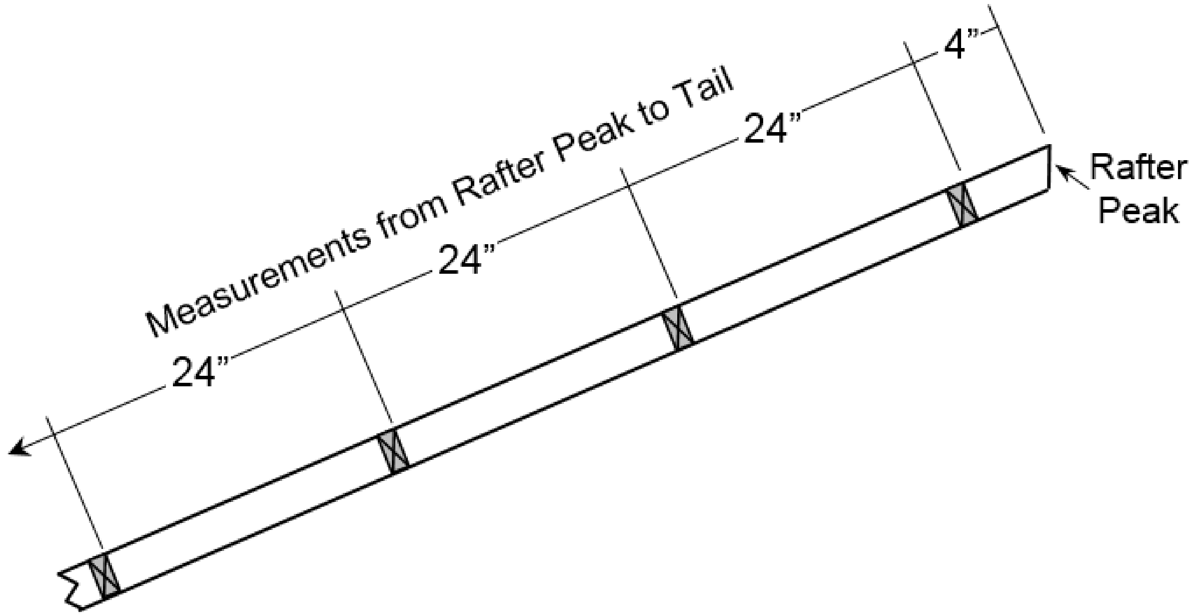


Figure 5-31. Ladder Panel Rung Placement

5.6.1.2 LADDER PANELS GREATER THAN 16 FEET

If the ladder panel is greater than 16 feet, it should be built in two sections (see Figure 5-32). Use 16-foot lumber for the (long section). Cut the peak of the inside and outside flyrafters with the appropriate angle. Most gables will have a matching pair of ladder panels, so all four rafters can be clamped together to mark the rung layout. Start marking the placement of the rungs at the peak end of the rafter and work towards the tail. The first rung should be placed 4 inches from the peak. The next five rungs are laid out 24 inches OC (see Figure 5-31). Attach the rafters to the rungs, using two 12d nails at each end and toe nail the rungs from both sides. Do not install the lowest rung so the short extension can slide into the long section.

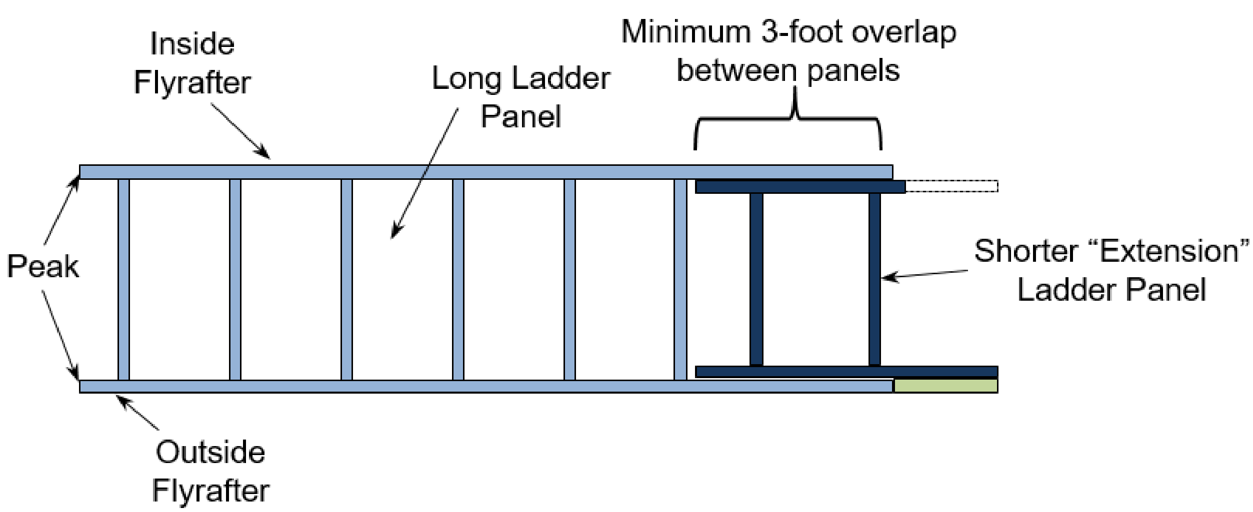


Figure 5-32. Ladder Panel Longer than 16 Feet

To build the ladder panel extension, the rungs should be cut at 35½ inches rather than 38½ inches because this shorter extension will slide into the longer section (see Figure 5-33). The measurement for the outside flyrafter can be calculated by subtracting 152 inches (slightly less than 13 feet) from the length of the top chord of the truss (measure in inches); this allows for a 3-foot overlap and a few inches for adjustment. The inside flyrafter (the one to be attached to the first common truss) should cut at about 18 inches shorter than the outside flyrafter to allow for a HUGS hook to be installed. Additionally, cut a block approximately 20 inches long with the appropriate angle to match the pitch of the house on one end; this will be placed at the tail of the outside flyrafter of the shorter section to provide a nailing surface for subfascia, fascia, and drip edge. The components can now be assembled on a level surface. Attach the rafters to the rungs, using two 12d nails and a deck screw on both ends.

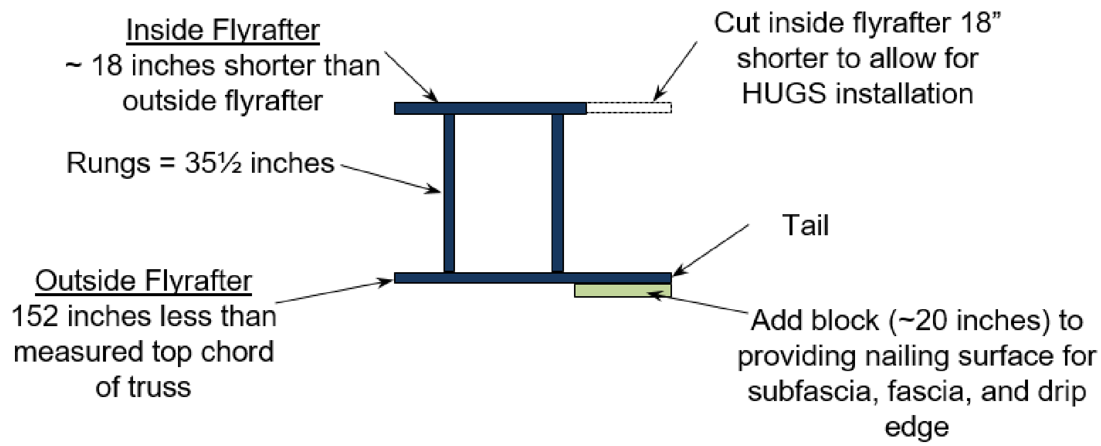


Figure 5-33. Ladder Panel Extension

Because of the weight and sometimes confined work space, do not attached the ladder panel extension to the larger ladder panel on the ground. This also allows for adjustments during installation.

5.6.1.3 TIE-IN LADDER PANEL

Most house will require at least one tie-in ladder panel (see Figure 5-34). The panel is constructed using the same methods outlined in Section 5.6.1.1. The outside flyrafter should be 1 to 2 inches above the plane of the lower roof line. The tail of the outside flyrafter is cut an angle based on the roof pitch, see Table 5.2.

Table 5.2 Angles for Tie-In Tails

Roof Pitch	Tie-In Tail*
4	53°
5	45°
6	37°

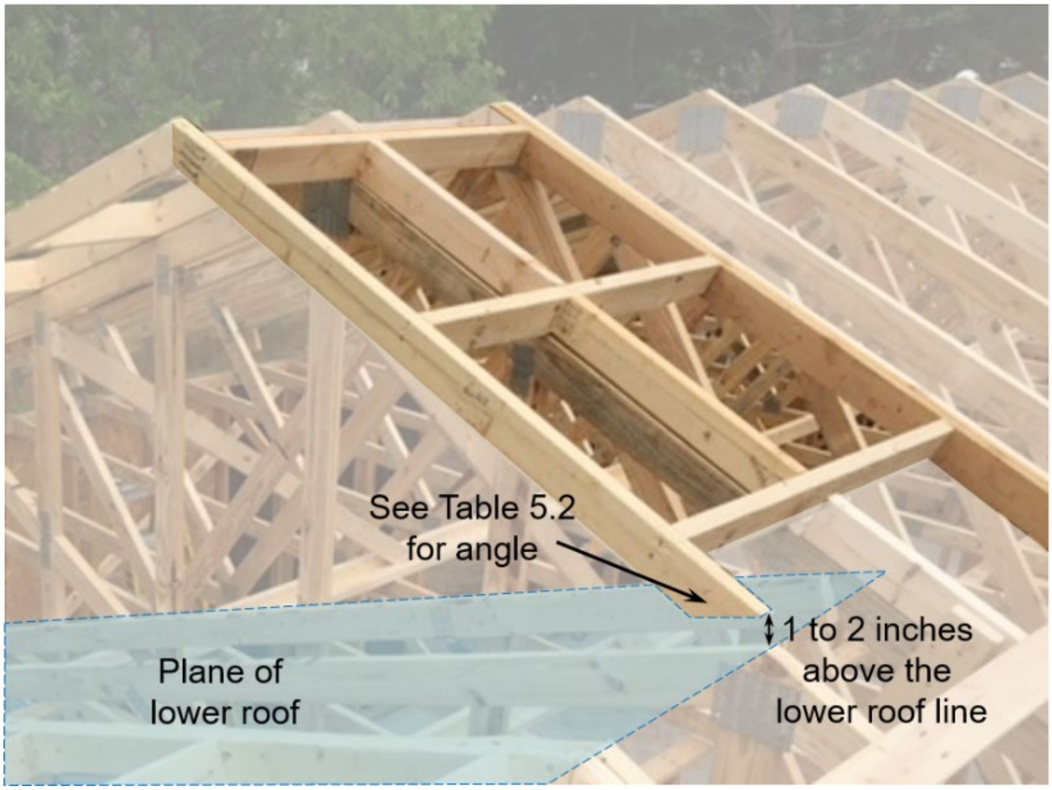
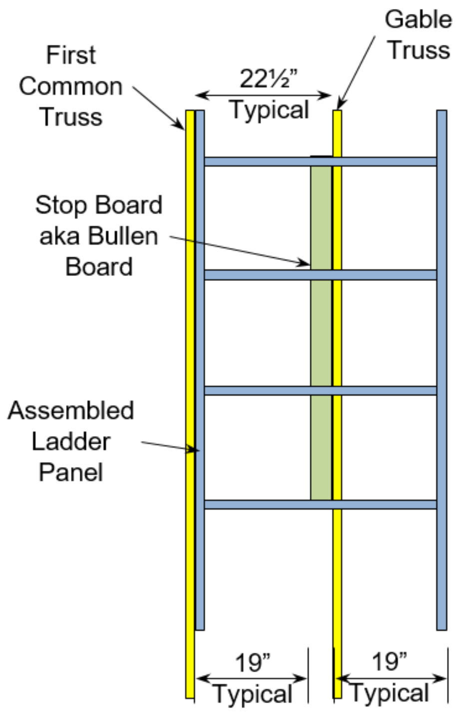


Figure 5-34. Tie-In Ladder Panel

5.6.1.4 STOP (BULLEN) BOARD

A 2x4 stop board (Bullen board) should be installed as shown in Figure 5-35 to ease installation and ensure the finished assembly is straight. The Bullen board should not extend beyond the top and bottom rungs of the ladder panel. To install, turn the assembled ladder over (i.e., bottom side of ladder panel facing up). Measure and mark 19 inches from the outside flyrafter and nail the bullen board in place using two 12d nails per rung. The gable truss will be nailed flush with the stop board. The stop board can help straighten warped gable trusses.



Measurements shown a based on trusses being 24" OC.

If not trusses are not 24" OC, the placement of the Bullen board and blocking must be adjusted based on the spacing between the first common truss and the gable truss.

The Bullen board should not extend beyond the top and bottom rungs of the ladder panel.

Figure 5-35. Bullen (Stop) Board

5.6.2 INSTALLING LADDER PANELS

Installation of ladder panels may start as soon as K-bracing and at least one run of permanent lateral bracing is complete on each side. First, the temporary lateral bracing between the gable truss and first common truss on one side must be removed to accommodate the ladder panel. Do not remove the temporary lateral bracing linking the gable truss to the common trusses on the other side until the first ladder panel assembly has been completely installed.
Slide the assembly up the gable and into place (see Figure 5-36). Align the inside peak of the ladder panel with the peak of the first common truss. The preinstalled stop board should force both the common and gable trusses to straighten. Some leverage may be required to get everything to fit together correctly. Prior to nailing the ladder panel in place, clamp the inside flyrafter of the ladder panel to the truss prior to avoid any slipping out of position.

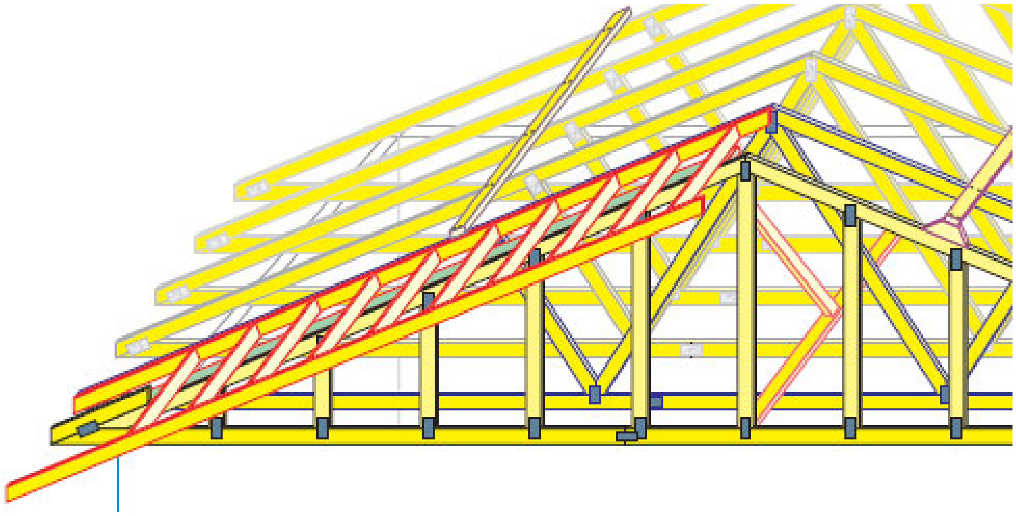


Figure 5-36. Installation of Ladder Panels

Using four 12d nails per bay (two on inside bay and two from the common truss side into ladder panel), nail through the common truss top chord into the ladder panel inside flyrafter first. Make sure the rafters are flush with each other. The ladder panel must also be nailed through the inside ladder panel flyrafter into the top chord of the common truss. Clamp the bullen board to the gable truss. Then slide the second ladder panel in place ensuring the peak matches the first ladder panel. Clamp the second ladder panel to the common truss and nail off. Check for square before nailing off completely. It is preferable for someone to sight down the existing truss peaks to match with the ladder panel rafter peak. Alternately, a framing square can be used to see if the rungs are running square to the rafters. Once square, nail through the gable truss into the stop board using two 12d nails per bay.

Do not nail the ladder panels into the gable truss until both ladder panels have been nailed to the common truss and the outside peak/outside flyrafters have been aligned.

The peak of the ladder panel rafters should line up with the truss peaks and have a tight seam. The ladder panel rafters need to be toe nailed to join the outside peak together. If the two ladder panel rafters do not match, use a truss push stick to push on the outside flyrafters to match at the peak.

If the ladder panels are longer than 16 feet, install the extension section after both of the longer sections have been secured in place and subfascia is installed. The subfascia will help align the extension. Slide the extension in place. It is helpful to have someone sight down the subfascia to align the bottom of the ladder. Once aligned, nail through into the longer ladder panel section, common truss, and gable truss using two 12d nails per bay.

If the ladder panel includes an extension, verify the overall length of the ladder panel is correct (same as truss) prior to nailing in place.

Install 2x4 blocking to fill the gaps between rungs over the gable trusses (see Figure 5-37). To help minimize splitting of the wood when nailing small pieces of blocking, dull the point of the nail with your hammer before nailing (the nail will then be crushing wood fibers instead of driving a wedge).

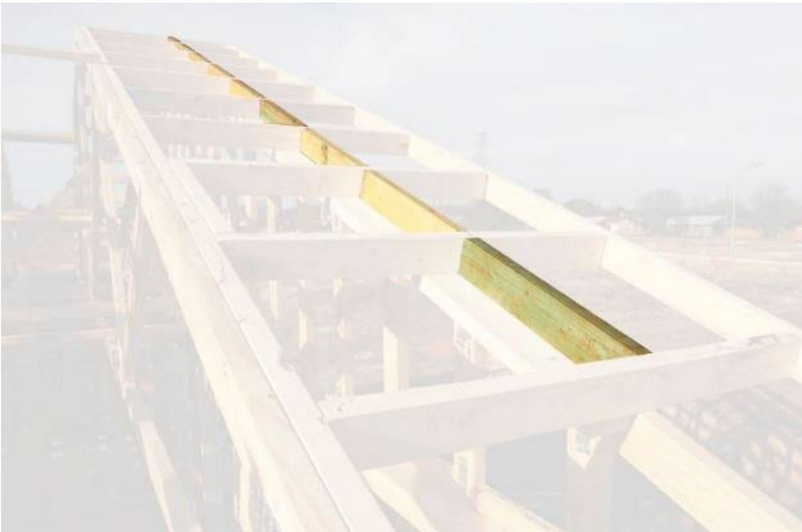


Figure 5-37. Ladder Panel Blocking Placement

5.7 HURRICANE TIES AND STC CLIPS

Two types of metal connection plates are installed to help secure the trusses to the framing. Hurricane ties are metal plates that connect the trusses to the exterior walls to reduce uplift forces caused by high winds. STC clips help control the alignment between a truss and interior wall by minimizing vertical truss chord movement.

5.7.1 HURRICANE TIES

Attach one hurricane tie to each truss end on the inside wall of the house (see Figure 5-38). On the side porch, the hurricane ties should be placed inside the house, not on the porch beam. Hurricane ties on the front porch should be installed on the inside of the porch beams where the trusses rest on the cap plate. Push the tie as far up against the truss and against the wall as possible. Put a Simpson nail in each hole (10 nails total). Using any other nail but a Simpson nail compromises the hurricane tie. Simpson nails should be flush against the plate; a palm nailer simplifies the installation process.

Figure 5-38. Hurricane Tie

5.7.2 STC CLIPS

L-straps are installed along the long hallway of the house and connect the truss to the interior wall. Rat runs must be installed prior to installing L-straps. Place the slotted side against the truss and secure with three 8d nails; two nails in the bottom and one halfway up in the slot (see Figure 5-39). The nail in the slot should be left sticking out by about ¼-inch.

Figure 5-39. STC Clip

5.8 ADDITIONAL BLOCKING

5.8.1 DECKING SUPPORT

As mentioned in Section 5.4.4, before setting the first porch truss, slide it up against the front main gable and trace the top of the truss onto the larger gable end truss. This will provide a guide to install a decking nailer that will support the roof decking (see Figure 5-15). The top end of the nailer should match the top cord of the truss it is attached to but should not extend below the bottom of the cap plate to avoid interfering with wall sheathing and Blue Board. Attach a scab to extend the nailer to support the subfascia (see Figure 5-40).

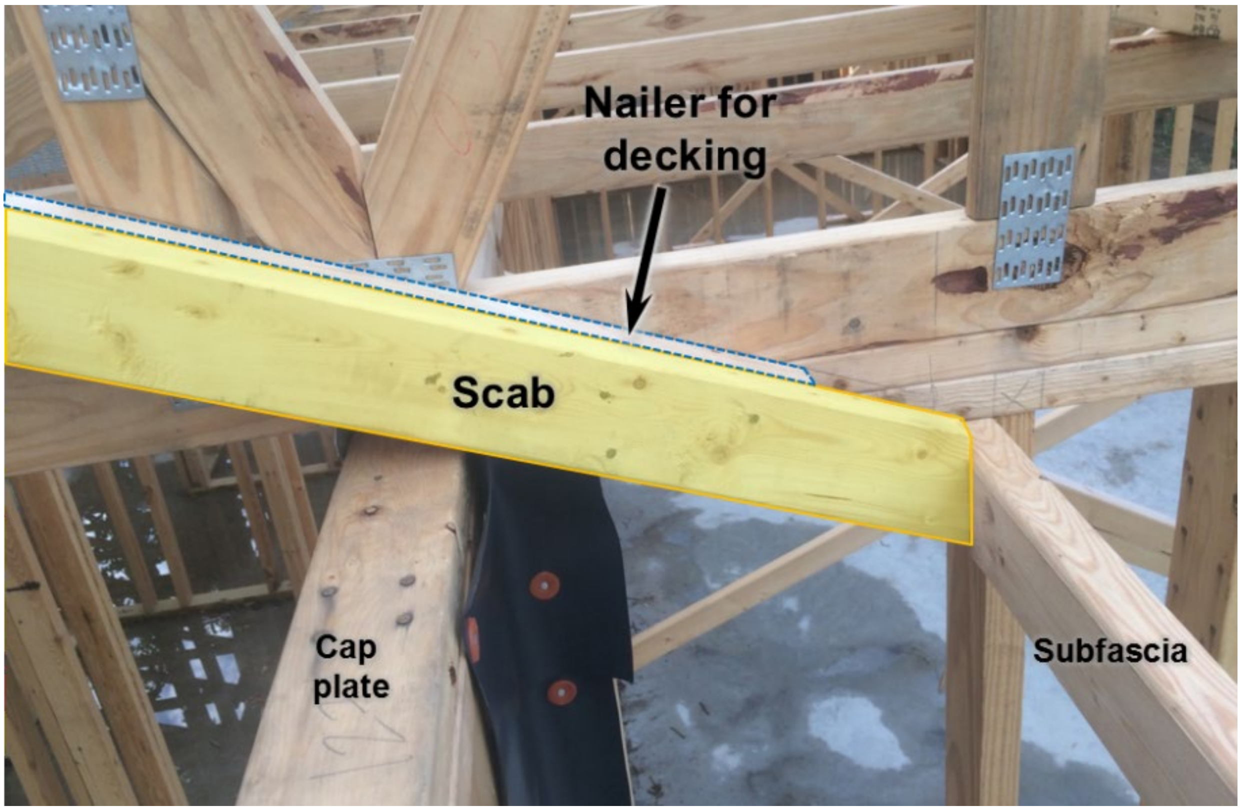


Figure 5-40. Scab (Highlighted in Yellow) to Extend Nailer

Additionally blocking on a gable truss may be needed where the trusses change height. Because the gable truss is 3½ inches shorter than a common truss, a 2x4 is added to the top of gable truss to make it the same height as the common trusses to support the decking (see Figure 5-41). The blocking should extend from the subfascia to bottom rung of the tie-in ladder panel. On alternating sides of the blocking, nail in smaller 2x4s (8 to 10 inches long) every 3 feet using two to three 12d nails. These blocks provide a nailing surface to attach the larger blocking to the truss. Slide the assembly on top of the gable truss. Nail through the smaller 2x4s block into the sides of the gable truss using two to three 12d nails.

Figure 5-41. Blocking Added to Gable Truss for Decking

5.8.2 RIDGE BLOCKING

To support the top row of decking and stabilize the top of the trusses, ridge blocking is installed at the peaks of the trusses (see Figure 5-42). Use solid 2x4s and nail in place with two 12d nails at each end.

Figure 5-42. Ridge Blocking

5.9 SPECIALIZED TRUSS TASKS

5.9.1 DUTCH HIP

A hip roof introduces a number of new truss types. A girder truss is designed to support the hip and jack trusses. The way these trusses fit together is shown in Figure 5-43. Installing a Dutch hip can be challenging because slight errors can be easily compounded into large discrepancies. The girder truss should be set first because proper placement of the hip and jack trusses depend on the girder truss. Knowing the truss overhang and resolving any truss and house plan differences is key to the placement of the girder truss. Next, the end jacks can be set. At this point, setting the subfascia is recommended. Carefully install the subfascia at the correct lengths and ensure the assembly is square. As long as this is done properly, the subfascia can be used as a guide to run the hip and jack trusses. The hip truss can now be set. If the end jack trusses were laid out correctly and the subfascia is square, there should be only one place where it can actually fit. Jack trusses can then be installed and there should also be only one place where each of the trusses will fit.

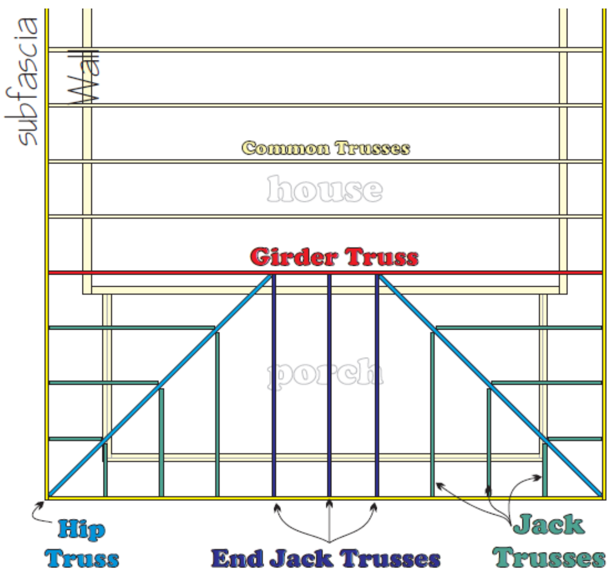


Figure 5-43. Different Truss Types Used in a Hip Roof

5.9.2 TIE-IN TRUSSES

House plans could include a design where the garage trusses are oriented perpendicularly to the main house trusses (see Figure 5-44). The prefabricated truss package will include a set of trusses that progressively step-down in size to create the tie-in area (see Figure 5-45). Before the tie-in trusses can be installed, all main house trusses must be set, the entire tie-in area must be decked, and all garage common trusses must be set.

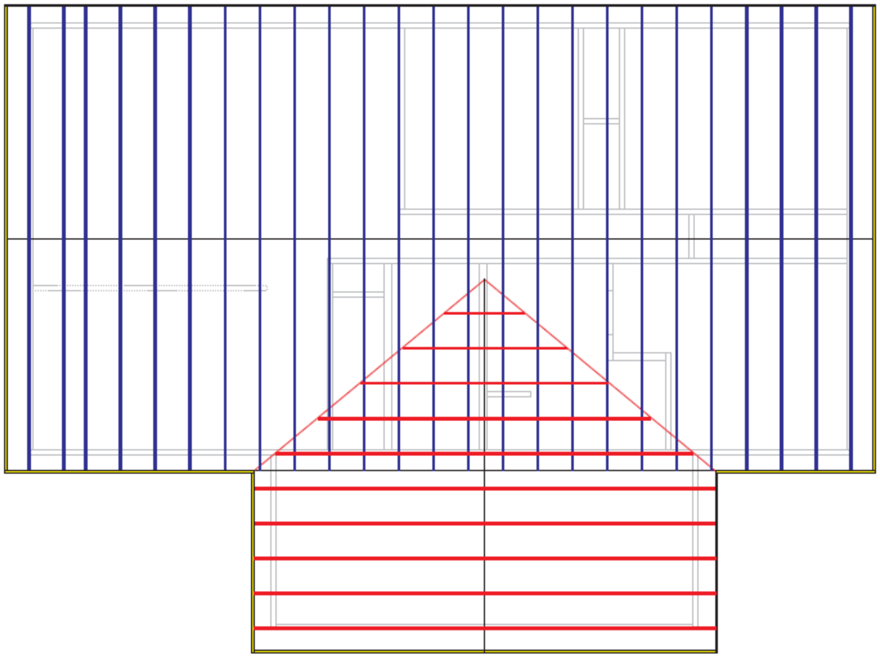


Figure 5-44. Tie-In Truss System

Figure 5-45. Progressively Smaller Tie-In Trusses

The first step is to attach a string line to the very peak of the garage gable truss, and then pull a straight line as close as possible to the peaks of the garage common trusses. Project this straight line all the way to the point it meets the decking of the main house. This string line is where each tie-in truss needs to have its peak aligned with to create a straight ridge line.

Figure 5-46 shows how to project the ridge line using a string line aligned with the existing truss peaks.

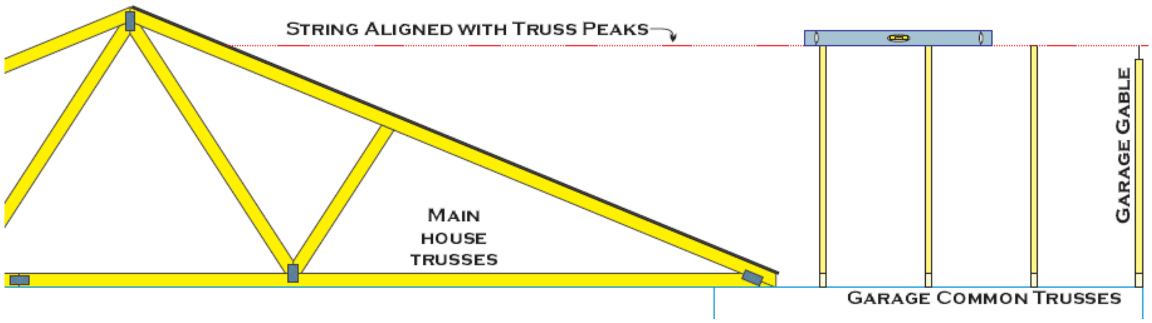


Figure 5-46. Projecting Ridge Line Using a String Line

Now the tie-in trusses can be set, starting with the largest. Each truss needs to be centered, plumb, and in the same plane as the garage trusses. Positioning this truss correctly can take a few hands and many readjustments, but there is only place it can go to meet all three requirements. Using multiple levels can increase the efficiency of the process.

Once in the correct position, the tails can be tacked in place with one 12d nail each and the top chord secured with temporary lateral bracing. Double check the position is correct. Then 2x4 cleats can be installed. The cleats are nailed onto the main house roof flush with the bottom chord of the tie-in truss. The cleats should be secured with 12d nails fastened to the 2x4 common trusses of the main house, not just to the OSB. The cleats do not need to be one continuous piece of lumber. Run the cleats about 6 inches short of the tie-in truss tails. Then the bottom chord of the tie-in truss can be nailed into the cleat with 12d nails.

The installation of the following tie-in trusses continues in the same manner. Make sure the tie-in trusses to do not start to push the string line out of the proper plane. Finally, measure a final 2x4 ridge block to connect the final tie-in truss to the main house as seen in Figure 5-47.

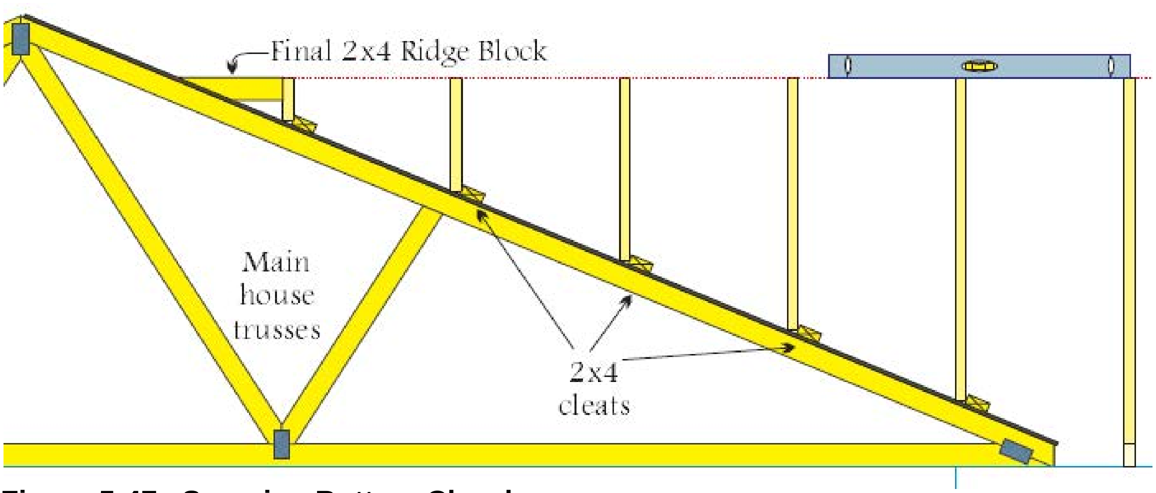


Figure 5-47. Securing Bottom Chord

5.10 COMMON ISSUES AND SOLUTIONS

- Both Ends of a Truss Not Touching the Cap Plate

Sometimes, part of the slab is slightly higher than the rest of the slab. As a result, both ends of a truss may not touch the cap plate at the same time. Do not use a clamp on the truss tail to bring the other end down and do not cut the cap plate on the exterior walls. The cap plate on the interior walls may be notched but should never be removed. If the cap plate is notched between ¼-inch and ½-inch, shim under the bottom cord of the truss to ensure it is snug. If the cap plate needs to be notched more than ½-inch, consult the DAHFH Construction Staff.

- Damaged/Broken Truss

During truss delivery, staging, and/or loading, truss elements may be cracked and/or truss gussets can separate; notify the House Leader and DAHFH Construction Staff. If the crack or break is minor, install 8-foot long 2x4s (aka scabs) centered on the crack/break on both sides. The 2x4s should be attached using both construction adhesive (if available) and 12d nails (see Figure 5-48). Use two nails every 6 inches. If the break or gusset issue is major, the manufacturer must be contacted for a solution or new truss.

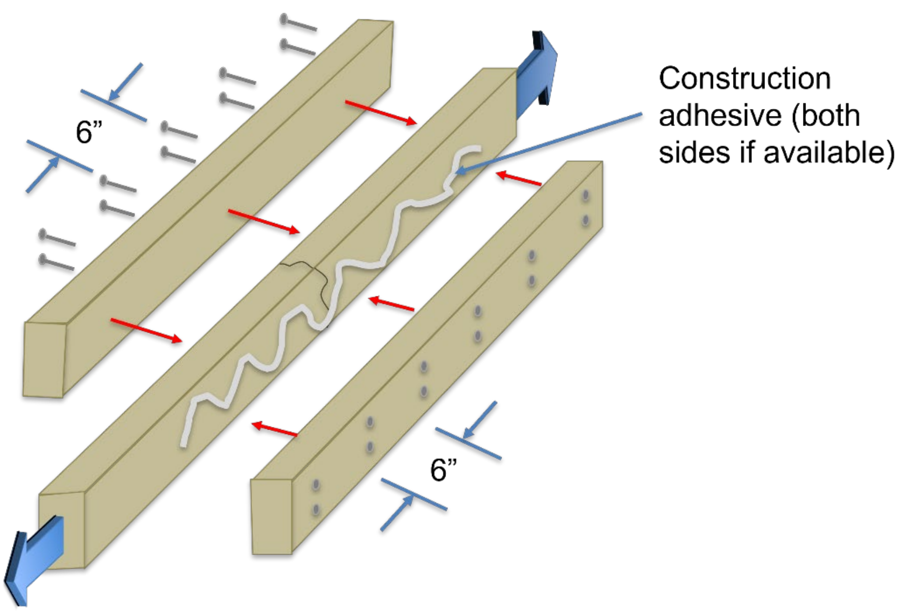


Figure 5-48. Truss Repair (Minor)

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CHAPTER 6: DRYING IN

Tools and Materials

- Hammer
- Measuring Tape
- Chalk Line
- Speed Square
- Nail Puller/Cat's Paw
- Utility Knife
- Metal Snips
- 2-Foot or 3-Foot Levels
- Circular Saw
- Reciprocating Saw
- Caulk Gun
- Sawhorses
- Ladders
- Extension Cords
- Eye Protection
- Ear Protection
- Hard Hat
- Oriented Strand Board (OSB) OSB or Engineered-Sheathing Material
- Blue Board
- WeatherMate Tape
- ZIP System Tape (if Engineered-Sheathing Material is used)
- Brick Flashing
- Brick Ties
- Shims
- Caulk
- Windows
- Window Sill Pans
- Butyl Adhesive Flashing Tape
- House Wrap
- 1x4 Trim
- 8d Nails
- Roofing Nails

Safety

- Eye protection is required at all times.
- Ear plugs and dust masks will be provided if requested (not mandatory).
- Gloves are recommended for handling lumber (especially sheathing) to prevent splinters.
- Do not wear gloves when operating a saw.
- Because of the size of the sheathing material, be sure there are enough people carrying the material and be aware of trip hazards and other obstacles.
- When carrying long pieces of 2x4, be aware of others, especially when turning.
- When cutting out windows with a reciprocating saw, be sure there is no one working on the other side that might be injured by the saw blade. Ask another volunteer to assist by watching from outside for others working in the same area.
- Be sure all ladders are properly positioned and stable. Follow all ladder safety rules (see Table 2.3).
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.
- For additional safety information, see Chapter 2.

Think About This...

- If the sheathing is wet do not install Blue Board.
- When installing Blue Board over the sheathing, do not match the seams of the Blue Board with the seams of the sheathing.
- After installing Blue Board, tape over the top of sheathing and Blue Board to protect against rain.
- It is best to test fit windows and check for level before applying caulk.
- Make sure windows are not installed backwards or upside down.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

6.1 SHEATHING

The purpose of the sheathing is to distribute lateral loads to the wall framing and provide lateral support to both the wall studs (i.e., buckling resistance) and the entire building (i.e., racking resistance). Sheathing should be installed with the smooth side (or stamped side) facing out. The smooth side has a better moisture resistance and will ultimately provide better performance against weather.

6.1.1 WALLS

Begin sheathing the exterior walls at the corners using full (4-foot wide) sheets of sheathing. The sheathing at the corners is known as a shear wall and must be full width and full height panels (e.g., if the house has 9-foot walls, the sheathing on the corners must also be 9-foot). If needed, install an additional stud rather than cut the sheathing. At the corners, the sheathing should overlap and not be offset (see Figure 6-1). The top of the sheathing should be 1-inch below the top of the cap plate (see Figure 6-2).

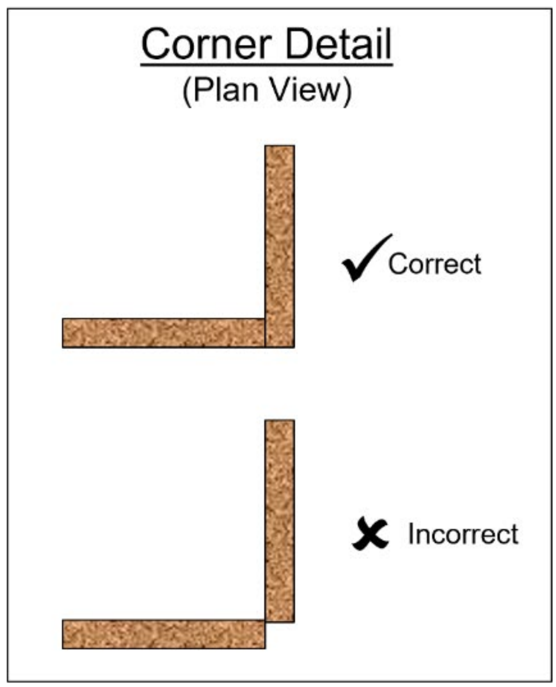


Figure 6-1. Sheathing Detail at Corners

Figure 6-2. Wall Sheathing Set 1-Inch Below the Top of the Cap Plate

To allow for expansion and contraction of the sheathing, include an ⅛-inch gap between the sheets of sheathing. This can be done using an 8d nail as a spacer between the sheets of sheathing; spacers should be placed at the top, middle, and bottom to maintain a consistent gap.

Sheathing should never be in contact with slab. In porch areas, place scraps of sheathing on the slab and rest the sheathing on the shims before nailing in place (see Figure 4-43). In some cases, it may be necessary to trim the sheathing.

Use 8d nails to attach sheathing to the exterior walls. The nails must be a maximum of 6 inches apart around the outer edge of each piece of sheathing and 12 inches apart on the interior of the sheathing (the field) (see Figure 6-3). Nail into the studs. The nailing pattern around windows and doorways is the same as for the edges, every 6 inches.

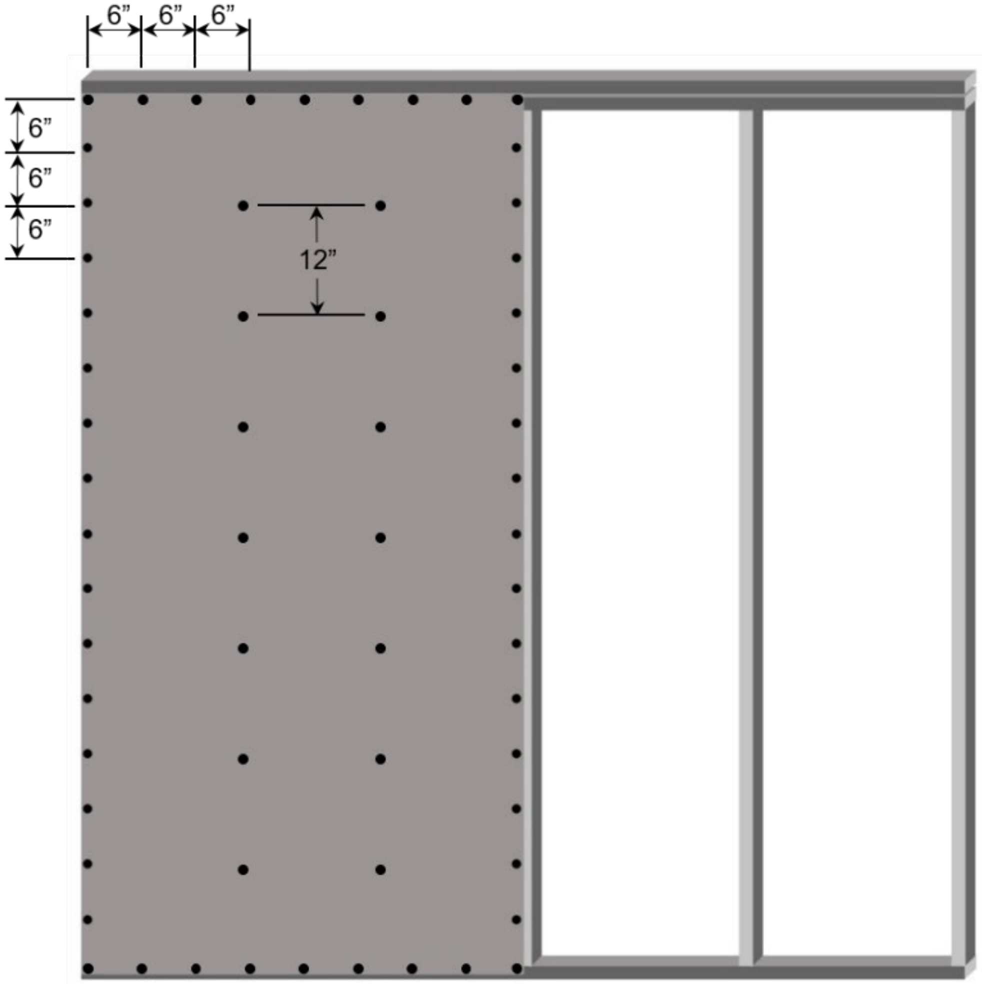


Figure 6-3. Nailing Pattern for Sheathing

6.1.2 GABLES

The gable end truss usually has vertical members spaced 2-foot on center to accommodate 4-foot panels of sheathing. The gable sheathing must meet up with top of the wall sheathing and should be cut about a ½-inch short from the top of the truss. Only install sheathing on the gables after all the permanent truss bracing and ladder panels are installed.

Typically, the back gable is sheathed with engineered-sheathing material rather than OSB; verify with the House Leader or DAHFH Construction Staff. Use full sheets of sheathing; do not piece small pieces together (see Figure 6-4). Begin the sheathing in the middle of the truss. Using 8d nails to attach the sheathing to the gables and include an ⅛-inch gap between the sheets of sheathing. Nail every maximum of 6 inches along the edges of the sheathing and every 12 inches in the field. If using engineered-sheathing material, apply ZIP tape to the seams. Care and caution should be used handling, positioning, and nailing large sheets of sheathing on ladders. A temporary ledger board can be used to support and align the sheathing while nailing (see Figure 6-5).

The gable sheathing should rest on the top of the wall sheathing.

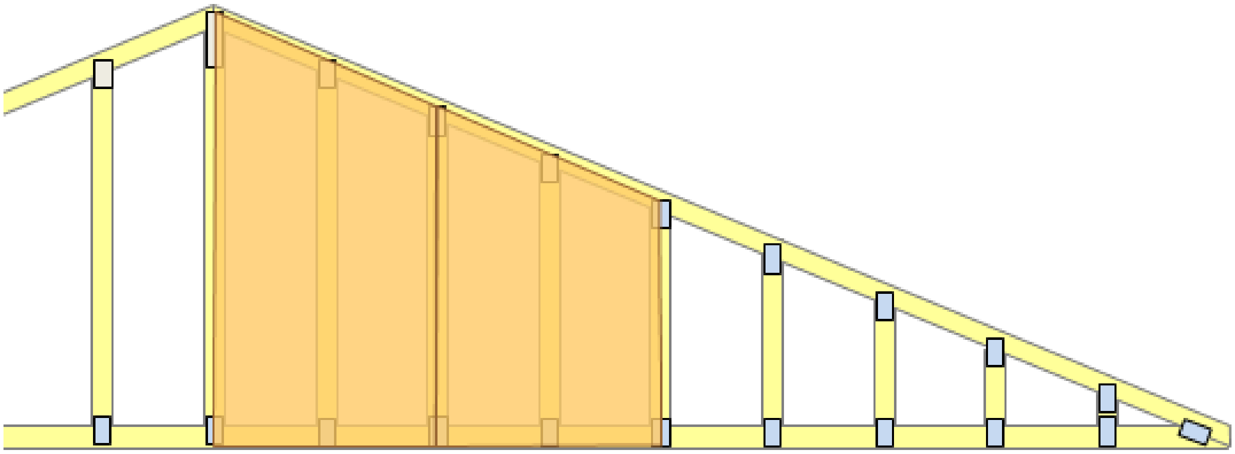


Figure 6-4. Gable End Sheathing

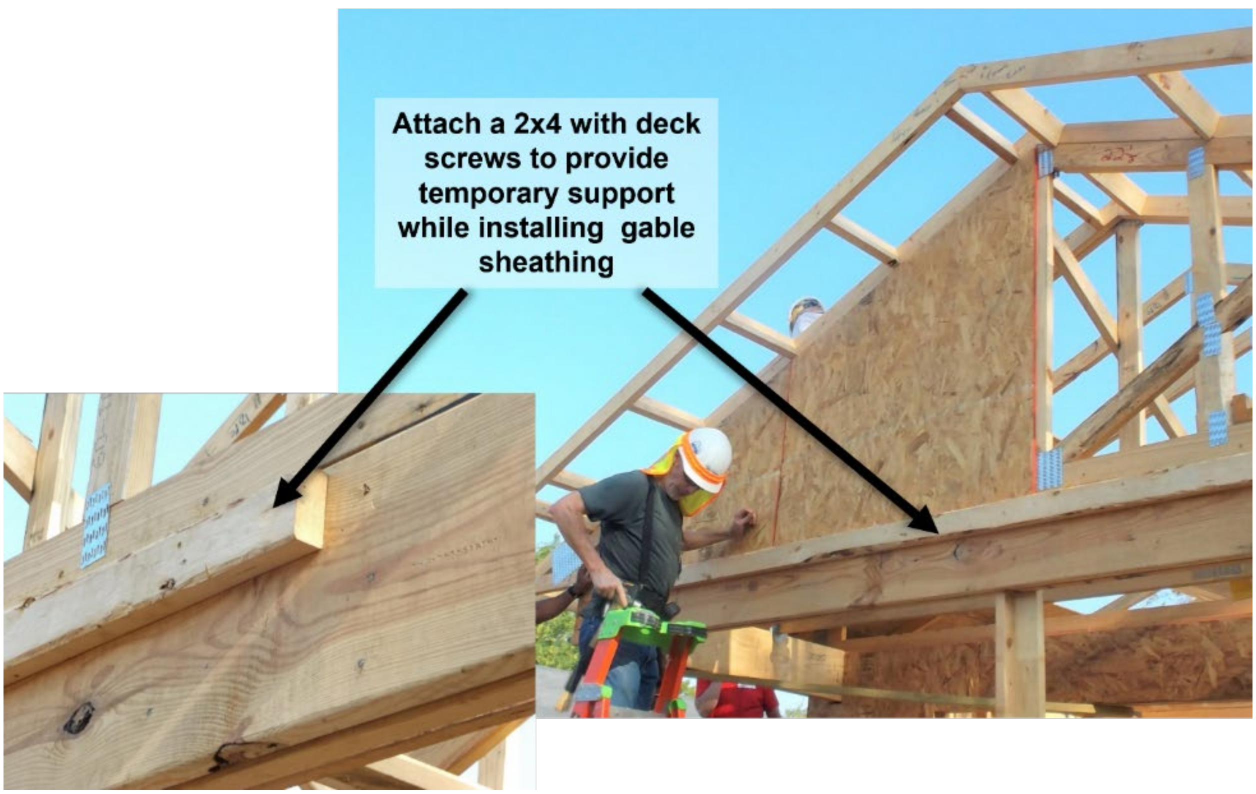


Figure 6-5. Ledger Board for Gable Sheathing Installation

6.2 BRICK FLASHING

Poly barrier is used for brick flashing and is applied to the bottom of the wall(s) to be bricked. The brick ledge, a sort of continuous step or curb along the side to be bricked, identifies this wall. The poly barrier lays on top of the brick ledge and will be covered by the masonry. Brick flashing is attached to the sheathing and install before the Blue Board to maintain the proper moisture barrier. Along the perimeter of the slab, the top of the poly barrier should be placed 12 inches above the brick ledge (see Figure 6-6).

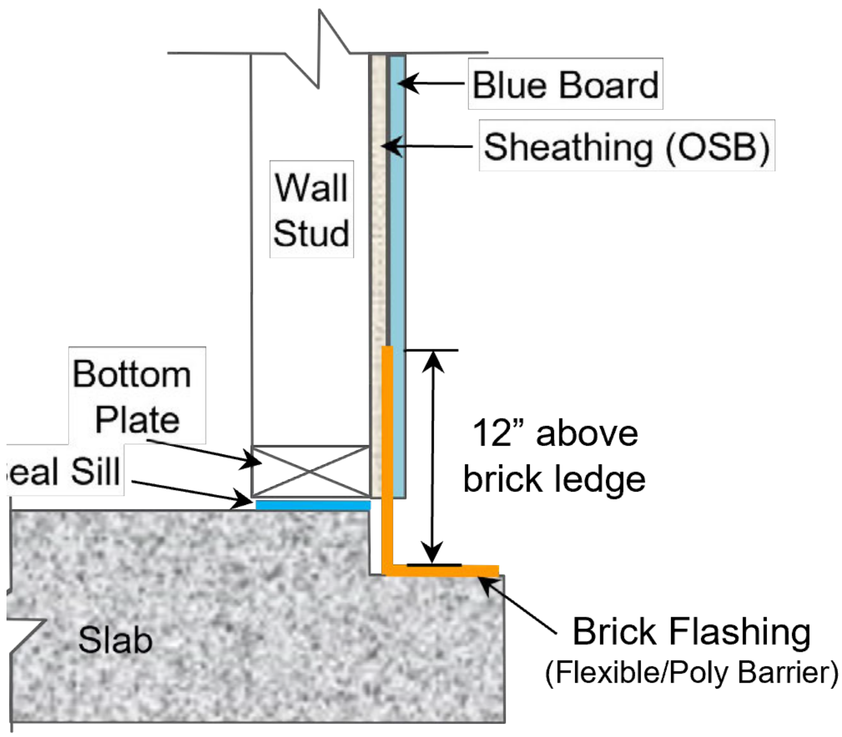


Figure 6-6. Brick Flashing

Attach poly to the sheathing using roofing nails, setting nails approximately every 16 inches. The brick flashing should overlap where two brick-sided walls meet at a corner. To ensure the brick ledge is fully covered by the poly, extend the poly barrier at least 8 inches so the material can be wrapped around the corner. In the “L” of the brick ledge, cut the poly horizontally and fold the upper vertical side around the corner. Repeat this for on the other wall, wrapping the corner (see Figure 6-7). Do not leave the corner of the brick ledge exposed; this negates the purpose of the flashing.

Figure 6-7. Brick Flashing at Corner

6.3 BLUE BOARD

Rigid Styrofoam insulation (aka Blue Board) goes on top of the sheathing to add a layer of insulation as well as a moisture barrier. Do not install Blue Board if the sheathing is wet. Any sheathing covering window or door openings must be cut out prior to installing Blue Board to ensure the sheathing around the opening has been properly nailed. Blue Board is applied to all exterior walls that will be sided as well as walls that will be bricked with the exception of the front porch gable. Because the porch gable is over a non-air conditioned/heated space, insulation is not needed. If the front porch gable will be brick, install Blue Board. If the front porch gable will be covered in siding, do not install Blue Board; cover the gable with sheathing and house wrap. Verify the treatment of the porch gable with the House Leader.

Before installing Blue Board, verify all sheathing has been correctly nailed to studs using the standard nailing pattern of a maximum of 6 inches around the edges and windows and a maximum of 12 inches in the field.

The seams in the Blue Board should not overlap the seams of the sheathing on the walls or gables (e.g., stagger the joints). Install Blue Board with the label or printed side out (see Figure 6-8). This is to better advertise one of our many "in-kind" donors. Attach Blue Board using roofing nails; nail every 24 inches. Do not allow the nails to indent the Blue Board. Seal all seams with clear WeatherMate tape. Also, tape over the top of Blue Board and sheathing to protect against rain.

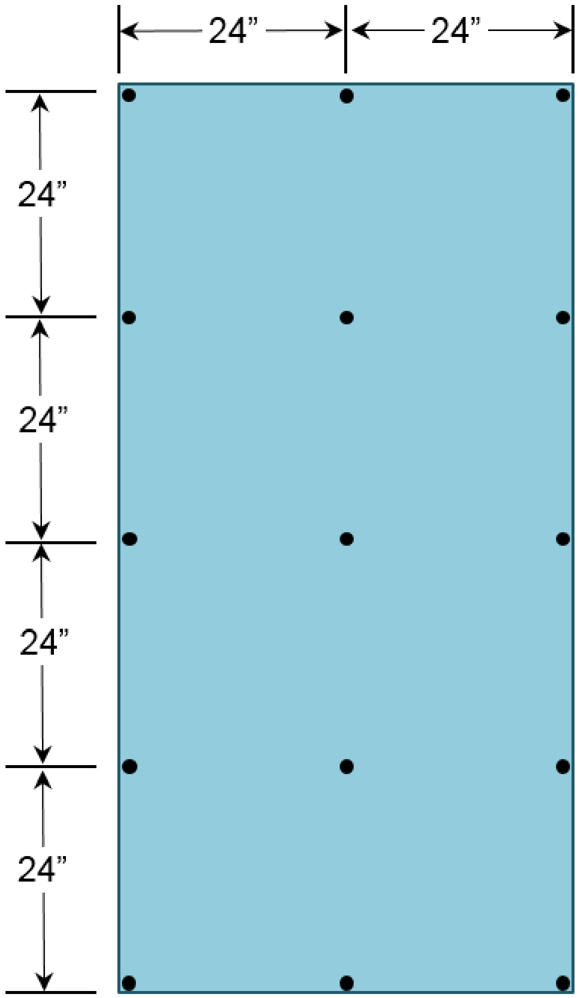


Figure 6-8. Blue Board Nailing Pattern

6.4 BRICK TIES

Brick ties are pliable metal strips used to secure the brick or stone to the house. Brick ties must be nailed into the studs, spaced every 16 inches vertically. Horizontal spacing is determined by the stud spacing (e.g., 16 inches). Brick ties are attached using 8d nails, placed in the top hole of the tie. Offset every other row, creating a checkerboard effect (see Figure 6-9). Brick ties are installed at the corners (nailing into the studs) and on porch posts over the felt paper that will be covered with brick or stone. Brick ties are not needed under windows.

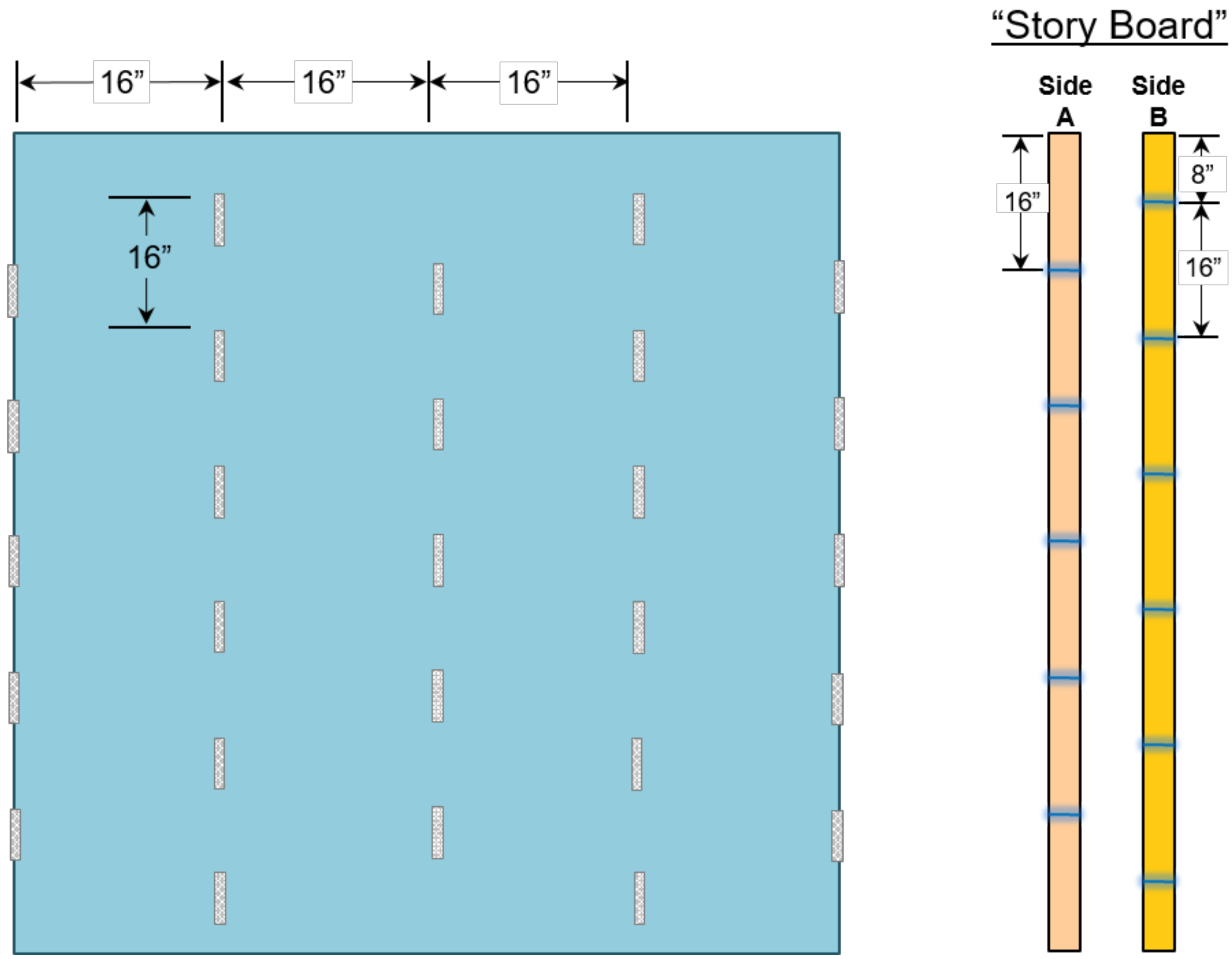


Figure 6-9. Brick Tie Layout and Story Board

It may be helpful to create a "story board" using a 2x4 stud (see Figure 6-9). Mark the stud at 16 inches down from the top and continue to make marks every 16 inches. Then turn it over and make a mark 8 inches from the top and then every 16 inches the rest of the way up the board. Align the top of the story board with the top of the cap plate. Start the first row with one side of the board and mark the wall at each mark on the board. Then move over to the next stud location, turn the board over, and make a mark matching each one on the board. Alternate sides of the board thereafter; this will help create a checkerboard pattern without measuring.

6.5 WINDOWS

Before cutting the window opening, double check the window framing is the correct size; do not assume the opening is the right size. It is easier to correct the size of the window opening prior to cutting the sheathing. Also, double check to make certain the sheathing is properly nailed around the window openings. Sometimes these edges are not secured before the openings are cut. Use a reciprocating saw to cut out the sheathing covering all window openings. When cutting out windows with a reciprocating saw, be sure there is no one working on the other side that might be injured by the saw blade. Ask another volunteer to assist by watching from outside for others working in the same area. It is important to make a perpendicular cut, as a jagged or slanted cut results in the sheathing being cut too far back from the opening, leaving an insufficient nailing surface to secure the window properly.

From the inside of the house, start by drilling a hole in each corner of the framing for the window. Cut from the hole towards either vertical 2x4, angling the saw blade so it is parallel to the frame and touching the 2x4 at the inner edge of the window. Do not cut through or into the 2x4. Now, place the "shoe" of the reciprocating saw on the inner side of the 2x4 frame and continue to cut to the bottom 2x4; stop before cutting into the 2x4. Repeat this process until the sheathing covering the entire window opening is removed. Make sure the cut is even (see Figure 6-10).

Figure 6-10. Properly Cut Window Opening

6.5.1 WINDOWS ON SIDING WALLS

Test the fit of the window in the opening, making sure the window is oriented correctly (the top is facing up, and outside is facing out). The opening around the windows should be no more than ½-inch larger than the window. Check to make sure the window can be horizontally centered in the opening and level horizontally and vertically (plumb). Once the window opening is correct, install the two-piece window sill pan. Nail the sill pan in place as indicated on the sill pan (Xs in the corners) using roofing nails, one nail on either end of the sill pans. Using butyl adhesive flashing tape, seal the top edge of corner pieces and where the sill pans overlap (see Figure 6-11).

Figure 6-11. Window Sill Pan Installation

Run a large bead of caulk around the inside flange of the window using a squiggle pattern, along the top and two sides but not the bottom (see Figure 6-12); the caulk should be close the edge to ensure it seal to the Blue Board. Set window in place. Leave the window closed during the installation to ensure it holds its shape.

Figure 6-12. Caulk the Inside Flange of the Window

Again, verify the window is centered in the opening and level horizontally and vertically (plumb) using a 2-foot level (see Figure 6-13). The window should “float” in the opening.

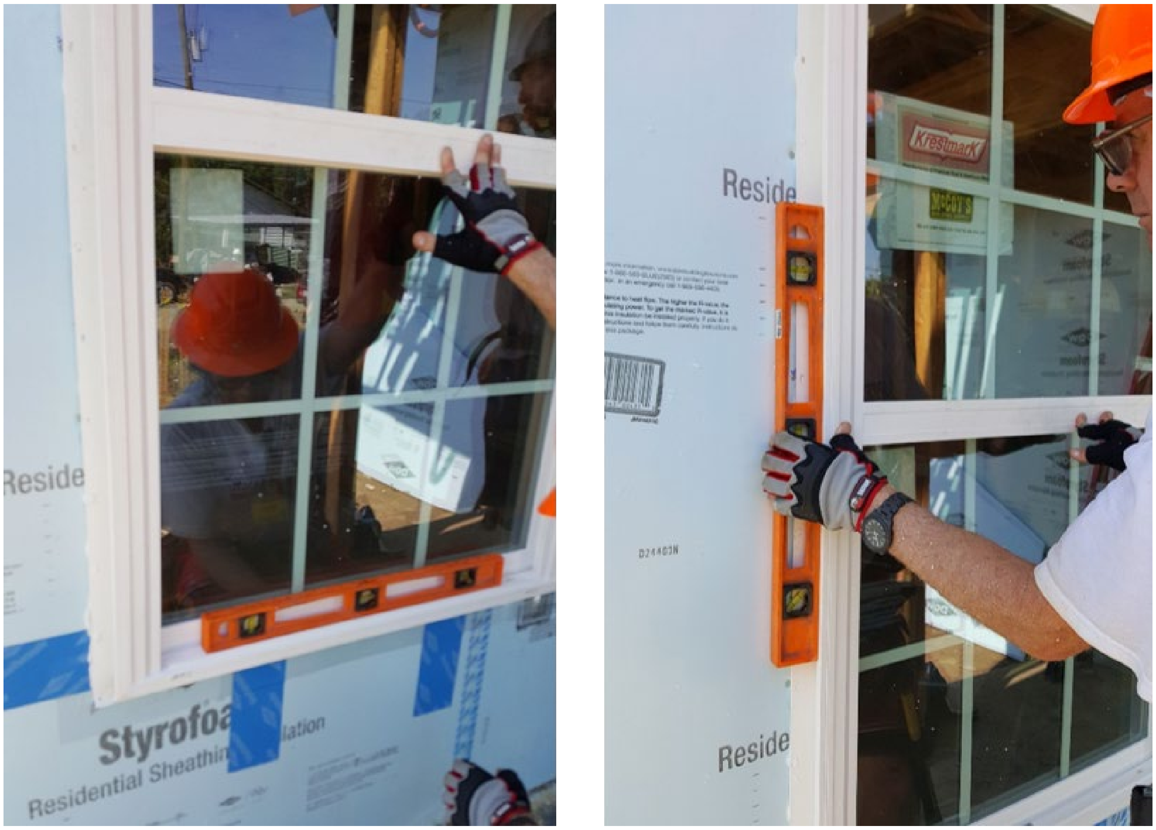


Figure 6-13. Check Fit and Level

Secure the window position with shims on the bottom (on top of the sill pan) and sides of the window. On the bottom, the shims should be placed under vertical parts of the window to help carry the weight (see Figure 6-14). On the sides, do not shim next to the horizontal structural members; go about six inches above and below the horizontal parts of the window frame. As much as possible, use shims in pairs, with each going in the opposite direction of its neighbors.

Figure 6-14. Shim Window as Needed

Once properly positioned and shimmed, set one roofing nail in each side of the flange, to maintain plumb. Finish the installation by nailing both sides and top of window, using every other hole in the window flange (see Figure 6-15). When nailing, place a shim on the window frame to protect it from damage. Verify the nails have gone into the studs and header. Also, open and close the window to test for level/plumb.

Figure 6-15. Nailing Window in Place

For smaller windows, do not nail along the bottom of the window to avoid penetrating the sill pan. For larger windows (e.g., 6 feet by 5 feet), a one nail along the bottom of the window in the center.

Butyl adhesive flashing tape is applied to the side flanges and then the top flange of the window, but not on the bottom (see Figure 6-16). The butyl adhesive tape should cover the nails used to install the windows. Because the butyl adhesive tape is very sticky, peel off the back of the tape as you install.

Figure 6-16. Install Butyl Adhesive Tape Around Sides and Top of Window

6.5.2 WINDOWS ON BRICKED WALLS

For windows on walls that will be bricked, the window opening needs to be furred out using 1x lumber prior to installing the sill pan (see Figure 6-17). If using material (e.g., trim) that has been primed, installed the primed side against the Blue Board. The material will be covered by the brick. The 1x should match the window opening, even with the framing. The corners do not have to be exact. Attach the 1x lumber with 12d nails into the studs. Then install the window as outlined in Section 6.5.1.

If using primed trim for furr out, install the primed side towards the Blue Board rather than facing out, as shown here.

Install furr out around window opening <u>then</u> install sill pan.

Figure 6-17. Window Furr Out for Brick

6.6 COMMON ISSUES AND SOLUTIONS

- Window Opening Too Large

In some cases, a window opening may be too wide only at the top or bottom and the nails are not long enough to secure the window at that part. Check with the DAHFH Construction Staff to see whether decking screws could be used in these areas.

- Plumbing Stack Located under Window

Occasionally a plumbing stack may be located underneath a window opening. Check with the DAHFH Construction Staff to see whether plumbing can be moved or diverted or if the window should not be installed.

CHAPTER 7: DECKING

Tools and Materials

- Hammer
- Measuring Tape
- Chalk Line
- Speed Square
- Utility Knife
- Nail Puller/Cat's Paw
- Circular Saw
- Saw Horses
- Ladders
- ZIP Tape Roller
- Extension Cords
- Eye Protection
- Hard Hat
- Decking Material [Oriented Strand Board (OSB) or Engineered-Decking]
- Butyl Tape
- ZIP System Tape
- Felt
- H-Clips
- 8d Nails
- Button Cap Nails

Safety

- Extension ladders are used to access the roof. Do not use A-frame ladders to access the roof.
- Be sure all ladders are properly positioned and stable. Follow all ladder safety rules (see Table 2.3).
- Any tools or material brought up to the roof deck must be secured with nails or cleats, or in workers' tool belts.
- If decking needs to be cut to fit, the piece should be cut on the ground.
- A ground crew will be assigned to cut wood and hand up decking and supplies to the crew installing the decking to minimize trips up and down.
- A team of two people should pass full sheets of decking to a team of two on the roof who will position the sheet for nailing. It is risky behavior for individuals to handle sheets by themselves.
- When placing felt, make sure the person unrolling the felt is aware of the roof edges.
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.
- For additional safety information, see Chapter 2.

Think About This...

- Take time to plan the layout so a minimum of cuts are made.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

7.1 DECKING

Standard sized 4-foot by 8-foot panels of OSB or engineered-decking material are used for decking. The panels are laid out on the roof lengthwise, with the joints staggered in a brick pattern and include an ⅛-inch gap between the short side (4-foot side) of decking (see Figure 7-1). It is also important to stagger the seams on the first course (and all subsequent odd-numbered courses) and the second course (and the subsequent even-numbered courses). This stagger distance is typically 48 inches. One sheet will usually cover five trusses [or four bays which are 24 inches on center (OC)]. Do not install pieces less than 40 inches long.

All decking should be cut on the ground and then installed.

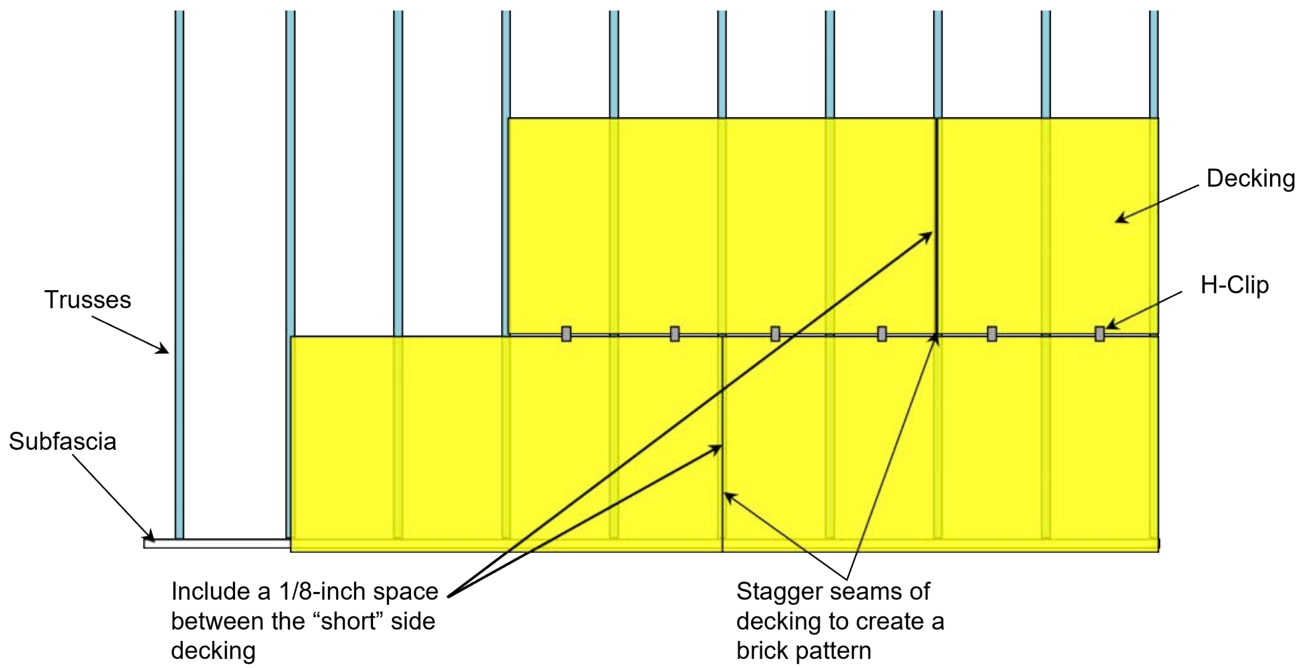


Figure 7-1. General Decking Layout

To determine the width of the first row of decking, divide the length (in inches) of the top cord of the trusses (measured peak to tail) by 48 (i.e., the width of decking); the resulting number will identify the number of full rows and remainder for the last row at the top of the roof. If the top row will be more than 10 inches, use full width (48 inch) panel for the first row. If the top row will be less than 10, the first row of decking should be ripped down to 36 inches to prevent a narrow piece of decking at the peak (ridge) of the house.

To establish the location for the first row of decking, subtract ½-inch from the width of the first row of decking (e.g., 48 inches minus ½-inch equals 47½ inches or 36 inches minus ½-inch equals 35½ inches). Use this measurement to mark from the outside top edge of the subfascia (see Figure 7-2) on the common trusses at the front and back of the house and the middle common truss. Using these marks, snap a chalk line across the top chords. Then project the chalk line to the fly rafters of the ladder panels. This allows the decking to overhang the subfascia. The decking along the rake is flush with the outside edge of the fly rafter on the ladder panel.

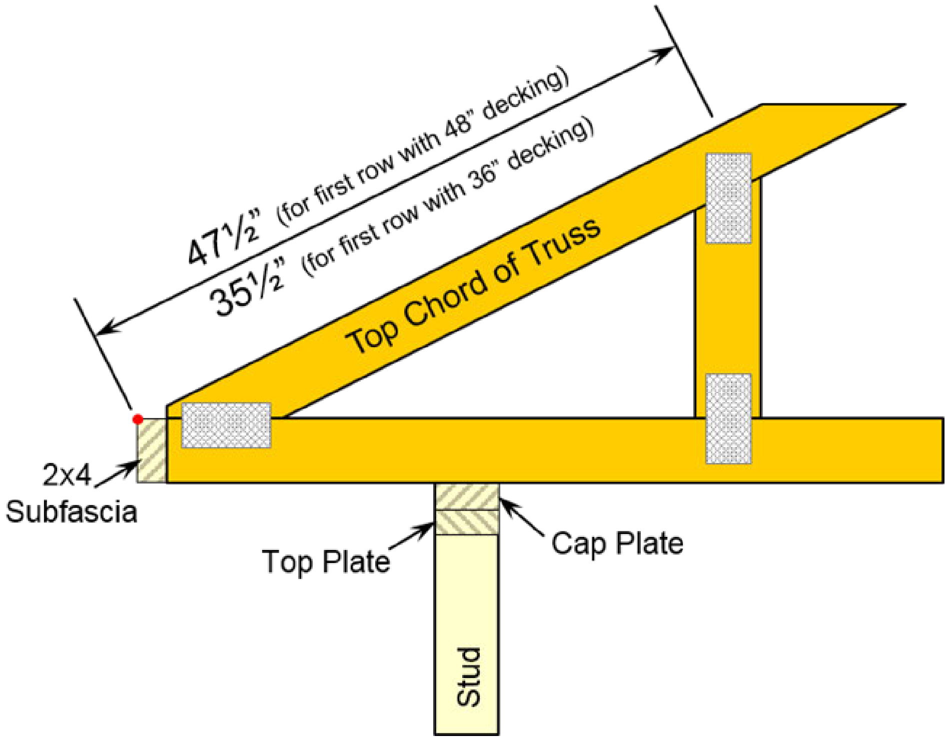


Figure 7-2. Measuring for First Row of Decking

If using OSB, the rougher side should be face up to provide extra traction on the roof.

The first row or course of decking will be aligned with the chalk line mark on each truss (see Figure 7-3). It is more important to follow the chalk line than for the decking to be exactly 47½ inches (or 35½ inches) on every truss. Bring the long edge of the decking panel to the chalk line and attach to the trusses using 8d nails every 6 inches on the edges and in the field (see Figure 7-4). Make sure the first row is on correctly before starting the next row.

Figure 7-3. Chalk Line for First Row of Decking

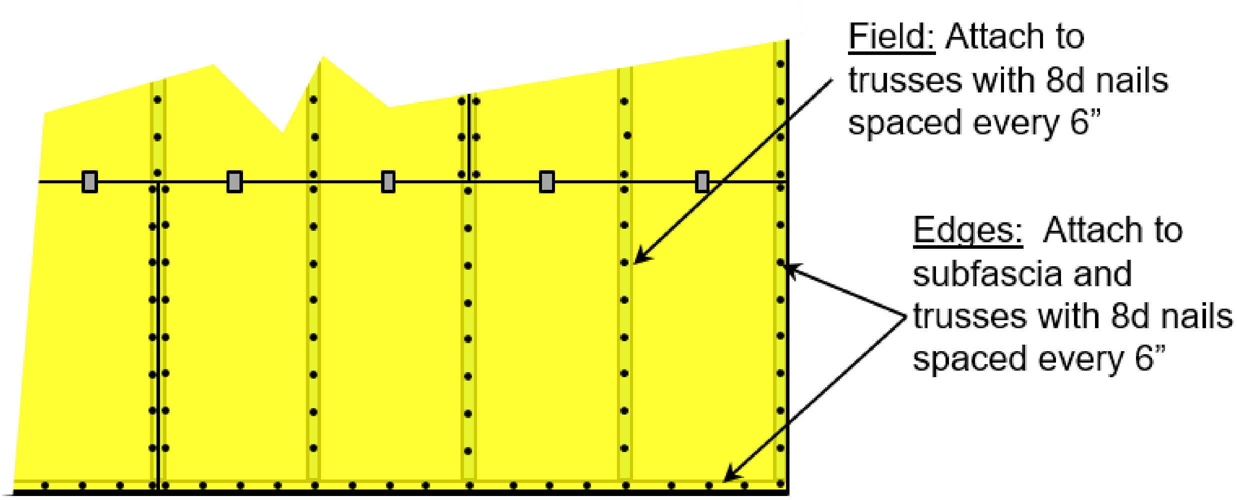


Figure 7-4. Nailing Pattern for Decking

Due to warping and bowing of lumber, trusses may not be 24 inches OC. The trusses may need to be pushed or pulled to maintain proper 24-inch OC spacing before nailing; measure before nailing. During installation, use a speed square to spot check the alignment/squareness between the decking and the trusses. If despite these adjustments the edge of each sheet of decking does not fall in the middle of the truss chord, install a 3 to 4-foot long 2x4 (called a scab) parallel and flush with the top chord of the truss. This provides a proper nailing surface for the decking. Use at least one 12d nail for each foot of the scab installed. Consult House Leader or DAHFH Construction Staff before scabbing.

Due to differences in OC spacing on the ladder panels, the first piece of decking will be less than a full sheet. This piece should span the entire ladder panel (the first two trusses) and, if possible, one common truss. The first piece of decking on the first course will need to be cut on the ground by the cut crew. The roof crew will take measurements to cover the ladder panel and tie into the roof (at least one truss bay). Subsequently, use full sheets until reaching the other end of the house (front gable), where the decking will again be cut to fit.

Place H-clips between each truss on the top edge of decking (see Figure 7-5). H-clips helps support the gap between abutting sheets of decking and should be installed with the smaller part of the clip open, to receive the next piece/course of decking.

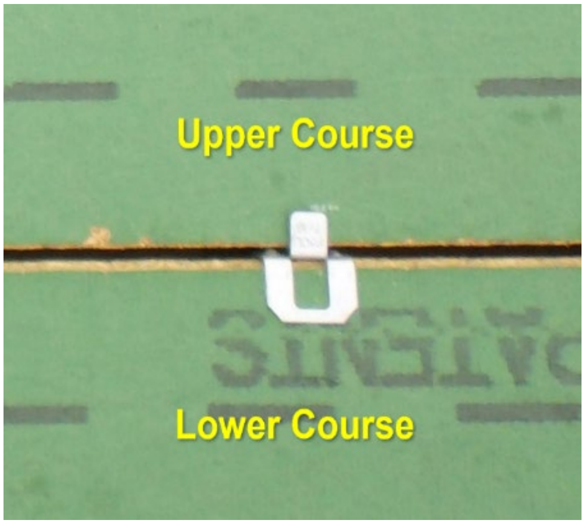


Figure 7-5. H-Clip (Wide Side of Clip is Attached to Lower Course of Decking)

In similar fashion to the first course, the second course will require the first piece be cut to create the proper stagger between the vertical seams in the first and second course (see Figure 7-1). Each subsequent course will require a similar cut (e.g., all subsequent odd-numbered courses should be the same and even-numbered courses should be the same) to maintain the proper offset between seams for all courses. These can be cut while lower courses are being installed.

The top row of decking will require a rip cut. The last course of decking on each side of the roof will meet flush to form the ridge. Measure from the top of the previous row of decking to the peak of the truss.

When the top row of decking requires a narrow piece of decking (e.g., less than 12 inches), use two H-clips per bay and spray paint the ridge to warn people not to step there.

Occasionally, decking may need to be cut slightly to fit. Mark the required cut on the decking on the roof and hand down to the cut crew for cutting. Check the fit and install. Whenever possible, butt factory edges together with the cut side at the outside rakes of the house.

7.2 PLUMBING VENTS

Plumbing vent stacks require holes to be cut in the field of some sheets of decking. To determine the location of the hole, measure from the top edge of decking in the course below the vent stack to the center of the vent and from the leading edge of the last piece of decking in the same course to the center of the vent. Where these two intersect should be the center of the vent stack. The ground crew will cut a hole centered on this mark, usually no more than 2 to 3 inches square (see Figure 7-6). This size allows for some play in final positioning of the decking, while not breaking the PVC pipe.

Figure 7-6. Plumbing Vent Stack in Decking

Use a circular saw to make a four-sided plunge cut. Hold the front or side edge of the plate of the saw on the decking, lift the blade guard, and sight down the blade to align it with the line drawn on the decking. Slowly lower the blade into the decking until the length of the line and slightly beyond has been cut. Repeat on the other three sides of the square. Punch out with a hammer. It is not necessary for this hole to be round or fit too tightly to the plumbing vent.

7.3 TAPING SEAMS

To help seal the decking, flashing tape is applied to the seams. Drip edge (see Section 8.2) must be installed prior to taping the seams. Additionally, apply a 2-inch square of butyl tape over each H-clip to smooth the edges of the clips so the ZIP flashing tape can properly seal the decking (see Figure 7-7).

Figure 7-7. Apply 2-Inch Square of Butyl Tape over Each H-Clip

Apply the ZIP flashing tape horizontally along the drip edge and first row of decking, centering the tape on the joint. Then apply the flashing tape to the vertical seams on the first row of decking; center the tape on the seams. The tape should be flush with the bottom of the horizontal tape and extend approximately 2 inches above the decking seam of the row above. Then apply the tape horizontally on the seam between the first and second rows of decking next. Continue this process, working toward the ridge of the house (see Figure 7-8). The ridge will likely require two rows of tape to completely cover the ridge. The joint between the drip edge and decking along the rake should be the last to be taped.

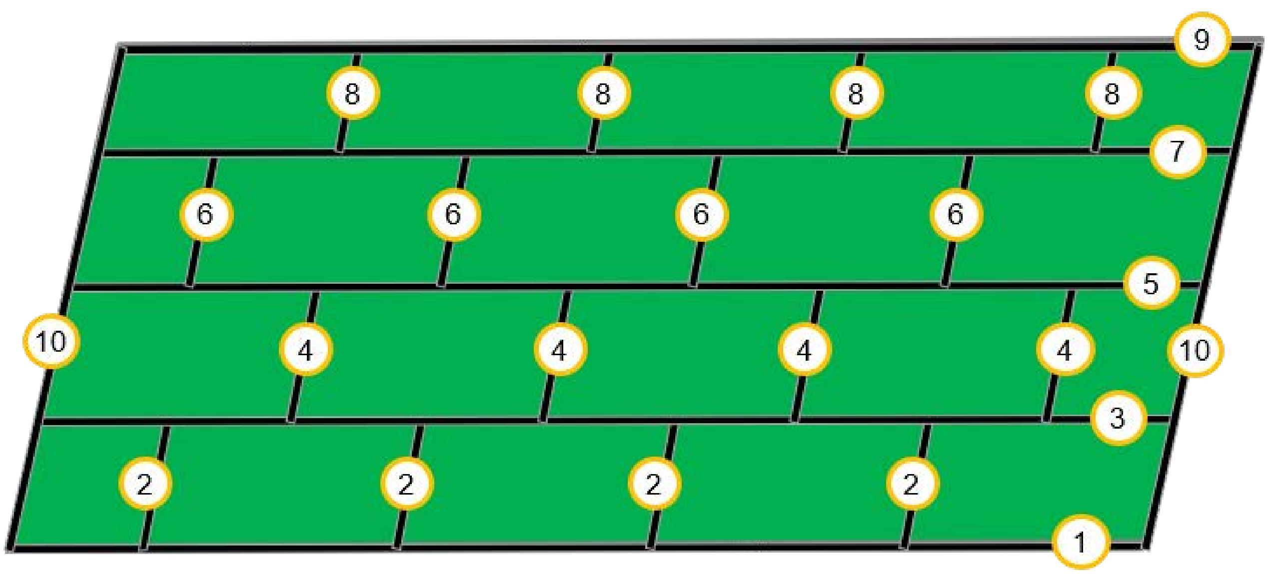


Figure 7-8. Sequence of Taping Decking Seams

Additional areas that must be taped include:

- Any damaged areas or nail holes from cleats (apply the flashing tape on the area, covering a minimum of 1-inch around the damage/hole).
- The seam between the roof decking and gable sheathing.
- Kick-out flashing (see Section 8.1).
- Roof vent caps (see Section 8.7).

Use the longest possible strip, overlapping the top of the vertical strips. Wherever a tape splice occurs, overlap the tape by at least 3 inches. Ensure the tape adheres fully to the decking to create a tight seal with no wrinkles or deformations by using a roller during installation. If wrinkles do occur, try to roll the wrinkles out using the tape roller. If rolling the tape does not remove the wrinkles, remove that section of tape and apply a new piece of tape that overlaps the existing tape by 3 inches or place another piece of tape over the wrinkle and roll the tape.

The ZIP tape surface is slick, avoid stepping on it once applied.

7.4 BRICK LEDGER BOARD SUPPORT

To provide additional support for the bricks, install 2x4 blocking/bracing under the brick ledger board (see Section 8.5) that will be set on top of the decking. In this area, the weight of the bricks can cause the decking to sag over time. Blocking should be placed on the garage wall by the porch and/or on the rat run (in front of the front gable truss) (see Figure 7-9).

Figure 7-9. Add Support for Brick Ledger Boards (Highlight in Yellow)

7.5 ROOFING FELT

If OSB is used for roof decking, roofing felt must also be installed. Roofing felt provides a vapor barrier between the OSB and the shingles. Before applying the felt, inspect the decking to ensure it is properly nailed off. Felt should not be installed during any sort of precipitation because the decking will be too slippery.

Start rolling the felt paper along the eave, keeping the felt paper even with the edge of the first row of decking. If fascia along the rake has not been installed, run paper long (about 3 inched) so it can be cut back to fascia after it is installed. Unroll five to six feet at a time and make sure the roll is square with the roof and the felt lies flat before nailing in place. Work from one end of the roof to the other to avoid buckles in the felt paper, which can be visible after the roof is shingled. Make sure the person unrolling the felt is aware of the roof edges. The felt should overlap valleys and ridges by about 6 inches.

Secure the felt with three rows of button caps (see Figure 7-10). The button cap nails should be spaced 6 inches along the bottom and edges; however, be sure not to nail into the drip edge or where the drip edge will be installed (come in about 3 inches from the bottom/side of the felt). The top row of button caps is not nailed until the next row of felt is rolled out. The next row of felt should overlap the first by about 4 inches. Next, a row of button caps is nailed through the new row of felt and the top of the last row of felt which is just beneath it.

Button caps should not be nailed any closer than 3 inches from edge (bottom or side) of roof so the drip edge will lay flat.

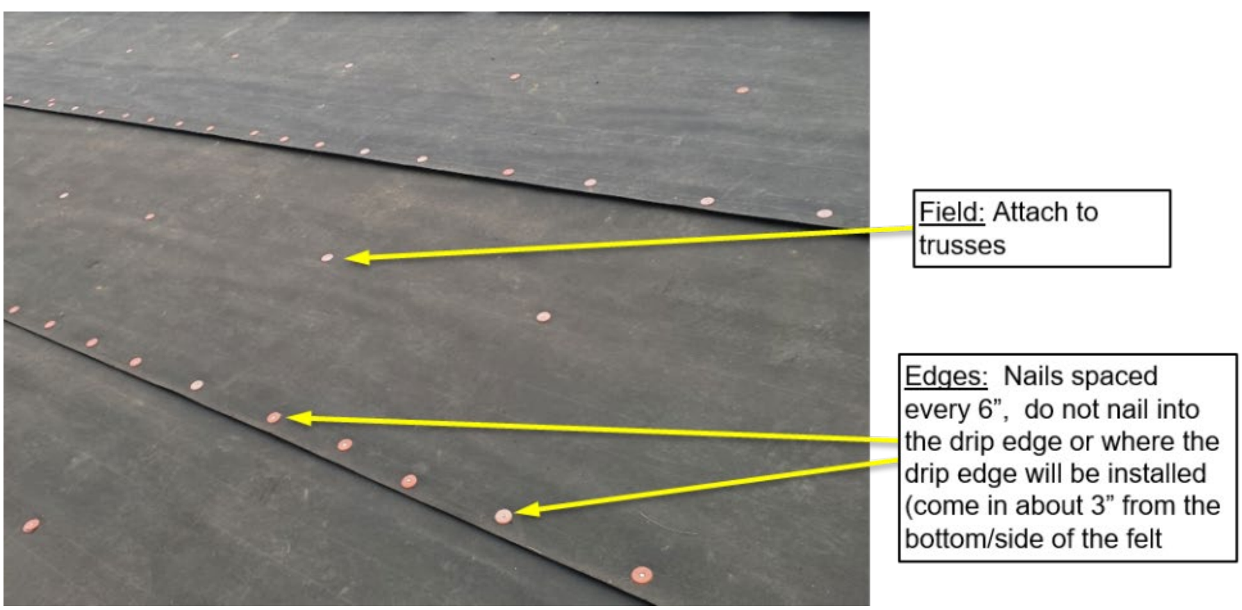


Figure 7-10. Nailing Pattern for Applying Felt

7.6 COMMON ISSUES AND SOLUTIONS

- Minimum Size for Decking

Decking should be a minimum of 6 inches wide and at least 4 feet long. Shorter pieces may not be adequately attached to the trusses and could tear off in a high wind (particularly if the short piece is on the edge). For pieces of decking less than 8 inches wide, use two H-clips per truss bay rather than one. Also, spray paint the felt paper 12 inches down from the ridge to warn volunteers to be cautious of the narrow strips.

CHAPTER 8: ROOFING

Tools and Materials

- Hammer
- Measuring Tape
- Chalk Line
- Nail Puller/Cat's Paw
- Utility Knife
- Hook Blades
- Lumber Crayon or China Marker
- Metal Snips
- Caulk Gun
- Framing Square
- Shingle Cutter
- Ladders
- Broom
- Hard Hat
- 2x6 Pressure Treated Lumber
- 4-Inch Deck Screws
- Drip Edge
- Starter Strips
- Shingles
- Ridge Cap
- PVC Boots
- Roofing Tar
- Step Flashing
- Black Spray Paint
- Ridge Vent
- Roofing Nails
- Button Caps

Safety

- Volunteers may not wear leather-soled or slick-soled shoes on the roof. Soft-soled shoes are recommended when working on the roof.
- Extension ladders are used to access the roof. Ladders should extend at least three rungs beyond the edge of the roof. Do not use A-frame ladders to access the roof.
- Be sure all ladders are properly positioned and stable. Follow all ladder safety rules (see Table 2.3).
- Ladder access to the roof should not be removed as long as anyone is on the roof.
- For 5 or 6 pitch roofs, install a cleat (nailed into at least three trusses) by the ladder when loading the shingles for extra footing.
- Any tools or material brought up to the roof must be secured with nails or cleats, or in workers' tool belts.
- Keep the roof clean by sweeping the roof periodically to remove any dirt or loose particles from the shingles.
- At the end of a row do not nail a shingle in place, allowing it to run long, and then lean over to cut flush with the drip edge.
- Remind volunteers not to "chase" anything.
- A drop zone should be established; materials should only be dropped from this location. Before tossing any scrap material off the roof, make sure it will not hit anyone on the ground. This also applies to sweeping dirt or loose particles off the roof.
- Place at least one bundle of shingles at the base of the extension ladder to help keep from moving when loading shingles.

- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.
- For additional safety information, see Chapter 2.

Think About This...

- When installing drip edge on install the corners first. On gables, start at the bottom (low end) and work up to the peak to maintain the correct overlap. On eaves, start at the back of the house and work towards the front.
- To minimize trash in the neighborhood, try to keep the wrappers from the shingles from landing or blowing into adjacent yards.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

8.1 KICK-OUT FLASHING

Where the eave of the house ties into a gable end, kick-out flashing is needed help to divert water away from the adjacent wall. Prior to installing the fascia (see Section 9.1) and drip edge (see Section 8.2), install kick-out flashing (see Figure 8-1). The decking must be trimmed flush to the subfascia board before installing the kick-out flashing. For siding, the kick-out is placed against the Blue Board. If the gable will be covered with brick or stone, the kick-out flashing needs to be offset from the house to allow for the brick ledger board (see Section 8.5) to support the brick/stone.

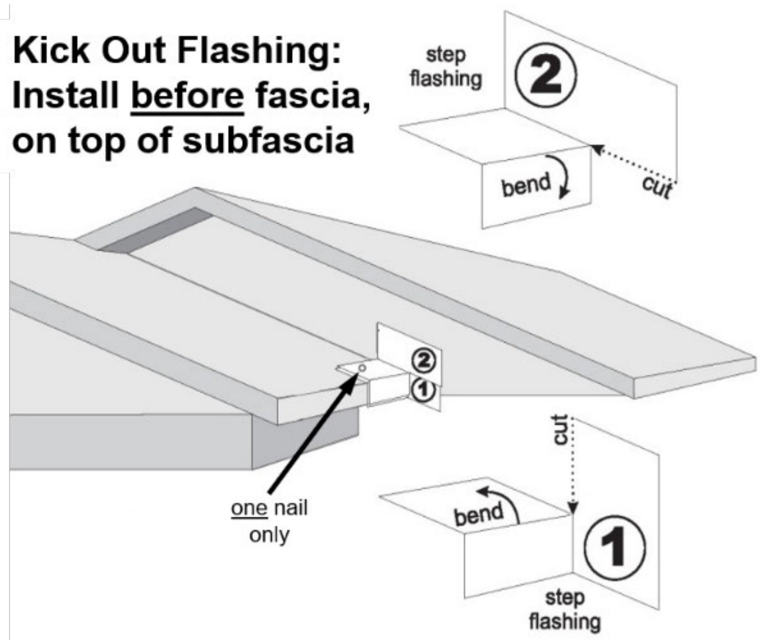


Figure 8-1. Kick-Out Flashing

Figure 8-2. Kick-Out Flashing Placement at Siding Wall

8.2 DRIP EDGE

Drip edge is installed on the outer edges of the decking. Drip edge is a type of flashing that helps keep water from wicking back under the shingles. Without a drip edge, water may run down the side of the fascia and siding - causing stains and eventually water damage. Drip edge cannot be installed until the fascia is installed (see Section 9.1).

Drip edge is easiest to install with two people. If felt paper has been installed over the decking, make sure the felt paper is not hanging over the edge and there are button cap nails along the edges that would be underneath the drip edge. Prior to installing, make sure the drip edge is not damaged (bent or twisted). The vertical edge of the drip edge butts against the fascia; do not force drip edge tight against fascia because this can lead to the bottom edge standing away from the fascia when nailed. Drip edge should be installed under the felt paper along the eaves and over the felt paper on the rakes (see Figure 8-3).

Figure 8-3. Felt Paper Goes Over the Drip Eave Along Eaves and Under Along Rakes

8.2.1 CORNERS

Corners are formed by two pieces of drip edges, each a minimum of 12 inches. The rake piece should be over the piece on the eave. Cut a slit in the eave piece of drip edge, just under the lip (see Step 1 in Figure 8-4). Using a speed square, bend the vertical part of the drip edge back 90 degrees (Step 2 in Figure 8-4). This creates a small “tab” that allows the drip edge to wrap from the eave to the rake. Trim the top portion of the eave drip edge to ½ inch from the bend (Step 3 in Figure 8-4). Interlock the eave piece with the rake piece. Cut the rake piece just deep enough to match the lip of the eave piece. Cut the vertical piece at an angle to match the fascia/ pitch of the roof (Step 4 in Figure 8-4). The drip edge should interlock with the rake piece resting on top of the eave piece (see Figure 8-5). Finally, tuck the folded eave piece behind the rake piece to form a secure corner wrap for the corner of the fascia.

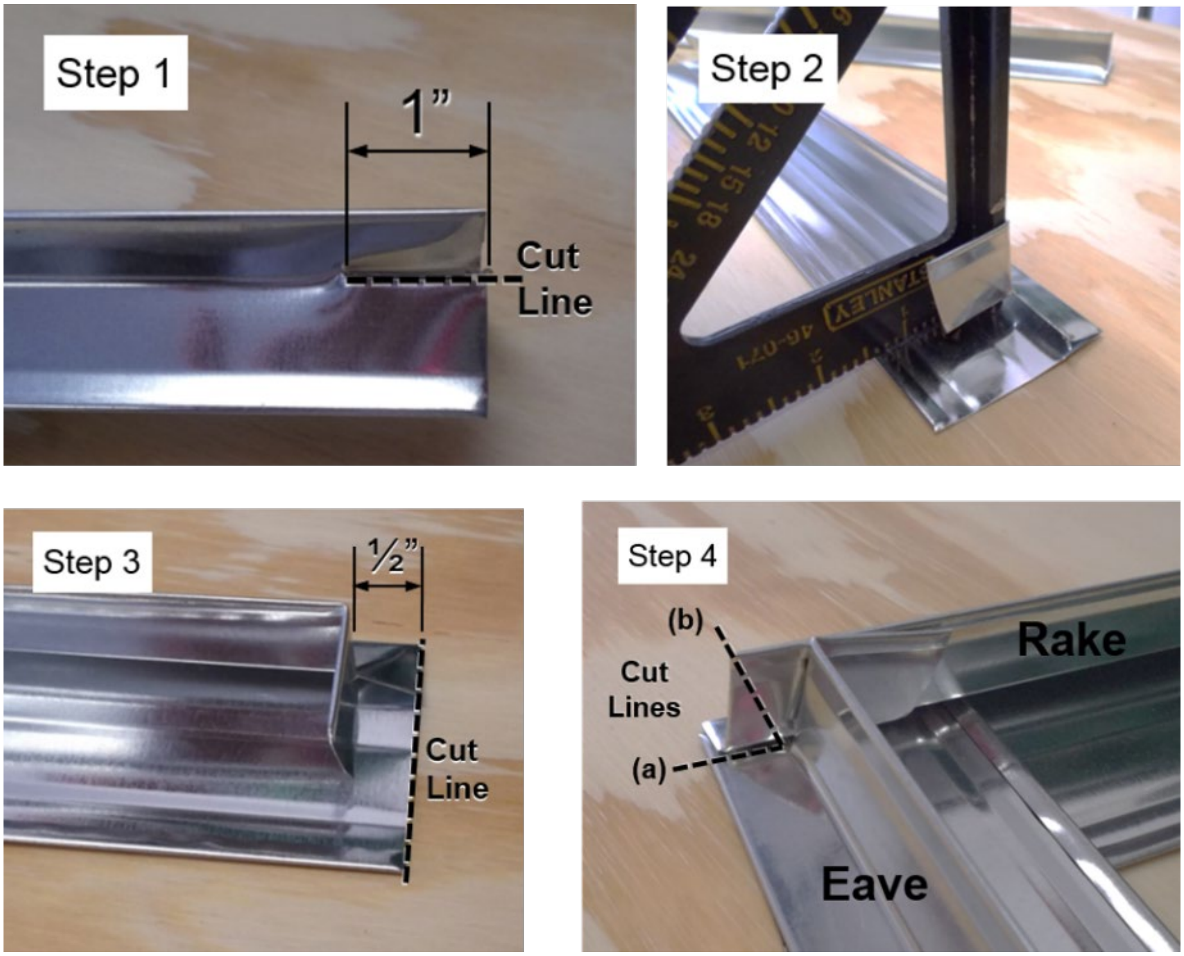


Figure 8-4. Drip Edge Corner

Figure 8-5. Installed Drip Edge at Corner

8.2.2 EAVES

Start from the back of the house and work down the eaves, toward the street, overlapping at least 3 to 4 inches. Nail from one end to the other so there are not any bulges along the drip edge. Use a roofing nail every 16 to 18 inches through the drip edge and into the sheathing.

8.2.3 RAKE

When running drip edge along the rakes, start at the bottom, making sure the pieces overlap so water runs over and not under the drip edge (Figure 8-6). At the peak of the roof, make a relief cut on the front vertical section of the drip edge and then bend it over the peak; do not cut the top section (Figure 8-7). Peaks should be the last pieces attached so the top piece is over the corresponding pieces on either side. Be sure the seams are at least 12 inches from the top of the peak.

On the rake, make sure the drip edge overlaps so the water runs over and not under the drip edge

Figure 8-6. Placement of Drip Edge on the Rake

Figure 8-7. Drip Edge over Peak

8.3 STARTER STRIP

Similar to the drip edge, the starter strip is placed on both the rake and eave edges of the roof. The starter strip may come in perforated sheets with two-starter strips per sheet; separate the starter strips by folding at the perforation. If 3-tab shingles will be installed, the starter strip should overhang the drip edge by a ½-inch along the eave. Starter strip is usually 6⅝ inches wide (verify the width before marking). From the outer or lower edge of the drip edge, mark 6⅛ inches (see Figure 8-8). Use these marks to snap a chalk line. Align the long edge of the starter strip along this line to ensure an even ½ inch overhang. If architectural shingles will be installed, the bottom edge of the starter strip should be flush the lower edge of the drip edge. Along the rake, the outside edge of the starter strip should be flush with the drip edge for both architectural and 3-tab shingles.

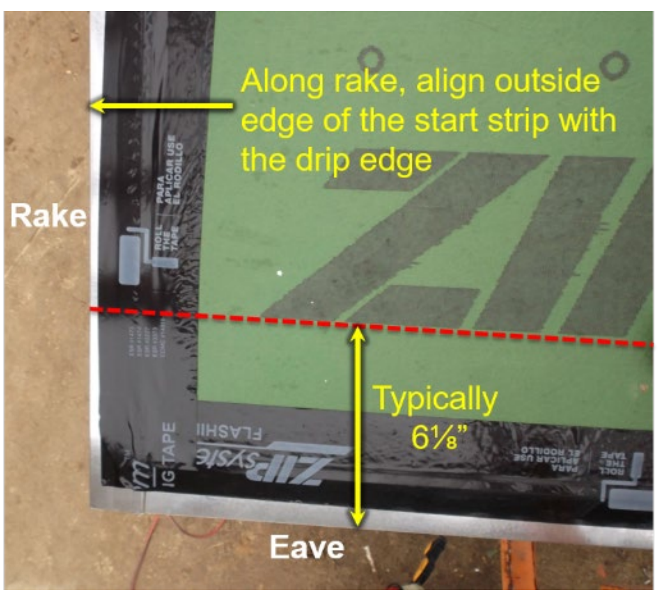


Figure 8-8. Marking Starter Strip Overhang Along Eave for 3-Tab Shingles Only

For architectural shingles, lay the starter strip tar side down. For 3-tab shingles, lay the starter strip tar side up. In both cases, lay the rake piece first and then the eave pieces next (see Figure 8-9). This will ensure the starter strip and first course of shingle seams are staggered, not lined up. Butt the edges and nail with four evenly spaced roofing nails; the nails should not penetrate the drip edge. At the peak, use a full-length starter strip and bend over the peak so the middle of the starter (lengthwise) is at the peak to allow good coverage of the peak (see Figure 8-10).

Figure 8-9. Starter Strip at Corner

Figure 8-10. Starter Strip at Peak (Shown for 3-Tab)

8.4 INSTALLING SHINGLES

Basic rules for installing shingles:

- For the first row of shingles, the bottom edge should align with the bottom edge of starter strip for 3-tab shingles (i.e., overhang the drip edge by ½ inch) or even with the drip edge if installing architectural shingles.
- Start shingling from the front of the house. This makes a cleaner edge at the front of the house where it is most visible.
- The side of a shingle should butt up to the one next to it; do not overlap. Be sure the shingle lays flat before nailing, especially in extreme temperatures.
- Do not nail into the drip edge.
- Use four nails for full shingles and three nails for shingles less than 13 inches.
- The last shingle of the row should be cut to fit.
- No cuts should be less than 10 inches.
- Seams should be a minimum of 6 inches apart.
- Do not follow the lines on the felt paper.
- Do not let the last shingle of a row to run long and then lean over the edge to cut. Trying to cut off overhanging shingles usually results in a jagged cut and is not a safe practice, especially if people are working below.

8.4.1 ARCHITECTURAL SHINGLES

For the first row of shingles, the bottom edge should align with the drip edge. For the remaining rows, the bottom edge of each row of shingles should be placed flush with the top of the cut or ridge of the shingle in the row below. Depending on the shingle brand, nail just above white or orange line or on the fabric strip above the ridge of the shingle. Nail both ends first (about 2 inches in from the sides) and then add two more nails equally spaced in the middle (see Figure 8-11). The nails will be going through the shingle below as well.

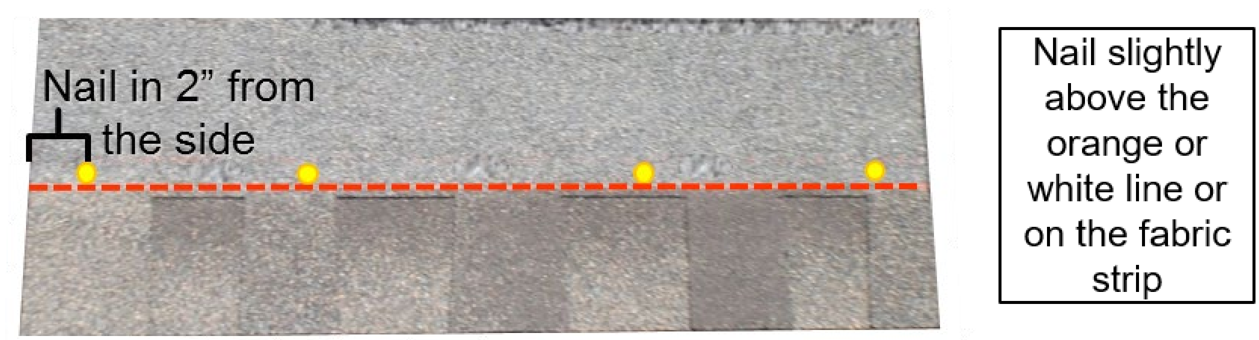


Figure 8-11. Nailing Pattern for Architectural Shingles

Beginning at the front of the house, align the first row flush with the starter strip along the eave and rake and install the first row or course. To create the stagger so the seams do not line up, cut a full shingle (39⅜ inches long) at approximately 26 inches (leaving 13 inches). The first course starts with a full shingle, the 26 inches ($^2/_3$ shingle) piece starts the second course, and the 13 inches (⅓ shingle) piece the third course. Repeat this pattern to stagger the seams at the beginning of each course or row (see Figure 8-12). Align shingles flush with the ridge of the course below it (see Figure 8-13). When placing shingles at the beginning of each row, make sure the shingle is properly aligned with the shingle on the previous row and then align with the drip edge/starter strip at the front of the house. It is more important to align with the previous row than the drip edge along the rake.

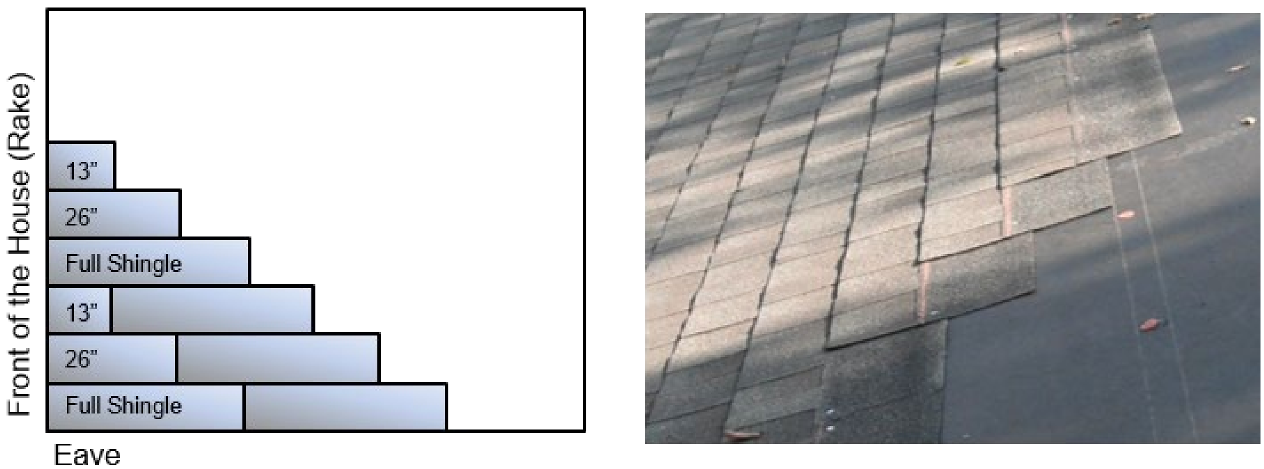


Figure 8-12. Stagger for Architectural Shingles

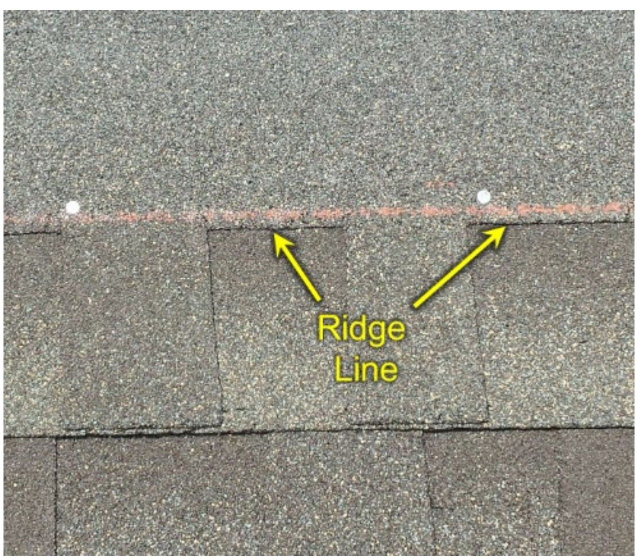


Figure 8-13. Align Bottom of Next Row of Shingles with the Ridge of the Row Below

At the end of a row, cut the shingle to fit before nailing. Lay the shingle down and nick on both ends with a knife or nail where the shingle hangs over. Cut using a shingle cutter or straight edge such as a framing square. It is best to avoid leaving a small strip of shingle at the end of a row. Shingles smaller than 10 inches are not acceptable; strong winds can lift up smaller shingles. Plan ahead and cut the next to last shingle if necessary to avoid a narrow piece.

When nailing near the edge, do not nail through the drip edge. Continue shingling until the orange or white line on the shingle is within 5 inches from the peak of the roof. Shingles may need to be cut down lengthwise to fit in one last row before installing the ridge cap.

Be sure to measure the roof periodically (i.e., every five to six rows); measure at each end and in the middle. Measure from the top-down or from the bottom-up (using the second row, not the drip edge or first row). If measuring from the top, insert a nail into the peaks of three common trusses, one at each end of the roof and one in the middle. Next, pull a tape from the nail or second course, to the top of the shingles. Now, repeat this step over again in the middle and at the other end of the roof. Ideally these measurements will be the same. If the measurements vary by more than ½-inch, snap a chalk line as a reference line for the next course (see Section 8.10). This will ensure all courses are parallel and uniform.

8.4.2 3-TAB SHINGLES

For the first row of shingles, the bottom edge should align with the starter strip (i.e., overhang the drip edge by ½-inch along the eave, flush along the rake). Nail both ends first (about 2 inches in from the sides) and then add two more nails equally spaced in the middle (see Figure 8-14). The sides of the shingles should butt together on the upper part of the shingle; on the lower half the sides do not meet and form a slot (see Figure 8-15).

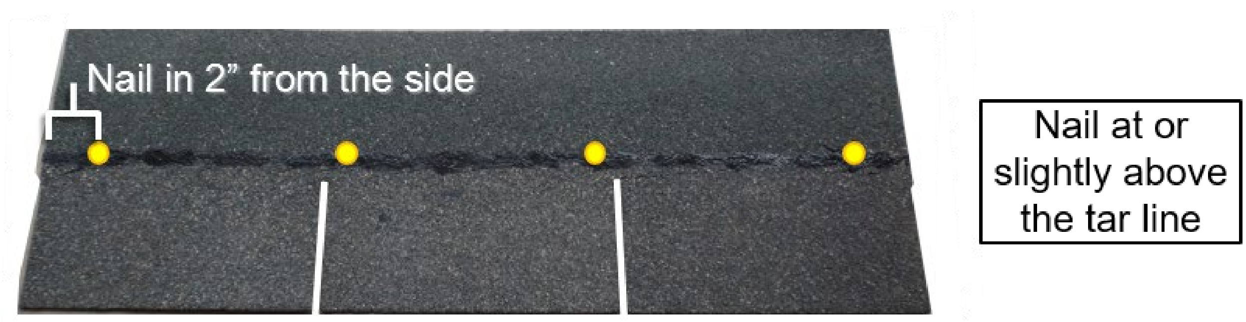


Figure 8-14. Nailing Pattern for 3-Tab Shingles

Figure 8-15. Butt Shingles Together on the Upper Part

Beginning at the front of the house, align the first row flush with the starter strip along the eave and rake and install the first row or course. To keep the subsequent rows aligned horizontally, a chalk line should be snapped every row. To establish the marks for the chalk lines, measure and mark every 5 inches (for 5-inch reveal) from the top of the first row of shingles up to the peak (see Figure 8-16). Mark at least three locations (both ends and middle). For longer roofs or in areas with plumbing vents, additional locations may need to be marked. Also, number the marks to help ensure the same mark is used when snapping the chalk line. For the remaining rows, the top of the shingle will be aligned with the chalk line and nailed in place.

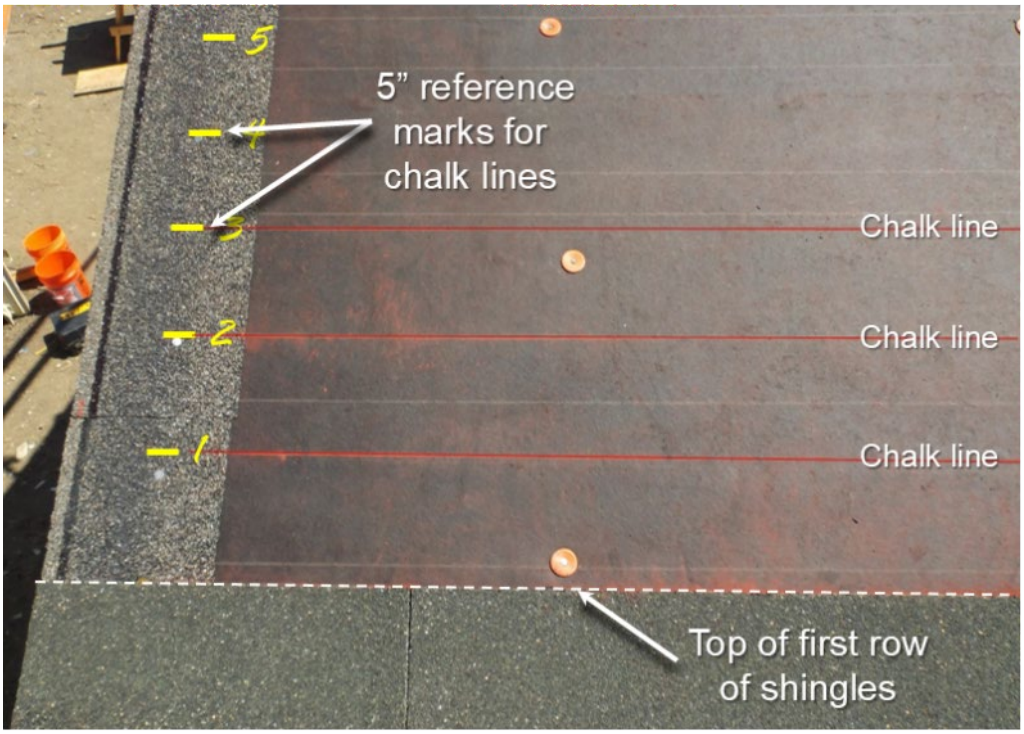


Figure 8-16. Chalk Lines to Maintain Horizontal Alignment of 3-Tab Shingles

To create the stagger so the seams do not line up, cut approximately 6 inches (half tab) off a full shingle on the side that will align with the front rake. Normally, 3-tab shingles have small cuts along the top edge of the shingles to mark the center point of each tab to indicate the 6-inch mark (see Figure 8-17). The first course starts with a full shingle, second course begins with a 2½ tab shingle, third course starts with 2-tab shingle, and the fourth course begins with a 1½ tab shingle (see Figure 8-18). Repeat this pattern to stagger the seams at the beginning of each course or row. It is also important to line up the "slots" of the shingles to create a brick pattern (see Figure 8-19).

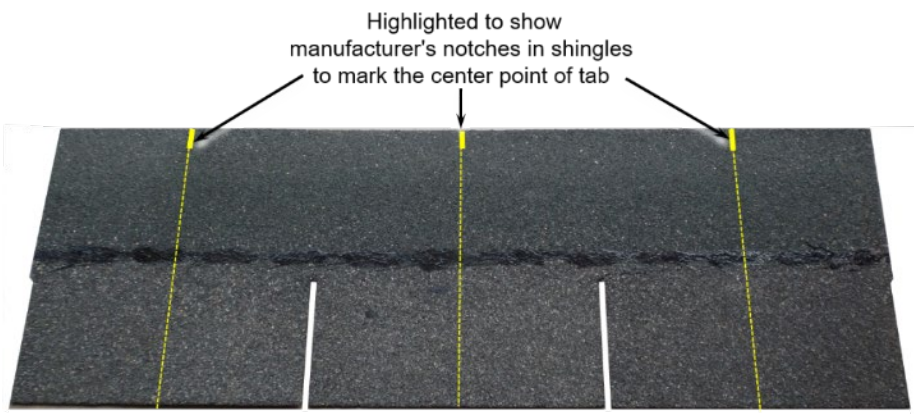


Figure 8-17. Location of Notch to Denote Center of Tab

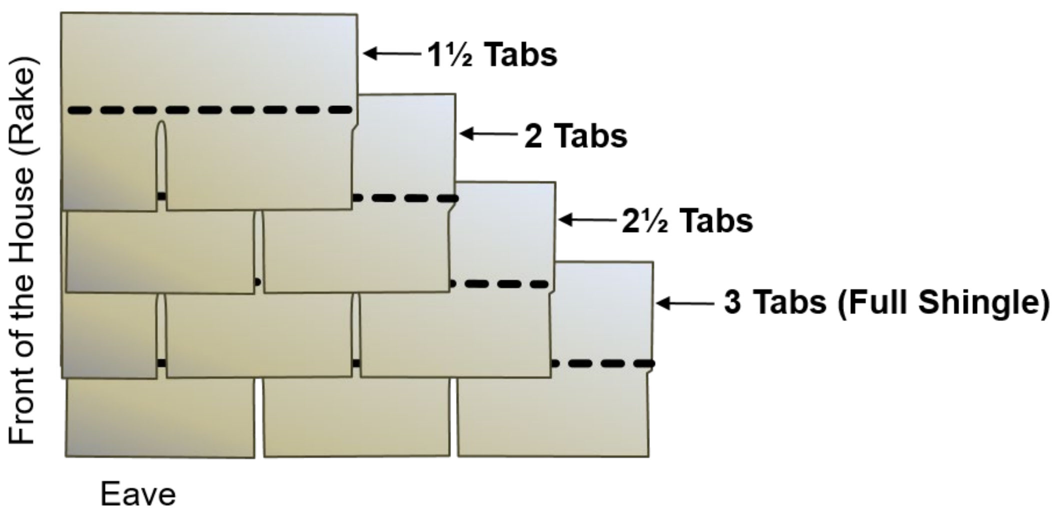


Figure 8-18. 3-Tab Stagger

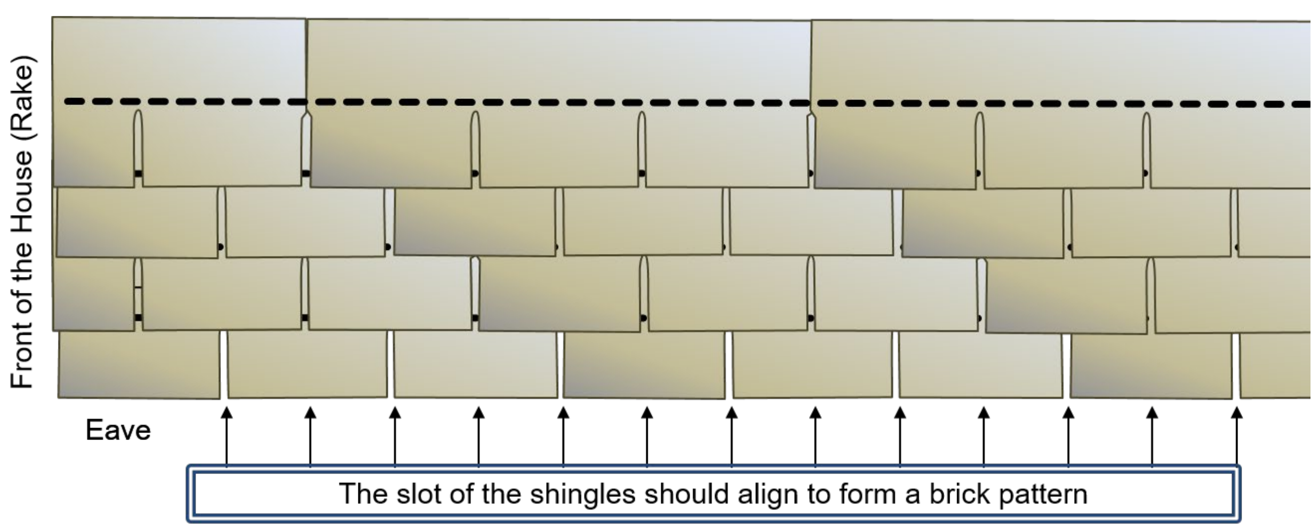


Figure 8-19. Maintain "Brick" Pattern of Slots

At the end of a row, cut the shingle to fit before nailing. Lay the shingle down and nick on both ends with a knife or nail where the shingle hangs over. Then, using a straight edge such as a framing square, turn the shingle over to the non-aggregate side and cut. Cut on top of an old shingle or scrap board so the felt or shingles already nailed down are not cut.

It is best to avoid leaving a small strip of shingle at the end of a row. Shingles smaller than 10 inches are not acceptable; strong winds can lift up smaller shingles. Plan ahead and cut the next to last shingle if necessary to avoid a narrow piece. When nailing near the edge, do not nail through the drip edge. Continue shingling until the tar line on the shingle is within 5 inches from the peak of the roof. Shingles may need to be cut down lengthwise to fit in one last row before installing the ridge cap.

8.4.3 VALLEY

Prior to rolling felt on the roof, the valley membrane, a 36 inches wide self-adhesive material with a paper backing, should be rolled directly on the decking down the valley. The material should be long enough to extend both above the top of the valley and beyond the eave along each outside edge of the valley. If multiple pieces are used each successive piece should overlap the one below by at least 6 inches.

Once the membrane is rolled out down the valley, fold it in half lengthwise to expose one side of the paper backing which is split lengthwise down the middle. Starting at the bottom of the valley, one person should hold the membrane in place while a second person peels away the paper backing a few feet at a time and pressing it onto the bare side of the valley. Always work from the centerline of the valley outwards to eliminate air bubbles and ensure uniform adhesion.

Once one side of the valley is complete, repeat the procedure for the opposite side. Trim excess material at the bottom so it is flush with the drip edge. Cut the material as necessary at the top of the valley so it lies flat on the roof decking with no bubbles. Felt paper may then be applied to the entire roof (see Figure 8-20). Nail with button caps along edges of the valley; do not put nails within 6 inches of the valley.

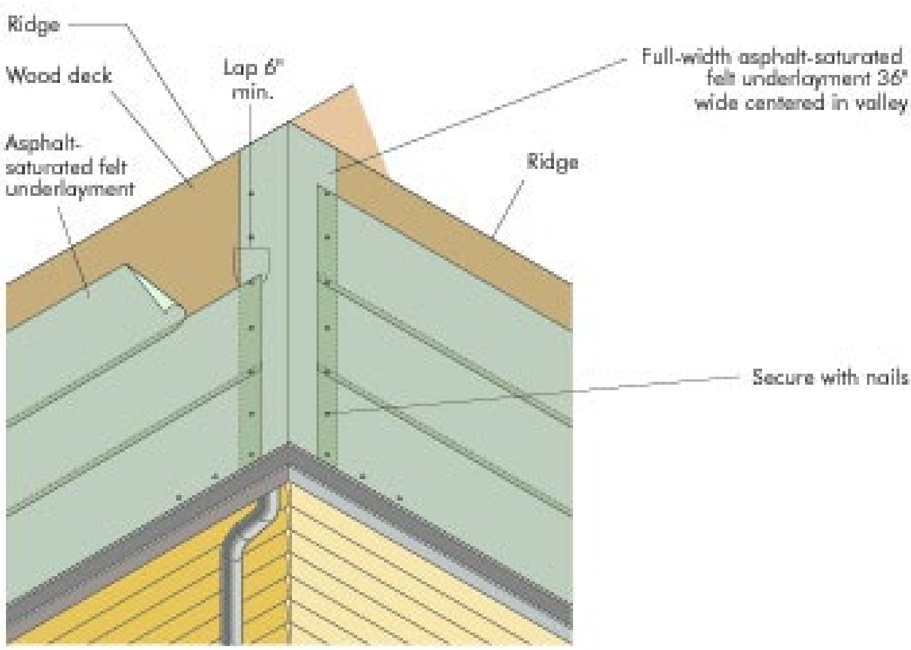


Figure 8-20. Placement of Membrane in Valley

Starting from the valley and working out, nail in the first course of shingles. As close to the valley as possible, place a measuring tape at the top of the first shingle and mark every 11 inches (11, 22, 33, etc.) if using architectural shingles to the peak of the roof (see Figure 8-21). This creates an exposure of 5½ inches for every two courses. If using 3-tab shingles, mark every 5 inches (5, 10, 15, etc.) to the peak of the roof to create an exposure of 5 inches. Repeat this process on the rake of the roof. Pull a chalk line across the marks (extending into the valley). Work from the valley outward toward the rake of the house.

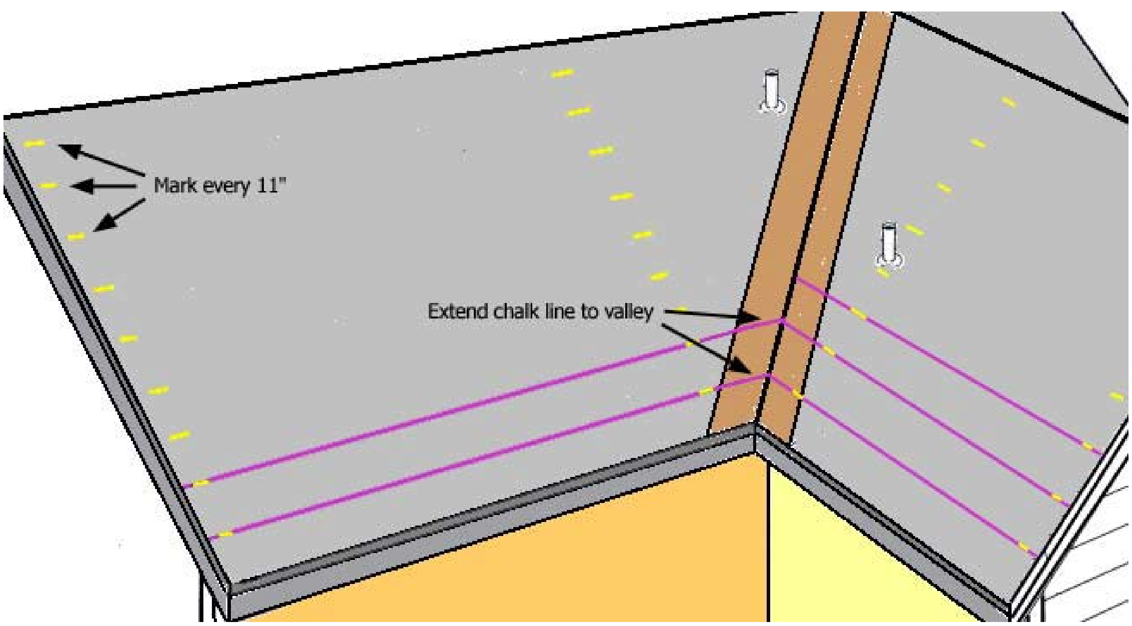


Figure 8-21. Chalk Lines for Valley

Start with and complete the side that has the lesser surface area before doing the other side of the valley. Align the bottom corner of shingle with far edge of felt roll and proceed across roof. Every other course should line up with the chalk line. Snap chalk line going up the center of valley (see Figure 8-22a). Place row of shingles vertically on the chalk line going up the valley (see Figure 8-22b). Now work on the side of the valley that has the greater surface area. Align the corner of the first shingle of each row within the edge of the shingles in the valley. The bottom corner should meet with the corner of the shingles on the adjacent roof plane (see Figure 8-22c). Every other course should line up with the chalk line.

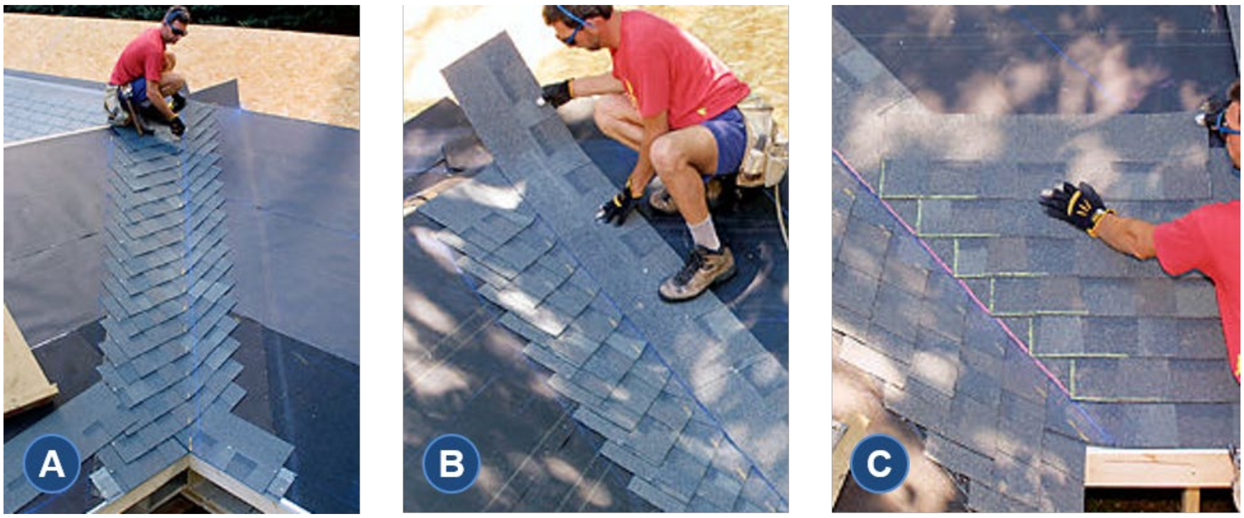


Figure 8-22. Shingling in a Valley

8.4.4 HIP ROOF

Beginning at one end of the hip roof, align the bottom corner of the first shingle with the starter strip along the eave and the ridge of the hip roof; the top of the shingle will overlap the hip peak. Nail the shingle in place and then trim the shingle to match the angle and location of the hip ridge. Shingle the remainder of the row as described in Section 8.4.1 for architectural shingles or Section 8.4.2 for 3-tab shingles. At the end of the row, nail the last shingle in place and then trim the shingle to match the angle and location of the ridge. At the beginning of next row, align the shingle up with the ridge of the shingle on the row below and the ridge of the hip roof. The shingle may need to be shifted to ensure the seams are a minimum of 6 inches apart.

8.5 BRICK LEDGER BOARD

Prior to beginning a roof section adjacent to a gable, consult with the house plans or House Leader to determine if the gable will be covered in siding or brick. If the gable will be bricked, a brick ledger board must be installed prior to roofing that section. The brick ledger board is comprised of three 2x6 pieces of lumber set on edge with a spacer and nailed into the gable (see Figure 8-23). The angle at the lower end of the boards should be the same as the pitch of the house and the angle cut at the top end of the boards should be 45°. Use 4-inch deck screws spaced at 24 inches to secure into the truss.

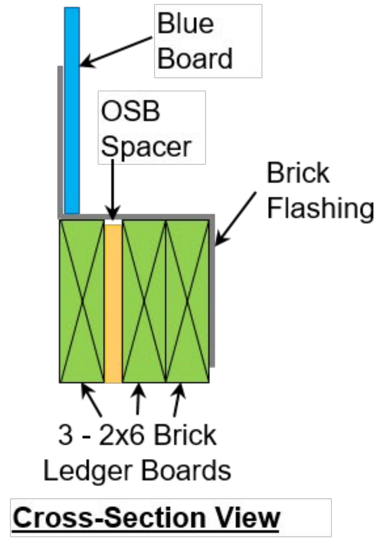


Figure 8-23. Brick Ledger Board

8.6 STEP FLASHING

Step flashing provides a barrier against water intrusion where a wall and a roof meet. If the gable will be clad in siding, the Blue Board must be installed prior to roofing. If the gable will be bricked, the brick ledger boards (see Section 8.5) must be installed prior to roofing.

Step flashing must be installed as the roof is shingled because each row of shingles overlaps the previous piece of flashing. Set the step flashing in place (see Figure 8-24a). Use the orange or white line or tar line of the course below as a guide for the bottom edge of the flashing; flashing should not protrude farther than the bottom edge of the next shingle. Then set the shingle in place (see Figure 8-24b). Nail the shingle in place; the end nail of the shingle should also go through the step flashing and hold it in place (see Figure 8-24c). This process will continue up the entire roof. After the step flashing has been installed, use WeatherMate or butyl flashing tape to cover the top edge of the step flashing.

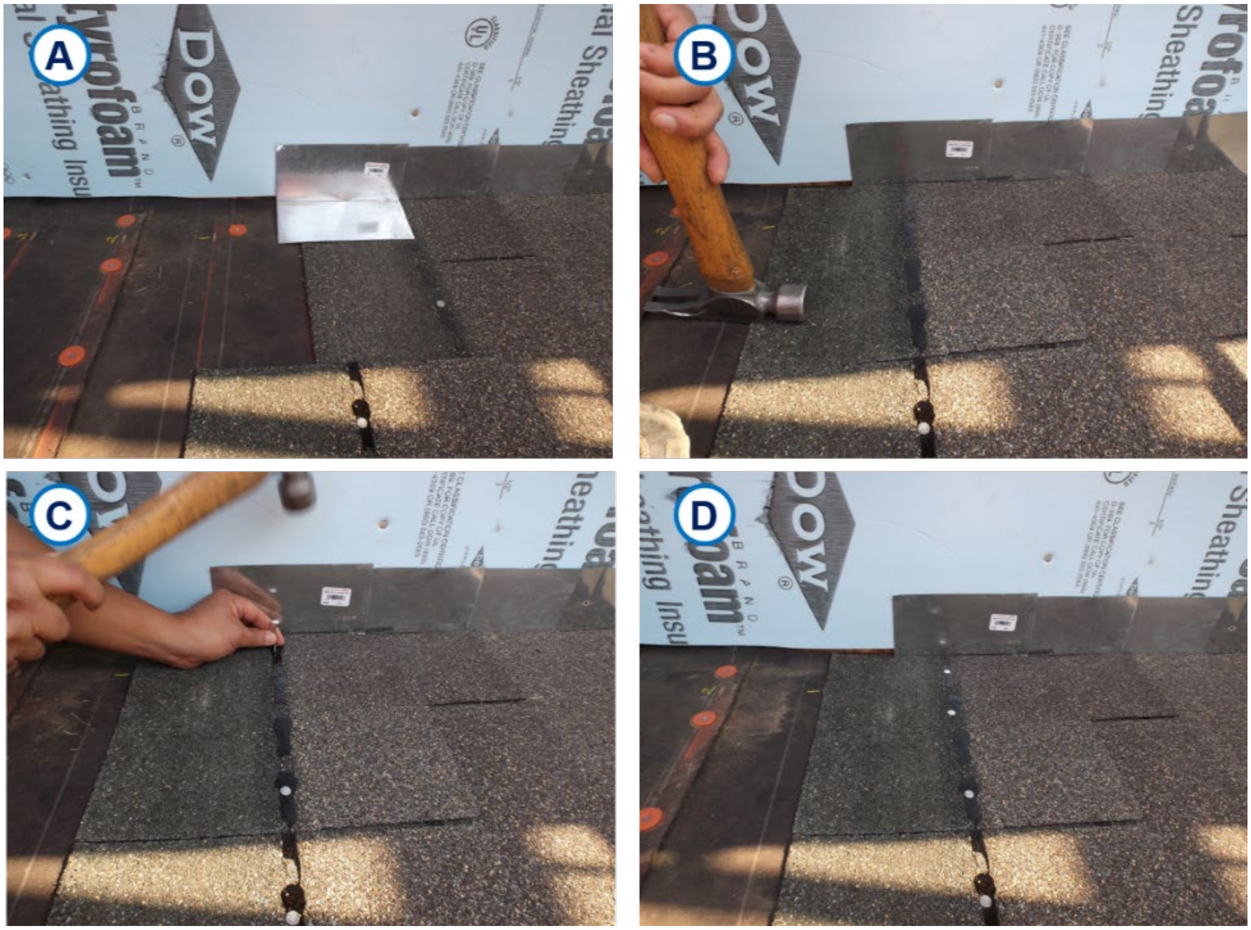


Figure 8-24. Installation of Step Flashing

For roof sections adjacent to a gable that will be bricked, an additional section of flashing should be installed over the brick ledger board once the roof is complete. Set the brick flashing in place, use the top and sides as a guide to cut the Blue Board. Remove any nails holding this section of Blue Board in place. Install the brick flashing by nailing every 24 inches along the top flange of the flashing into the gable end. Reinstall the cut piece of Blue Board and use clear WeatherMate tape to seal the cuts in the Blue Board (see Figure 8-25).

Figure 8-25. Brick Ledger Board Flashing

The upper section of brick flashing goes behind the Blue Board.

8.7 VENT CAPS

Every house will have pipes or vents extending through the decking. These provide ventilation for the HVAC and plumbing systems. A PVC boot or vent cap is used to ensure a watertight seal. The vent pipes vary in size; be sure to use the correct size and type.

Shingle until the top of the shingle is just below the vent pipe. If the bottom edge of the boot will be at or below the nailing line of the shingle, the shingle will go under the boot (see Figure 8-26 and Figure 8-27a). The shingle may need to be cut to go around the pipe (see Figure 8-27b). Then install the boot by nailing in the marks indicated on the vent cap (see Figure 8-27c). Before placing the next row of shingles, seal the sides and top of the vent cap with ZIP Tape. Place the next course of shingles over the boot (see Figure 8-27d). For the following course(s), it may be necessary to cut the shingle to fit around the boot (see Figure 8-27e and Figure 8-27f).

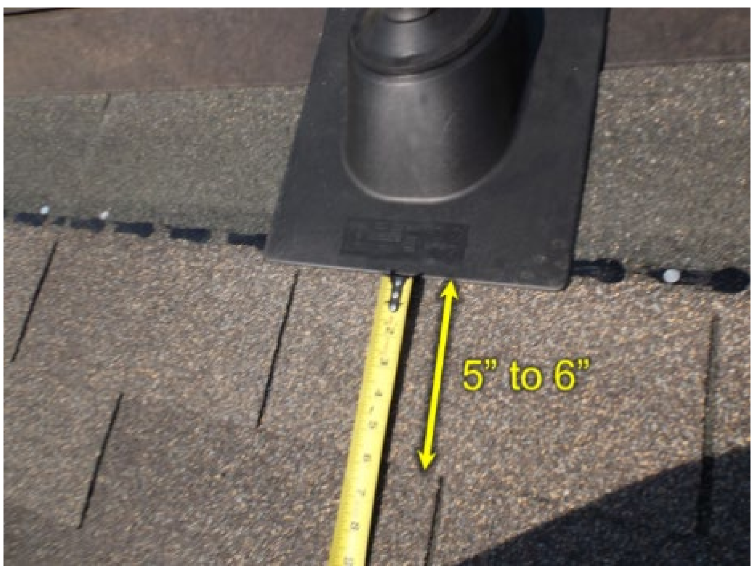


Figure 8-26. Determining When to Install PVC Boot

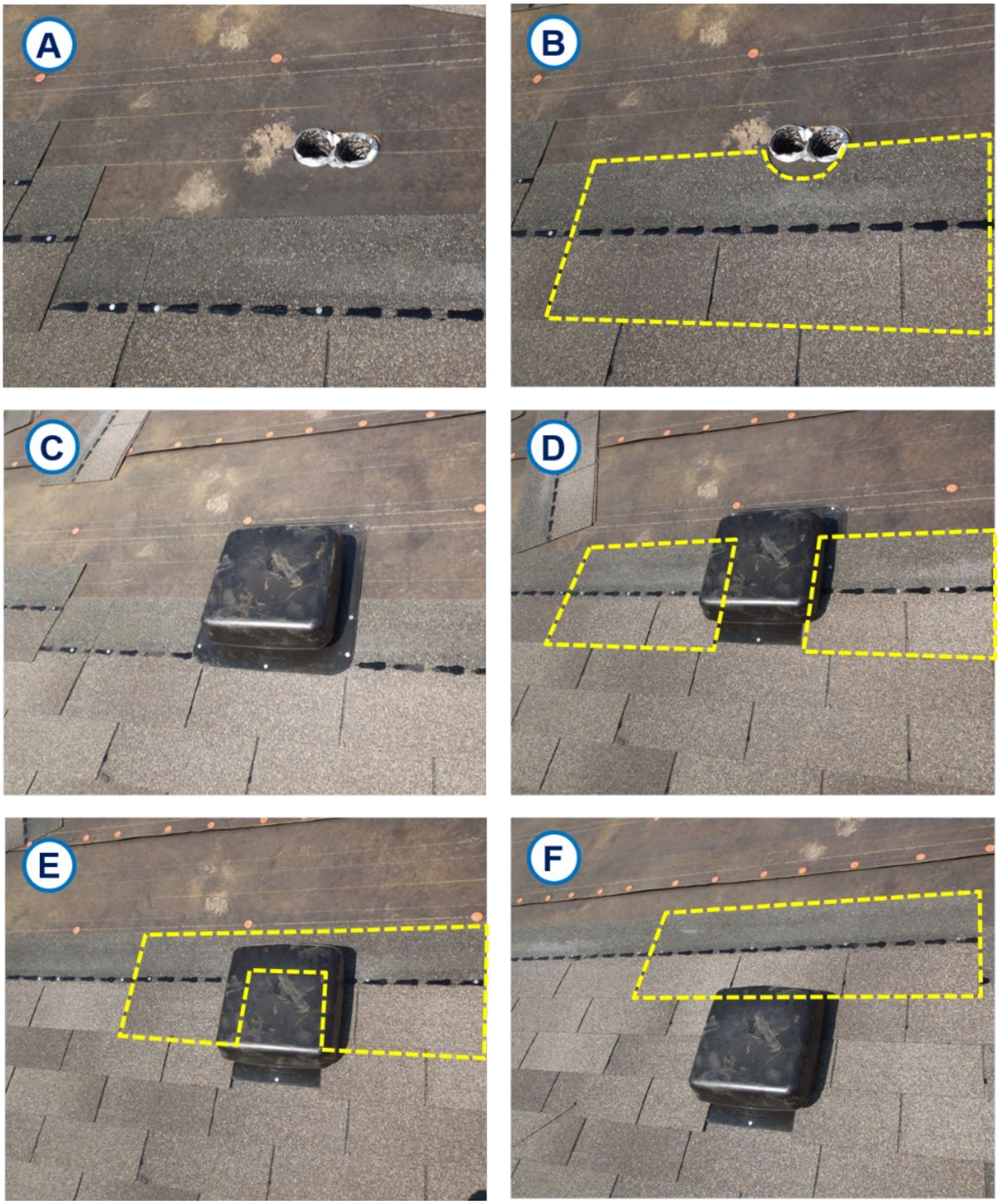


Figure 8-27. Shingling a Square Vent

Only the bottom and the flange of the boot should be visible (see Figure 8-28). When possible, avoid having a seam immediately above the boot (see Figure 8-29).

Figure 8-28. Cut Shingle(s) to Fit Around the Boot

Figure 8-29. Avoid a Seam Directly Over the Boot

8.8 RIDGE CAP

Three-tab shingles may be used as the ridge cap. Use a utility knife and cut the shingle on the non-asphalt side as shown in Figure 8-30.

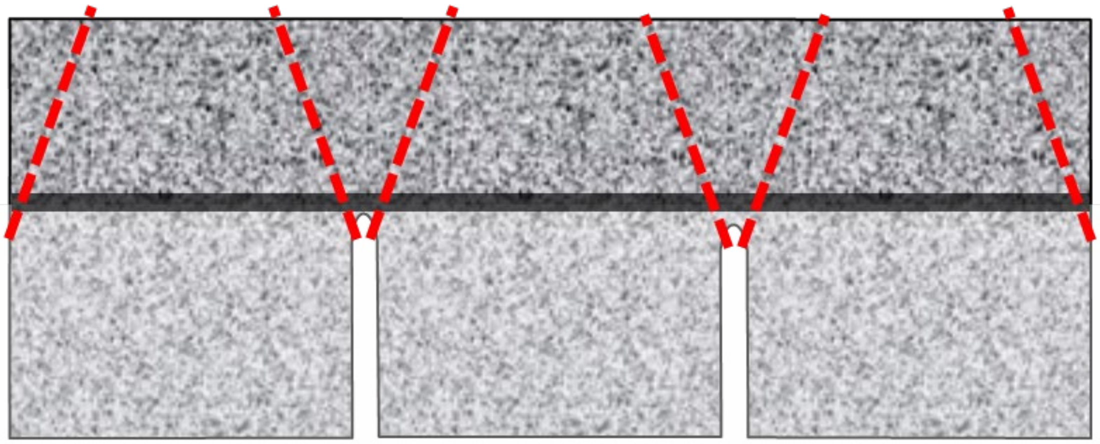


Figure 8-30. Cutting Ridge Cap

On one side of the roof, measure 5½ inches down from the peak (ridge line) of the roof at each end of the roof and in the middle (see Figure 8-31). Use these marks to snap a chalk line to align the ridge cap.

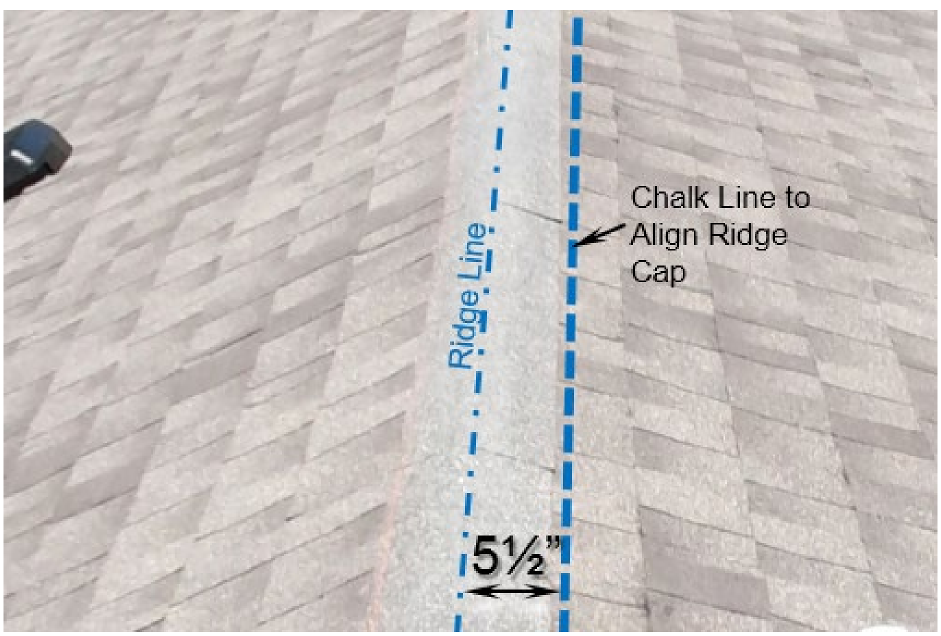


Figure 8-31. Marking for Ridge Cap

Start the ridge cap on either (or both) ends of the roof. Bend the ridge cap across the peak, aligning one side with the snap line. Each cap should cover the tar strip of the piece preceding it (approximately a 5-inch reveal). Put two nails in each ridge cap, above the tar strip (see Figure 8-32). Continue to the overlap until the ridge cap meets in the middle. To complete, cut the triangular section off of one piece of ridge cap to create a rectangle; install with four nails (one in each corner). Where the ridge cap meets another roof line, notch the ridge cap to go underneath the fascia (see Figure 8-33).

Figure 8-32. Ridge Cap

Figure 8-33. Final Piece of Ridge Cap

8.9 FINISHING

- Spray paint pipes black to retard UV damage from the sun (see Figure 8-34).
- Tar any exposed nails, remembering the vent caps and final piece of ridge cap (see Figure 8-35).

Figure 8-34. Paint Vent Pipes

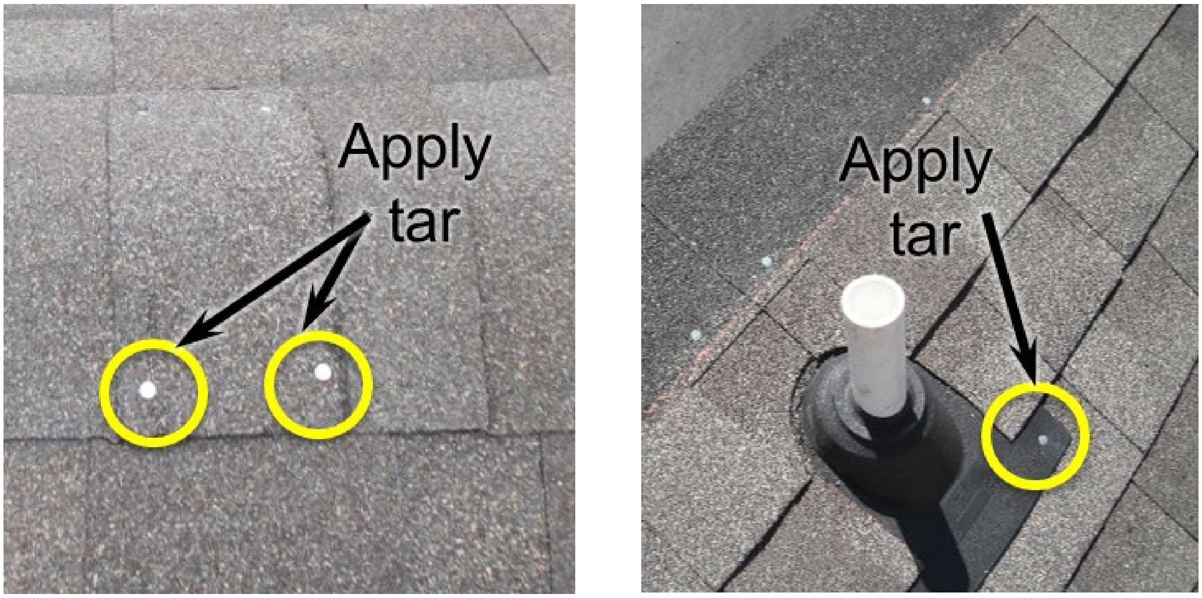


Figure 8-35. Tar Exposed Nails

8.10 COMMON ISSUES AND SOLUTIONS

- Rows Vary by ½-inch or More

If architectural shingles are being installed, measure about every five rows. Measure in three to four locations. Pop a chalk line if the row varies by more than ½ inch. How to correct:

- o If measuring from the ridge: Measure from the ridge to the top of the shingle in several locations. Locate the place on the roof with the longest measurement (see Figure 8-36). At this location, set a shingle in place as if you were going to nail it place but do not nail. Mark the location of the top of the shingle on the felt. Remove the shingle and measure from the ridge to this line. Mark this same measurement on both ends and the middle of the roof and use for popping a chalk line. Use the chalk line as a guide to align the top of the next row of shingles.

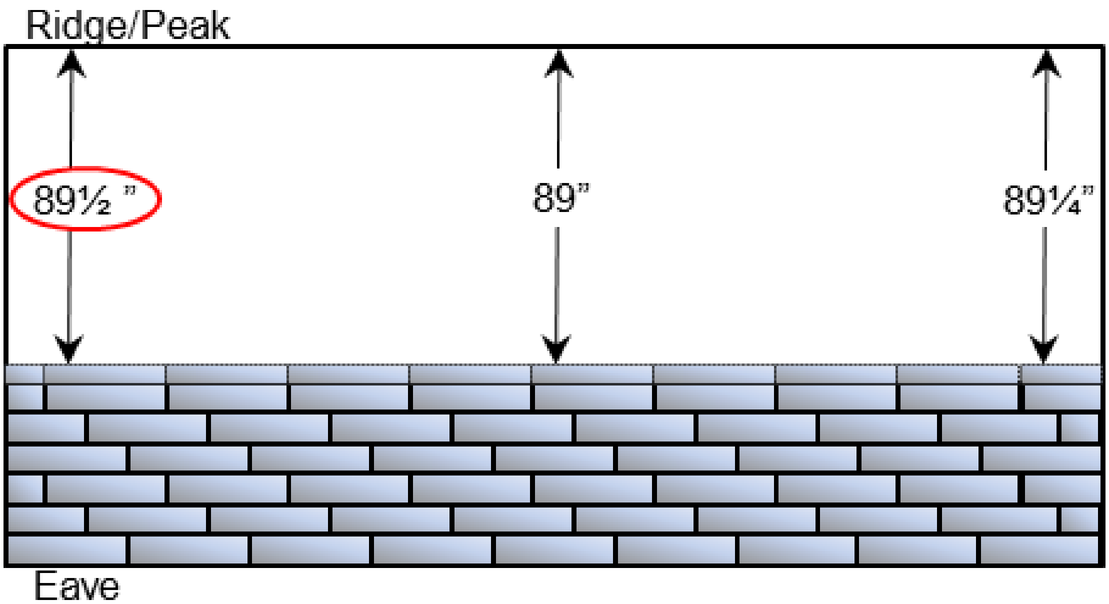


Figure 8-36. Correcting Variance by Measuring from Ridge

- o If measuring from bottom: Measure from the bottom of the shingle of the second row in several places; do not measure from the first row/drip edge. Locate the shortest measurement (see Figure 8-37). At this location, set a shingle in place as if you were going to nail it place but do not nail. Mark the location of the top of the shingle on the felt. Remove the shingle and measure from the bottom of the shingle of the second row to this line. Mark this same measurement on both ends and the middle of the roof and use for popping a chalk line. Use the chalk line as a guide to align the top of the next row of shingles.

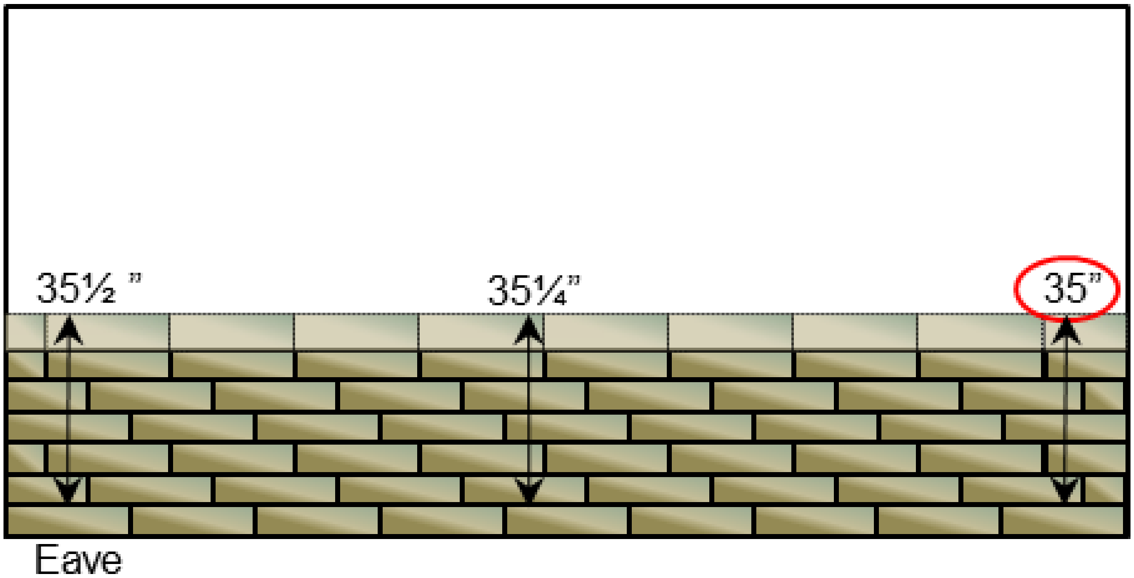


Figure 8-37. Correcting Variance by Measuring from the Second Row

CHAPTER 9: EXTERIOR TRIM

Tools and Materials

- Hammer
- Measuring Tape
- Chalk Line
- Nail Puller/Cat's Paw
- Speed Square
- Chisel
- Level (4-Foot or longer)
- Miter Saw
- Circular Saw
- Jig Saw
- Finishing Nail Gun
- Coil Nail Gun
- Compressor
- Hoses
- Caulk Gun
- Sawhorses
- Ladders
- Extension Cords
- Nail Set
- Eye Protection
- Hard Hat
- 1x4 Trim
- 1x6 Trim
- 1x8 Trim
- 1x10 Trim
- 1x12 Trim
- 16-Inch Soffit Material
- 4x8 Porch Ceiling Material
- 2x8 Lumber
- Z-Flashing
- 8d Ring Shank Nails
- 2½-Inch Finishing Nails
- 12d Nails
- Roofing Nails
- Caulk

Safety

- Always check the nail guns are operating properly before using. Oil nail guns before using. Be sure the safety is working and the nails are being shot to the proper depth. Never use a nail gun that has a faulty or missing safety.
- Never point a nail gun at anyone for any reason.
- Keep your finger off the trigger until you are ready to shoot a nail.
- If a nail gun jams, disconnect the air supply hose before attempting to repair the jam. This will prevent the gun from firing unexpectedly and injuring someone.
- Be sure all ladders are properly positioned and stable. Follow all ladder safety rules (see Table 2.3).
- Ladders should be properly positioned and stable, especially extension ladders used to reach the peak of a gable.
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.
- For additional safety information, see Chapter 2.

Think About This...

- Take time measuring, cutting, and installing trim pieces as they are an integral part of the appearance of the house.
- When possible, paint the trim before cutting and installing.
- As the trim is installed, use white primer to prime all cuts and caulk the seams prior to nailing.
- For trim details by house plan, see Appendix E.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

9.1 FASCIA

Fascia is the first piece of exterior trim installed after the subfascia is up and the roof decking is in place (see Figure 9-1). The 1x6 trim used is an engineered product designed to protect against fungal decay and insects and comes in 16-foot lengths. Trim is nailed in place, wood grain side out, using a nail gun with 2½-inch finishing nails. The fascia is applied to the eaves and the gable rakes. Each is described in the following sections.

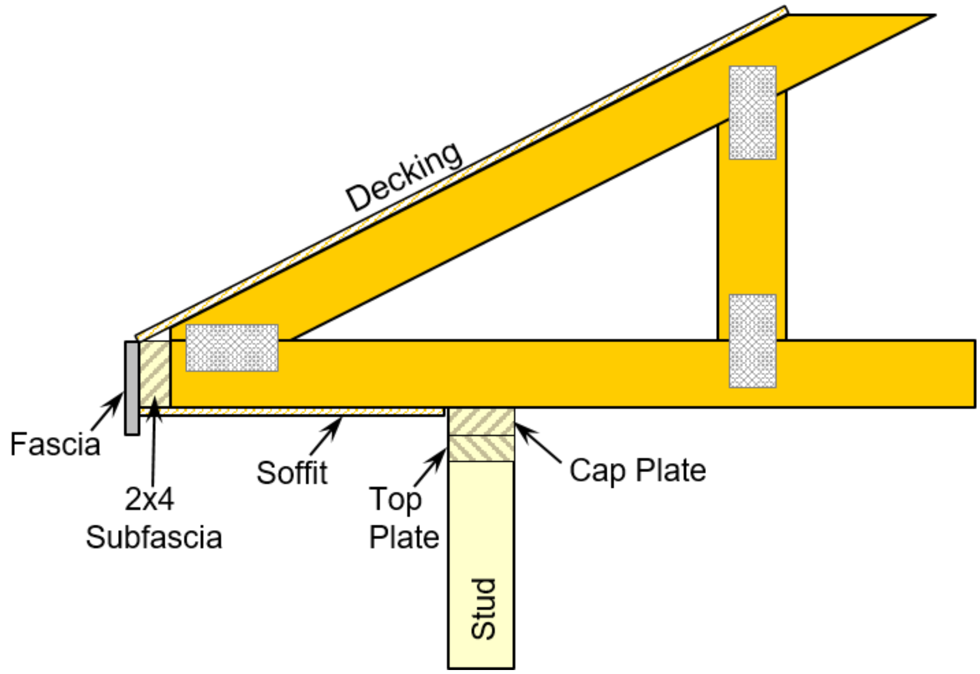


Figure 9-1. Fascia

Always check the nail guns are operating properly before using. Oil nail guns before using. Be sure the safety is working and the nails are being shot to the proper depth. Never use a nail gun that has a faulty or missing safety. Always disconnect nail gun from air supply when reloading or clearing jam.

9.1.1 EAVES

The fascia should be straight along its entire length. The subfascia provides the nailing surface for the fascia boards. Before installing, sight down the subfascia or use a string line to check the subfascia and make corrections as needed. This can be done with shims or wood scraps to ensure a straight subfascia (see Section 5.5.8).

Start the fascia from the front of the house where the rake and eave meet. Measure to make sure the joint for the next fascia board is not over a subfascia joint. The wood grain side of the material goes to the outside and fits just under the slight overhang of the roof decking. It is a good idea to first run a scrap piece of wood along the rake where it will meet the eave. Use this to butt the end of the fascia so the rake piece will meet perfectly and cover the end of the eave board. Do not use a piece of fascia that is shorter than 4 feet. Cut the next to last piece of fascia on an eave if it leaves less than 4 feet to finish the eave.

The ends are straight cut; not angled or scarfed. Nail in place with 2½-inch finishing nails, one above the other every 18 to 24 inches, or into every truss tail. Continue down the side, butting the seams. Caulk the joints the fascia is being installed. The fascia on each end of the eave is cut so it is inside and flush with the fascia running down the rake. Then the seam is visible from the side, not the front.

For fascia tying into a gable, kick-out flashing needs to be installed (<u>see Section 8.1</u>); this is should be done prior to installing the fascia.

If the gable will be covered with brick or stone, the fascia also needs to be shortened to allow for the brick/stone. The end of the fascia needs to be installed 5½ inches out from the wall framing, 5 inches from the wall sheathing, or 4½ inches from Blue Board (see Figure 9-2). If the gable will be covered with siding, the fascia also needs installed 1¾ inches out from the wall framing, 1¼ inches from the wall sheathing, or ¾-inch from Blue Board.

Figure 9-2. Shorten Fascia at Gable End

9.1.2 RAKE (GABLE ENDS)

The flyrafter (outside) of the ladder panel on the roof provides the nailing surface for the fascia. Using the same method of butting seams as previously described in <u>Section 9.1.1</u> measure and cut material to length. Do not use a piece of fascia that is shorter than 4 feet.

The longest length should start at the corner of the house and run toward the peak to minimize the visibility of the seam. Starting at the corner with the eave, hold a full piece of fascia in place and mark the back side of the fascia where it meets with the fascia on the eave. The lower end covers the face of the horizontal fascia board so as to create a square finished corner when standing facing the front or back of the house. Cut and install making sure the piece at the peak will be longer than 4 feet. The wood grain side goes to the outside and the fascia material is nailed with two nails into the rungs of the ladder panel. The cut at the peak of the house is determined by the slope of the roof. Ask the DAHFH Construction Staff or House Leader for the pitch of the roof. Table 9.1 shows the angles used with the appropriate roof pitch; these can be cut on the miter saw. The angle in the table for the tie-in tail refers to the angle on the bottom of a short ladder panel (see Section 5.6.1.3) that starts at the peak, but then ends at a section of the roof that extends out further than the ladder panel (like over the porch).

Table 9.1 Cut Angle for Gable Fascia

Roof Pitch	Tail	Peak	Tie-In Tail*
4	18½°	18½°	53°
5	22½°	22½°	45°
6	26½°	26½°	37°

9.2 SOFFIT

Soffit is the material that covers the framed opening under the porch and under the eaves and rakes. It should be installed after the fascia is up and the gable ends of the house have the sheathing and Blue Board in place. Soffit is an exterior grade composite material and comes in sheets measuring 4-feet by 8-feet and pre-cut lengths of 16 feet by 16 inches. The large sheets are used primarily for ceilings and porch overhangs. Cuts must be straight and square. A chalk box will be handy for snapping straight lines. On both rakes and eaves, the soffit should fit tight against the fascia (see Figure 9-3). Install the soffit on the rakes first.

Figure 9-3. Soffit Installation – Good Gap (left) versus Bad Gap (right)

Prior to installation, mark the location of the trusses and ladder rungs on the Blue Board. This will provide a reference point for nailing the soffit to the trusses and ladder rungs. Soffit material is installed using 8d ring shank nails. Soffit ends should always land in middle of truss or ladder panel rung. Soffit should fit tightly to back of fascia; it is acceptable to have a gap against wall because it will be covered by trim. As needed, use a large pry bar between the soffit and the

Blue Board to push the soffit against the fascia to close gaps. Install soffit with 8d ring shank nails using a coil nail air gun. Nail from one end of soffit using a 3-2-3 pattern - 3 nails per truss/ladder rung, then 2 nails per at the next truss/ladder rung, then 3 nails at the next per truss/ladder rung (see Figure 9-4). Also, add a nail between the trusses along the subfascia. Three nails should be used on each end.

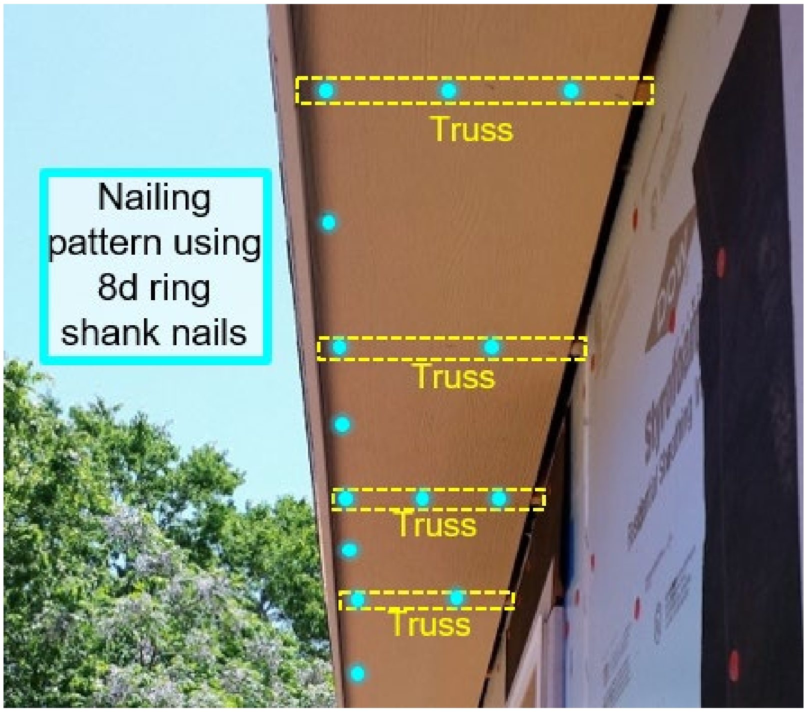


Figure 9-4. Nailing Pattern for Soffit

9.2.1 RAKES

Install the soffit on the rakes first. It is best to start at the bottom and work up, so the seams are higher and out of sight and the shortest length (lightest) is the last piece (see Figure 9-5). The last piece should be nailed into at least three ladder panel rungs. Cut the long piece of soffit as needed to make this possible. For flat soffit, the bottom edge at the eave butts up to the inside of the horizontal fascia. A bevel cut (33°) on this edge makes for a good, finished look.

Figure 9-5. Rake Soffit

Where the soffit meets at the peak, it is helpful to run one side a little long. Cut the other piece with a 45° bevel at the peak so that it just touches the other soffit. Be sure the material is tight to the fascia and secure in place with two nails along each rung of the ladder panel. Make sure the peak of the house, where the two ladder panels meet, has 2x4 framing in place to provide a nailing surface. It may be necessary in install a 2x4 at the peak to provide a nailing surface (see Figure 9-6). Also nail the long edge of the soffit to the flyrafter every two feet to firmly attach to the soffit.

Figure 9-6. 2x4 (Highlighted in Yellow) Installed at Peak to Provide Nailing Surface

9.2.2 EAVES

Use the same principles outlined in <u>Section 9.2</u> for installing soffit on the eaves. In general, the end pieces of eave soffit should meet the rake soffit (see Figure 9-7). However, at the front porch gable, the soffit should only extend a ½-inch past face of the truss and should be even with the gable sheathing. This will allow the bottom of the gable siding to match the bottom of the fascia. Where the soffit turns a corner, run one piece long running parallel with the length of the house and butt the other end to it. For sloped soffit on the eave, the soffit material should run all the way to the gable fascia (see Figure 9-8).

Figure 9-7. Flat Eave Soffit at Rake

Figure 9-8. Sloped Eave Soffit at Rake

If the side eave on the front porch is wider than 16 inches, rip a second piece of soffit to fill in the space. Place the factory edge of the smaller piece against the factory edge of the full width soffit to ensure a tight seam.

9.2.3 PORCH CEILING

Sheets of 4-foot by 8-foot engineering material with a textured face are used for the porch ceilings. Measure the width and length of the porch and plan the layout of the material. Depending on the floor plan, material will usually be installed side by side with seams running perpendicular with the length of the house. If the optimum layout is not obvious, check with the House Leader or DAHFH Construction Staff. No material should be less than 8 inches width so two partial pieces may need to be installed at either end. All sheets can be ripped to the same length. It is best to draw a picture and take multiple measurements for length and width so as to duplicate it for a perfect fit.

Verify there is framing in place around the interior of the porch opening to provide a nailing surface for each piece of ceiling. The framing area of the porch may need nailers to be put in place especially along the inside (against the house) edge (see Figure 9-9). Shim the nailers as necessary so they are flush and provide a level nailing surface for the ceiling.

Figure 9-9. Porch Ceiling

When installing the material, be sure the seams are tight and parallel to the house. It is important the first piece goes up square to the opening. The use of a framing square may be helpful for marking the edge of the first piece. If using a partial length, be sure the factory edge meets the factory edge of the next piece and the cut edge is against the porch beam. The outer edges will be covered with trim so the outside edges of the soffit do not need to be tight to the porch beams or inside edge against the house. It is helpful to have someone on the porch with a dead man (2x4s nailed in a T-shape) supporting the material while securing the pieces in place. Nail every 12 inches along the edge and every 12 inches in the field into the bottom of the trusses or blocking.

9.3 CORNER TRIM

The corner trim consists of two boards (standard exterior 1x4) fastened at the corners of the house with an overlap joint that is positioned so it is hidden from the most prominent view (see Figure 9-10). When possible, paint the siding at the corners of the house before installing the trim. This will give a cleaner finish to the house.

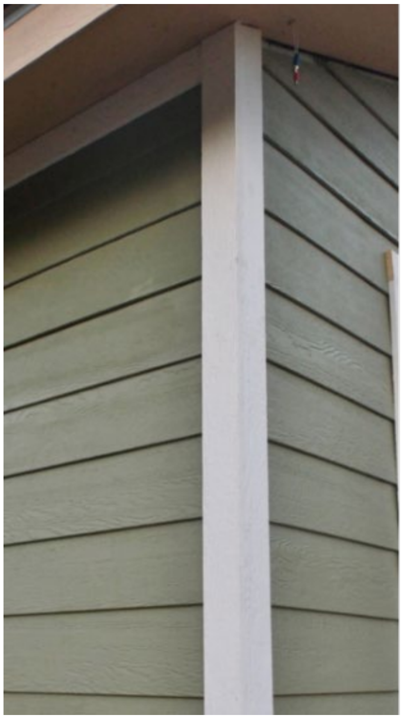



Figure 9-10. Corner Trim - Outside Corner (left) and Inside Corner (right)

Trim is nailed in place using a nail gun with 2½-inch finishing nails. Place the nails where the trim meets the bottom edge of the siding (see Figure 9-11). The corner trim boards should be flush with the bottom of the siding. Align the boards so the joint faces away from the front of the house (to the side of the house). Assemble the corner piece prior to installing it on the house for better results; caulk the seam prior to nailing.

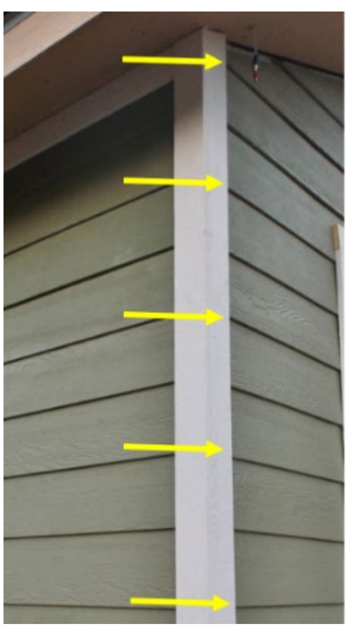



Figure 9-11. Nailing Location for Trim

On gabled sides of the house, the corner trim should extend all the way up to the soffit and be cut at the appropriate angle for the pitch of the roof (see Figure 9-12). Table 9.1 provides the angle for the cut based on the pitch of the roof. It is preferable to have the soffit installed before installing the corner trim. This allows the top of the trim board to sit tight against the soffit. Corner trim is attached to the wall using 2½-inch finishing nails, nailing into the bottom of every other row of siding. Position nails no closer than ¾-inch from the side edges of the trim board, and no closer than 1-inch from the ends.

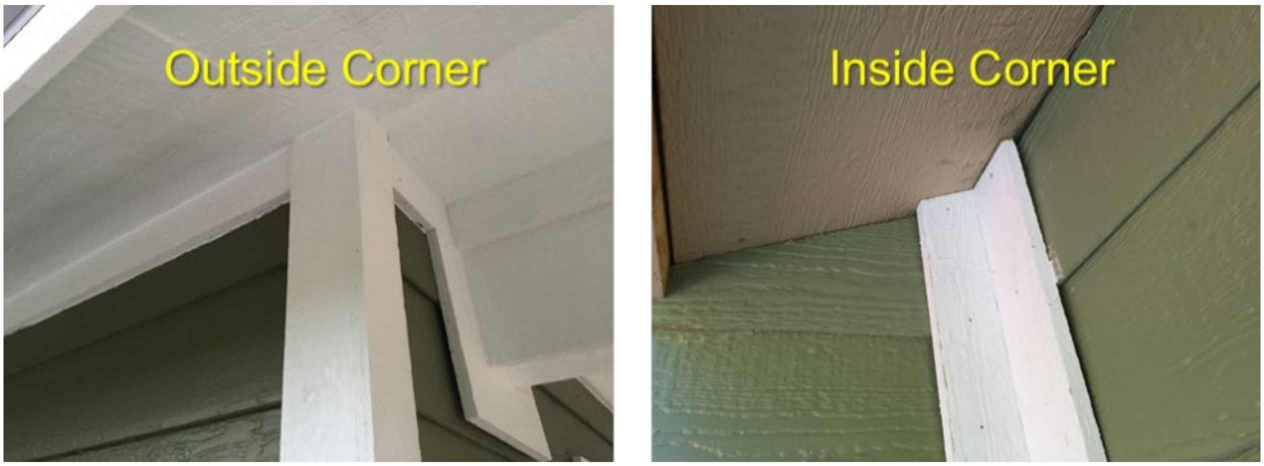


Figure 9-12. Corner Trim at Soffit

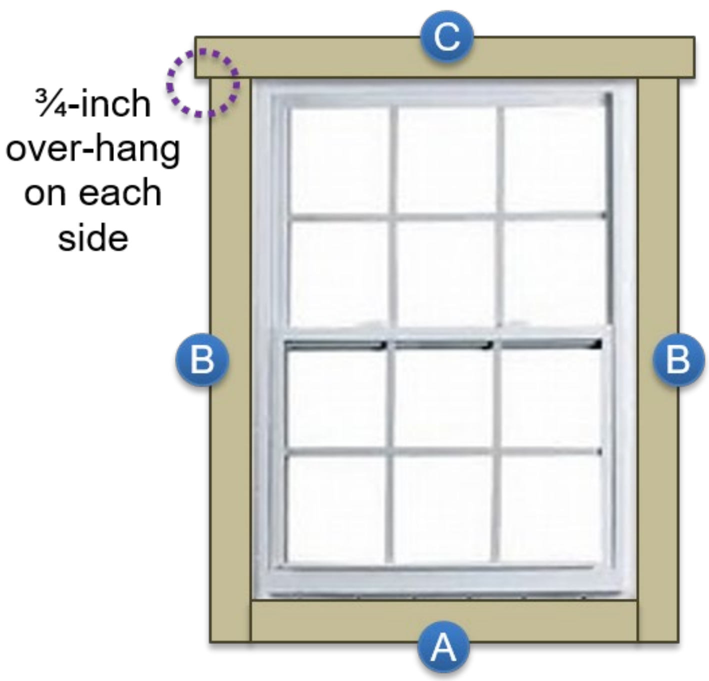
For siding wall to brick wall transition not at a corner of the house, the edge of the brick ledge will indicate where along the wall the brick will terminate. At the transition point, verify there is a stud at this location to allow a solid nailing surface for the exterior trim. If the framing does not include a stud, add a stud or blocking at this location. At this location install a piece of 1x4 trim flat against the wall and another piece of 1x4 trim nailed on edge to the first 1x4 attached to the house and extend it 1½ inches below the brick ledge (see Figure 9-13).

Figure 9-13. Siding Wall to Brick Wall Transition Not at a Corner

9.4 WINDOW TRIM

On siding walls, 1x4 trim is placed around each window after the siding installation is complete . When possible, paint the siding around the window before installing the trim. This will give a cleaner finish to the house. Some window frames have vinyl seams protruding at the corners, these should be removed with a knife before installing trim.

Trim is nailed in place using a nail gun with 2½-inch finishing nails. Install the bottom piece (A) (see Figure 9-14) first, then the sides (B). To help align the side trim with the bottom, use a scrap piece of trim. Place the nails where the trim meets the bottom edge of the siding (see Figure 9-11). The top piece of trim (C) should extend ¾-inch on either side of the side trim. As the trim is installed, caulk in between the joints to ensure a weatherproof seal. An alternative option for the top piece is to extend the trim using a 45 degree (see Figure 9-15). The top pieces of trim over the windows and garage door should look the same. Consult with Construction Staff and/or the House Leader on preferred look.



Bottom (A) fits tightly between the two “B” pieces of trim

Sides (B) are the window height + width of 1x4

Top (C) is the width of window + width of 1x4 + 1½ inches (¾” over hang each side)

Figure 9-14. Window Trim Installation

Figure 9-15. Trim Around Windows

9.5 SIDING FRIEZE

Siding frieze is placed on top of the siding along the eaves, rakes, and front porches (see Figure 9-16). Siding frieze should fit tightly against the soffit or ceiling. On the eave, a kick-out strip (typically screen molding) is tacked along the top edge of the last row of siding using the finishing nail gun prior to installing the trim (frieze). This helps the frieze sit vertically on the siding (see Figure 9-17). Similar to the corner and window trim, 1x4 trim is used and is attached using 2½-inch finishing nails. Along the eaves, the nailing pattern is every 12 inches; along the rakes, nail at the bottom of the siding where the pieces overlap.

Figure 9-16. Siding Frieze on Eave (left) and Gable (right)

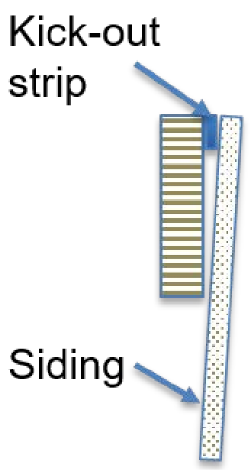


Figure 9-17. Siding Frieze Kick-Out

9.6 BRICK FRIEZE

Prior to brick being installed, a piece of trim (i.e., brick frieze) is attached to the soffit to guide the mason laying the brick façade. Exterior 1x trim is used for the brick frieze. The front of brick frieze is installed 6¼ inches out from the wall framing or 5¾ inches from the sheathing or 5¼ inches from Blue Board (see Figure 9-18). Prior to installing, determine the type of transition needed between the rake and eave (see Section 9.7); this can affect the end point of the brick frieze.

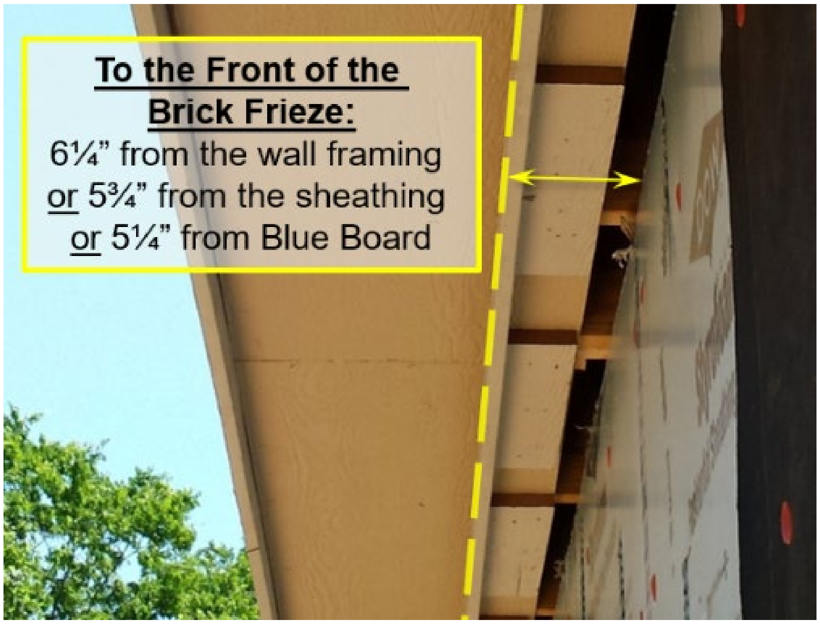


Figure 9-18. Location of Brick Frieze

To mount brick frieze, subtract the thickness of the trim being used from the dimension of the front of the brick frieze; this will provide the measurement from the back of the brick frieze to the wall. Using this dimension, mark the soffit and snap a line. Then install scrap 1x boards flat along the line snapped on the soffit to provide a nailing surface (see Figure 9-18). Cut these blocks at least 26 inches long so both ends can be nailed into a truss (look at nailing pattern on the soffit) to provide a stable backing. Then install the narrow side of the frieze against the soffit and use a nail gun with 2½-inch finishing nails to nail through the brick frieze into the board.

In the porch area, the type of brick frieze transition depends upon if the porch beam will be covered with brick or siding. If the beam will be covered with siding or trim, the porch beams with 1x trim to wrap around the beam, keeping the same 6¼ inches or 5¾ inches from the wall. Where two lengths of wood are required, the joints are butted, not cut at an angle (see Figure 9-19). If the beam will be covered with brick or stone, the 1x trim should not wrap around the beam and the distance between the brick frieze should be 13 inches (back of brick frieze to back of brick frieze) (see Figure 9-20).

Figure 9-19. Brick Frieze around Porch Beam Covered with Trim

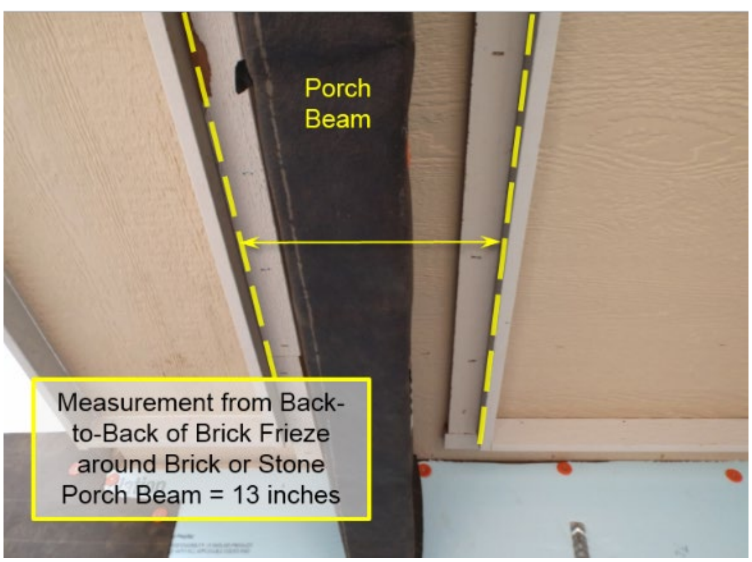


Figure 9-20. Brick Frieze around Porch Beam Covered with Brick or Stone

Another location that may require a brick-to-siding transition is the side porch. At this location, end the brick frieze even with the trim board. Then cut and install a small piece of brick frieze to bridge the gap between the brick frieze and trim board (see Figure 9-21).

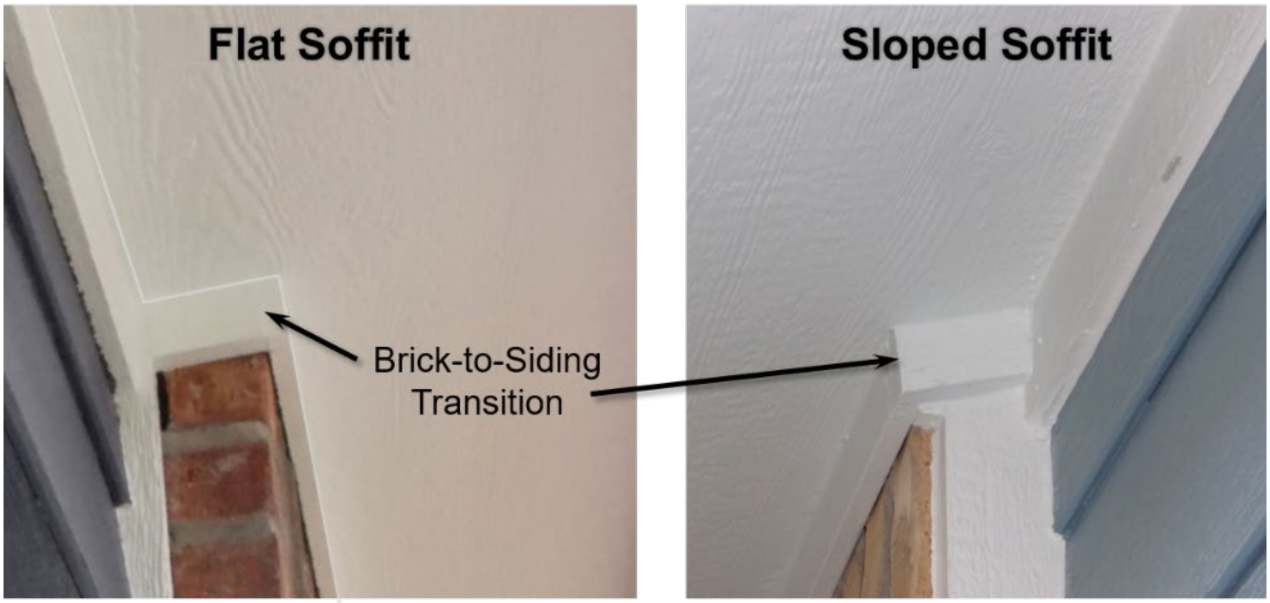


Figure 9-21. Brick-to-Siding Transitions

9.7 SOFFIT TRANSITIONS

For houses with flat eave soffit, a cornice return or “bird box” is constructed using exterior grade trim to transition from the eave soffit to the rake soffit. The configuration depends on the type of material being used for the exterior walls (e.g., brick-to-siding, brick-to-brick, or siding-to-brick). The bird box should be installed using a nail gun and 2½-inch finishing nails. For sloped soffits, soffit transitions are not needed.

9.7.1 BRICK-TO-SIDING

For a brick-to-siding transition, the brick frieze on the eave will end even with the back side of the corner trim. A piece of 1x12 or 1x10 exterior trim is then cut and installed to cover the exposed Blue Board (see Figure 9-22). The angle of the trim should match the pitch of the roof.

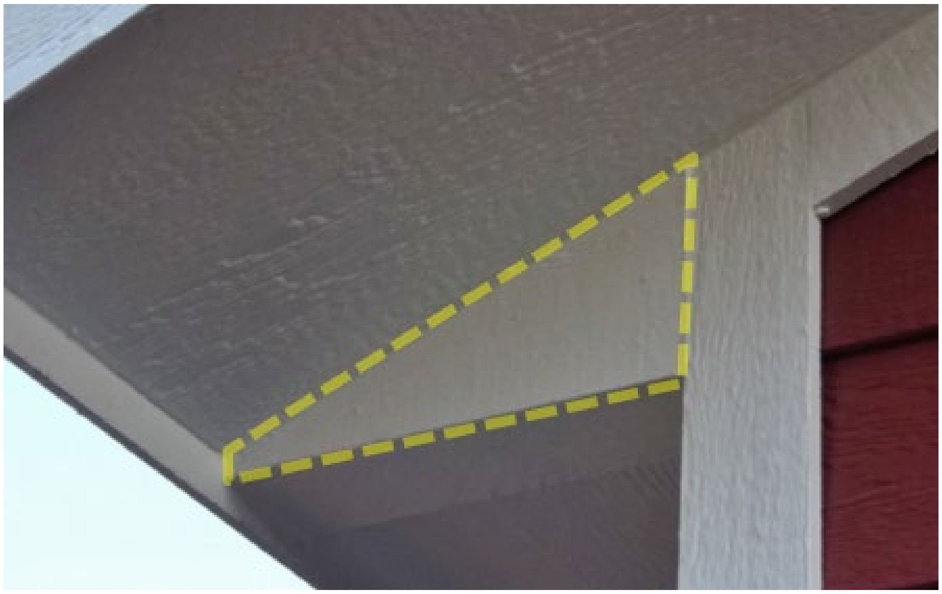


Figure 9-22. Brick-to-Siding Transition

9.7.2 BRICK-TO-BRICK

For brick-to-brick walls, there are two ways to build the transition. The first option for brick-to-brick transition does not extend the brick frieze beyond the eave soffit (see Figure 9-23). In this option, the individual pieces for the bird box are cut and assembled as a unit prior to installing on the house.

Figure 9-23. Installed Bird Box (Brick-to-Brick Transition), Option 1

As shown in Figure 9-24a, measure the height from the bottom of the brick frieze to the soffit (A), bottom of the fascia to the soffit (B), and the distance from the brick frieze to the soffit (C). Use these measurements to cut a piece of 1x12 exterior trim to cover the wall sheathing or Blue

Board (see Figure 9-24b). The angle of the trim should match the pitch of the roof. Then cut a piece of 1x6 exterior trim (height = A with a width of 3¾ inches) to fit between the brick frieze on the eave and rake (see Figure 9-24c). Again, the angle of the trim should match the pitch of the roof. Next, cut and install a piece of 1x4 trim to extend from the bottom of the eave brick frieze to the rake soffit (see Figure 9-24d). Assembly as a unit and install using a nail gun and 2½-inch finishing nails.

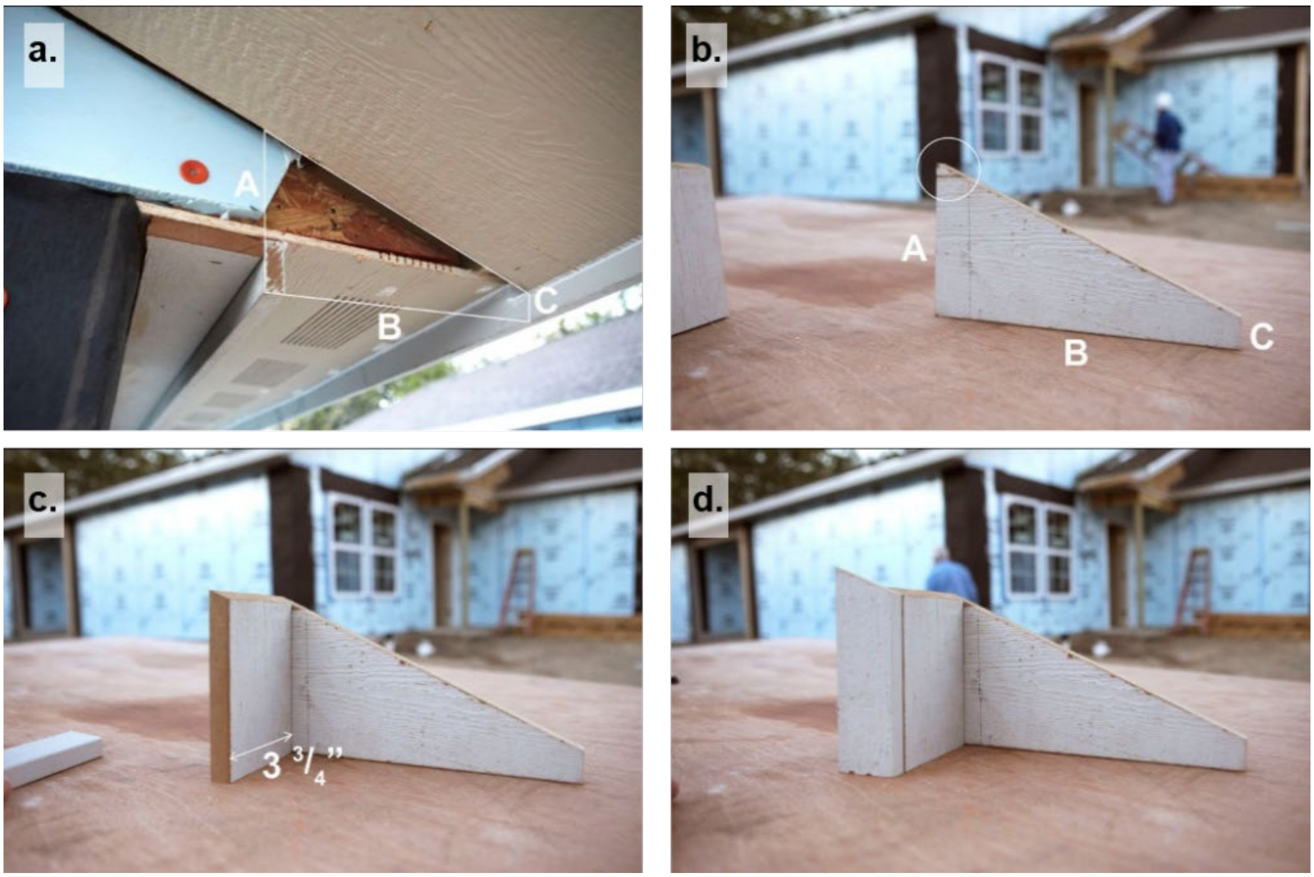


Figure 9-24. Assembly of Bird Box (Brick-to-Brick Transition), Option 1

The second option requires the brick frieze on the eave to be extended 4½ inches beyond the eave soffit (see Figure 9-25a). The individual pieces for the bird box are cut and individually installed. Then cut a piece of 1x6 exterior trim to fit between the eave brick frieze to the rake soffit; the angle of the trim should match the pitch of the roof (see Figure 9-25b). Next, cut and install a piece of brick frieze trim to extend from the bottom of the eave brick frieze to the rake soffit (see Figure 9-25c). Then install the brick frieze on the rake soffit (see Figure 9-25d). Similar to brick-to-siding transition (see Figure 9-22), a piece of 1x6 exterior trim is then cut and installed to cover the exposed wall sheathing.

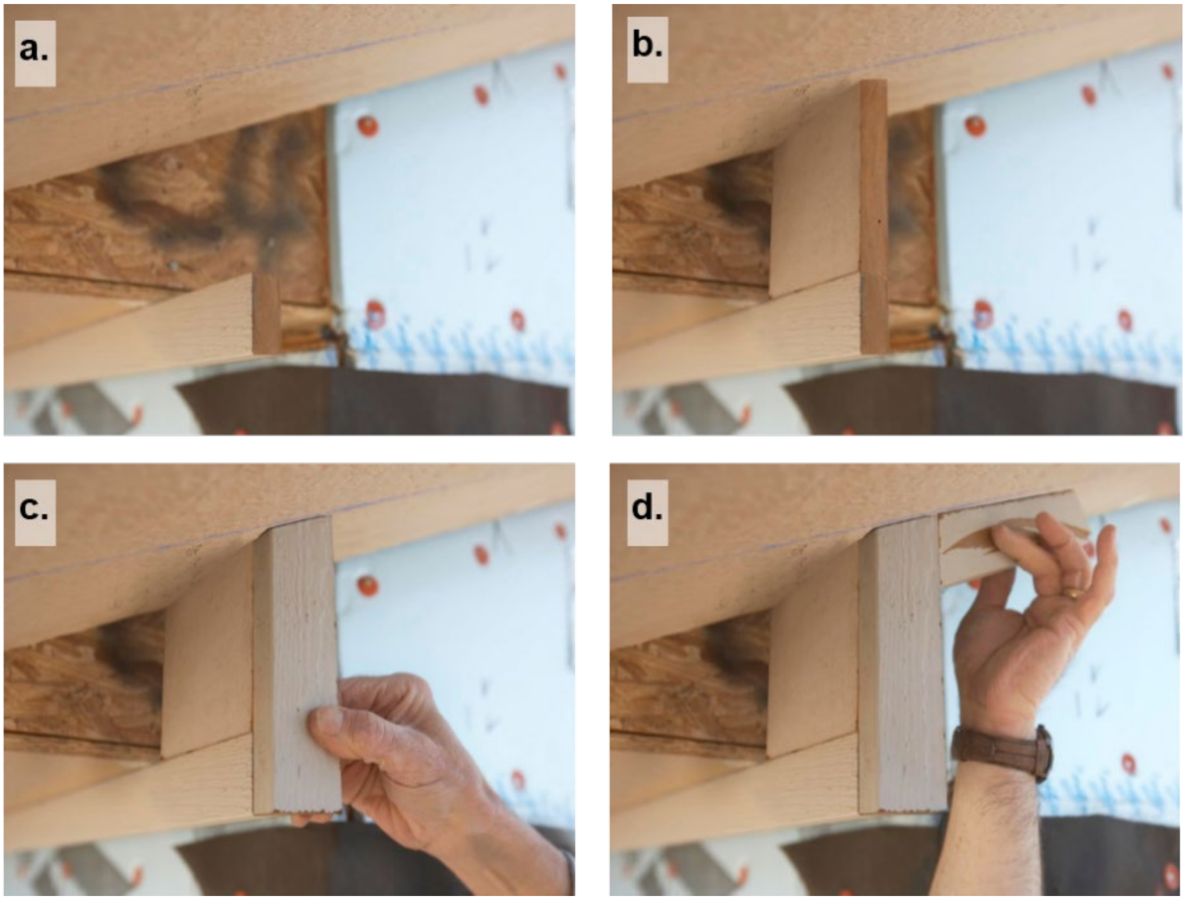


Figure 9-25. Installation of Bird Box (Brick-to-Brick Transition), Option 2

9.7.3 SIDING-TO-SIDING

The transition for siding-to-siding is the same as the brick-to-siding transition shown in Figure 9-22. A piece of 1x6 exterior trim is cut and installed to cover the exposed Blue Board (see Figure 9-22). The angle of the trim should match the pitch of the roof.

9.8 PORCH TRIM

The sequence to install trim on the porches will vary by the location of porch (i.e., front, side, or back) and the cladding (e.g., siding, brick, or stone). The following provides general guidelines for trim and Appendix E provides porch trim details by house plan.

Porch beams are covered with 1x trim material. First install a piece of 1x trim to cover the bottom of the beam using a finish nailer with 2½-inch nails; the trim may need to be ripped to match the width of the beam. Then clad both vertical sides with 1x12 trim; the lower edge should be flush with the bottom trim piece (see Figure 9-26). If using painted trim, the porch ceiling is trimmed with 1x4 material nailed to the interior of the porch and the exterior side beams (see Figures 9-26 and 9-27). If using cedar trim, the porch ceiling and the top of the exterior side beams are trimmed with 1x2 material (see Figure 9-28). This covers small gaps between the porch beams/house wall and the soffit ceiling.

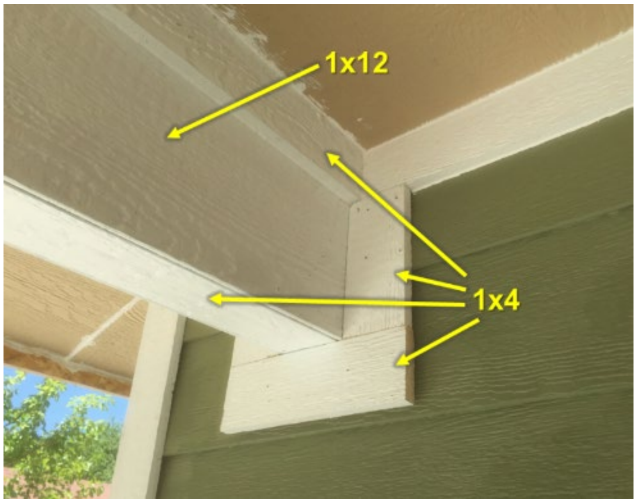


Figure 9-26. Porch Beam Trim

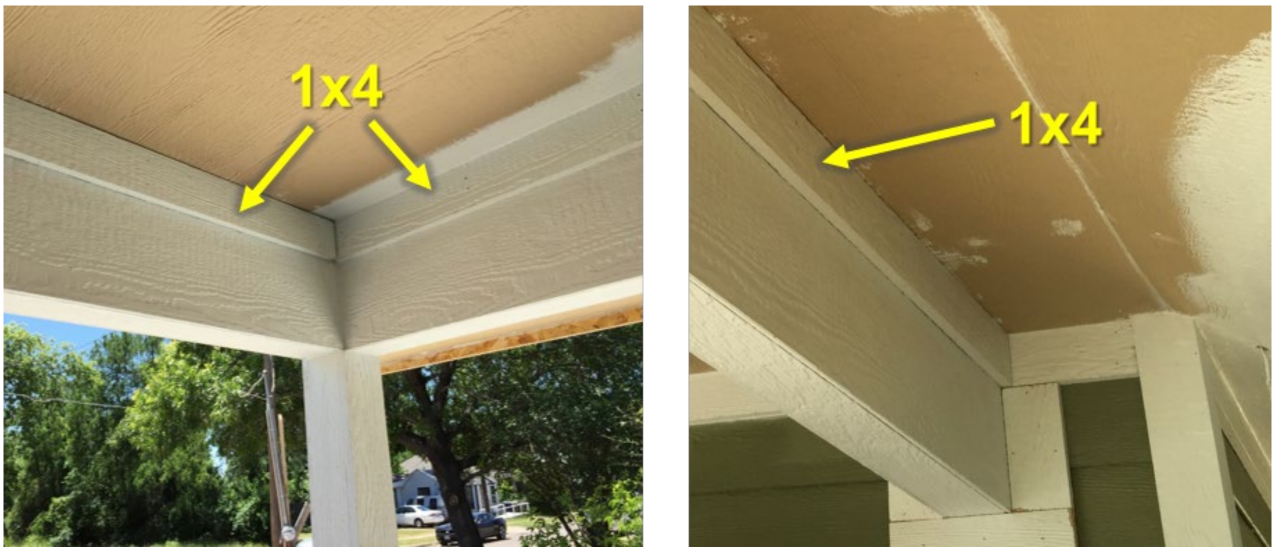


Figure 9-27. Porch Beam Trim at Ceiling and Soffit

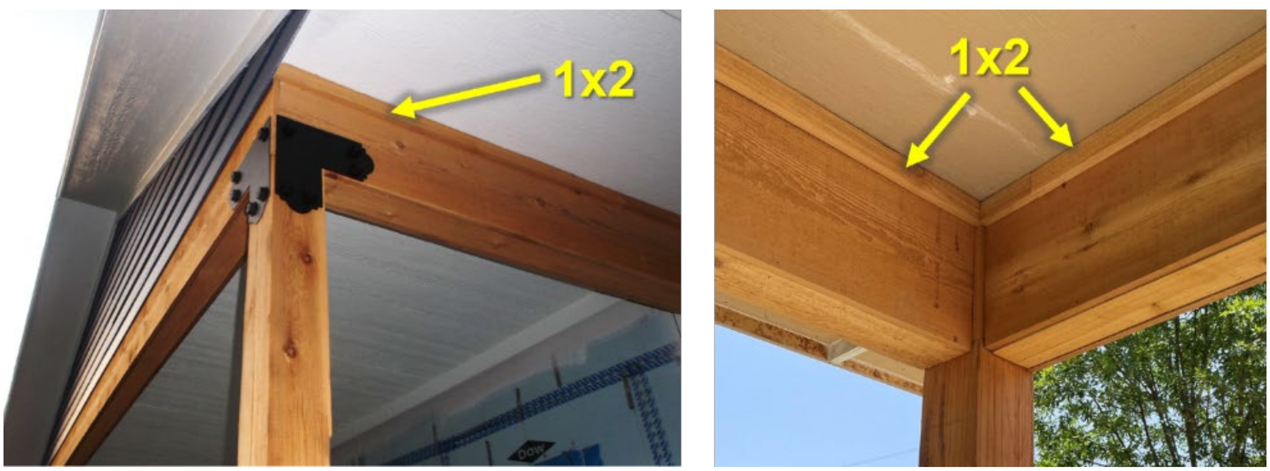


Figure 9-28. Porch Beam Trim at Ceiling and Soffit

9.9 PORCH POST TRIM

Before trimming out the porch post, the porch beam trim must be installed (see Section 9.8). Consult the House Leader or DAHFH Construction Staff on the type of trim or finish of the porch post.

9.9.1 CEDAR POST

Typically, 4x4 cedar posts only require trim at the top and bottom of the post. Add 1x6 and 1x2 cedar trim collars. Pieces should be miter cut (45 degree) (see Figure 9-29). The bottom collar should be ½-inch off the slab. Attach the trim to the post using 2½-finishing nails.

Figure 9-29. 4x4 Cedar Post Trim

9.9.2 PRESSURE TREATED OR COMPOSITE POST

If a pressure treated or composite post is used, the sides of the post will be clad with both 1x6 and 1x4 trim (see Figure 9-30). The trim should be cut to extend from the bottom of the porch beam to approximately a ½-inch above the slab. Three pieces of trim (forming a U) can be assembled prior to installing it on the house for better results. Attach the trim to the column using 2½-finishing nails.

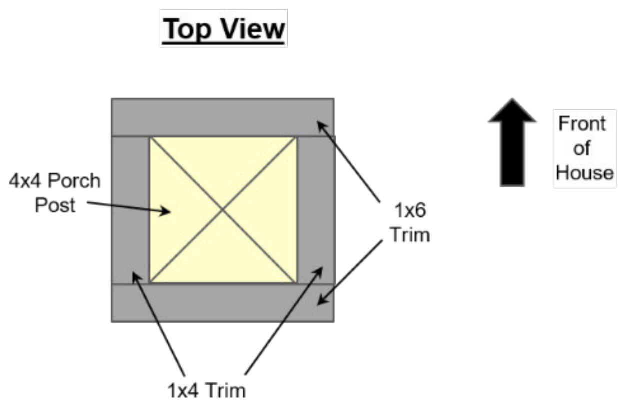


Figure 9-30. Pressure Treated or Composite Porch Post Trim

Trim out the bottom of the columns using 1x6 (see Figure 9-31). The trim should not rest on the slab. The back piece of trim (nearest to the house) should be set ½-inch above the slab. Mark this location on the back of the column and extend a level to the front of the column. Align the top of the base trim with this line and nail in place using 2½-inch finishing nails.

Figure 9-31. Trim at Base of Porch Column

9.10 GARAGE DOORS

The opening of garage door is trimmed out with both pressure treated 2x lumber. If the wall will be clad in siding, use a 2x8 ripped to a width of 5¾ inches. This width allows the 2x8 to extend ¾-inch from the Blue Board and a ½-inch from the inside of the framing to allow for drywall (see Figure 9-32). If the wall will be clad in brick, use a 2x10 ripped to a width of 8 inches (see Figure 9-33).

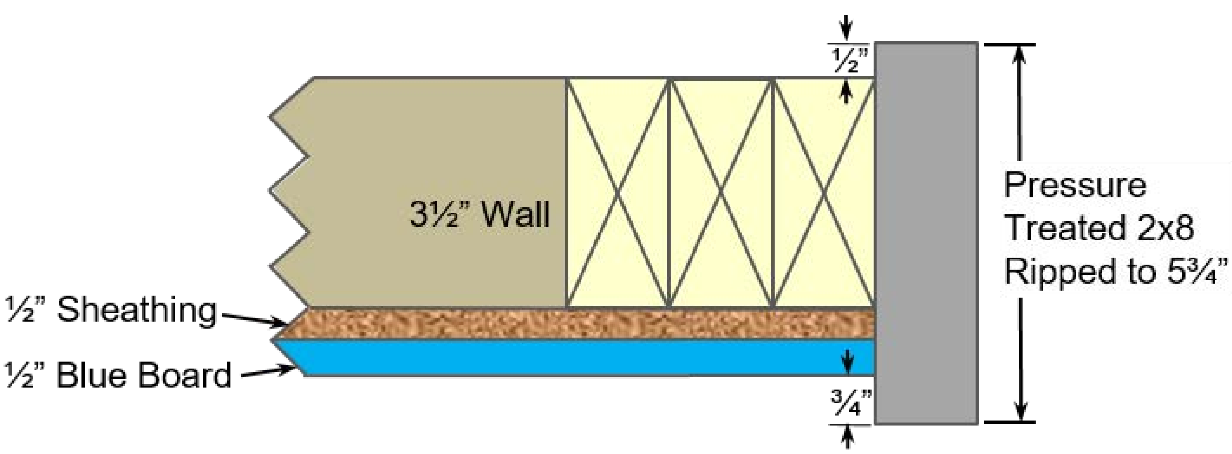


Figure 9-32. Placement of Ripped 2x8 for Garage Opening on Siding Wall

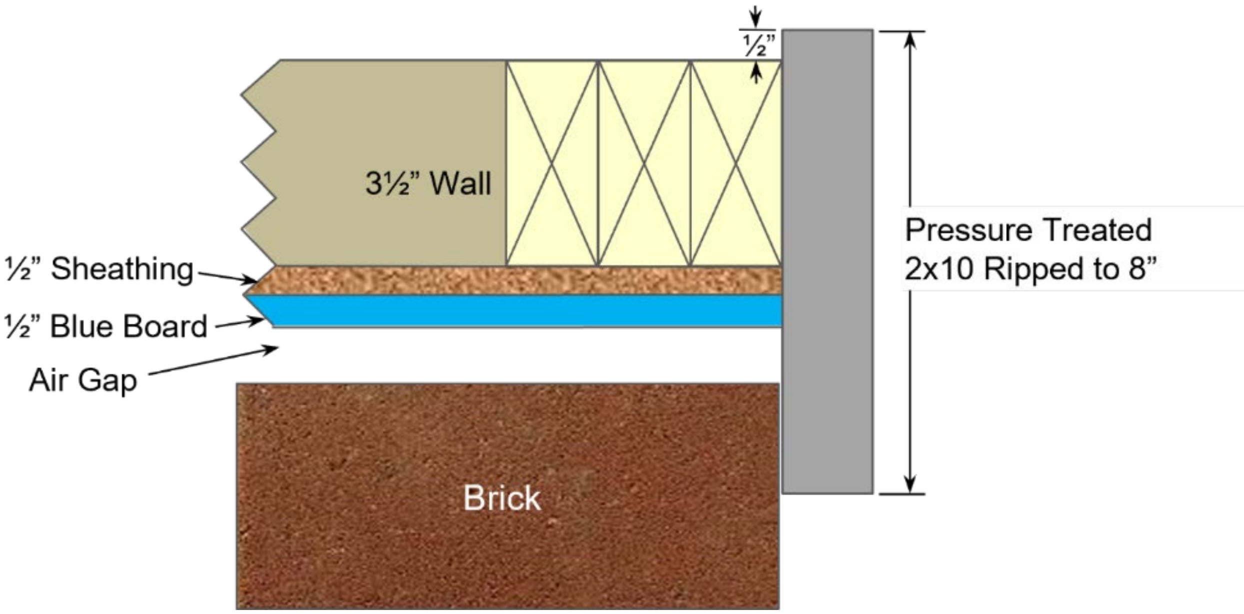


Figure 9-33. Placement of Ripped 2x10 for Garage Opening on Bricked Wall

Install the top piece of 2x along the length of the opening using deck screws to hold it in place and then nailed with two 12d nails every 24 inches. Then install the side pieces. For the sides, the bottom of the 2x should be cut at a 45-degree bevel and should be ¾-inch off the slab (see Figure 9-34). Prime the bottom of the 2x before installing.

Figure 9-34. Bottom of Ripped 2x8 Around Garage Door Opening

For walls clad in siding, add 1x4 trim (see Figure 9-35). The trim should include a ¼ -inch reveal from the edge of the 2x (see Figure 9-36). Install the sides first, then the top piece. Similar to windows, the top piece of trim should extend ¾-inch on either side of the side trim. As the trim is installed, caulk in between the joints to ensure a weatherproof seal.

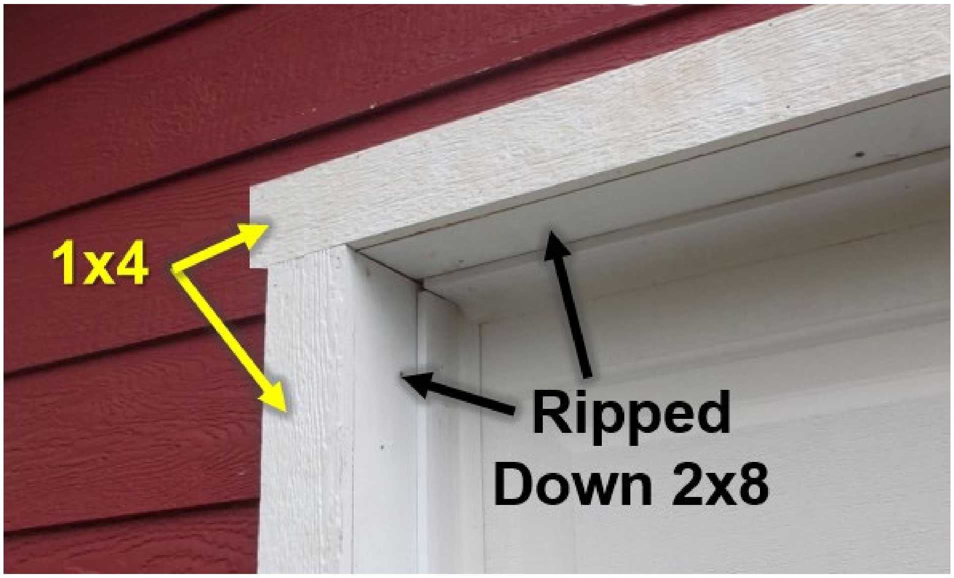


Figure 9-35. 1x4 Trim Around Garage Door Opening

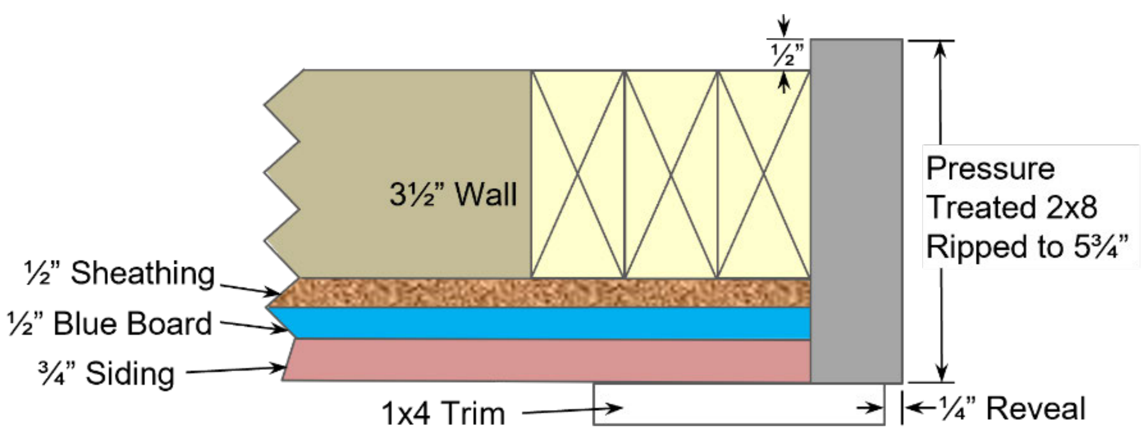


Figure 9-36. Placement of 1x4 Trim on Siding Wall

Trim the opening after installing one row of siding above the garage door opening. The Z-flashing should be cut to wrap over the edges of the trim. Add Z-flashing over the trim using 2-inch roofing nails every 18 inches. Then continue siding; the next row of siding will cover the vertical section of the flashing (see Figure 9-37).

Figure 9-37. Z-Flashing Over Garage Trim

9.11 EXTERIOR DOORS

The trim on exterior doors depending on the location of the door and the floor plan. See Appendix E for trim by floor plan.

9.12 COMMON ISSUES AND SOLUTIONS

- Soffit Just Short of a Truss Tail or Ladder Panel Rung

When installing soffit along the eave or rake, the ends of the soffit should end in the middle of a truss tail or ladder panel rung. Many times this requires having to make a cut because a full piece comes to the edge of a truss instead of the middle. One solution is to scab a short piece of 2x4 to the side of the truss tail or ladder panel rung using 12d nails.

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CHAPTER 10: SIDING

Tools and Materials

- Hammer
- Measuring Tape
- Speed Square
- Chalk Line
- Nail Puller/Cat's Paw
- Level (4-Foot or longer)
- Miter Saw
- Circular Saw
- Drill
- Hole Saws (1-Inch for Wiring, 1½ Inches for Pipes)
- Sawhorses
- Ladders
- Extension Cords
- Nail Set
- Siding Gauge
- Eye Protection
- Hard Hat
- Siding
- WeatherMate Tape
- Butyl Tape
- 8d Ring Shank Nails
- 2½-Inch Finishing Nails

Safety

- Ladders should be properly positioned and stable, especially extension ladders used to reach the peak of a gable. Follow all ladder safety rules (see Table 2.3).
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.
- For additional safety information, see Chapter 2.

Think About This...

- No piece shorter than 32 inches on long runs of siding.
- Keep the seams/joints (from one row to the next row) at 48 inches or more. A repeating pattern of seams every fourth row on a large wall looks better.
- There should be a 7-inch reveal between immediate courses of siding.
- No seams (joints) above/below windows (immediate course) and no seams over doors (immediate course).
- Do not overdrive nails.
- Nailing pattern is 16 inches into a stud, use 8d ring shank nails. It is okay to add nails near siding seams and ends.
- Match corners; each course level with the one around the corner.
- Do not use a Sharpie pen to mark on the front of siding; use a pencil. Depending on the paint color used, a Sharpie pen may show through.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

10.1 INTRODUCTION

DAHFH uses an engineered siding product. This material is designed to last against rot, hail damage, termites, and many other possible problems. The material can be cut with a miter saw, circular saw, jig saw, or a drill with a hole saw.

10.2 GENERAL SIDING INSTALLATION PRINCIPLES

- Typically, siding has a 7-inch reveal. Siding gauges (aka Geckos) spacers are designed to hold siding at the proper level while nailing; however, it is critical to measure every row to verify and maintain the proper reveal. Measure from the second row.
- Seams must be staggered. There should be a minimum distance of 4 feet on either side of the seams from the row below. Create a pattern of seams that repeats every fourth row (see Figure 10-1).

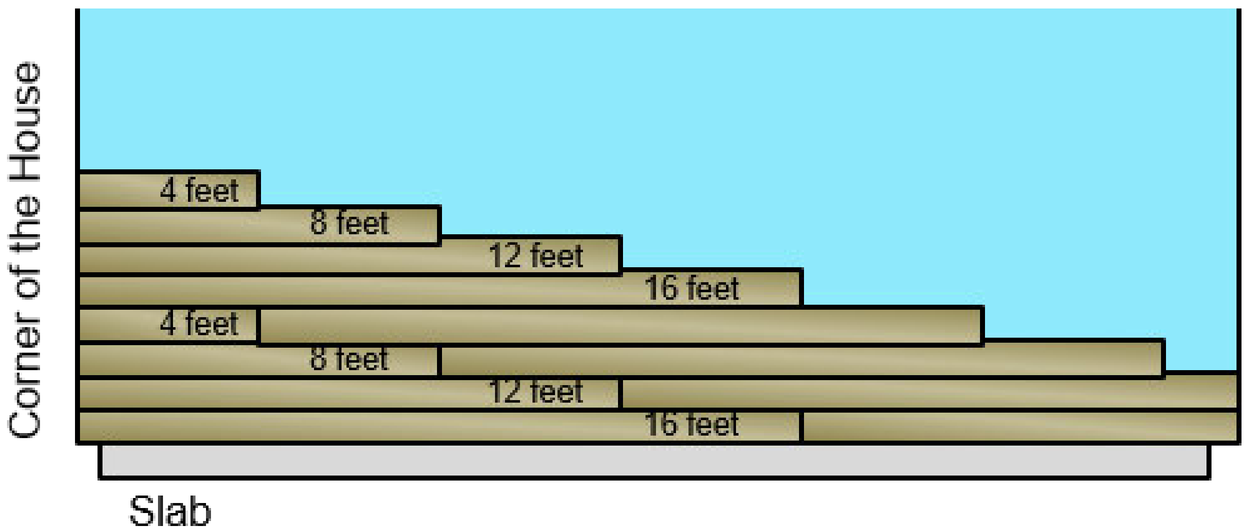


Figure 10-1. Siding Pattern

- There should be no joints immediately above or below windows or doors or near the corners of windows and doors.
- The minimum siding length is 32 inches on long runs of siding.
- The siding seams (joints) in the middle of the wall must both be factory edges or cut edge using a miter saw (not a circular saw).
- The cut edges of siding in the field should be primed.
- The bottom edges of the siding around corners.
- The bottom edges of siding should be aligned and seams in the middle of the field should be butted together with no gap (see Figure 10-2).

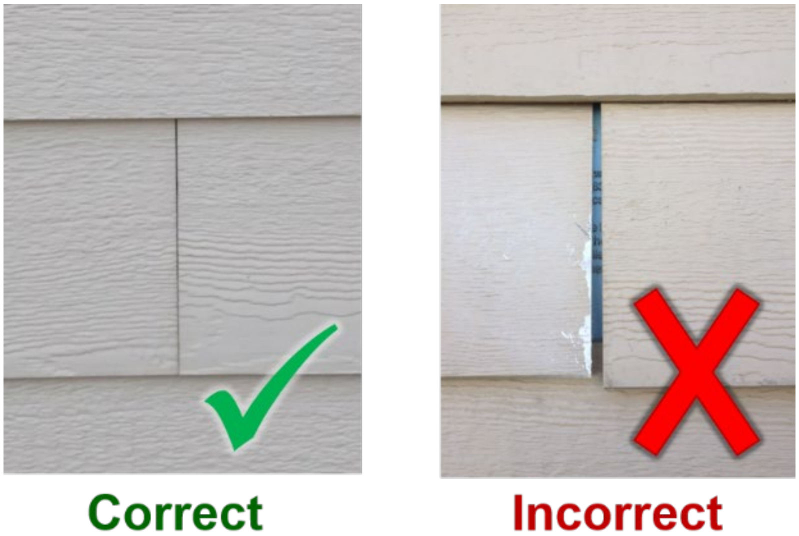


Figure 10-2. Bottom Alignment and Seams

- Use 8d ring shank nails and nail into studs. Drive nails perpendicular to siding and framing. Do not over-drive nail heads or drive nails at an angle.
- Siding is installed using the blind nailing technique where the nails will be covered by the next course of siding. The overlap between siding is ¾-inch. Nails should be no further than ⅜-inch from the top of the siding to avoid damaging the top edge and prevent nail heads being exposed below the next row (see Figure 10-3).
- Nail heads should fit snug against siding (no air space).
- No nails should be placed within 2 inches of the corners of the siding (corners break off easily).

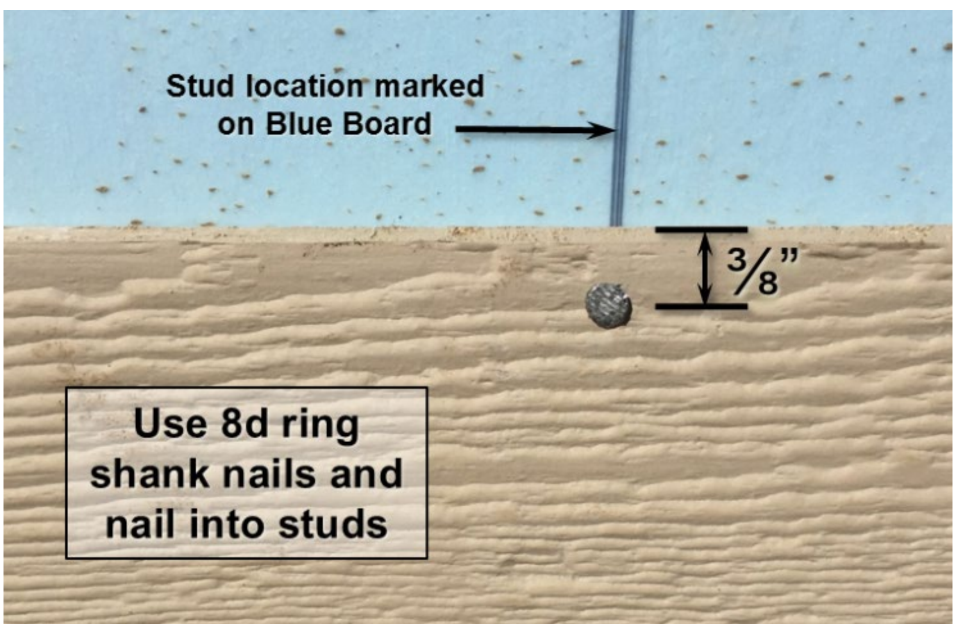


Figure 10-3. Siding Nailing Location

Siding will also need to be cut to allow for plumbing and electrical protrusions. A hole saw, a spade bit, or jig saw should be used for these cuts. Cut outs should be as close to the protrusion as possible (see Figure 10-4).

Figure 10-4. Siding Cut Outs for Protrusions

10.3 PREPARATION FOR SIDING INSTALLATION

10.3.1 MARKING FOR FIRST AND SECOND ROWS OF SIDING

At all of the house corners, measure first row and second rows of siding. For 8-foot walls, the first row is set at 91 inches from top of the cap plate and the second row at 84 inches (see Figure 10-5). For 9-foot walls, the first row is set at 103 inches from top of the cap plate and the second row at 96 inches. Because the siding gauges can be used to set the second row, it is not necessary to snap the second line around the entire house. It is necessary to make the mark the second row in porch areas because the siding gauges will not fit under the first row of siding. Marking the second row does add a second reference line to ensure a consistent 7-inch reveal. To mark the gable side of the house where there are no trusses to measure down from, measure down on the eave side of the house, make a mark, and transfer it around the corner with a 2-foot or longer level. Then snap a chalk line across the entire gable wall.

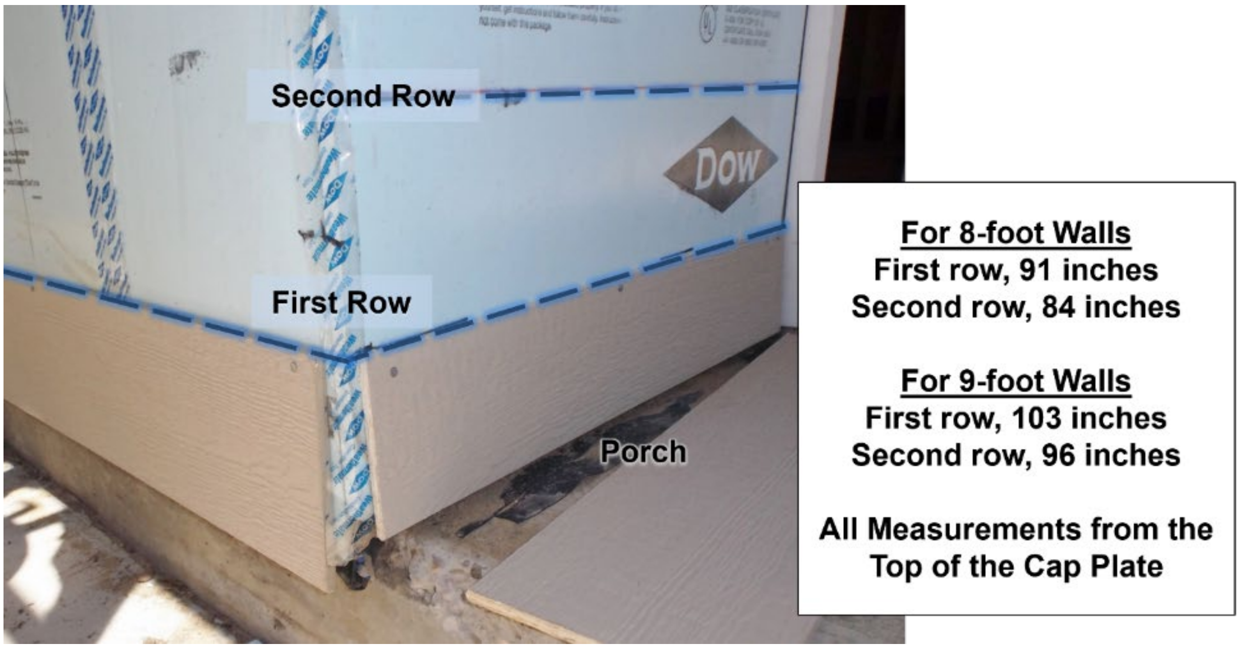


Figure 10-5. Measurements for First and Second Rows for Siding

Use the measurement to snap a chalk line all around the house. It is easier to snap the lines for both rows at the same time. The first line sets the top edge of the siding. The purpose of these lines is to set the siding so it follows (is level with) the roof line and ensures the reveal of the first row of siding is 7 inches. Do not spray the snap line with lacquer; it damages the plastic coating on the Blue Board.

10.3.2 STORY LINES

Reference pencil marks or “story lines” can be added to windows and door frames to show where bottom edges of siding should be located. The purpose of a story line is to provide a visual cue to the volunteers so they know exactly where the bottom edge of every row of siding should be placed. These lines on the corners will also ensure the siding rows line up around the corner from one wall to the next (critical).

Story lines can also be drawn (with pencil) on window and door frames (recommended). After the first row is installed, measure up from the bottom of the first row at each corner of the house and mark (with a pencil) the corners with lines every 7 inches. It is not recommended to build a separate template or tool with the story lines on it. Story lines drawn right on the corners, windows, and doors do not move or get lost and they provide for easy quality control even after a wall is complete. Do not use pens or Sharpies to mark storyboards; the ink is difficult to cover when painting.

10.4 SIDING INSTALLATION

Before beginning installation, check to see where the joints will be and how the siding layout will adhere with the rules for no joints under or over the windows or no closer than 3 feet on each side of the joints.

Use the snap lines for the first two rows (see Section 10.3.1). Align the top of the siding with the chalk lines and nail in place at studs using 8d ring shank nails. For the third row of siding, use a spacer tool to establish the 7-inch reveal from row to row (see Figure 10-6). Because of the length (16 feet) of the siding, use three spacers to prevent sagging in the middle. As each row of siding is installed, check around corners to ensure rows line up wall to wall.

Figure 10-6. Using Siding Gauges to Maintain 7-Inch Reveal

The siding gauges can slip while nailing. Check for a 7-inch reveal as each row is installed.

On the porch, siding should be ½-inch above the porch slab; this may require the first row of siding to be cut (see Figure 10-5). When possible, the cut side of the siding should be placed at the top. On sloped porches, the siding may need to be cut to match the slope of the porch so the top edge of the siding remains level. Prime the cut edge before installing. Leave a ½-inch gap between the siding and the slab (see Figure 10-7).

Figure 10-7. Siding on Sloped Porch

Porch ceilings and soffit must be in place before installing the last row of siding. On non-gable end walls, the last row of siding may need to be cut (ripped down) using a circular saw to maintain the 7-inch reveal. The cut edge of the siding should be placed against the ceiling or soffit.

On gable end walls, the siding will need to be cut (using a circular saw) to fit against the soffit. Based on the pitch of the roof, make templates for the cuts on the right and left sides of the wall (see Figure 10-8). Cut the piece of siding making sure there is a minimum gap (no more than ½-inch) between the siding and the siding frieze at the soffit.

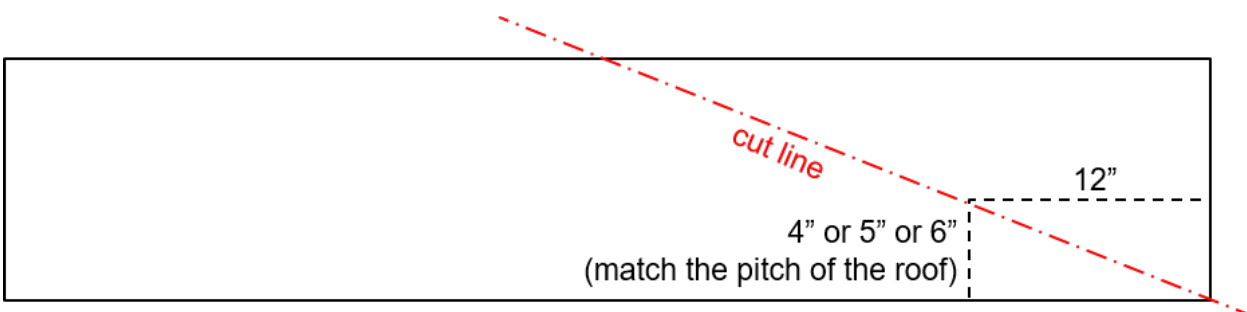


Figure 10-8. Marking Angle Cut for Siding on Gable

At the top of the gable wall, the last piece of siding will be cut at an angle on both ends, forming a small triangle. Fasten this piece to the wall by nailing at least ¾-inch from the top edge of the panel. A scrap piece of siding can be installed behind this final piece to keep it from rocking back against the Blue Board too steeply.

10.5 AROUND WINDOWS

Plan the layout so there are no seams immediately below or above the window or near the corners. Leave a ¼-inch gap between the edge of the siding and the inside surface of the window channel (see Figure 10-9).

Figure 10-9. Siding Around Windows

10.6 AROUND DOORS

Plan so there are no seams immediately above the door or near the corners. Leave a ¼-inch gap between the edge of the siding and the inside framing of the door (see Figure 10-10).

Figure 10-10. Siding Around Doors

Over the garage door, trim the opening after installing one row of siding above the opening. Add Z-flashing over the trim and the continue siding (see Section 9.10).

10.7 INTERSECTING WALL

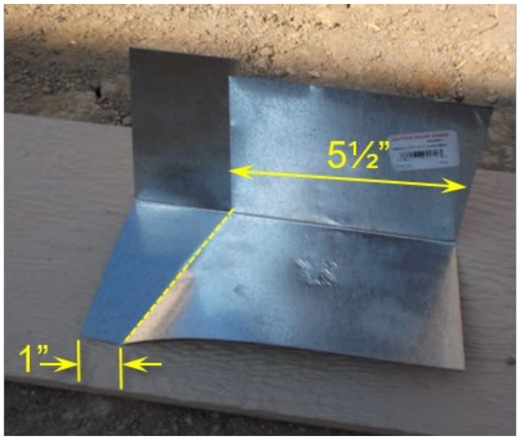
It is acceptable to have an irregular gap where the other end of the siding meets the soffit under the gable because the gap will be masked by the siding frieze (1x4 trim). It is preferable that the siding goes behind the fascia rather than cutting the siding to go around the fascia. Do not cut the siding around the drip edge on the porch roof. If needed, cut the last ½-inch or so of the drip edge and shingles flush with the fascia board so the siding can be cut to run straight up the fascia board (see Figure 10-11). This prevents water being directed behind the siding by the drip edge.

Figure 10-11. Siding at Intersection Wall

10.8 OVER PORCH ROOFS

Siding should be spaced off the shingles a minimum of 1-inch. On walls adjacent to a roof, an additional piece of step flashing should be installed to divert water away from the siding (see Figure 10-12). Before installing siding over the roof, create a diverter by cutting the bottom section of a piece of step flashing to the bend. At this cut, bend to the top section to form a slight angle (see Figure 10-13). Slide the flashing underneath the first shingle and nail the upper section to the wall.

Figure 10-12. Installed Diverter



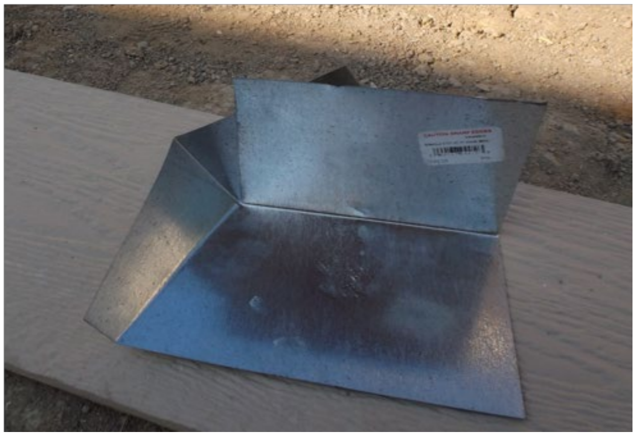


Figure 10-13. Making a Diverter

10.9 SIDING AROUND OPENINGS

The location and size of vents and other openings varies. Before installing siding around plumbing fixtures (i.e., faucets and cleanouts), place butyl adhesive tape around the protrusion (see Figure 10-14).

Figure 10-14. Place Butyl Adhesive Tape Around Faucet

10.10 SIDING TRIM

The corners, windows, and doors are trimmed with 1x4 material. See Section 9.3 for corner boards, Section 9.4 for window trim, Section 9.5 for siding frieze, and Sections 9.10 and 9.11 for door trim.

10.11 COMMON ISSUES AND SOLUTIONS

- Leveling Short Pieces of Siding

Never use a level when siding. For short pieces of siding (e.g., down the side of garage or porch doors), mark a story board on both sides of all short pieces of siding. These short pieces are often very visible and it is important that they look good. Special care must be taken to make sure that the spacing is even between rows and that the rows line up on either side of the opening.

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CHAPTER 11: DRYWALL

Tools and Materials

- Hammer
- Measuring Tape
- Utility Knife
- Screw Gun
- Drywall Saw
- Spiral Saw
- Metal Snips
- Sawhorses
- Drywall Square
- Rasp
- Ladders
- Hard Hat
- Eye Protection
- Dust Mask
- Drywall
- Joint Compound
- Drywall Screws
- Drywall Nails
- Metal Corner Bead
- Construction Adhesive
- 2x4 Lumber

Safety

- Be sure all ladders are properly positioned and stable. Follow all ladder safety rules (see Table 2.3).
- Wear a dust mask to avoid getting dust particles in your lungs.
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.
- For additional safety information, see Chapter 2.

Think About This…

- Hanging drywall is not just about speed it is about doing the job right.
- Be sure to protect the corners and edges of the drywall; these can easily be marred or damaged.
- Minimize joints; it will be better to use a bit more drywall than to create extra work for the finishers.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

11.1 INTRODUCTION

Drywall (aka plasterboard, wallboard, gypsum board, or Sheetrock) is a panel made of gypsum plaster pressed between two thick sheets of paper. It is used to make interior walls and ceilings. Drywall typically comes in 4-foot by 8-foot or 4-foot by 14-foot panels.

11.2 PREPARATION

Prior to installing drywall, sweep the floor and remove any excess building materials from the room. Then mark the locations of studs, cripples, and electrical boxes on floor with spray paint or a Sharpie, except in the garage (use a pencil). Mark the truss locations on top plate. Additionally, make sure there are adequate surfaces (deadwood or trusses) along the perimeter of the room to screw into.

11.3 CUTTING DRYWALL

- Take time to measure, accurate cuts will make taping and mudding easier.
- Cut panels a ¼-inch short. This will allow a ⅛-inch gap on both sides of the panel and allow the neighboring panel to be fit more easily.
- Use a drywall square to make straight cuts. Score the panel using a utility knife and then snap the cut open so the panel folds back on itself. Then cut through the paper at the crease.
- If the cut edges are not smooth, use a rasp to smooth the edge.
- Holes for electrical boxes, plumbing, or vents must be laid out accurately. Transfer the measurements to the drywall panel to be cut. For circular holes, use a compass. Cut the openings using a drywall saw by plunging the tip of the saw into the panel from the front side of the panel.
- Do not sweep floor so that the dust allows easier pick up of fallen drywall mud.

11.4 INSTALLATION

Drywall is installed using drywall screws on the ceiling and drywall nails on the walls. Both must dimple the surface without breaking the paper. Attach the drywall to the trusses or studs using drywall screws/nails every 8 inches on the edges and 12 inches in the field. Along the edge of the panel, place the screws/nails about ⅝-inch from the edge.

- Install drywall on the ceiling first, then the walls. During installation, hold upper sheet tight against ceiling.
- Hold lower wall sheet tight against upper wall sheet
- Keep nails and screws 6 inches away from receptacles and lights.
- Nail edges of door and window openings before cutting.

For walls, the drywall is hung horizontally (i.e., long side is perpendicular to the studs). This reduces the number of joints and helps hides irregulars in the framing. Prior in installing place a bead of glue along each stud about the thickness of a #2 pencil. Make sure the top plate is thoroughly glued to provide an additional air sealing measure. Place the drywall panel against the studs so that one edge butts against the ceiling panel and one end fits snugly against the abutting wall and nail.

Begin the bottom row with a shorter piece so that the seam in the top row will not be directly above the seam in the bottom row. Position the piece and nail in place. There should be a slight gap between the floor and the drywall so that the drywall will not jam against bumps in the floor; the baseboard will cover it. If necessary, trim the sheet to leave about a ½-inch gap to the floor.

When covering outside corners, cut the drywall piece long so that it hangs over the corner. Then trim with a spiral saw after it is in place. Hang the abutting panel, leaving it long too, and then trim to create a tight, well-fitted corner. Protect the corners with metal corner bead. A bead that is a bit long will kink when fastened. To prevent this, cut the bead with tin snips, leaving it about ½-inch short. Hold the bead tight against the ceiling. Screws will distort the bead, so nail it in place, spacing the nails every 9 inches.

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CHAPTER 12: INTERIOR TRIM

Tools and Materials

- Hammer (smooth faced)
- Measuring Tape
- Speed Square
- Utility Knife
- 3-Foot and 6-Foot Levels
- Miter Saw
- Circular Saw
- Jig Saw
- Belt Sander
- Air Hoses
- Compressor
- Finishing Nail Guns (16 gauge)
- Narrow Crown Staple Gun
- Caulk Gun
- Nail Set
- Long-Handle Pry Bar
- Sawhorses
- Ladders
- Ear Protection
- Eye Protection
- Hard Hat
- Trim (e.g., Baseboards, Casing)
- Shelving
- Exterior Doors
- Interior Doors
- 1½-Inch and 2½-Inch Finishing Nails
- 1½-Inch Narrow Crown Staples
- 3-inch Deck Screws
- Shims
- Silicone Caulk
- QuikCrete
- Construction Adhesive

Safety

- Eye protection is required at all times.
- Ear plugs and dust masks will be provided if requested (not mandatory).
- Do not wear gloves when operating a saw.
- Be sure all ladders are properly positioned and stable. Follow all ladder safety rules (see Table 2.3).
- Always check the nail guns are operating properly before using. Oil nail guns before using (two drops of oil in the air hose connection). Be sure the safety is working and that nails are being shot to the proper depth. Never use a nail gun with a faulty or missing safety.
- Never point a nail gun at anyone for any reason.
- Keep your finger off the trigger until you are ready to shoot a nail.
- If a nail gun jams, disconnect the air supply hose before attempting to repair the jam. This will prevent the gun from firing unexpectedly and injuring someone.
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.
- For additional safety information, see Chapter 2.

Think About This...

- In some cases, the studs may have been marked on the slab during framing. If not, use a stud finder to mark the stud locations on the floor with a marker (except in the garage) before beginning work.
- Always nail into a stud, a header, or a base plate. Nails driven into drywall alone will not hold effectively.
- Set every nail below the surface of the wood using a nail set or use a finish nail gun.
- Measure very carefully. Caulk is not a solution.
- Cut and cope very carefully.
- When measuring from one wall to another, do not bend the tape at the far wall and estimate the measurement. Instead, cut a block of wood exactly 10 inches long and push it into the corner. Measure from one corner up to the block then add 10 inches.
- It is always better to over-measure than to under-measure. You can always cut a little more off of a piece that is too long.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

12.1 INTRODUCTION

Trim is installed around doors, bottom of the walls, and bottom of windows. It can also be called casing, molding, or millwork. Trim is essentially a filler or transition where there are gaps like where baseboards meet flooring. Unless noted otherwise, interior trim is installed using a nail gun with 2½-inch finishing nails.

12.2 DOORS

The doors used by DAHFH are pre-hung. A pre-hung door is a door that is already hanging in its own frame. While this eliminates the step of hanging the door to the doorframe, it still requires fitting the pre-hung unit into the wall. If the unit is not installed correctly, the door may not close or swing properly. Figure 12-1 shows common terms used to describe part of a door.

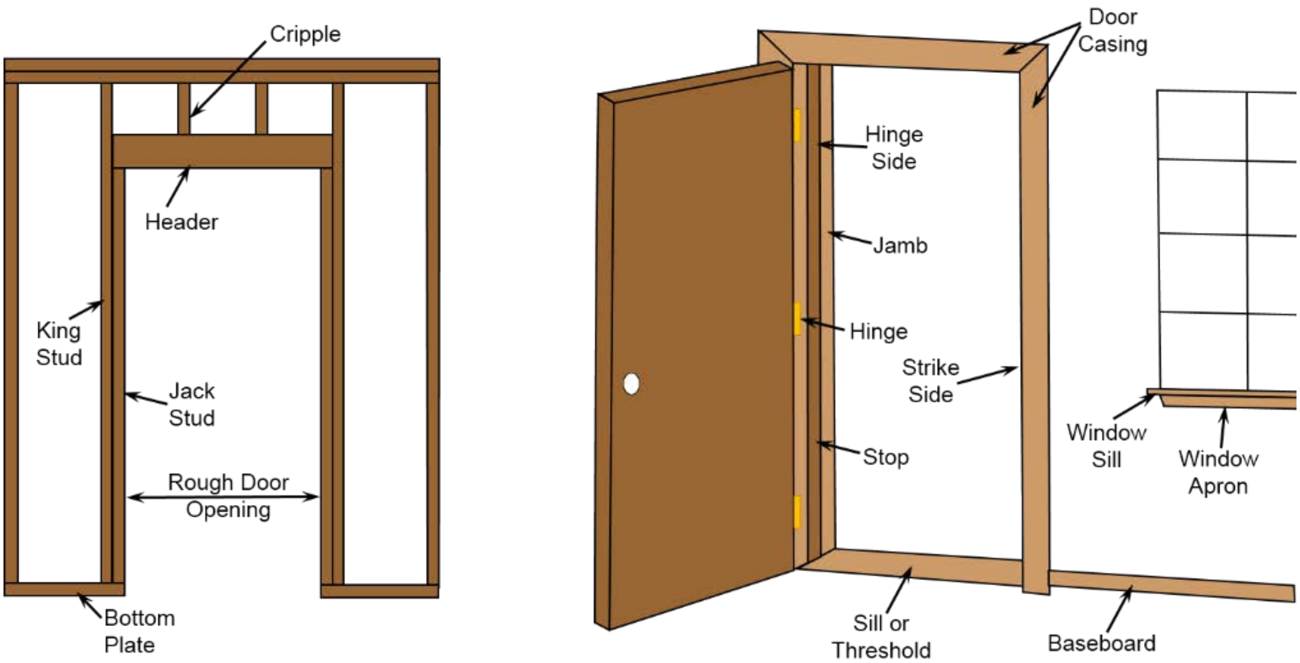

Figure 12-1. Door/Interior Trim Nomenclature

Prior to beginning the installation of a door:

- Review the house plans to verify the door size for each opening and the direction of swing of the door.
- Check the rough opening between the jack studs to be sure it is about 2 inches wider than the door itself, e.g., if the door is 36 inches wide the rough opening should be about 38 inches.
- For exterior doors, any wall sheathing that protrudes into the rough opening must be trimmed back flush with the jack stud.

- If tile will be installed next to an exterior door, the door will need to be raised to allow a clean seam when the tile is installed. A piece of siding should be cut to fit under the exterior door threshold to raise the door. This piece of siding will be left in place.
- For interior doors, drywall that extends beyond the jack studs must be trimmed so the drywall is flush with the stud.
- In most cases, the sill plate will have already been cut/removed from the framing. However, if the sill plate is still intact, it will need to be removed prior to installing the door. If so, verify the king/jack studs are firmly secured before cutting out the sill plate.
- Verify the jack studs on both sides of the rough opening are at right angles to the adjoining walls. A speed square and long straight edge (e.g., 4-foot level) can be used to verify. Correct as necessary using shims to make minor adjustments.
- Make sure the bottom plate next to the king stud is fastened to the slab.
- Check the hinge side and strike side (side on which the lock or passage-set strike plate will be installed) jacks for plumb with a level that is at least 6-feet long (see Figure 12-2). If the hinge side is out of plumb (with level on the inside of the rough opening) by more than ¼-inch, then add overlapping shims (narrow points overlap) along the jack stud where the hinges will be attached. Nail through both shims with 2½-inch nails so that when the level is held against the jack/shims it is plumb.
- Verify the jack stud is plumb (level on the outside of the rough opening). If it is out by ¼-inch or less use a block and hammer on the bottom plate to move the wall over. If it can't be moved enough, consult with the DAHFH Construction Staff.

Figure 12-2. Check the Hinge Side of the Rough Opening for Plumb

12.2.1 EXTERIOR DOORS

Check the slab between the jack studs to see if it is flat. If there is a high spot under the threshold it may cause the door to drag. Shims under both jambs can be used to eliminate the bow. If the area between the jacks is low, then there will be a gap under the threshold. The low spot can be corrected with successive layers of fast setting QuikCrete to provide a stable and level base under the threshold (see Figure 12-3). In either case, consult with the DAHFH Construction Staff for the best method to use to correct these problems.

Figure 12-3. Filling Large Gap Under the Threshold

12.2.1.1 PREPARING THE DOOR FOR INSTALLATION

Remove any nails or packing material from the door paying attention to staples that may be on the bottom of the jambs (see Figure 12-4). Lay the door down and inspect the bottom of the threshold to make sure there is nothing that will keep it from sitting firmly on the slab.

Figure 12-4. Remove Packing Material from the Bottom of the Jambs

Some doors have a package above the head jamb with longer screws and additional weather stripping material; remove and save. Sometimes one, or both, of the jambs are too long and will hold the threshold above the slab; if this is the case, sand or cut the jamb(s) down so they are flush with the metal threshold.

If the trim is not attached to the outside of the jambs it will need to be cut and installed unless the door is from the garage into the house. Trim (1x2) is attached to the outside door jambs to provide a transition from the door frame to the wall surface (e.g., brick or siding). To install the trim, draw a set back line on the outside edge of the jamb that is ¼-inch away from the edge. The trim will install along this line. Measure along the line to find the length of the trim. Install using a finish nailer with 2½-inch nails.

Doors from the garage to the interior of the house are exterior doors without trim. The interior edge of this door has to be set ½-inch beyond the jack stud to allow for flush fit of the drywall. Using ½-inch blocks screwed along the edge of the jack helps to set the proper depth (see Figure 12-5). A stop board can be used to steady the door before it is screwed in place (see Figure 12-6).

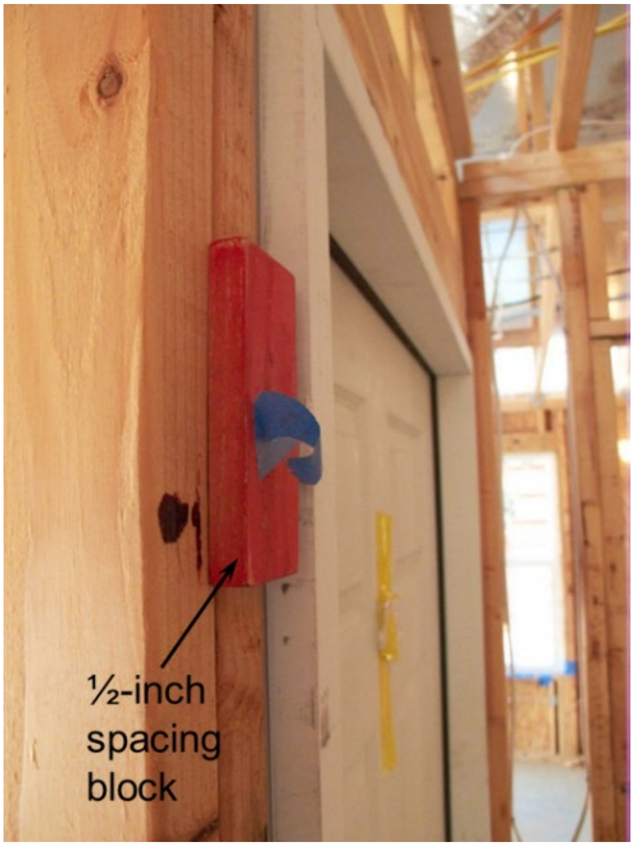

Figure 12-5. Use ½-Inch Blocks (in Red) to Allow for Drywall

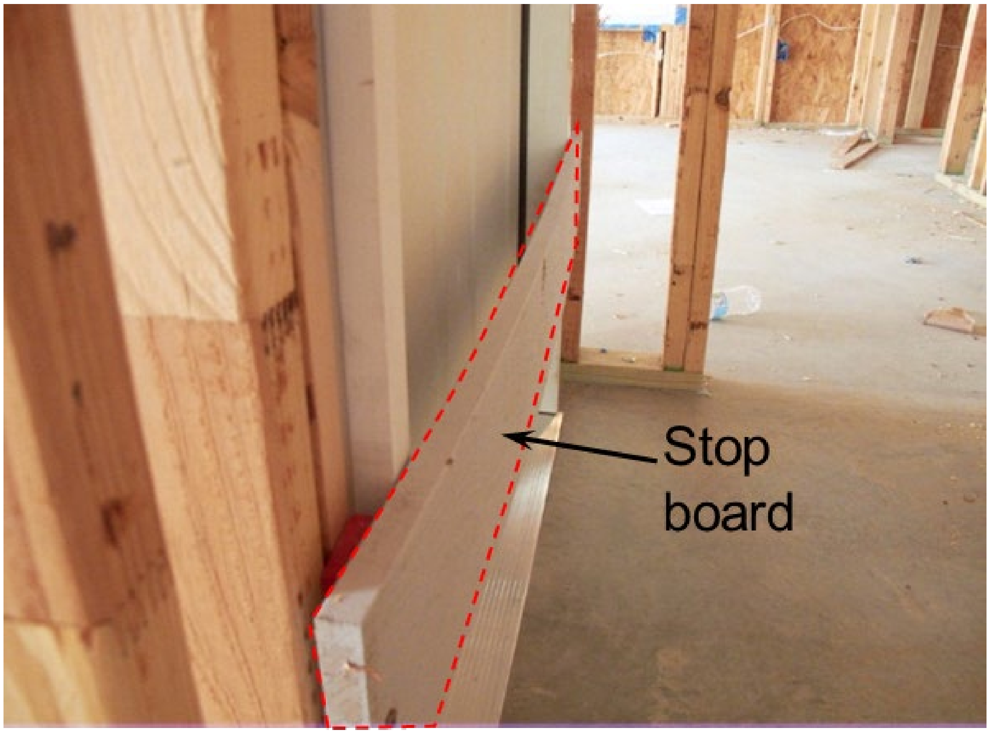

Figure 12-6. Stop Board

12.2.1.2 SETTING AN EXTERIOR DOOR

Raise the door unit into the opening for a test fit. Set the threshold into the opening and raise the unit into place. Make sure the trim (if used) is tight against the wall sheathing. Cut away any Blue Board that may be in the way. The inside edge of both side jambs should be ½-inch beyond the jack stud to allow for a flush fit with the ½-inch drywall. Measure the gap between the top of the door jamb and the header. If it is more than 1½ inches, then install a filler block to the bottom of the header as a nailer for the top door trim. A gap between ¾ inches and 1½ inches will need a piece of sheathing or a 1x4 block nailed to the bottom of the header. If less than ¾-inch no blocks are needed.

If the fit of the door unit in the opening looks good, then mark where the threshold should be on the slab (see Figure 12-7). Then remove the door from the opening and apply a thick bead of 100 percent silicone caulk on the slab where the door will set and run the caulking up 2 to 4 inches on both jack studs (see Figure 12-8).

Do not forget to remove the nails that hold the door shut in the jamb before starting the installation. Do not try remove them after the door is installed.

Figure 12-7. Mark Location of Threshold on Slab

Figure 12-8. Apply Silicone Caulk to Jambs and Slab (Not the Threshold as Shown)

Tilt the door back into the opening with the trim tightly against the sheathing. Push the hinge side jamb tight against the jack stud. Make sure the inside edge of the jambs is ½-inch beyond the inside edge of the jack studs so the drywall will lie flush. The hinge jamb should be flush with the jack stud even if the jack is a little out of plumb. Pull the weather stripping back near the top of the jamb and insert a 3-inch screw behind the weather strip (see Figure 12-9). The screw should be driven just tight so that the head is flush with jamb face – do not over tighten. The weather strip should hide the screw.

Figure 12-9. Fold Back Weather Stripping to Install Screws

Add another screw near the bottom of the hinge side jamb. From the outside of the door, stand back and check the top reveal between the top of the door and the head jamb. It should be equal with the gap on the hinge side carrying across to the strike side. If it is too tight on the strike side take out the top screw on the hinge side and use shims at the top of the hinge side jamb to wedge the door over until the reveal is opened correctly. Drive a screw through the jamb and wedges. If this does not correct the strike side reveal it may be necessary to raise the strike side jamb but do this as a last resort because it will raise the threshold off of the slab creating another problem.

Check the door to see if it is closing tightly against the weather strip. If you can see daylight between the edge of door and the weather stripping it is not fitting tightly. The strike jamb may need to be tilted slightly at the top or bottom to make a tight fit. If the weather strip cannot be made to fit tightly by tilting the strike side the hinge side may need to be tilted but at this point you should consider removing the door and straightening the walls on either side of the rough opening.

From the outside, check the reveal between the hinge side of the door and the jamb. It should be equal and not tight. Loosen screws to adjust the gap and add shims where necessary. Add a third 3-inch screw behind the weather stripping on the hinge side near the middle hinge.

If the gap between the strike side jamb and jack is ⅜-inch or greater use a piece of sheathing to fill the gap starting at the middle of the jamb between the hardware cutouts. Add shims behind the sheathing to tighten the reveal between the door and jamb (see Figure 12-10). The reveal should be about ⅛-inch. As much as possible, use shims in pairs, with each going in the opposite direction of its neighbors. This will help keep the two sides of the shim stack parallel to one another. The goal is to use pairs of wedges to create a "single" piece of wood that is just the right thickness. Otherwise, you are installing an actual wedge which can add a significant twist to the jamb when it is screwed through the shim pack to the rough framing.

Figure 12-10. Use Shims in Pairs

Add shims just above and below the cutouts for the deadbolt and handle then screw them in place while maintaining an even reveal. Add shims along the strike side as needed to ensure an equal reveal top to bottom. Make sure that shims are placed near the bottom and top of the strike jamb (see Figure 12-11). If the shims are below the top jamb or above the threshold, they will tend to bow the entire vertical jamb inwards. Do not over tighten the screws. Once the corners are secure then you can carefully install shims between the top and the bottom of the door to make the reveal as uniform as possible (see Figure 12-12).

Figure 12-11. Shim Near the Bottom and Top of the Strike Jamb

Figure 12-12. Use Shims to Adjust the Reveal

Hold the door halfway open and see if it swings by itself. If it does, then the hinge jamb is twisted and not parallel with strike jamb. Back off hinge side jamb screws and use shims to adjust. The same procedure can be used to correct a door that when closed springs partially open. Recheck reveals and correct if necessary.

Make one final check for equal reveals on the sides and top of the door, a tight fit against the weather stripping, and a door that swings properly (see Figure 12-13). Remove one of the screws from the hinge on the jamb that is nearest to the door stop and closest to the weather stripping (see Figure 12-14). Insert a 3-inch screw that is approximately the same color as the others through the same hole so that it is through the jack stud. This stabilizes the door. Do this for the other two hinges as well.

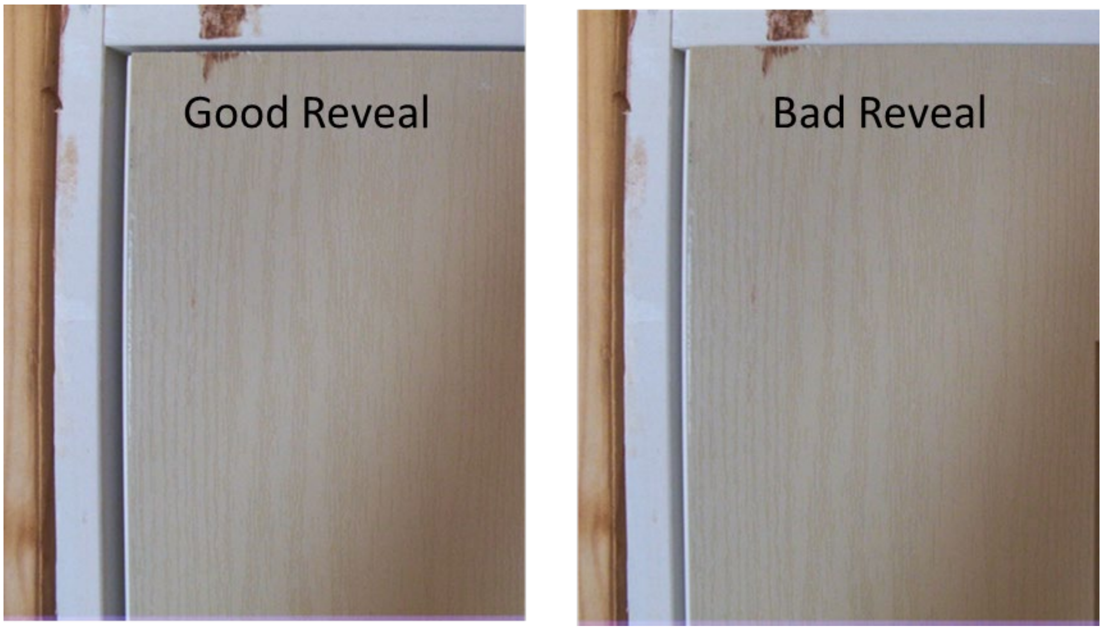

Figure 12-13. Check For Equal Reveals On the Sides and Top of the Door

Figure 12-14. Replace One of the Hinge Screws with a Long Screw

The exterior doors used by DAHFH typically have a metal brace that covers both strike plates. To add security, add a screw (through the shims) above and below this plate on the strike side of the jamb (see Figure 12-15). Using a utility knife, cut all protruding shims so that they are flush with the jack stud and will not interfere with sheet rock installation.

Figure 12-15. Reinforce Door Frame on Strike Side of Jamb

12.2.2 INTERIOR DOORS

The installation of interior doors is similar to exterior doors. Prior to beginning, check the level of the floor between the jack studs with a 3-foot level. If the floor is out of level by ¼-inch or more then the high side jamb leg may need to be cut with a circular saw or the low side shimmed. Remove any nails or packing material from the door paying attention to staples that may be on the jamb bottoms.

If the door trim is not attached to one side of the jambs, then it will need to be cut and installed preferably on the side of the jamb nearest the hinges. There is a raised lip on the inside edge of the jamb and the trim sits against it on both sides and the top. Nail the trim to the jamb with 2½-inch finishing nails or 1½-inch narrow crown staples.

Once unattached, the door and jambs must be handled very carefully to avoid damage.

Remove the plug from the doorknob cut out; you may be able to push it back in partially to hold the door and jamb together but make sure it can be removed from the hole once the door is installed. Carefully (do not allow the door to swing free of the jamb) tilt the unit into the opening with the trim tight against the drywall on all three sides. To move the unit without the plug, press the jambs tightly against the door.

Working from the side of the door unit with the trim attached, press the top of the hinge side toward the jack stud. Measure the gap between the top of the door jamb and the header. If it is more than 1½ inches, then install a filler block to the bottom of the header as a nailer for the top door trim. A gap between ¾ inches and 1½ inches will need a piece of sheathing or 1x4 block nailed to the bottom of the header. If less than ¾-inch no blocks are needed.

With the door unit setting in the opening and the trim tight against the drywall, press the hinge side jamb tight against the jack stud. Check the gap (reveal) between the head jamb and the top of the door. It should be about ⅛-inch along its entire length. If the reveal is too wide on the strike side, then pry the hinge jamb up to make the reveal uniform and put a shim under the bottom of the hinge jamb. Or push the bottom of the hinge jamb toward the strike side until the reveal is uniform. If the reveal is too tight on the strike side, then shim under the strike side jamb or try tapping the bottom of the hinge side jack back toward its jack stud. Once the top reveal is about equal nail into the hinge side trim about 3 inches from the top. Use 2½-inch nails to attach the trim to the wall.

Stand back and look at the top reveal between the head jamb and top of the door. The jambs can be moved easily with only one nail holding the door. Once the head jamb/door reveal is uniform nail through the hinge side trim near the bottom.

With the door closed lift up on the strike side of the door enough to take the weight off and push the jamb and top hinge against the stud. The reveal between the top hinge and the jamb should be a little tight, nail into the trim near the top hinge. If the reveal between the door and jamb near the top hinge looks good, add another nail into the trim near the top hinge.

Check the top reveal and the hinge side reveal for uniformity. Hold the strike side trim tight against the wall and carefully open the door and make sure it does not swing by itself. If it does check for plumb along the ¾-inch edge of the hinge jamb. Wind blowing through the house can make the door swing so closing exterior doors and windows may be necessary. Adjust correct for plumb. Once done, nail into the trim on the hinge side about every 12 to 15 inches while moving the trim in or out to keep a good reveal.

Start nailing the vertical strike side trim about 3 inches from the top of the door. Push or pull the trim to get a constant reveal of about ⅛-inch and nail down the trim about every 15 to 24 inches. Nail through the top trim every 15 to 24 inches.

Working from the side of the door unit without trim, close the door and see if the door is tight against the door stop on the strike side. If the bottom of the door does not hit the stop but the top does, then use a block of wood to lightly tap the bottom of the strike jamb toward the door. If the bottom of the door touches the stop but the top does not, then use the block of wood to lightly tap the bottom of the hinge jamb toward the door.

Cut and nail trim on the untrimmed side. Use 2½-inch finishing nails or 1½-inch narrow crown staples to fasten the trim to the jamb along the raised lip on the edge of the jamb. Make another check of how the door swings and the reveal. If is good, nail through the trim and into the jack stud using 2½-inch finishing nails. On both sides of the door, two nails need to be placed about 2 inches from the floor into the trim to prevent baseboard installation from moving the door trim. A nail through the face of the jamb above and below the strike plate is also needed.

Again, check for reveals and the door not moving when open. Nail above and below each hinge on the jamb face. Remove one screw in the top door hinge that is closest to the stop and replace it with a 3-inch screw that is similar in appearance.

12.3 INTERIOR TRIM

See Figure 12-1 for interior trim nomenclature.

12.3.1 BASEBOARDS

Generally, measure and install the baseboards along the long walls first. That way if the baseboard is measured or cut incorrectly, it can be used for the shorter walls. The exception is small corners behind doors; install those first and cope over them to get a good fit.

- For walls with doors, do not install the baseboard until the doors have been installed (see Section 12.2).
- On a wall that is so long that two pieces of baseboard must be used, miter the splice 45°. Plan ahead so the splice is located over a stud.
- Do not install baseboards on kitchen walls where cabinets will be installed or bathroom walls where the vanity will be installed.
- Measure the length of the wall and cut the baseboard material to fit.
- In each room or closet, fit all the baseboard pieces together before nailing.
- The baseboards need to be elevated off the slab by ½-inch if the floor will receive carpet or linoleum or ⅝-inch if the area will be tiled.
- Nail the baseboard into the studs using two nails per stud using 2½-inch finishing nails. Place the two nails in the upper half of the baseboard only to make sure the top of the baseboard fits tightly against the drywall. Do not nail below the drywall; this may cause the top of the baseboard to pull away from the drywall.

12.3.1.1 INSIDE CORNERS

At inside corners, a butt joint is used. A butt joint is used where two pieces of trim with a square profile come together. Cut the first piece of the baseboard so it fits flush against the wall. For the second piece, cut the baseboard the length needed. The end of second piece of trim is placed flat against the side of the first one (see Figure 12-16).

Figure 12-16. Baseboard Inside Corner Joint

12.3.1.2 OUTSIDE CORNERS

For outside corners, trim should be mitered. It is best to start with two short scrap pieces of baseboard to test the fit. Cut both at 45½°. Set tight against the outside corner. If there is a gap on the front of the corner increase the angle to 46°. If there is a gap on the back of the corner reduce the angle. Both pieces must have the same angle. Once the right angle is found cut a final piece of baseboard to fit the wall but make sure to use the angle found above. It is best to cut this final piece about ⅛-inch long, check the fit and cut again if needed (see Figure 12-17).

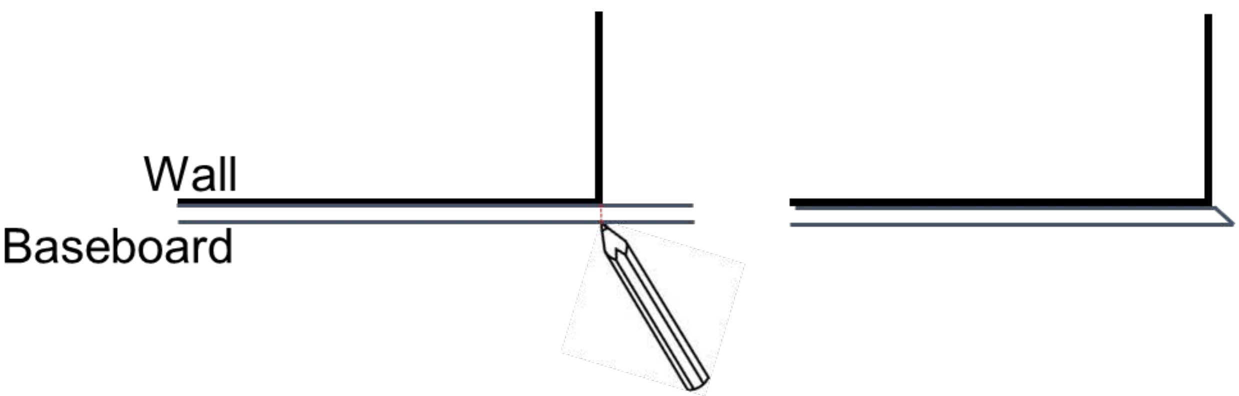

Figure 12-17. Marking and Cutting Baseboard for Outside Corners

To install, use carpenters glue on the outside corner and use a 2½-inch finishing nails to nail through the angle in a couple of places (see Figure 12-18). Then with the corner set continue attaching the baseboard to the wall.

Figure 12-18. Installed Baseboard (Outside Corner)

12.3.2 WINDOW SILL AND APRON

Measure the width and depth of the window opening. Measure the width from the drywall on either side of the window opening. Measure the depth from the window frame to the front edge of the drywall. Cut a square piece of window sill material 2 inches wider than the width of the window opening. Measure, mark, and cut notches out of either side of the back of the sill piece. Each notch should be 1-inch wide and as deep as the window opening (see Figure 12-19). If the front of the edge of the sill extends forward (into the room) more than 1½-inches beyond the window opening, cut the excess off the back of the sill. Using 2½-inch finishing nails, nail the sill into place by alternating the nails between the edge of the window frame and the front edge of the drywall.

Figure 12-19. Notched Window Sill

Use 2¼-inch wide door trim material for the window apron. Cut the apron the same width as the window opening and miter the two ends at 22½° (see Figure 12-20). Nail in place using 2½-inch finishing nails; be sure to nail into studs.

Figure 12-20. Window Apron

12.3.3 ATTIC ACCESS OPENING

Measure and cut the trim for all four sides before installing. Measure each side of the opening. Cut the trim so that each piece is 1-inch shorter than the corresponding side of the opening; this provides a lip on which the attic door rests. Locate the first two pieces ½-inch inside the opening, creating the overhang lip. Use a square to be sure the trim pieces are at 90°. Nail the first two pieces in place using 2½-inch finishing nails. Use a square at each subsequent corner to be sure that they are square. Trim the final piece, if necessary, to make as tight of a fit as possible.

12.4 SHELVING

Shelves are made of 1x12 material and 1x2 or 1x4 material is used of for shelf supports. Shelving is typically installed in the kitchen pantry, linen closet, bedroom closets, and laundry room using 2½-inch finishing nails. Figure 12-21 shows the measurements for the placement the shelf supports. All other pantry and linen closet measurements are from the top of the previous support to the top of the next one.

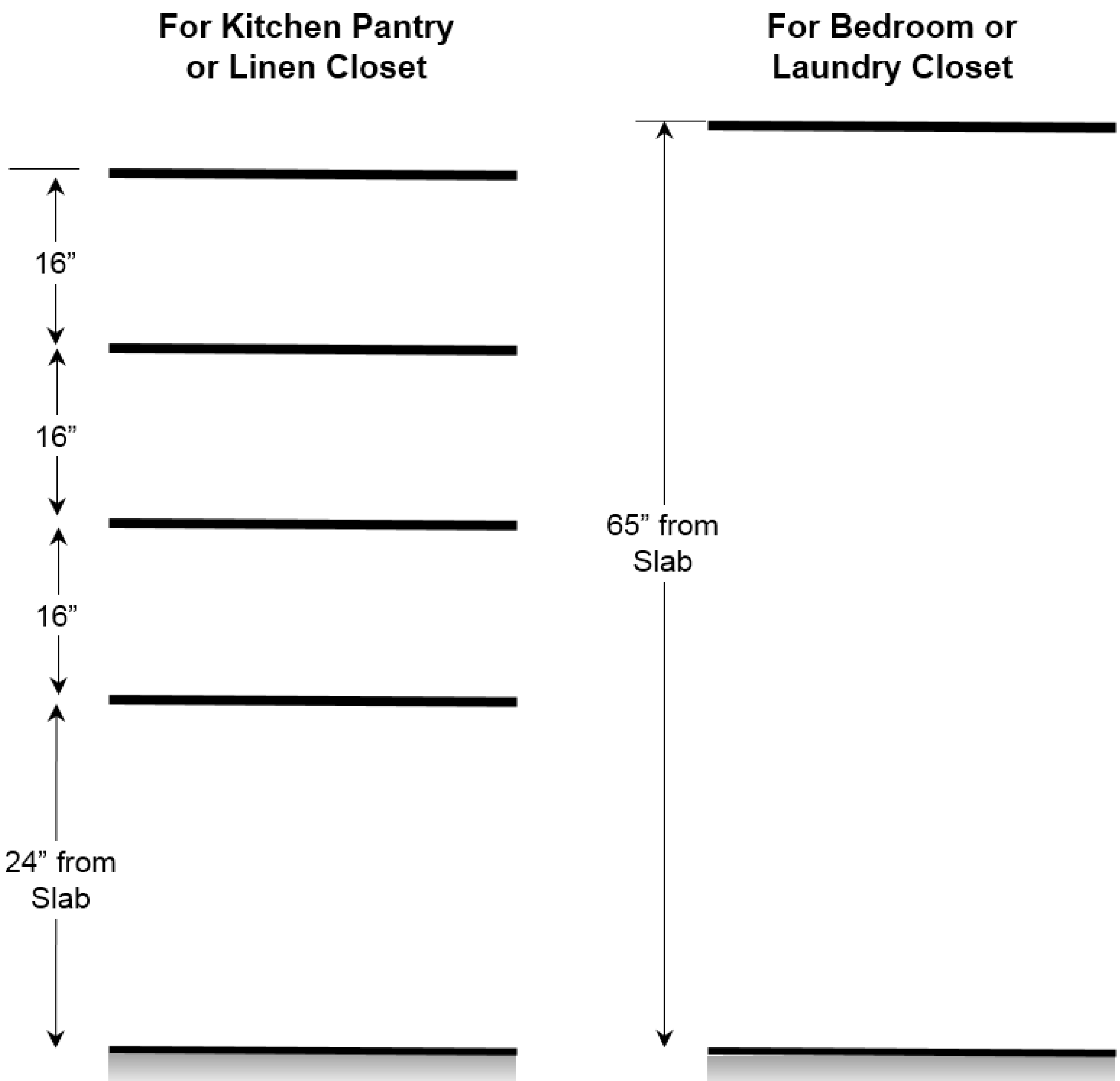

Figure 12-21. Shelf Placement

Measure the width of the back wall of the closet. Cut a shelf support to that length using 1x2 or 1x4 material. See Figure 12-21 for the proper location to install the support. Be sure it is level and nail it into the studs. Cut the side shelf supports either (a) 13 inches long, (b) 1-inch beyond the nearest stud that is at least 13 inches out from the back wall, or (c) the distance from the back wall to the front wall in shallow enclosures (see Figure 12-22). Cut both side shelf supports to the same length. Use the same 1x2 or 1x4 material and ensure that the side supports are level and flush on top with the back support.

Figure 12-22. Support Brackets for Shelving

If the front edge of a side support will be visible (i.e., the support does not extend to the front wall of the space), miter the front to 22½°. Butt a side shelf support against the back shelf support and level and nail it. In shallow enclosures, measure, cut, and nail the side supports to the front and back studs.

Also cut vertical pieces of 1x2 or 1x4 material for the back shelf bracket support (see Figure 12-23). Use 9-inch long supports in closets in the bedrooms and 11-inch in the laundry room. Miter the bottom to 22½°. Install two supports into studs if possible; equally spaced along the back of the closet. If no stud is at the spot where the cleat is equally spaced under the shelf then butter the back with construction adhesive and put in place under the shelf. Butt the top end of the vertical bracket support against the bottom edge of the back shelf support. Attach using 2½-inch finishing nails shot in at an angle to hold the support while the adhesive sets.

Figure 12-23. Shelf Bracket Support

Measure and cut the shelf out of 1x12 material and place on the shelf supports. Some closets like the linen and pantry can be deep enough to need 1x12 shelves that are two deep (i.e., 24-inch). Check with the DAHFH Construction Staff for details. Do not nail the shelves in place. It is much easier to paint them, and the closet, if they can be removed. After painting, nail the shelves every 8 to 10 inches to attach the shelf to the supports.

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CHAPTER 13: CABINETS

Tools and Materials

- Hammer (smooth faced)
- Measuring Tape
- Speed Square
- Utility Knife
- 3-Foot and 6-Foot Levels
- Laser Level[1]
- Miter Saw
- Jig Saw[1]
- Table Saw
- Cordless Drill[1]
- Impact Driver[1]
- Right Angle Drill[1]
- Countersink Bits[1]
- Square Drive Bits[1]
- Phillips Drive Bits[1]
- Drill Bits[1]
- Hole Saw (14-Piece Set)[1]
- Stud Finder[1]
- Cabinet Surface Clamps[1]
- Bar Clamps
- Air Compressor
- Air Hoses
- Finishing Nail Guns (18 gauge)
- Brad Nailer (18 gauge)[1]
- Nail Set
- Step Stool or 6-Foot Ladder
- Extension Cords
- Broom
- Ear Protection
- Eye Protection
- Hard Hat
- Cabinets[2]
- Filler Strips[2]
- Scribe Molding[2]
- Toe Kick Material[2]
- Straight 2x4 or 1x4
- 3-inch Deck Screws
- 1½-Inch #8 Flat Head Steel Screws[1]
- 2½-inch #8 Flat Head Steel Screws[1]
- 2½-Inch #8 Steel Washer Head Screws[1]
- Construction Adhesive[1]
- Wood Shims
- Screw Lube[1]

Notes:
1. Included in DAHFH cabinet installation kit
2. Supplies by cabinet manufacturer

Safety

- Eye protection (safety glasses/googles) is required at all times.
- Ear plugs and dust masks will be provided if requested (not mandatory).
- Gloves are recommended for handling lumber to prevent splinters.
- Do not wear gloves when operating a saw.
- Be sure all ladders are properly positioned and stable. Follow all ladder safety rules (see Table 2.3).
- Always check the nail guns are operating properly before using. Oil nail guns before using. Be sure the safety is working and that nails are being shot to the proper depth. Never use a nail gun with a faulty or missing safety.

- Never point a nail gun at anyone for any reason.
- Keep your finger off the trigger until you are ready to shoot a nail.
- If a nail gun jams, disconnect the air supply hose before attempting to repair the jam. This will prevent the gun from firing unexpectedly and injuring someone.
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.
- For additional information on safety, see Chapter 2.

Think About This...

- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

13.1 INTRODUCTION

There are three types of cabinets:

- Wall cabinets – hung on the wall (may also referred to as “uppers”).
- Base cabinets – installed directly on the slab, these cabinets will have a countertop installed.
- Bathroom vanity cabinets – these cabinets will also have a countertop and sink installed.

Figure 13-1 shows the typical terms associated with cabinets that will be used throughout this section.

A. Cabinet Side
B. Face Plate/Frame
C. Drawer
D. Hinges
E. Shelves
F. Door Styles
G. Toe Kick

Figure 13-1. Cabinet Nomenclature

13.2 PREPARING FOR CABINET INSTALLATION

Prior to installing cabinets, sweep the floor where the cabinets will be installed. Also check the floor and walls for large drops or globs of texturing or wall mud that may affect the positioning of the cabinets.

13.2.1 CABINET INVENTORY

Prior to beginning cabinet installation, take an inventory of the cabinets. Do not take the shipping cardboard off yet because the cardboard has a label to identify the size and type of cabinet (see Figure 13-2).

Figure 13-2. Label on Shipping Package Indicating Cabinet Type and Size

Cabinet names found on cardboard covering the cabinet with the following labeling:

- First characters indicate type:
  - W indicates wall mounted
  - B indicates base (floor) mounted
  - SB indicates sink base for kitchen
  - V indicates vanity (bathroom)
- Next two characters indicate cabinet width, e.g., 30 indicates a cabinet is 30 inches wide, 21 indicates a cabinet is 21 inches wide.
- Next two characters indicate cabinet height, e.g., 30 indicates 30 inches high
- Examples:
  - W2130 – Wall hung cabinet that is 21 inches wide by 30 inches high
  - B12 – Base cabinet that is 12 inches wide
  - SB33 – Sink base cabinet that is 33 inches wide

Review the cabinet shipping list and/or layout drawing to ensure that all of the cabinets have been delivered by the cabinet manufacturer. Make sure that you have the correct layout for the house where the cabinets will be installed. The cabinet plans can vary only slightly between different house plans so if the correct cabinet plan is not matched to the correct house plan there will be problems and they may not be obvious until you are well into the installation job. Review the accessories package to ensure that an adequate supply of filler strips, toe kick trim, and scribe molding are included.

Filler strips are supplied by the cabinet manufacturer. These are generally 3 inches wide by 30 inches long. Filler strips are installed at the intersection between cabinets. Filler strips are used primarily for proper cabinet alignment, spacing and to account for wall irregularities. The room might not be precisely square. The filler strips are stained and finished to match the cabinets. Care should be taken so that the filler strips are installed with the finished side facing out.

If any cabinets are missing, determine if critical cabinets are missing and whether or not a partial cabinet installation can be performed. If in doubt, consult the House Leader and/or the DAHFH Construction Staff.

13.2.2 LAYOUT AND DRY FIT

To visualize the placement of the cabinets, review the general layout of the cabinets in the room and the layout diagram. Check the dimensions to make sure that everything will fit correctly.

- Stove opening must be 30½ inches minimum
- The refrigerator needs 36 inches of clearance from the wall
- Dish washer must be 24½ inches minimum

Organize the cabinets as they will be installed starting with the wall cabinets. This may be done in stages as the cabinets for a particular wall are prepared for installation. This requires floor space, which may or may not be available depending on the activities taking place in the house.

After a group of cabinets is organized for installation, remove the shipping cardboard from the cabinets. Inspect the cabinets to make sure that they were not damaged during shipping or delivery. If there is any damage, determine if it will be visible after the cabinets are installed. If the damage will be visible, contact the DAHFH Construction Staff to discuss if the cabinet installation should proceed or not.

Never install cabinets that have visible damage.

13.2.3 BLOCKING

Blocking should be installed in each of the walls during the framing stage, which are to receive cabinets. The walls requiring blocking vary depending on the house plan, but the vertical placement is the same for all houses. Figure 13-3 shows the heights of the blocking in the kitchen. For rehab homes, blocking may or may not be present. If blocking is not present, mark the location of the studs in the wall. A stud finder may be used to locate the blocking or a hammer and a small finish nail. If using a hammer and nail, ensure that the spots checked will be behind cabinets when they are installed. Use pencil to mark the location of the blocking or the wall studs on the wall. These locations will be used to support the cabinets.

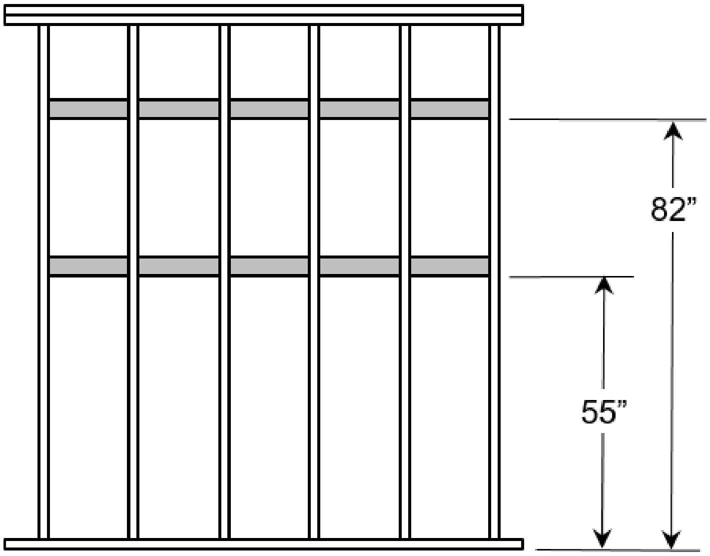

Figure 13-3. Kitchen Blocking Location, Profile View

It is very important that the cabinets be installed into the blocking (or into studs if blocking is not available) in the wall due to the weight they will support when used by the homeowner.

13.2.4 INSTALLATION ORDER

The upper cabinets should be installed first, as it is much easier to lift them into position without the base cabinets in the way. Start the cabinet installation on the longest wall and if it has an opening for the refrigerator then that is a good place to start. Allow for a 36-inch opening for the refrigerator. Then install the wall cabinets on the other wall. Most of the DAHFH house plans only have cabinets on two walls. Apply this same installation order to the base cabinets and start at the refrigerator opening. The base cabinet at the refrigerator opening should line up with the wall cabinet above.

13.2.5 CLEATS FOR WALL MOUNT CABINETS

Cleats are used to support the wall mounted cabinets temporarily while the cabinets are fastened to the wall. Strike a level line on all walls where cabinets will be installed at a distance of 42 inches from the ceiling. Create a cleat (one or two depending on house plan) using very straight 1x4 or 2x4. The top of the cleat should be installed at the 42-inch line on the side wall and the end wall. Use 3-inch deck screws to fasten the cleat to the studs where the first cabinets will be installed (see Figure 13-4). The cleat will be moved from wall to wall, so only drive the screws to the surface of the cleat so it can be removed easily.

Figure 13-4. Install Cleat to Support Upper Cabinets During Installation

13.3 GENERAL CABINET INSTRUCTIONS

This section provides general instructions for all cabinet installation. The installation of cabinets requires some tools that are not typically found on a DAHFH build site. As a result, Dallas Habitat has created a Cabinet Installation Kit (see Figure 13-5), which include the specialty tools listed on page 13-1 under Tools and Materials.

Figure 13-5. Cabinet Installation Kit

13.3.1 CONNECTING CABINETS TOGETHER

Select the group of cabinets to be installed and place the cabinets on their backs on the floor. Line up the row of cabinets so the tops of all of the cabinets are in a straight line. Remove all the doors and/or drawers. Use the cabinet surface clamps to clamp the styles of the cabinets together.

It is easier to connect the cabinets together if the doors are removed from the cabinets.

Ensure that the styles and the spacers are flush with each other before drilling any holes. Drill three pilot holes (top, middle, and bottom) in the styles of one of the cabinets (see Figure 13-6). Drill the pilot holes on the hinge side of the cabinet if possible. Drilling on the hinge side will make the screws less visible. Avoid the holes in the style that are used for the hinges. Then use a counter sink bit to allow the screws to be driven flush in the styles. Use 2½-inch flat head screws to connect the cabinets together and filler strip(s). Use a small amount of lube on the screws to make the screws easier to drive into the hardwood styles and filler strip to the end cabinet (if used).

Figure 13-6. Drilling Pilot Holes

13.3.2 PREPARING WALL CABINETS FOR INSTALLATION

For wall cabinets, drill small pilot holes along the top and bottom edge of the cabinet (not in the cabinet skin). If blocking is installed in the walls, drill pilot holes at approximately 16 inches on center starting near each corner. If blocking is not installed, then set the attached cabinets in place and drill pilot holes where studs are located as indicated by markings on wall. Each wall cabinet must have two screws, preferably three, along the top and bottom. If studs and/or blocking cannot be found to support at least two screws, contact the House Leader or DAHFH Construction Staff.

13.4 WALL CABINET INSTALLATION

Carefully lift the row of cabinets and set it temporarily on the cleat (see Figure 13-7). Remember the cabinets are only connected together at the face styles at the front of the cabinets and mishandling could damage the cabinets. Slide the row of cabinets for correct opening for refrigerator (36-inch opening) or slide the row of cabinets until it fits correctly in the corner.

Figure 13-7. Use Cleat to Support Upper Cabinets During Installation

Use a long level to verify that the row of cabinets is level. If the wall is significantly bowed, place appropriate shims behind the cabinet before fastening the cabinet to the wall, so that the cabinets are not bowed when screwed to the wall.

Use a drill to drive a 2½-inch washer head screw through the pilot holes on the top edge of the cabinet row into the wall blocking or wall studs (see Figure 13-8). Ensure that you drill into solid material. If the screw does not hit a stud or blocking, move a short distance to either side of the pilot hole and install another screw. Once the top is secure, drive a 2½-inch washer head screw through the pilot holes on the bottom edge of the cabinet row into the wall blocking or wall studs.

Figure 13-8. Securing Top of Upper Cabinets to Wall

Remove the temporary wall cleat and install it on the next wall where cabinets are to be installed. Use the same method to install the remaining wall cabinets. Once all the wall cabinets have been installed the cabinets need to be connected where they come together in the corner. Each cabinet should have a filler strip attached so it is important to attach the two filler strips together. Screws need to be placed on the back side. Drill pilots hole thru one filler strip into the adjacent filler strip. This is a really tight space so it may only be possible to get a pilot hole near the bottom and one near the top. Use 1½-inch flat head screws to connect the cabinet filler strips. It is much easier to perform this task before the base cabinets are installed.

One of the wall cabinets will be over the stove. This cabinet is 15 inches tall and will have a vent hood attached underneath (someone else will install the vent hood). This cabinet will require two holes cut in the back; one for the vent pipe and the other for the electrical outlet. Determine the exact location on the wall the cabinet will be installed. Measure to determine where these holes need to be located on the back of the cabinet. If the vent pipe and electrical outlet do not fall behind the cabinet then notify the House Leader or DAHFH Construction Staff immediately. Use a jig saw to cut these holes. Alternately, the entire back of cabinet may be removed if it has a thin back panel.

13.5 BASE CABINET INSTALLATION

Start the installation of the base cabinets at the same location that the wall cabinets were started, typically the refrigerator opening. The base cabinet should be plumb with the upper cabinet (see Figure 13-9). Using the instructions in Section 13.3.1, connect the base cabinets together. Use filler strips where called for on the layout or where needed for alignment.

Figure 13-9. Base Cabinet Should be Plumb (Even) with the Upper Cabinet

Remember, the following opening dimensions must be used:

- Stove opening must be 30½ inches minimum
- The refrigerator needs 36 inches of clearance from the wall
- Dish washer must be 24½ inches minimum

Use a power drill to install three 2½-inch washer head screws through the blocking or wall studs to fasten the cabinets to the wall. Once the cabinets have been pushed back to the wall if there is a gap between the wall and the back of the cabinet then use shims to fill the gap before driving the screw into the wall (see Figure 13-10). The maximum depth from the wall to the front of the cabinet is 24½ inches; counter tops are 25 inches deep. It is important that the screws attaching the cabinets to the wall go into solid wood. This may require finding the blocking or studs before attaching the cabinets to the wall.

Figure 13-10. Fastening Base Cabinets to the Wall

As the base cabinets are installed, make sure that the base cabinets remain level. If the cabinets are not level use shims to level the cabinet. When base cabinets come together in a corner and one or both of the cabinets have drawers then filler strips are required to allow the drawers to open. Filler strips should already have been installed based on the layout plans. Without at least 1-inch of offset the drawers will not open.

When a base cabinet is abutting a wall, a filler strip is used to move the cabinet away from the wall slightly then a short 2x4 block should be attached to the side of the cabinet at the floor level. This block will provide support for the toe kick when installed. This block is attached to the side of the cabinet with the filler strip. Attach this block before the base cabinet is installed. If the cabinet is placed next to the wall without a filler strip, then the 2x4 block is not needed.

13.5.1 SINK BASE CABINETS

Verify all of the plumbing lines have been installed. In the kitchen there should be two hot water lines, one cold water line, one drain line, and one clean out. In a bathroom, one hot water line, one cold water line, and one drain line. Align the sink base cabinet and mark the positions of the drain and water supply lines on the back of the cabinet. Drill a pilot hole from the back of the cabinet after the plumbing lines have been marked. Depending on the arrangement of the plumbing, use a hole saw or jigsaw to cut the drain and water line openings from the inside of the cabinet (see Figures 13-11 and 13-12). This will ensure that the cutouts are even and have a finished appearance.

Figure 13-11. Plumbing Cutouts Using a Hole Saw

Figure 13-12. Plumbing Cutouts Using a Jigsaw

After the holes have been cut in the cabinet, install the cabinet over the plumbing lines and push the cabinet against the wall, ensuring that the cabinet is spaced properly. Use a level to verify that the cabinet is level front to back and left to right (see Figure 13-13). Use shims to correct an out of level condition. After the cabinets have been connected together, verify that the cabinets are level, shimming as necessary (see Figure 13-14). Remember, the maximum depth from the wall to the front of the cabinet is 24½ inches; counter tops are 25 inches deep.

Figure 13-13. Check Level of Base Cabinets

Figure 13-14. Use Shims to Prevent Bowing the Cabinets

13.5.2 FILLER STRIPS

After the base cabinets are installed, the filler strips that intersect at the corners of the base cabinets need to be screwed together. Drill a hole through the filler strip into the adjacent filler strip. This is done in the blind space behind the cabinets. Drill a hole at the top, middle, and bottom of the cabinet. Use 1½-inch screws to connect the filler strips together. Install screws at the top, middle, and bottom of the filler strip (see Figure 13-15).

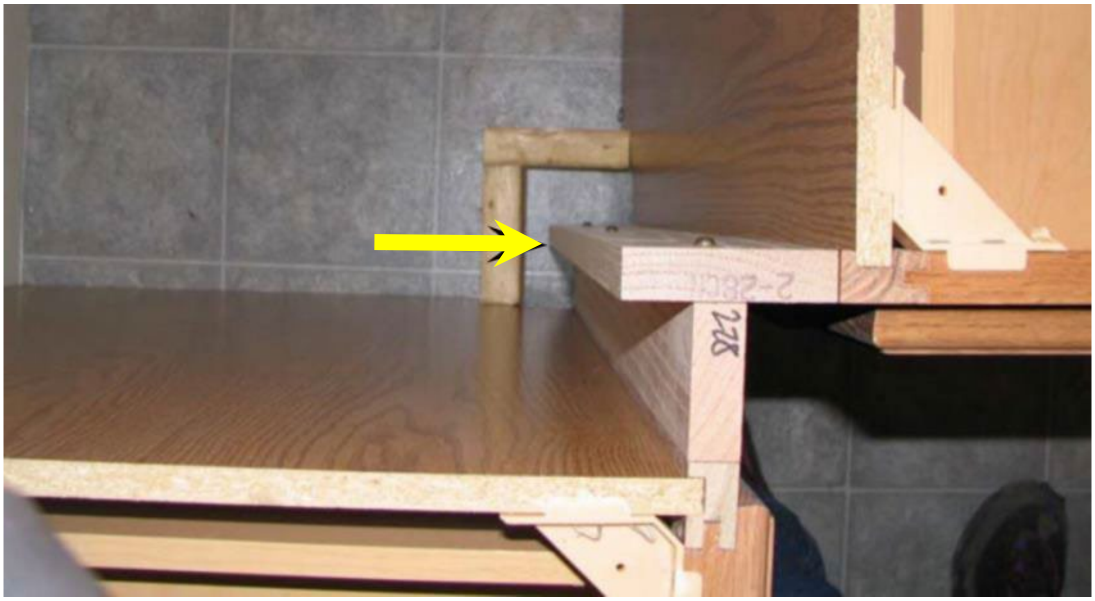

Figure 13-15. Connecting Filler Strips (Top View)

13.5.3 FRAMING CORNER FOR THE COUNTER TOP

The blind corners of the kitchen will be hidden by the counter top, which is installed on top of the base cabinets. It needs to be supported so that it does not sag. Cut two short lengths of 2x4 (approximately 20 inches long) for each blind corner. Fasten the lengths of 2x4 into the corner on each wall using 3-inch deck screws (see Figure 13-16). The deck screws must be driven into studs or blocking. The 2x4 should be installed at the same height as the top of the base cabinets.

Figure 13-16. Framing for Counter Top in Corners

13.5.4 TOE KICK BLOCKING

The bottom of the cabinets will be covered with a thin sheet of material designated as a toe kick. This material will be unsupported in the area immediately below the intersection of the filler strips. Corner blocks are installed to provide support for the toe kick. Cut two short lengths of 2x4 to form an "L" for the corner blocks. Attach the corner block to the bottom of the base cabinet. Ensure that the "L" is flush with the bottom of the cabinet in both planes. Install blocking for each inside corner (see Figures 13-17 and 13-18).

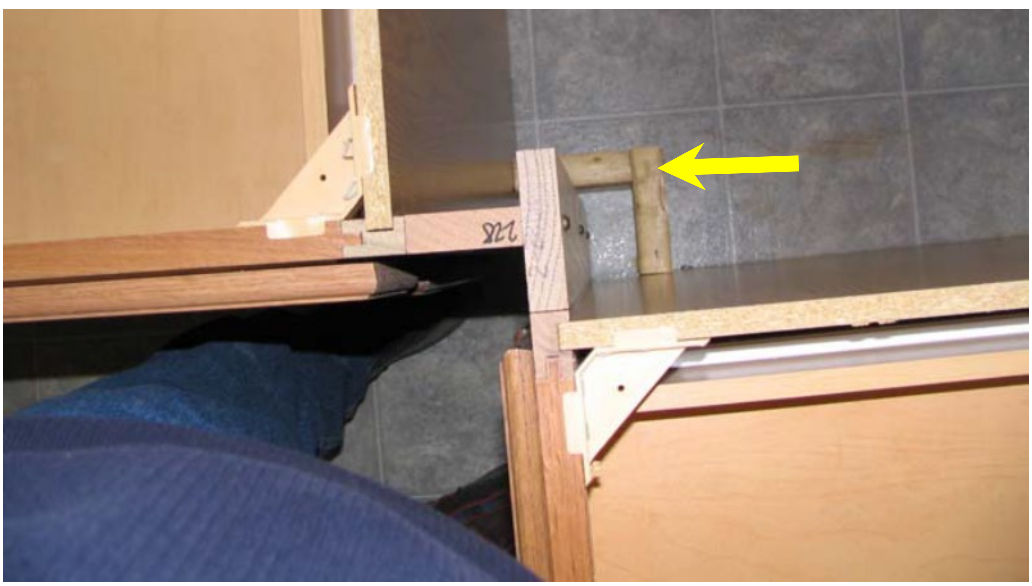

Figure 13-17. Framing for Toe Kick (Top View)

Figure 13-18. Framing for Toe Kick (Front View)

13.6 BATHROOM VANITIES

Bathroom vanities should be installed in the same manner as the sink base unit (see Section 13.5.1). It is best to locate studs in the wall before the vanities are pushed into place. The walls behind the vanities do not typically have blocking and studs can sometimes be hard to find. If solid wood cannot be found, discuss with the House Leader or DAHFH Construction Staff before proceeding.

13.6.1 VANITY BETWEEN TWO WALLS

Center the vanity between the walls and mark the plumbing lines. Cut the holes in the back of the vanity as shown in Section 13.5.1. Then install filler strips between the sides of the vanity and the walls. Use a table saw or trim saw to rip the filler strips to the needed width. Screw the filler strips to the sides of the vanity using three 2½-inch flat head screws.

Before the vanity is set into place attach, a short 2x4 block on each side of the vanity at the bottom to support the toe kick material. Push the vanity into place and attach the back of the vanity to the wall. Use a level to verify that the cabinet is level front to back and left to right (see Figure 13-13). Use shims to correct an out of level condition.

13.6.2 VANITIES WITH ONE WALL

Review the cabinet layout plan to see if a filler strip is needed. If needed, attach the filler to the side of the vanity using three 2½-inch flat head screws. Set the vanity (with filler strip, if needed) into the corner and mark the location of the plumbing lines. Cut the holes in the back of the vanity as discussed in Section 13.5.1. If a filler strip is used, attach a short 2x4 block on the side that has the filler strip to provide support for the toe kick. Push the vanity into place and attach the back of the vanity to the wall. Use a level to verify that the cabinet is level front to back and left to right (see Figure 13-13). Use shims to correct an out of level condition.

13.6.3 BATHROOM VANITY COUNTERTOP SUPPORT

In bathrooms with a large vanity and a half-wall, a support made of 2x4 must be installed for the extension of the counter top. This is done in a manner similar to that done for the blind space on the kitchen counter tops. This piece should be no longer than 18 inches long. It should be cut at an angle to soften its appearance (see Figure 13-19).

Figure 13-19. Bathroom Countertop Support

13.7 TOE KICK PLATES AND FINAL TRIM ITEMS

To finish out each cabinet, toe kick plate, shoe molding, and possibly scribe molding is installed. The toe kick material should be cut to length along the plane of each wall. Use a butt joint for the corner blocks. Attach the toe kick material to the very bottom of the base cabinets using construction adhesive and a few nails (use nails only as necessary to hold the toe kick in place until the adhesive dries). After the toe kick has been installed, use the shoe molding supplied by the manufacturer to finish off the joint between the toe kick and the floor covering. This will also cover any shims that were installed to level the cabinets (see Figure 13-20).

Do not install the shoe molding if the floor covering has not been installed.

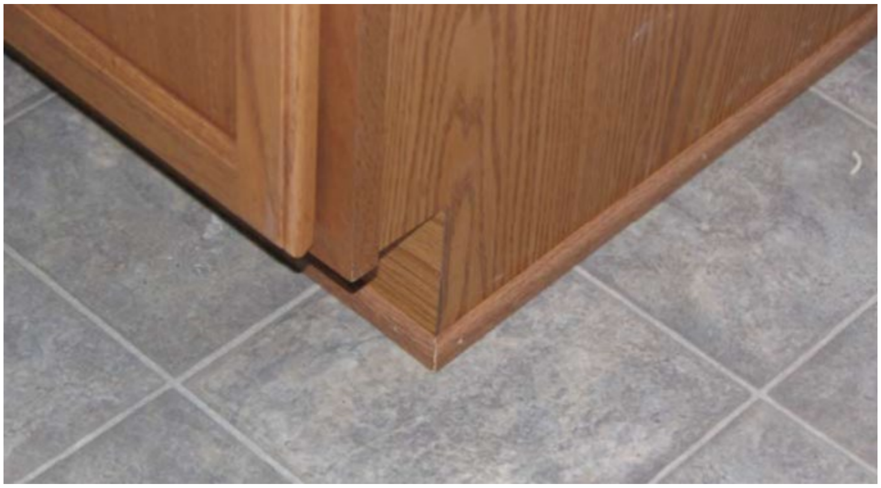

Figure 13-20. Kick Plates and Shoe Molding Around Base Cabinet

The final trim step is to install scribe molding to cover the gap between the cabinets and the wall or over the intersection of the filler strips (if necessary) (see Figure 13-21). This applies to base cabinets as well as wall cabinets. This molding must be applied in "pairs." i.e., if you install it on one side of the kitchen or bathroom vanity, you must install a corresponding piece on the other side of the kitchen or bathroom vanity. Scribe molding is not needed where the stove or dishwasher will be installed because these areas will not be visible. Scribe molding is needed in the opening for the refrigerator.

Figure 13-21. Add Scribe Molding to Cover Gap

13.8 RE-ATTACH DOORS

Re-attach doors to all the cabinets. Make sure the doors are properly aligned. The door hinges have a short slot for vertical movement of the doors. The objective is that all the doors are even.

CHAPTER 14: PAINTING

Tools and Materials

- Hammer
- Utility Knife
- Caulk Guns
- Ladders
- Nail Sets
- Flat Brushes, 3-Inch to 4-Inch
- Angled Brushes, 1½ to 2½-Inch
- Paint Buckets
- Extension Poles
- Roller Covers
- Roller Trays
- Garden Hose and Nozzle (for clean up)
- Buckets (for clean up)
- Wire Brush or Paintbrush Comb
- Hard Hat
- Caulk
- Paper Towels/Rags
- Blue Painter's Tape
- Plastic
- Felt Paper
- Spackle
- Sandpaper
- Exterior Primer for Metal
- Siding Paint
- Trim Paint
- Accent Paint
- Interior Paint

Safety

- Ladders should be properly positioned and stable, especially extension ladders used to reach the peak of a gable. Follow all ladder safety rules (see Table 2.3).
- When painting the upper areas (soffit, fascia, gable peaks, and ceilings), be aware of those working below.
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All Dallas Area Habitat for Humanity (DAHFH) volunteers are expected to comply with this policy while participating in any construction activity.

Think About This...

- If time and materials allow, paint the trim material before it is installed on the house.
- A careful, deliberate job of caulking will be nearly invisible once covered with paint. A bad caulking job will be highly obvious and look sloppy.
- When painting the front or side porch and the garage entrance, cover the concrete with roofing felt to prevent paint from dripping onto the concrete.
- If the air conditioning unit has been installed, cover it with sheathing (not plastic) to prevent paint drips on the unit.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.
- For additional safety information, see Chapter 2.

14.1 PAINT PREPARATION

Before painting can take place, proper preparation is required. The desired result is that seams and holes will be virtually invisible once the paint is on the house. Caulk is for seams but may be used for filling holes. However, if available, use spackle for filling holes left behind by nails. All materials (e.g., caulk, spackle, paint) are water soluble latex, relatively nontoxic, and can be cleaned up with soap and water.

14.1.1 CAULKING

Caulk, by its elastic nature, allows for seams to stay sealed when walls expand and contract with moisture changes and minor settling. Caulk should be applied where two pieces of soffit, fascia, or other trim butt together.

Cut a small hole at a 45° angle in the end of the caulk tube. Cut the smallest possible hole; less is more. Larger holes will make the job messier and harder to manage and will lead to greater waste. To caulk a seam, start at one end of the seam. Slowly squeeze the trigger of the caulk gun. Move the tip of the caulk tube steadily along the seam. Control the amount of caulk by moving the tip of the gun faster or slower along the seam. Release the pressure on the gun to stop the flow of caulk. Most caulk guns used by DAHFH have a trigger at the end of the gun for this purpose. Run your finger along the seam to press the caulk into the seam and to smooth it out (see Figure 14-1).

Figure 14-1. Caulking Seams

The key is to be sure no excess caulk remains but the seam is completely filled. Remove any excess caulk. Large gaps may require a second layer of caulk after the first sets up. Caulk is extremely difficult to remove once it has set up so it is critical that any excess, drips, smears, etc. be removed while it is still wet. Caulk cannot be sanded.

Tips for Caulking:

- Use your bare finger, a wet finger, or a wet rag to smooth out caulk. It is really a matter of personal preference.
- Keep a rag (wet or dry) available all times while caulking. Use it to remove excess caulk and to keep the tip of the tube and hands clean.
- Do not forget to caulk the seam behind the fascia where it meets the soffit. This is commonly overlooked.
- Putty knives are not good for smoothing caulk on wood grained surfaces and should only be used on smooth, flat surfaces.

A careful, deliberate job of caulking will be nearly invisible once covered with paint. A bad caulking job will be highly obvious and look sloppy.

14.1.2 SPACKLING

Spackle is hard and brittle once it dries and should only be used to fill holes. Any excess spackle can be sanded smooth once it is completely dry. Before spackling, be sure all nail holes are set below the surface of the wood. If a nail is sticking out or is flush with the surface, it will need to be hammered below the surface with a nail set. The same holds true for staples.

Apply spackle with your finger. Remove excess spackle with your finger or a rag leaving a smooth, flat surface (see Figure 14-2). When smoothing out the excess, follow the wood grain. Any excess spackle that is not wiped off must be removed by sanding, so removing the excess spackle while it is wet saves time in the long run, and also results in a better finish. If applying to a surface with a wood grain, do not use a putty knife to apply the spackle. It will leave too much spackle behind, effectively flattening the grain. Where excess spackle is left behind and allowed to dry, sand lightly, with the grain, to smooth the surface, effectively hiding the hole.

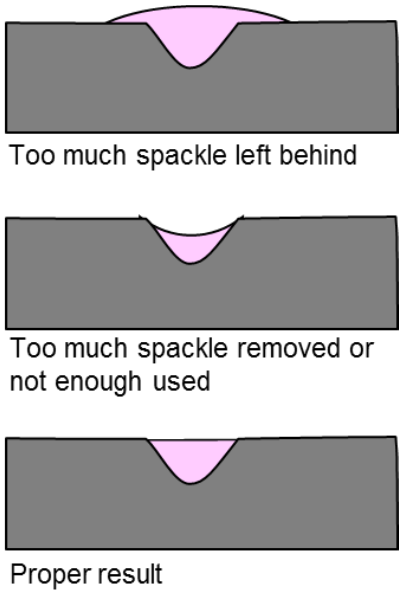

Figure 14-2. Spackling Holes

14.1.3 TAPING

To protect areas that will not be painted, blue painter's tape can be used. Specifically, window frames and door hinges do not get painted. The key to using painter's tape effectively is to be sure there are no bubbles or gaps. The edge of the tape must be completely and continuously adhered to the surface being protected. If cabinets are installed, mask the edge of cabinets next to the walls to be painted using blue tape and plastic. It is not recommended to tape the edges between the siding and trim because fresh paint tends to be pulled off with the tape. It is best to remove tape as soon after the final coat is applied as possible. If the paint dries before the tape is removed, pulling the tape up may also pull paint from the adjoining surface.

14.1.4 PRIMING

Exterior trim and siding are already primed. Baseboards and interior trim may need to be primed.

14.2 GENERAL PAINTING TECHNIQUES

Before painting, be sure all paint prep is completed. Take a broom and/or wet rags and clean off dirt from the siding and trim. Lay felt paper or cardboard on porch and top of driveway to protect the concrete from paint drips. Set up an area in the yard to fill roller trays and paint containers; do not set up this area on the porch or driveway. Also set up an area to clean brushes and rollers (see Section 14.6).

- Rollers are used only on large flat surfaces (like soffits, porch ceiling, siding, interior walls, and ceilings). Brushes are best for all other surfaces.

- Two thin coats are better than one thick coat. This allows the paint to cure properly and will last longer.
- It is important that any drips be smoothed out quickly before the drips have a chance to dry. Otherwise, they will be there forever.
- Do not apply the second coat until the first coat is thoroughly dry. Otherwise, the integrity and appearance of the paint may suffer. Allow a minimum of one-hour or longer, depending on weather conditions.
- On the first coat of paint it is important to make sure that the edge between paint colors, e.g., between trim and siding gets some paint on it. Make sure to overlap the edge with the trim color (this is usually the lighter color) rather than trying to cut in too carefully.

14.2.1 TIPS FOR USING A BRUSH

- Dip no more than ⅓ of the brush into the paint. This will provide all the paint needed and it will be a lot less likely to dribble off. It also prevents paint from drying at the top of the brush, which will reduce the usefulness, if not completely ruin, the brush.
- Use long, even strokes, and try to feather (thin out) all the edges.
- Paint is applied with the tip of the brush and not with the side of the brush. This is especially important when painting detailed work such as doors, door trim, and porch rail spindles. The details can catch and hold paint, which will drip when not looking!
- Use a straight edge brush on siding and fascia and an angled brush for "cutting in" (see Section 14.2.2)
- If you have to set a brush aside for a while (to eat lunch for example), either clean it or wrap in aluminum foil or plastic wrap and set it out of the sun. Once paint dries on a brush, the brush is ruined.
- When painting wood (or simulated wood grain), always follow the grain.

14.2.2 TIPS FOR CUTTING IN

Cutting in is a way of creating a line of one color of paint next to another color of paint. For instance, using just the tip, slide the brush along a piece of trim where it fits next to a wall surface or another piece of trim.

- An angled brush gives the best results, regardless of the size of the brush.
- When painting the exterior, it is easier to cut in from below. For example, between the siding frieze and the top course of siding, it is better to cut in with the siding color from below the siding frieze, rather than using the trim color above the top course of siding.
- Use long steady strokes to give a nice straight edge.
- Use enough paint. If there is too little paint on the brush, it will be much harder.
- Work in the direction that gives direct sight of the area being painted so you can see and control how well the paint flows.
- Press the brush against the wall just enough to flex the bristles and use the narrow edge of the paint brush when cutting in. Then turn the brush and go over the paint again with a

steady stroke to smooth the previous coat, this time there is no need to get too close but close enough to smooth the paint out nicely.

14.2.3 TIPS FOR USING A ROLLER

- Pour paint into the well of the paint tray to a depth equal to about half the thickness of the roller.
- To apply paint to the roller, roll it into the well of the paint tray. Do not dip the roller in the paint.
- Roll the excess paint on the "grid" end of the tray.
- If the roller leaves globs and drips on the wall there is too much paint on the roller.
- If you have to push hard to get paint to come off onto the surface being painted, there is not enough paint on the roller.
- Immediately use a brush to smooth out any drips made by the roller.
- Rollers can also speed up the task of painting exterior siding. Because the rollers used are wider than a single course of siding, it is best to use a horizontal motion, flipping the roller periodically to use all the paint on it.
- For interior ceiling and walls, roll a W or M shape on the wall to distribute the bulk of the paint. Then use overlapping vertical strokes to spread paint evenly between the lines. Continue painting the wall in this manner until it is covered. Overlap a bit of the cut-in edges to blend away any visible brush marks.

14.3 EXTERIOR PAINT

Every exterior surface should receive two coats of paint except window frames, and door hinges, drip edge. The following list shows what color to apply to which surfaces.

- Siding Paint: Siding paint color goes on all surfaces covered with siding.
- Trim Paint: This color goes on all surfaces that are not siding: corner trim, fascia, soffit, soffit trim/brick frieze, door frame, garage door frame (up to but not including the vinyl seal), porch beams, porch rails, porch posts, and porch ceiling. There may be other trim details, depending on the elevation.
- Accent Paint: This is for the exterior doors and any design details such as gable vents and shutters, depending on the elevation.

It is best to start at the top and work down and from the back to the front of the house. Back to front allows the painters to gain experience before painting the front and most visible section of the house. Top to bottom allows for covering any drips that may occur without having to return for extra touchup. The number of volunteers working will determine the order of events and how much can/will be done at the same time.

Under ideal conditions, painting should be split up by task:

- Trim: Use two to three people per side or section of the house - two people on ladders to paint the fascia and soffit and one on the ground to paint the trim. Another person can paint soffits from the ground using a roller and extension pole.
- Siding: This is best done using teams of about three or four people, one team per side of the house. A general guideline that works is to have two people with brushes for every one person with a roller. Rollers are actually not needed for siding but will make the work go a bit faster. Rollers tend to create more drips and will not sufficiently cover the undersides of the siding courses. This is why the brushes are still required. At least one or two people will need to use ladders to reach the upper courses of siding.
- Accents: One person who is meticulous is best for painting the front and side doors (see Section 14.5). This should be done with a brush, with brush strokes going in the same direction as the wood grain. Avoid drips and sags at the corners of the door panels. Gable vents and any other details that will be painted the accent color can be painted before being installed.

14.4 INTERIOR PAINT

Interior surfaces (e.g., walls, ceilings, trim) should receive two coats of paint except window frames, door hinges, and cabinets. This includes the interiors of closets, pantry, shelving, doors, and garage. Using a brush, paint the trim and baseboards first. Then use a brush to cut in a 2 to 3-inch band of paint at all corners, against the ceiling, and next to baseboard and door molding. Roll the ceilings first and then the walls.

14.5 PAINTING DOORS

Prior to painting, use a wet rag and clean off dirt from the door. Tape off the doorknob, lock, and hinges using blue painter’s tape. To minimize brush marks, apply the paint in sections and in sequence as shown in Figure 14-3. Painting paneled doors must be done in a way that defines the look of these areas. Whenever the styles and rails meet, a straight line must be maintained. Always brush in the direction of the wood grain. On exterior doors, the hinge edge of the door is painted the exterior accent color. The latch edge of the door is painted the interior color.

Order of Painting:
1. Bevels
2. Panels
3. Rails
4. Styles
5. Hinge edge side of door

Figure 14-3. Painting a Door

14.6 CLEAN UP

All paints used by DAHFH are latex based, which means clean up with water. If dish soap is available, it will make clean up a little easier. Rinse all equipment under running water (from garden hose) or in a bucket of water. The water will need to be changed frequently. To prevent spattered paint, set up the cleaning area away from the house and away from vehicles. The ideal location is the back of the lot or in an empty lot. Clean up should never take place in the street, and run-off should be kept on the lot and not allowed into the storm sewer.

A wire brush or comb can be used to remove dried paint from the brushes. A spinner may be used to work excess water out. If the spinner is used on brushes, be sure to smooth the ends of the bristles back together to preserve the brush shape and its future usefulness.

14.7 COMMON ISSUES AND SOLUTIONS

- Second Coat

It can be hard to tell which parts of the house have had a second coat of paint - especially for the trim - so do not start the second coat anywhere on the house until the first coat is complete everywhere on the house.

- Paint on Bricks

It is impossible to get paint off of brick so make sure that only the most careful painters are painting the trim and brick frieze that adjoins the masonry. If possible, put at least the first coat of paint on the trim and brick frieze before the brick is laid.

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CHAPTER 15: LANDSCAPING

Tools and Materials

- Garden Hose and Nozzle
- Gloves
- Rakes
- Shovels (Square and Round Nose)
- Pick Axe
- Spading Fork
- Hand Trowels
- Wheelbarrows
- Sprinkler
- Eye Protection
- Hard Hat
- Gloves
- Knives
- Machete
- Plants
- Trees
- Sod
- Mulch
- Compost and Other Soil Amendments

Safety

- Sod and trees can be heavy. Lift with your legs, not your back. Avoid twisting when lifting.
- Do not leave landscaping tools laying on the ground.
- When using a pick axe, be aware of others around you.
- Hard hats and eye protection (safety glasses/goggles) are to be worn at all times within the area defined as an active build site. All volunteers are expected to comply with this policy while participating in any construction activity.
- For additional safety information, see Chapter 2.

Think About This...

- Before digging holes for trees, check location of water and sewer lines and overhead utilities.
- Do not walk or stand behind someone using a pick axe.
- DAHFH Construction Staff may ask volunteers to vary from the practices included in this manual due to a change in materials, procedures, or other special circumstances.

15.1 SITE PREPARATION

Before sod can be laid or plants can be planted, the ground must be prepared. All construction debris, large rocks, and weeds should be removed. If a load of soil has also been delivered to the site, it needs to be spread to fill holes and even out the surface. The ground should slope slightly away from the house to be sure water drains away from the foundation.

Mark the location of the planting beds and trees. Verify with the House Leader or DAHFH Construction Staff on the location of the planting beds and trees. The location of the trees will be marked on the site plan for the house and should be consulted to identify the general location for trees, e.g., front or back yard. The site plan locates the trees to comply with city ordinances.

15.2 TREES

A large tree like an oak could reach 40 to 80 feet in height and the canopy of a mature oak will reach 60 to 100 feet in diameter. A redbud may become 20 to 30 feet tall with a canopy of about 25 feet in diameter. A tree needs to be planted so that when it matures it will not interfere with overhead power lines and or be too close to the house. In addition, larger trees have extensive and large roots that can crack a sidewalk or driveway and should then be planted at least six feet from these surfaces. A smaller tree should not be planted so that a larger tree will shade it from getting at least six hours of direct sunlight.

The most important item when planting a tree is the size of the hole that will be dug. In general, the hole needs to be at least twice the diameter of the root ball or container that holds the tree (see Figure 15-1). The depth of the hole should be 2 inches shallower than the height of the root ball. While the hole is being dug the roots of the tree should be kept moist. It should be left in the burlap or container until the hole is ready.

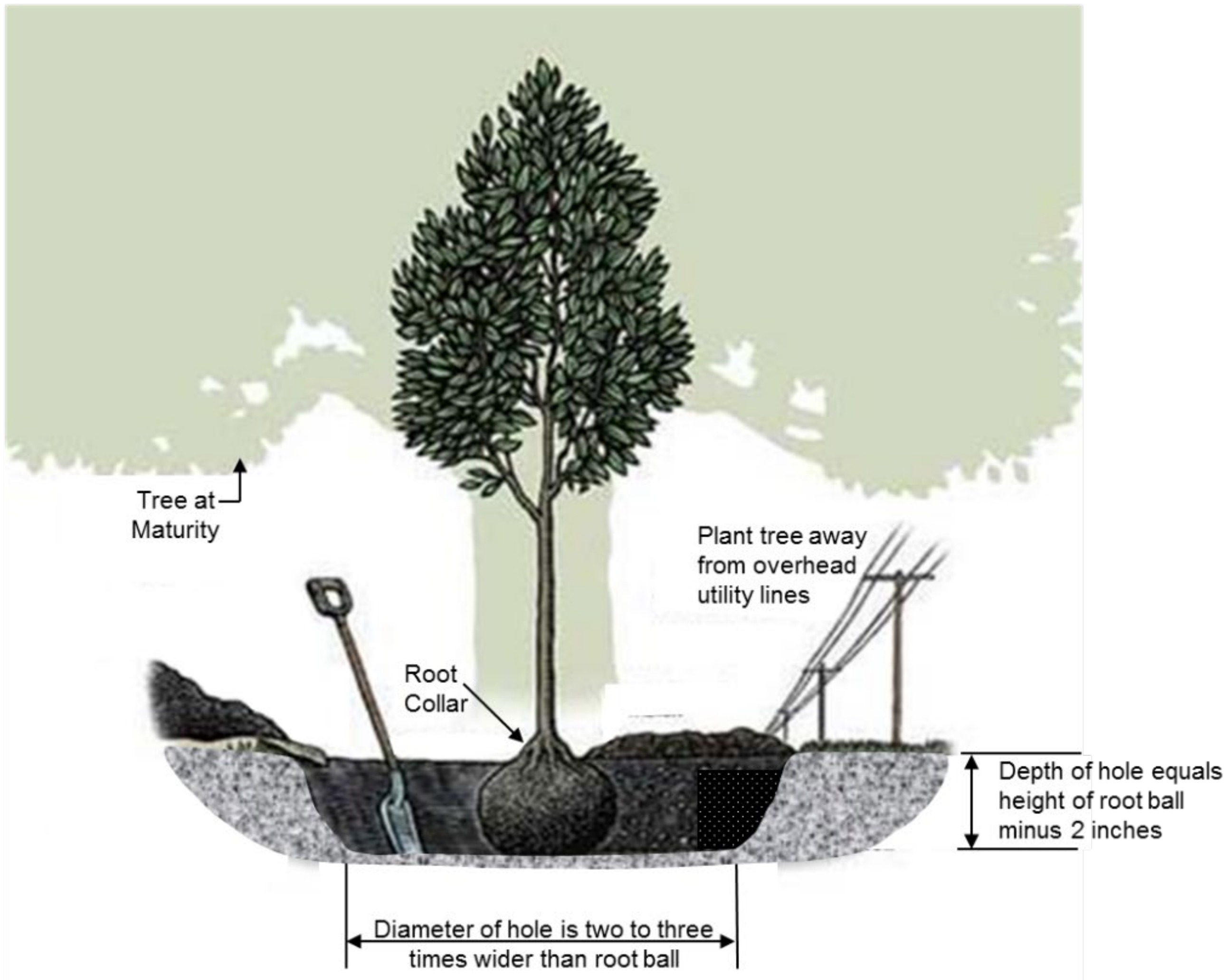

Figure 15-1. Preparation of Ground for Trees

Source: This Old House

Before planting, observe where the trunk of the tree contacts the dirt – this is where the trunk begins to flare to the roots and is known as the root collar. This should be positioned about two inches higher than the ground around the hole. In no case should the tree be planted so the root collar will be below the surrounding ground level. A long straight board or long level can be useful in establishing the proper height of the root collar.

The next step is to remove the container or burlap from the root ball. This should be done very carefully to avoid damage to the root ball. Trees that have grown in a confined space may have some roots that have begun to circle the container. Larger circling roots (greater than ½-inch diameter), should be cut back with a sharp knife to a point where the roots are no longer circling the other roots. The root ball should be loosened by gently pulling roots away from the tight ball shape that formed in the container. Depending on the size of the tree several people may need to grasp the tree trunk and lift it into the hole. Once in place in the center of the hole again check to be sure that the root collar will be about 2 inches above the average ground level. If not, remove the tree and add/subtract the backfill. Make sure the trunk is plumb.

The dirt dug from the hole is used to backfill the hole. Any large clods should be broken up. If a root stimulator is available, then it should be used according to directions. Use only the soil dug from the hole as backfill. If not, add any available sand (up to ⅓ of the total backfill), to black clay soil before filling the hole. If no sand is available, then just fill with the soil previously dug. Fill the hole about ⅓ of the way and tamp the dirt so it is firm; add a little water. Continue with adding dirt, water and tamping until the dirt is about 2 inches below the root collar. Do not put any dirt on top of the root ball. Cover the area of the hole with mulch, making sure an area of 2 to 3 inches around the trunk is free of mulch. There should not be a berm around the hole. Too much water retention weakens the tree; the mulch will retain enough water.

Water the tree with a slow trickle from the hose. Examine the canopy to see if any branches were broken in the moving/planting process. If so, cut the broken branch off with sharp shears about ¼-inch from the nearest intersecting branch.

15.3 GRASS

Grass (aka sod) should be delivered as close as possible to the time when it will be installed. If the pallet of grass has been sitting for a while it may need to be lightly watered to prevent drying. A sheet of plastic over the pallet may also prevent drying on hot days.

The ground around the house will need to be thoroughly raked and leveled before laying sod. Large clods and rocks need to be removed. An area in front of the house and usually next to the porch is used to plant flowers and/or shrubs. It needs to be marked so sod is not laid in the flower bed. The sod is laid next to the foundation of the house so that at least 3 to 4 inches of the concrete foundation is visible above the sod.

The sod should extend at least 5 feet from the foundation on all four sides of the house. To ensure there is enough sod for the front yard, it is best to lay the sod in the backyard starting at the house and to not finish laying sod past the 5-foot point until the front and side lawns have been completed. This ensures the front of the house looks good even if additional sod is needed to complete the backyard.

Strips of sod should be laid across the slope with the seams staggered (see Figure 15-2). After laying the first row, cut a strip of sod in half to start the next row. Continue this offset pattern. The edges of sod need to be laid tightly against one another.

Figure 15-2. Lay Sod With Staggered Seams

It helps to walk on the sod as it is being laid to make sure it is in good contact with the dirt underneath. It is important to water the sod immediately after it is put down. Water the area with a sprinkler or by hand. Move the sprinkler frequently to avoid overwatering.

15.4 FLOWERS AND SHRUBS

Small plants will be delivered in plastic containers. As it is with trees, some recognition of the species is advised. The plant label will provide information on the plant, such as size and spacing recommendations. Shrubs that naturally grow tall and/or wide should be planted at the back of a flower bed, but no closer than 24 inches to the house. Smaller plants will be planted in front of the larger shrubs. Consider how close each plant will be to its neighbor or the house when it reaches maturity.

A rough outline of the flower beds should be drawn on the ground using spray paint, string, or a line in the dirt. The site for the flower bed should slope away from the porch and foundation. Adding or removing dirt may be necessary to ensure that water will not pond in the flower bed or drain back to the porch or foundation.

A hole slightly larger and deeper than each plant should be dug. As each plant is removed from its container the roots should be carefully loosened before planting. No root pruning is usually necessary, but it may be considered for the roots of larger shrubs. All plants should be planted so the root collar is just above the average ground level. When all planting is complete add 2 inches of mulch to the flower bed making sure the mulch is not in contact with the root collar of each plant. Water thoroughly.

15.5 COMMON ISSUES AND SOLUTIONS

- Gaps Between Pieces of Sod

If sod has been laid with visible gaps between pieces, fill in the gaps with compost or loose dirt.

- Water Cut Off Valve Box Below Grade

The water cut off valve box is located near the front door of the house. Locate the box prior to laying out the flower bed. The box needs to be visible and accessible. If the valve box is below grade, dig out the box. Then set extra bricks in the hole to raise the valve box slightly above the grade of the yard (see Figure 15-3). Backfill the hole and proceed with planting the flower bed.

Figure 15-3. Reseting Level of Valve Box

GLOSSARY

- Blue Board: Rigid foam insulation placed on outside of house between the wall sheathing and siding.
- Bottom Plate: The lumber that runs under the studs and between the studs and slab. The bottom plate is used to attach the wall to the slab. Pressure treated lumber used for the bottom plate to help prevent rot and insect damage.
- Bullen Board: A 2x4 stop board installed on a ladder panel to ease installation and ensure the finished assembly is straight.

- California Corner: Constructed of two 2x4s, 2x6s, etc. nailed at a 90° angle to each other. Used to provide dimensional stability for bracing. Also often used at the end of a wall, to provide a nailing surface where one wall joins another.
- Cap Plate: The upper top plate, horizontal structural member of a stud framed wall. Comprised of solid lumber, the cap is nailed over the top plate, overlapping at joints to provide added structural integrity where walls abut or join.
- Chalk Line: A method for marking long, straight lines on relatively flat surfaces, much farther than is practical by hand or with a straightedge.
- Cleat: A strip of wood used to provide support or stability.
- Cripple: A shortened stud used to fill around an opening, usually over or under a window opening or over a door opening.
- Crown: The natural bow in wood, the convex side of the bow. When using lumber horizontally (headers, joists, etc.), the lumber should be placed with the crown up. When used vertically, the crown should be placed so as not to bow out, interfering with sheathing or drywall.

- Dimensional Lumber: Term used for lumber that is finished/planed and cut to standardized width and depth specified in inches. For example, a 2x4 is not actually 2 inches by 4 inches. When the board is first rough sawn from the log, it is a true 2x4, but the drying process and planing of the board reduce it to the finished size of 1½ inches by 3½ inches.

- Eave: An eave is the edge of a roof. The eaves extend beyond the side of the outside wall. The primary function of the eaves is to throw rainwater off the walls and to prevent the ingress of water at the junction where the roof meets the wall. The eaves may also protect a pathway around the building from the rain, prevent erosion of the footings, and reduce splatter on the wall from rain as it hits the ground.
- End Nailing: Most common form of nailing in construction. Two boards are fastened together at a 90° angle and a nail is driven through one piece of wood into the end grain of the adjoining piece.

- Face Nailing: Directly nailing into the face, or flat part of the piece of wood or material.
- Fascia: Exterior trim installed over the subfascia. Fascia is textured on one side, which faces out.
- Finger Jointed Lumber: Lumber comprised of shorter pieces of wood joined together by glue. Finger jointed lumber is not dimensionally sound and can only be used vertically as a stud.
- Flyrafter: The outside rafter of the projecting portion of a gabled roof.
- Furr Out: Adding wood to raise the level or surface of a floor or a wall.

- Gable: Generally, the triangular portion of a wall between the edges of a sloping roof. The shape of the gable and how it is detailed depends on the structural system being used (which is often related to climate and availability of materials) and aesthetic concerns. A gable wall or gable end more commonly refers to the entire wall, including the gable and the wall below it.
- Green Board or Pressure Treated: Wood that has been treated with chemicals to make it more durable and able to resist moisture and insects. The process used to treat the wood gives it a green color.

- Header: Also called lintels. Wood that runs horizontally over the top of door and window rough openings and support the weight of the roof or floor above.
- Hurricane Tie: A metal device connecting the trusses to the walls at the cap plate. The tie helps provide a continuous structural load transfer path from the top of a building to its foundation, helping to protect buildings from damage resulting from high wind.

- Jack Stud: Shorter stud(s) used to support a header. Can be used in pairs or singly, always in combination with a king stud to provide support and stability for a header (used in door and window openings). A jack stud sits inside a king stud at a rough opening for a window or door and is the primary structural support for a header near the top of the rough opening. Jack studs should be nailed to the adjoining king stud with 12d nails every 12 inches on center to transfer some of the weight to the stud.

- King Stud: A full-length pre-cut stud that is the beginning of a rough opening in the wall. It runs continuously from the bottom plate to the top plate. The king stud is no different from a regular 2x4 full-length stud except that it is the beginning and end of a rough opening for a window or door.

- Ladder Panel: Ladder panels, or lookout ladders, are the assemblies that create the overhang at the gables of the house. Ladder panels are preassembled into a unit that resembles a ladder and then positioned into place. The assembly consists of two parallel rafters connected by rungs.

- Laminated Veneer Lumber (LVL): An engineered wood product that is composed of multiple layers of thin wood assembled with adhesives. It is stronger, straighter, and more uniform than milled lumber and is much less likely to warp, twist, bow, or shrink due to its composite nature. LVL is typically used for headers and porch beams.
- On Center (OC): The distance between studs or trusses as measured from the center of one to the center of the next. Practically, it is measured from the left (right) edge of one stud or truss to the left (right) edge of the next.
- Oriented Strand Board (OSB): A flat wood sheet, composed of wood fibers bonded with resins. Used to sheath exterior walls and deck trusses, to provide structure and nailing surfaces for siding and shingles.

- Penny: A term applied to nails that originally meant the price per hundred. Today, it indicates nail length and is abbreviated with the letter "d," the English sign for one cent.
- Pitch: Numerical measure of the steepness of a roof or gable. Pitch is the measured vertical rise divided by the measured horizontal span; the same thing as slope in geometry.
- Plates: The horizontal component of a wall. Also see top plate, bottom plate, and cap plate.
- Plumb: The term used to define a vertical element that is perfectly perpendicular to a level surface above or below.

- Rafter: The sloped structural members that extend from the ridge of the roof to the cap plate, down slope perimeter or eave, and are designed to support the roof deck and its associated loads.
- Rip: A cut made along the grain of the wood.
- Rough Opening: The framed-in opening, slightly larger than the actual window/door, that replaces wall studs to support the structure and accommodate a window/door.
- Ridge Vent: Type of vent installed at the peak of a sloped roof which allows warm, humid air to escape the attic.

- Sill Seal: A foam strip attached to the bottom plate to help reduce air infiltration between a concrete foundation and bottom plate.
- Simpson Nails: Structural nails used to install hurricane straps, hurricane ties, and mud sills anchors. All the holes on the straps/ties must be filled with a Simpson nail. Simpson nails should be flush against the plate.
- Sheathing: The structural covering applied over studs, rafters, or roof trusses.
- Snap Line: See Chalk Line.
- Soffit: The underside board of eaves and rakes. Soffits are often vented to draw air into the attic.
- Solid Lumber: Lumber made from a single piece of wood, such as a 2x4 plate. Also called clear lumber. Solid lumber also refers to non-finger jointed lumber.

- Squaring:
    - 3-4-5 Method: To create a square (90°) corner, use the 3-4-5 rule from basic geometry: $A^2 + B^2 = C^2$. This means the square of the hypotenuse of a right triangle is equal to the sum of the square of both legs. Measure 3 feet from the corner in one direction and make a mark. Measure 4 feet from the corner in the other direction and make a mark. Measure the distance between the marks. If the corner is square, the distance will be 5 feet.
    - Using Diagonals: Measure diagonally opposite corners. If square, these measurements should be equal.
- Stud: The vertical component of a wall, which reaches from the top plate to the bottom plate.
- Subfascia: A 2x4 board attached to the bottom of the rafters to add lateral stability.

- T Component: A framing component constructed of 2x4s or 2x6s. It is installed where one wall joins another along the length of the first wall.
- Toe Nailing: Starting a nail at an angle or slant in one framing member and driving it through into a second (usually perpendicular) framing piece.
- Top Plate: The top horizontal framing members of a framed wall. The top plate forms the top of the wall. Solid 2x4 or 2x6 material is used for the top plate.
- Truss: An engineered structure of short framing members, such as beams, chords, and diagonals, assembled into a rigid support structure.

- U Component: Constructed of 2x4s or 2x6s. A framing component constructed of 2x4s or 2x6s. It is installed where one wall joins another along the length of the first wall.

Volunteer Code of Conduct

Habitat's Vision

…A world where everyone has a decent place to live. Seeking to put God's love into action, Habitat for Humanity brings people together to build homes, communities, and hope.

As a volunteer, I am committed to:

Personal Responsibility

- Be dependable, recognizing the commitment and responsibility to my volunteer assignment(s).
- Accept assignment(s) consistent with my interest, abilities, and available time.
- Accept assignment(s) and direction with an open mind and a willingness to learn. Respect authority and the chain of command (see Construction Manual).
- Accept feedback from my supervisor in order to do the best job possible.
- Avoid conflict of interest situations and refrain from actions that may be perceived as such; Volunteers should reveal any potential or actual conflicts of interest as they arise.
- Not accept tips, request meals to be paid for, or otherwise accept payment for my volunteer work.
- Address ethical concerns by speaking directly with the colleague with whom I have the concern; and when necessary, report such to my leader in the defined chain of command.
- Advocate for the organization, its mission, and values in a positive and informed way on the job site, in public settings and on social media. Ensure your opinions are understood to be solely your own and not representing Habitat for Humanity.

Respect

- Treat all individuals with a sense of dignity, respect, and worth. Make a personal commitment to be nonjudgmental about cultural differences, living conditions, and the life-style of each person with whom I work. Harassment based on sex, race, ethnicity or sexual orientation is prohibited.
- Avoid profane and abusive language and disruptive behavior that is dangerous to self and others.
- Abstain from the use of photo, audio, or video recording equipment for commercial purposes unless authorized.
- Respect all confidential information. Volunteers are responsible for maintaining the confidentiality of all proprietary or privileged information to which they are exposed while serving as a volunteer, whether this information involves a single staff, volunteer, client, or other person.
- Not pressure anyone to accept my political, cultural, or religious beliefs.

- Comply with mandated reporting in cases of suspected child and vulnerable adult abuse or neglect.
- Respect and use all equipment appropriately and as required for my assignment.
- Abstain from the use of Habitat equipment/resources for personal use.

Safety

- Review, internalize, and adhere to all safety rules and guidelines as defined in the Construction Manual. Follow safe jobsite practices, including participation in applicable education sessions, using appropriate personal safety equipment and reporting accidents, injuries, and unsafe situations.
- Not use, possess or be under the influence of alcohol or illegal drugs at any time while serving on an active job site.
- Abstain from all illegal activity.
- Wear required identification and clothing. All items of clothing must be suitable for the work environment and should not contain offensive or objectionable material (slogans or graphics).
- Report suspicious activities to my supervisor.

I recognize I have a responsibility to adhere to the rules, procedures, and chain of command of the agency. Failure to do so or failure to satisfactorily perform my volunteer assignment may cause me to be subject to immediate suspension or dismissal from the volunteer program.

Safety Information

Introductions & Logistics

- Welcome and thank you the SPONSOR GROUP (if applicable) – appreciate everyone volunteering to help!
- **The three goals for the day: 1) work safely; 2) have fun; 3) build a quality home**
- Introduction of the most important person – **[homeowner and family]**. This family is buying this home, not receiving it as a gift. Habitat is a hand up, not a hand out.
- Introduction of House Leader(s), Core Volunteers, and DAHFH Construction Staff. We are here to teach and guide you with today's goals. This is especially true for the correct and proper use of power tools.
- Location of the rest rooms, first aid kit, tools, supplies, and power tools.
- Work schedule for the day covering the key goals and work will end around X PM with everyone helping clean and pick-up at the end of the day. Lunch around noon.

Personal Safety

- Wear appropriate clothing, and shoes. Loose clothing and dangling jewelry are a hazard around power equipment.
- Long hair should be tied back.
- Hard hats and eye protection are required.
- Hearing protection is available.
- Hydration is critical. Drink plenty of fluids. Muscle cramps, headaches, dizziness, lightheadedness, and upset stomach are some common signs of heat exhaustion. Stop and take a break to drink and cool down. If ignored, could lead to the serious condition of heat stroke.
- Take breaks when tired or feeling weak. You make poor safety choices when tired.
- Lift with your legs, not your back. Avoid twisting when lifting.
- Work within your comfort zone. It is okay to say no.
- Know your limits; team work is encouraged.

Site Safety

- Watch out for trip hazards.
- Keep the site as clean and orderly as possible.
- Never leave nails sticking out of wood
- Remember lumber has two ends.
- Be aware of people working around you, especially above you.

Ladder Safety

- Test ladder stability. Do not put anything under the low side; dig out the high-side to level.
- Set at correct angle.
- Always face ladder when using, need three points of contact.
- Make sure A-frame ladders are fully open on slab or level surface.
- Do not stand on the top two steps.
- Never leave anything on top of the ladder.
- Do not over reach doing a task (belly button inside outer rails).

Activity Specific Safety

- See following page(s).

- Ask for patience getting started.
- Divide the group by those wishing to stay on the ground, willing to work on ladders, and so forth.

Have a fun and safe day! Let's get ready to build!

Activity Specific Safety

Power Tools (Days Used: Framing, Trussing, Decking, Exterior Trim, Siding)

- Anyone using a power tool or in the immediate vicinity is required to wear eye protection.
- Do not wear gloves when operating a saw.
- Ear plugs and dust masks will be provided if requested (not mandatory).

Framing

- Be sure there are enough people carrying each wall to the slab because some walls are heavy and there are trip hazards and other obstacles on the site.
- When standing a wall, do not leave it unattended until it has been fastened to the slab and properly braced so it cannot fall and injure someone.
- Because of the size of the sheathing material, be sure there are enough people carrying the material and be aware of trip hazards and other obstacles.

Truss

- Be sure all personnel involved in loading and standing trusses understand their role before work begins.
- Do not lift the truss up until the truss pushers are ready. There should be one person to lead this group so everyone lifts together in a coordinated effort.
- When handling trusses, be cautious of the metal gusset plates. The plates may extend beyond the wood and can be sharp.
- Be sure all ladders are properly positioned and stable. Follow all ladder safety rules.
- Only extension ladders are used to access the roof. Ladders should extend at least three rungs beyond the edge of the cap plate. Never use A-frame ladders to access the roof.
- Ladder access to the roof must not be removed as long as anyone is working in the trusses.
- Follow the established fall protection program during truss installation.
- When working up in the trusses, always be aware of your footing and those working below. Know where it is safe to step.

Windows

- When cutting out windows with a reciprocating saw, be sure there is no one working on the other side that might be injured by the saw blade. Ask another volunteer to assist by watching from outside for others working in the same area.

Decking

- Extension ladders are used to access the roof. Ladders should extend at least three rungs beyond the edge of the roof. Do not use A-frame ladders to access the roof.
- Ladder access to the roof must not be removed as long as anyone is on the roof.
- Ladders should be properly braced.
- Any tools or material brought up to the roof deck must be secured with nails or cleats, or in workers' tool belts.
- A ground crew will be assigned to cut wood and hand up decking material and supplies to the crew installing the decking to minimize trips up and down.
- If decking needs to be cut to fit, the piece must be cut on the ground.

- A team of two people should pass full sheets of decking to a team of two on the roof who will position the sheet for nailing. It is risky behavior for individuals to handle sheets by themselves.
- When placing felt, make sure the person unrolling the felt is aware of the roof edges.
- When installing decking, DAHFH will employ the Horizontal Under-Eave Guardrail Systems (HUGS). Remind volunteers:
  - Do not lean against any of the hugs rails.
  - Do not use the hugs as a foot hold.
  - Do not place a ladder next to a HUGS; the ladder should be in center of an 8-foot section.
  - Do not lean any material against rail system.

Roofing

- Volunteers may not wear leather-soled or slick-soled shoes on the roof. Soft-soled shoes are recommended when working on the roof.
- Extension ladders are used to access the roof. Ladders should extend at least three rungs beyond the edge of the roof. Do not use A-frame ladders to access the roof.
- Ladders should be properly braced.
- Ladder access to the roof must not be removed as long as anyone is on the roof.
- Any tools or material brought up to the roof must be secured with nails or cleats, or in workers' tool belts.
- Keep the roof clean by sweeping the roof periodically to remove any dirt or loose particles from the shingles.
- At the end of a row do not nail a shingle in place, allowing it to run long, and then lean over to cut flush with the drip edge.
- Remind volunteers not to "chase" anything.
- Establish a drop zone.
- Before tossing any scrap material off the roof, make sure it will not hit anyone on the ground. This also applies to sweeping dirt or loose particles off the roof.
- When installing decking, DAHFH will employ HUGS. Remind volunteers:
  - Do not lean against any of the hugs rails.
  - Do not use the HUGS as a foot hold.
  - Do not place a ladder next to a HUGS; the ladder should be in center of an 8-foot section.
  - Do not lean any material against rail system.

Exterior Trim

- Always check the nail guns are operating properly before using. Oil nail guns before using. Be sure the safety is working and the nails are being shot to the proper depth. Never use a nail gun that has a faulty or missing safety.
- Never point a nail gun at anyone for any reason.
- Keep your finger off the trigger until you are ready to shoot a nail.
- If a nail gun jams, disconnect the air supply hose before attempting to repair the jam. This will prevent the gun from firing unexpectedly and injuring someone.
- Ladders should be properly positioned and stable, especially extension ladders used to reach the peak of a gable.

Siding

- Ladders should be properly positioned and stable, especially extension ladders used to reach the peak of a gable.
- When siding the upper areas (gables), be aware of those working below.

Interior Trim/Cabinets

- Always check the nail guns are operating properly before using. Oil nail guns before using. Be sure the safety is working and that nails are being shot to the proper depth. Never use a nail gun with a faulty or missing safety.
- Never point a nail gun at anyone for any reason.
- Keep your finger off the trigger until you are ready to shoot a nail.
- If a nail gun jams, disconnect the air supply hose before attempting to repair the jam. This will prevent the gun from firing unexpectedly and injuring someone.

Painting

- Ladders should be properly positioned and stable.
- When painting the upper areas (soffit, fascia, gable peaks, and ceilings), be aware of those working below.

Landscaping

- Sod and trees can be heavy. Lift with your legs, not your back. Avoid twisting when lifting.
- Do not leave landscaping tools laying on the ground.
- When using a pick axe be aware of others around you.

Nail Gun Safety Legal Advisory

LEGAL ADVISORY

Subject: **Nail Gun Safety**
Date: **Updated January 2011**

INTRODUCTION

Nail guns are extremely dangerous tools; all safety precautions regarding the use of nail guns should be taken very seriously. Nail guns have become increasingly popular over the past two decades. These powerful tools increase the speed of construction work and help workers avoid the repetitive stress problems associated with hammers. However, nail guns can also be extremely dangerous, causing injuries to not only the extremities such as hands, feet, arms and legs, but potentially fatal injuries to the head, neck and heart. Workers may be seriously injured by errantly discharged nails as well as chips of wood or concrete flying off of nailed surfaces. The rise in use of nail guns has been matched by a correspondingly high increase in injuries. Much of the risk is inherent in the design of these powerful tools, but just as much risk stems from the misuse of nail guns. Knowledge of how these tools operate and important safety rules can prevent many injuries, and possibly save lives.

Nail gun safety rules are particularly relevant to Habitat for Humanity affiliates because the risk of injury is particularly present when inexperienced volunteers use these tools.

To minimize the risk of injury associated with nail guns, affiliates should have an understanding of the types of nail guns and how they operate. In addition to providing an overview of how nail guns work, this advisory also provides a list of minimum safety precautions that should be communicated to all people on a Habitat worksite where nail guns will be used.

TYPES OF NAIL GUNS

The most important distinction to make is that between sequential trip nail guns and coil type nail guns. Sequential trip nail guns require two steps (the "sequence") to fire each nail: (1) depressing the trigger and making contact with the surface to be nailed, and (2) releasing the trigger and pulling it each time the user desires to fire a nail. Coil type nail guns also may have a trigger, but they are configured to fire a nail each time the nose makes contact with a surface while holding down the trigger. Coil type nail guns generally make for quicker work, but pose a much higher risk of firing at unintended objects by mistake. Many of the injuries that take place with coil type guns occur when a co-worker just happens to brush against the gun, or when the user of the gun changes position and bumps the gun against his/her own body or nearby objects.

ADVISORY
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HFHI strongly recommends that affiliates use only sequential trip nail guns. Affiliates involved in large amounts of construction may save time (and thus money) with coil type nail guns because of their speed; however, affiliates should not prioritize efficiency and lower costs over safety. The amount of time that can be saved on a Habitat worksite by having nail guns that fire on contact is not worth the increased risk of injury. Because manufacturers and the construction industry have been choosing speed and efficiency over safety, sequential trip nail guns are becoming less common. If your affiliate has no choice but to use coil type nail guns, restrict the use of these tools to those individuals on the worksite who possess a high level of skill or experience.

Furthermore, affiliates should take note of the distinction between nail guns used for roofing and trim opposed to nail guns used for framing. Framing nail guns can be either sequential trip or coil type nail guns; however, framing nail guns are generally configured for the use of nails that are three inches plus long and entail greater force of pressure. Therefore, framing nail guns can be especially dangerous (compared to roofing and trim nail guns that require less pressure and drive nails that are about an inch long.) Also, more people tend to be involved with the installation of framing compared to other types of construction work, which means that framing nail guns may be used in more congested areas. For these reasons, affiliates may want to consider limiting the use of framing nail guns on the worksite (based on the level of skill and experience of the workers). In any case, it is HFHI's policy that no child under the age of 18 be allowed to use any type of nail gun.

SAFETY TIPS

- Always read and understand the manufacturer's manual.
- Nail guns should only be used by those crew members who possess a high level of skill or experience.
- Always wear safety glasses.
- Always keep your finger off the trigger when the gun is not in use.
- Never assume the tool is empty.
- Never point the tool at anyone, even if it is empty or disconnected from the air supply.
- Keep your free hand out of the line of fire.
- Keep others out of the line of fire.
- Keep extremities away from the business end of the nailer.
- Never try to nail beyond your reach – take the time to get a ladder.
- Never support or backup a workpiece temporarily with a foot or knee.
- Always disconnect the tool before clearing jams or performing other maintenance. Maintenance should only be performed by the experienced members of the group.
- Use sequential trip nail guns when possible, and coil types only when a safe record of use and experience with the tool has been developed.
- Never leave a nail gun unattended where an inexperienced crew member or minor could access it.

CONCLUSION

Nail guns are extremely dangerous tools. While volunteers should be able to enjoy their time on the worksite, they should take safety precautions extremely seriously. The best way to prevent injury is through educating the workers and through supervision.

**For more information, please contact the Habitat for Humanity International, Inc. Legal Department.*

HUGS Installation

Tools

- Ladders
- Marking template
- Sharpie marker
- #10 1½-inch Hex screws
- Deck screws
- Simpson nails
- Screw gun with a Hex bit

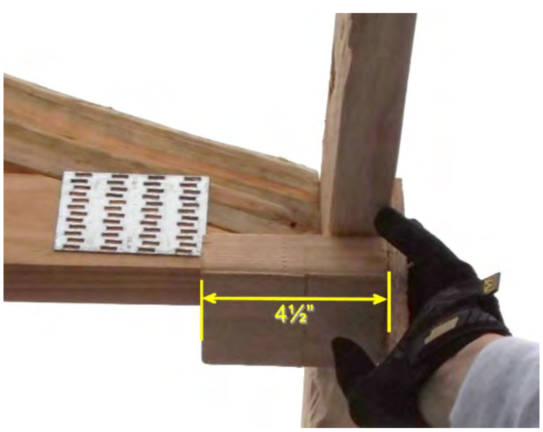
General Instructions

- Begin layout and installation of HUGS when approximately half of the trusses are stood and braced. Two teams of two running along each side of the house can speed installation.
- Marking and hanging of brackets is to be completed while standing on ladders; no one needs be on the roof for this.
- Brackets should be installed every 8 feet.

HUGS brackets should not be installed on the outside flyrafter of the ladder panels.

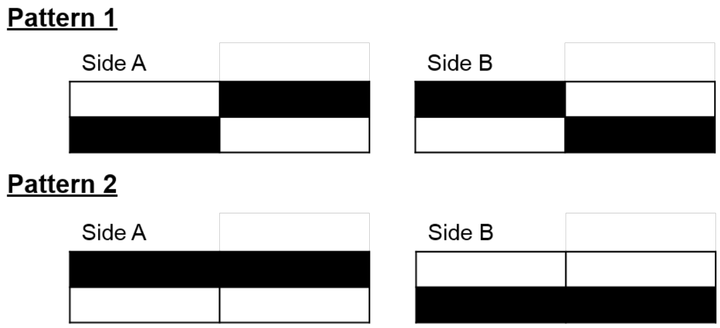
Installation of Brackets

- Mark end of truss tail 4½ inches from outside face of subfascia using the template and Sharpie marker.
- Screw in a self-tapping 1½-inch #10 Hex screw in the middle of the mark, leaving ¼-inch of thread exposed.



- Position a HUGS bracket on the truss tail and slide it down the truss so the notch goes over the screw head (now the bracket will stay in place on its own, hands fee).
- Put a second screw into the rear notch in the bracket.

- On the sides of the bracket, there are four slots – two top and two lower Install one screw and one Simpson nail on each side of the bracket using one of the following patterns:



- Each bracket must also be installed over top of a gusset plate (gang nail). If the gusset plate will not be present at the same location where the bracket is to be installed, a galvanized gusset plate should be installed on both sides of the truss prior to installing the bracket.

Installing the Safety Rails

- Configuration:
  - o Bottom row - 2x6 rails
  - o Middle row and top row - 2x4 rails
- The bottom safety rail can be installed by two people on A-frame ladders. For the middle and top rows have two people on the roof and one person on the ground to hand up the rails.

- Begin installing the safety rails along the eaves at the rear corners. The safety rails should span two HUGS brackets each and extend past the gable. Rails should overlap by at least 1-foot and be screwed together from both sides.
- Install safety rails down each side of the gable; these will butt into the rails along the eave so they will not slide out onto the ground. A deck screw may be used to secure the corner pieces together.

HUGS Hawaii Bracket Installation

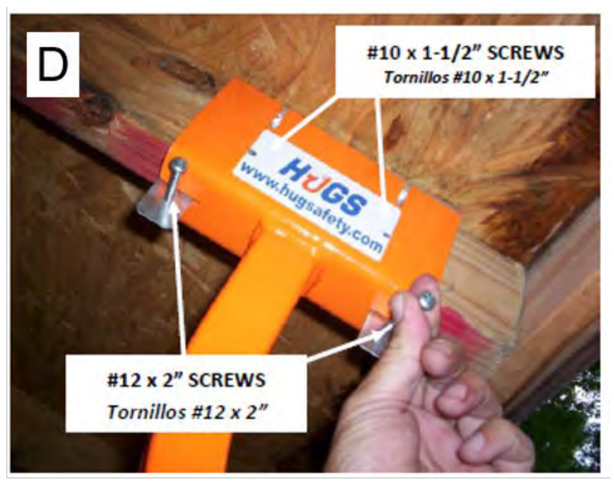
A) Place the HUGS Hawaii Bracket along the side of the truss or rafter tail, approximately 3” from the roof edge.

B) Insert a #10 x 1-1/2 self-tapping pan head Phillips screw into each of the two upper mounting holes of the HUGS Hawaii Bracket and securely fasten it to the truss or rafter tail.

Source: HUGS Installation & Removal Manual

C) Once the two screws are snug and in place, insert a #12 x 2 self-tapping pan head Phillips screw halfway into the inward tab hole. Place a HUG Bracket over the inward tab screw. Lift and seat the HUG into place.

D) Insert a #12 x 2” self-tapping pan head Phillips screw halfway into the outward tab hole. This will support the HUG bracket until two #10 x 1-1/2” self-tapping screws are installed. Install one #10 x 1-1/2” self-tapping screw into the middle two holes of the HUG Bracket.

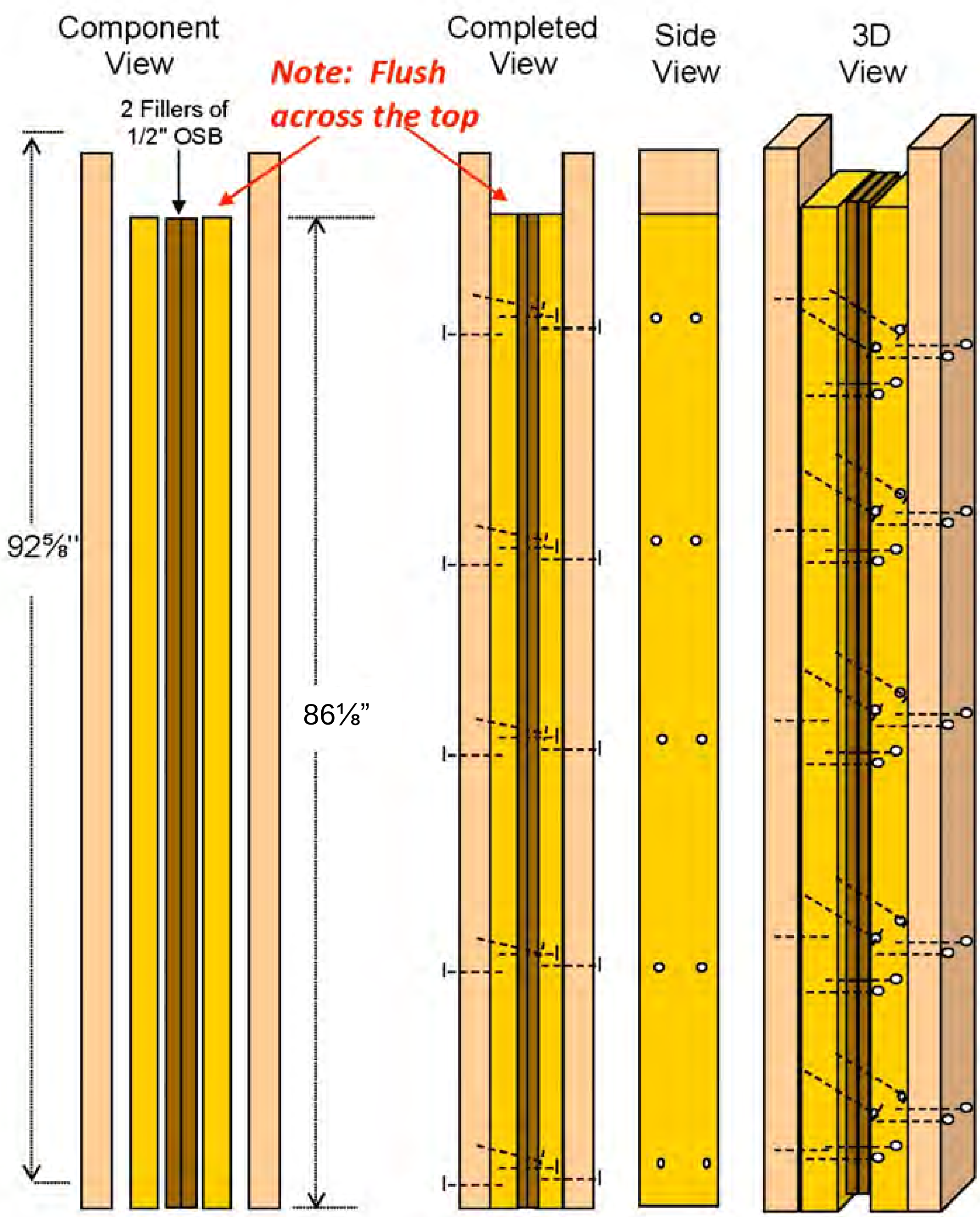


Source: HUGS Installation & Removal Manual

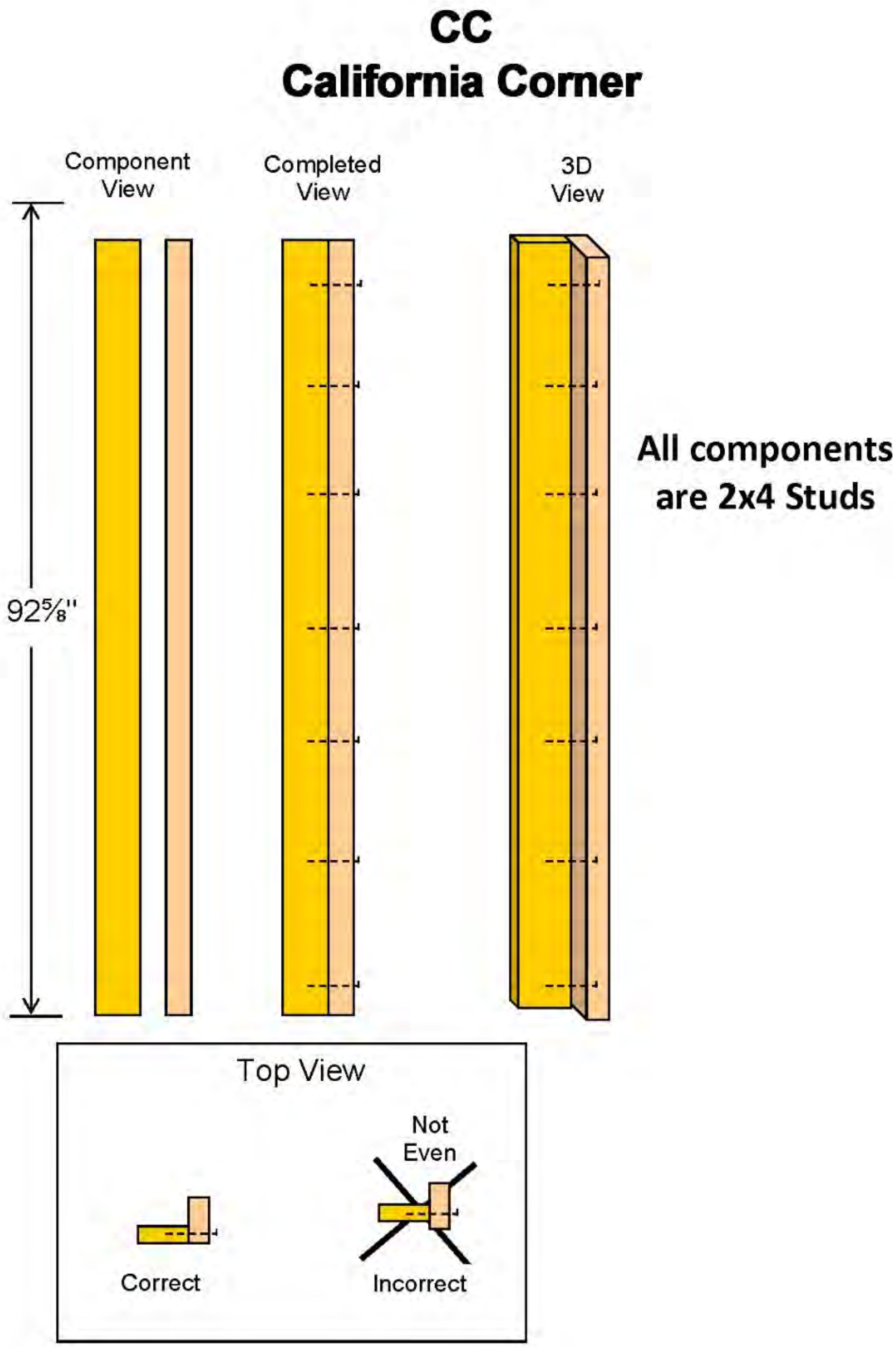
Framing Details

Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and beam supports are 98⅛ inches.

BP
Beam Pocket

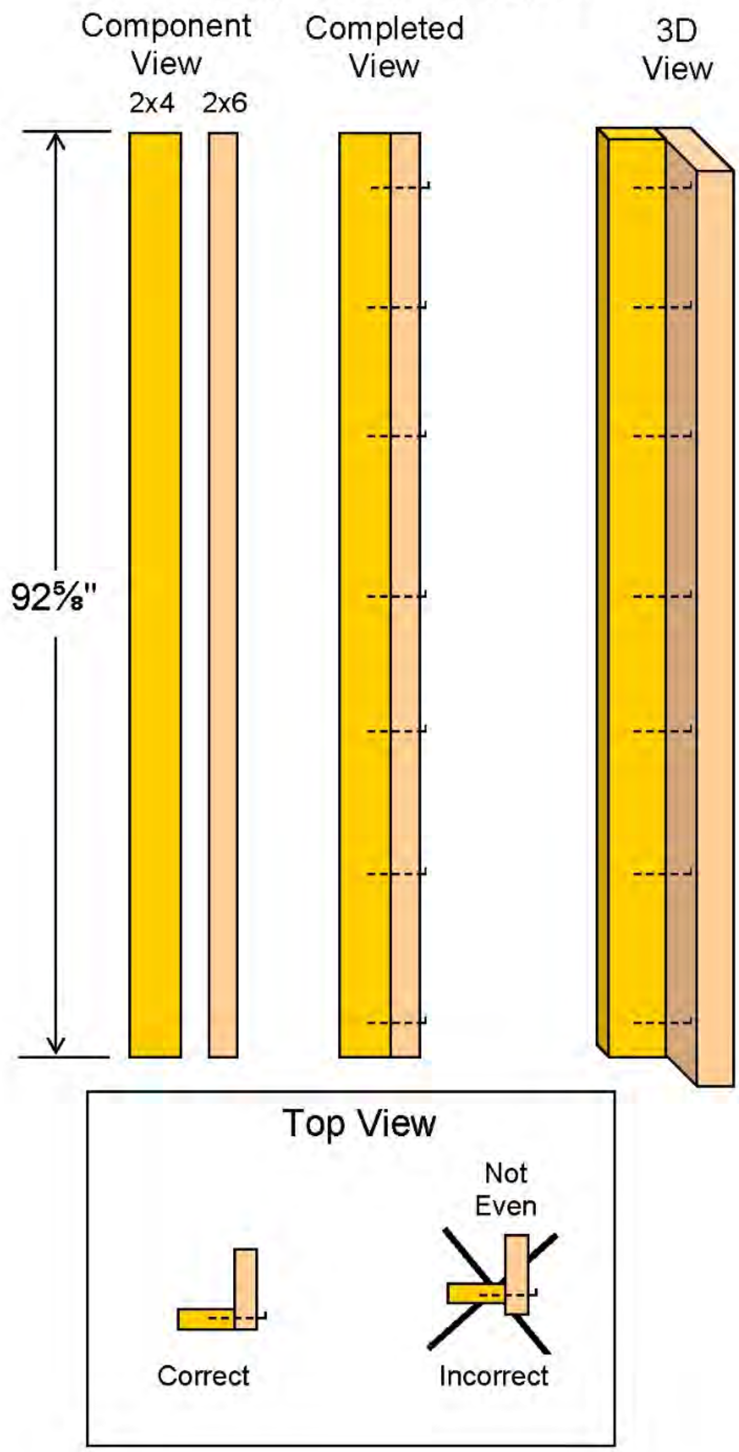


Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

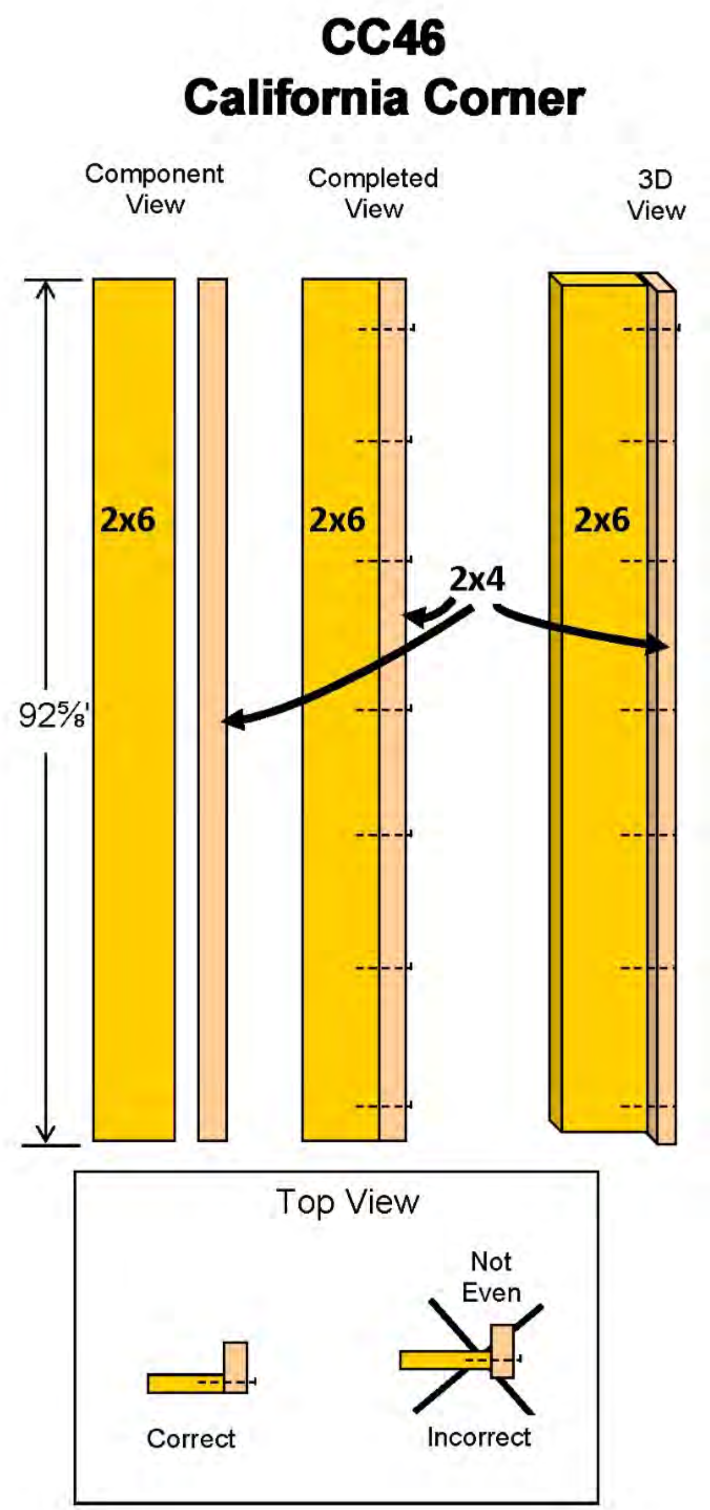


Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

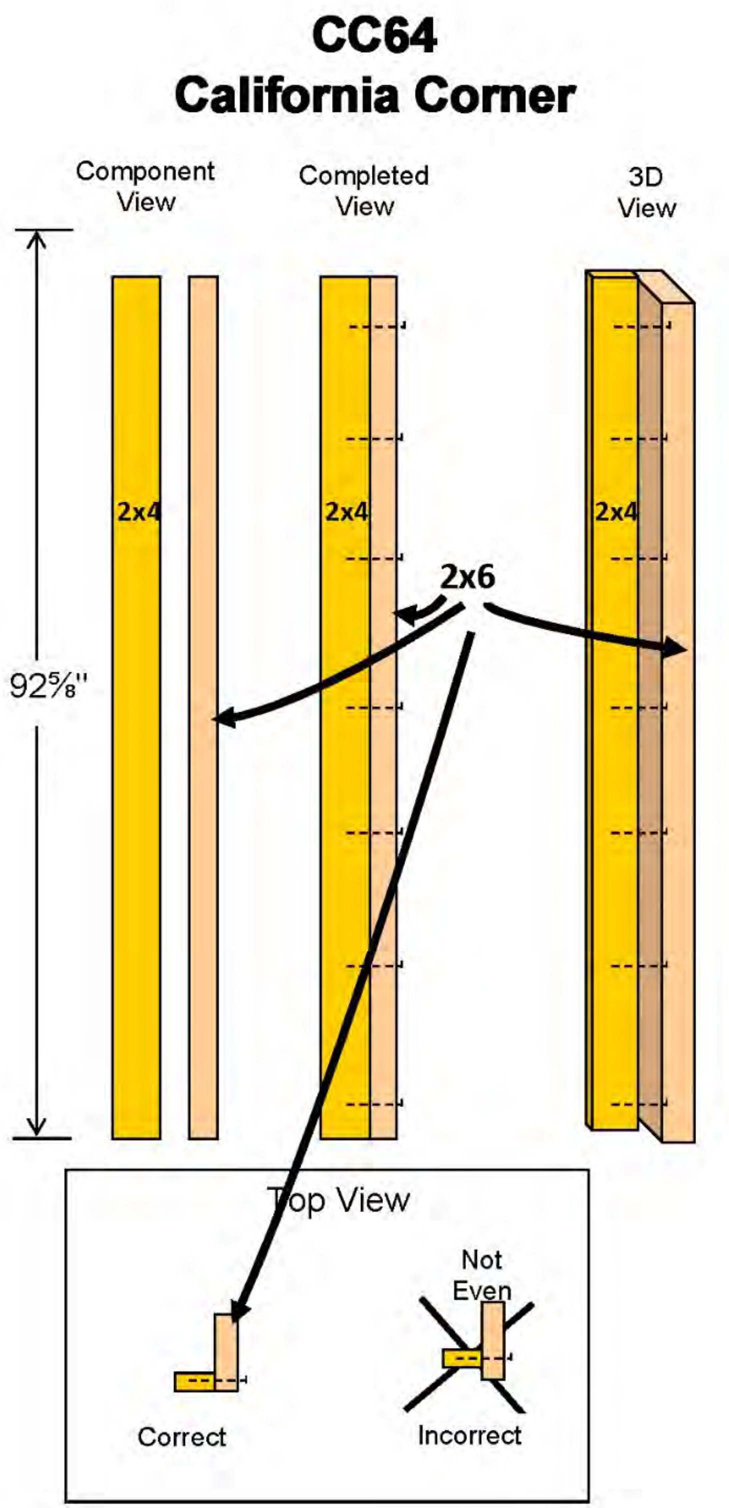
CC6
California Corner



Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

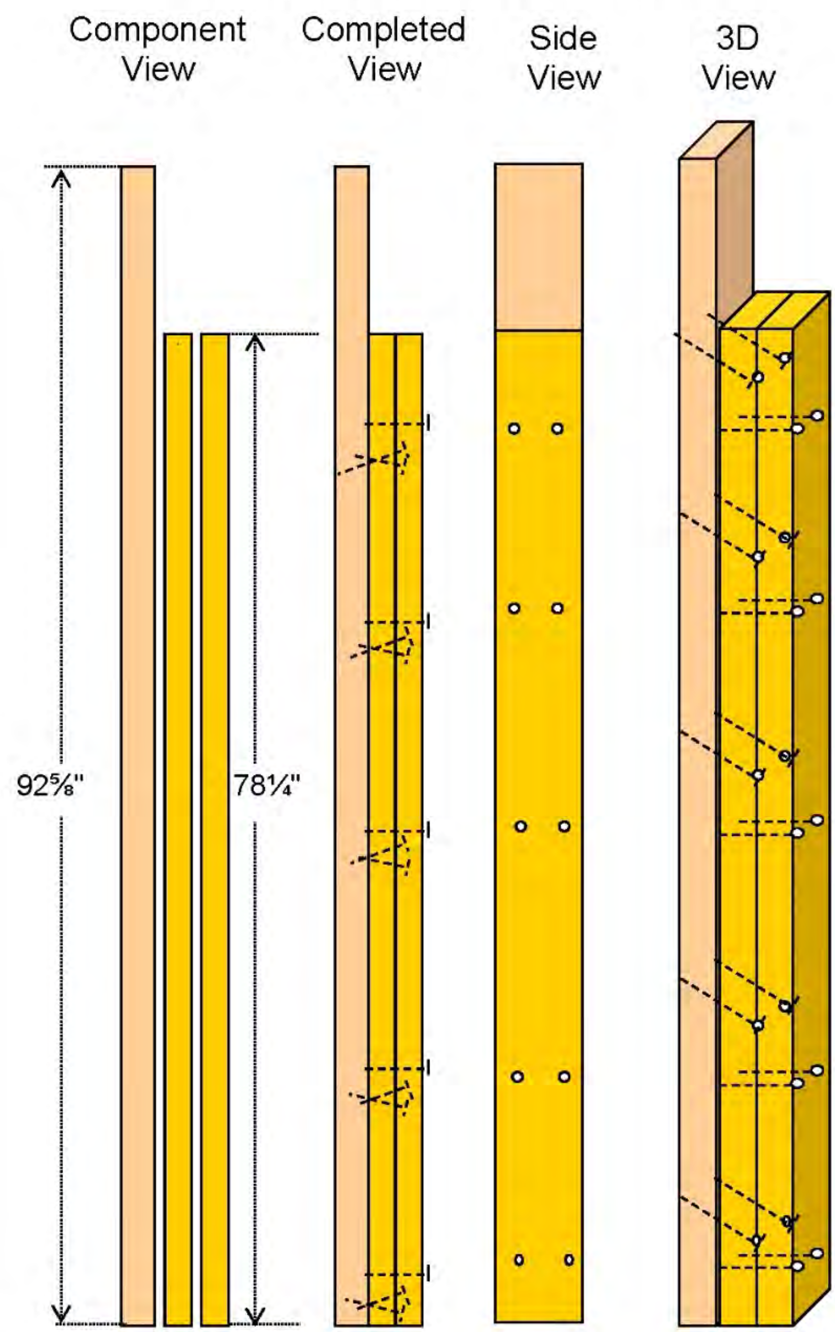


Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.



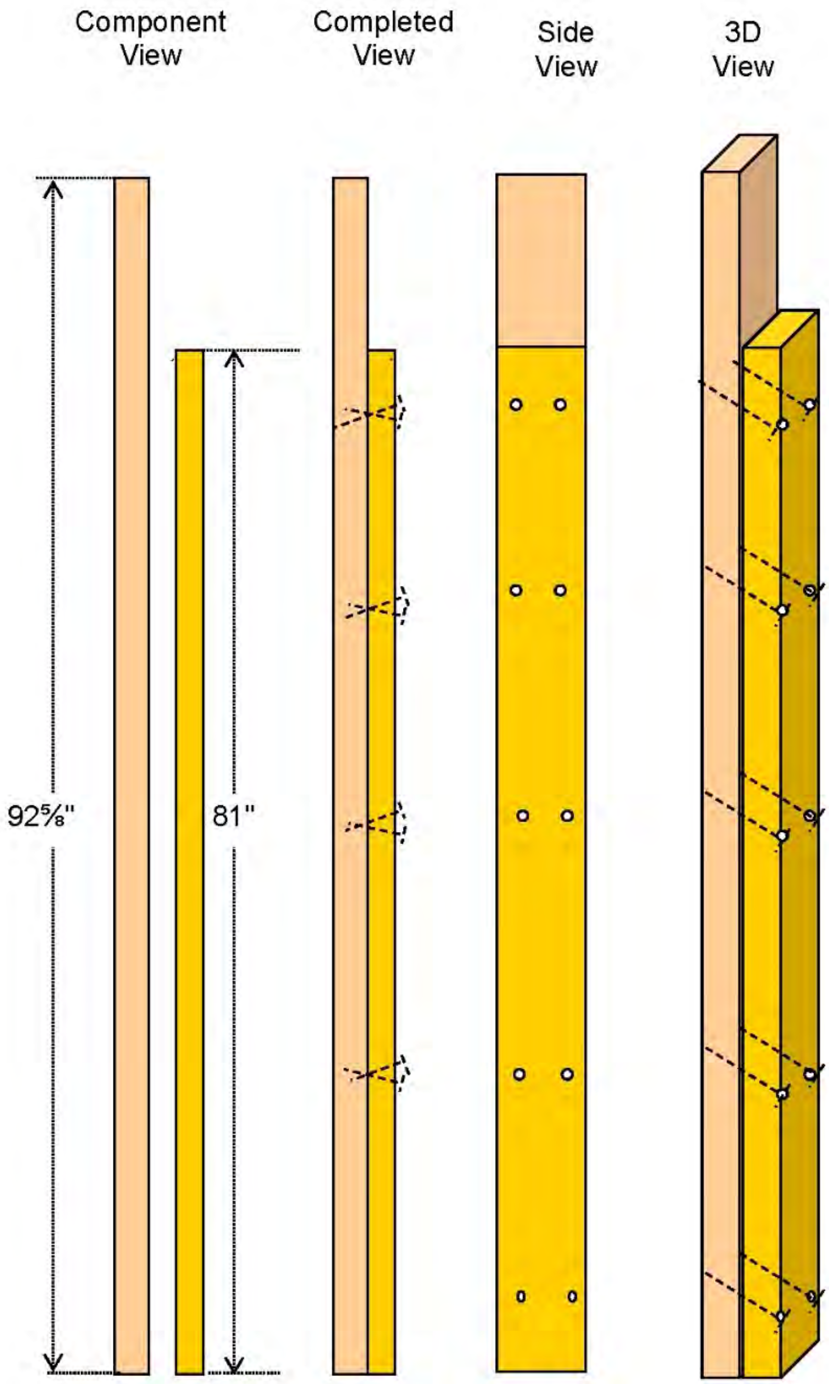
Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

GHP
Garage Header Pocket

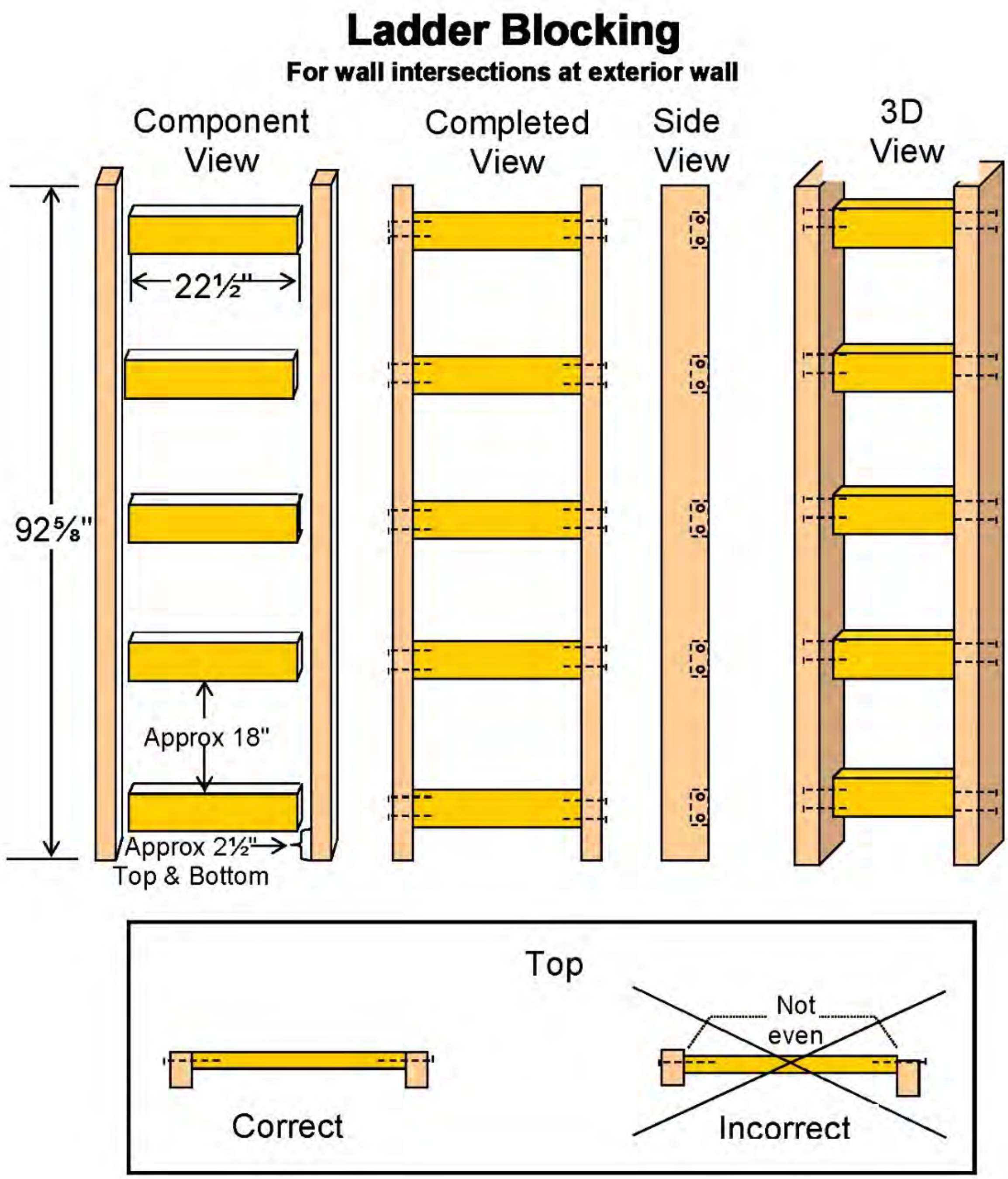


Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

KJ
King Jack

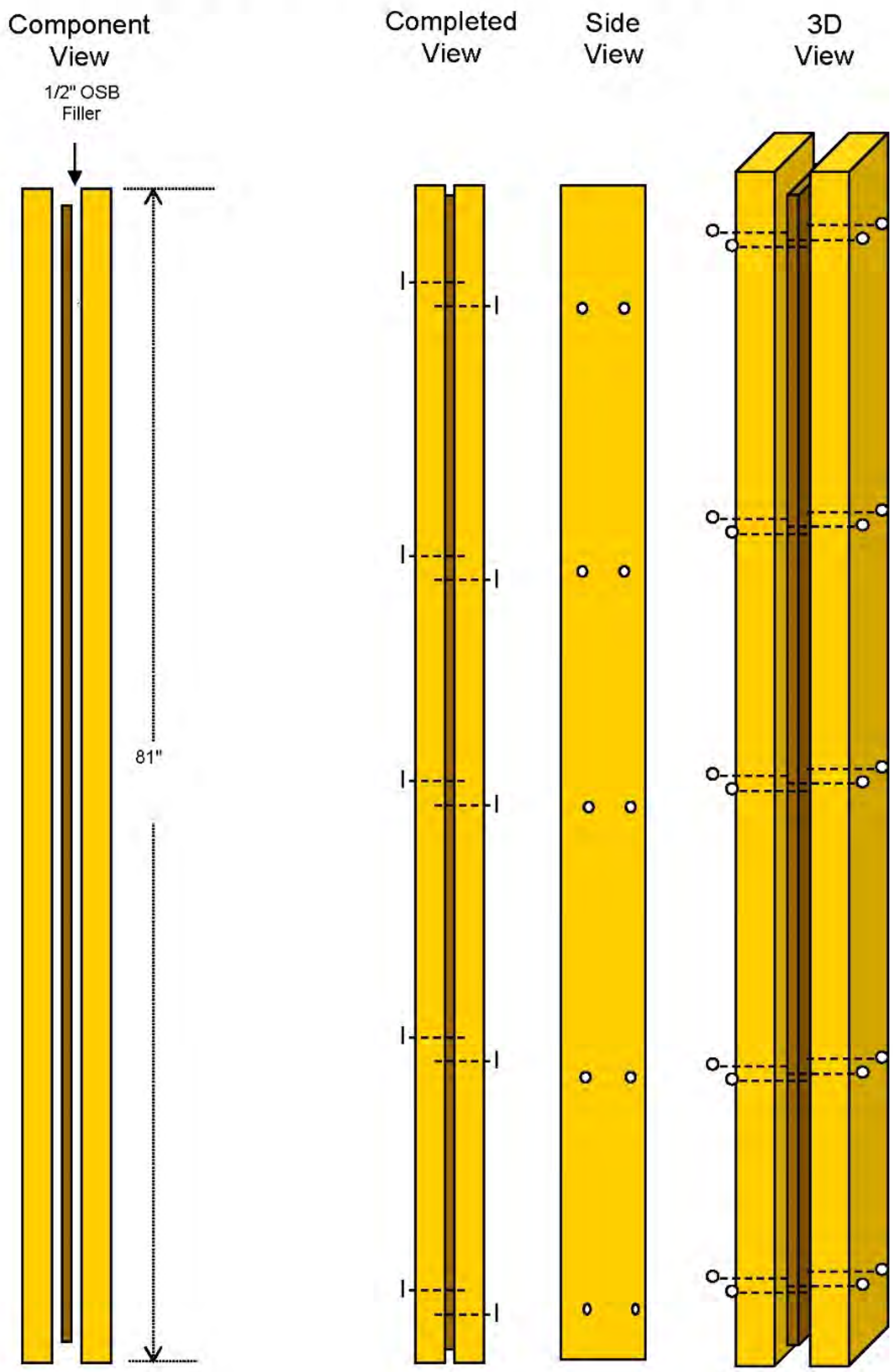


Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

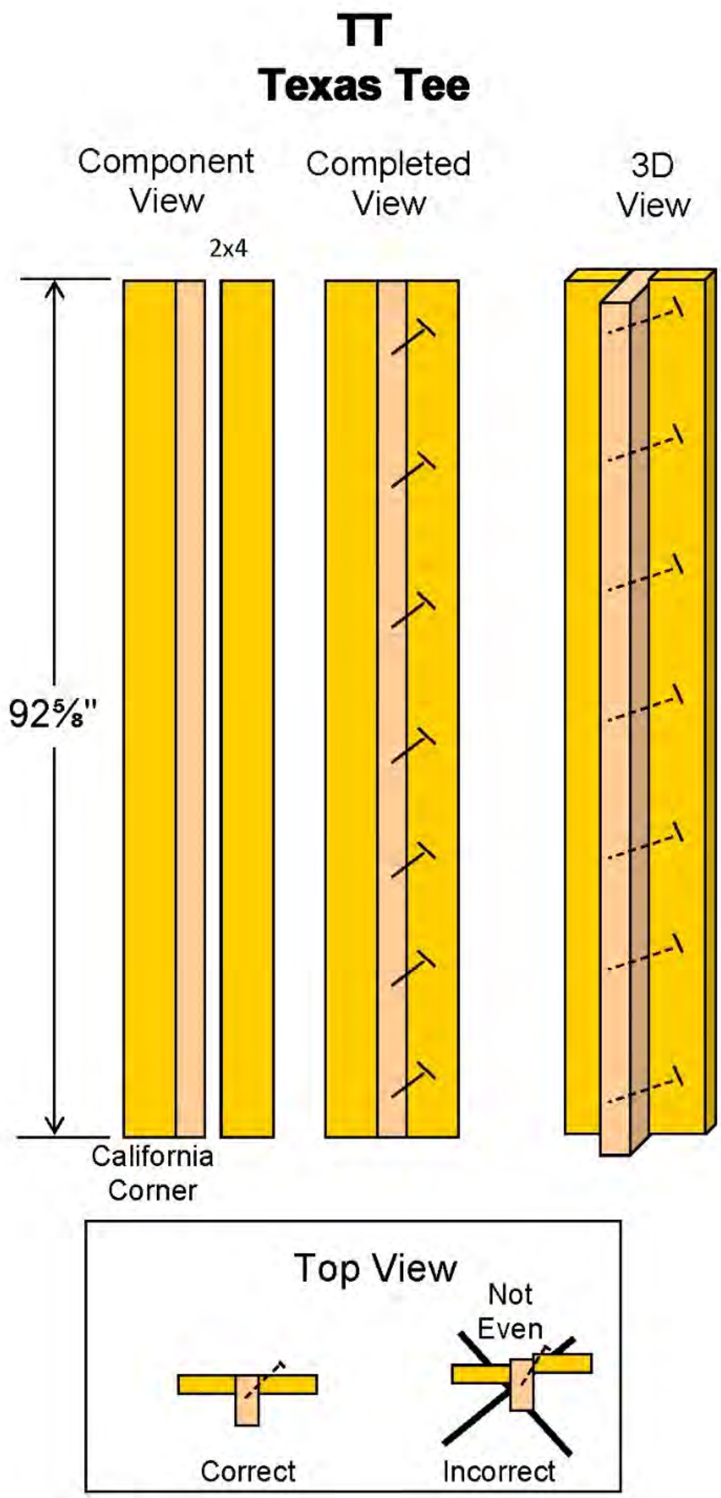


Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

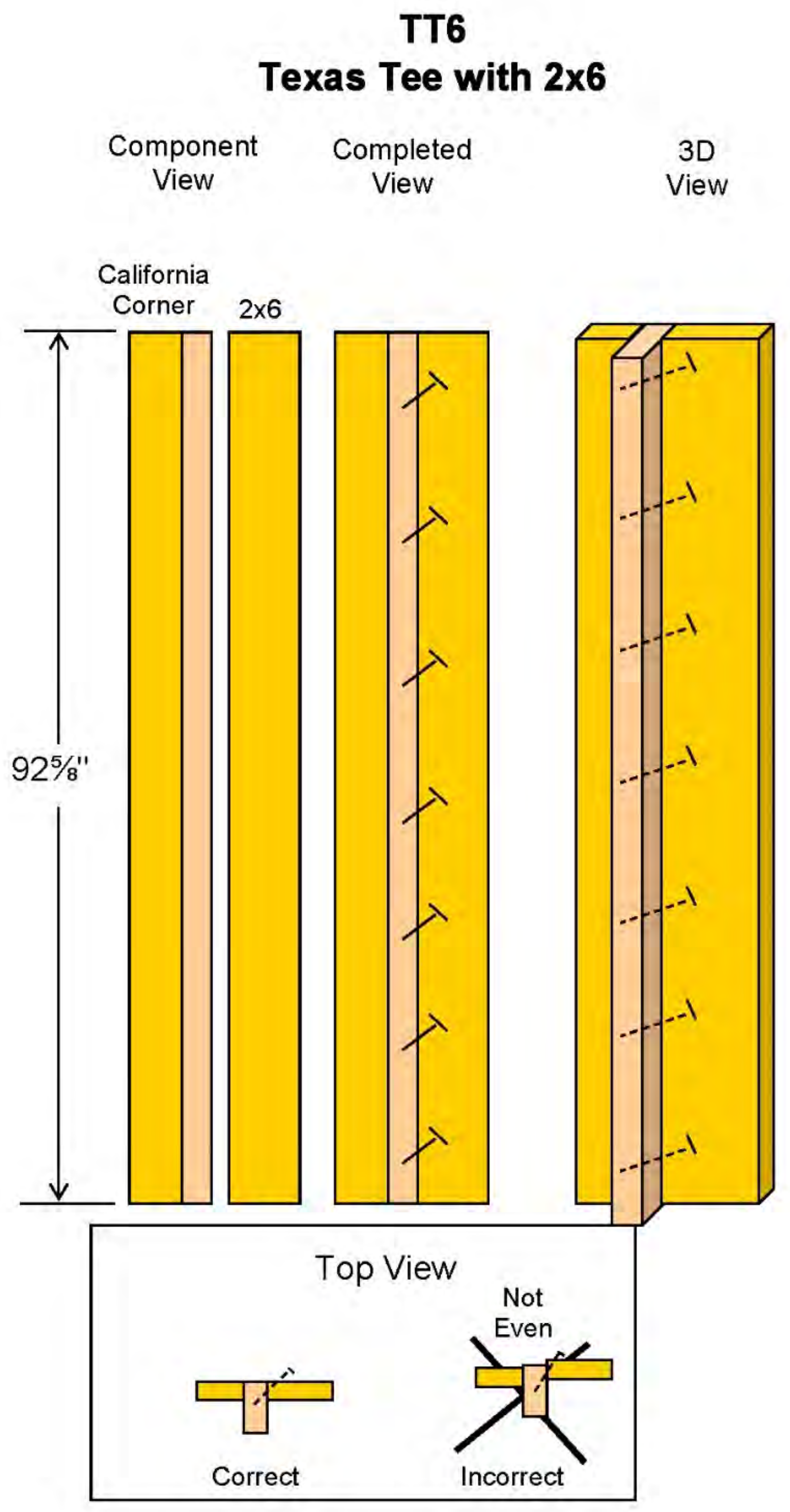
Mullion
Center support for double windows



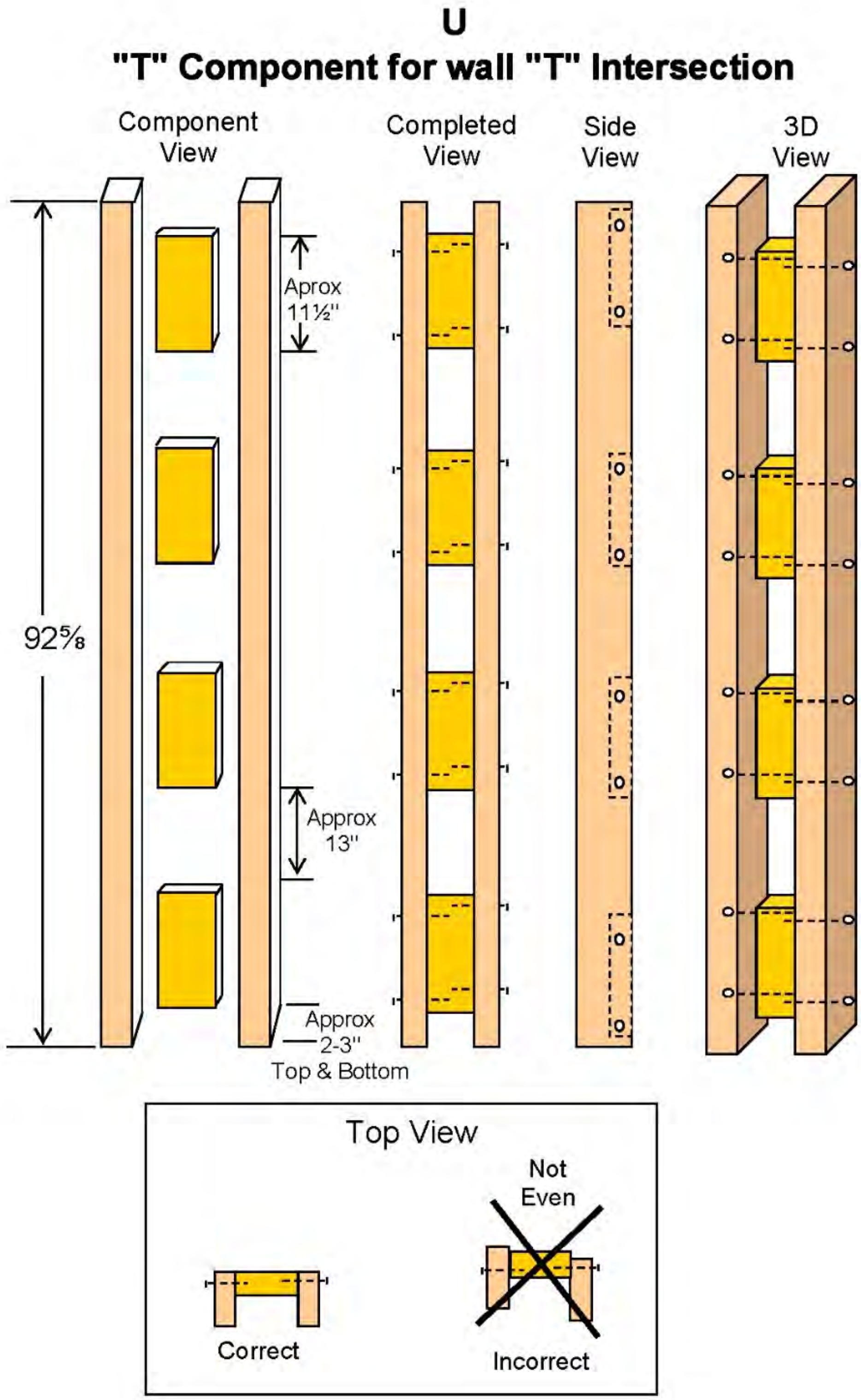
Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.



Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

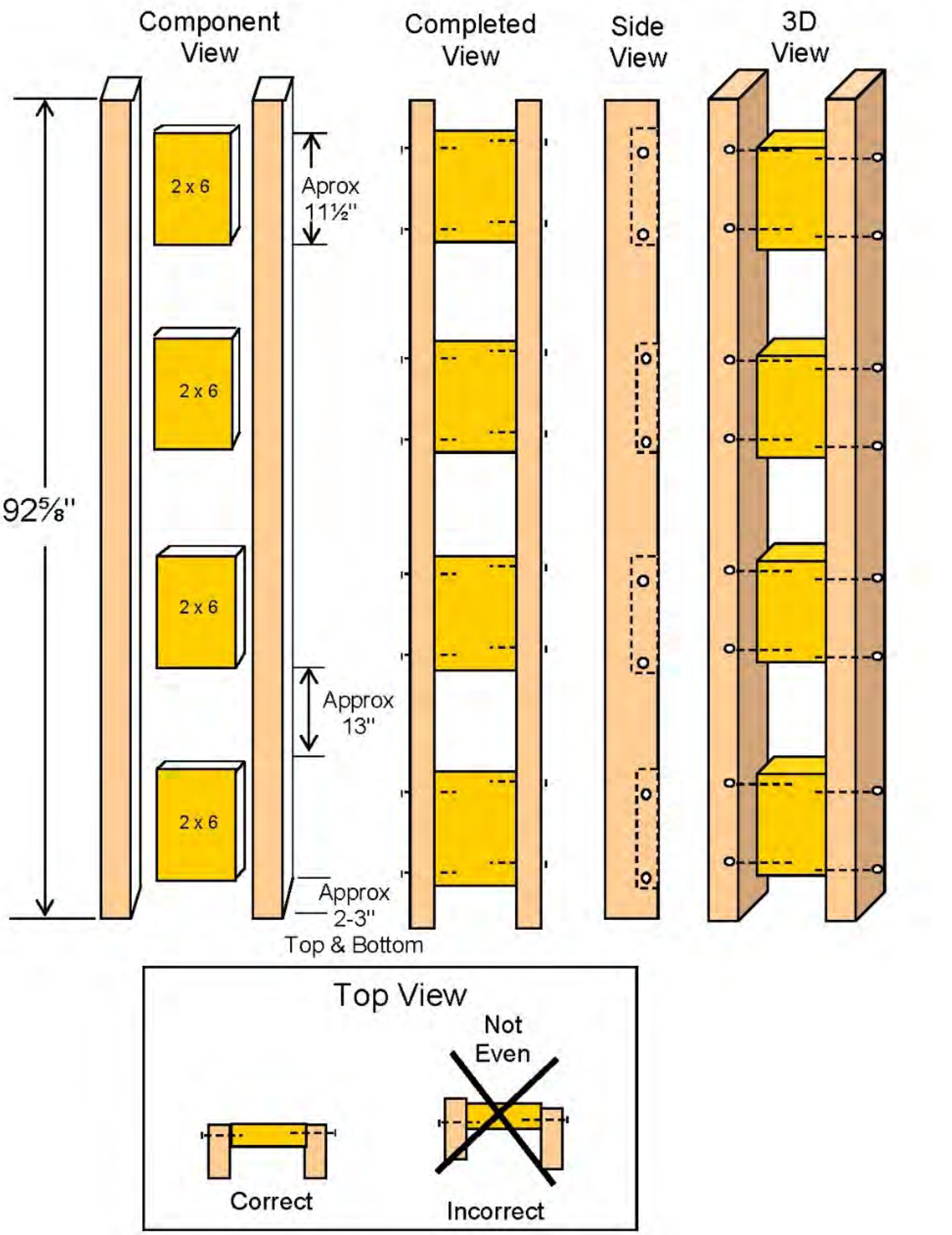


Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.



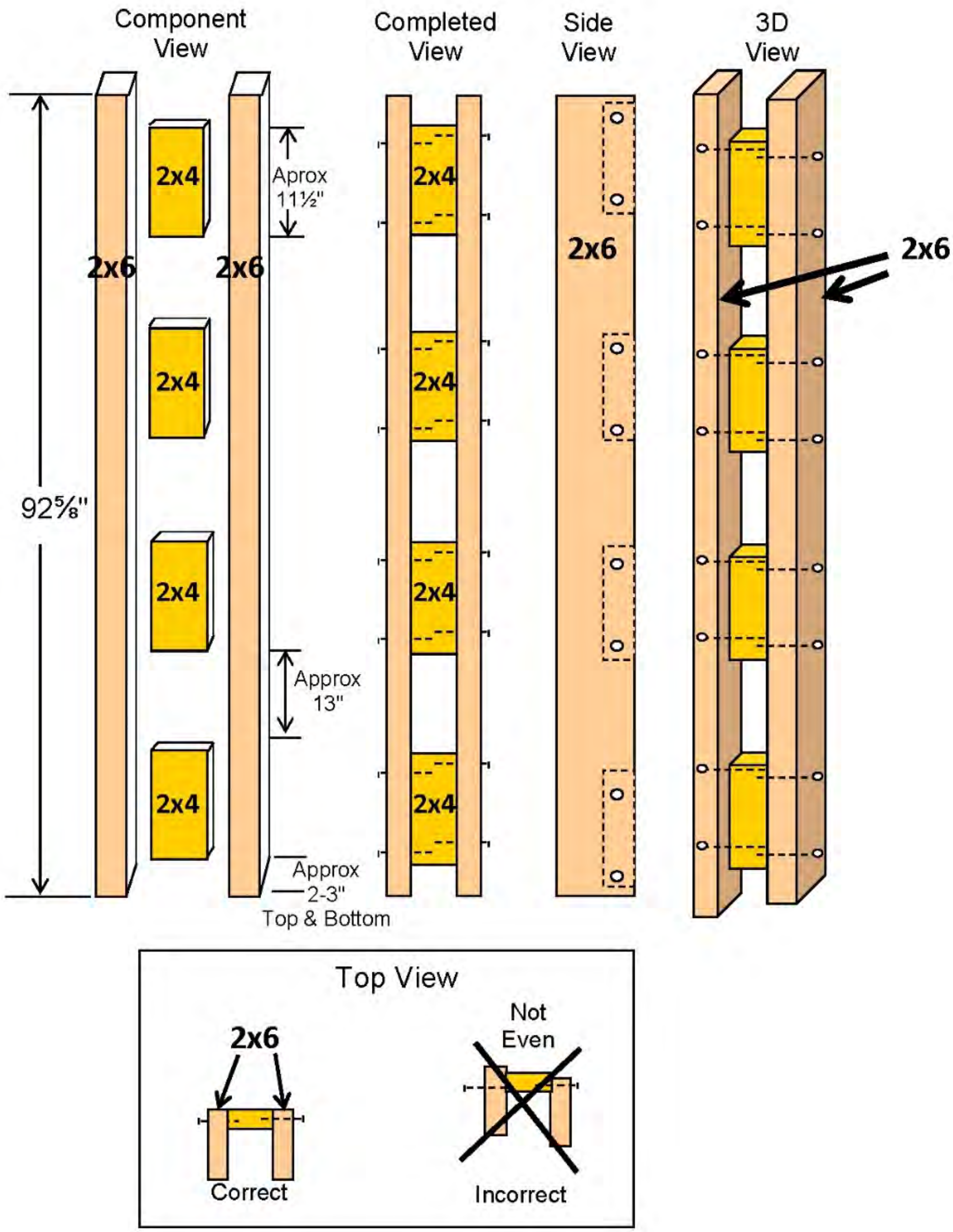
Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

U6
"T" Component for wall "T" Intersection



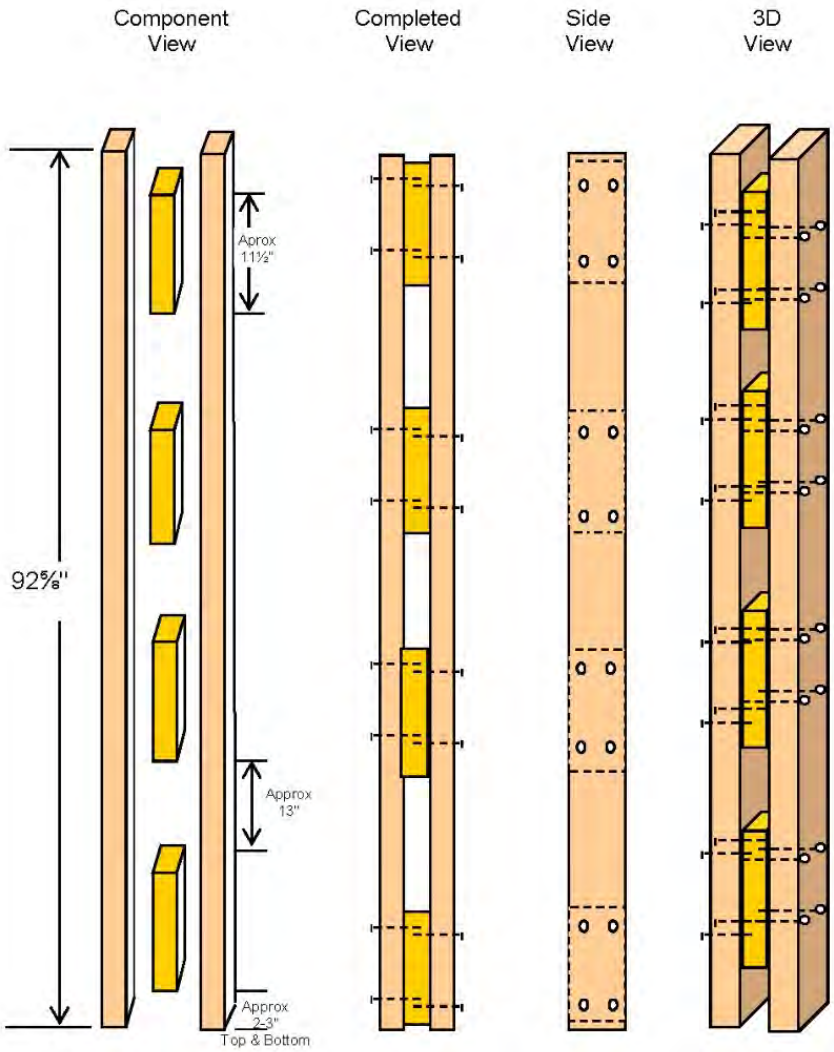
Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

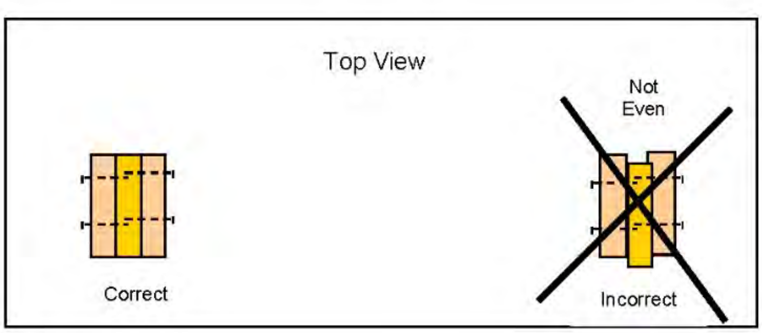
U646
"T" Component for wall "T" Intersection



Diagrams based on 8-foot walls. For 9-foot walls, studs and king studs are 104⅝ inches.

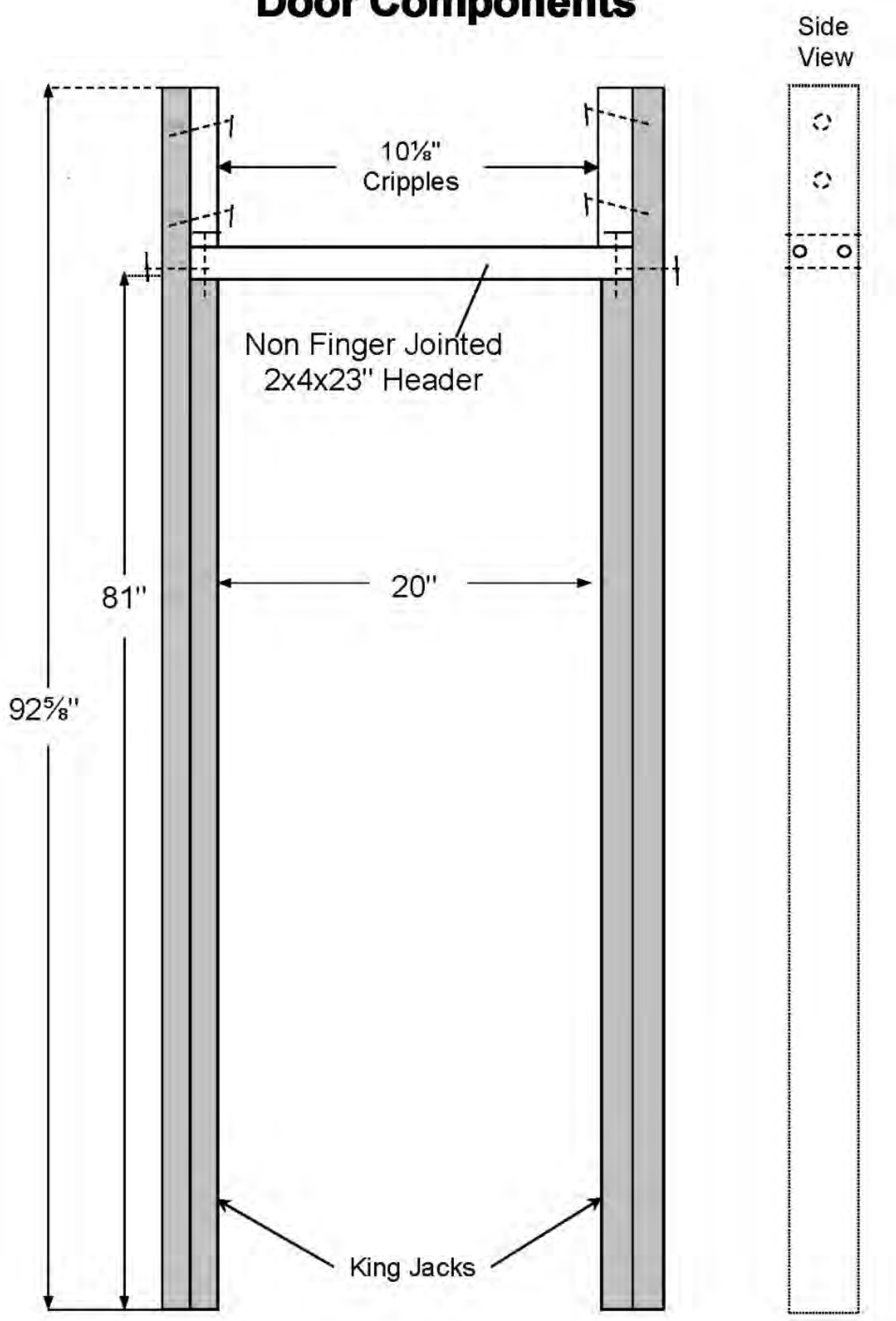
XBX
End of Free Standing Wall



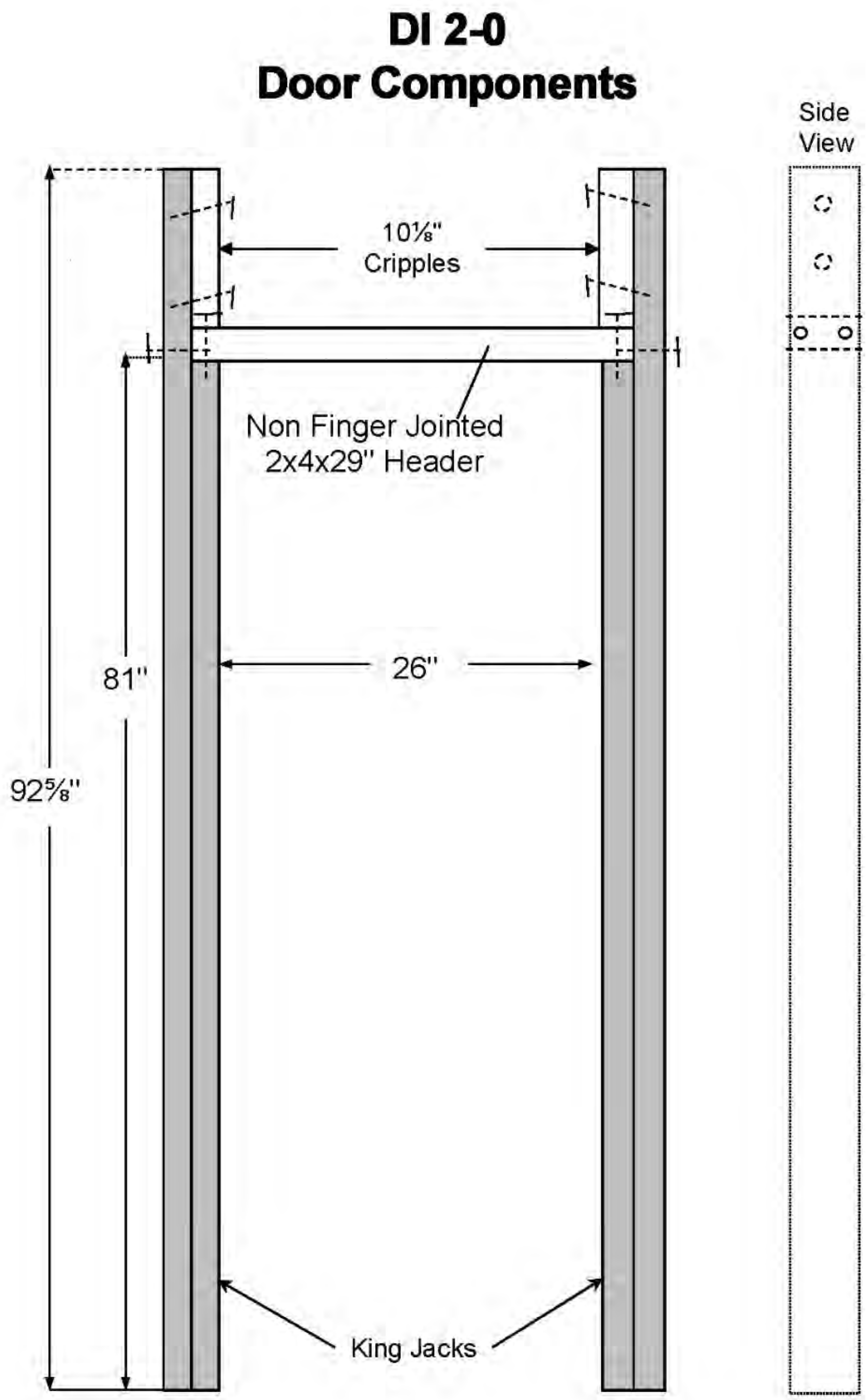


Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 22⅛ inches

DI 1-6
Door Components

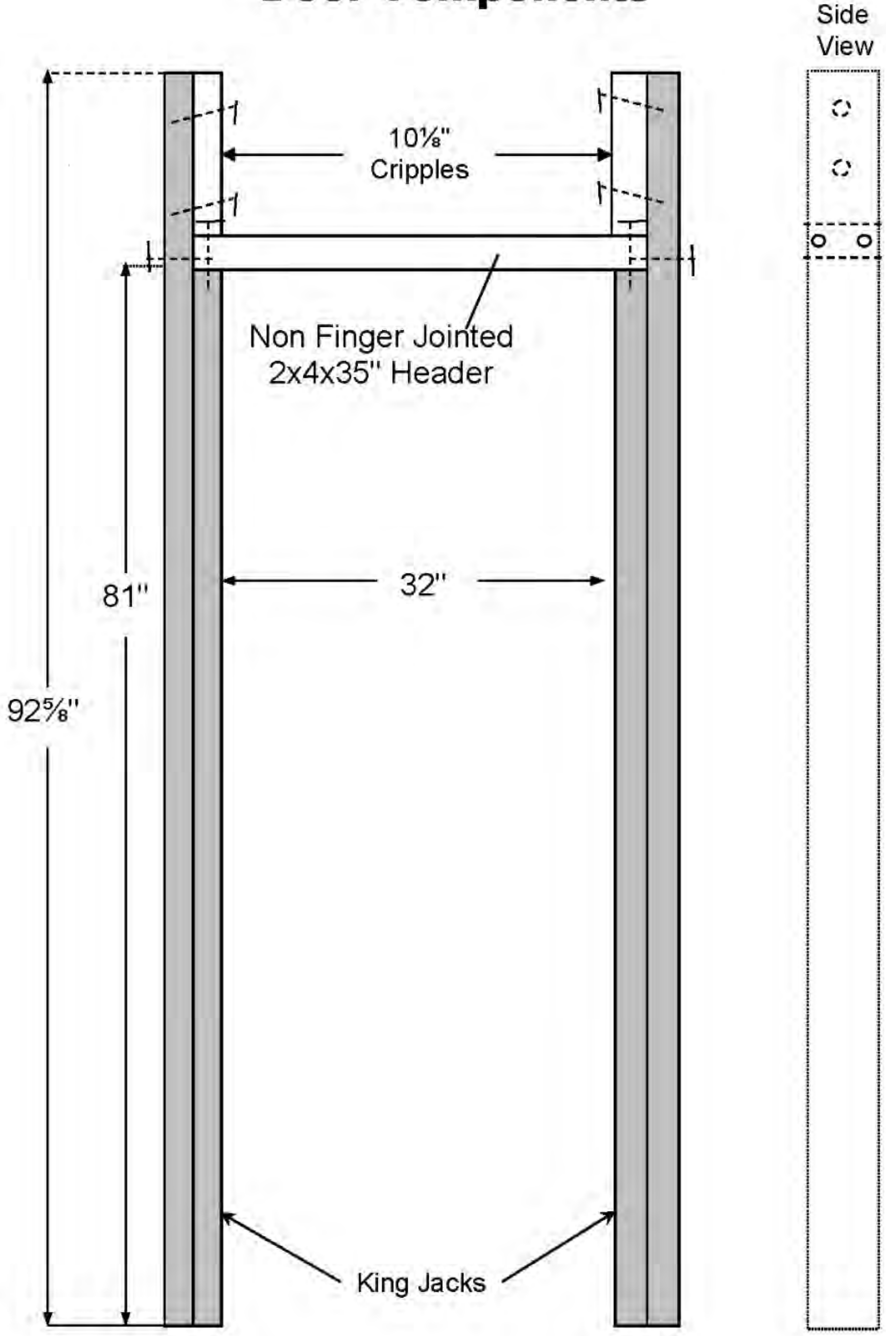


Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 22⅛ inches

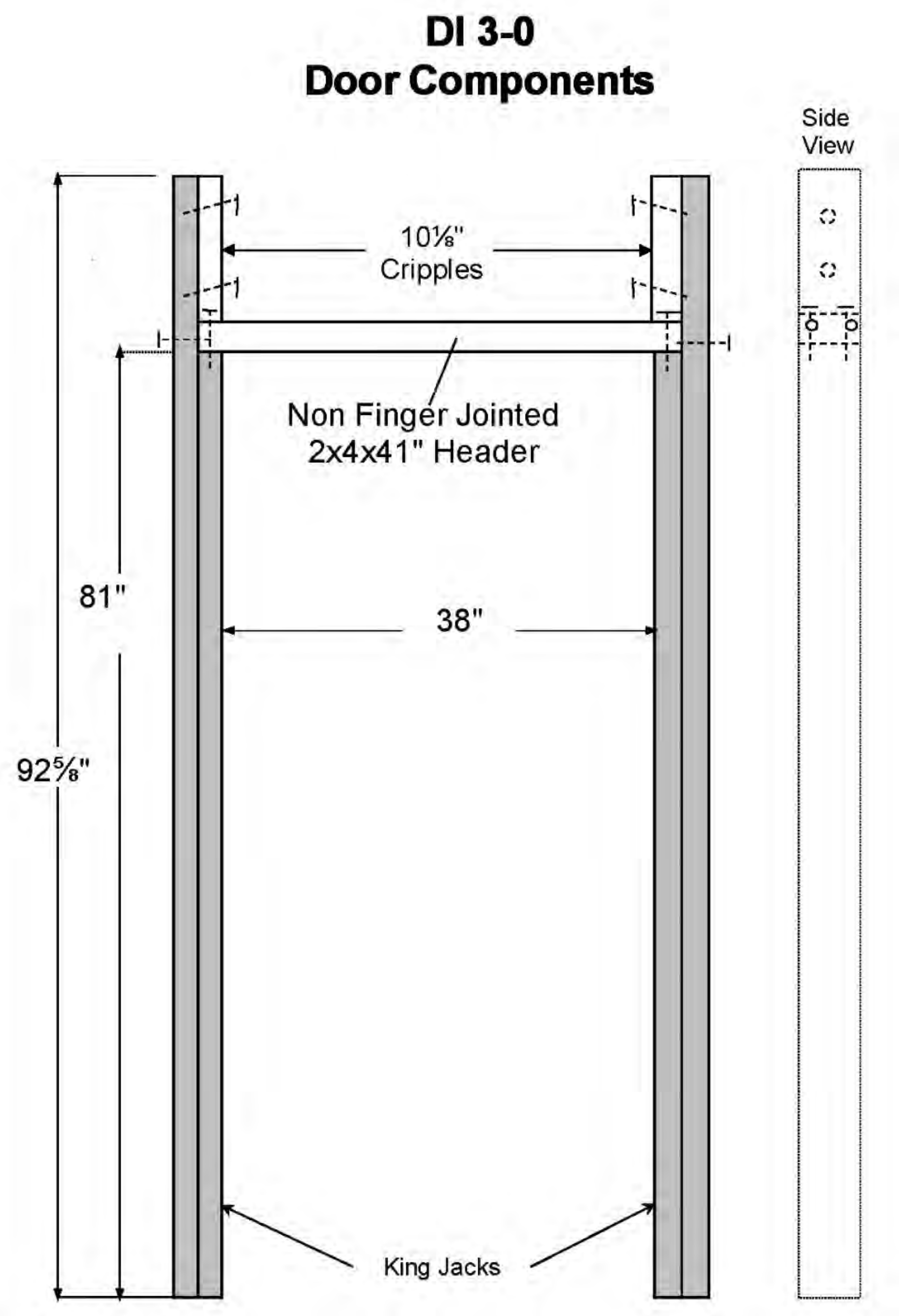


Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 22⅛ inches

DI 2-6
Door Components

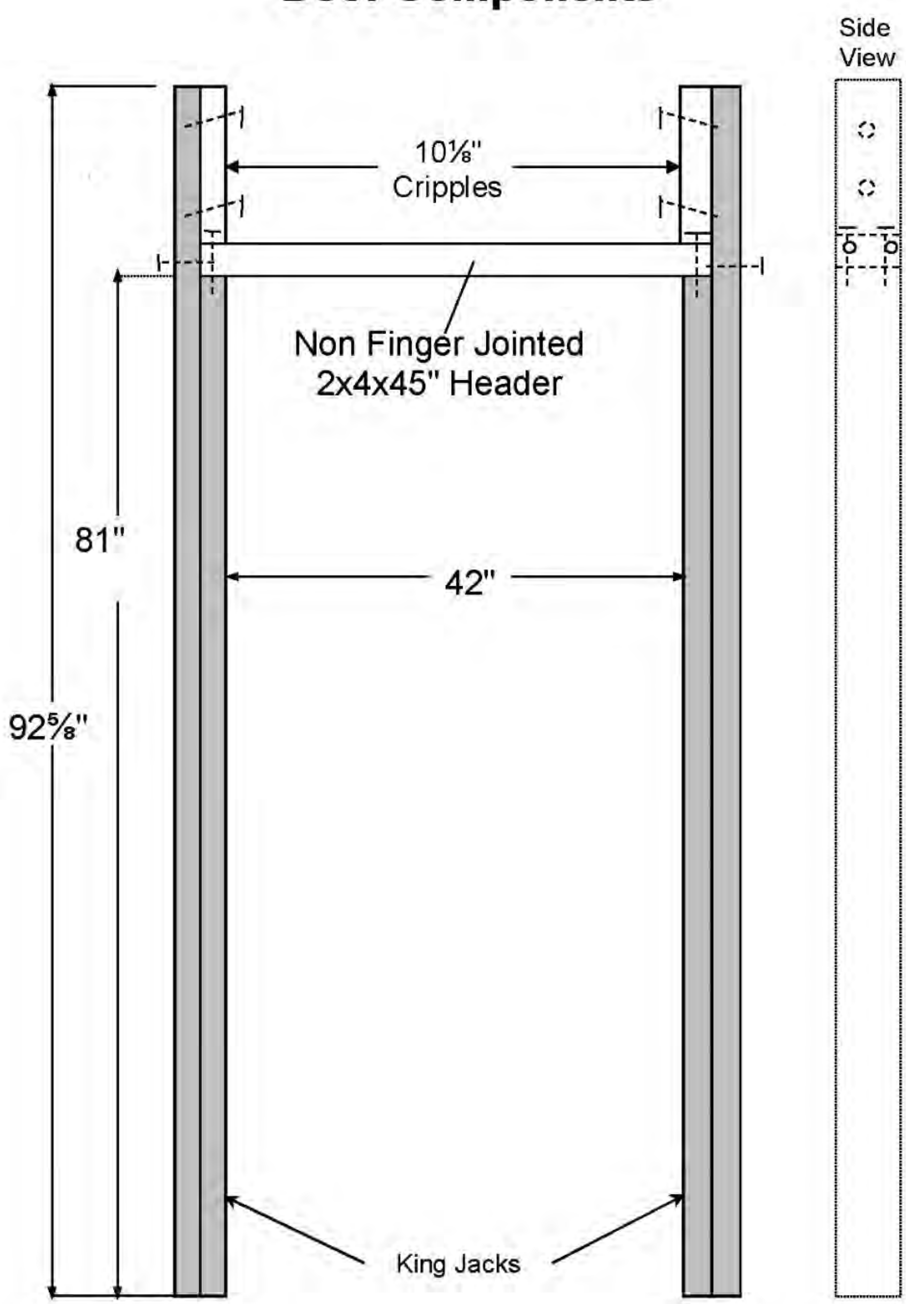


Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 22⅛ inches

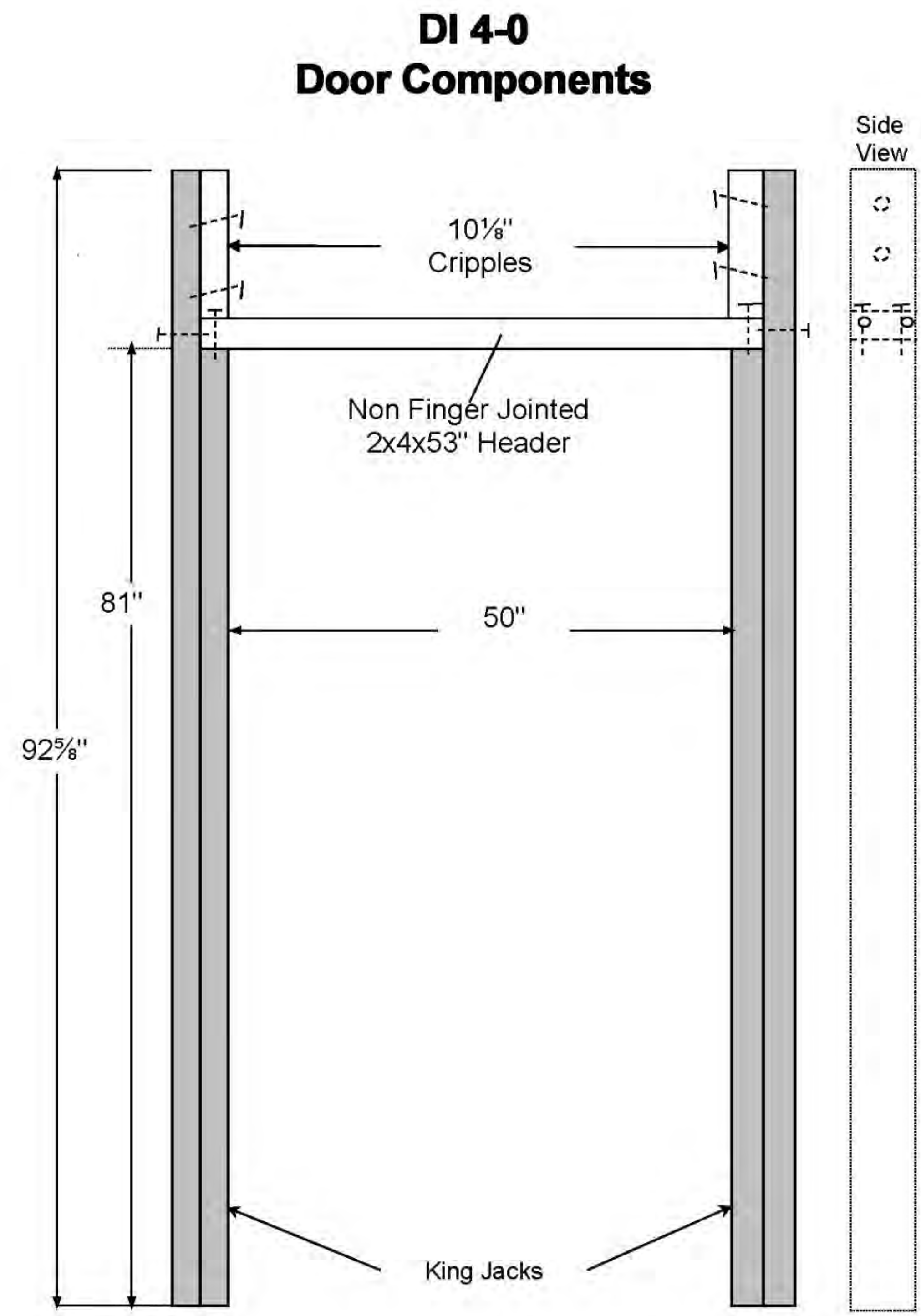


Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 22⅛ inches

DI 3-4
Door Components

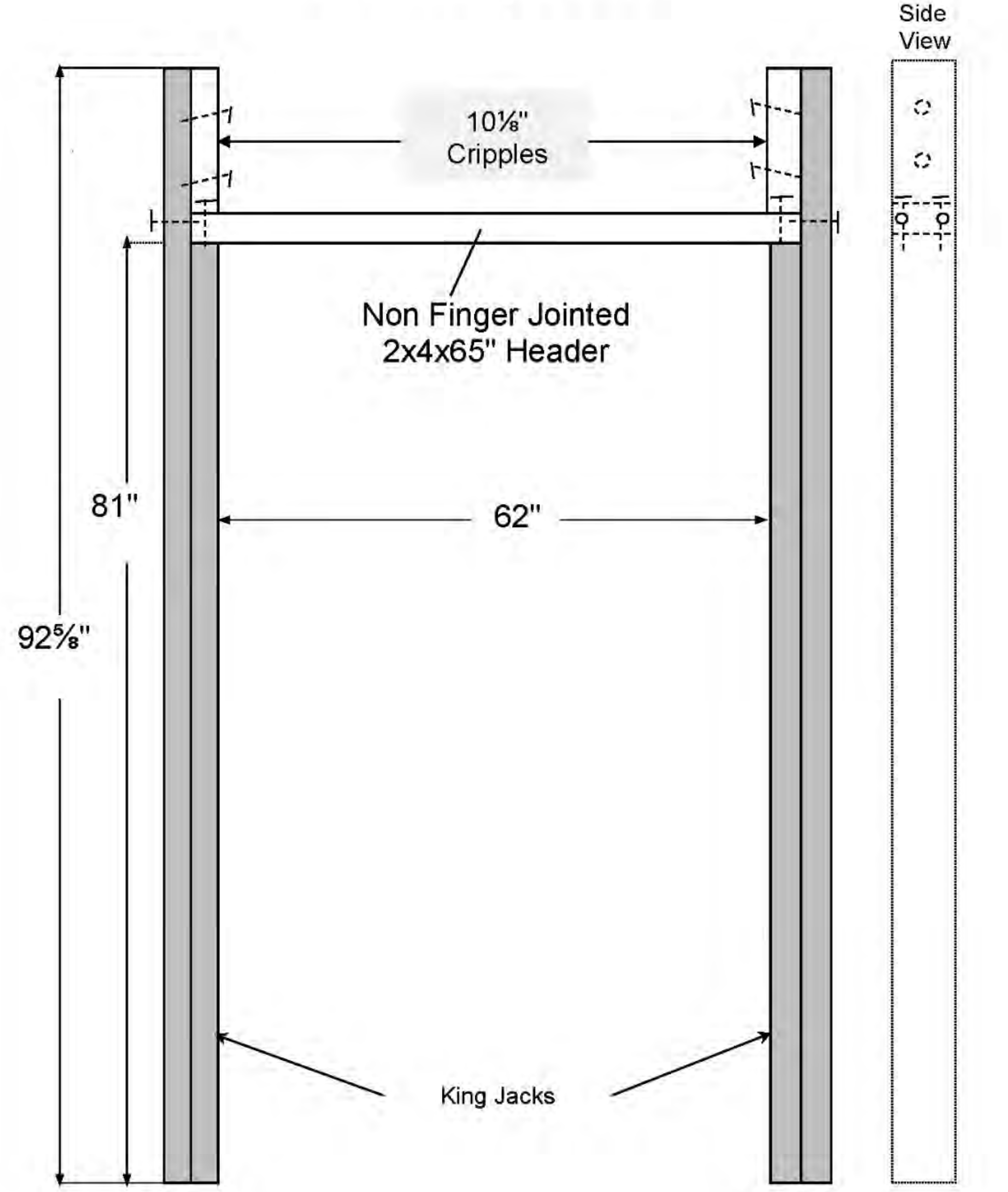


Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 22⅛ inches

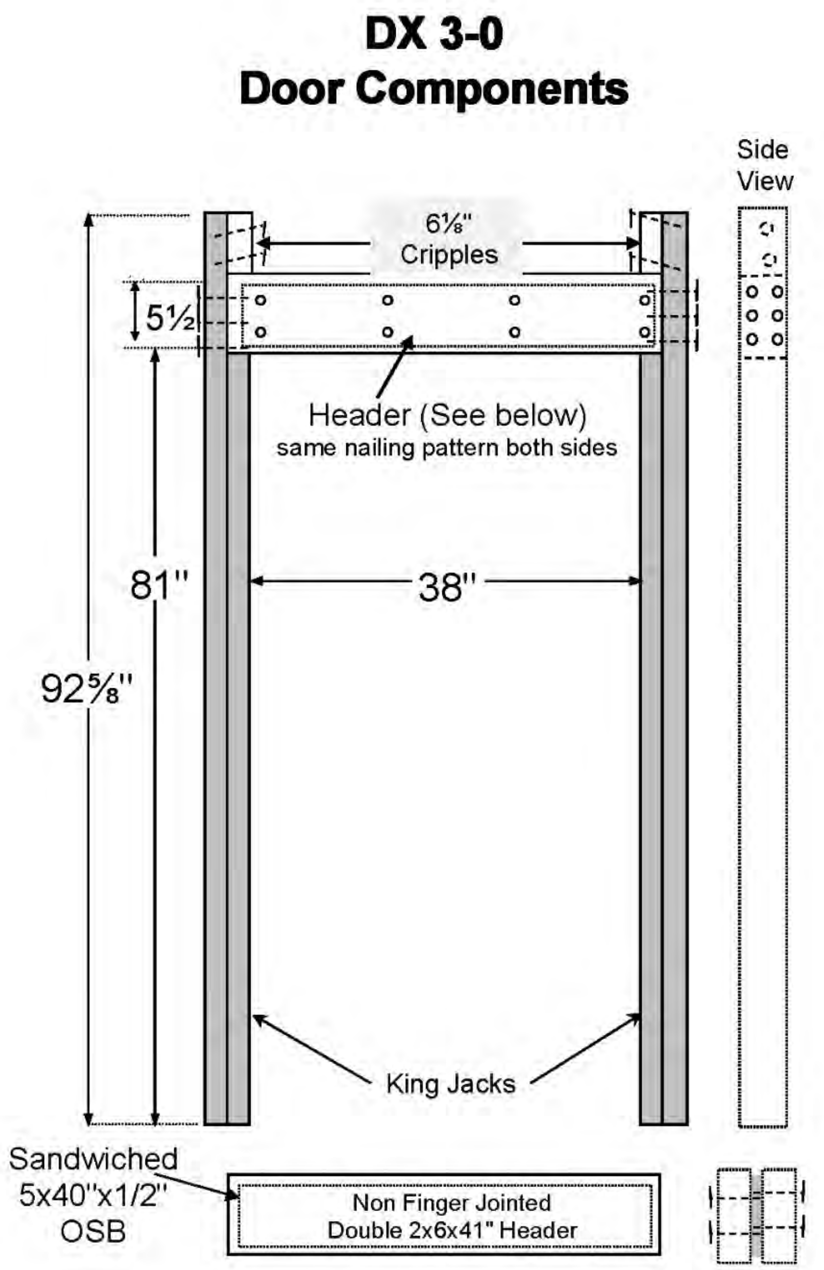


Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 22⅛ inches

DI 5-0
Door Components

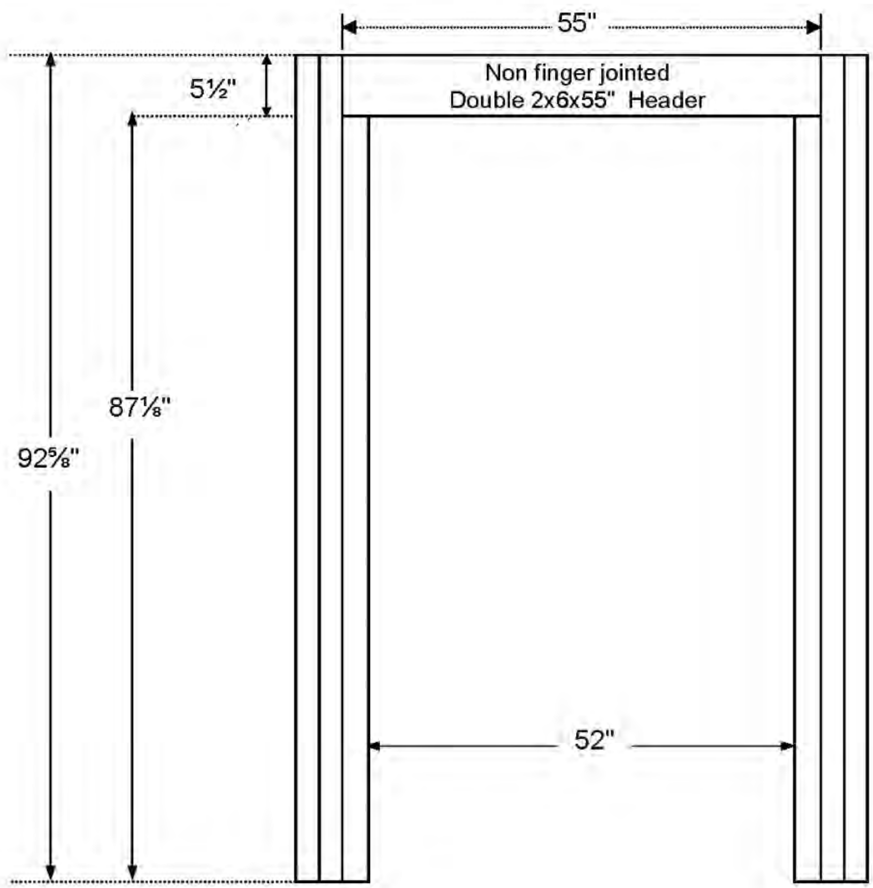


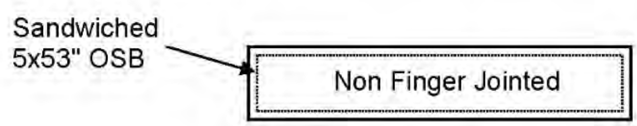
Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 18⅛ inches



Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and 12-inch cripples need to be added above the header

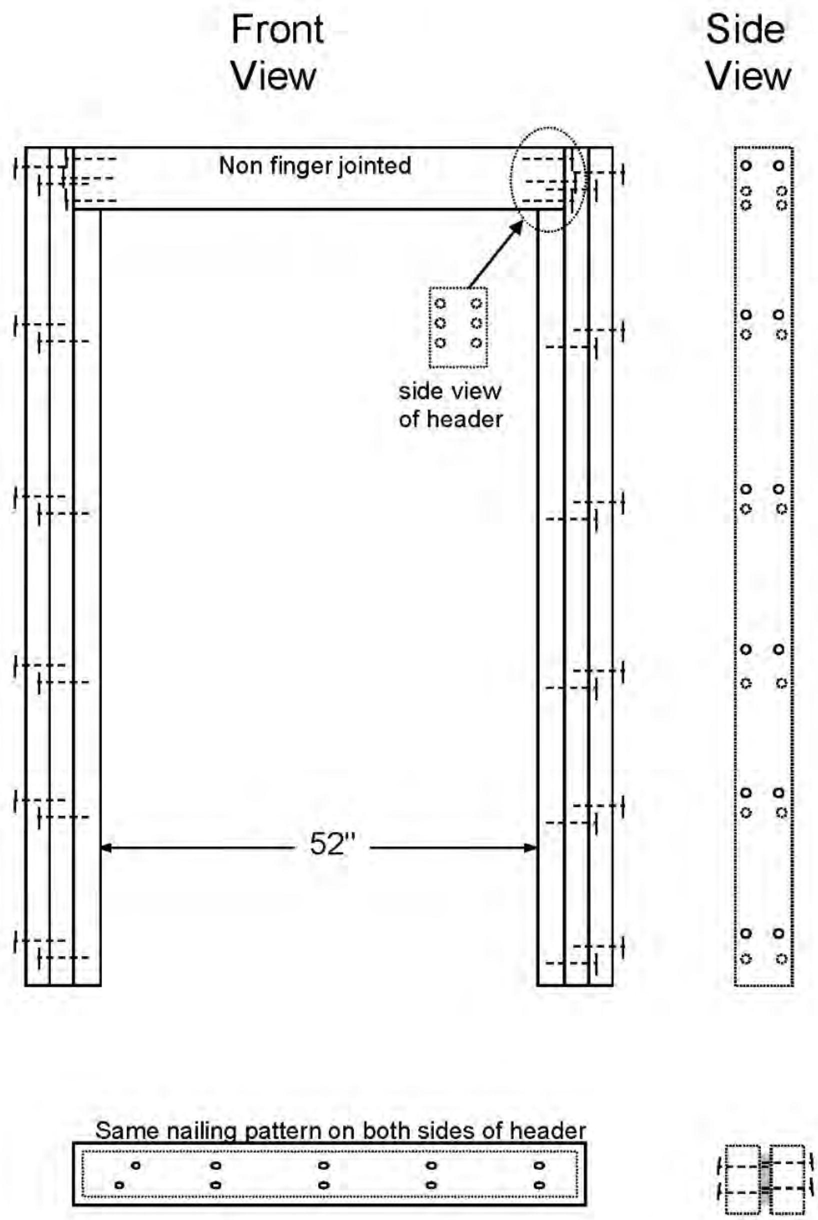
Custom Entry





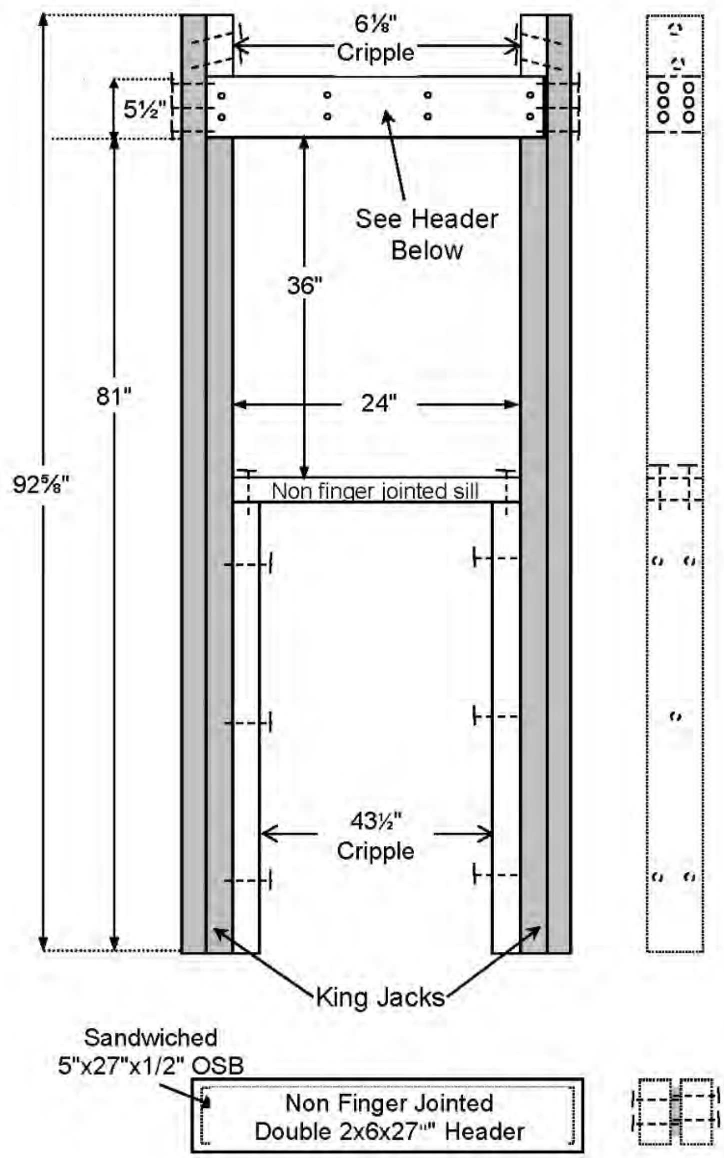
Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and 12-inch cripples need to be added above the header

Custom Entry Nailing Pattern



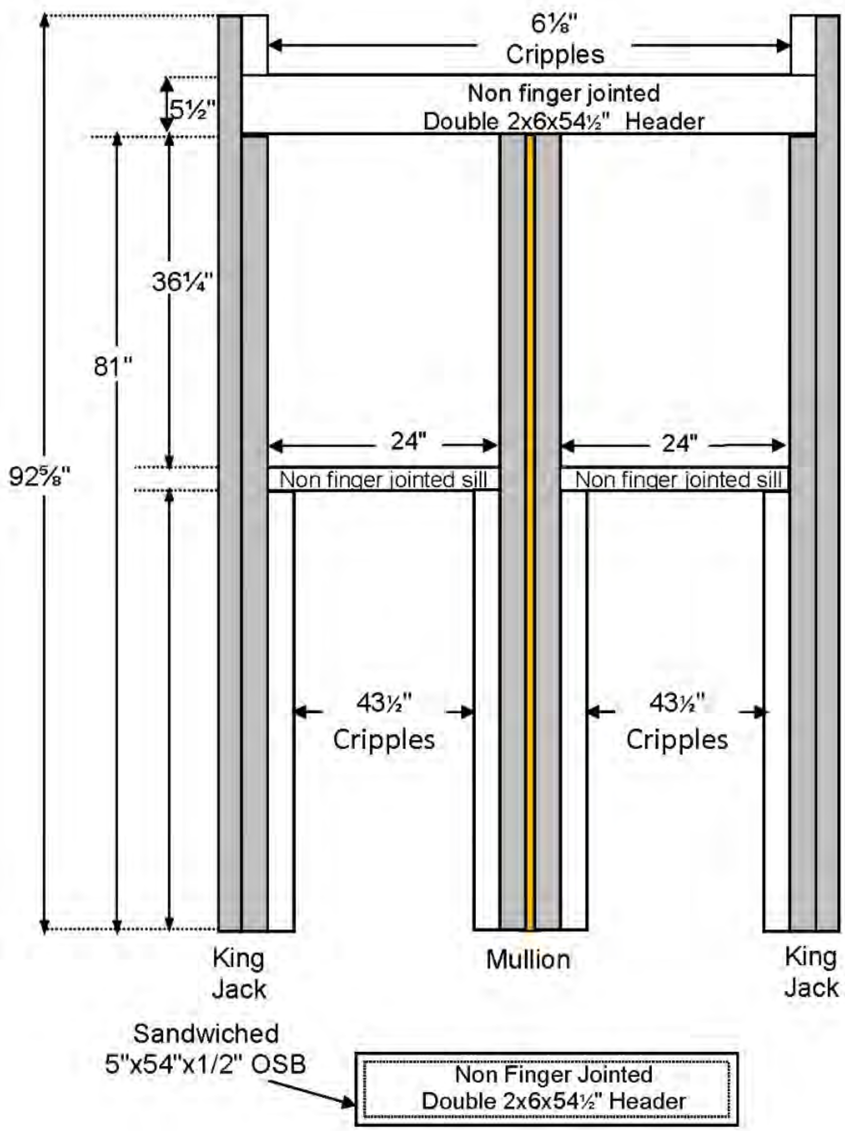
Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 18⅛ inches

Window 2x3



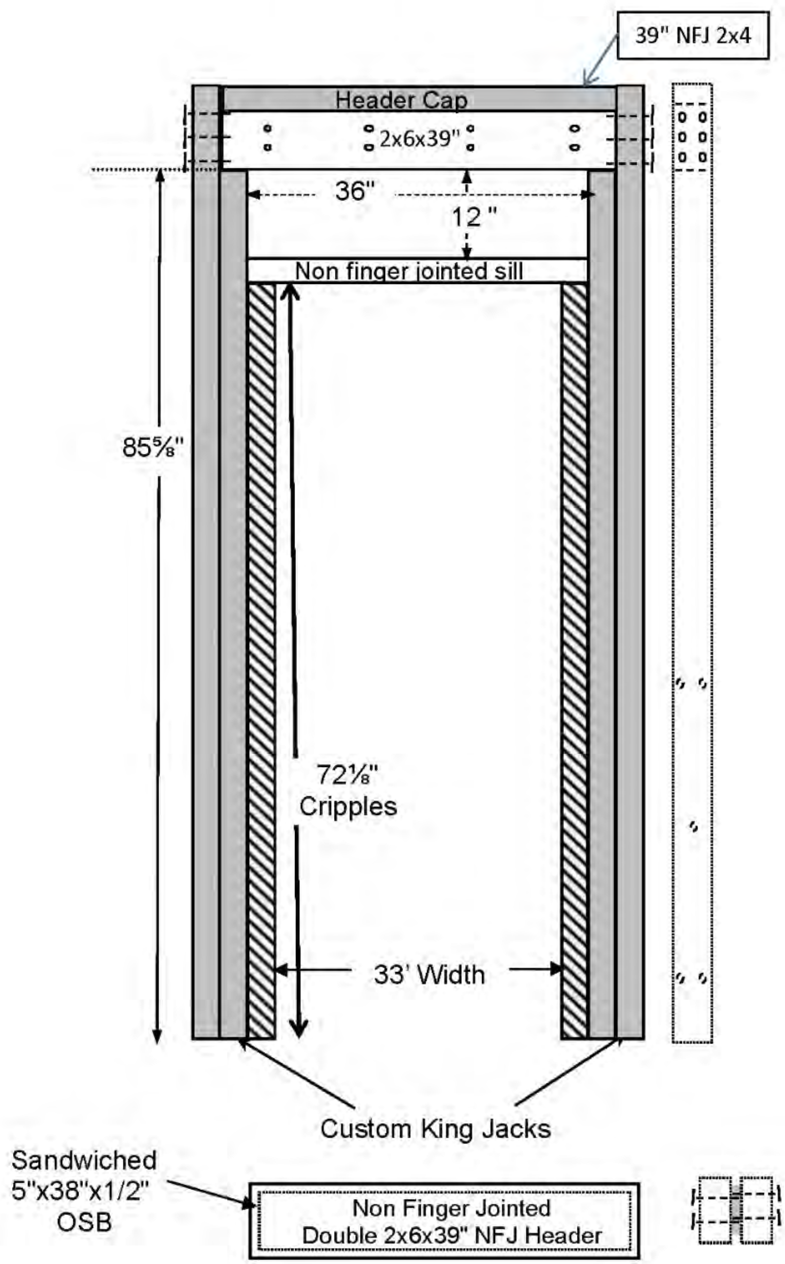
Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 18⅛ inches

Window 2x3 Double



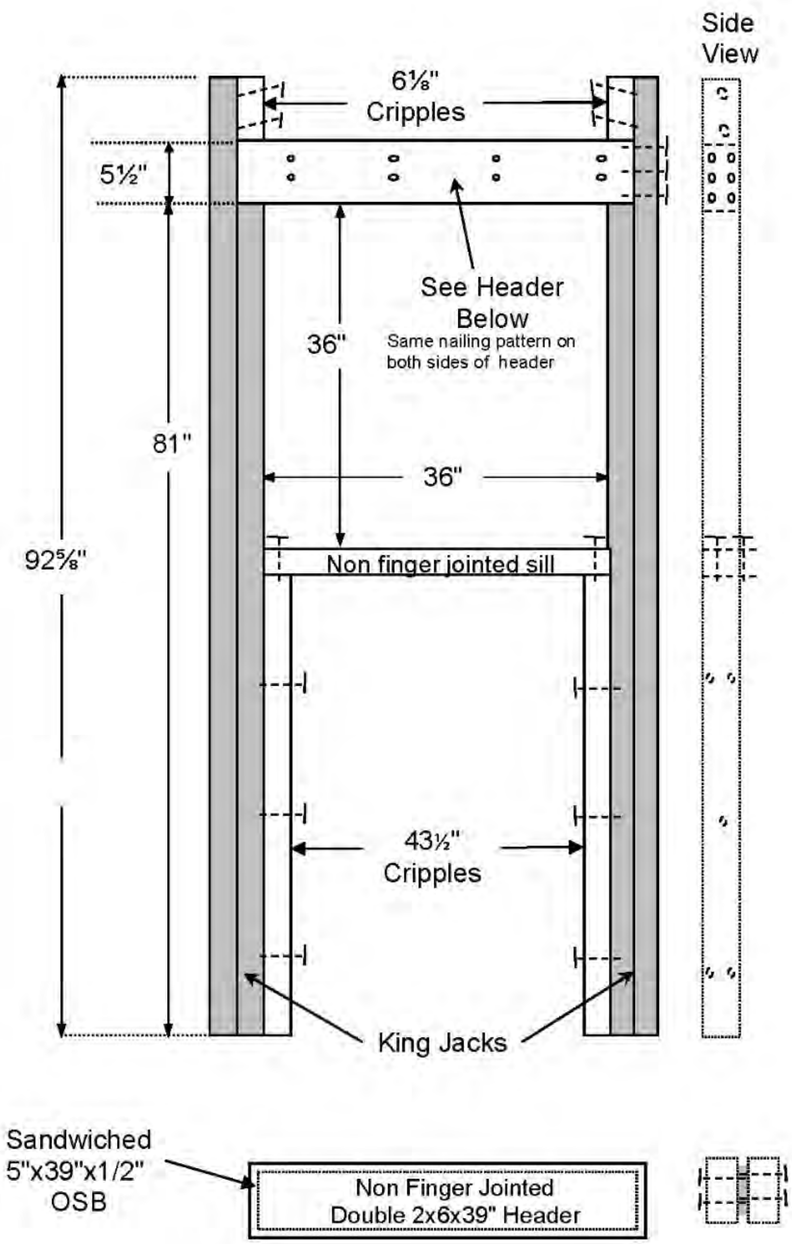
Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches

Window 3x1

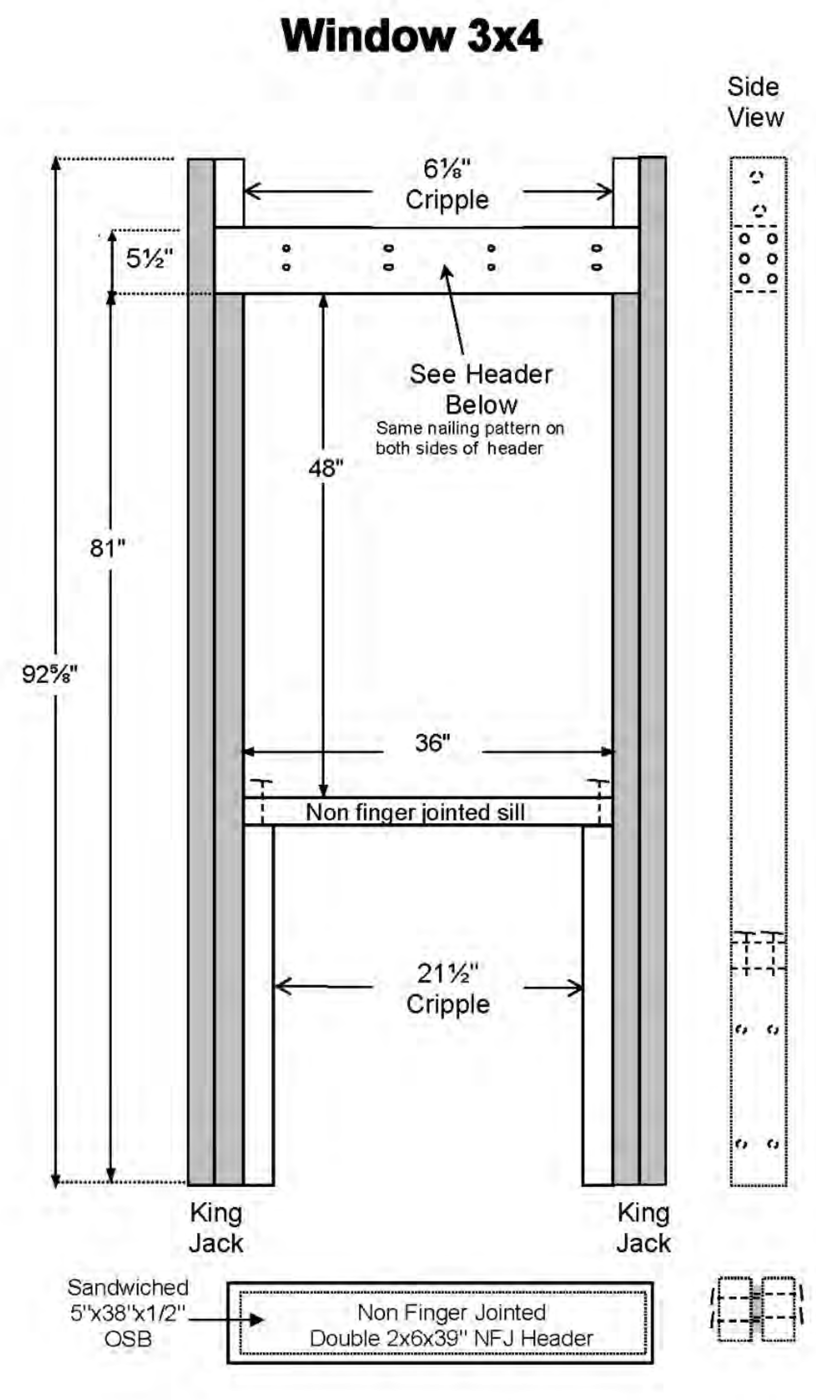


Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 18⅛ inches

Window 3x3

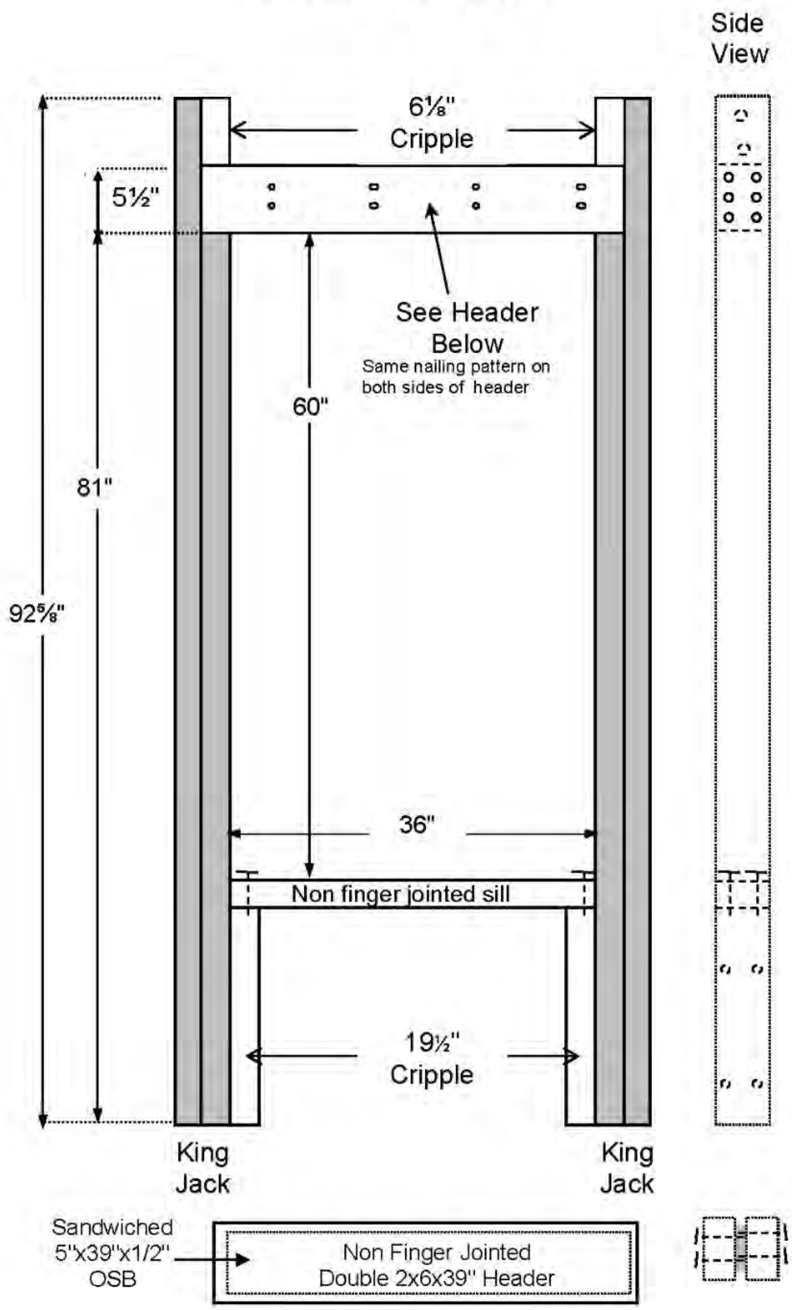


Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 18⅛ inches



Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 18⅛ inches

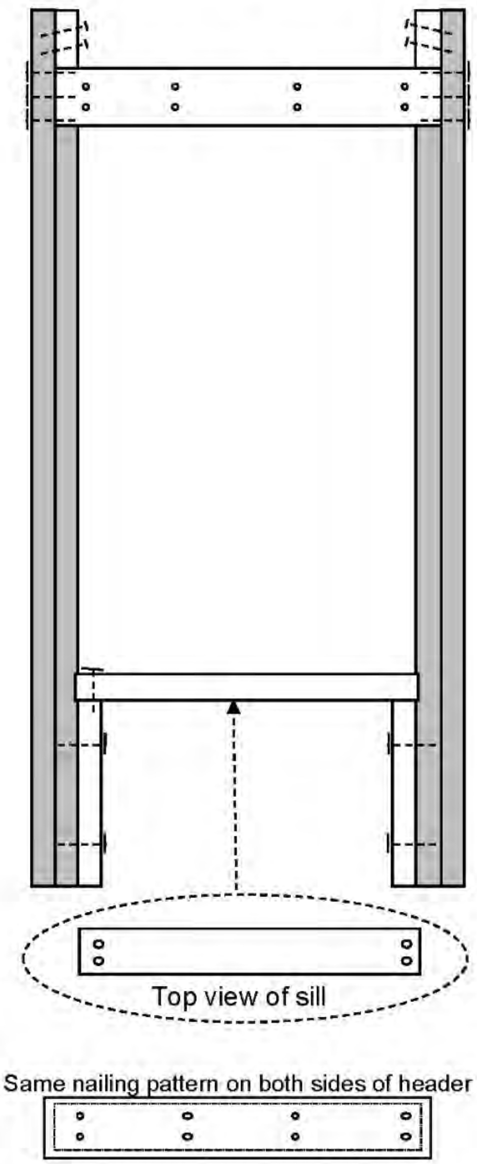
Window 3x5



8' Walls

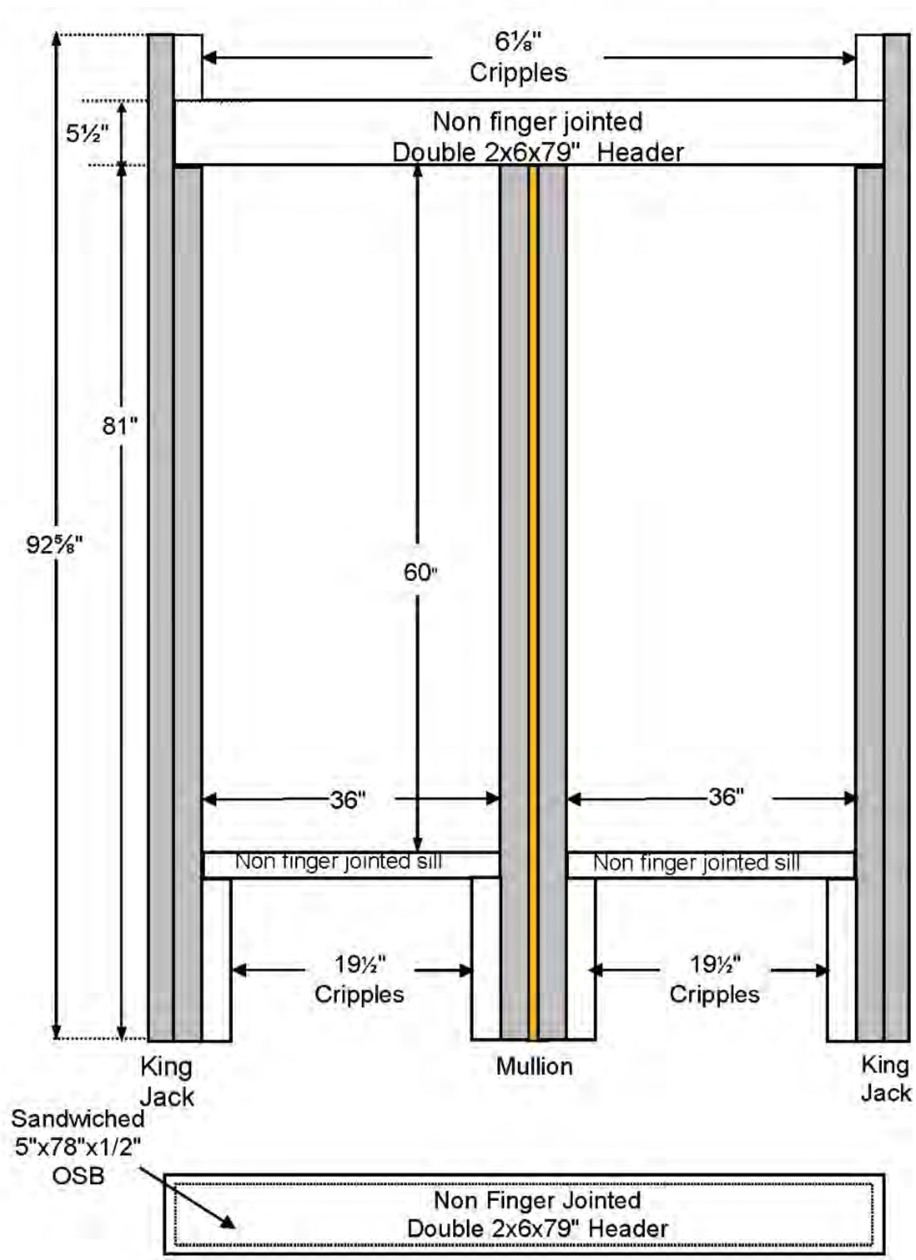
Window 3x5 Nailing Patterns

Front View



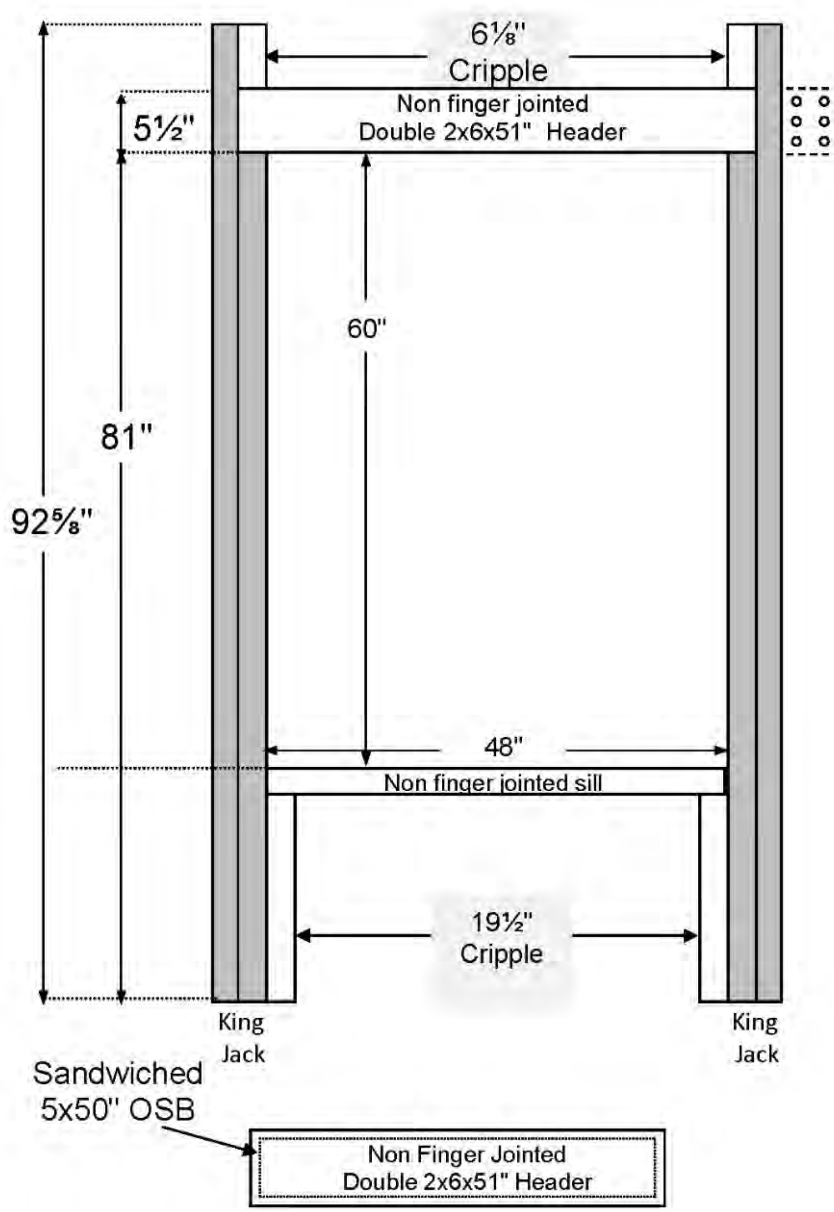
Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 18⅛ inches

Window 3x5 Double



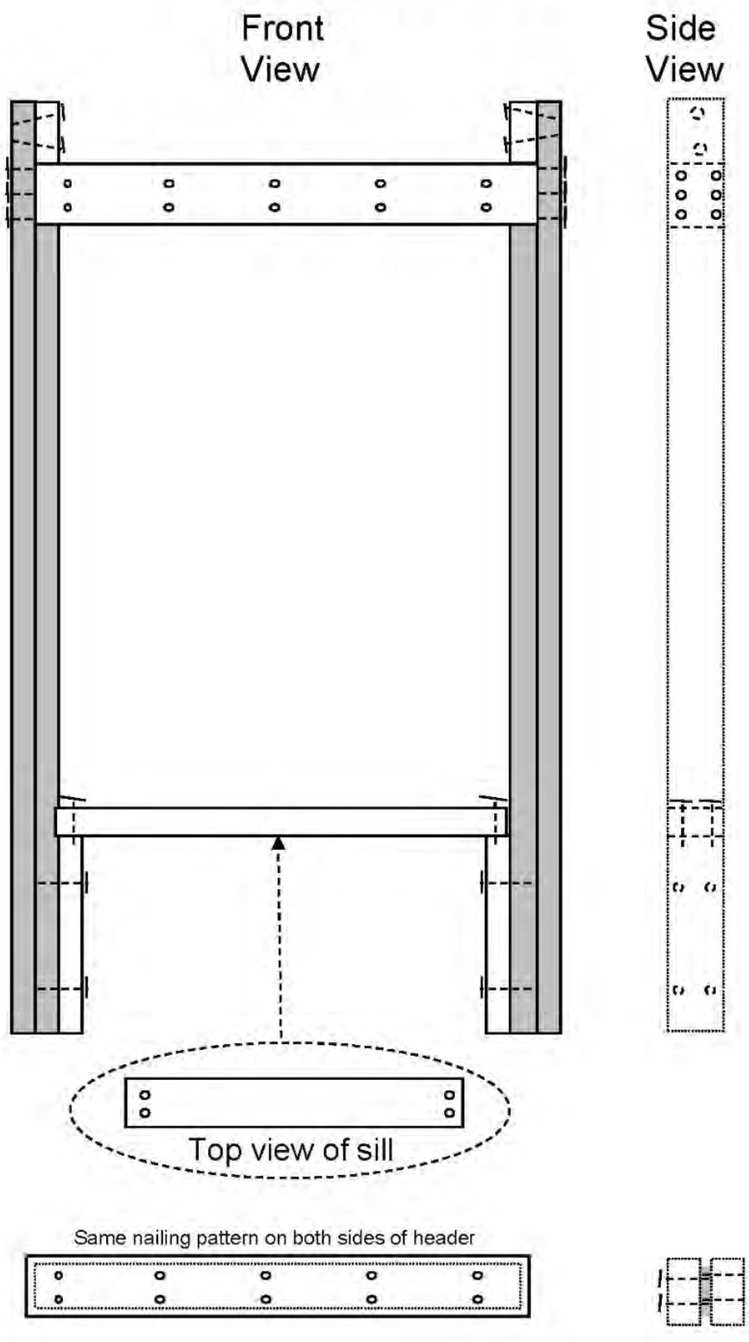
Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the header are 18⅛ inches

Window 4x5



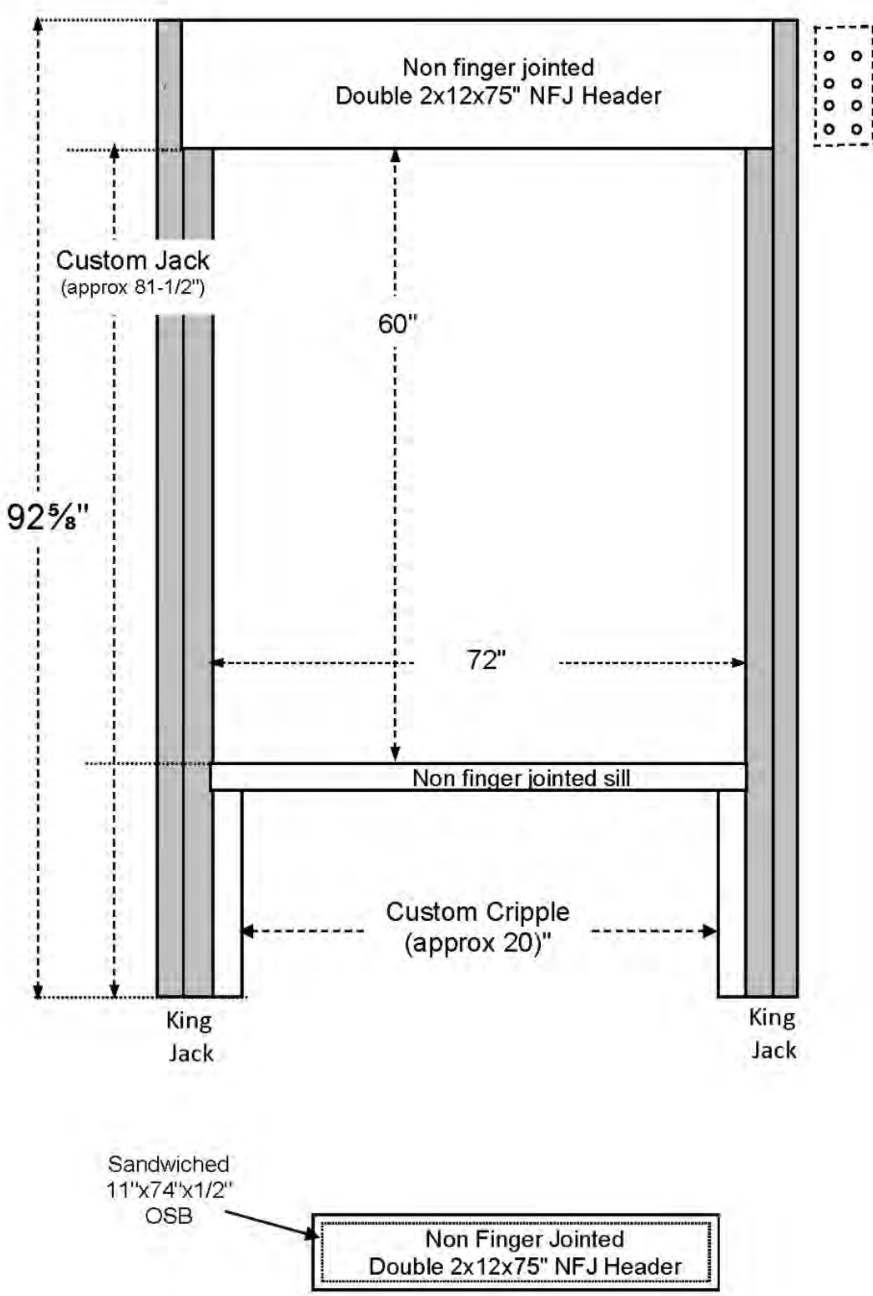
8' Walls

Window 4x5 Nailing Patterns

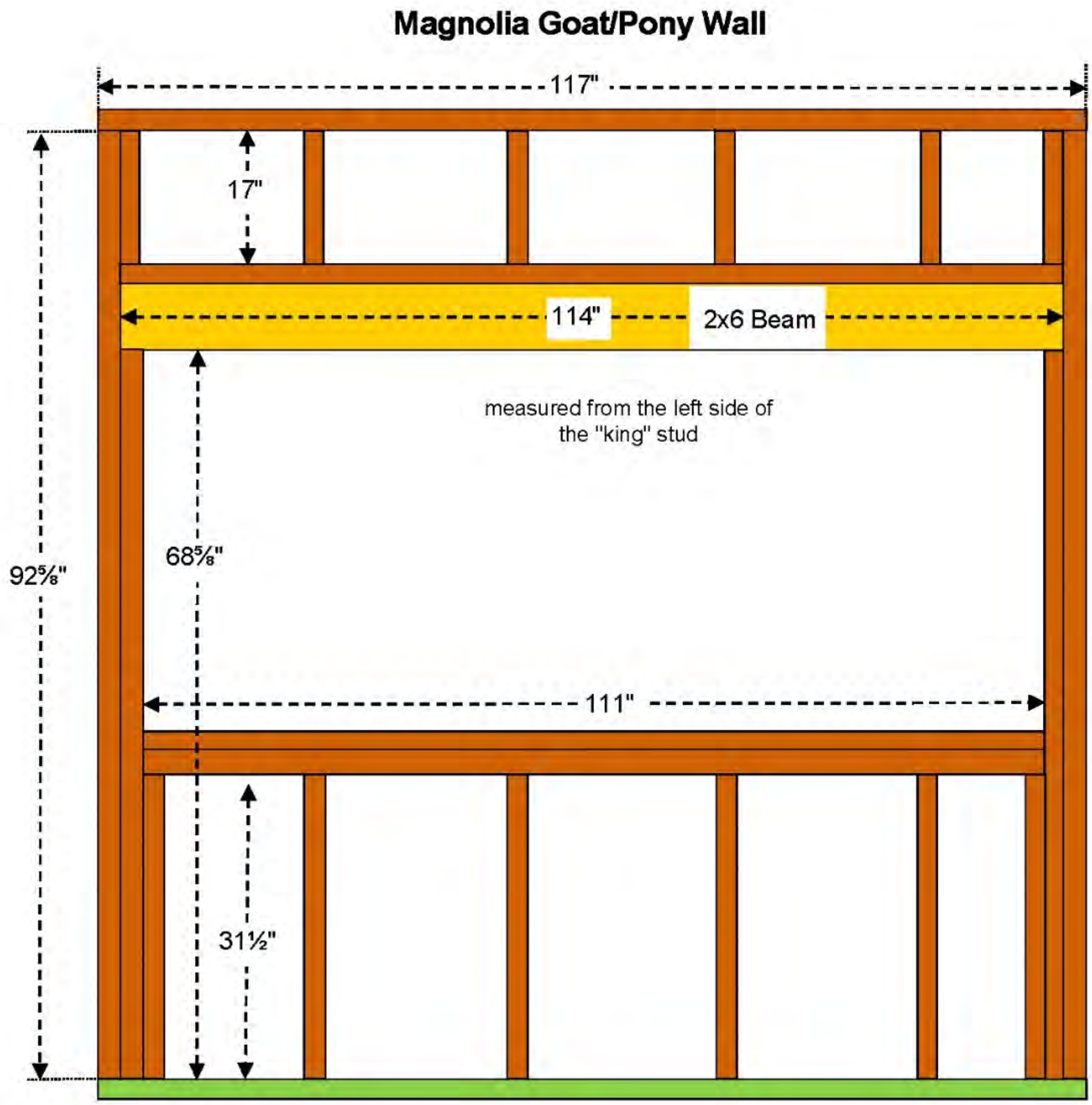


Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and 12-inch cripples are added above are the header

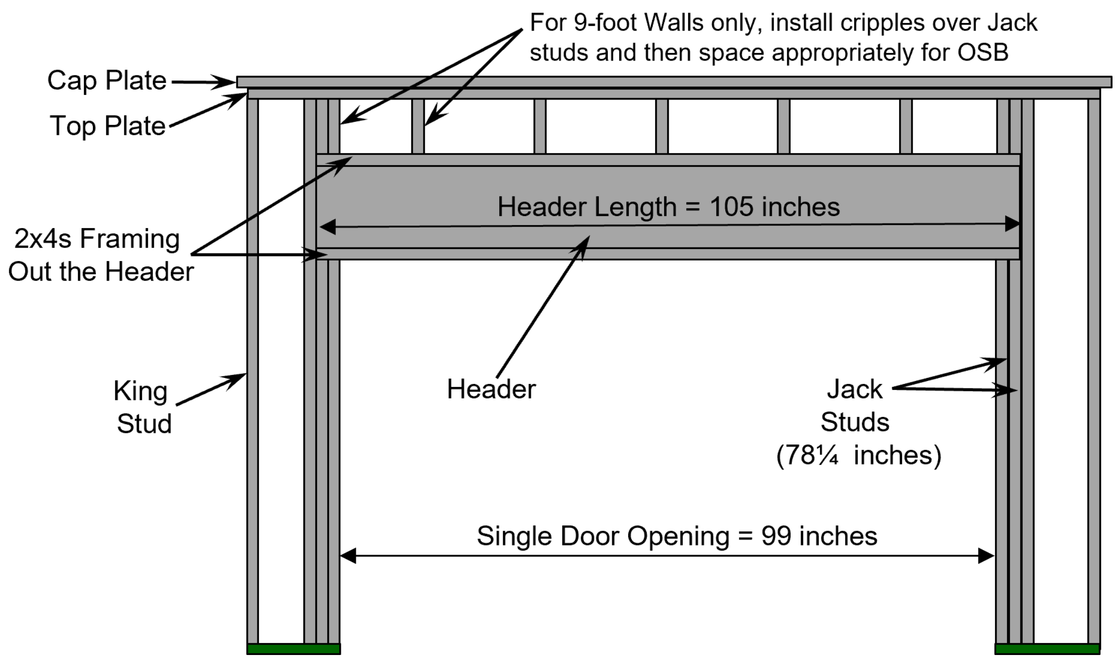
Window 6x5



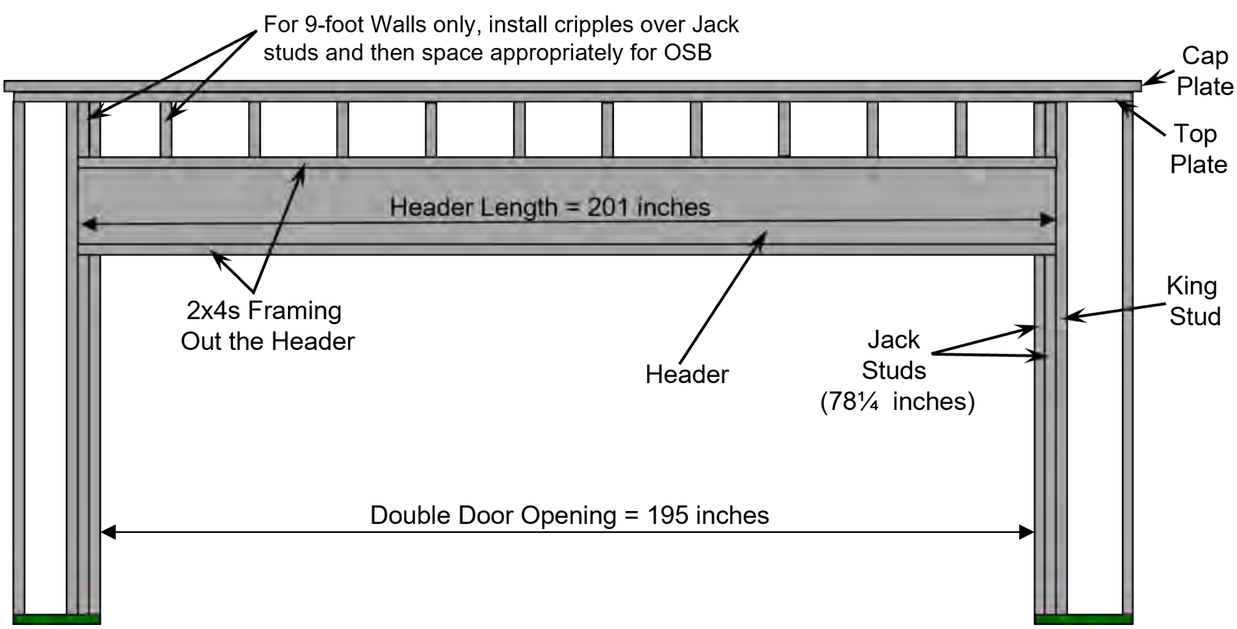
Diagrams based on 8-foot walls.
For 9-foot walls, studs and king studs are 104⅝ inches and cripples above the opening are 29 inches



Single Garage Door



Double Garage Wall



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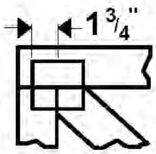
House Plan	Layout	Overall House Dimension*	Total Square Footage*	Page
Hawthorne	4 Bedroom, 2 Bath, 2-Car Garage	36’ 2” by 62’ 6”	2,104	D-3
Magnolia	3 Bedroom, 2 Bath, 1-Car Garage	31’ by 65’ 7”	1,804	D-12
Misener A	3 Bedroom, 2 Bath, 1-Car Garage	34’ 11” by 54’ 5½”	1,810	D-19
Misener B	3 Bedroom, 2 Bath, Single Car Garage	34’ 11” by 54’ 5½”	1,810	D-29
Willow	3 Bedroom, 2 Bath, Single Car Garage	27’ 11” by 58’ 9”	1,587	D-45

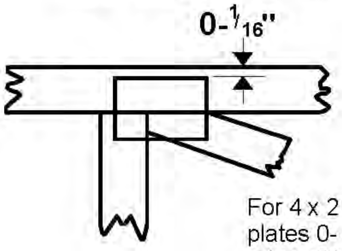
* Approximate

Symbols

PLATE LOCATION AND ORIENTATION



Center plate on joint unless x, y offsets are indicated. Dimensions are in ft-in-sixteenths. Apply plates to both sides of truss and fully embed teeth.



For 4 x 2 orientation, locate plates 0- 1/16" from outside edge of truss.

This symbol indicates the required direction of slots in connector plates.

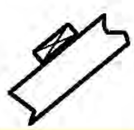
* **Plate location details available in MiTek 20/20 software or upon request.**

PLATE SIZE

4 x 4

The first dimension is the plate width measured perpendicular to slots. Second dimension is the length parallel to slots.

LATERAL BRACING LOCATION



Indicated by symbol shown and/or by text in the bracing section of the output. Use T or I bracing if indicated.

BEARING

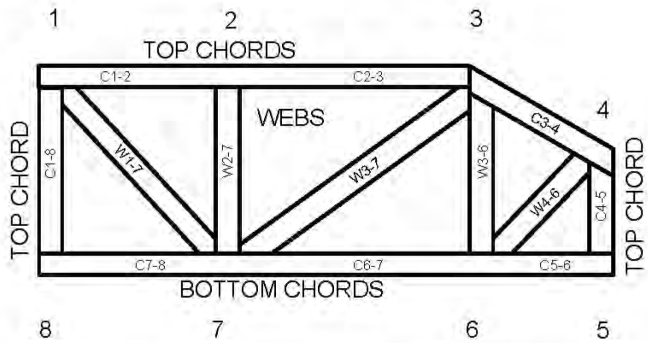
Indicates location where bearings (supports) occur. Icons vary but reaction section indicates joint number where bearings occur. Min size shown is for crushing only.

Industry Standards:

ANSI/TPI1: National Design Specification for Metal Plate Connected Wood Truss Construction.
DSB-89: Design Standard for Bracing.
BCSI: Building Component Safety Information, Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses.

Numbering System

dimensions shown in ft-in-sixteenths
(Drawings not to scale)



JOINTS ARE GENERALLY NUMBERED/LETTERED CLOCKWISE AROUND THE TRUSS STARTING AT THE JOINT FARTHEST TO THE LEFT.

CHORDS AND WEBS ARE IDENTIFIED BY END JOINT NUMBERS/LETTERS.

PRODUCT CODE APPROVALS

ICC-ES Reports:

ESR-1311, ESR-1352, ESR1988
ER-3907, ESR-2362, ESR-1397, ESR-3282

Trusses are designed for wind loads in the plane of the truss unless otherwise shown.

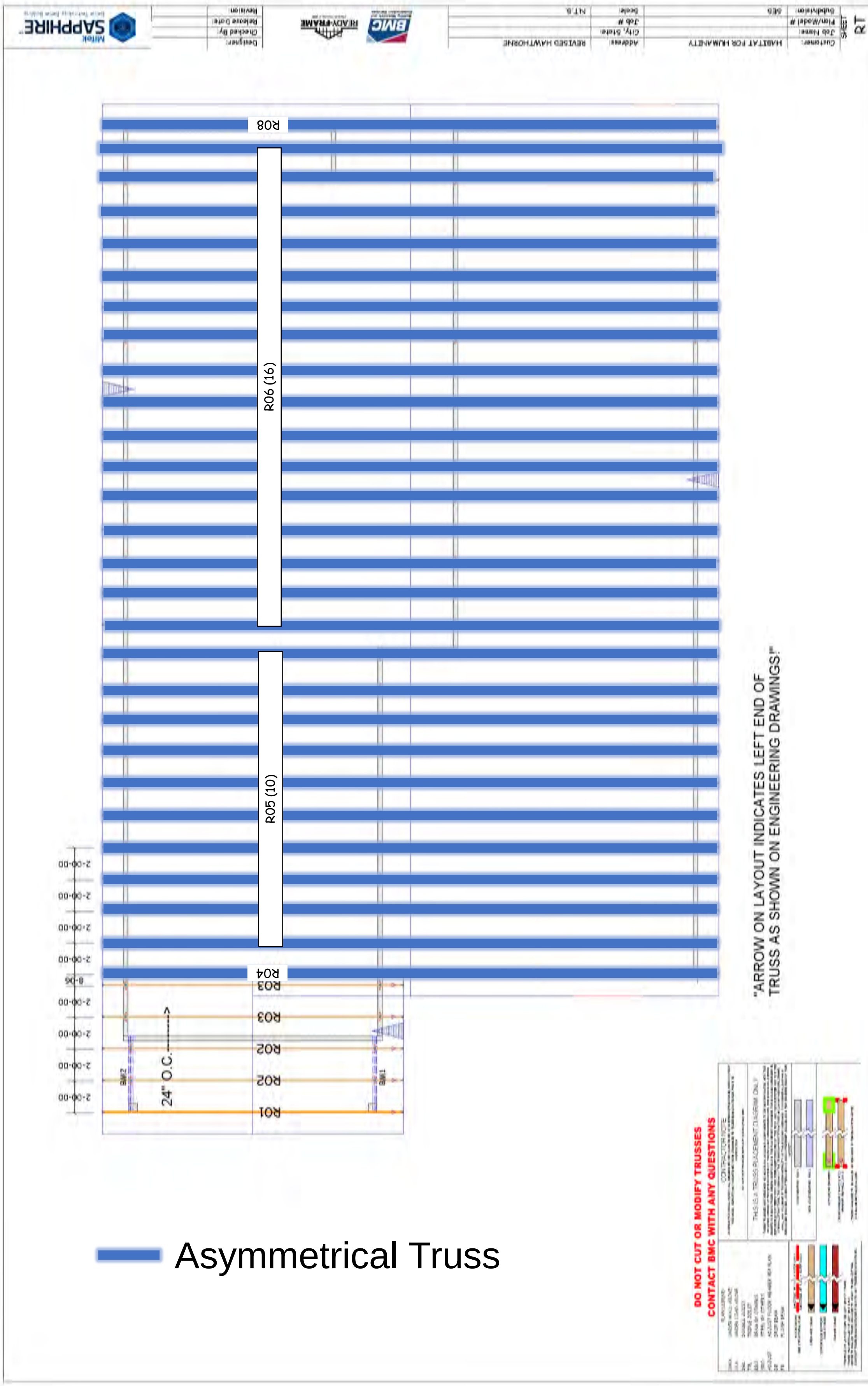
Lumber design values are in accordance with ANSI/TPI 1 section 6.3 These truss designs rely on lumber values established by others.

MiTek®

MiTek Engineering Reference Sheet: MII-7473 rev. 5/19/2020

Hawthorne Floor Plan

Truss ID and Type	Length*	Height*	Weight (lb)*	Quantity	Notes	Page
R01 Front Gable	19’ 0”	4’ 0”	107	1	Symmetrical	D-5
R02 Common	19’ 0”	4’ 3½”	81	2	Symmetrical	D-6
R03	19’ 0”	4’ 3½”	80	2	Symmetrical	D-7
R04 Garage Gable	38’ 10”	8’ 1¼”	292	1	Asymmetrical	D-8
R05	38’ 10”	8’ 5”	191	10	Asymmetrical	D-9
R06 Common	38’ 10”	8’ 5”	196	16	Asymmetrical	D-10
R08 Back Gable	38’ 10”	8’ 1¼”	259	1	Asymmetrical	D-11
* Approximate				33		


R08
R06 (16)
R05 (10)
R04
R03
R03
R02
R02
R01
24" O.C.
"ARROW ON LAYOUT INDICATES LEFT END OF TRUSS AS SHOWN ON ENGINEERING DRAWINGS!"
DO NOT CUT OR MODIFY TRUSSES
CONTACT BMC WITH ANY QUESTIONS
Asymmetrical Truss

Job	Truss	Truss Type	Qty	Ply	HABITAT/ HAWTHORNE
21-011779T	R01	GABLE	1	1	R65917667 Job Reference (optional)

BMC (Frisco, TX), Fri[illegible]X - 75034,

8 430 s Dec 17 2020 MiTek Industries, Inc. Tue Mar 30 14 19:36 2021 Page 1
ID kq3pfNDshv6CDquZTi4jkGyejol-aZQCRy7QUCJncUDltJVYg4yxOn7NBkzrQHWERlzVhiL

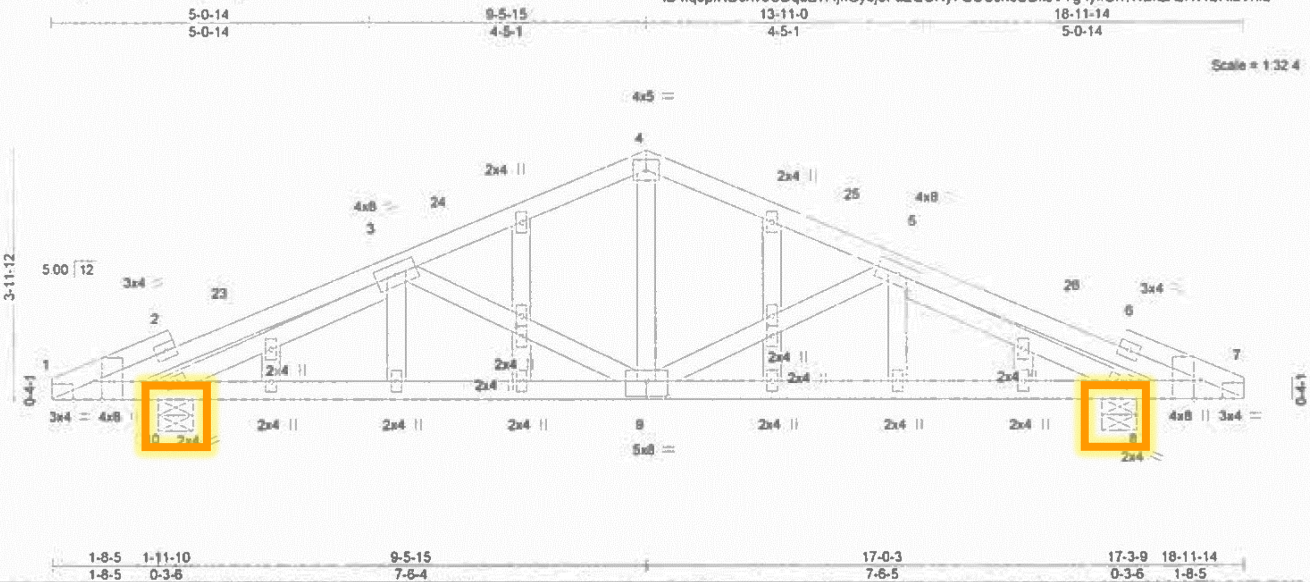


Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-3-13,Edge], [6:0-0-0,0-0-0], [7:0-3-8,Edge], [7:0-3-13,Edge], [9:0-4-0,0-3-0], [11:0-1-14,0-1-0], [19:0-1-14,0-1-0], [22:0-0-0,0-0-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.23	Vert(LL)	-0.06	8-9	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.55	Vert(CT)	-0.13	8-9	>999	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.35	Horz(CT)	0.02	8	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 107 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
OTHERS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing.

REACTIONS. (lb/size) 10=760/0-6-11, 8=759/0-6-11
Max Horz 10=69(LC 12)
Max Uplift 10=-163(LC 12), 8=-163(LC 13)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-328/23, 2-23=-314/62, 3-23=-313/119, 3-24=-792/217, 4-24=-743/234, 4-25=-743/234, 5-25=-792/217, 5-26=-313/119, 6-26=-314/62, 6-7=-328/22
BOT CHORD 1-10=-57/338, 9-10=-227/880, 8-9=-212/880, 7-8=-57/338
WEBS 4-9=-33/378, 3-10=-1037/607, 5-8=-1037/607

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-0-0 to 3-0-0, Interior(1) 3-0-0 to 9-5-15, Exterior(2R) 9-5-15 to 12-5-15, Interior(1) 12-5-15 to 18-11-14 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) All bearings are assumed to be SPF No.2 crushing capacity of 425 psi.
8) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 163 lb uplift at joint 10 and 163 lb uplift at joint 8.
9) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

STATE OF TEXAS
DAVID BAXTER
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COR F-12513
March 30,2021

WARNING - Verify design parameters and READ NOTES ON THIS AND INCLUDED MITEK REFERENCE PAGE MII 7473 rev. 5/19/2020 BEFORE USE
Design valid for use only with MiTek® connectors. This design is based only upon parameters shown, and is for an individual building component, not a truss system. Before use, the building designer must verify the applicability of design parameters and properly incorporate this design into the overall building design. Bracing indicated is to prevent buckling of individual truss web and/or chord members only. Additional temporary and permanent bracing is always required for stability and to prevent collapse with possible personal injury and property damage. For general guidance regarding the fabrication, storage, delivery, erection and bracing of trusses and truss systems, see ***ANSI/TPI1 Quality Criteria, DSB-89 and BCSI Building Component Safety Information*** available from Truss Plate Institute, 2670 Crain Highway, Suite 203 Waldorf, MD 20601

MiTek USA, Inc.
400 Sunrise Avenue, Suite 270
Roseville, CA 95661

Job	Truss	Truss Type	Qty	Ply	HABITAT/ HAWTHORNE
21-011779T	R02	Common	2	1	R65917668
					Job Reference (optional)

BMC (Frisco, TX), Frisco, TX - 75034,

8.430 s Dec 17 2020 MiTek Industries, Inc. Tue Mar 30 14:20:08 2021 Page 1
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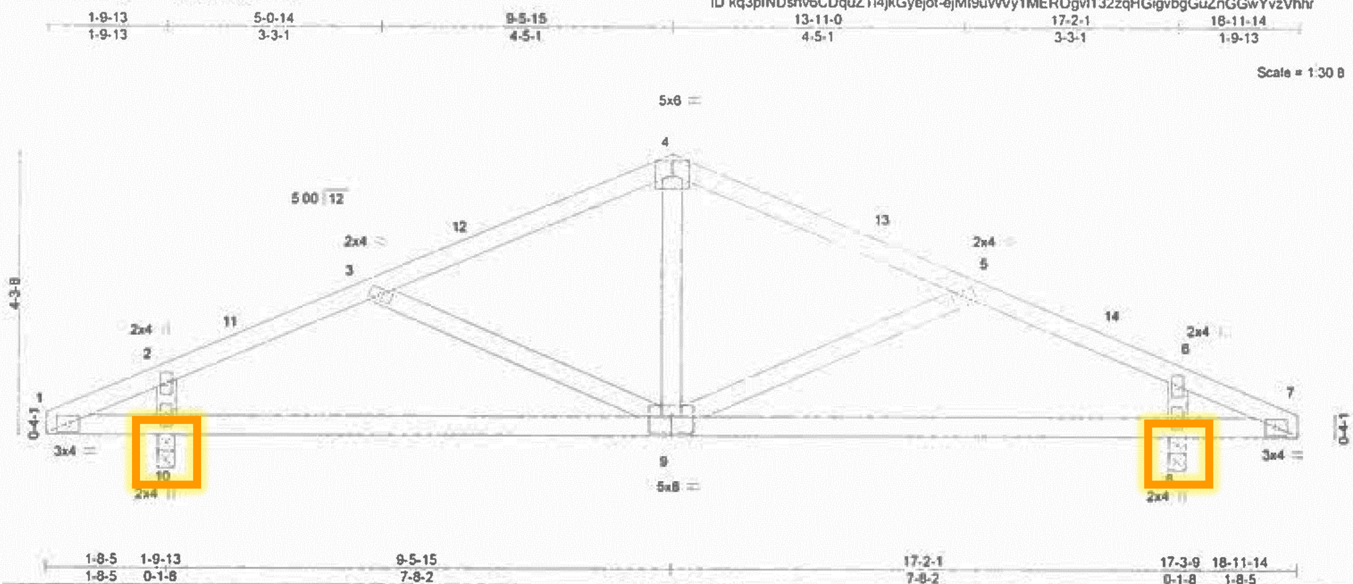

Plate Offsets (X,Y)-- [6:0-0-0,0-0-0], [9:0-4-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.78	Vert(LL)	-0.10	9	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.63	Vert(CT)	-0.17	9	>999	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.09	Horz(CT)	0.02	8	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 81 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 4-11-9 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

REACTIONS. (lb/size) 10=760/0-3-0, 8=759/0-3-0
Max Horz 10=-75(LC 13)
Max Uplift 10=-163(LC 12), 8=-163(LC 13)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-605/97, 2-11=-764/206, 3-11=-737/219, 3-12=-674/187, 4-12=-648/202, 4-13=-648/202, 5-13=-674/187, 5-14=-737/219, 6-14=-764/206, 6-7=-605/97
BOT CHORD 1-10=-109/618, 9-10=-171/618, 8-9=-109/618, 7-8=-109/618
WEBS 2-10=-517/313, 6-8=-516/313

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-0-0 to 3-0-0, Interior(1) 3-0-0 to 9-5-15, Exterior(2R) 9-5-15 to 12-5-15, Interior(1) 12-5-15 to 18-11-14 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
5) All bearings are assumed to be SPF No.2 crushing capacity of 425 psi.
6) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 163 lb uplift at joint 10 and 163 lb uplift at joint 8.
7) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

STATE OF TEXAS
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COR F-12513
March 30,2021

Job	Truss	Truss Type	Qty	Ply	HABITAT/ HAWTHORNE
21-011779T	R03	Common	2	1	R65917669 Job Reference (optional)

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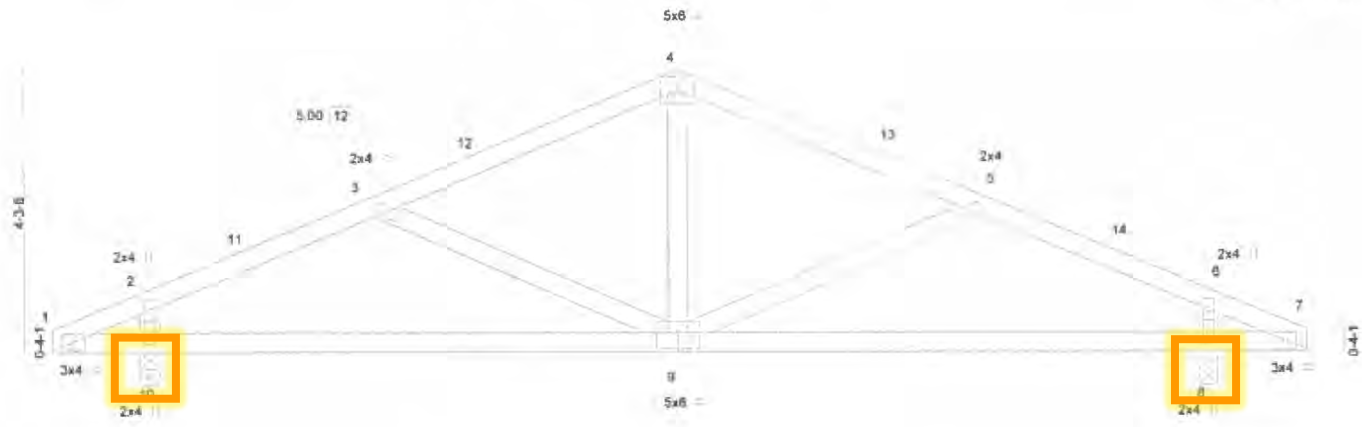
BMC (Frisco, TX) Frisco, TX - 75034

8.430 s Dec 17 2020 MiTek Industries, Inc. Tue Mar 30 14:20:29 2021 Page 1
ID kq3pfNDshv6CDquZTi4jkGyejot-XI7EZ3mg0U7FSdnxTxy_KFeu084U5mnlc1sXoBzVhhW

1-5-12	5-0-14	9-5-15	13-11-0	17-6-2	18-11-14
1-5-12	3-7-2	4-5-1	4-5-1	3-7-2	1-5-12

Scale = 1:30.8



1-4-0	1-5-12	9-5-15	17-6-2	17-7-14	18-11-14
1-4-0	0-1-12	8-0-3	8-0-3	0-1-12	1-4-0

Plate Offsets (X,Y)-- [9:0-4-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.67	Vert(LL)	-0.09	9	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.64	Vert(CT)	-0.15	9	>999	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.11	Horz(CT)	0.02	8	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 80 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 4-10-5 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

REACTIONS. (lb/size) 10=760/0-3-8, 8=760/0-3-8
Max Horz 10=75(LC 16)
Max Uplift 10=-161(LC 12), 8=-161(LC 13)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-740/144, 2-11=-899/261, 3-11=-864/273, 3-12=-750/219, 4-12=-723/233, 4-13=-723/233, 5-13=-750/219, 5-14=-864/273, 6-14=-899/261, 6-7=-740/144
BOT CHORD 1-10=-169/752, 9-10=-199/752, 8-9=-169/752, 7-8=-169/752
WEBS 4-9=0/298, 2-10=-494/311, 6-8=-494/311

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-0-0 to 3-0-0, Interior(1) 3-0-0 to 9-5-15, Exterior(2R) 9-5-15 to 12-5-15, Interior(1) 12-5-15 to 18-11-14 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
5) All bearings are assumed to be SPF No.2 crushing capacity of 425 psi.
6) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 161 lb uplift at joint 10 and 161 lb uplift at joint 8.
7) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

STATE OF TEXAS
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COR F-12513
March 30,2021

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	HABITAT/ HAWTHORNE
21-011779T	R04	Common Structural Gable	1	1	R65917670 Job Reference (optional)

BMC (Frisco, TX), Frisco, TX 75034, 8 430 s Dec 17 2020 MiTek Industries, Inc. Tue Mar 30 14:20:42 2021 Page 1
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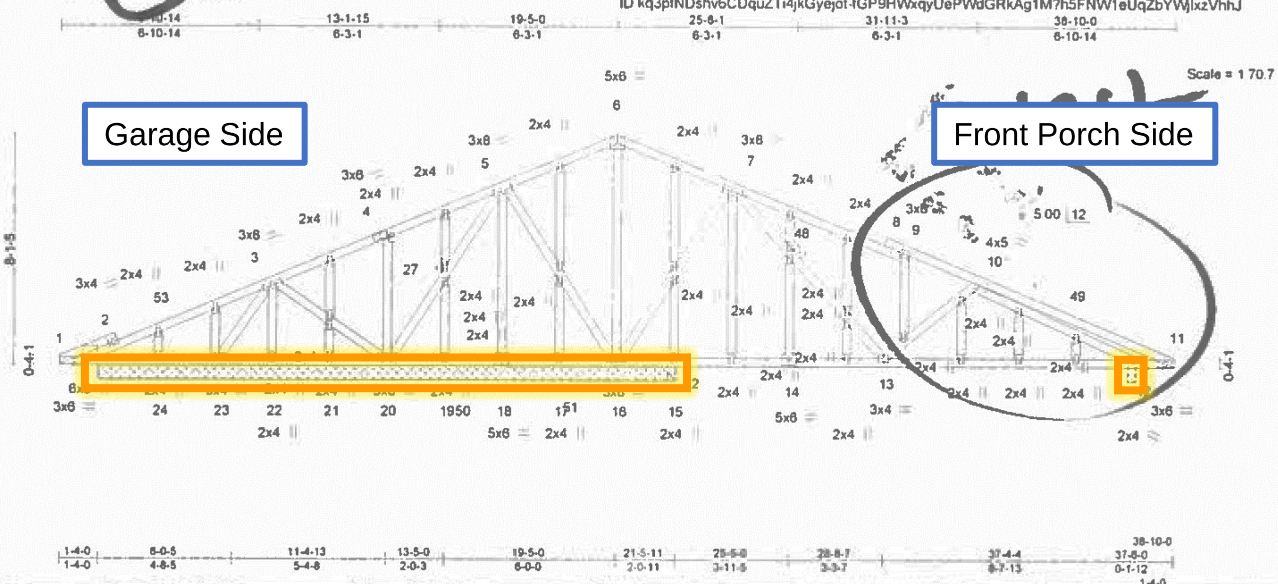

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.71	Vert(LL)	-0.13	12-13	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.60	Vert(CT)	-0.25	12-13	>767	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.76	Horz(CT)	0.01	12	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 292 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
OTHERS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing, Except: 10-0-0 oc bracing: 12-13,11-12.
JOINTS 1 Brace at Jt(s): 27, 48

REACTIONS. All bearings 20-1-11 except (jt=length) 12=0-3-8.
(lb) - Max Horz 1=148(LC 12)
Max Uplift All uplift 100 lb or less at joint(s) 24 except 23=-209(LC 12), 20=-151(LC 26), 16=-584(LC 13), 12=-106(LC 13)
Max Grav All reactions 250 lb or less at joint(s) 1, 20, 17, 21, 22, 24, 15, 19 except 23=472(LC 25), 16=1632(LC 1), 15=281(LC 18), 12=605(LC 28)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 6-7=-161/712, 7-8=-298/32, 8-9=-277/0, 9-10=-361/17, 10-49=-418/0, 11-49=-465/0, 1-2=-292/375, 2-53=-274/401, 3-53=-260/489, 3-4=-97/323, 4-5=-78/418, 5-6=-154/715
BOT CHORD 1-24=-370/234, 23-24=-370/234, 19-20=-438/352, 19-50=-438/352, 18-50=-438/352, 18-51=-438/352, 17-51=-438/352, 16-17=-438/352, 15-16=-238/270, 15-52=-238/270, 14-52=-238/270, 13-14=-238/270, 12-13=-55/552, 11-12=0/407
WEBS 3-23=-563/291, 20-27=-120/318, 5-27=-129/341, 5-16=-481/230, 6-16=-649/152, 7-16=-733/336, 7-48=-139/739, 13-48=-143/698, 10-13=-461/307, 10-12=-347/222

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-0-0 to 3-10-10, Interior(1) 3-10-10 to 19-5-0, Exterior(2R) 19-5-0 to 23-6-15, Interior(1) 23-6-15 to 38-10-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members, with BCDL = 10.0psf.
7) All bearings are assumed to be SPF No.2 crushing capacity of 425 psi.
8) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 24 except (jt=lb) 23=209, 20=151, 16=584, 12=106.
9) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

STATE OF TEXAS
DAVID BAXTER
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COR F-12513
March 30,2021

MiTek®
MiTek USA, Inc.
400 Sunrise Avenue, Suite 270
Roseville, CA 95661

Job	Truss	Truss Type	Qty	Ply	HABITAT/ HAWTHORNE
21-011779T	R05	Common	10	1	R65917671 Job Reference (optional)

BMC (Frisco, TX), Frisco, TX - 75034,

8.430 s Dec 17 2020 MiTek Industries, Inc. Tue Mar 30 14 20 57 2021 Page 1
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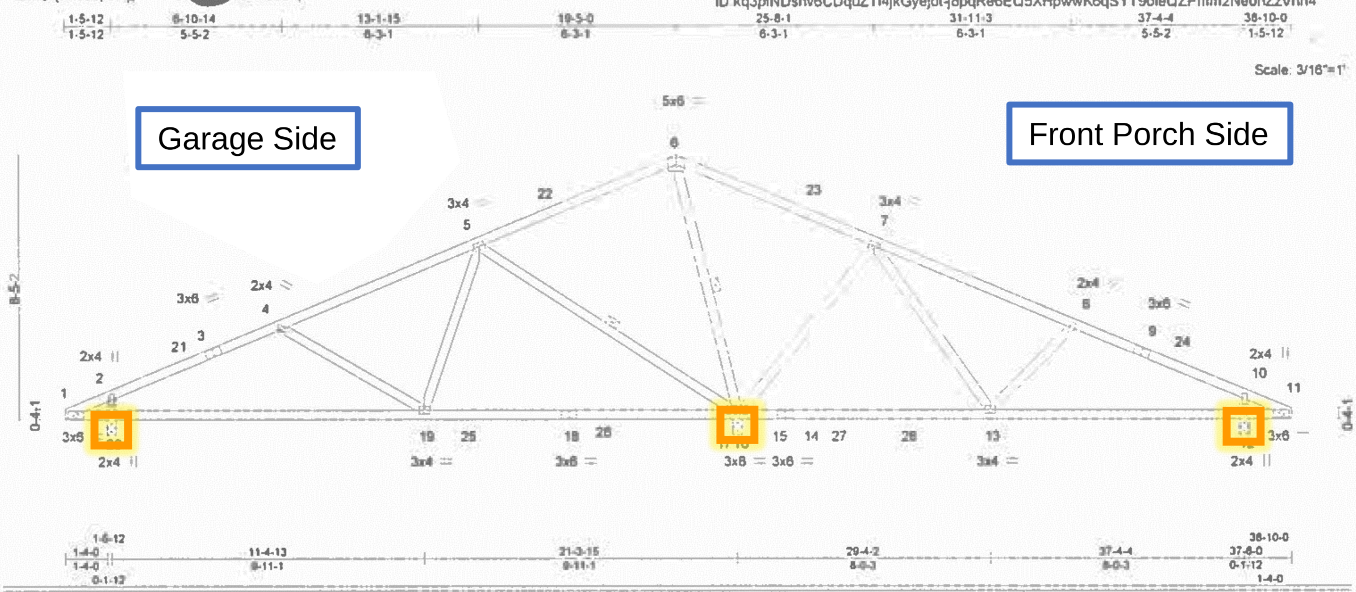

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.57	Vert(LL)	-0.22	16-19	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.87	Vert(CT)	-0.38	16-19	>631	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.63	Horz(CT)	0.02	16	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 191 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 5-10-8 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing.
WEBS 1 Row at midpt 5-16, 6-16

REACTIONS. (lb/size) 16=2113/(0-3-8 + bearing block) (req. 0-3-9), 12=382/0-3-8, 20=611/0-3-8
Max Horz 20=154(LC 12)
Max Uplift 16=-375(LC 12), 12=-121(LC 13), 20=-155(LC 12)
Max Grav 16=2259(LC 2), 12=526(LC 28), 20=738(LC 27)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-694/82, 2-21=-792/184, 3-21=-732/195, 3-4=-701/206, 4-5=-524/93, 5-22=-110/594, 6-22=-95/712, 6-23=-159/961, 7-23=-174/831, 7-8=-186/268, 8-9=-303/164, 9-24=-351/142, 10-24=-413/132, 10-11=-325/114
BOT CHORD 1-20=-100/675, 19-20=-253/675, 19-25=-79/293, 25-26=-79/293, 18-26=-79/293, 17-18=-79/293, 16-17=-79/293, 15-16=-415/263, 14-15=-415/263, 14-27=-415/263, 27-28=-415/263, 13-28=-415/263, 12-13=-122/324, 11-12=-122/324
WEBS 4-19=-366/242, 5-19=-17/569, 5-16=-892/314, 6-16=-983/282, 7-16=-663/310, 7-13=-98/616, 8-13=-362/225, 10-12=-311/205, 2-20=-412/252

NOTES-
1) 2x4 SP No.2 bearing block 12" long at jt. 16 attached to front face with 2 rows of 10d (0.131"x3") nails spaced 3" o.c. 8 Total fasteners. Bearing is assumed to be SPF No.2.
2) Unbalanced roof live loads have been considered for this design.
3) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-0-0 to 3-10-10, Interior(1) 3-10-10 to 19-5-0, Exterior(2R) 19-5-0 to 23-3-10, Interior(1) 23-3-10 to 38-10-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
4) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
5) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members, with BCDL = 10.0psf.
6) All bearings are assumed to be SPF No.2 crushing capacity of 425 psi.
7) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 16=375, 12=121, 20=155.
8) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

STATE OF TEXAS
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COR F-12513
March 30,2021

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	HABITAT/ HAWTHORNE
21-011779T	R06	Common	16	1	R65917672 Job Reference (optional)

BMC (Frisco, TX), Frisco, TX 75034,

8.430 s Dec 17 2020 MiTek Industries, Inc. Tue Mar 30 14 21 12 2021 Page 1
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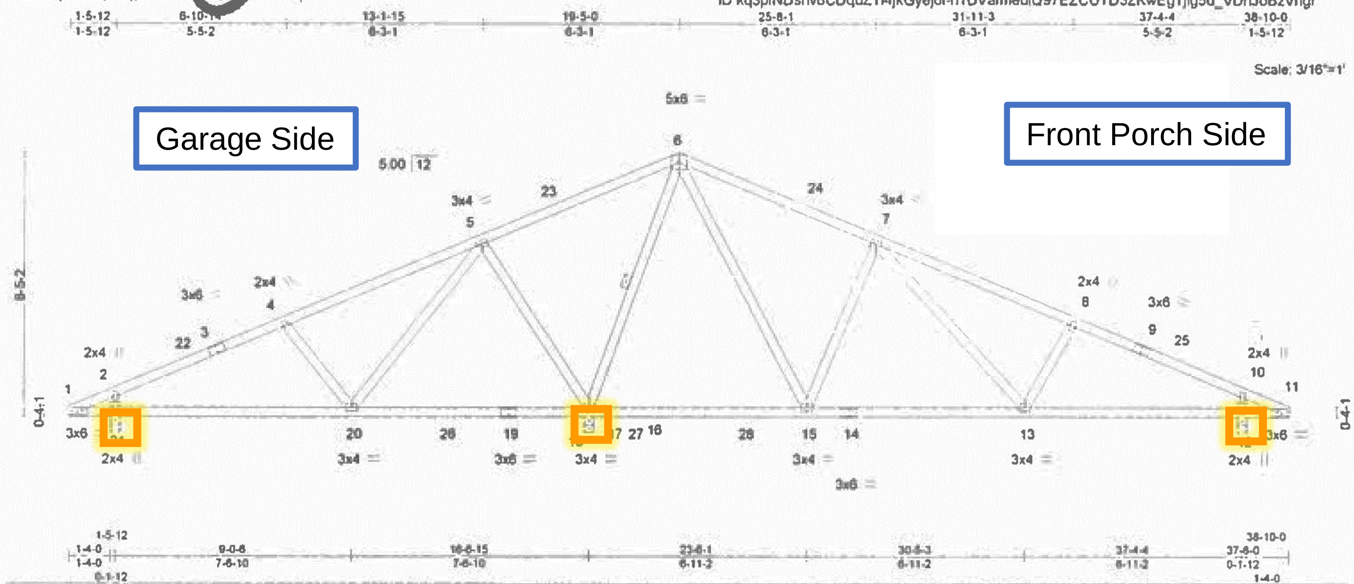

LOADING	(psf)	SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.64	Vert(LL)	-0.11	13-15	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.75	Vert(CT)	-0.20	13-15	>999	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.61	Horz(CT)	0.01	17	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 196 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 5-2-13 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing, Except: 10-0-0 oc bracing: 12-13,11-12.
WEBS 1 Row at midpt 6-17

REACTIONS. (lb/size) 17=2096/(0-3-8 + bearing block) (req. 0-3-9), 21=340/0-3-8, 12=671/0-3-8
Max Horz 21=154(LC 12)
Max Uplift 17=-359(LC 12), 21=-114(LC 12), 12=-194(LC 13)
Max Grav 17=2276(LC 2), 21=460(LC 27), 12=778(LC 28)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 2-22=-311/171, 3-22=-251/181, 4-5=-102/291, 5-23=-124/879, 6-23=-108/988, 7-8=-775/272, 8-9=-831/264, 9-25=-838/252, 10-25=-900/242, 10-11=-767/147
BOT CHORD 20-26=-521/292, 19-26=-521/292, 18-19=-521/292, 17-18=-521/292, 16-17=-358/242, 16-27=-358/242, 27-28=-358/242, 15-28=-358/242, 14-15=-28/341, 13-14=-28/341, 12-13=-153/767, 11-12=-153/767
WEBS 4-20=-355/221, 5-20=-119/661, 5-17=-643/306, 6-17=-1514/342, 6-15=-241/882, 7-15=-578/300, 7-13=-123/523, 8-13=-278/201, 2-21=-289/193, 10-12=-465/234

NOTES-
1) 2x4 SP No.2 bearing block 12" long at jt. 17 attached to front face with 2 rows of 10d (0.131"x3") nails spaced 3" o.c. 8 Total fasteners. Bearing is assumed to be SPF No.2.
2) Unbalanced roof live loads have been considered for this design.
3) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-0-0 to 3-10-10, Interior(1) 3-10-10 to 19-5-0, Exterior(2R) 19-5-0 to 23-3-10, Interior(1) 23-3-10 to 38-10-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
4) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
5) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members, with BCDL = 10.0psf.
6) All bearings are assumed to be SPF No.2 crushing capacity of 425 psi.
7) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 17=359, 21=114, 12=194.
8) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

STATE OF TEXAS
DAVID BAXTER
118383
LICENSED
PROFESSIONAL ENGINEER

COR F-12513
March 30,2021

WARNING - Verify design parameters and READ NOTES ON THIS AND INCLUDED MITEK REFERENCE PAGE MII-7473 rev. 5/19/2020 BEFORE USE.
Design valid for use only with MiTek® connectors. This design is based only upon parameters shown, and is for an individual building component, not a truss system. Before use, the building designer must verify the applicability of design parameters and properly incorporate this design into the overall building design. Bracing indicated is to prevent buckling of individual truss web and/or chord members only. Additional temporary and permanent bracing is always required for stability and to prevent collapse with possible personal injury and property damage. For general guidance regarding the fabrication, storage, delivery, erection and bracing of trusses and truss systems, see ANSI/TPI1 Quality Criteria, DSB-89 and BCSI Building Component Safety Information available from Truss Plate Institute, 2670 Crain Highway, Suite 203 Waldorf, MD 20601

MiTek
MiTek USA, Inc.
400 Sunrise Avenue, Suite 270
Roseville, CA 95661

Job	Truss	Truss Type	Qty	Ply	HABITAT/ HAWTHORNE
21-011779T	R08	Common Supported Gable	1	1	R65917673 Job Reference (optional)

BMC (Frisco, TX), Frisco, TX - 75034, 8.430 s Dec 17 2020 MiTek Industries, Inc. Tue Mar 30 14 21:28 2021 Page 1
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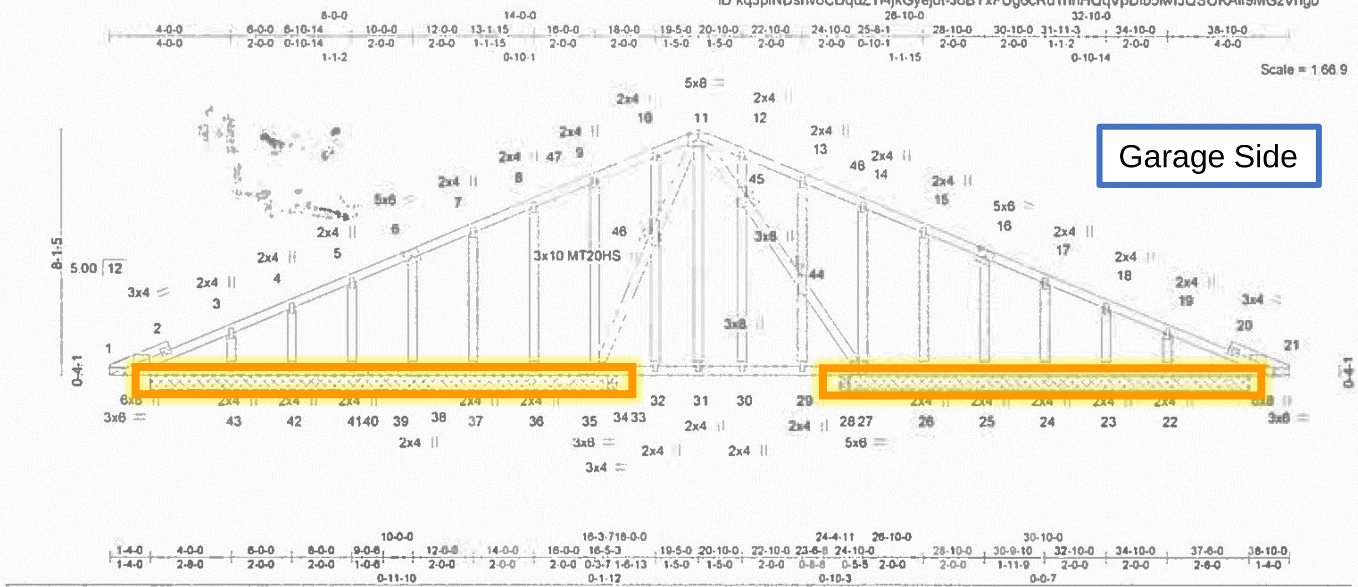


Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-1-13,Edge], [6:0-3-0,0-3-0], [16:0-3-0,0-3-0], [21:0-3-8,Edge], [21:0-1-13,Edge], [27:0-3-0,0-3-0], [35:0-2-12,0-1-8]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.19	Vert(LL)	-0.01	29-30	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.25	Vert(CT)	-0.03	29-30	>999	180	MT20HS	187/143
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.11	Horz(CT)	0.01	21	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 259 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP 2400F 2.0E *Except*
21-27,27-35: 2x4 SP No.2
WEBS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing.
JOINTS 1 Brace at Jt(s): 44, 45, 46

REACTIONS. All bearings 15-4-11 except (jt=length) 22=13-4-13, 23=13-4-13, 24=13-4-13, 25=13-4-13, 26=13-4-13, 27=13-4-13, 21=13-4-13, 33=0-3-8, 28=0-3-8.
(lb) - Max Horz 1=148(LC 16)
Max Uplift All uplift 100 lb or less at joint(s) 1, 43, 42, 41, 38, 37, 36, 34, 22, 23, 24, 25, 26, 27, 21, 33 except 28=-113(LC 13)
Max Grav All reactions 250 lb or less at joint(s) 1, 42, 41, 38, 37, 36, 23, 24, 25, 26, 27, 21, 33 except 43=313(LC 25), 34=345(LC 1), 22=312(LC 26), 28=360(LC 26)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-0-0 to 4-0-0, Interior(1) 4-0-0 to 19-5-0, Exterior(2R) 19-5-0 to 23-3-10, Interior(1) 23-3-10 to 38-10-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) All plates are MT20 plates unless otherwise indicated.
4) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
5) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
6) All bearings are assumed to be SPF No.2 crushing capacity of 425 psi.
7) Solid blocking is required on both sides of the truss at joint(s), 1.
8) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 43, 42, 41, 38, 37, 36, 34, 22, 23, 24, 25, 26, 27, 21, 33 except (jt=lb) 28=113.
9) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

STATE OF TEXAS
DAVID BAXTER
118383
LICENSED
PROFESSIONAL ENGINEER

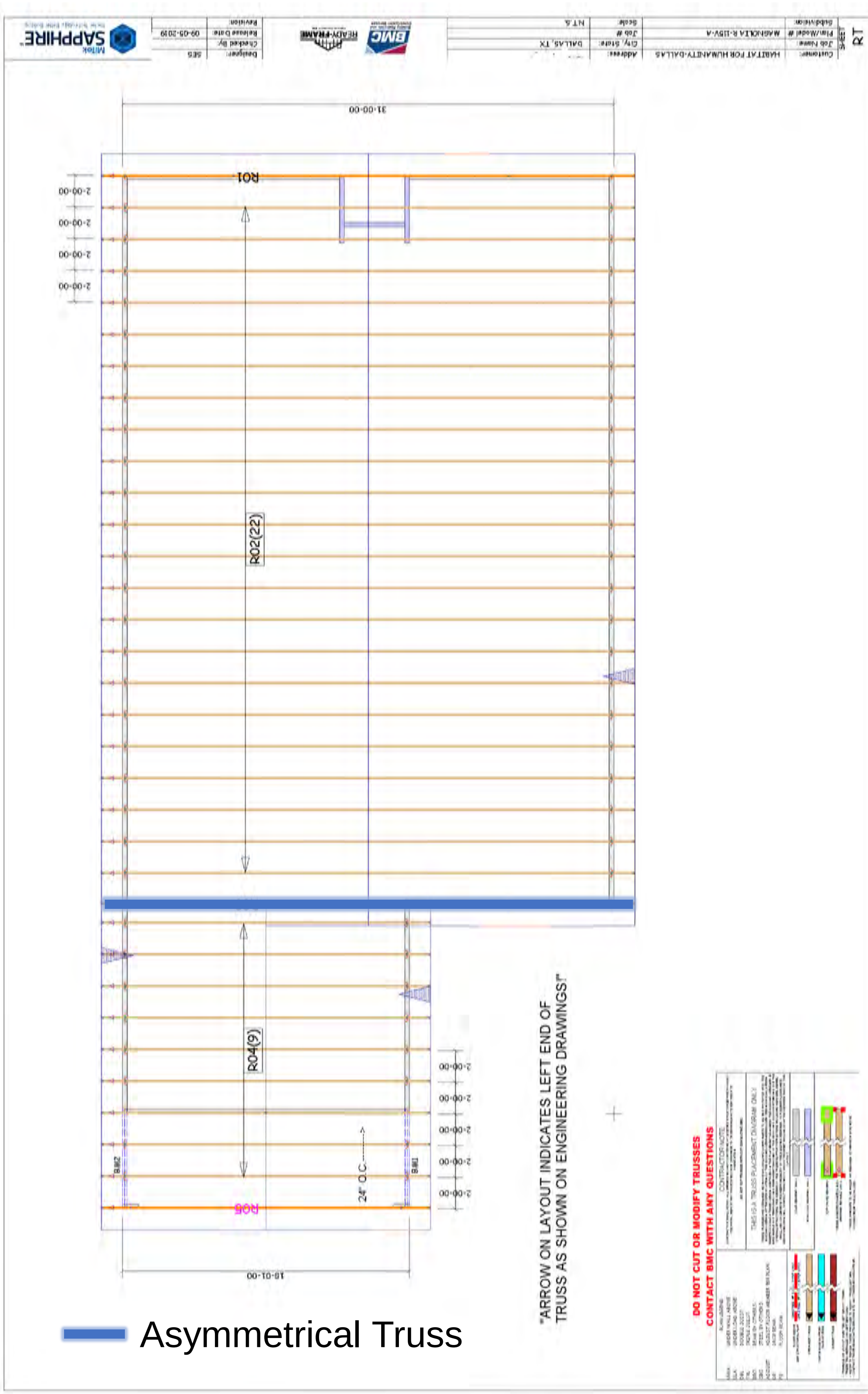
COR F-12513
March 30,2021

WARNING - Verify design parameters and READ NOTES ON THIS AND INCLUDED MITEK REFERENCE PAGE MII-7473 rev. 5/19/2020 BEFORE USE.
Design valid for use only with MiTek® connectors. This design is based only upon parameters shown, and is for an individual building component, not a truss system. Before use, the building designer must verify the applicability of design parameters and properly incorporate this design into the overall building design. Bracing indicated is to prevent buckling of individual truss web and/or chord members only. Additional temporary and permanent bracing is always required for stability and to prevent collapse with possible personal injury and property damage. For general guidance regarding the fabrication, storage, delivery, erection and bracing of trusses and truss systems, see ANSI/TPI1 Quality Criteria, DSB-89 and BCSI Building Component Safety Information available from Truss Plate Institute, 2670 Crain Highway, Suite 203 Waldorf, MD 20601

MiTek
MiTek USA, Inc.
400 Sunrise Avenue, Suite 270
Roseville, CA 95661

Magnolia Floor Plan

Truss ID and Type	Length*	Height*	Weight (lb)*	Quantity	Notes	Page
R01 Back Gable	33’ 8”	7’ $^{7}/_{16}$”	180	1	Symmetrical	D-14
R02 Common	33’ 8”	7’ 4$^{3}/_{16}$”	163	22	Symmetrical	D-15
R03 Garage Gable	33’ 8”	7’ $^{7}/_{16}$”	236	1	Asymmetrical	D-16
R04 Common	20’ 9”	4’ 8”	91	9	Symmetrical	D-17
R05 Front Gable	20’ 9”	4’ 4⅛”	105	1	Symmetrical	D-18
* Approximate				34		


R01
R02(22)
R04(9)
R06
24" O.C.
31-00-00
18-01-00
2-00-00
"ARROW ON LAYOUT INDICATES LEFT END OF TRUSS AS SHOWN ON ENGINEERING DRAWINGS!"
DO NOT CUT OR MODIFY TRUSSES
CONTACT BMC WITH ANY QUESTIONS
Asymmetrical Truss

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity/Magnolia
20-082006T	R01	GABLE	1	1	R67477893 Job Reference (optional)

Builders FirstSource (Frisco, TX), Frisco, TX - 75034, 8.430 s Jun 2 2021 MiTek Industries, Inc. Wed Aug 4 11:14:42 2021 Page 1

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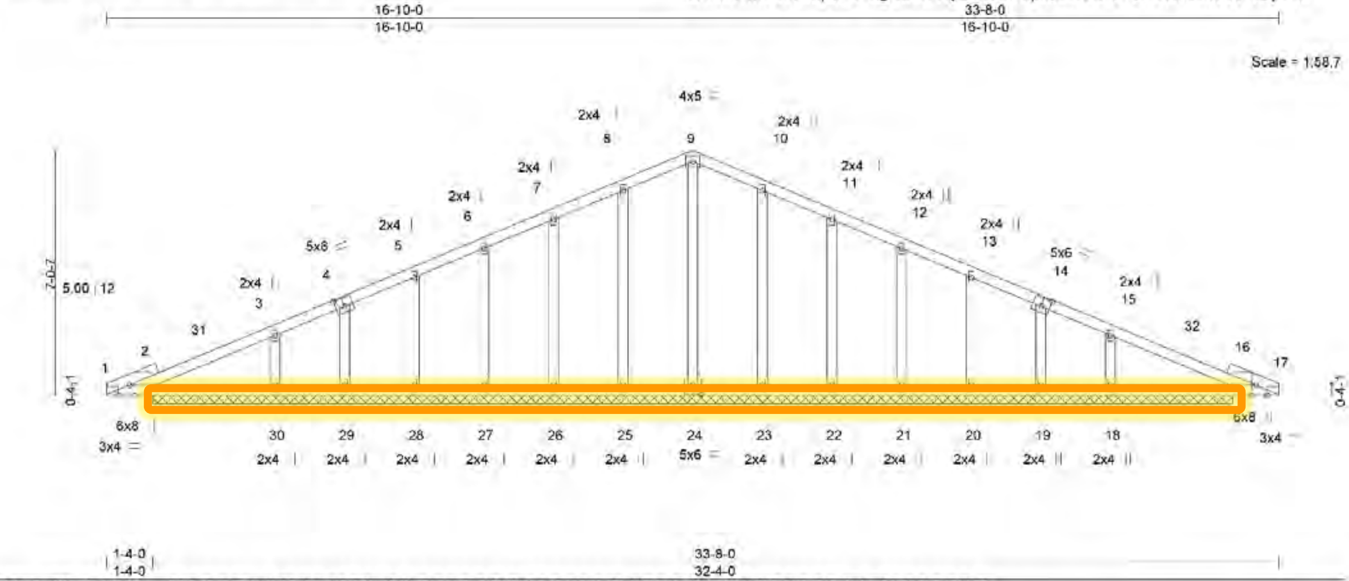

Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-3-13,Edge], [4:0-3-0,0-3-0], [14:0-3-0,0-3-0], [17:0-3-13,Edge], [17:0-3-8,Edge], [24:0-3-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.26	Vert(LL)	n/a	-	n/a	999	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.15	Vert(CT)	n/a	-	n/a	999		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.16	Horz(CT)	0.01	17	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 180 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
OTHERS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 10-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing.

REACTIONS. All bearings 31-0-0.
(lb) - Max Horz 1=-103(LC 10)
Max Uplift All uplift 100 lb or less at joint(s) 1, 17, 25, 26, 27, 28, 29, 30, 23, 22, 21, 20, 19, 18
Max Grav All reactions 250 lb or less at joint(s) 1, 17, 24, 25, 26, 27, 28, 29, 23, 22, 21, 20, 19 except 30=392(LC 23), 18=392(LC 24)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
WEBS 3-30=-274/212, 15-18=-274/212

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; B=50ft; L=30ft; eave=2ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Corner(3E) 0-0-0 to 3-0-0, Exterior(2N) 3-0-0 to 16-10-0, Corner(3R) 16-10-0 to 19-10-0, Exterior(2N) 19-10-0 to 33-8-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) Solid blocking is required on both sides of the truss at joint(s), 1.
8) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 17, 25, 26, 27, 28, 29, 30, 23, 22, 21, 20, 19, 18.
9) Non Standard bearing condition. Review required.
10) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

COR F-12513
August 4,2021

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity/Magnolia
20-082006T	R02	Common	22	1	R67477894 Job Reference (optional)

Builders FirstSource (Frisco, TX), Frisco, TX - 75034, 8.430 s Jun 2 2021 MiTek Industries, Inc. Wed Aug 4 11:14:43 2021 Page 1
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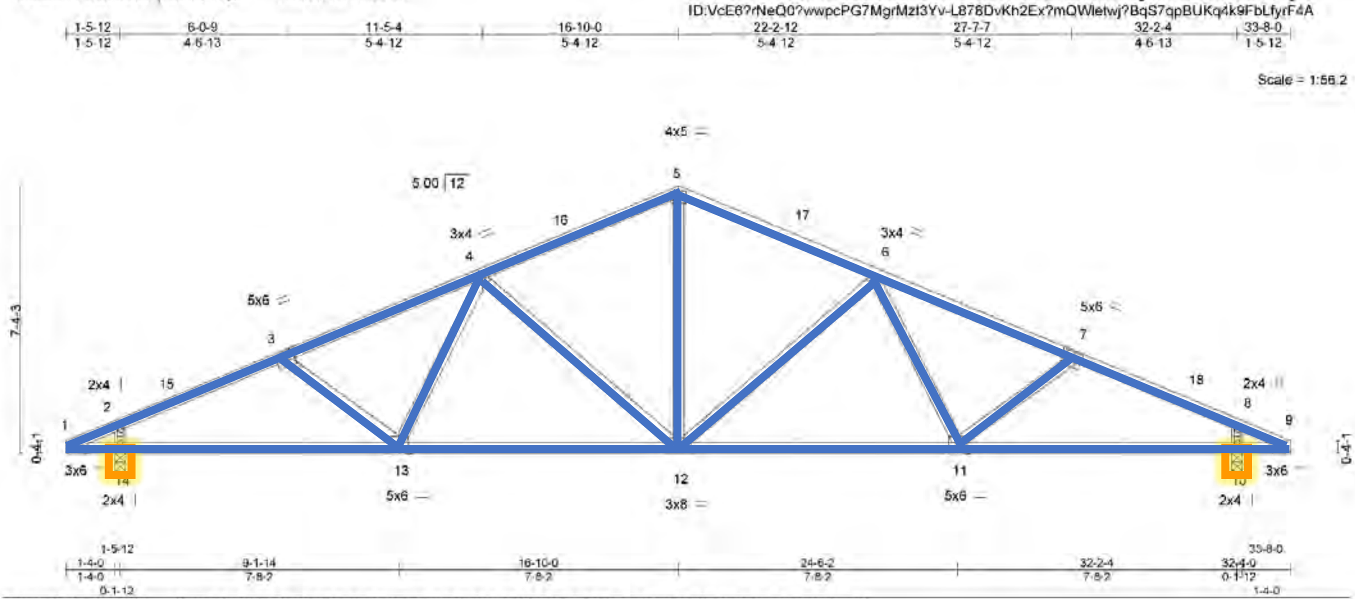

Plate Offsets (X,Y)-- [1:0-3-0,0-0-14], [3:0-3-0,0-3-0], [7:0-3-0,0-3-0], [9:0-3-0,0-0-14], [11:0-3-0,0-3-0], [13:0-3-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.74	Vert(LL)	-0.28	11-12	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.91	Vert(CT)	-0.57	11-12	>648	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.52	Horz(CT)	0.09	10	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 163 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2 *Except*
1-3,7-9: 2x4 SP 2400F 2.0E or 2x4 SP DSS or 2x4 SP M 31
BOT CHORD 2x4 SP 1650F 1.5E or 2x4 SP No.1 or 2x4 SP SS *Except*
11-13: 2x4 SP No.2
WEBS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 3-0-1 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

REACTIONS. (size) 14=0-3-8, 10=0-3-8
Max Horz 14=-108(LC 10)
Max Uplift 14=-303(LC 12), 10=-266(LC 12)
Max Grav 14=1347(LC 1), 10=1347(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-1736/306, 2-3=-2068/447, 3-4=-1937/422, 4-5=-1549/402, 5-6=-1549/402, 6-7=-1937/427, 7-8=-2068/455, 8-9=-1736/320
BOT CHORD 1-14=-327/1788, 13-14=-327/1788, 12-13=-262/1726, 11-12=-264/1726, 10-11=-335/1788, 9-10=-335/1788
WEBS 5-12=-168/851, 6-12=-518/175, 4-12=-518/172, 2-14=-931/323, 8-10=-931/323

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; B=50ft; L=30ft; eave=4ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Exterior(2E) 0-0-0 to 3-0-0, Interior(1) 3-0-0 to 16-10-0, Exterior(2R) 16-10-0 to 19-10-0, Interior(1) 19-10-0 to 33-8-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 14=303, 10=266.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

COR F-12513
August 4,2021

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity/Magnolia
20-082006T	R03	Common Structural Gable	1	1	R67477895 Job Reference (optional)

Builders FirstSource (Frisco, TX), Frisco, TX - 75034,

8.430 s Jun 2 2021 MiTek Industries, Inc. Wed Aug 4 11:14:45 2021 Page 1

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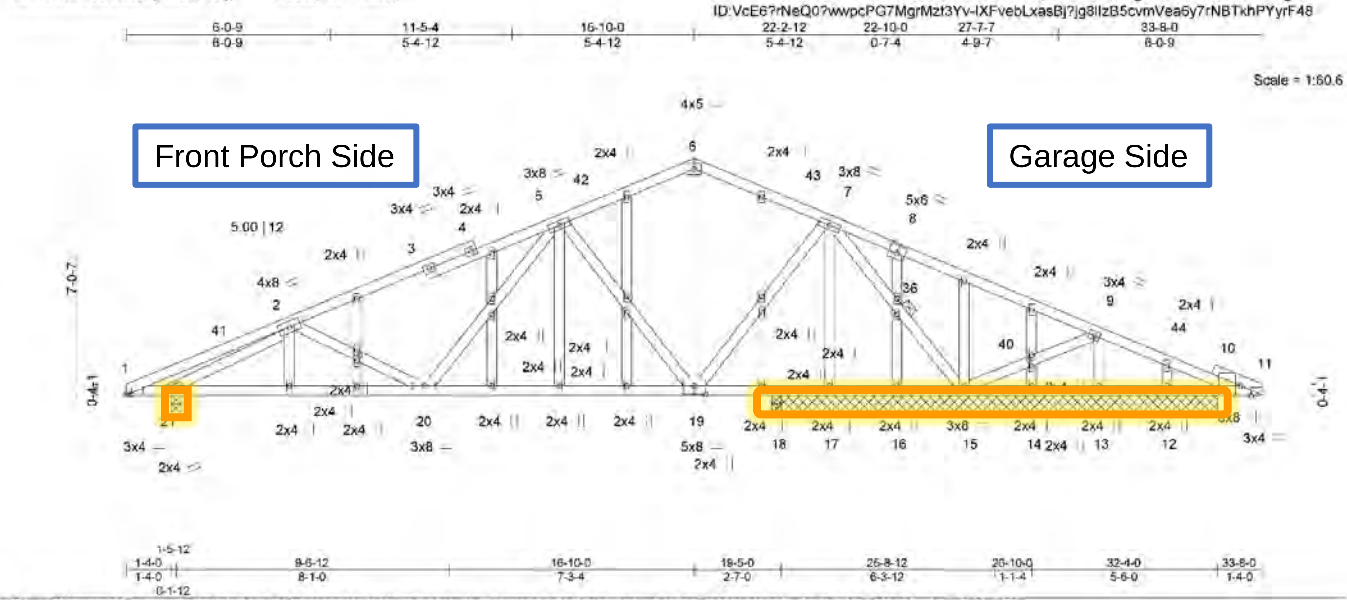

Plate Offsets (X,Y)-- [1:0-1-14,0-0-2], [8:0-3-0,0-3-0], [11:0-3-13,Edge], [11:0-3-8,Edge], [19:0-4-0,0-3-0], [29:0-1-15,0-1-0], [40:0-1-13,0-1-0]

LOADING (psf)		SPACING-		CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.88	Vert(LL)	-0.10	19-20	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.63	Vert(CT)	-0.23	19-20	>947	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	1.00	Horz(CT)	0.04	11	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 236 lb	FT = 0%

SPACING- 2-0-0

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
OTHERS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 2-2-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing.
JOINTS 1 Brace at Jt(s): 36

REACTIONS. All bearings 13-2-8 except (jt=length) 21=0-3-8, 18=0-3-8.
(lb) - Max Horz 21=103(LC 11)
Max Uplift All uplift 100 lb or less at joint(s) 11, 17, 18 except 15=-353(LC 12), 21=-222(LC 12)
Max Grav All reactions 250 lb or less at joint(s) 11, 17, 16, 13, 12, 14, 18 except 15=1289(LC 1), 21=967(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-305/0, 2-5=-1332/285, 5-6=-691/241, 6-7=-687/239, 7-8=-35/508, 8-9=-83/478
BOT CHORD 1-21=0/260, 20-21=-283/1336, 19-20=-123/967, 18-19=-10/389, 17-18=-10/389, 16-17=-10/389, 15-16=-10/389
WEBS 5-20=0/406, 5-19=-617/219, 6-19=-105/319, 7-19=0/331, 7-36=-1252/280, 15-36=-1311/325, 2-21=-1409/480, 15-40=-510/265, 9-40=-515/268

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; B=50ft; L=30ft; eave=4ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Exterior(2E) 0-0-0 to 3-0-0, Interior(1) 3-0-0 to 16-10-0, Exterior(2R) 16-10-0 to 19-10-0, Interior(1) 19-10-0 to 33-8-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 11, 17, 18 except (jt=lb) 15=353, 21=222.
8) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

STATE OF TEXAS
MARCOS A. HERNANDEZ
113878
LICENSED
PROFESSIONAL ENGINEER

COR F-12513
August 4,2021

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity/Magnolia
					R67477896
20-082006T	R04	Common	9	1	Job Reference (optional)

Builders FirstSource (Frisco, TX), Frisco, TX - 75034, 8.430 s Jun 2 2021 MiTek Industries, Inc. Wed Aug 4 11:14:46 2021 Page 1
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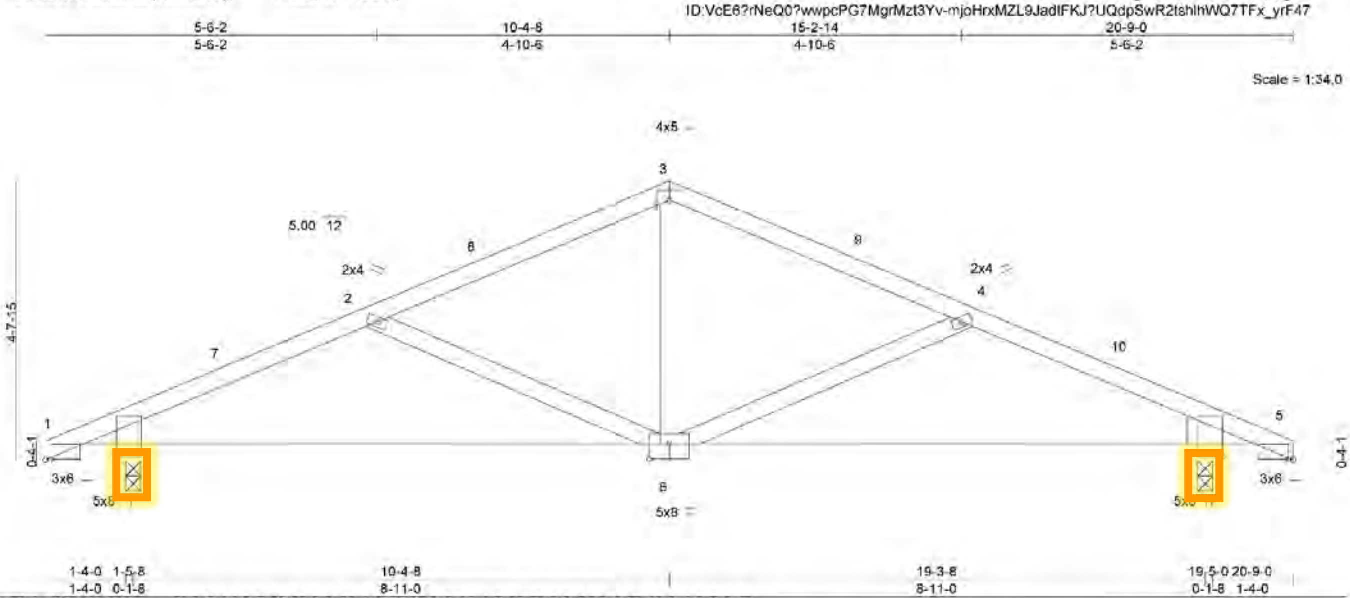

Plate Offsets (X,Y)-- [1:0-0-14,0-0-2], [1:0-0-12,1-2-2], [5:0-0-12,1-2-2], [5:0-0-14,0-0-2], [6:0-4-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.93	Vert(LL)	-0.19	1-6	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.79	Vert(CT)	-0.42	1-6	>579	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.26	Horz(CT)	0.04	5	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 91 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP 1650F 1.5E or 2x4 SP No.1 or 2x4 SP SS
WEBS 2x4 SP No.3
WEDGE
Left: 2x6 SP 1650F 1.5E or SS or , Right: 2x6 SP 1650F 1.5E or SS or

BRACING-
TOP CHORD Structural wood sheathing directly applied or 4-0-4 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

REACTIONS. (size) 1=0-3-0, 5=0-3-0
Max Horz 1=-67(LC 10)
Max Uplift 1=-163(LC 12), 5=-163(LC 12)
Max Grav 1=820(LC 1), 5=820(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-1589/471, 2-3=-1191/342, 3-4=-1191/342, 4-5=-1589/471
BOT CHORD 1-6=-378/1426, 5-6=-373/1426
WEBS 3-6=-83/616, 4-6=-444/233, 2-6=-444/233

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; B=50ft; L=30ft; eave=4ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Exterior(2E) 0-1-8 to 3-1-8, Interior(1) 3-1-8 to 10-4-8, Exterior(2R) 10-4-8 to 13-4-8, Interior(1) 13-4-8 to 20-7-8 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 1=163, 5=163.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

COR F-12513
August 4,2021

WARNING - Verify design parameters and READ NOTES ON THIS AND INCLUDED MITEK REFERENCE PAGE MII-7473 rev. 5/19/2020 BEFORE USE.
Design valid for use only with MiTek® connectors. This design is based only upon parameters shown, and is for an individual building component, not a truss system. Before use, the building designer must verify the applicability of design parameters and properly incorporate this design into the overall building design. Bracing indicated is to prevent buckling of individual truss web and/or chord members only. Additional temporary and permanent bracing is always required for stability and to prevent collapse with possible personal injury and property damage. For general guidance regarding the fabrication, storage, delivery, erection and bracing of trusses and truss systems, see ***ANSI/TPI1 Quality Criteria, DSB-89 and BCSI Building Component Safety Information*** available from Truss Plate Institute, 2670 Crain Highway, Suite 203 Waldorf, MD 20601

MiTek
MiTek USA, Inc.
400 Sunrise Avenue, Suite 270
Roseville, CA 95661

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity/Magnolia
20-082006T	R05	Common Structural Gable	1	1	R67477897 Job Reference (optional)

Builders FirstSource (Frisco, TX), Frisco, TX - 75034, 8.430 s Jun 2 2021 MiTek Industries, Inc. Wed Aug 4 11:14:47 2021 Page 1
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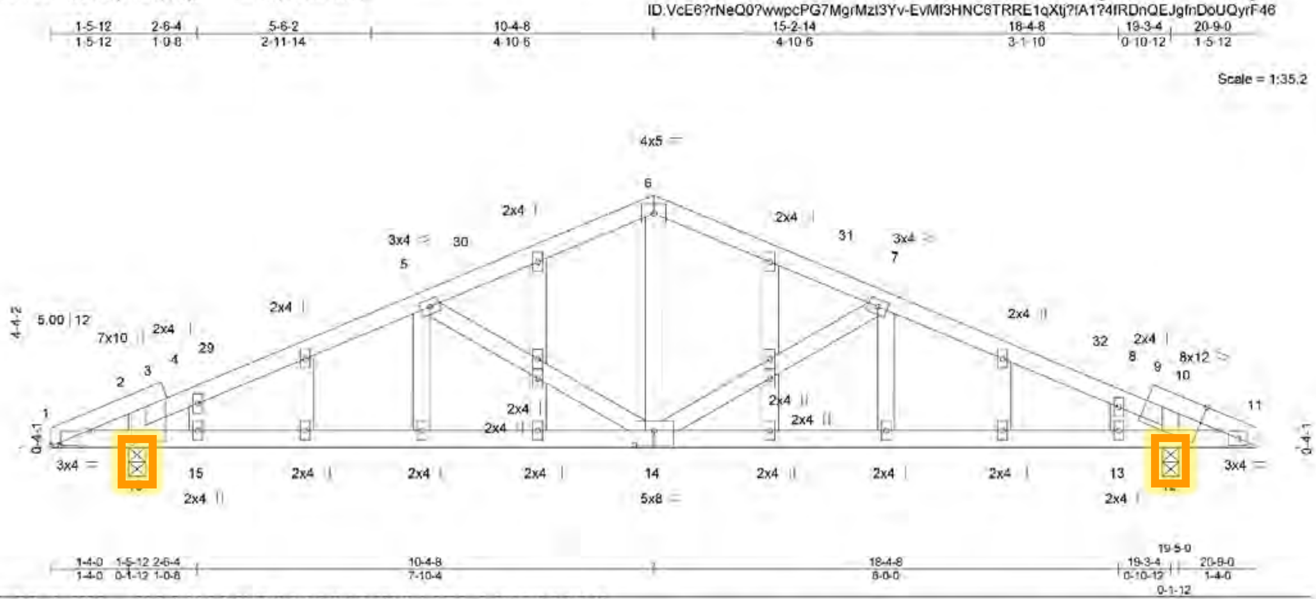


Plate Offsets (X,Y)-- [1:0-1-14,0-0-2], [2:0-2-8,0-8-14], [10:0-4-1,Edge], [14:0-4-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.90	Vert(LL)	-0.09	13-14	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.81	Vert(CT)	-0.22	13-14	>988	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.17	Horz(CT)	0.03	12	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-R							Weight: 105 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
OTHERS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 2-2-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

REACTIONS. (size) 16=0-3-8, 12=0-3-8
Max Horz 16=-62(LC 10)
Max Uplift 16=-201(LC 12), 12=-163(LC 12)
Max Grav 16=830(LC 1), 12=830(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-975/203, 2-4=-1097/233, 4-5=-1136/310, 5-6=-915/258, 6-7=-915/258, 7-8=-1140/311, 8-10=-1089/225, 10-11=-980/206
BOT CHORD 1-16=-205/1000, 15-16=-211/1000, 14-15=-211/1000, 13-14=-206/1000, 12-13=-206/1000, 11-12=-206/1000
WEBS 6-14=-40/444, 7-14=-257/131, 5-14=-256/130, 2-16=-428/103, 10-12=-394/76

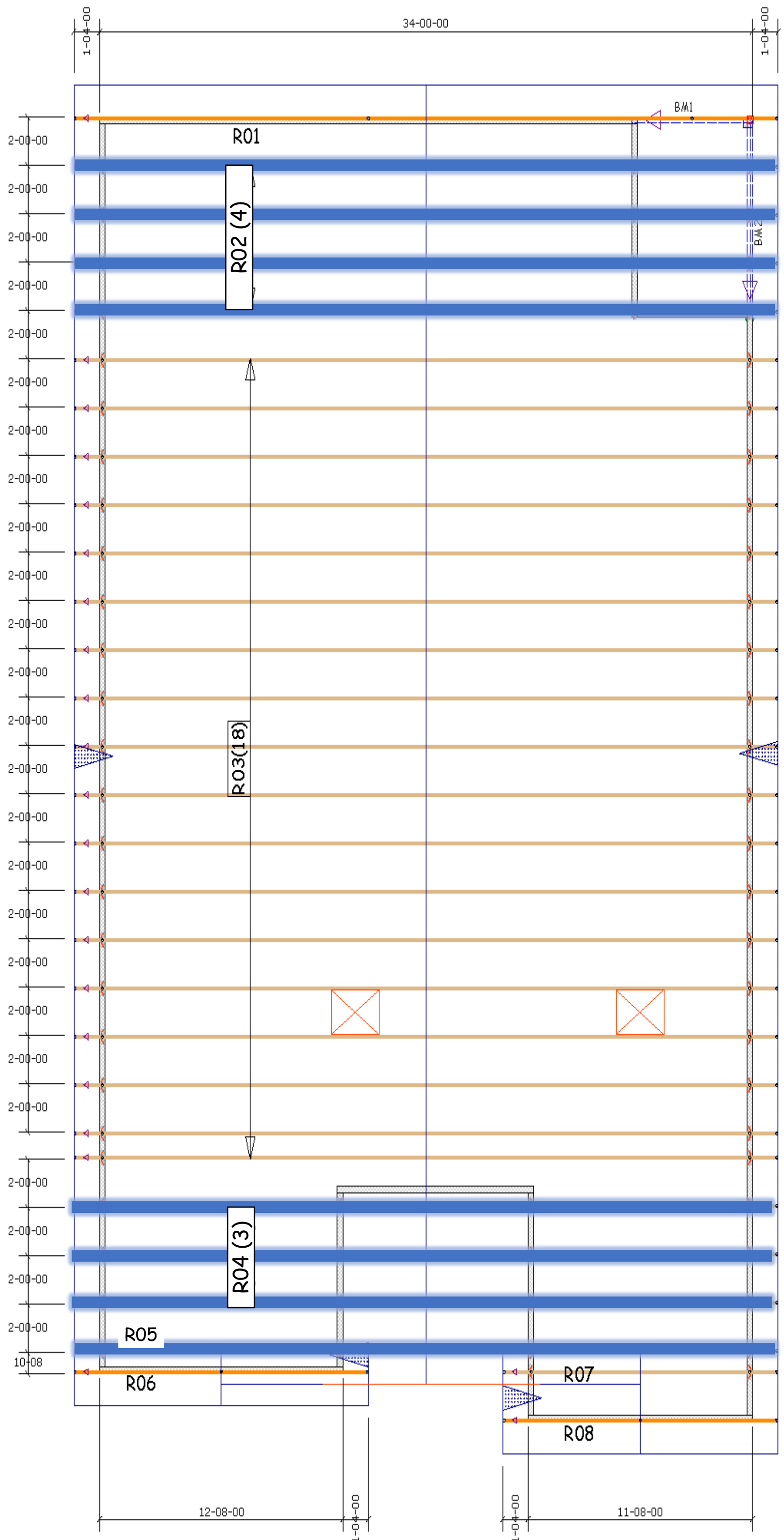
NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=5.0psf; h=35ft; B=50ft; L=30ft; eave=4ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Exterior(2E) 0-0-0 to 3-0-0, Interior(1) 3-0-0 to 10-4-8, Exterior(2R) 10-4-8 to 13-4-8, Interior(1) 13-4-8 to 20-9-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 16=201, 12=163.
8) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

COR F-12513
August 4,2021

Misener Floor Plan A

Truss ID and Type	Length*	Height*	Weight (lb)*	Quantity	Notes	Page
R01 Back Gable	36’ 8”	7’ 8”	210	1	Symmetrical	D-21
R02 Common	36’ 8”	8’ 0”	199	4	Asymmetrical	D-22
R03 Common	36’ 8”	8’ 0”	197	18	Symmetrical	D-23
R04 Common	36’ 8”	8’ 0”	189	3	Asymmetrical	D-24
R05 Monopitch Structural Gable	36’ 8”	7’ 8”	274	1	Asymmetrical	D-25
R06 Common Supported Gable	15’ 4”	3’ 2$^{9}/_{16}$”	68	1	Symmetrical	D-26
R07 Common	14’ 4”	3’ 4”	54	1	Symmetrical	D-27
R08 Common Supported Gable	14’ 4”	3’ 0”	64	1	Symmetrical	D-28
* Approximate				30		

Misener/RF Truss Layout



Asymmetrical Truss

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA
22-039387T	R01	GABLE	1	1	Job Reference (optional)

BMC, Frisco, TX 75033
8.420 s Jun 17 2021 MiTek Industries, Inc. Thu Mar 17 15:00:30 2022 Page 1
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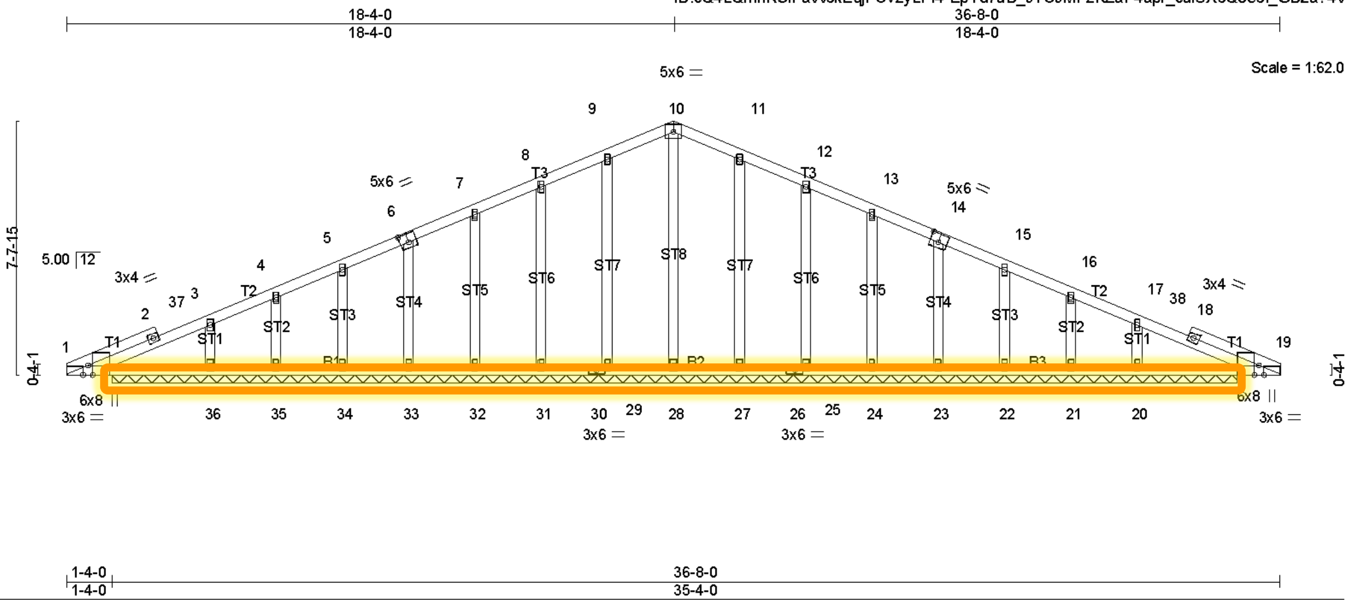

Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-1-13,Edge], [6:0-3-0,0-3-0], [14:0-3-0,0-3-0], [19:0-3-8,Edge], [19:0-1-13,Edge]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.19	Vert(LL)	n/a	-	n/a	999	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.11	Vert(CT)	n/a	-	n/a	999		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.14	Horz(CT)	0.01	19	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 210 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2 *Except*
B1: 2x4 SP 2400F 2.0E or 2x4 SP DSS or 2x4 SP M 31
OTHERS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. All bearings 34-0-0.
(lb) - Max Horz 1=130(LC 12)
Max Uplift All uplift 100 lb or less at joint(s) 1, 29, 31, 32, 33, 34, 35, 36, 27, 25, 24, 23, 22, 21, 20
Max Grav All reactions 250 lb or less at joint(s) 1, 19, 28, 29, 31, 32, 33, 34, 35, 27, 25, 24, 23, 22, 21 except 36=329(LC 25), 20=327(LC 26)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Corner(3E) 0-0-0 to 3-8-0, Exterior(2N) 3-8-0 to 18-4-0, Corner(3R) 18-4-0 to 22-0-0, Exterior(2N) 22-0-0 to 36-8-0 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) All plates are 2x4 MT20 unless otherwise indicated.
5) Gable studs spaced at 2-0-0 oc.
6) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
7) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
8) Solid blocking is required on both sides of the truss at joint(s), 1.
9) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 29, 31, 32, 33, 34, 35, 36, 27, 25, 24, 23, 22, 21, 20.
10) Non Standard bearing condition. Review required.
11) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA
22-039387T	R02	Common	4	1	Job Reference (optional)

BMC, Frisco, TX 75033 — 8.420 s Jun 17 2021 MiTek Industries, Inc. Thu Mar 17 15:00:31 2022 Page 1

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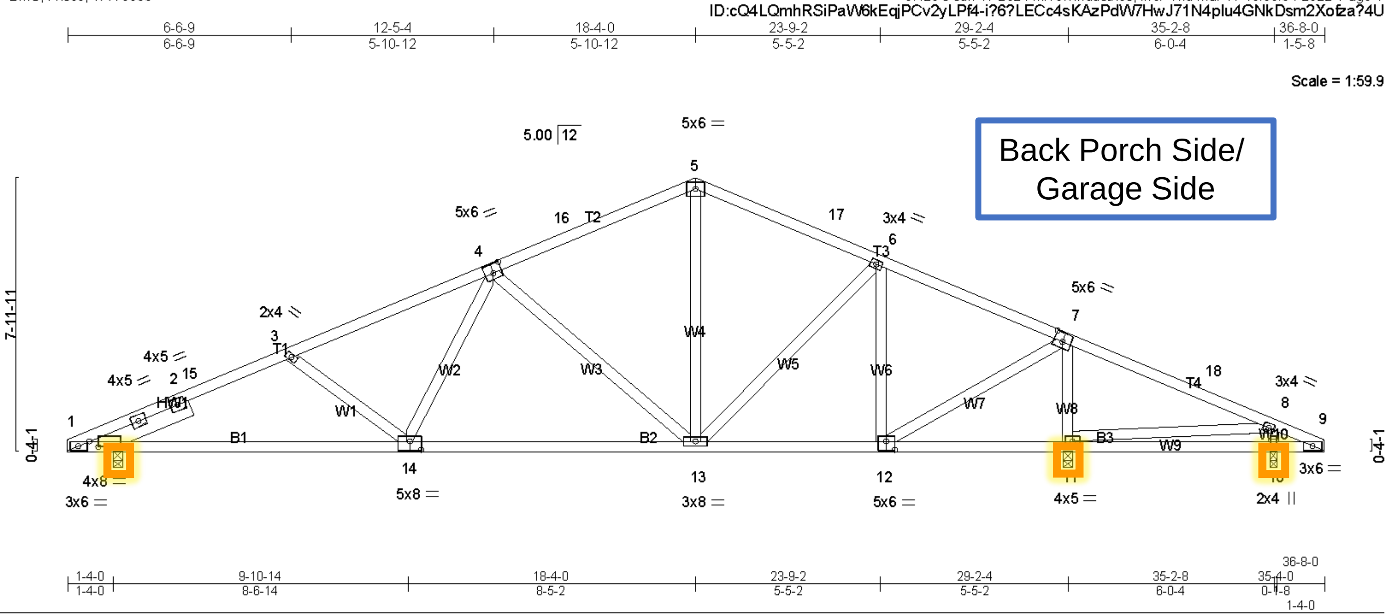

Plate Offsets (X,Y)-- [1:0-3-2,0-2-0], [4:0-3-0,0-3-0], [7:0-3-0,0-3-0], [12:0-3-0,0-3-0], [14:0-4-0,0-3-0]

LOADING (psf)		SPACING-		CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.55	Vert(LL)	-0.16	1-14	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.92	Vert(CT)	-0.36	1-14	>974	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.91	Horz(CT)	0.05	10	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 199 lb	FT = 10%

Spacing: 2-0-0

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
SLIDER Left 2x6 SP No.2 -` 3-1-5

BRACING-
TOP CHORD Structural wood sheathing directly applied or 3-2-10 oc purlins.
BOT CHORD Rigid ceiling directly applied or 2-2-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 1=1093/0-3-8 (min. 0-1-8), 11=1790/0-3-8 (min. 0-2-2), 10=39/0-3-0 (min. 0-1-8)
Max Horz 1=-135(LC 13)
Max Uplift1=-180(LC 12), 11=-184(LC 13), 10=-106(LC 25)
Max Grav 1=1093(LC 1), 11=1790(LC 1), 10=160(LC 26)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-2202/375, 2-15=-2137/377, 3-15=-2129/390, 3-4=-1869/308, 4-16=-1038/225, 5-16=-963/250, 5-17=-963/248, 6-17=-1029/231, 6-7=-799/179, 7-18=-95/672, 8-18=-108/582
BOT CHORD 1-14=-423/1982, 13-14=-237/1455, 12-13=-15/677, 11-12=-507/125
WEBS 3-14=-405/221, 4-14=-26/536, 4-13=-759/260, 5-13=-47/450, 6-13=-56/372, 6-12=-621/134, 7-12=-147/1379, 7-11=-1582/270, 8-11=-655/135

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-1-12 to 3-9-12, Interior(1) 3-9-12 to 18-4-0, Exterior(2R) 18-4-0 to 22-0-0, Interior(1) 22-0-0 to 36-8-0 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 1=180, 11=184, 10=106.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA
22-039387T	R03	Common	18	1	Job Reference (optional)

BMC, Frisco, TX 75033
8.420 s Jun 17 2021 MiTek Industries, Inc. Thu Mar 17 15:00:33 2022 Page 1
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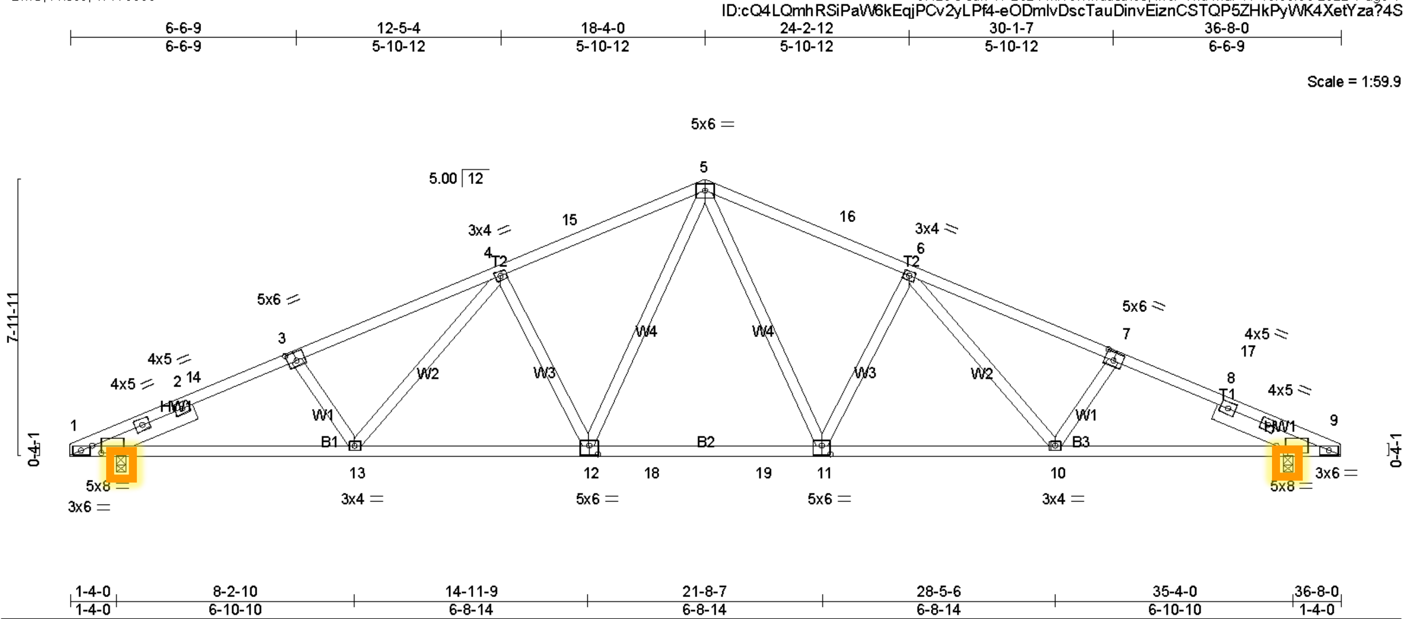

Plate Offsets (X,Y)-- [1:0-3-2,0-2-8], [3:0-3-0,0-3-0], [7:0-3-0,0-3-0], [9:0-3-2,0-2-8], [11:0-3-0,0-3-0], [12:0-3-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.54	Vert(LL)	-0.27	11-12	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	1.00	Vert(CT)	-0.48	11-12	>901	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.41	Horz(CT)	0.16	9	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 197 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
SLIDER Left 2x6 SP No.2 -` 3-1-7, Right 2x6 SP No.2 -` 3-1-7

BRACING-
TOP CHORD Structural wood sheathing directly applied or 2-8-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 2-2-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 1=1455/0-3-8 (min. 0-1-14), 9=1455/0-3-8 (min. 0-1-14)
Max Horz 1=135(LC 16)
Max Uplift1=-211(LC 12), 9=-211(LC 13)
Max Grav 1=1570(LC 2), 9=1570(LC 2)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-3343/439, 2-14=-3290/441, 3-14=-3283/455, 3-4=-3184/448, 4-15=-2480/383, 5-15=-2419/406, 5-16=-2419/406, 6-16=-2480/383, 6-7=-3184/449, 7-17=-3283/455, 8-17=-3290/441, 8-9=-3343/439
BOT CHORD 1-13=-482/3039, 12-13=-309/2491, 12-18=-126/1883, 18-19=-126/1883, 11-19=-126/1883, 10-11=-222/2491, 9-10=-348/3039
WEBS 5-11=-172/876, 6-11=-624/263, 6-10=-106/640, 7-10=-338/200, 5-12=-172/876, 4-12=-624/263, 4-13=-106/640, 3-13=-338/200

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-1-12 to 3-9-12, Interior(1) 3-9-12 to 18-4-0, Exterior(2R) 18-4-0 to 22-0-0, Interior(1) 22-0-0 to 36-6-4 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members, with BCDL = 10.0psf.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 1=211, 9=211.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA
22-039387T	R04	Common	3	1	Job Reference (optional)

BMC, Frisco, TX 75033 — 8.420 s Jun 17 2021 MiTek Industries, Inc. Thu Mar 17 15:00:34 2022 Page 1

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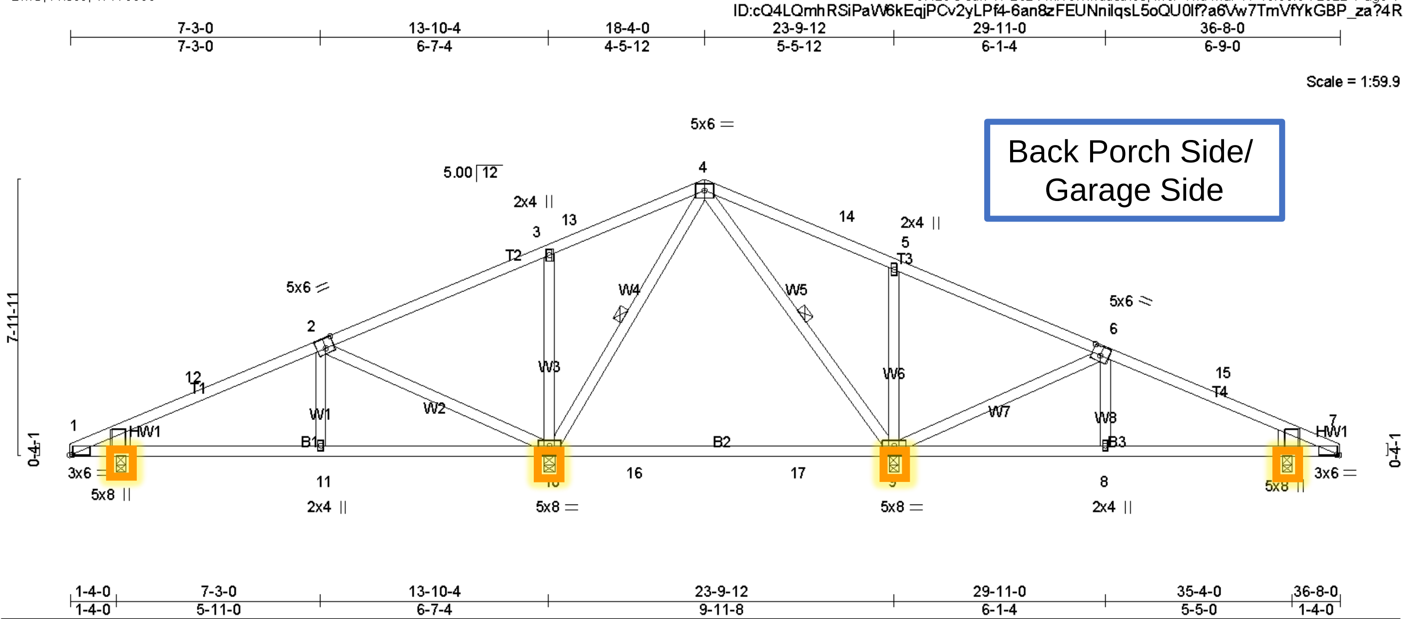

Plate Offsets (X,Y)-- [1:0-0-12,1-2-2], [1:0-0-14,0-0-2], [2:0-3-0,0-3-4], [6:0-3-0,0-3-0], [7:0-0-12,1-2-2], [7:0-0-14,0-0-2], [9:0-4-0,0-3-0], [10:0-4-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.61	Vert(LL)	-0.37	9-10	>319	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.90	Vert(CT)	-0.57	9-10	>208	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.78	Horz(CT)	0.01	7	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 189 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
WEDGE
Left: 2x6 SP No.2 , Right: 2x6 SP No.2

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing, Except: 3-1-0 oc bracing: 9-10.
WEBS 1 Row at midpt 4-10, 4-9

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. All bearings 0-3-8.
(lb) - Max Horz 1=135(LC 12)
Max Uplift All uplift 100 lb or less at joint(s) 1, 7 except 10=-254(LC 12), 9=-233(LC 13)
Max Grav All reactions 250 lb or less at joint(s) except 10=1255(LC 2), 9=1157(LC 28), 1=409(LC 27), 7=378(LC 28)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-12=-477/61, 2-12=-390/79, 2-3=-95/453, 3-13=0/376, 4-13=0/454, 4-14=0/402, 5-14=0/306, 5-6=-39/412, 6-15=-349/90, 7-15=-436/74
BOT CHORD 1-11=-102/390, 10-11=-104/383, 8-9=-13/331, 7-8=-11/336
WEBS 2-11=0/270, 2-10=-774/252, 3-10=-340/205, 4-10=-366/59, 4-9=-293/35, 5-9=-359/216, 6-9=-693/229

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-1-12 to 3-9-12, Interior(1) 3-9-12 to 18-4-0, Exterior(2R) 18-4-0 to 22-0-0, Interior(1) 22-0-0 to 36-6-4 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members, with BCDL = 10.0psf.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 7 except (jt=lb) 10=254, 9=233.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA
22-039387T	R05	Monopitch Structural Gable	1	1	Job Reference (optional)

BMC, Frisco, TX 75033 — 8.420 s Jun 17 2021 MiTek Industries, Inc. Thu Mar 17 15:00:36 2022 Page 1

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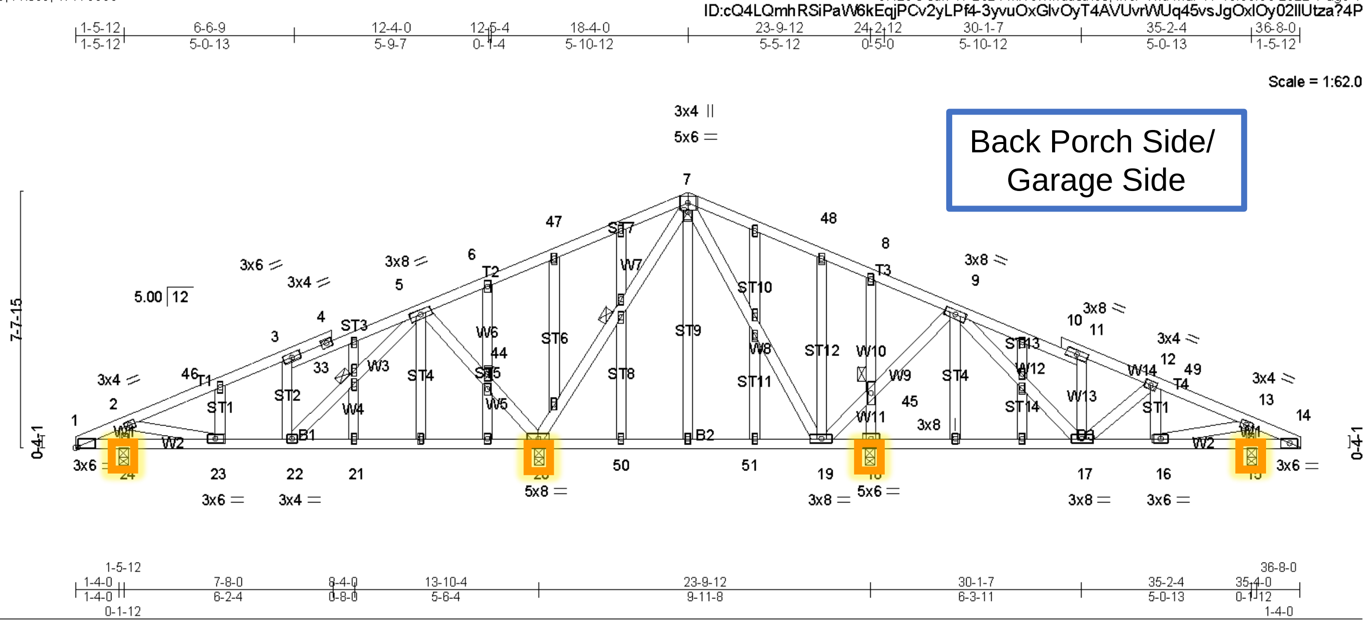

Plate Offsets (X,Y)-- [1:0-0-14,0-0-2], [7:0-0-12,0-1-8], [18:0-3-0,0-3-0], [20:0-4-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.66	Vert(LL)	-0.19	19-20	>634	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.65	Vert(CT)	-0.31	19-20	>387	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.50	Horz(CT)	0.01	15	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 274 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
OTHERS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing, Except:
6-0-0 oc bracing: 21-22,20-21.
WEBS 1 Row at midpt 7-20
JOINTS 1 Brace at Jt(s): 33, 44, 45

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. All bearings 0-3-8.
(lb) - Max Horz 24=-130(LC 13)
Max Uplift All uplift 100 lb or less at joint(s) 20 except 24=-149(LC 12), 15=-108(LC 13), 18=-180(LC 13)
Max Grav All reactions 250 lb or less at joint(s) except 20=1374(LC 2), 24=570(LC 25), 15=717(LC 2), 18=575(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-278/170, 2-46=-506/138, 3-46=-410/154, 3-4=-387/159, 4-5=-359/163, 5-6=0/289, 6-47=0/307, 7-47=0/378, 7-48=-279/145, 8-48=-337/128, 8-9=-285/83, 9-10=-771/162, 10-11=-718/126, 11-12=-755/111, 12-49=-752/125, 13-49=-801/114
BOT CHORD 1-24=-195/332, 23-24=-325/332, 22-23=-175/379, 21-22=-205/273, 20-21=-205/273, 18-19=0/453, 17-18=0/453, 16-17=-55/694
WEBS 22-33=0/274, 5-33=0/309, 5-44=-513/220, 20-44=-637/292, 7-20=-669/9, 7-19=0/383, 2-24=-574/232, 13-15=-682/159, 13-16=-59/668, 18-45=-397/181, 19-45=-251/131, 9-45=-300/132, 9-17=-91/393, 8-45=-327/179

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-0-0 to 3-8-0, Interior(1) 3-8-0 to 18-4-0, Exterior(2R) 18-4-0 to 22-0-0, Interior(1) 22-0-0 to 36-8-0 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) All plates are 2x4 MT20 unless otherwise indicated.
5) Gable studs spaced at 2-0-0 oc.
6) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
7) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members, with BCDL = 10.0psf.
8) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 20 except (jt=lb) 24=149, 15=108, 18=180.
9) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

Continued on page 2

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA
22-039387T	R06	Common Supported Gable	1	1	Job Reference (optional)

BMC, Frisco, TX 75033 — 8.420 s Jun 17 2021 MiTek Industries, Inc. Thu Mar 17 15:00:38 2022 Page 1

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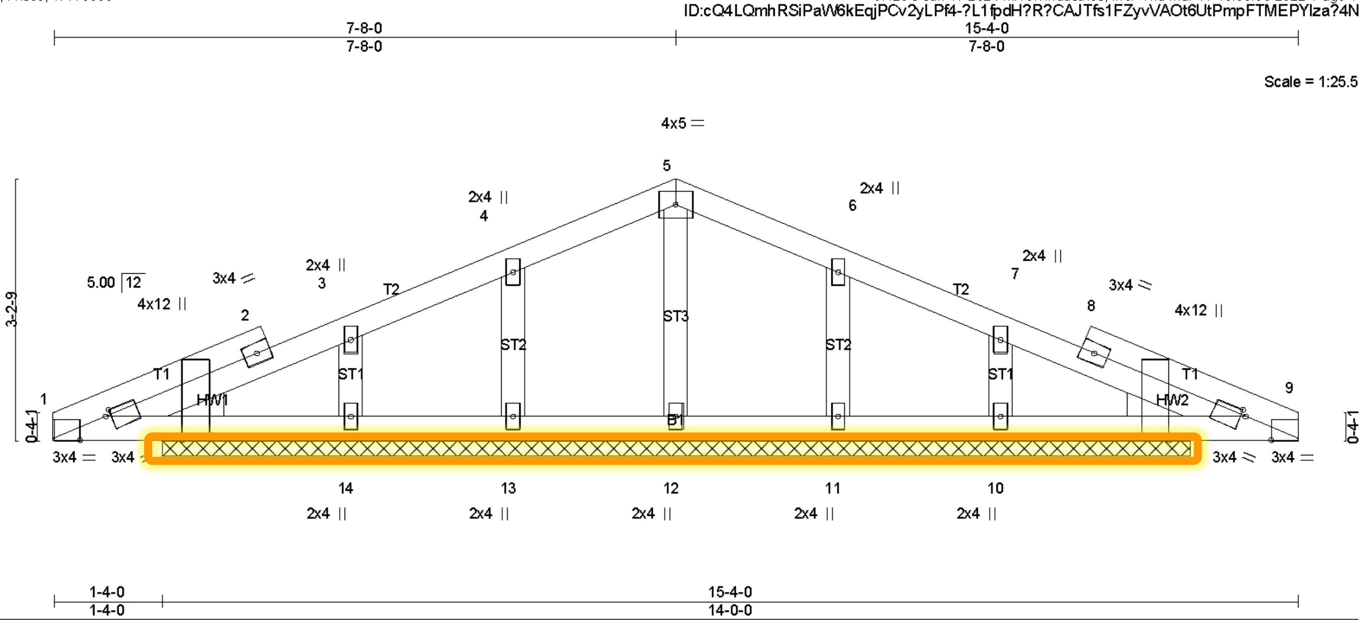

Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-3-13,Edge], [1:0-0-12,0-0-12], [9:0-3-8,Edge], [9:0-3-13,Edge], [9:0-0-12,0-0-12]

LOADING (psf)		**SPACING-**	2-0-0	**CSI.**		**DEFL.**	in	(loc)	l/defl	L/d	**PLATES**	**GRIP**
TCLL	20.0	Plate Grip DOL	1.25	TC	0.11	Vert(LL)	n/a	-	n/a	999	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.08	Vert(CT)	n/a	-	n/a	999		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.05	Horz(CT)	0.00	9	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 68 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
OTHERS 2x4 SP No.3
WEDGE
Left: 2x4 SP No.3 , Right: 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 10-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. All bearings 12-8-0.
(lb) - Max Horz 1=51(LC 16)
Max Uplift All uplift 100 lb or less at joint(s) 1, 9, 13, 14, 11, 10
Max Grav All reactions 250 lb or less at joint(s) 1, 9, 12, 13, 11 except 14=270(LC 1), 10=270(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Corner(3E) 0-0-0 to 3-8-0, Exterior(2N) 3-8-0 to 7-8-0, Corner(3R) 7-8-0 to 11-0-13, Exterior(2N) 11-0-13 to 15-4-0 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 9, 13, 14, 11, 10.
8) Non Standard bearing condition. Review required.
9) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA
22-039387T	R07	Common	1	1	Job Reference (optional)

BMC, Frisco, TX 75033

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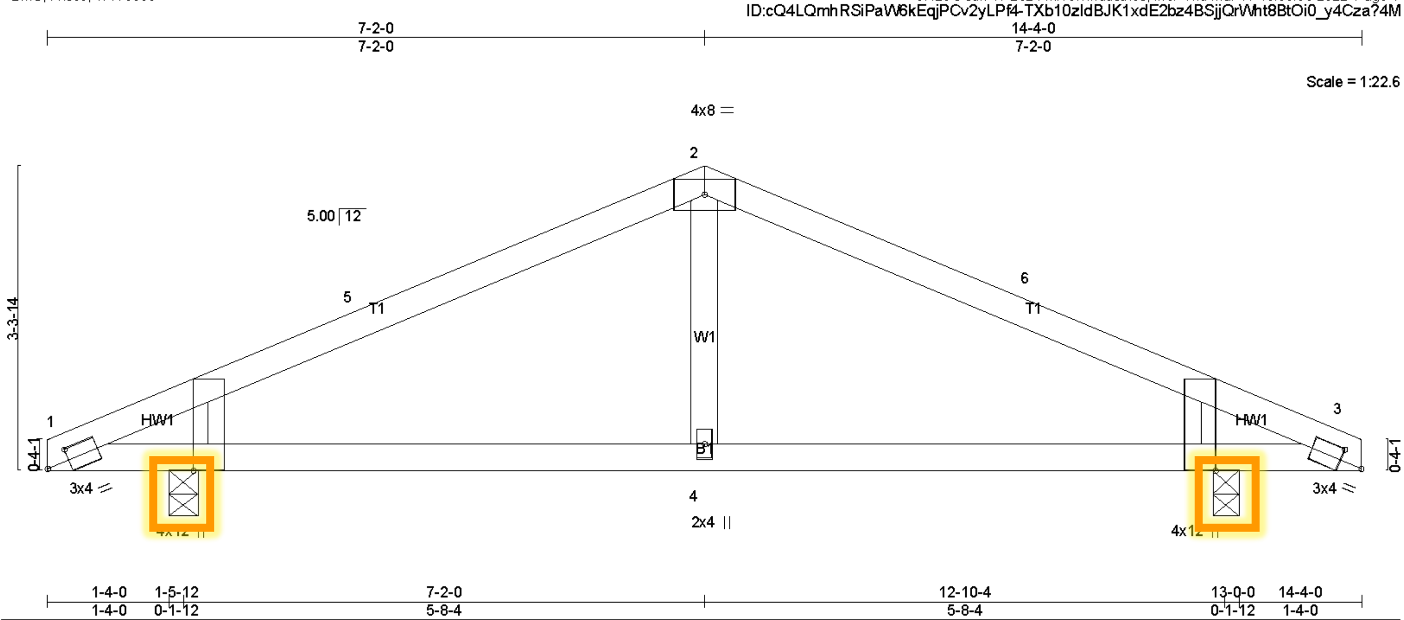

Plate Offsets (X,Y)-- [1:0-3-0,0-1-8], [1:0-0-4,Edge], [3:0-3-0,0-1-8], [3:0-0-4,Edge]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.67	Vert(LL)	-0.08	1-4	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.67	Vert(CT)	-0.16	1-4	>999	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.13	Horz(CT)	0.02	3	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 54 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
WEDGE
Left: 2x6 SP No.2 , Right: 2x6 SP No.2

BRACING-
TOP CHORD Structural wood sheathing directly applied or 4-4-7 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 1=562/0-3-8 (min. 0-1-8), 3=562/0-3-8 (min. 0-1-8)
Max Horz 1=-53(LC 17)
Max Uplift1=-81(LC 12), 3=-81(LC 13)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-5=-916/279, 2-5=-835/296, 2-6=-830/300, 3-6=-916/283
BOT CHORD 1-4=-185/767, 3-4=-185/767
WEBS 2-4=0/340

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-1-12 to 3-6-9, Interior(1) 3-6-9 to 7-2-0, Exterior(2R) 7-2-0 to 10-6-13, Interior(1) 10-6-13 to 14-2-4 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 3.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA
22-039387T	R08	Common Supported Gable	1	1	Job Reference (optional)

BMC, Frisco, TX 75033

8.420 s Jun 17 2021 MiTek Industries, Inc. Thu Mar 17 15:00:41 2022 Page 1

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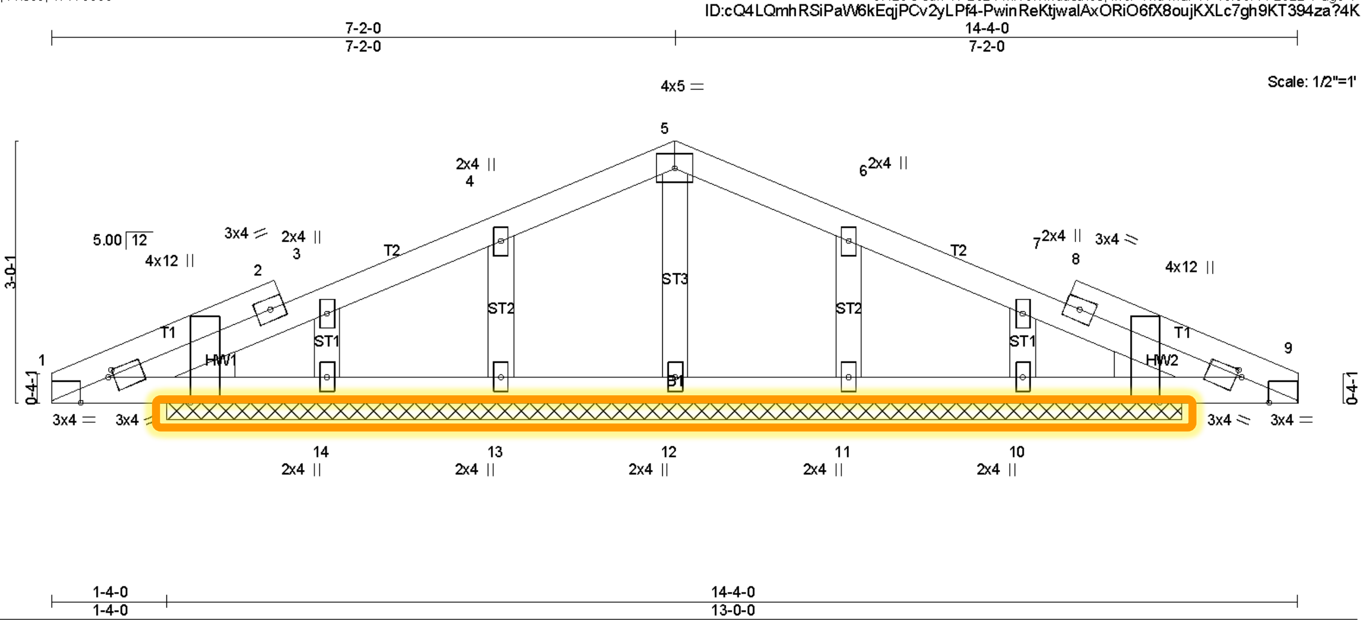


Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-3-13,Edge], [1:0-0-12,0-0-12], [9:0-3-8,Edge], [9:0-3-13,Edge], [9:0-0-12,0-0-12]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.07	Vert(LL)	n/a	-	n/a	999	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.03	Vert(CT)	n/a	-	n/a	999		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.05	Horz(CT)	0.00	9	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 64 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP 2400F 2.0E or 2x4 SP DSS or 2x4 SP M 31
OTHERS 2x4 SP No.3
WEDGE
Left: 2x4 SP No.3 , Right: 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. All bearings 11-8-0.
(lb) - Max Horz 1=48(LC 12)
Max Uplift All uplift 100 lb or less at joint(s) 1, 9, 13, 14, 11, 10
Max Grav All reactions 250 lb or less at joint(s) 1, 9, 12, 13, 14, 11, 10

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

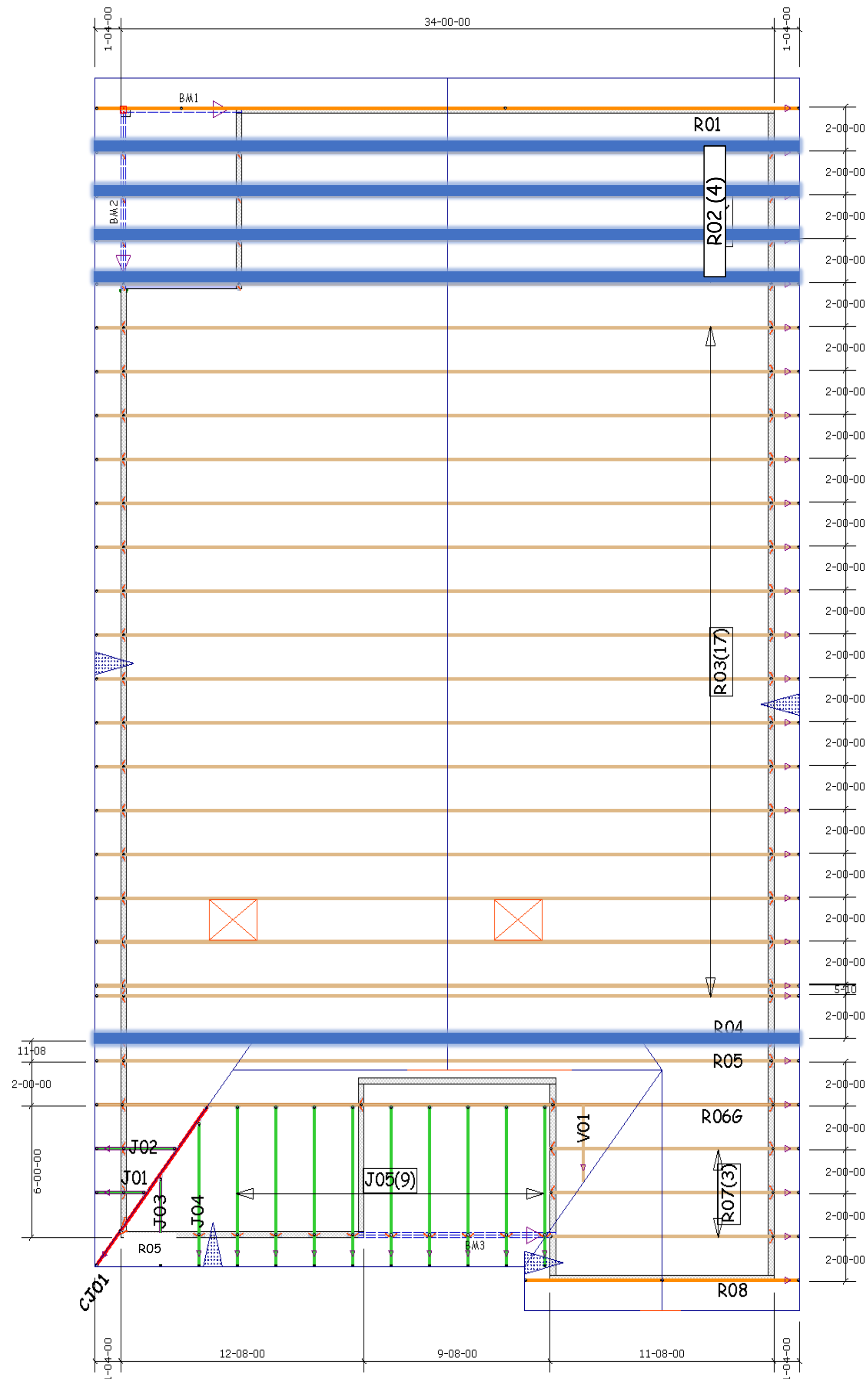
NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Corner(3E) 0-0-0 to 3-2-0, Exterior(2N) 3-2-0 to 7-2-0, Corner(3R) 7-2-0 to 10-6-13, Exterior(2N) 10-6-13 to 14-4-0 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) Solid blocking is required on both sides of the truss at joint(s), 1.
8) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 9, 13, 14, 11, 10.
9) Non Standard bearing condition. Review required.
10) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Misener Floor Plan B

Truss ID and Type	Length*	Height*	Weight (lb)*	Quantity	Notes	Page
R01 Back Gable	36’ 8”	7’ 8”	210	1	Symmetrical	D-31
R02 Common	36’ 8”	8’ 0”	199	4	Asymmetrical	D-32
R03 Common	36’ 8”	8’ 0”	197	17	Symmetrical	D-33
R04 Common Structural Gable	36’ 8”	8’ 0”	189	1	Symmetrical	D-34
R05 Common	36’ 8”	7’ 8”	274	1	Symmetrical	D-35
R06G Roof Special Girder	15’ 4”	3’ 2$^{9}/_{16}$”	68	1	Asymmetrical	D-36
R07 Common	14’ 4”	3’ 4”	54	3	Asymmetrical	D-37
R08 Common Supported Gable	14’ 4”	3’ 0”	64	1	Symmetrical	D-38
CJ01 Diagonal Hip Girder	9’ 3½”	2’ 9”	43	1	Asymmetrical	D-39
J01 Jack-Open	2’ 7”	1’ 5”	11	1	Asymmetrical	D-40
J02 Jack-Open	4’ 2¼”	2’ 1”	16	1	Asymmetrical	D-41
J03 Jack-Open	4’ 0¾”	1’ 8¼“	14	1	Asymmetrical	D-42
J04 Jack-Partial	6’ 6¾”	2’ 6¼”	22	1	Asymmetrical	D-43
J05 Jack-Partial	7’ 4”	2’ 9½”	24	9	Asymmetrical	D-44
V01 Valley	3’ 5”	1’ 11¾”	10	1	Asymmetrical	D-45
* Approximate				44		

Misener-B/RF Truss Layout R



Asymmetrical Truss

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	R01	GABLE	1	1	Job Reference (optional)

BMC, Frisco, TX 75033
8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:46 2022 Page 1
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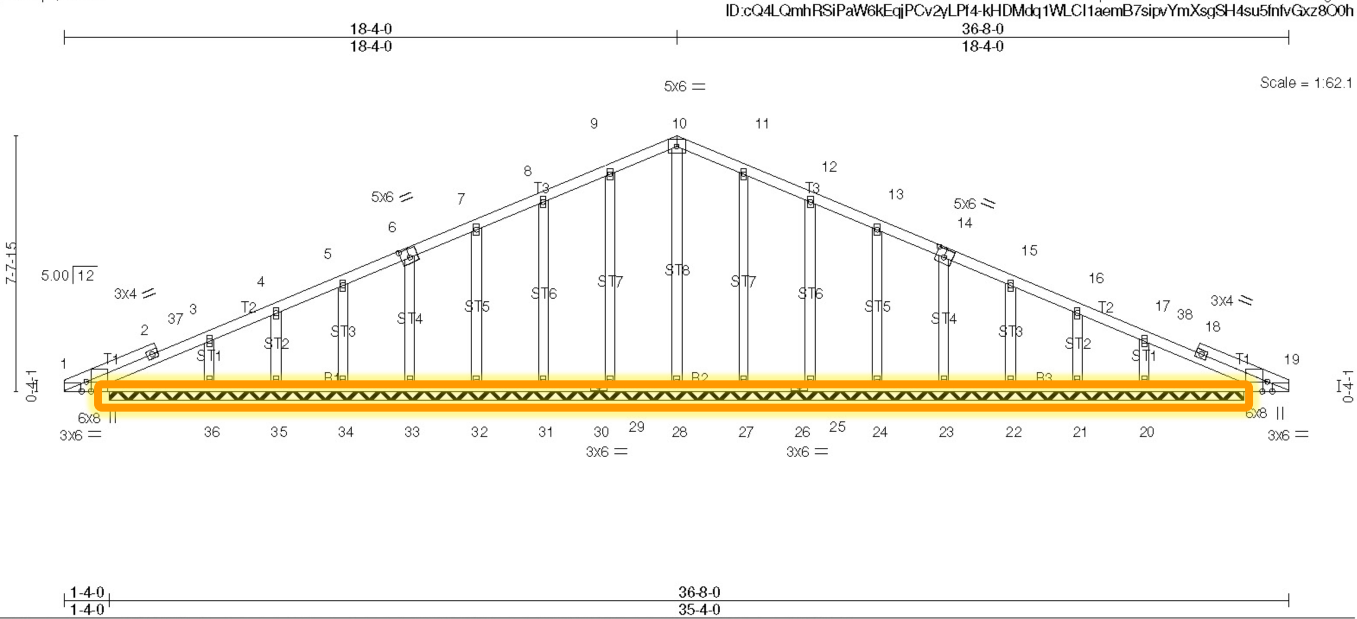

Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-1-13,Edge], [6:0-3-0,0-3-0], [14:0-3-0,0-3-0], [19:0-3-8,Edge], [19:0-1-13,Edge]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.19	Vert(LL)	n/a	-	n/a	999	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.11	Vert(CT)	n/a	-	n/a	999		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.14	Horz(CT)	0.01	19	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 210 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2 *Except*
B1: 2x4 SP 2400F 2.0E or 2x4 SP DSS or 2x4 SP M 31
OTHERS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. All bearings 34-0-0.
(lb) - Max Horz 1=130(LC 12)
Max Uplift All uplift 100 lb or less at joint(s) 1, 29, 31, 32, 33, 34, 35, 36, 27, 25, 24, 23, 22, 21, 20
Max Grav All reactions 250 lb or less at joint(s) 1, 19, 28, 29, 31, 32, 33, 34, 35, 27, 25, 24, 23, 22, 21 except 36=329(LC 25), 20=327(LC 26)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Corner(3E) 0-0-0 to 3-8-0, Exterior(2N) 3-8-0 to 18-4-0, Corner(3R) 18-4-0 to 22-0-0, Exterior(2N) 22-0-0 to 36-8-0 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) All plates are 2x4 MT20 unless otherwise indicated.
5) Gable studs spaced at 2-0-0 oc.
6) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
7) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
8) Solid blocking is required on both sides of the truss at joint(s), 1.
9) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 29, 31, 32, 33, 34, 35, 36, 27, 25, 24, 23, 22, 21, 20.
10) Non Standard bearing condition. Review required.
11) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	R02	Common	4	1	Job Reference (optional)

BMC, Frisco, TX 75033

8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:47 2022 Page 1

ID:cQ4LQmhRSiPaW6kEqjPCv2yLPl4-CTnkqA286WQuBoKOhZD2Smlc34btp7CEuROSpOz8O0g

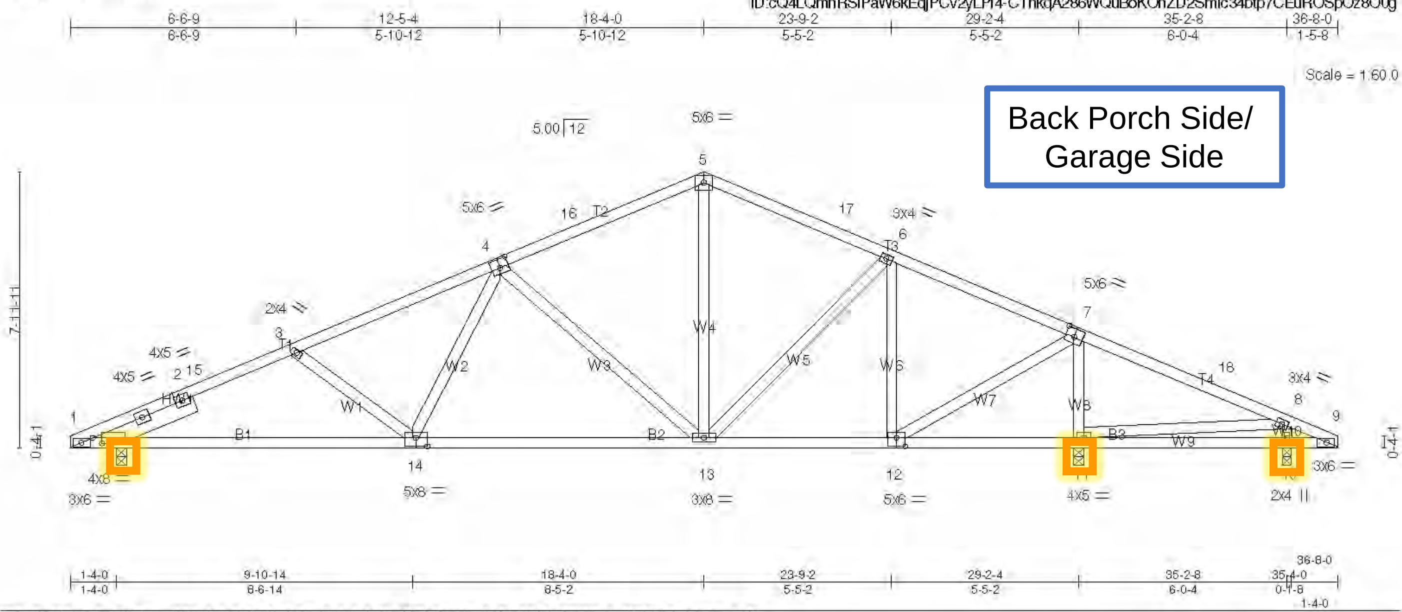

Plate Offsets (X,Y)-- [1:0-3-2,0-2-0], [4:0-3-0,0-3-0], [7:0-3-0,0-3-0], [12:0-3-0,0-3-0], [14:0-4-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.55	Vert(LL)	-0.16	1-14	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.92	Vert(CT)	-0.36	1-14	>974	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.91	Horz(CT)	0.05	10	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 199 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
SLIDER Left 2x6 SP No.2 3-1-5

BRACING-
TOP CHORD Structural wood sheathing directly applied or 3-2-10 oc purlins.
BOT CHORD Rigid ceiling directly applied or 2-2-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 1=1093/0-3-8 (min. 0-1-8), 11=1790/0-3-8 (min. 0-2-2), 10=39/0-3-0 (min. 0-1-8)
Max Horz 1=-135(LC 13)
Max Uplift1=-180(LC 12), 11=-184(LC 13), 10=-106(LC 25)
Max Grav1=1093(LC 1), 11=1790(LC 1), 10=160(LC 26)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-2202/375, 2-15=-2137/377, 3-15=-2129/390, 3-4=-1869/308, 4-16=-1038/225, 5-16=-963/250, 5-17=-963/248, 6-17=-1029/231, 6-7=-799/179, 7-18=-95/672, 8-18=-108/582
BOT CHORD 1-14=-423/1982, 13-14=-237/1455, 12-13=-15/677, 11-12=-507/125
WEBS 3-14=-405/221, 4-14=-26/536, 4-13=-759/260, 5-13=-47/450, 6-13=-56/372, 6-12=-621/134, 7-12=-147/1379, 7-11=-1582/270, 8-11=-655/135

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-1-12 to 3-9-12, Interior(1) 3-9-12 to 18-4-0, Exterior(2R) 18-4-0 to 22-0-0, Interior(1) 22-0-0 to 36-8-0 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 1=180, 11=184, 10=106.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	R03	Common	17	1	Job Reference (optional)

BMC, Frisco, TX 75033 — 8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:49 2022 Page 1
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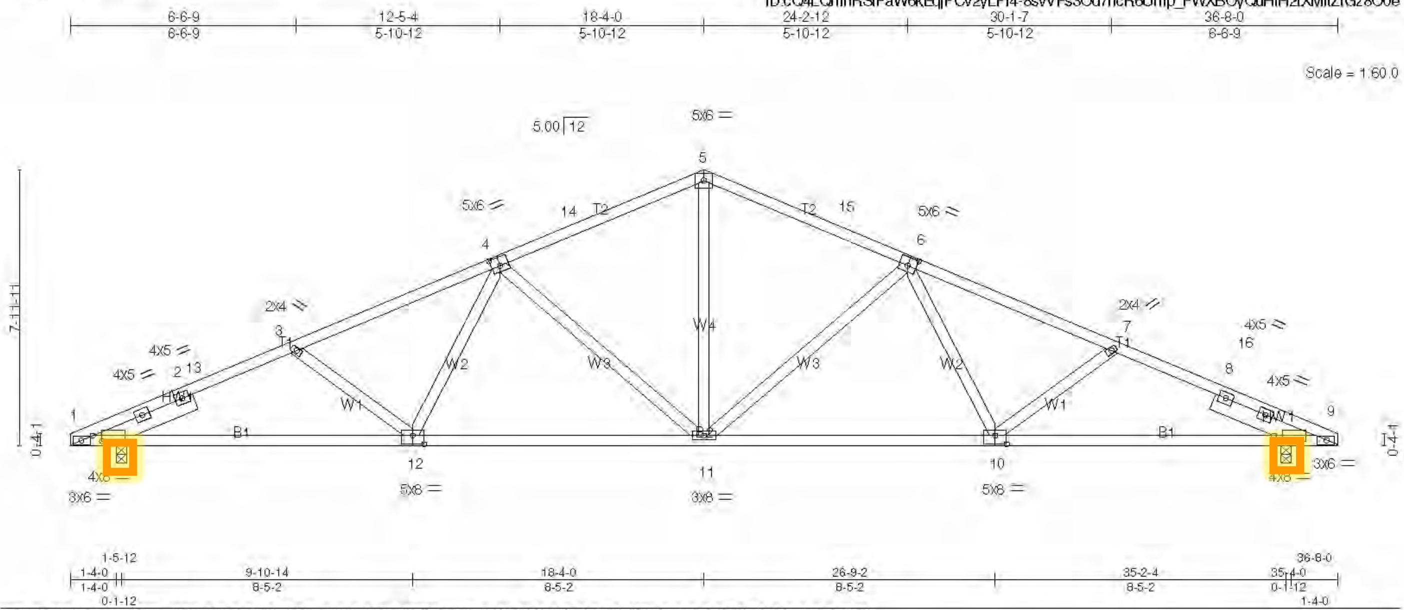

Plate Offsets (X,Y)-- [1:0-3-2,0-2-0], [4:0-3-0,0-3-0], [6:0-3-0,0-3-0], [9:0-3-2,0-2-0], [10:0-4-0,0-3-0], [12:0-4-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.56	Vert(LL)	-0.18	11	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.90	Vert(CT)	-0.42	9-10	>999	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.90	Horz(CT)	0.15	9	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 191 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP 1650F 1.5E or 2x4 SP No.1 or 2x4 SP SS *Except*
B2: 2x4 SP No.2
WEBS 2x4 SP No.3
SLIDER Left 2x6 SP No.2 3-1-5, Right 2x6 SP No.2 3-1-5

BRACING-
TOP CHORD Structural wood sheathing directly applied or 2-8-12 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing, Except:
8-9-10 oc bracing: 1-12.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 1=1455/0-3-8 (min. 0-1-11), 9=1455/0-3-8 (min. 0-1-11)
Max Horz 1=-135(LC 17)
Max Uplift1=-211(LC 12), 9=-211(LC 13)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-3106/455, 2-13=-3042/456, 3-13=-3034/470, 3-4=-2783/391, 4-14=-1972/334, 5-14=-1898/359, 5-15=-1898/359, 6-15=-1972/334, 6-7=-2783/391, 7-16=-3034/470, 8-16=-3042/457, 8-9=-3106/455
BOT CHORD 1-12=-495/2813, 11-12=-311/2307, 10-11=-223/2307, 9-10=-360/2813
WEBS 5-11=-120/1133, 6-11=-749/261, 6-10=-28/516, 7-10=-392/219, 4-11=-749/261, 4-12=-27/516, 3-12=-392/218

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-1-12 to 3-9-12, Interior(1) 3-9-12 to 18-4-0, Exterior(2R) 18-4-0 to 22-0-0, Interior(1) 22-0-0 to 36-6-4 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 1=211, 9=211.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	R04	Common Structural Gable	1	1	Job Reference (optional)

BMC, Frisco, TX 75033 8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:51 2022 Page 1
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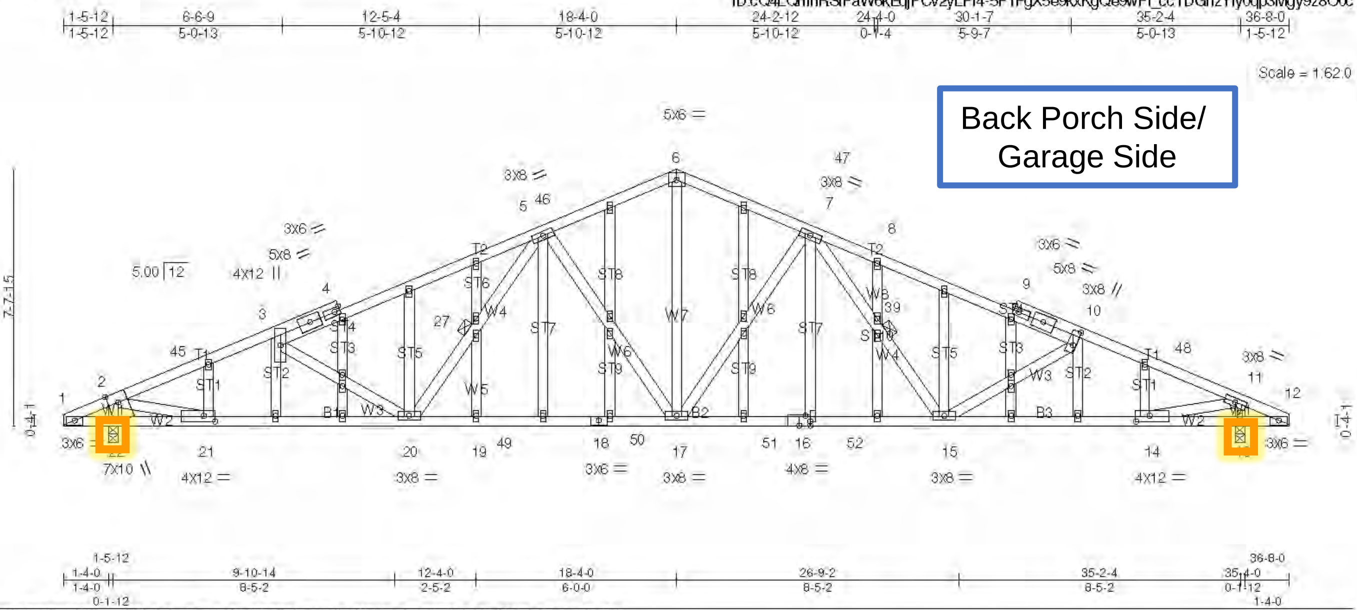

Plate Offsets (X,Y)-- [10:0-5-4,0-1-0], [14:0-5-0,0-2-0], [21:0-4-0,0-2-0], [37:0-2-0,0-1-12]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.86	Vert(LL)	-0.40	15-17	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.87	Vert(CT)	-0.71	15-17	>570	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.85	Horz(CT)	0.08	13	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 270 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP 1650F 1.5E or 2x4 SP No.1 or 2x4 SP SS *Except*
T2: 2x4 SP 2400F 2.0E or 2x4 SP DSS or 2x4 SP M 31
BOT CHORD 2x4 SP 2400F 2.0E or 2x4 SP DSS or 2x4 SP M 31 *Except*
B2: 2x4 SP 1650F 1.5E or 2x4 SP No.1 or 2x4 SP SS
WEBS 2x4 SP No.3 *Except*
W4: 2x4 SP No.2
OTHERS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 2-2-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 9-9-2 oc bracing.
JOINTS 1 Brace at Jt(s): 27, 39

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 22=1467/0-3-8 (min. 0-1-14), 13=1467/0-3-8 (min. 0-1-14)
Max Horz 22=130(LC 16)
Max Uplift22=-220(LC 12), 13=-220(LC 13)
Max Grav22=1596(LC 2), 13=1596(LC 2)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 2-45=-2750/402, 3-45=-2710/421, 3-4=-2476/277, 4-5=-2443/309, 5-46=-1950/321, 6-46=-1941/338, 6-47=-1927/334, 7-47=-1936/317, 7-8=-2498/350, 8-9=-2493/304, 9-10=-2509/286, 10-48=-2698/411, 11-48=-2737/392, 11-12=-294/79
BOT CHORD 1-22=-85/342, 21-22=-214/350, 20-21=-447/2505, 19-20=-245/2119, 19-49=-245/2119, 49-50=-245/2119, 18-50=-245/2119, 17-18=-245/2119, 17-51=-165/2071, 16-51=-165/2071, 16-52=-165/2071, 15-52=-165/2071, 14-15=-305/2482, 13-14=-103/414, 12-13=-103/414
WEBS 6-17=-180/1361, 7-17=-578/232, 7-39=-70/542, 15-39=0/367, 10-15=-307/219, 5-17=-657/255, 5-27=0/356, 3-20=-389/247, 2-22=-1932/401, 2-21=-251/2244, 11-13=-1948/370, 11-14=-208/2134

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-0-0 to 3-8-0, Interior(1) 3-8-0 to 18-4-0, Exterior(2R) 18-4-0 to 22-0-0, Interior(1) 22-0-0 to 36-8-0 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) All plates are 2x4 MT20 unless otherwise indicated.
5) Gable studs spaced at 2-0-0 oc.
6) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
7) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members, with BCDL = 10.0psf.
8) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 22=220, 13=220.
9) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	R05	Common	1	1	Job Reference (optional)

BMC, Frisco, TX 75033 8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:53 2022 Page 1
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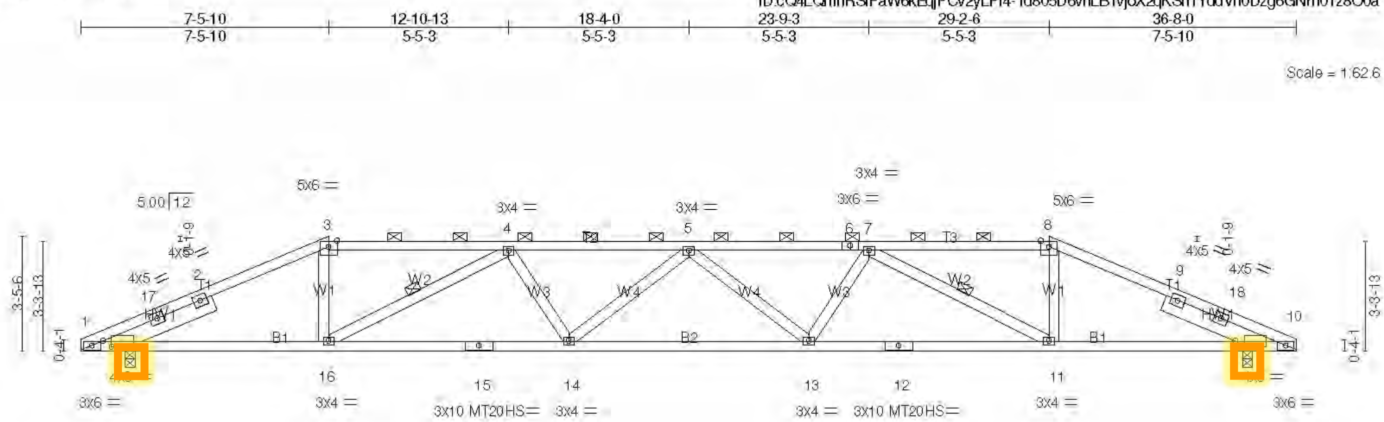

1-4-0	7-5-10	14-8-9	21-11-7	29-2-6	35-4-0	36-8-0
1-4-0	6-1-10	7-2-15	7-2-15	7-2-15	6-1-10	1-4-0

Plate Offsets (X,Y)-- [1:0-3-2,0-2-0], [10:0-3-2,0-2-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.61	Vert(LL)	-0.37	13-14	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.74	Vert(CT)	-0.78	13-14	>559	180	MT20HS	187/143
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.40	Horz(CT)	0.20	10	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 178 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP 1650F 1.5E or 2x4 SP No.1 or 2x4 SP SS *Except*
T2,T3: 2x4 SP No.2
BOT CHORD 2x4 SP 1650F 1.5E or 2x4 SP No.1 or 2x4 SP SS
WEBS 2x4 SP No.3
SLIDER Left 2x6 SP No.2 3-6-7, Right 2x6 SP No.2 3-6-7

BRACING-
TOP CHORD Structural wood sheathing directly applied or 2-10-1 oc purlins, except 2-0-0 oc purlins (2-6-6 max.): 3-8.
BOT CHORD Rigid ceiling directly applied or 7-0-10 oc bracing.
WEBS 1 Row at midpt 4-16, 7-11

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 1=1455/0-3-8 (min. 0-1-11), 10=1455/0-3-8 (min. 0-1-11)
Max Horz 1=-53(LC 13)
Max Uplift1=-223(LC 12), 10=-223(LC 13)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-17=-3125/506, 2-17=-3083/513, 2-3=-3037/530, 3-4=-2783/511, 4-5=-4200/788, 5-6=-4200/788, 6-7=-4200/788, 7-8=-2783/511, 8-9=-3037/530, 9-18=-3083/513, 10-18=-3125/506
BOT CHORD 1-16=-432/2820, 15-16=-716/4018, 14-15=-716/4018, 13-14=-796/4392, 12-13=-709/4018, 11-12=-709/4018, 10-11=-425/2820
WEBS 3-16=-77/857, 4-16=-1496/337, 4-14=-33/403, 5-14=-290/182, 5-13=-290/182, 7-13=-33/403, 7-11=-1496/337, 8-11=-77/857

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-1-12 to 3-9-12, Interior(1) 3-9-12 to 7-5-10, Exterior(2R) 7-5-10 to 12-10-13, Interior(1) 12-10-13 to 29-2-6, Exterior(2R) 29-2-6 to 34-4-10, Interior(1) 34-4-10 to 36-6-4 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Provide adequate drainage to prevent water ponding.
4) All plates are MT20 plates unless otherwise indicated.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 1=223, 10=223
8) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.
9) Graphical purlin representation does not depict the size or the orientation of the purlin along the top and/or bottom chord.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	R06G	Roof Special Girder	1	1	Job Reference (optional)

BMC, Frisco, TX 75033 — 8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:56 2022 Page 1
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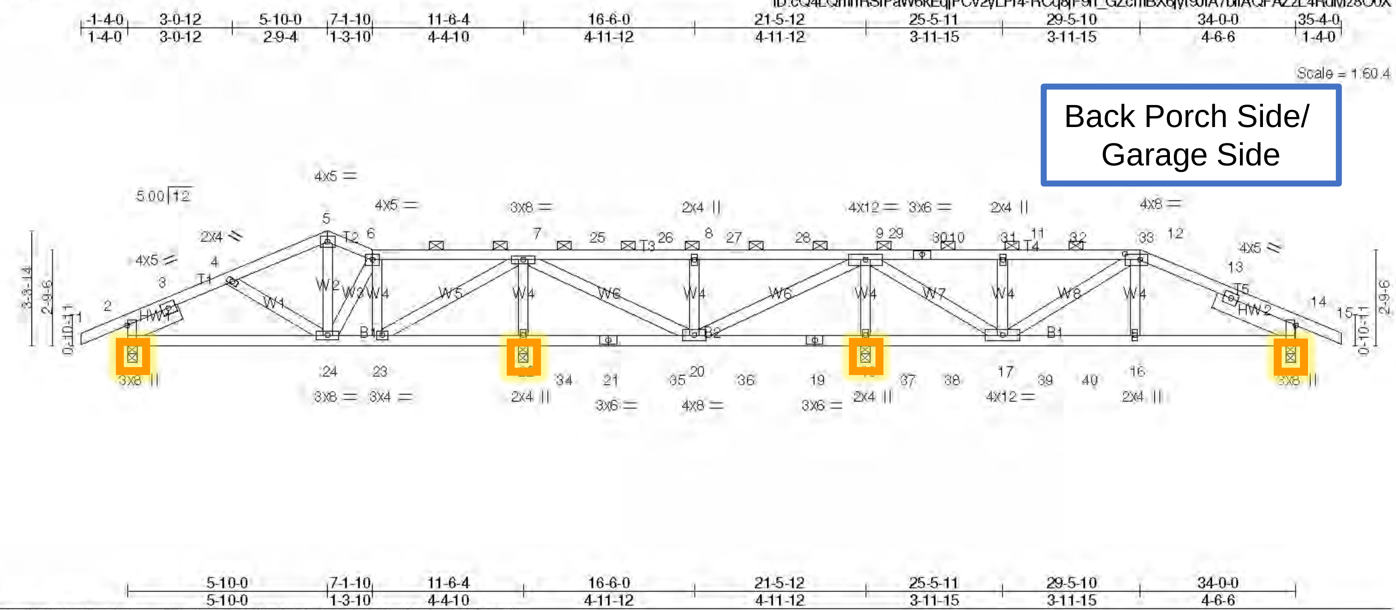

Plate Offsets (X,Y)-- [2:0-6-3,0-0-5], [12:0-5-4,0-2-0], [14:0-6-3,0-0-5]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.69	Vert(LL)	0.05	16-17	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.52	Vert(CT)	-0.09	16-17	>999	180		
BCLL	0.0 *	Rep Stress Incr	NO	WB	0.73	Horz(CT)	-0.01	18	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 184 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
SLIDER Left 2x6 SP No.2 1-8-2, Right 2x6 SP No.2 2-6-12

BRACING-
TOP CHORD Structural wood sheathing directly applied or 3-9-12 oc purlins, except 2-0-0 oc purlins (5-1-5 max.): 6-12.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. All bearings 0-3-8.
(lb) - Max Horz 2=53(LC 8)
Max Uplift All uplift 100 lb or less at joint(s) except 2=-121(LC 29), 22=-312(LC 5), 18=-637(LC 9), 14=-274(LC 9)
Max Grav All reactions 250 lb or less at joint(s) except 2=432(LC 1), 22=1441(LC 1), 18=2442(LC 22), 14=969(LC 22)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 2-3=-446/140, 3-4=-394/153, 4-5=-290/123, 5-6=-280/135, 7-25=-354/158, 25-26=-354/158, 26-27=-354/158, 8-27=-354/158, 8-28=-354/158, 28-29=-354/158, 9-29=-354/158, 9-30=-867/304, 10-30=-867/304, 10-31=-867/304, 11-31=-867/304, 11-32=-866/304, 32-33=-867/304, 12-33=-867/304, 12-13=-1440/436, 13-14=-1513/424
BOT CHORD 2-24=-129/351, 23-24=-95/281, 22-23=-394/123, 22-34=-394/123, 21-34=-394/123, 21-35=-394/123, 20-35=-394/123, 20-36=-767/230, 19-36=-767/230, 18-19=-767/230, 18-37=-767/230, 37-38=-767/230, 17-38=-767/230, 17-39=-322/1310, 39-40=-322/1310, 16-40=-322/1310, 14-16=-315/1273
WEBS 6-23=-323/47, 7-23=-67/631, 7-22=-1238/412, 7-20=-201/808, 8-20=-699/387, 9-20=-326/1248, 9-18=-2204/750, 9-17=-511/1921, 11-17=-572/312, 12-17=-524/138, 12-16=-103/635

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone; cantilever left exposed ; end vertical left exposed; Lumber DOL=1.60 plate grip DOL=1.60
3) Provide adequate drainage to prevent water ponding.
4) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
5) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
6) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 121 lb uplift at joint 2, 312 lb uplift at joint 22, 637 lb uplift at joint 18 and 274 lb uplift at joint 14.
7) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.
8) Graphical purlin representation does not depict the size or the orientation of the purlin along the top and/or bottom chord.
9) Hanger(s) or other connection device(s) shall be provided sufficient to support concentrated load(s) 194 lb down and 129 lb up at 11-11-4, 194 lb down and 129 lb up at 13-11-4, 194 lb down and 129 lb up at 15-11-4, 194 lb down and 129 lb up at 17-11-4, 194 lb down and 129 lb up at 19-11-4, 194 lb down and 129 lb up at 21-11-4, 194 lb down and 129 lb up at 23-11-4, and 194 lb down and 129 lb up at 25-11-4, and 194 lb down and 129 lb up at 27-11-4 on top chord, and 103 lb down at 11-11-4, 103 lb down at 13-11-4, 103 lb down at 15-11-4, 103 lb down at 17-11-4, 103 lb down at 19-11-4, 103 lb down at 21-11-4, 103 lb down at 23-11-4, 103 lb down at 25-11-4, and 103 lb down at 27-11-4, and 541 lb down and 193 lb up at 29-5-10 on bottom chord. The design/selection of such connection device(s) is the responsibility of others.

Continued on page 2

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	R07	Common	3	1	Job Reference (optional)

BMC, Frisco, TX 75033

8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:58 2022 Page 1
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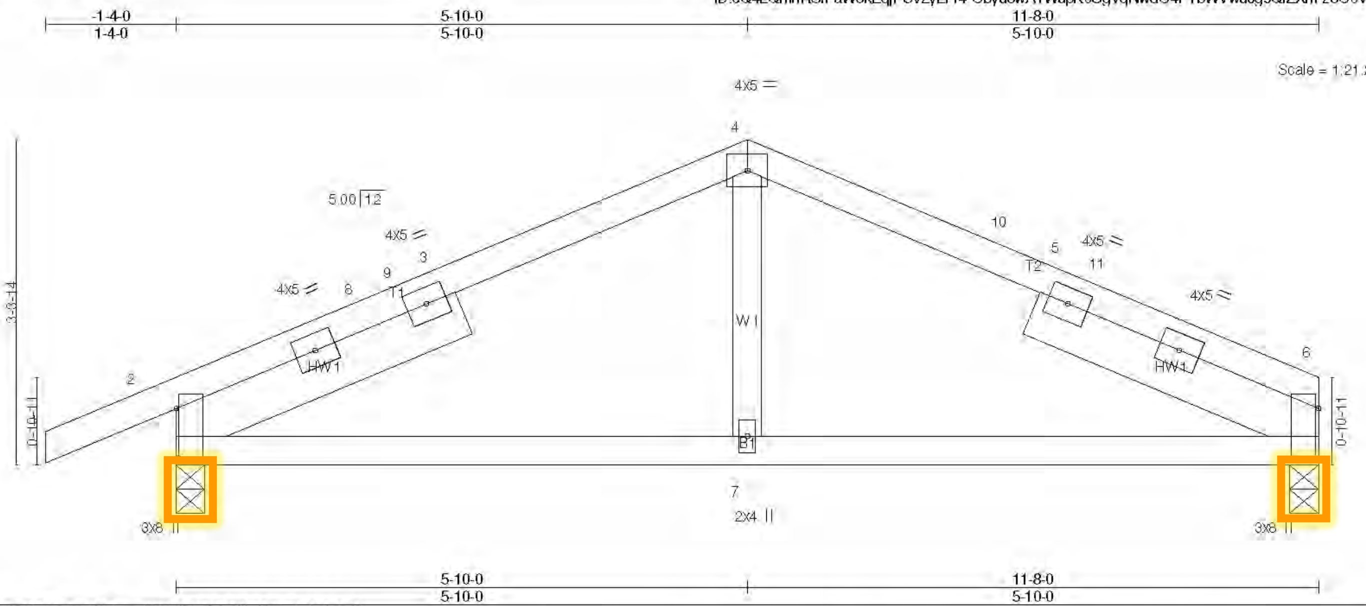

Plate Offsets (X,Y)-- [2:0-6-3,0-0-5], [6:0-6-3,0-0-5]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.34	Vert(LL)	-0.02	6-7	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.31	Vert(CT)	-0.04	6-7	>999	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.09	Horz(CT)	0.01	6	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 58 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
SLIDER Left 2x6 SP No.2 3-2-5, Right 2x6 SP No.2 3-2-5

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 6=462/0-3-8 (min. 0-1-8), 2=551/0-3-8 (min. 0-1-8)
Max Horz 2=-54(LC 13)
Max Uplift 6=-65(LC 13), 2=-98(LC 12)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 2-8=-640/232, 8-9=-574/234, 3-9=-563/234, 3-4=-530/250, 4-10=-530/258, 5-10=-534/246, 5-11=-559/241, 6-11=-618/241
BOT CHORD 2-7=-123/490, 6-7=-123/490

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) -1-4-0 to 2-0-13, Interior(1) 2-0-13 to 5-10-0, Exterior(2R) 5-10-0 to 9-2-13, Interior(1) 9-2-13 to 11-8-0 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 65 lb uplift at joint 6 and 98 lb uplift at joint 2.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	R08	Common Supported Gable	1	1	Job Reference (optional)

BMC, Frisco, TX 75033

8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:59 2022 Page 1
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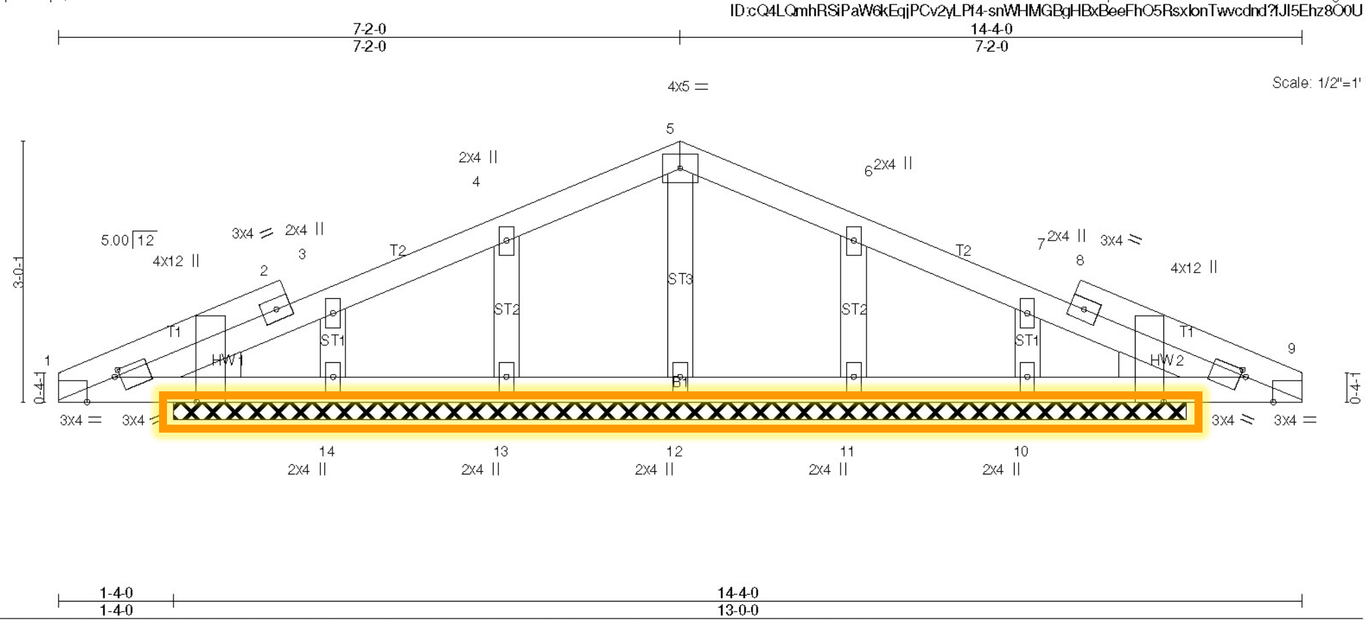

Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-3-13,Edge], [1:0-0-12,0-0-12], [9:0-3-8,Edge], [9:0-3-13,Edge], [9:0-0-12,0-0-12]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.07	Vert(LL)	n/a	-	n/a	999	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.03	Vert(CT)	n/a	-	n/a	999		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.05	Horz(CT)	0.00	9	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 64 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP 2400F 2.0E or 2x4 SP DSS or 2x4 SP M 31
OTHERS 2x4 SP No.3
WEDGE
Left: 2x4 SP No.3 , Right: 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. All bearings 11-8-0.
(lb) - Max Horz 1=48(LC 12)
Max Uplift All uplift 100 lb or less at joint(s) 1, 9, 13, 14, 11, 10
Max Grav All reactions 250 lb or less at joint(s) 1, 9, 12, 13, 14, 11, 10

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Corner(3E) 0-0-0 to 3-2-0, Exterior(2N) 3-2-0 to 7-2-0, Corner(3R) 7-2-0 to 10-6-13, Exterior(2N) 10-6-13 to 14-4-0 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) Solid blocking is required on both sides of the truss at joint(s), 9.
8) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 9, 13, 14, 11, 10.
9) Non Standard bearing condition. Review required.
10) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	CJ01	Diagonal Hip Girder	1	1	Job Reference (optional)

BMC, Frisco, TX 75033

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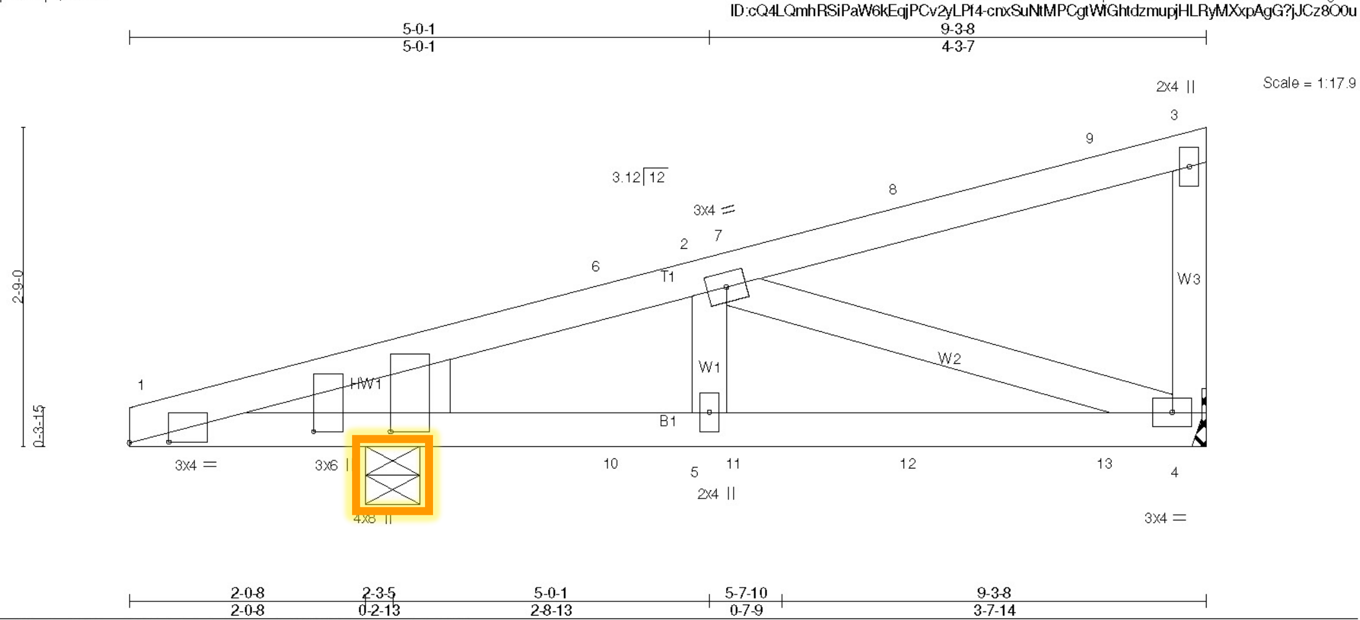

Plate Offsets (X,Y)-- [1:0-4-1,0-0-1], [1:0-1-3,1-7-2], [1:0-1-3,2-3-1]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.31	Vert(LL)	-0.03	1-5	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.36	Vert(CT)	-0.05	1-5	>999	180		
BCLL	0.0 *	Rep Stress Incr	NO	WB	0.33	Horz(CT)	0.01	4	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-SH							Weight: 43 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
WEDGE
Left: 2x6 SP No.2

BRACING-
TOP CHORD Structural wood sheathing directly applied or 5-10-6 oc purlins, except end verticals.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 4=566/Mechanical, 1=394/0-5-10 (min. 0-1-8)
Max Horz 1=98(LC 21)
Max Uplift4=-167(LC 4), 1=-83(LC 4)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-6=-921/188, 2-6=-851/195
BOT CHORD 1-10=-256/855, 5-10=-256/855, 5-11=-256/855, 11-12=-256/855, 12-13=-256/855, 4-13=-256/855
WEBS 2-4=-859/257

NOTES-
1) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone; cantilever left exposed ; end vertical left exposed; Lumber DOL=1.60 plate grip DOL=1.60
2) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
3) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
4) Refer to girder(s) for truss to truss connections.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 167 lb uplift at joint 4 and 83 lb uplift at joint 1.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.
7) Hanger(s) or other connection device(s) shall be provided sufficient to support concentrated load(s) 24 lb down and 53 lb up at 4-3-0, 42 lb down and 79 lb up at 5-3-11, and 46 lb down and 89 lb up at 6-9-12, and 124 lb down and 123 lb up at 8-6-2 on top chord, and 8 lb down at 4-3-0, 19 lb down at 5-3-11, and 28 lb down at 6-9-12, and 82 lb down at 8-6-2 on bottom chord. The design/selection of such connection device(s) is the responsibility of others.
8) In the LOAD CASE(S) section, loads applied to the face of the truss are noted as front (F) or back (B).

LOAD CASE(S) Standard
1) Dead + Roof Live (balanced): Lumber Increase=1.25, Plate Increase=1.25
Uniform Loads (plf)
Vert: 1-3=-60, 1-4=-20
Concentrated Loads (lb)
Vert: 7=-20(B) 8=-43(F) 9=-124(B) 11=-7(B) 12=-14(F) 13=-41(B)

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	J01	Jack-Open	1	1	Job Reference (optional)

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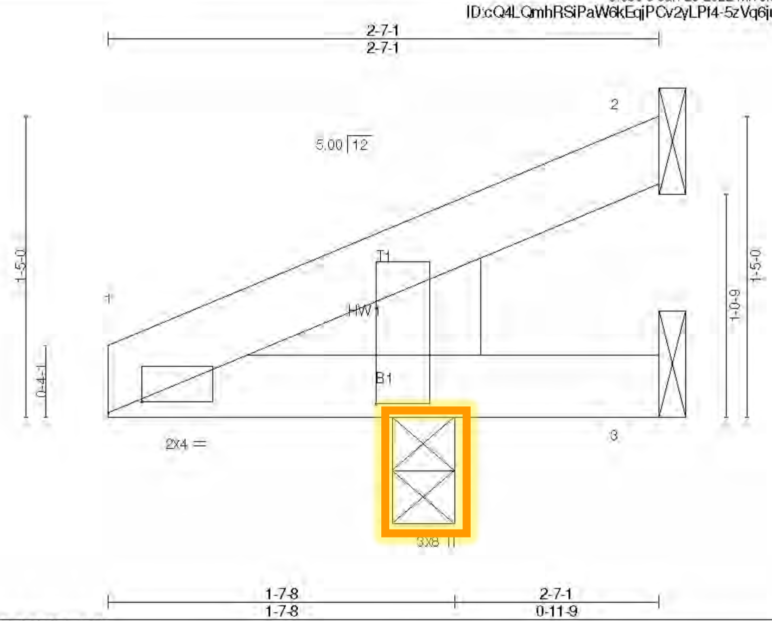

Plate Offsets (X,Y)-- [1:0-1-14,0-0-10], [1:0-0-8,1-3-2]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.10	Vert(LL)	-0.00	1-3	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.06	Vert(CT)	-0.00	1-3	>999	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.00	Horz(CT)	-0.00	2	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-P							Weight: 11 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEDGE
Left: 2x6 SP No.2

BRACING-
TOP CHORD Structural wood sheathing directly applied or 2-7-1 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 2=71/Mechanical, 3=24/Mechanical, 1=95/0-3-8 (min. 0-1-8)
Max Horz 1=44(LC 12)
Max Uplift2=-44(LC 12), 1=-10(LC 12)
Max Grav2=71(LC 1), 3=48(LC 3), 1=95(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
2) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
3) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
4) Refer to girder(s) for truss to truss connections.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 44 lb uplift at joint 2 and 10 lb uplift at joint 1.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	J02	Jack-Open	1	1	Job Reference (optional)

BMC, Frisco, TX 75033 — 8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:35 2022 Page 1
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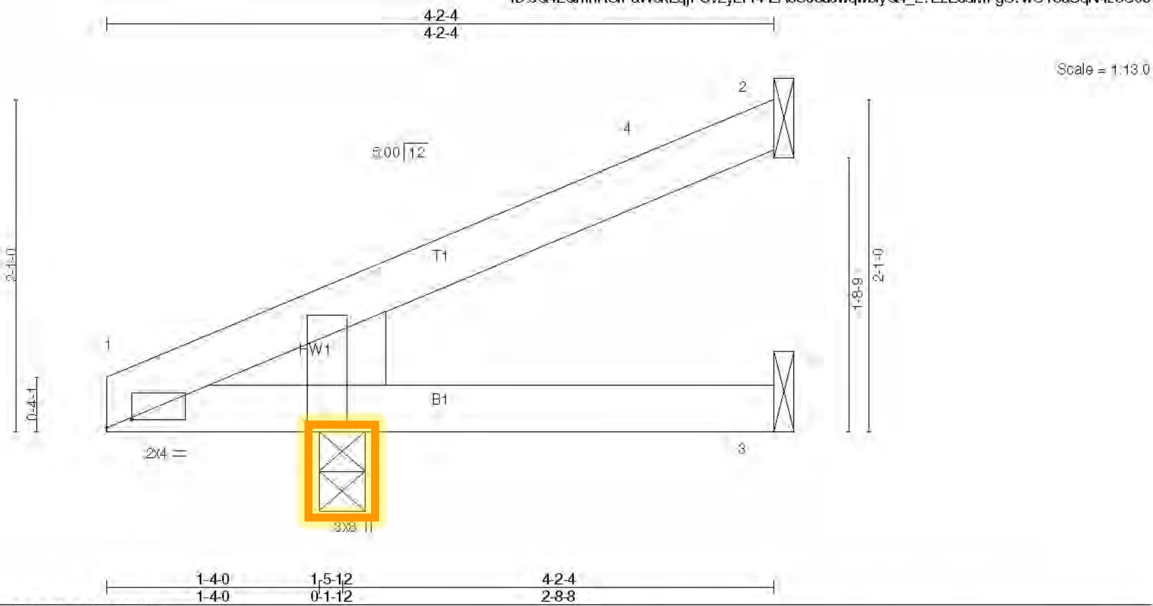

Plate Offsets (X,Y)-- [1:0-1-14,0-0-10], [1:0-0-8,1-3-2]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.28	Vert(LL)	-0.02	1-3	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.19	Vert(CT)	-0.03	1-3	>999	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.00	Horz(CT)	-0.00	2	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-P							Weight: 16 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEDGE
Left: 2x6 SP No.2

BRACING-
TOP CHORD Structural wood sheathing directly applied or 4-2-4 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 2=119/Mechanical, 3=40/Mechanical, 1=159/0-3-8 (min. 0-1-8)
Max Horz 1=71(LC 12)
Max Uplift2=-73(LC 12), 1=-18(LC 12)
Max Grav2=119(LC 1), 3=80(LC 3), 1=159(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-1-12 to 3-6-9, Interior(1) 3-6-9 to 4-1-8 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
2) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
3) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
4) Refer to girder(s) for truss to truss connections.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 73 lb uplift at joint 2 and 18 lb uplift at joint 1.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	J03	Jack-Open	1	1	Job Reference (optional)

BMC, Frisco, TX 75033 — 8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:36 2022 Page 1
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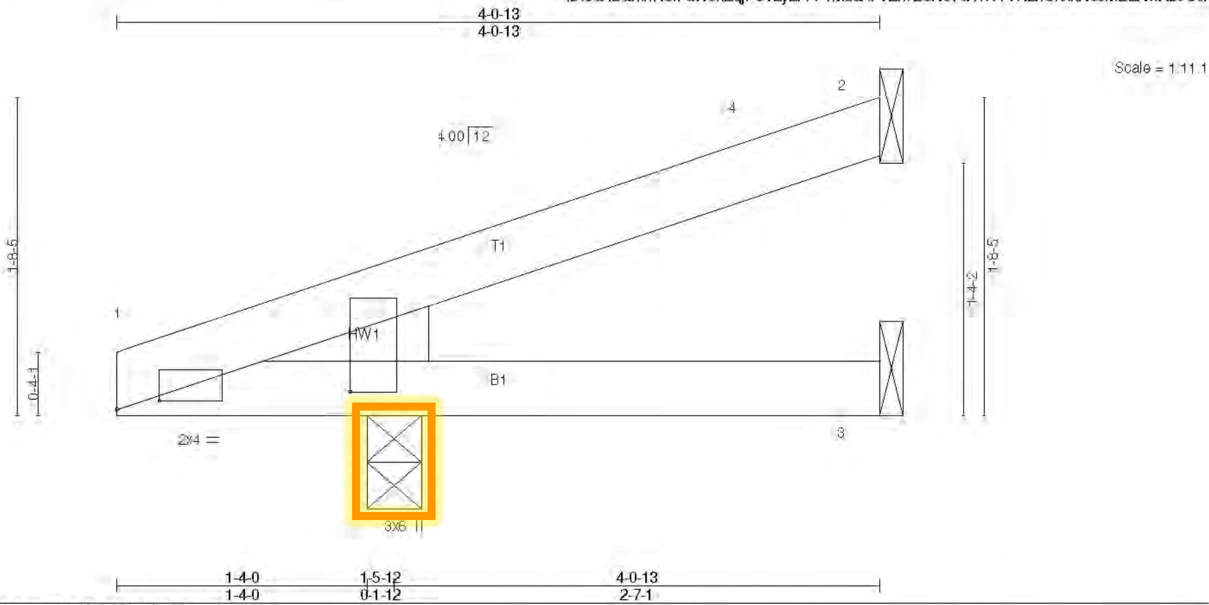

Plate Offsets (X,Y)-- [1:0-2-12,0-0-9], [1:0-1-2,1-2-15]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.32	Vert(LL)	-0.01	1-3	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.18	Vert(CT)	-0.03	1-3	>999	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.00	Horz(CT)	-0.00	2	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-P							Weight: 14 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEDGE
Left: 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 4-0-13 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 2=116/Mechanical, 3=39/Mechanical, 1=154/0-3-8 (min. 0-1-8)
Max Horz 1=56(LC 8)
Max Uplift2=-66(LC 8), 1=-22(LC 8)
Max Grav2=116(LC 1), 3=77(LC 3), 1=154(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-1-12 to 3-6-9, Interior(1) 3-6-9 to 4-0-1 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
2) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
3) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
4) Refer to girder(s) for truss to truss connections.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 66 lb uplift at joint 2 and 22 lb uplift at joint 1.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	J04	Jack-Partial	1	1	Job Reference (optional)

BMC, Frisco, TX 75033

8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:31:37 2022 Page 1
ID:cQ4LQmhRSiPaW6kEqjPCv2yLPf4-VYByklwsSRAJ?GaT6T2i2fusJ2GhTqumbuzwSzz8O0q

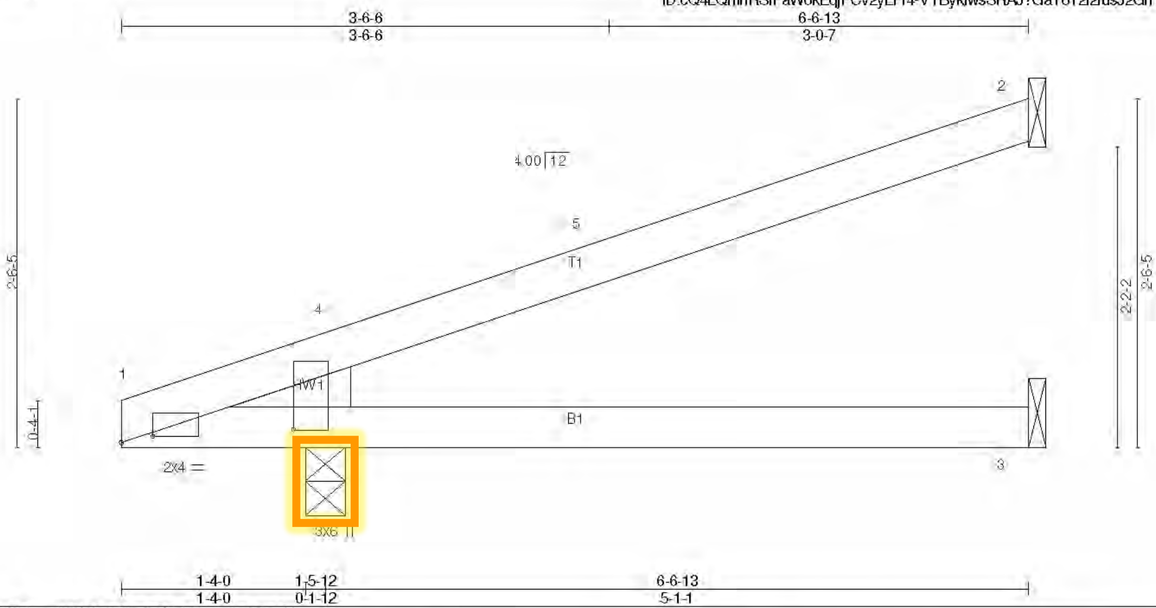

Plate Offsets (X,Y)-- [1:0-2-12,0-0-9], [1:0-1-2,1-2-15]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.76	Vert(LL)	-0.10	1-3	>778	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.52	Vert(CT)	-0.20	1-3	>389	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.00	Horz(CT)	-0.00	2	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-P							Weight: 22 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEDGE
Left: 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 2=191/Mechanical, 3=64/Mechanical, 1=254/0-3-8 (min. 0-1-8)
Max Horz 1=90(LC 8)
Max Uplift2=-107(LC 8), 1=-38(LC 8)
Max Grav2=191(LC 1), 3=127(LC 3), 1=254(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) 0-1-12 to 3-6-9, Interior(1) 3-6-9 to 6-6-1 zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
2) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
3) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
4) Refer to girder(s) for truss to truss connections.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 107 lb uplift at joint 2 and 38 lb uplift at joint 1.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Job	Truss	Truss Type	Qty	Ply	HABITAT / SEQUOIA / B
ELEVATION B	V01	Valley	1	1	Job Reference (optional)

BMC, Frisco, TX 75033 8.530 s Jan 25 2022 MiTek Industries, Inc. Wed Jun 8 09:32:00 2022 Page 1
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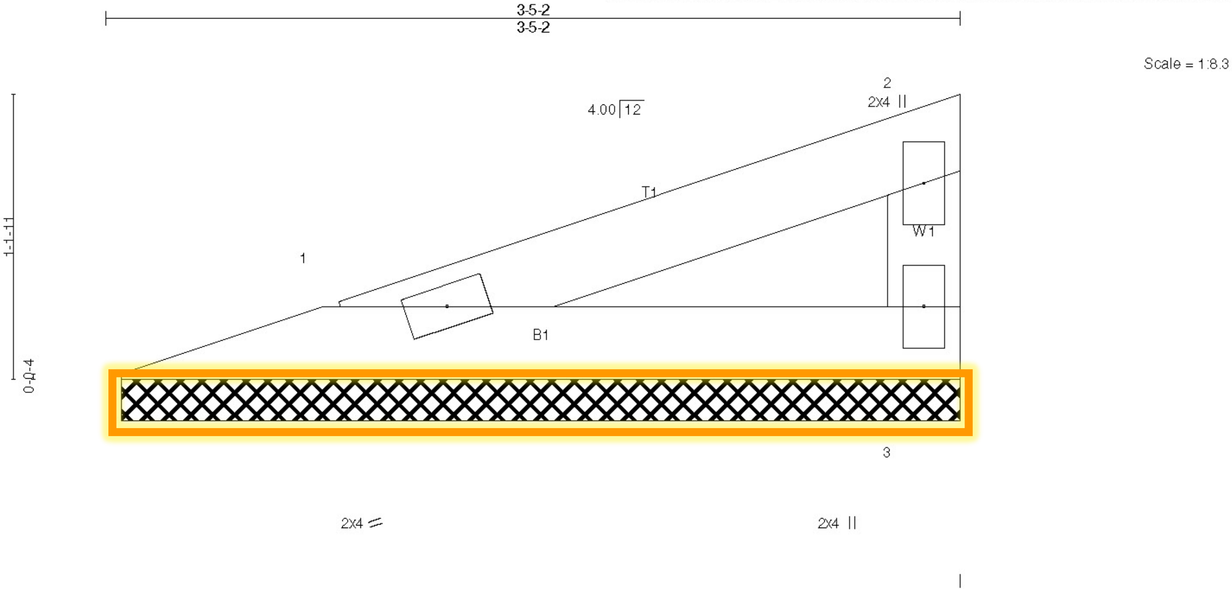


LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.25	TC	0.09	Vert(LL)	n/a	-	n/a	999	MT20	244/190
TCDL	10.0	Lumber DOL	1.25	BC	0.06	Vert(CT)	n/a	-	n/a	999		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.00	Horz(CT)	0.00		n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-P							Weight: 10 lb	FT = 10%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 3-5-2 oc purlins, except end verticals.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS. (lb/size) 1=94/3-4-6 (min. 0-1-8), 3=94/3-4-6 (min. 0-1-8)
Max Horz 1=32(LC 8)
Max Uplift1=-14(LC 8), 3=-25(LC 8)

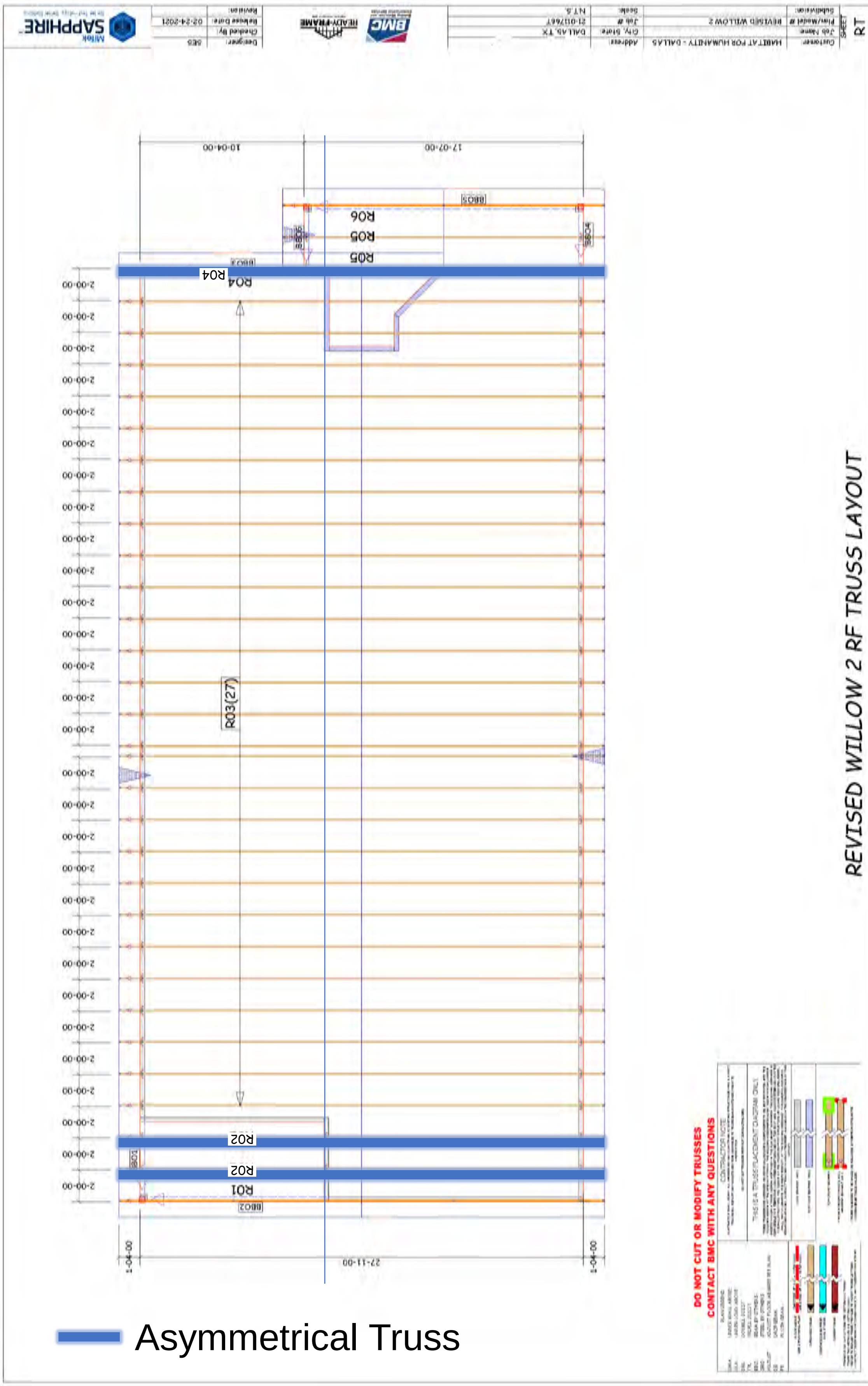
FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; Enclosed; MWFRS (envelope) gable end zone and C-C Exterior(2E) zone; cantilever left exposed ; end vertical left exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
2) Gable requires continuous bottom chord bearing.
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 3.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

Willow Floor Plan

064	Length*	Height*	Weight (lb)*	Quantity	Notes	Page
R01 Back Gable	30’ 7”	6’ 5”	164	1	Symmetrical	D-47
R02 Common	30’ 7”	6’ 8½”	141	2	Asymmetrical	D-48
R03 Common	30’ 7”	6’ 8½”	135	27	Symmetrical	D-49
R04 Garage Gable	30’ 7”	6’ 5”	205	1	Asymmetrical	D-50
R05 Common	20’ 3”	4’ 6”	89	2	Symmetrical	D-51
R06 Front Gable	20’ 3”	4’ 3”	95	1	Symmetrical	D-52
* Approximate				34		


REVISED WILLOW 2 RF TRUSS LAYOUT
DO NOT CUT OR MODIFY TRUSSES
CONTACT BMC WITH ANY QUESTIONS
R03(27)
Asymmetrical Truss

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity / Willow 2
22-0439157	R01	Common Supported Gable	1	1	Job Reference (optional) R70549052

Builders FirstSource (Frisco, TX), Frisco, TX - 75034, 8.530 s Feb 3 2022 MiTek Industries, Inc. Thu Apr 21 15 40 32 2022 Page 1
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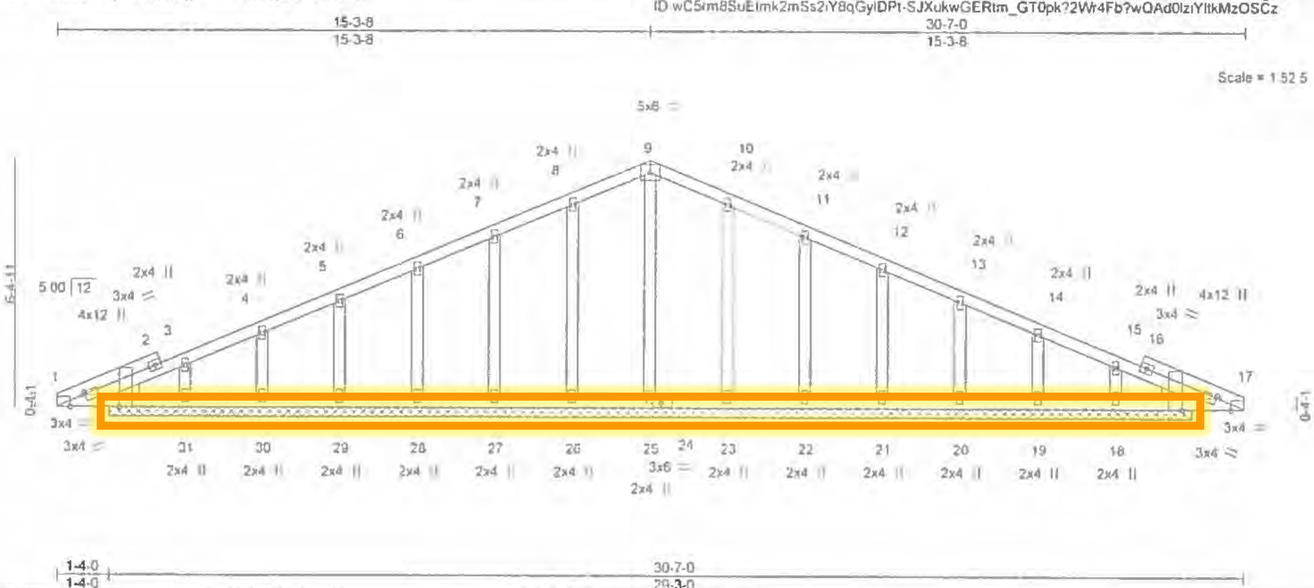

Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-3-13,Edge], [1:0-0-12,0-0-12], [17:0-3-8,Edge], [17:0-3-13,Edge], [17:0-0-12,0-0-12], [24:0-2-8,0-1-8]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.15	TC	0.09	Vert(LL)	n/a	-	n/a	999	MT20	244/190
TCDL	10.0	Lumber DOL	1.15	BC	0.07	Vert(CT)	n/a	-	n/a	999		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.08	Horz(CT)	0.00	17	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-S							Weight: 164 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
OTHERS 2x4 SP No.3
WEDGE
Left: 2x4 SP No.3, Right: 2x4 SP No.3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 6-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

REACTIONS. All bearings 27-11-0.
(lb) - Max Horz 1=-99(LC 10)
Max Uplift All uplift 100 lb or less at joint(s) 26, 27, 28, 29, 30, 31, 23, 22, 21, 20, 19, 18
Max Grav All reactions 250 lb or less at joint(s) 1, 17, 25, 26, 27, 28, 29, 30, 31, 23, 22, 21, 20, 19, 18

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; B=70ft; L=31ft; eave=2ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Corner(3E) 0-0-0 to 3-3-8, Exterior(2N) 3-3-8 to 15-3-8, Corner(3R) 15-3-8 to 18-4-3, Exterior(2N) 18-4-3 to 30-7-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) Solid blocking is required on both sides of the truss at joint(s), 1.
8) One RT4 MiTek connectors recommended to connect truss to bearing walls due to UPLIFT at jt(s) 26, 27, 28, 29, 30, 31, 23, 22, 21, 20, 19, and 18. This connection is for uplift only and does not consider lateral forces.
9) Non Standard bearing condition. Review required.
10) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

STATE OF TEXAS
DAVID BAXTER
118383
LICENSED PROFESSIONAL ENGINEER
COR F-12513
April 21,2022

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity / Willow 2
22-043915T	R02	Common	2	1	R70549053 Job Reference (optional)

Builders FirstSource (Frisco, TX), Frisco, TX - 75034, 8.530 s Dec 6 2021 MiTek Industries, Inc. Thu Apr 21 13:38:41 2022 Page 1
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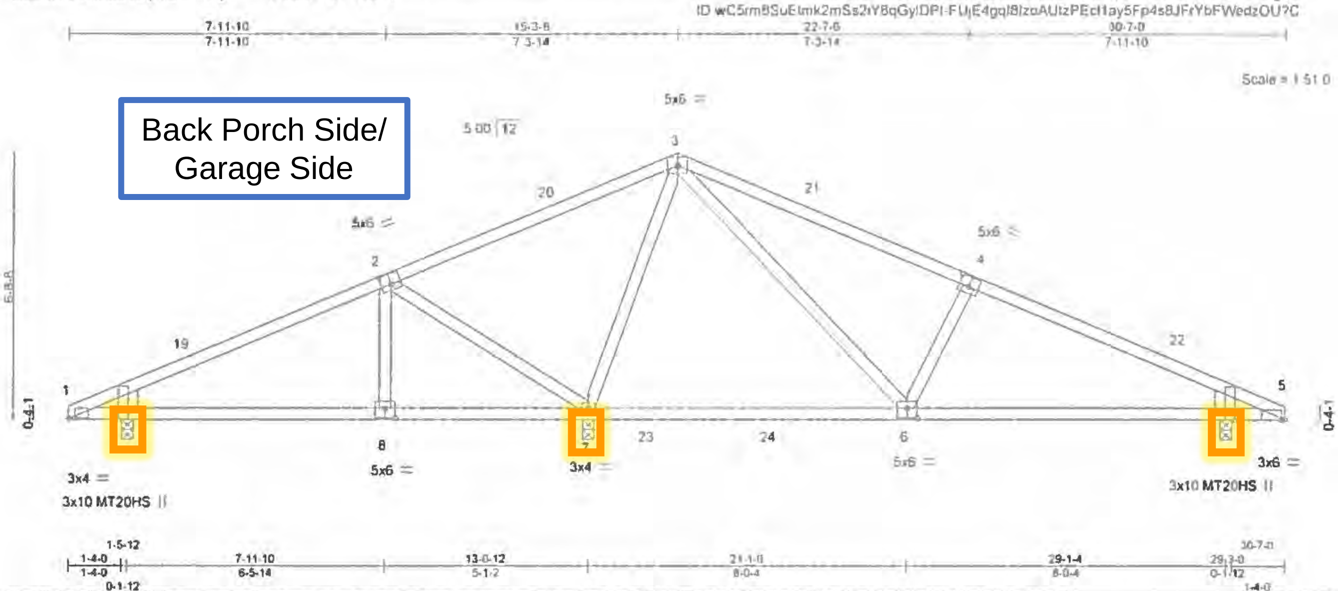

Plate Offsets (X,Y)-- [1:0-0-4,Edge], [1:0-1-14,0-0-2], [2:0-3-0,0-3-4], [4:0-3-0,0-3-0], [5:0-0-14,Edge], [5:0-0-4,Edge], [6:0-3-0,0-3-0], [8:0-3-0,0-3-0]

LOADING (psf)		SPACING-		CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.15	TC	0.52	Vert(LL)	-0.14	6-7	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.15	BC	0.58	Vert(CT)	-0.22	6-7	>946	180	MT20HS	187/143
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.82	Horz(CT)	0.01	5	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-AS							Weight: 141 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
WEDGE
Left: 2x6 SP No.2 , Right: 2x6 SP No.2

BRACING-
TOP CHORD Structural wood sheathing directly applied.
BOT CHORD Rigid ceiling directly applied.

REACTIONS. (size) 7=0-3-8, 1=0-3-8, 5=0-3-8
Max Horz 1=103(LC 11)
Max Uplift 7=-105(LC 12), 1=-44(LC 12), 5=-61(LC 12)
Max Grav 7=1465(LC 19), 1=518(LC 25), 5=742(LC 18)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-409/81, 2-3=0/405, 3-4=-682/164, 4-5=-819/138
BOT CHORD 1-8=-7/323, 7-8=-10/318, 5-6=-53/695
WEBS 2-7=-666/157, 3-7=-910/169, 3-6=-81/835, 4-6=-397/179

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; B=70ft; L=31ft; eave=4ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Exterior(2E) 0-0-0 to 3-0-11, Interior(1) 3-0-11 to 15-3-8, Exterior(2R) 15-3-8 to 18-4-3, Interior(1) 18-4-3 to 30-7-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) All plates are MT20 plates unless otherwise indicated.
4) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
5) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members, with BCDL = 10.0psf.
6) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 5 except (jt=lb) 7=105.
7) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.
8) This truss design requires that a minimum of 7/16" structural wood sheathing be applied directly to the top chord and 1/2" gypsum sheetrock be applied directly to the bottom chord.

STATE OF TEXAS
DAVID BAXTER
118383
LICENSED
PROFESSIONAL ENGINEER

COR F-12513
April 21,2022

WARNING - Verify design parameters and READ NOTES ON THIS AND INCLUDED MITEK REFERENCE PAGE MII-7473 rev. 5/19/2020 BEFORE USE.
Design valid for use only with MiTek® connectors. This design is based only upon parameters shown, and is for an individual building component, not a truss system. Before use, the building designer must verify the applicability of design parameters and properly incorporate this design into the overall building design. Bracing indicated is to prevent buckling of individual truss web and/or chord members only. Additional temporary and permanent bracing is always required for stability and to prevent collapse with possible personal injury and property damage. For general guidance regarding the fabrication, storage, delivery, erection and bracing of trusses and truss systems, see *ANSI/TPI1 Quality Criteria, DSB-89 and BCSI Building Component Safety Information* available from Truss Plate Institute, 2670 Crain Highway, Suite 203 Waldorf, MD 20601

MiTek USA, Inc.
400 Sunrise Avenue, Suite 270
Roseville, CA 95661

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity / Willow 2
22-043915T	R03	Common	27	1	R70549054 Job Reference (optional)

Builders FirstSource (Frisco, TX), Frisco, TX - 75034, 8 530 s Dec 6 2021 MiTek Industries, Inc. Thu Apr 21 13 38 42 2022 Page 1
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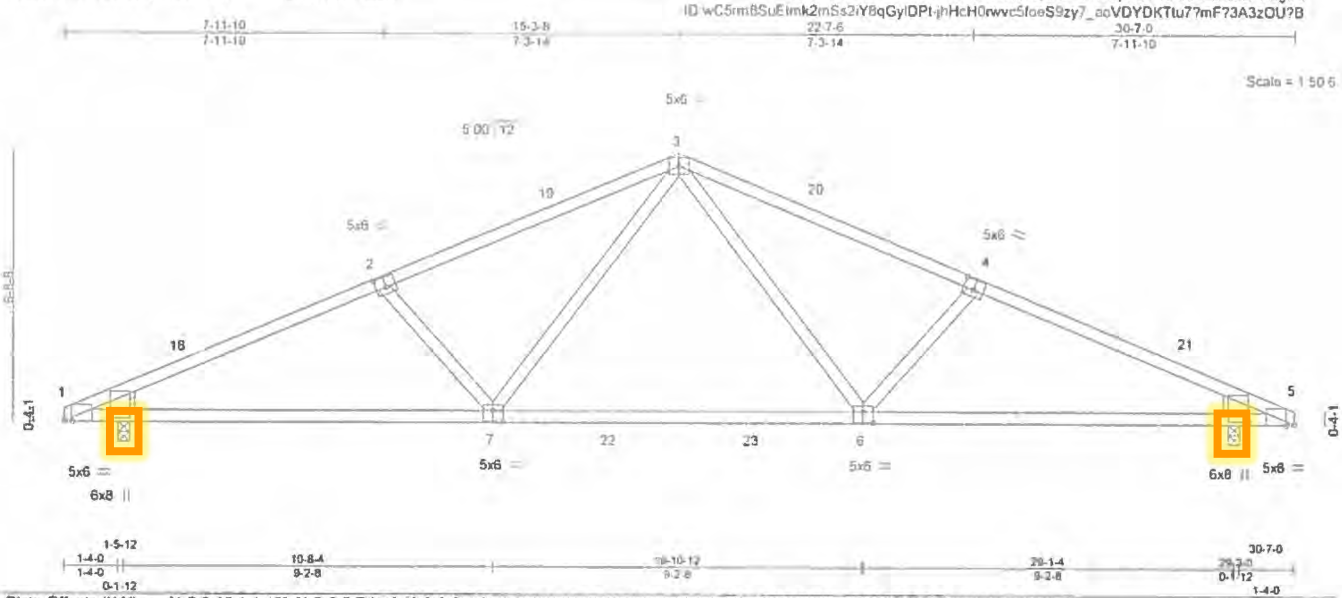

Plate Offsets (X,Y)-- [1:0-0-12,1-1-10], [1:0-2-5,Edge], [2:0-3-0,0-3-0], [4:0-3-0,0-3-0], [5:0-0-12,1-1-10], [5:0-2-5,Edge], [6:0-3-0,0-3-4], [7:0-3-0,0-3-4]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.15	TC	0.74	Vert(LL)	-0.42	6-7	>875	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.15	BC	0.94	Vert(CT)	-0.71	6-7	>520	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.27	Horz(CT)	0.07	5	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-AS							Weight: 135 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2 *Except*
1-2,4-5: 2x4 SP 1650F 1.5E or 2x4 SP No.1 or 2x4 SP SS
BOT CHORD 2x4 SP 1650F 1.5E or 2x4 SP No.1 or 2x4 SP SS
WEBS 2x4 SP No.3
WEDGE
Left: 2x6 SP No.2 , Right: 2x6 SP No.2

BRACING-
TOP CHORD Structural wood sheathing directly applied.
BOT CHORD Rigid ceiling directly applied.

REACTIONS. (size) 1=0-3-8, 5=0-3-8
Max Horz 1=-103(LC 10)
Max Uplift 1=-105(LC 12), 5=-105(LC 12)
Max Grav 1=1338(LC 17), 5=1338(LC 18)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-2088/293, 2-3=-1889/282, 3-4=-1888/282, 4-5=-2089/293
BOT CHORD 1-7=-196/1892, 6-7=-79/1344, 5-6=-188/1843
WEBS 3-6=-16/649, 4-6=-341/169, 3-7=-18/651, 2-7=-340/168

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; B=70ft; L=31ft; eave=4ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Exterior(2E) 0-0-0 to 3-0-11, Interior(1) 3-0-11 to 15-3-8, Exterior(2R) 15-3-8 to 18-4-3, Interior(1) 18-4-3 to 30-7-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members, with BCDL = 10.0psf.
5) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 1=105, 5=105.
6) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.
7) This truss design requires that a minimum of 7/16" structural wood sheathing be applied directly to the top chord and 1/2" gypsum sheetrock be applied directly to the bottom chord.

COR F-12513
April 21,2022

WARNING - Verify design parameters and READ NOTES ON THIS AND INCLUDED MITEK REFERENCE PAGE MII-7473 rev. 5/19/2020 BEFORE USE.
Design valid for use only with MiTek® connectors. This design is based only upon parameters shown, and is for an individual building component, not a truss system. Before use, the building designer must verify the applicability of design parameters and properly incorporate this design into the overall building design. Bracing indicated is to prevent buckling of individual truss web and/or chord members only. Additional temporary and permanent bracing is always required for stability and to prevent collapse with possible personal injury and property damage. For general guidance regarding the fabrication, storage, delivery, erection and bracing of trusses and truss systems, see *ANSI/TPI1 Quality Criteria, DSB-89 and BCSI Building Component Safety Information* available from Truss Plate Institute, 2670 Crain Highway, Suite 203 Waldorf, MD 20601

MiTek
MiTek USA, Inc
400 Sunrise Avenue, Suite 270
Roseville, CA 95661

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity / Willow 2
22-043915T	R04	COMMON STRUCTURAL GA	1	1	R70549055 Job Reference (optional)

Builders FirstSource (Frisco, TX), Frisco, TX - 75034

8.530 s Feb 3 2022 MiTek Industries, Inc. Thu Apr 21 15 37 22 2022 Page 1
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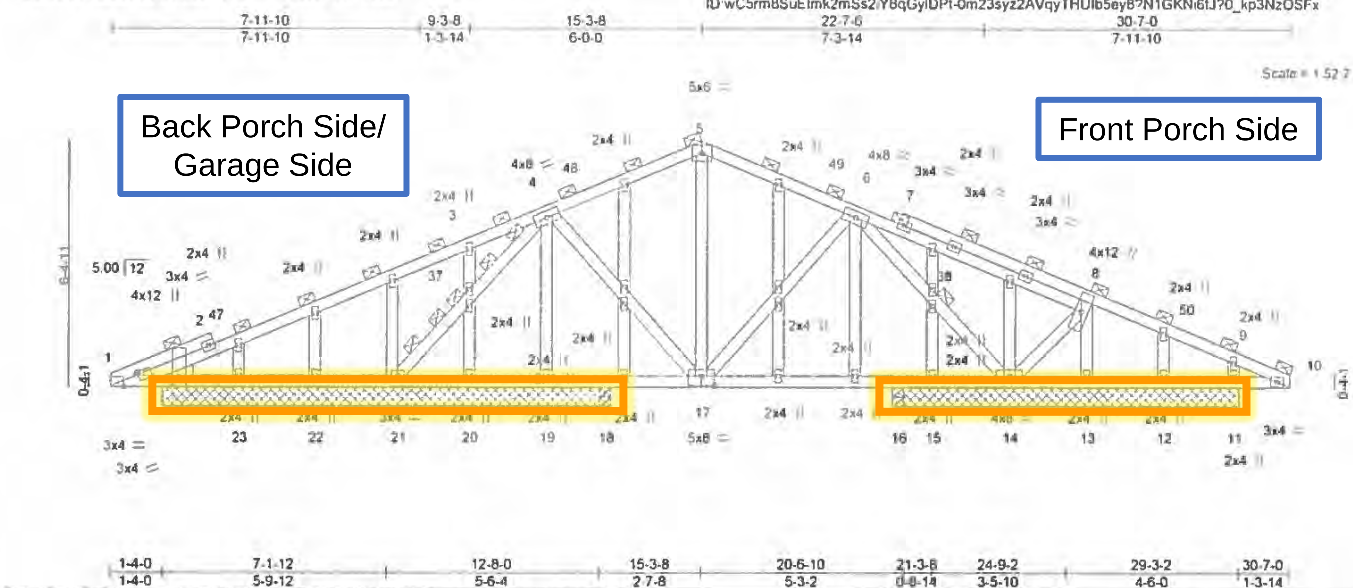

Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-3-13,Edge], [1:0-0-12,0-0-12], [17:0-4-0,0-3-0]

LOADING (psf)		SPACING-		CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.15	TC	0.45	Vert(LL)	0.05	39	>339	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.15	BC	0.84	Vert(CT)	0.07	39	>231	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	1.00	Horz(CT)	0.01	11	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-AS							Weight: 205 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
OTHERS 2x4 SP No.3
WEDGE
Left: 2x4 SP No.3

BRACING-
TOP CHORD 2-0-0 oc purlins (6-0-0 max.).
BOT CHORD Rigid ceiling directly applied.
WEBS 2 Rows at 1/3 pts 21-37, 4-37
JOINTS 1 Brace at Jt(s): 10, 5, 37, 38

REACTIONS. All bearings 11-7-8 except (jt=length) 14=9-0-0, 13=9-0-0, 12=9-0-0, 15=9-0-0, 11=9-0-0, 18=0-3-8, 16=0-3-8.
(lb) - Max Horz 1=-98(LC 10)
Max Uplift All uplift 100 lb or less at joint(s) 1, 21, 22, 15, 11 except 23=-109(LC 12), 14=-174(LC 12)
Max Grav All reactions 250 lb or less at joint(s) 1, 19, 20, 22, 13, 12, 18, 16, 1 except 21=540(LC 1), 23=331(LC 1), 14=844(LC 1), 11=252(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 4-48=-437/183, 5-48=-417/199, 5-49=-381/192, 6-49=-433/176, 6-7=-35/294
BOT CHORD 20-21=-76/426, 19-20=-76/426, 18-19=-76/426, 17-18=-76/426, 16-17=-18/314, 15-16=-18/314, 14-15=-18/314
WEBS 21-37=-568/119, 4-37=-386/45, 6-38=-783/233, 14-38=-770/229, 8-14=-313/128

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; B=70ft; L=31ft; eave=4ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Exterior(2E) 0-0-0 to 3-0-11, Interior(1) 3-0-11 to 15-3-8, Exterior(2R) 15-3-8 to 18-4-3, Interior(1) 18-4-3 to 30-7-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 21, 22, 15, 11, 1 except (jt=lb) 23=109, 14=174.
8) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.
9) Graphical purlin representation does not depict the size or the orientation of the purlin along the top and/or bottom chord.

LOAD CASE(S) Standard

COR F-12513
April 21,2022

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity / Willow 2
22-043915T	R05	Common	2	1	R70549056 Job Reference (optional)

Builders FirstSource (Frisco, TX), Frisco, TX - 75034, 8.530 s Dec 6 2021 MiTek Industries, Inc. Thu Apr 21 13:38:46 2022 Page 1
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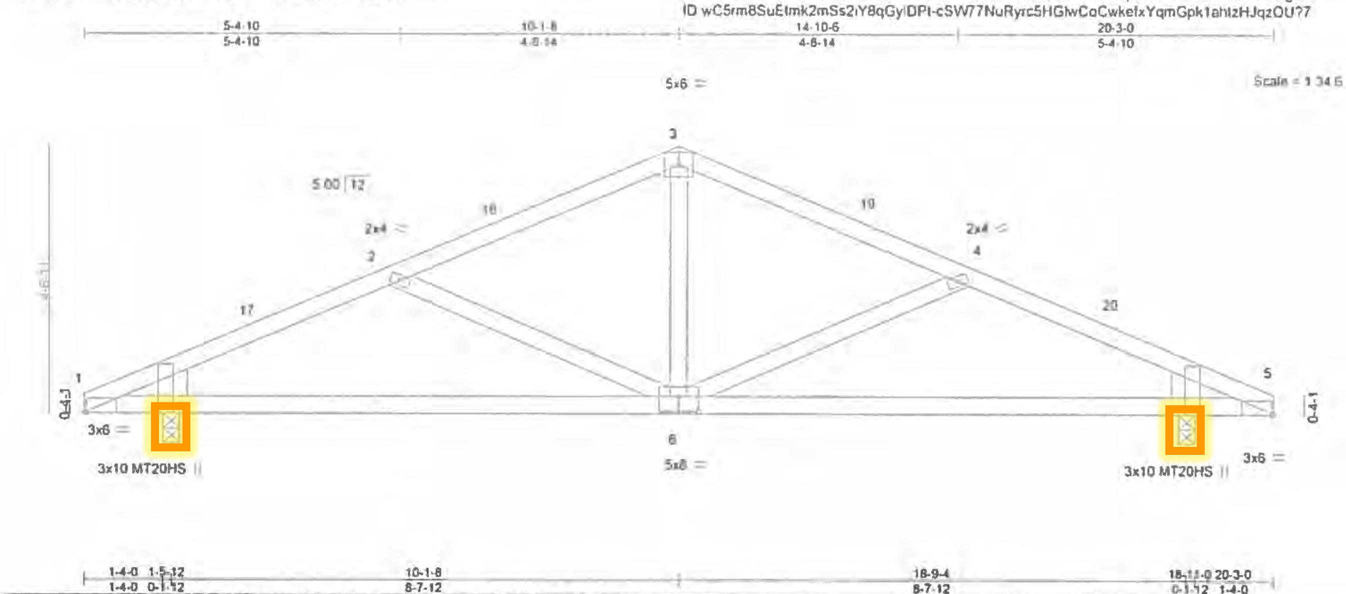

Plate Offsets (X,Y)-- [1:0-0-6,Edge], [1:0-0-4,Edge], [5:0-0-4,Edge], [5:0-0-6,Edge], [6:0-4-0,0-3-0]

LOADING (psf)		SPACING-	2-0-0	CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20.0	Plate Grip DOL	1.15	TC	0.55	Vert(LL)	-0.07	6-16	>999	240	MT20	244/190
TCDL	10.0	Lumber DOL	1.15	BC	0.62	Vert(CT)	-0.15	6-16	>999	180	MT20HS	187/143
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.14	Horz(CT)	0.02	5	n/a	n/a		
BCDL	10.0	Code IRC2018/TPI2014		Matrix-AS							Weight: 89 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
WEBS 2x4 SP No.3
WEDGE
Left: 2x6 SP No.2 , Right: 2x6 SP No.2

BRACING-
TOP CHORD Structural wood sheathing directly applied.
BOT CHORD Rigid ceiling directly applied.

REACTIONS. (size) 1=0-3-8, 5=0-3-8
Max Horz 1=-65(LC 10)
Max Uplift 1=-69(LC 12), 5=-69(LC 13)
Max Grav 1=810(LC 1), 5=810(LC 1)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 1-2=-1065/276, 2-3=-852/214, 3-4=-852/214, 4-5=-1065/276
BOT CHORD 1-6=-186/917, 5-6=-181/917
WEBS 3-6=0/377

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; B=70ft; L=28ft; eave=4ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Exterior(2E) 0-0-0 to 3-0-0, Interior(1) 3-0-0 to 10-1-8, Exterior(2R) 10-1-8 to 13-1-8, Interior(1) 13-1-8 to 20-3-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) All plates are MT20 plates unless otherwise indicated.
4) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
5) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
6) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) 1, 5.
7) This truss is designed in accordance with the 2018 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.
8) This truss design requires that a minimum of 7/16" structural wood sheathing be applied directly to the top chord and 1/2" gypsum sheetrock be applied directly to the bottom chord.

STATE OF TEXAS
DAVID BAXTER
118383
LICENSED
PROFESSIONAL ENGINEER

COR F-12513
April 21,2022

WARNING - Verify design parameters and READ NOTES ON THIS AND INCLUDED MITEK REFERENCE PAGE MII-7473 rev. 5/19/2020 BEFORE USE.
Design valid for use only with MiTek® connectors. This design is based only upon parameters shown, and is for an individual building component, not a truss system. Before use, the building designer must verify the applicability of design parameters and properly incorporate this design into the overall building design. Bracing indicated is to prevent buckling of individual truss web and/or chord members only. Additional temporary and permanent bracing is always required for stability and to prevent collapse with possible personal injury and property damage. For general guidance regarding the fabrication, storage, delivery, erection and bracing of trusses and truss systems, see ***ANSI/TPI1 Quality Criteria, DSB-89 and BCSI Building Component Safety Information*** available from Truss Plate Institute, 2670 Crain Highway, Suite 203 Waldorf, MD 20601

MiTek
MiTek USA, Inc.
400 Sunrise Avenue, Suite 270
Roseville, CA 95661

Dallas Area Habitat for Humanity®

Job	Truss	Truss Type	Qty	Ply	Habitat for Humanity / Willow 2
22-043915T	R06	Common Supported Gable	1	1	R70549057 Job Reference (optional)

Builders FirstSource (Frisco, TX), Frisco, TX - 75034,

8 530 s Feb 3 2022 MiTek Industries, Inc. Thu Apr 21 15 39 48 2022 Page 1
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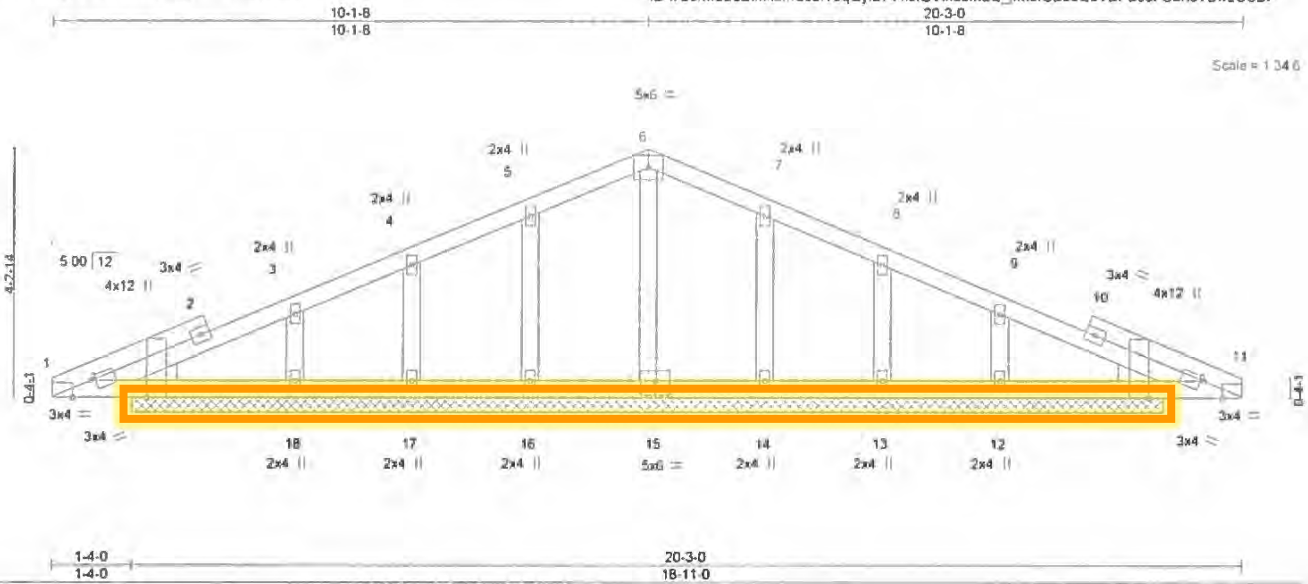

Plate Offsets (X,Y)-- [1:0-3-8,Edge], [1:0-3-13,Edge], [1:0-0-12,0-0-12], [11:0-3-8,Edge], [11:0-3-13,Edge], [11:0-0-12,0-0-12], [15:0-3-0,0-3-0]

LOADING (psf)		SPACING-		CSI.		DEFL.	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	20 0	Plate Grip DOL	1.15	TC	0.19	Vert(LL)	n/a	-	n/a	999	MT20	244/190
TCDL	10 0	Lumber DOL	1.15	BC	0.11	Vert(CT)	n/a	-	n/a	999		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.05	Horz(CT)	0.00	11	n/a	n/a		
BCDL	10 0	Code IRC2018/TPI2014		Matrix-S							Weight: 95 lb	FT = 0%

LUMBER-
TOP CHORD 2x4 SP No.2
BOT CHORD 2x4 SP No.2
OTHERS 2x4 SP No 3
WEDGE
Left: 2x4 SP No 3 , Right: 2x4 SP No 3

BRACING-
TOP CHORD Structural wood sheathing directly applied or 10-0-0 oc purlins.
BOT CHORD Rigid ceiling directly applied or 6-0-0 oc bracing.

REACTIONS. All bearings 17-7-0.
(lb) - Max Horz 1=-61(LC 10)
Max Uplift All uplift 100 lb or less at joint(s) 1, 11, 16, 17, 18, 14, 13, 12
Max Grav All reactions 250 lb or less at joint(s) 1, 11, 15, 16, 17, 14, 13 except 18=310(LC 23), 12=310(LC 24)

FORCES. (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.

NOTES-
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-16; Vult=115mph (3-second gust) Vasd=91mph; TCDL=6.0psf; BCDL=6.0psf; h=25ft; B=70ft; L=28ft; eave=2ft; Cat. II; Exp C; Enclosed; MWFRS (directional) and C-C Corner(3E) 0-0-0 to 3-0-0, Exterior(2N) 3-0-0 to 10-1-8, Corner(3R) 10-1-8 to 13-1-8, Exterior(2N) 13-1-8 to 20-3-0 zone; cantilever left and right exposed ; end vertical left and right exposed;C-C for members and forces & MWFRS for reactions shown; Lumber DOL=1.60 plate grip DOL=1.60
3) Truss designed for wind loads in the plane of the truss only. For studs exposed to wind (normal to the face), see Standard Industry Gable End Details as applicable, or consult qualified building designer as per ANSI/TPI 1.
4) Gable studs spaced at 2-0-0 oc.
5) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
6) * This truss has been designed for a live load of 20.0psf on the bottom chord in all areas where a rectangle 3-6-0 tall by 2-0-0 wide will fit between the bottom chord and any other members.
7) Solid blocking is required on both sides of the truss at joint(s), 1, 11.
8) One RT4 MiTek connectors recommended to connect truss to bearing walls due to UPLIFT at jt(s) 1, 11, 16, 17, 18, 14, 13, and 12. This connection is for uplift only and does not consider lateral forces.
9) Non Standard bearing condition. Review required.
10) This truss is designed in accordance with the 2018 International Residential Code sections R502 11 1 and R802 10 2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard

COR F-12513
April 21,2022

Exterior Trim Details

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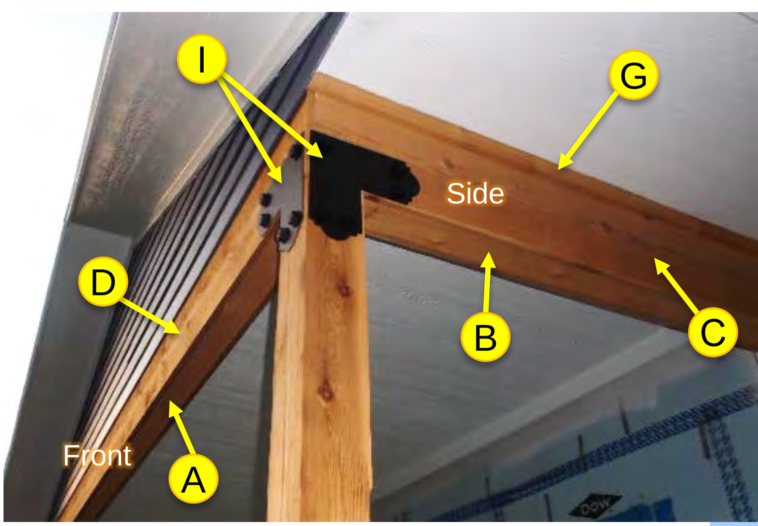
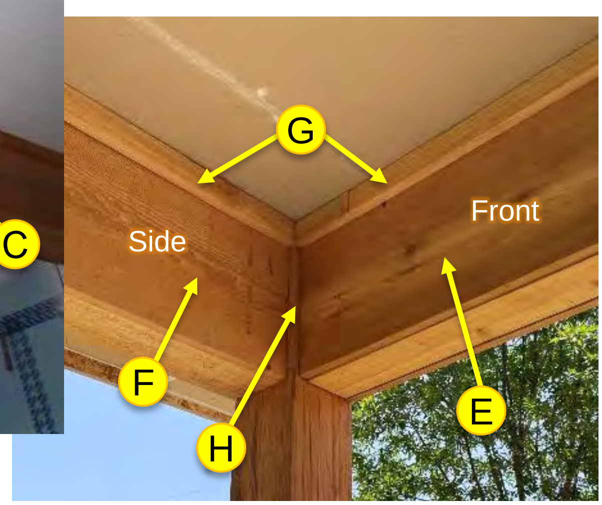
Front Porch Trim
(Hawthorne, Magnolia, Willow)

Installation Steps

A. Measure the maximum width of beam bottom and rip a 1x6 to this measurement. Install the bottom trim on the front beam (porch post to porch post).
B. Install bottom trim on the side beam(s).
C. Install 1x12 on the exterior of the side beam(s). Bottom of 1x12 is flush with the bottom trim (no reveal).
D. Install exterior front beam 1x12 trim; should cover ends on side beam 1x12 with bottom flush with the bottom trim (no reveal). If the lumber is too short to span the beam, join two pieces of trim with a scarf joint approximately midway on the beam.
E. Install 1x12 to the interior of the front beam.
F. Install 1x12 to the interior of the side beam(s).
G. Add 1x2 strips (leftover 1x6 from Step A) to cover the inside seam between the beam and porch ceiling and between the side beam(s) and soffit.
H. Add a ¾" square piece of trim on the inside of the porch between the 1x2 trim at the ceiling and top of the post.
I. Install ornamental L-straps to connect the posts to the front and sides beams using structural screws and hex washers.



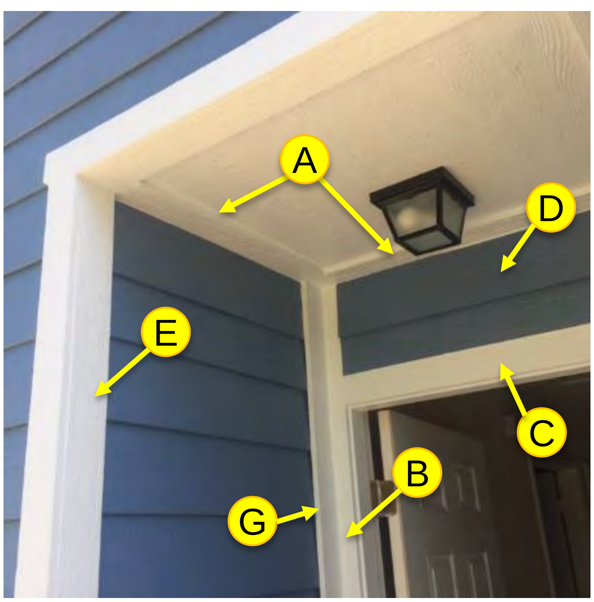


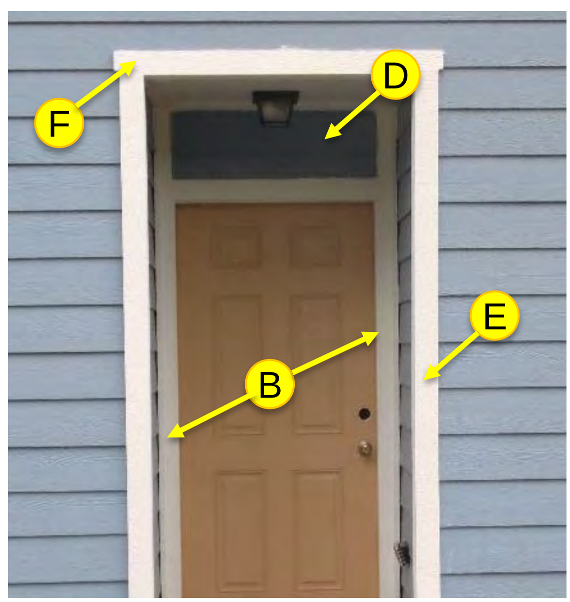
Back Porch Trim (Magnolia)

Before trimming out the door, install the porch ceiling and remove existing molding from door

Installation Steps

A. Install 1x4 trim flat against ceiling edges
B. Install 1x4 on each side of door jam (bottom aligned to bottom of siding to ceiling flat 1x4) with a ¼" reveal (Note: siding and/or trim should be at least a ½' above the slab)
C. Install 1x4 between vertical door trim on top of door with a ¼" reveal
D. Cut soffit material to fit inside area surrounded by door/ceiling trim
E. Install outside corner trim (California corner)
F. Install 1x4 trim over corner trim overhanging by ¾" each side
G. Install 1x4 trim to back wall over siding





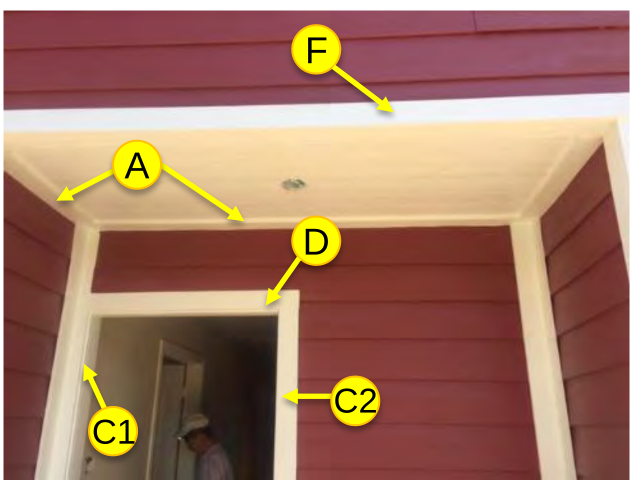
Back Porch Trim (Hawthorne)

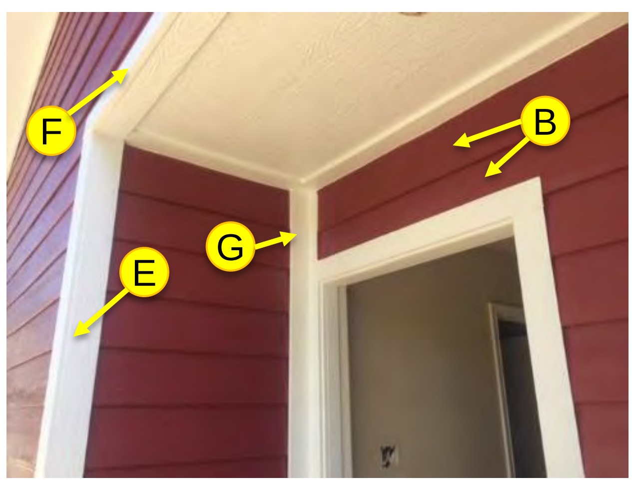
Before trimming out the door, install the porch ceiling and remove existing molding from door and install 1x2 spacers on top of door jam sides and top

Installation Steps

A. Install 1x4 trim flat against ceiling edges
B. Install siding over and around door
C. Install 1x4 on each side of door jam
   1. For the trim piece adjacent to the side wall, the bottom aligned to bottom of siding to ceiling flat 1x4
   2. For the other trim piece, the bottom is aligned with the bottom of the siding and to the top of the jamb with a ¼" reveal

   (Note: siding and/or trim should be at least a ½' above the slab)
D. Install 1x4 between vertical door trim on top of door – use ¼" reveal
E. Install outside corner trim (California corner)
F. Install horizontal 1x4 trim over corner trim overhanging by ¾"
G. Install 1x4 trim to back wall over siding



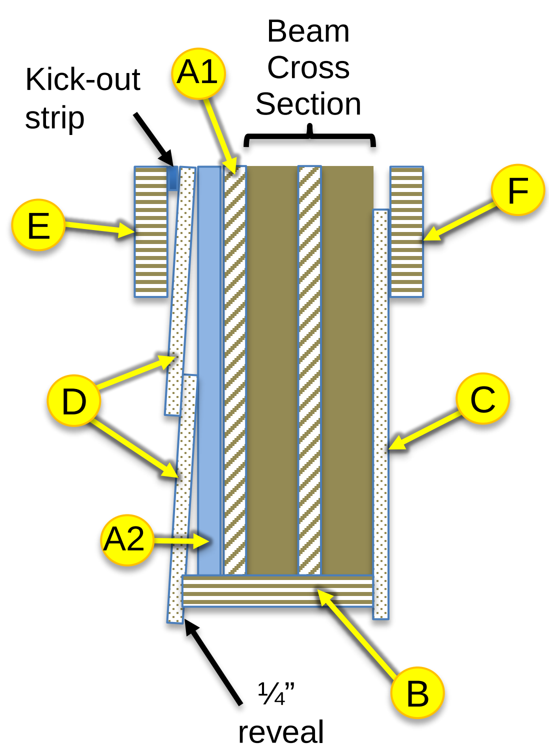


Side Porch Beam Trim (Trinity/Sabine)

Before trimming the beam, install the porch ceiling

<u>Installation Steps</u>

A. To furr out the beam, on the exterior side of the beam install:
   1. Sheathing over beam
   2. Blue Board over sheathing
B. Cut 1x6 trim cut to 4¾" wide to cover the bottom of the beam and provide kick-out for siding (may require shims between beam and trim to obtain proper height)
C. Install 1x12 trim to interior side of beam
D. Install two rows of siding. It is critical that the beam siding aligns with the house siding.
E. Install siding frieze on the exterior side of the beam.
F. Install 1x4 trim on interior of beam to cover gap between 1x12 and porch ceiling

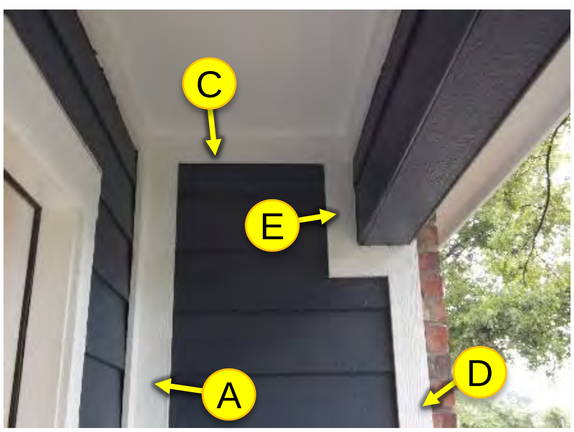


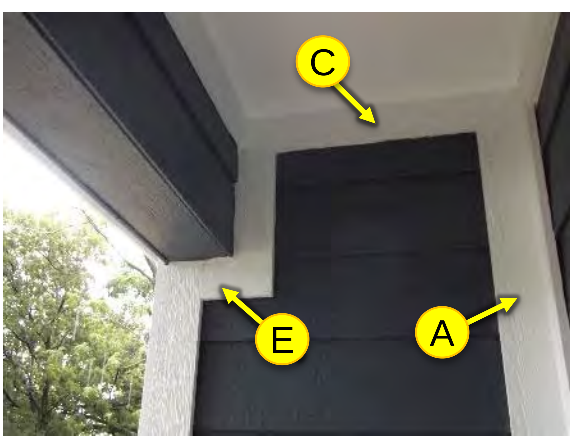
Side Porch Trim (Trinity/Sabine)

Before trimming the beam, install the porch ceiling

Installation Steps

A. Install 1x4 at inside corners from bottom of siding to porch ceiling (California corners)
B. Install 1x4 at outside corner from bottom of siding to soffit (California corner)
C. Install siding frieze
D. Install 1x4 to cover siding and exposed brick end
E. Install 1x4s to wrap beam over siding





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Reference Sheets

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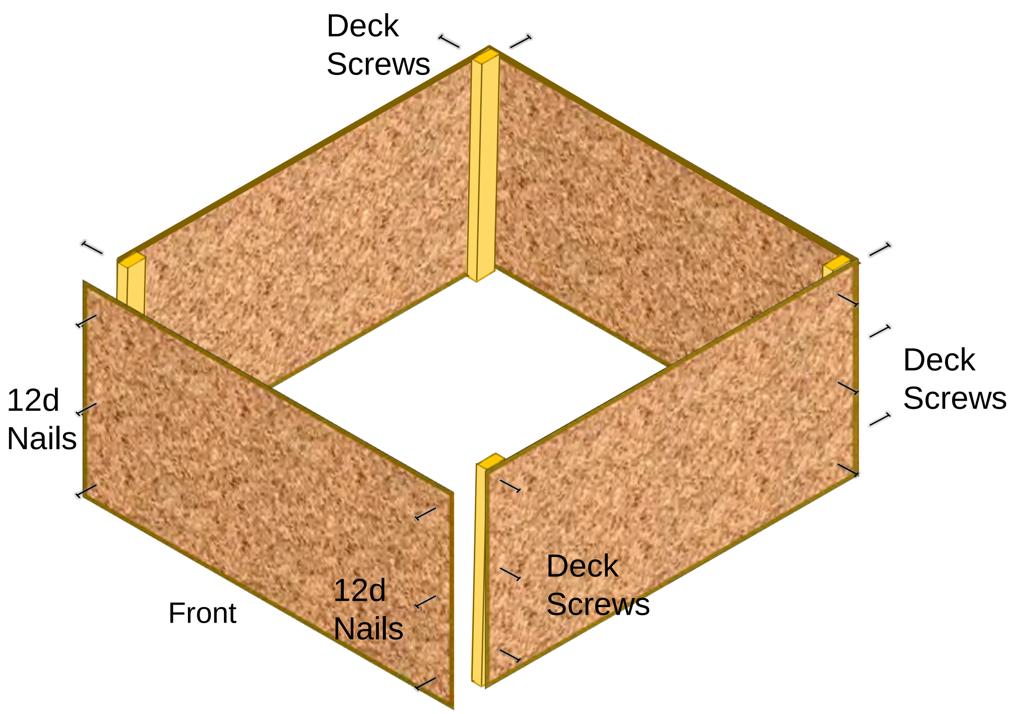
Trash Bin

- A trash bin will help keep the work site safe and orderly.
- Build the bin near the front of the site so in can be easily cleared out.
- Use four full sheets of Oriented-Strand Board (OSB) and four 2x4s cut to a length of 4 feet.
- Align the 2x4s with the 4-foot edge a sheet of OSB; attach using deck screws.
- For the front of the bin, attach the OSB using 12d nails instead of deck screws so it can be opened without any power tools.

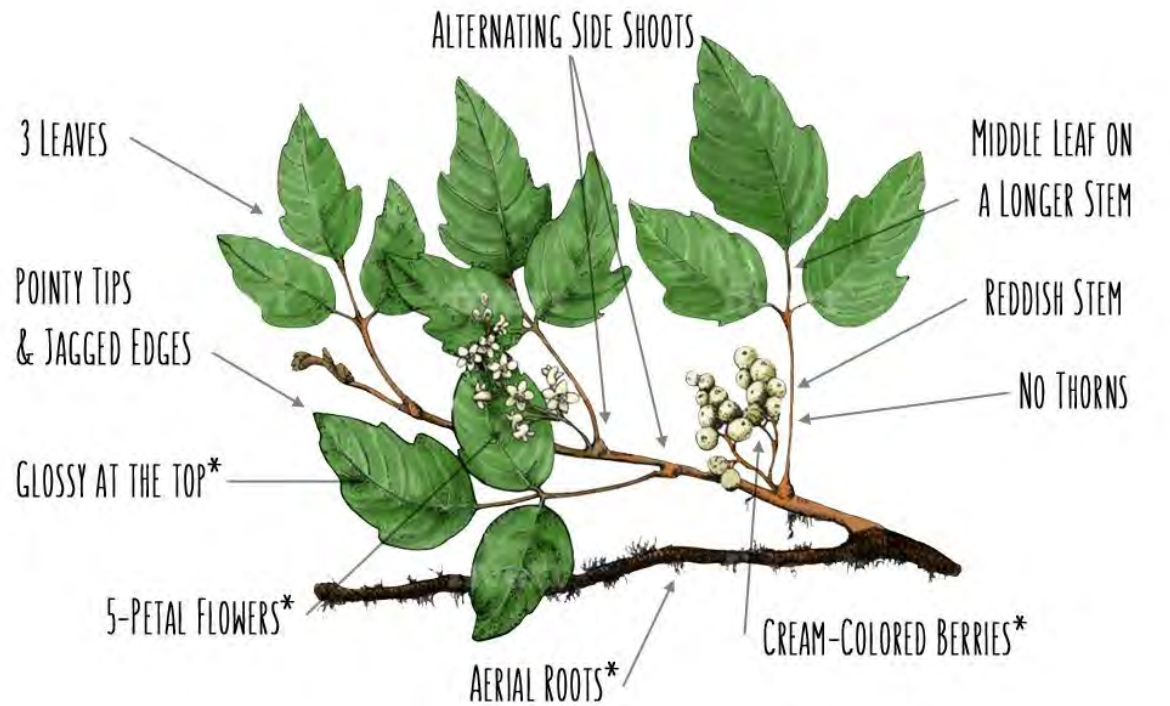


SITE SAFETY

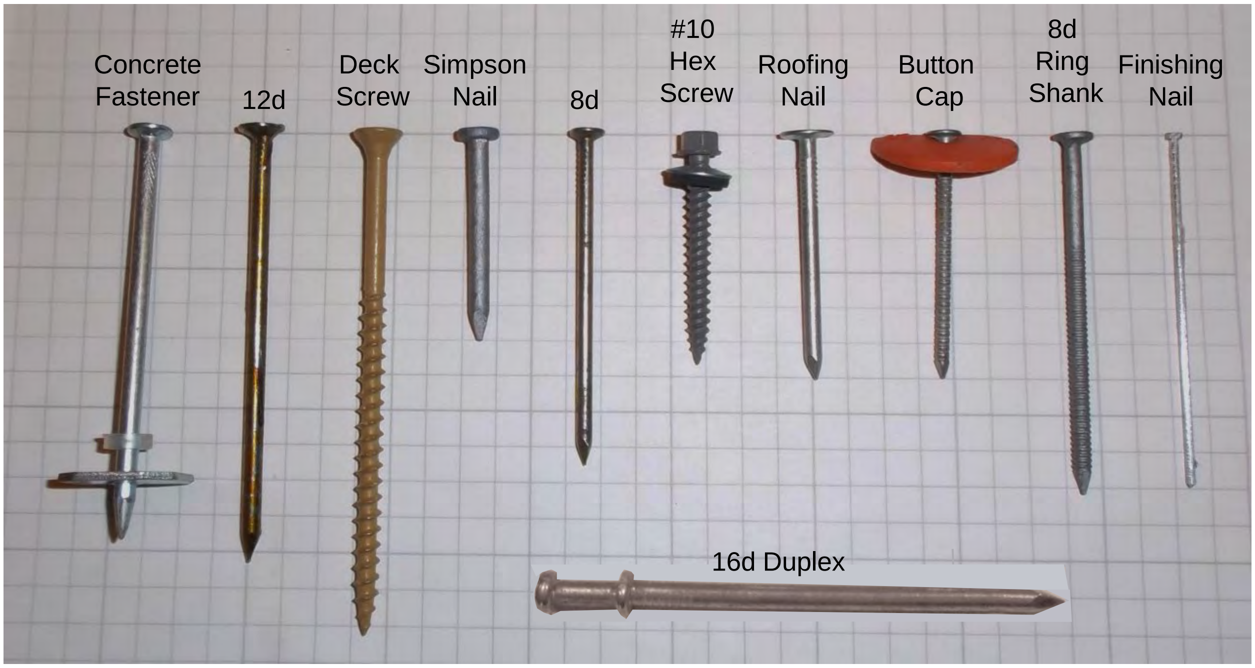
Poison Ivy Identification

(Source - https://www.greenbelly.co/pages/how-to-identify-poison-ivy)

Six Must-Haves	(*Might-Haves)
1. Three Leaves	Leaves glossy at the top
2. Alternating side shoots	Cream-colored berries
3. Pointy tips and jagged edges	Five-petal greenish flowers
4. Middle leaf on a longer stem	Aerial roots
5. Reddish stem	
6. No thorns	



NAILING PATTERNS



Type of Fastener	Usage	Nailing Pattern
Concrete Fastener	attach framing (bottom plate) to slab	6 inches from the stud on each end of the wall Within 4 feet of an anchor bolts Bay adjacent to a door opening
12d	temporary wall bracing	2 nails top & bottom
	joining walls together	2 nails every 18 to 24 inches; nail from both sides
	cap plate	2 nails over every stud for 2x4 walls / 3 nails over every stud for 2x6 walls / 5 at intersections
	deadwood	3 nails minimum, every 8 to 12 inches
	headers/porch beams	2-3-2 pattern, columns 12 to 18 inches apart
	trusses	2 nails each side of truss into cap plate (both ends)
	subfascia	2 nails per truss tail
16d	temporary truss bracing	2 nails per truss
Deck Screw	porch beams	4 screws to connect beam at corners / 4 screws to connect beam to framing
	brick ledger board	2 screws every 24 inches into truss
	cleats for cabinets	1 screw per stud
	countertop supports	3 screws per block
Simpson Nail	hurricane ties	Fill all holes; nails should be flush against the plate
	joist hangers	Fill all holes; nails should be flush against the plate
	hurricane straps	Fill all holes; nails should be flush against the plate
	HUGS installation	Used in combination with hex screws
8d	wall sheathing	Every 6 inches on edges / 12 inches in field
	roof decking	Every 6 inches on edges / 6 inches in field
	brick ties	One in top hole into stud
#10 Hex Screw	HUGS Installation	Used in combination with Simpson nails
Roofing Nail	Dow Blue Board	Every 24 inches horizontally and vertically into a stud
	drip edge	1 nail every 16 to 18 inches
	starter/shingles	4 per shingle
	cap shingles	2 per cap shingle
	poly barrier/brick flashing	Every 16 inches
Button Cap	felt paper	Every 24 inches horizontally into trusses / 6 inches vertically
8d Ring Shank	soffit*	3-2-3 nails per truss tail/ladder panel rung
	siding	⅜-inch down from top edge / every 16 inches horizontally into a stud
Finishing Nail*	exterior trim	1 to 2 nails every 18 to 24 inches
	interior trim	1 to 2 nails every 18 to 24 inches

* Typically fascia, soffit, and trim are installed using nail guns
** Cabinet installation uses various specialty screws, see Chapter 13

LUMBER

Type of Lumber	Sizes	Use
Solid (non-finger jointed)*	2x4	top plate cap plate headers deadwood temporary bracing permanent bracing kitchen blocking HVAC closet ladder panels nailers subfascia
	2x6	top plate cap plate headers
	2x8	garage door trim on siding walls
	2x10	garage door trim on bricked walls
	2x12	porch beams garage door header bathroom blocking door knob blocking
Finger-Jointed*	2x4	studs
	2x6	studs
Green Board (pressure treated)*	2x4	bottom plate supports for HVAC lower ledger board
	2x6	brick ledger board
	4 feet x 8 feet	decking for HVAC closet
	4x4	porch posts
Composite Post	4x4	porch posts
Sheathing [Oriented Strand Board (OSB) or engineered-material]	4 feet x 8 feet	HVAC closet
		wall and gable sheathing
		decking
		filler for headers
Cedar	1x4	porch beam and post trim
	1x6	porch beam and post trim
	1x12	porch beam trim
	4x4	porch post
	6x6	porch post
SmartPanel	1x4	exterior window and corner trim
	1x6	fascia and porch trim
	1x10	porch trim
	1x12	porch trim
	7¾ x 16 feet	siding
	4 feet x 8 feet	porch ceiling

*The dimension used for lumber is the finished/planed size not the actual size. For example, a 2x4 is not actually 2 inches by 4 inches. When the board is first rough sawn from the log, it is a true 2x4, but the drying process and planing of the board reduce it to the finished size of 1½ inches by 3½ inches.

Cap Plate

Measuring/Cutting

- Measure cap plates using top plates and mark measurements (in inches) on bottom plates.
- Use solid 2x4s or 2x6s only; do not use finger jointed lumber.
- At butt joints, where two walls meet end to end, the overlap is at least 4-foot either side of the joint.
- Cap plate should be cut slightly short, ⅛-inch or so to allow for “play” when installing the cap plate.
- Where walls intersect, the cap plate should completely overlap that joint to tie the two walls together (think "brick pattern").

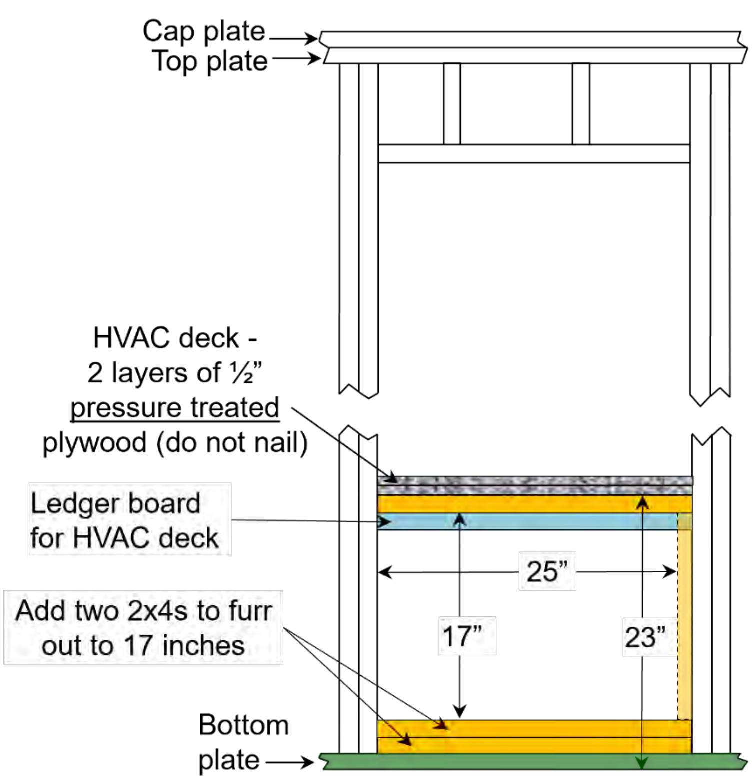
Cap plate should not be installed until all walls have been strung, plumbed, and nailed off.

Nailing

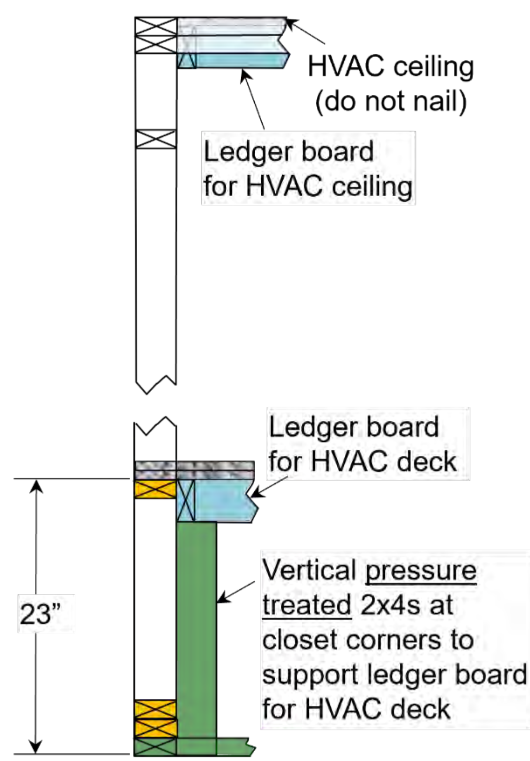
- Cap plate is nailed flush with the top plate.
- Use two 12d nails driven directly over each stud (three 12d nails on 2x6 plumbing walls). At intersecting walls, use five nails to tie-in the two intersecting wall sections.
- Begin nailing at one end of the cap plate, nailing in the same direction to help keep the cap plate flush with the top plate.

HVAC Closet

- Mark the stud locations on the slab to help provide a guide for nailing.
- The entire inside of the HVAC closet is sheathed, including the ceiling.
    - The sheathing should not sit on slab. Place scraps of sheathing on the slab and rest wall panels on the shims.
    - Using 8d nails, nail every 6 inches on the edges, every 12 inches in the field into the studs.
- Using pressure treated 2x4, cut four supports at 19½ inches. Install the supports in the corners and sides using 12d nails; nailing into studs
- Use 2x4 non-finger jointed lumber for ledger boards. Using 12d nails, install the ledger boards at the front and back first, then the sides; nail into studs.
- Cut two pieces of ½-inch pressure treated plywood to fit on top of the frame; do not nail in place. The HVAC deck should extend to the front face of the closet.
- Using 2x4s, furr out the opening below the decking to approximately 25 inches wide by 17 inches tall for the return air grate.
- For the ceiling, install two 2x4 ledger boards perpendicular to the trusses. The top of the boards should align with the top of the sheathing. Cut one piece of sheathing to fit on top of the frame. Do not nail the ceiling in place.



Front View



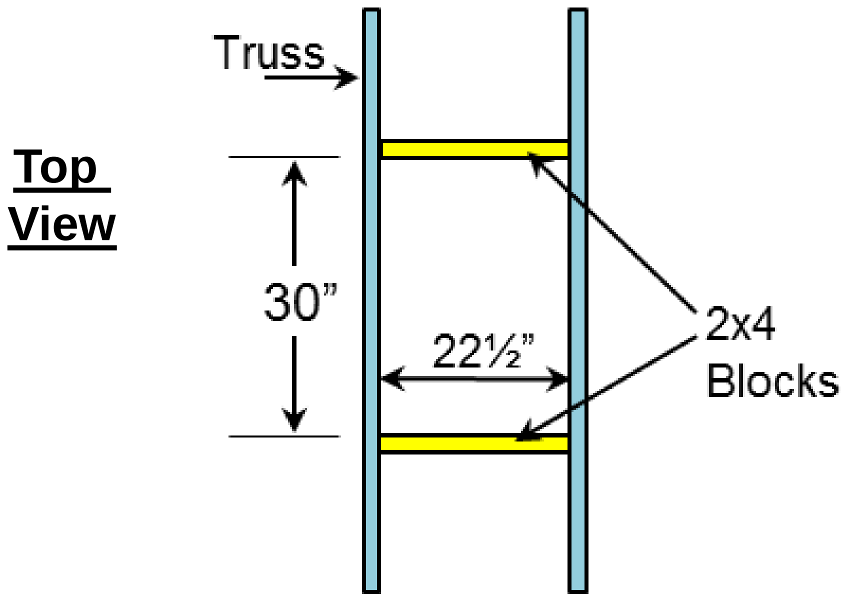
Side View

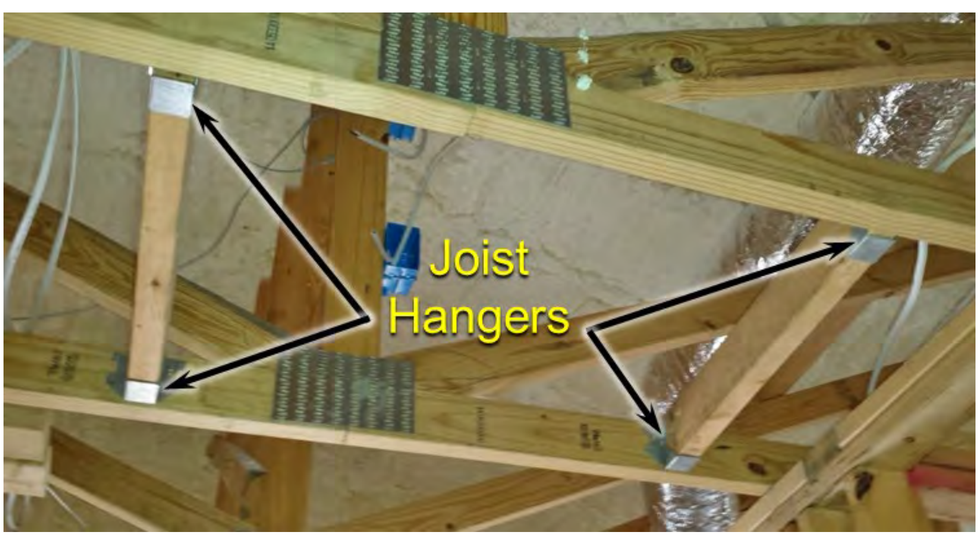
HVAC should not be sheathed until all walls have been strung, plumbed, and nailed off.

FRAMING

Attic Access

- There are normally two attic accesses, one in the garage and one in the house. Consult with the Construction Supervisor or House Leader to confirm proper locations.
- The opening should to 30 inches by 22½ inches (measured from inside to inside).
- Make sure the opening is positioned so there is 3-foot of vertical clearance into the attic and there are no obstructions above it (e.g., ductwork, bracing, wires).
- Using solid, non-finger jointed 2x4 lumber with 12d nails.
- Install joist hangers (using Simpson nails in all holes) to reinforce the blocking attached to the trusses. Simpson nails should be flush against the plate.





Deadwood

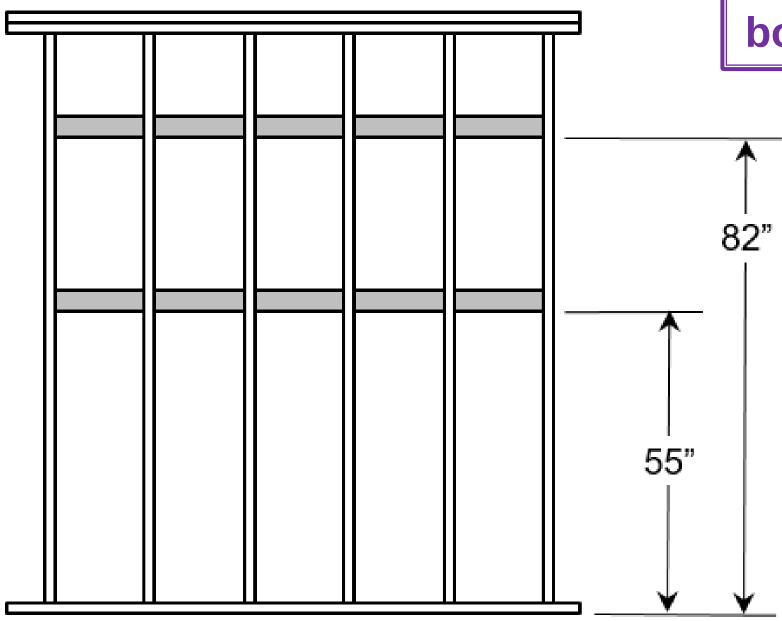
- Deadwood is placed on walls running parallel to the trusses to provide a backing for sheetrock.
- Deadwood is needed on all interior walls; trusses are not deadwood.
- Use scrap 2x4; do not use finger-jointed wood.
- Set the blocks or board along the tops of the wall so that the 3½-inch side lies partially to the cap plate with the remainder hanging over the cap.
- Nail into cap plate using at least three 12d nails.
- Install deadwood using 12d nails every 8 to 12 inches. The maximum space between two pieces should be 4 inches or less.
- Deadwood along the exterior walls should be installed prior to decking.

Kitchen & Bathroom Blocking

- Use solid 2x12 or 2x6 lumber; do not use finger-jointed lumber.
- Blocks are turned so the wide side of the block is flush with the interior face of the studs.
- Attach using five 12d nails on each end of the 2x12 blocks, three if using 2x6 material.

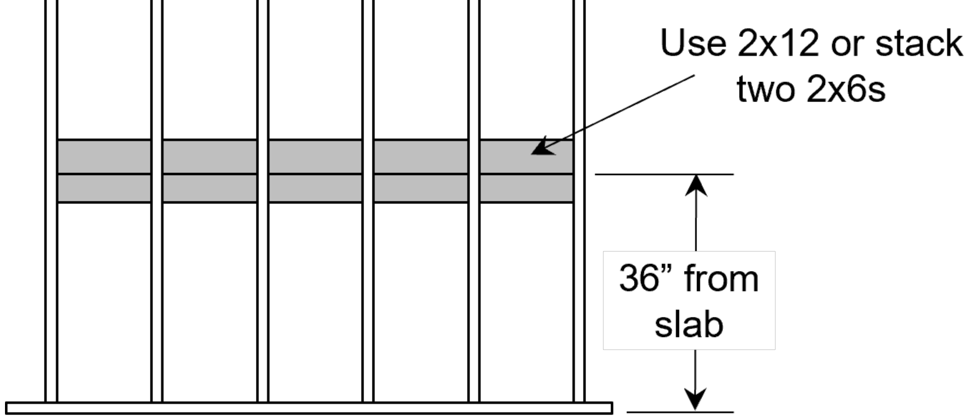
All measurements are from the slab to the bottom of the blocking.

Kitchen Cabinet



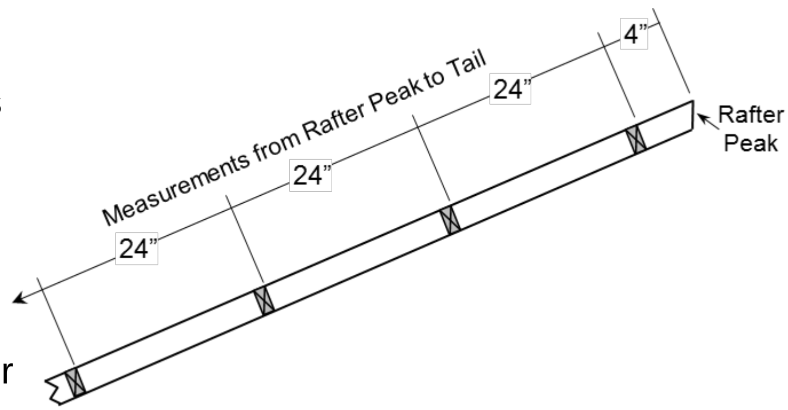
Bathroom ADA Requirements

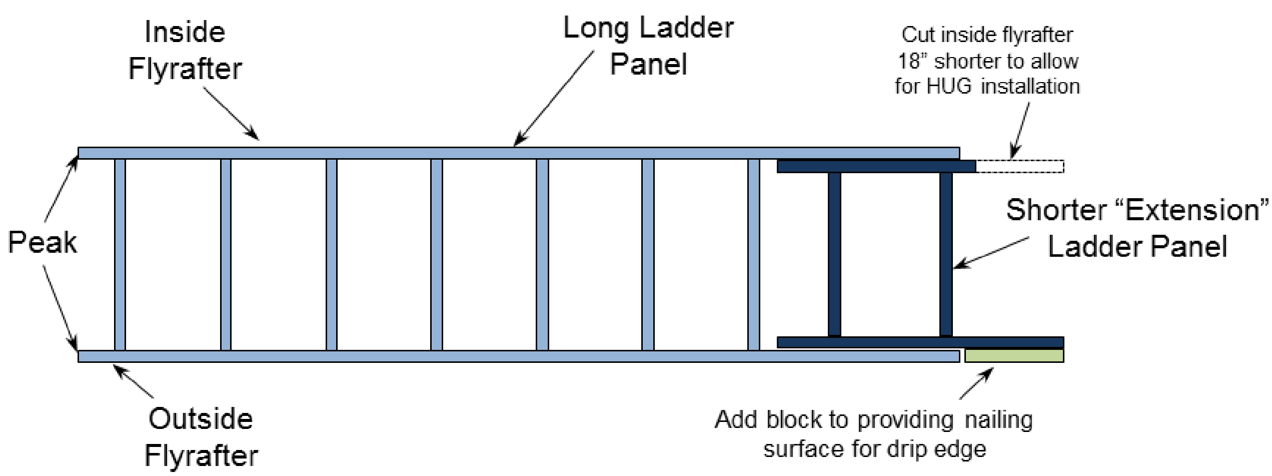
Hint: To help minimize splitting of the wood when nailing small pieces of blocking, dull the point of the nail with your hammer before nailing (the nail will then be crushing wood fibers instead of driving a wedge).

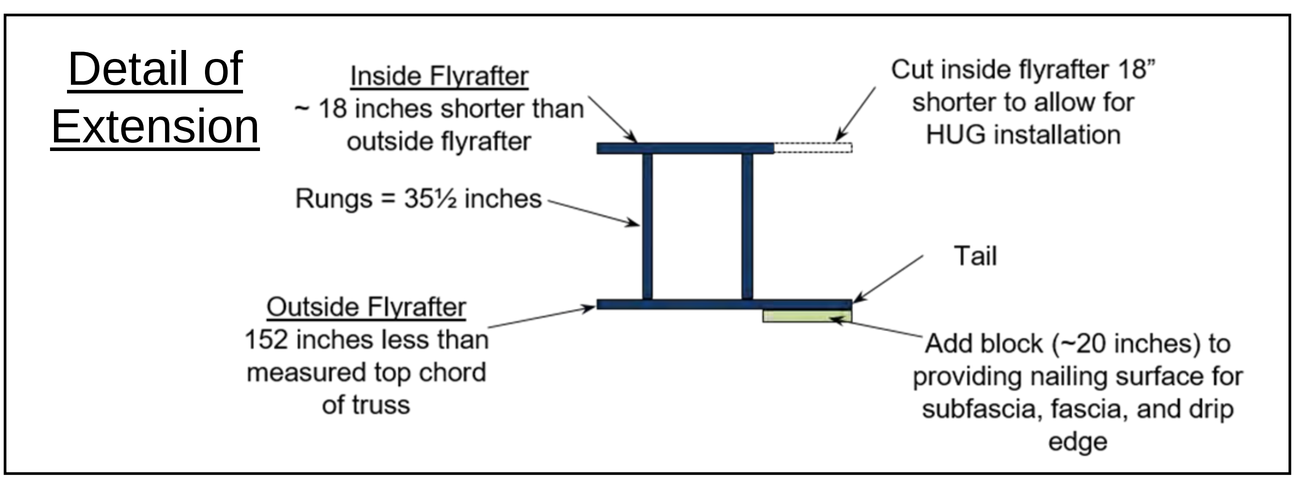


Ladder Panels

- Use the straightest 2x4 solid lumber available and 12d nails.
- If the space between the gable end truss and first common truss is 24 inches OC, the length of the rungs should be 38½ inches. If not, determine Check with the House Leader or Construction Supervisor.
- Most gables will have a matching pair of ladder panels, so all four rafters can be clamped together to mark the rung layout.
- The first rung should be placed 4 inches from the peak. The remaining rungs are laid out 24 inches OC.
- Attach the rafters to the rungs, using two 12d nails and a deck screw at each end.
- If the ladder panel is greater than 16 feet, it should be built in two sections.



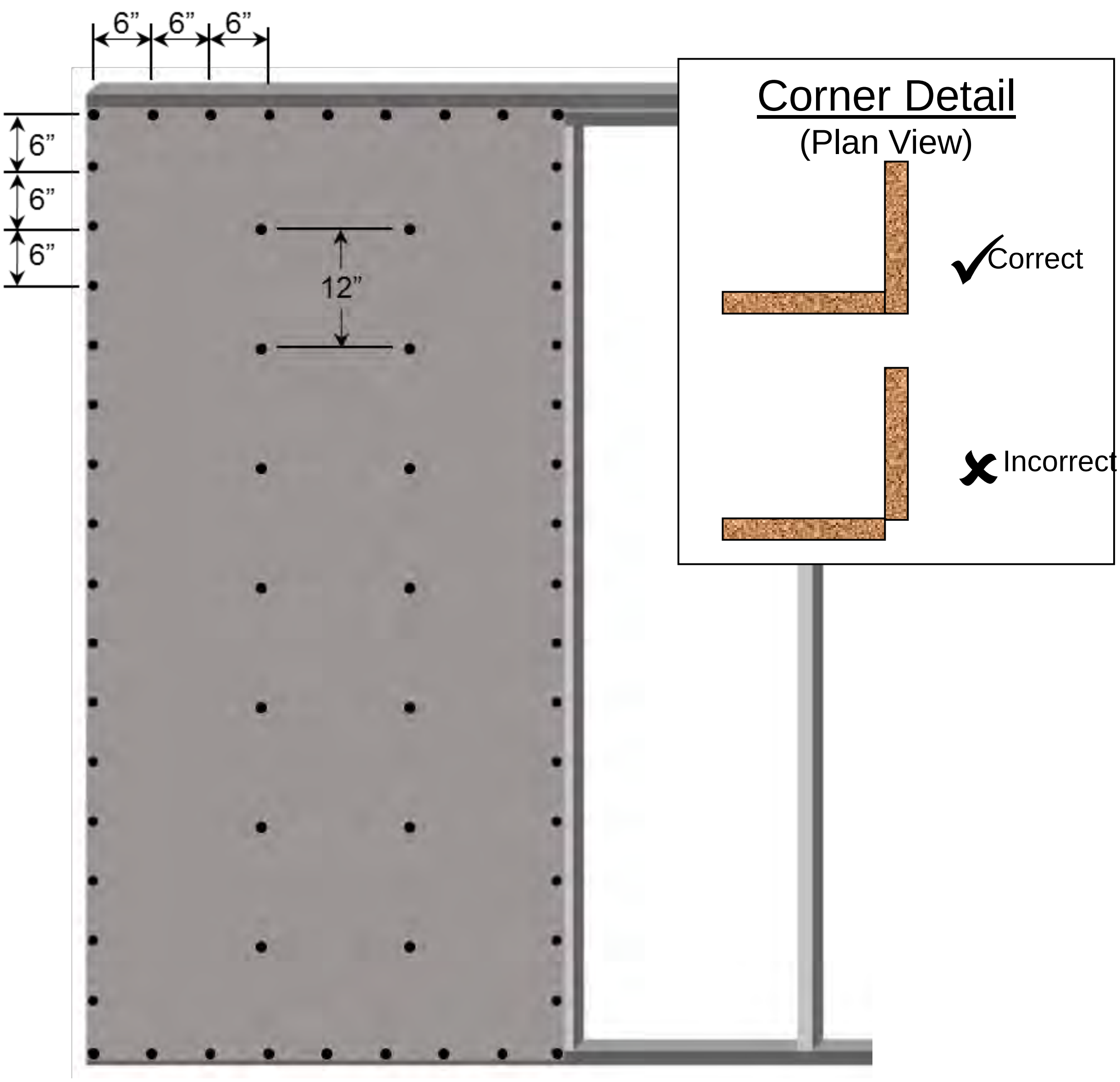




TRUSSES

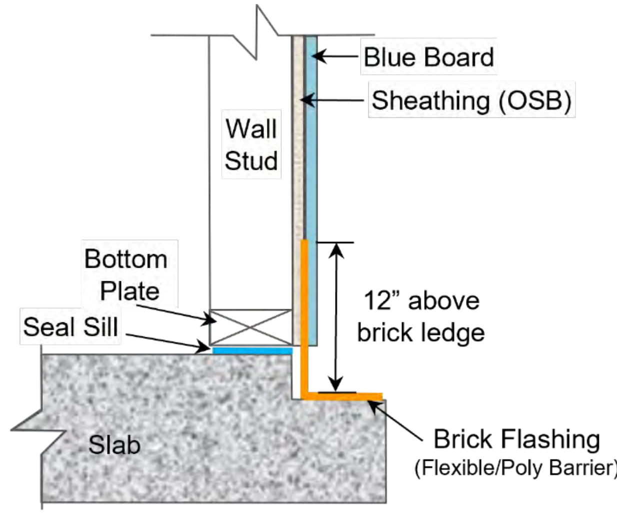
Sheathing Walls

- Sheathing should be installed with the smooth side (or stamped side) facing out.
- Begin at the corners of the house.
- The corners must be sheathed using full wide (4-foot) and full height (if house has 9-foot walls, use 9-foot sheathing). If needed, install an additional stud rather than cut the sheathing.
- The top of the sheathing should set 1-inch below the top of the cap plate.
- Use 8d nails to nail into the studs.
- Nail every 6 inches around the outer edge and 12 inches apart on the interior (the field).
- The nailing pattern around windows and doorways is the same as for the edges, every 6 inches.
- Include an ⅛-inch gap between the sheets of sheathing; use an 8d nail as a spacer at the top, middle, and bottom to maintain a consistent gap.



Brick Flashing (Corner)

Brick flashing is attached to the sheathing and install before the Blue Board to maintain the proper moisture barrier.



Do not leave the corner of the brick ledge exposed; this negates the purpose of the flashing.

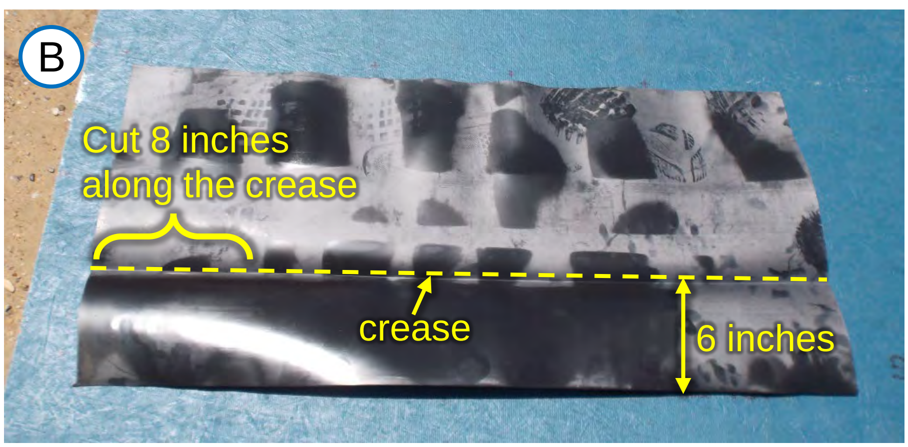
Installation Steps

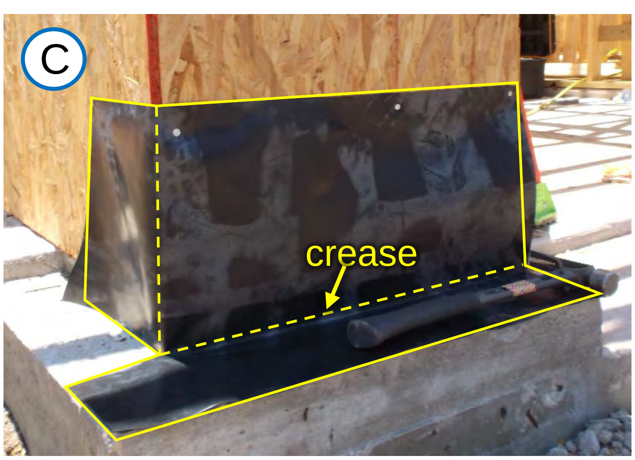
A. Measure the length of wall/brick ledge and add at least 8 inches so the poly will extend past the corner. Cut the poly to length.

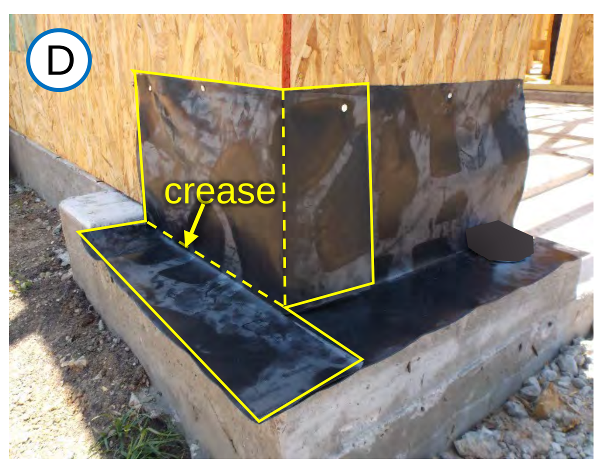
B. Measure and mark the poly 6 inches from the bottom edge. Fold and crease the poly along this line. From the end to be wrapped around the corner, cut the poly along the crease about 8 inches.

C. Place the 6-inch section of poly on the brick ledge and the upper section (12-inch section above the crease) over the sheathing; the crease should align with the “L” of the brick ledge. Wrap the upper section, around the corner. Nail in place, using roofing nails every 16 inches.

D. Repeat Step C on the other wall.

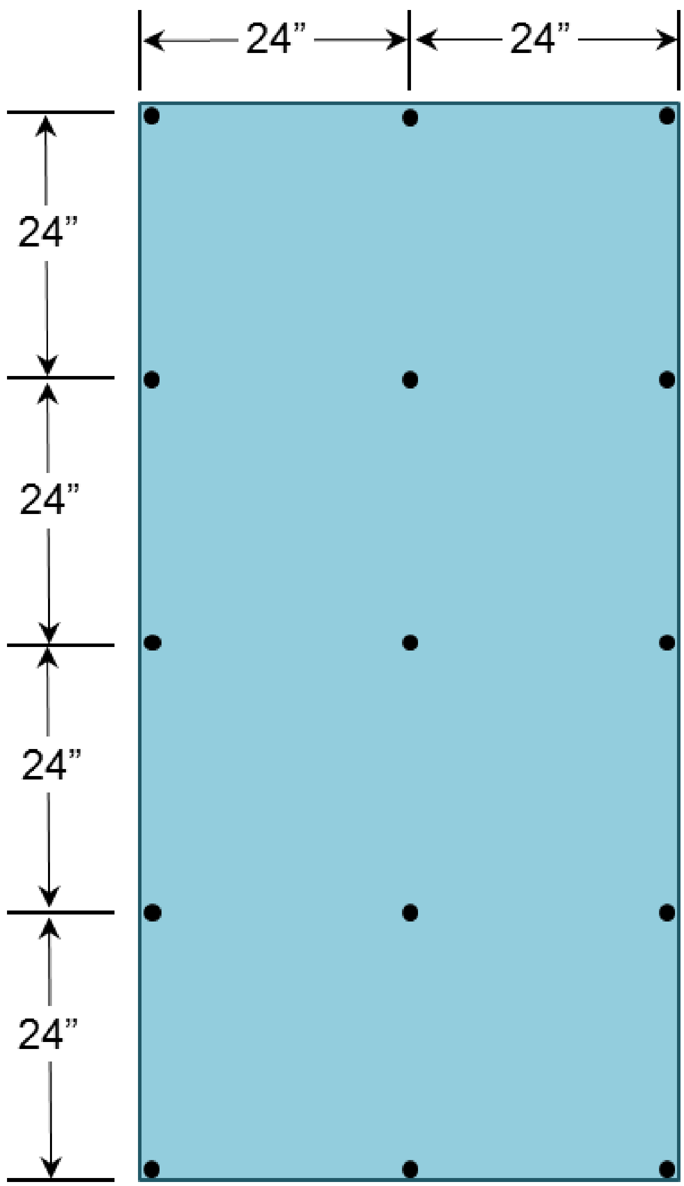






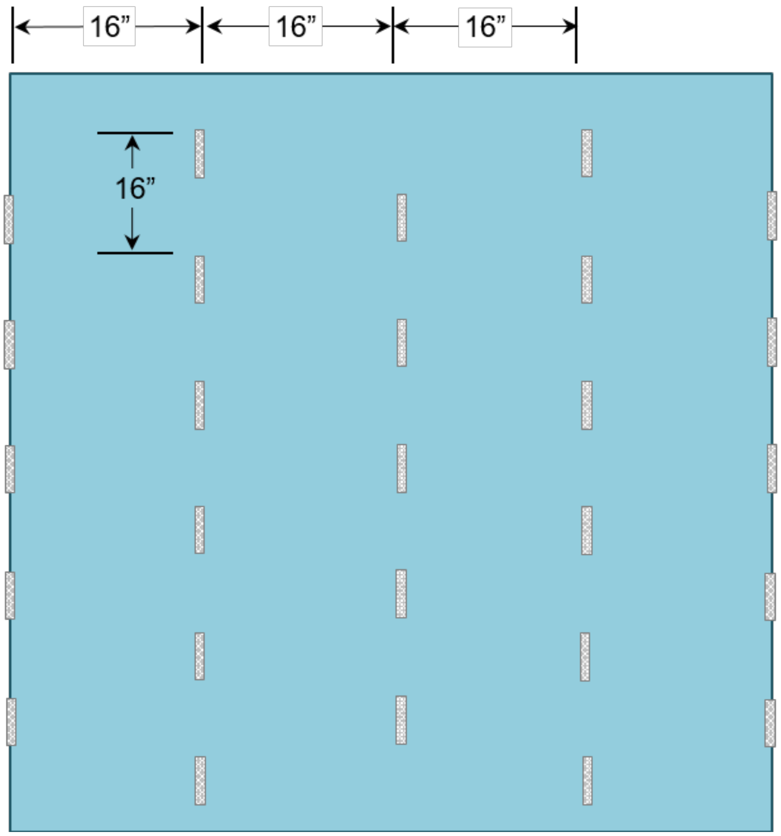
Blue Board

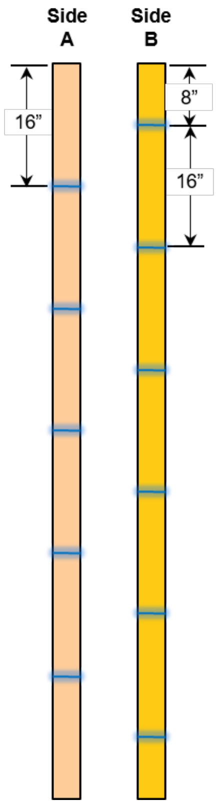
- The seams in the Blue Board should not overlap the seams of the sheathing on the walls or gables (e.g., stagger the joints).
- Cut any sheathing covering window or door openings prior to installing Blue Board to ensure sheathing has been properly nailed around the opening.
- Blue Board should be aligned with the bottom of the sheathing.
- Install Blue Board with the label or printed side out.
- Attach Blue Board using 2-inch roofing nails every 24 inches horizontally and vertically.
- Do not allow the nails to indent the Blue Board.
- Seal all seams with clear Weathermate tape.
- Tape over the top of sheathing and Blue Board.



Brick Ties

- Using one 8d nail in the first hole from the top.
- Nail into studs.
- Spaced every 16 inches vertically and every 16 inches horizontally.
- Brick ties are not needed under windows.



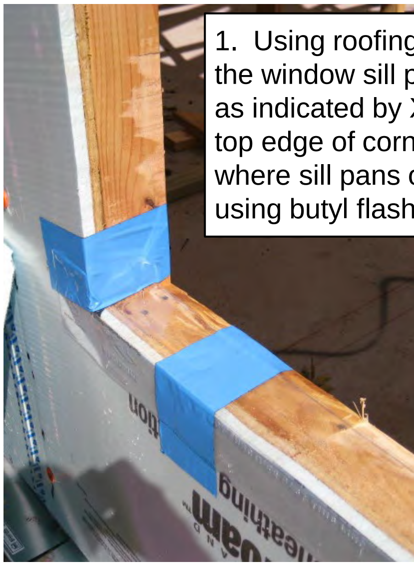


Helpful Hint: Create a "story board" using a 2x4 stud.

- Mark a 2x4 at 16 inches from the top and continue to make marks every 16 inches.
- Turn it over and make a mark 8 inches from the top and then every 16 inches the rest of the way up the board.
- Place the story board on the first stud and transfer the marks to the wall of the house.
- Then move over to the next stud location, turn the board over and make a mark matching each one on the board.
- Alternate sides of the board thereafter; this will help create a checkerboard pattern without measuring.

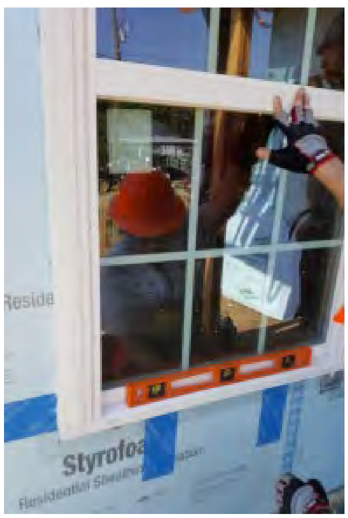
Windows

- Test fit of the window. The opening should be no more than ½-inch larger than the window.
- The window should be closed and latched during installation.



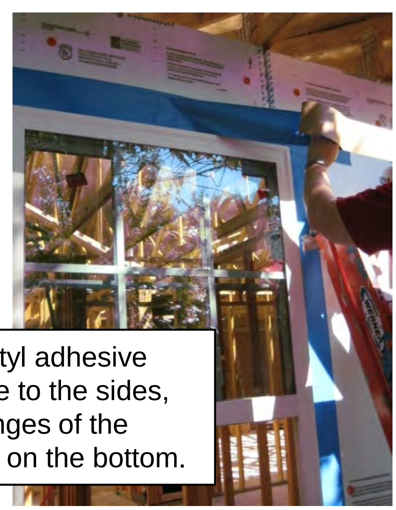
1. Using roofing nails, nail the window sill pan in place as indicated by Xs. Seal the top edge of corners and where sill pans overlap using butyl flashing tape.

2. Run a large bead of caulk around the inside flange of the top and sides of window but not the bottom.



3. Set the window in place. Verify the window is centered in the opening and level horizontally and vertically (plumb) using a 2-foot level. Secure the window position with shims, if necessary.

4. Place a roofing nail in every other hole in the flange on the top and side. Do not nail along the bottom.

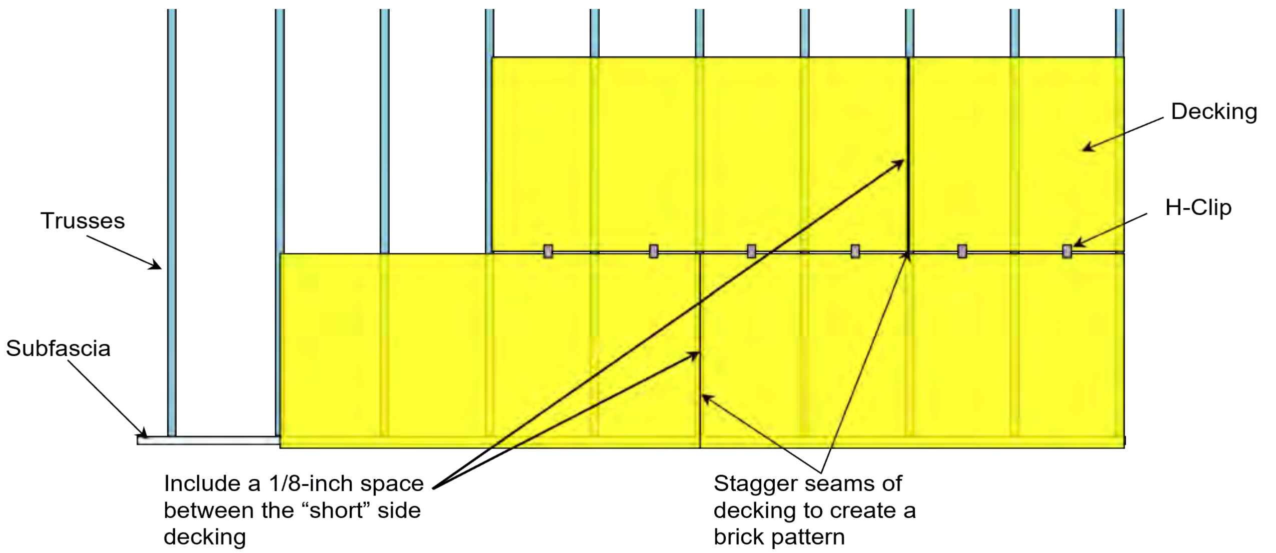


5. Apply butyl adhesive flashing tape to the sides, then top flanges of the window, not on the bottom.

DECKING

Decking

- All decking should be cut on the ground and then installed.
- To determine the width of the first row of decking, divide the length (in inches) of the top cord of the trusses by 48 (i.e., the width of decking). the resulting number will identify the number of full rows and remainder for the last row at the top of the roof.
  - o If the top row will be more than 10 inches, use full width (48 inch) panel for the first row.
  - o If the top row will be less than 10, the first row of decking should be ripped down to 36 inches to prevent a narrow piece at the ridge.
- To establish the location for the first row of decking, mark 47½ inches (for full width decking) or 35½ inches (when using a 36-inch width for the first row) from the outside top edge of the subfascia on the common trusses at the front and back of the house and the middle common truss. Using these marks, snap a chalk line across the top chords.
- It is more important to follow the chalk line then for the decking to be exactly 47½ or 35½ inches on every truss.
- Nail using 8d nails every 6 inches on the edges and 6 inches in the field.
- Include an ⅛-inch gap between the short side (4-foot side) of the decking using an 8d nail as a spacer.

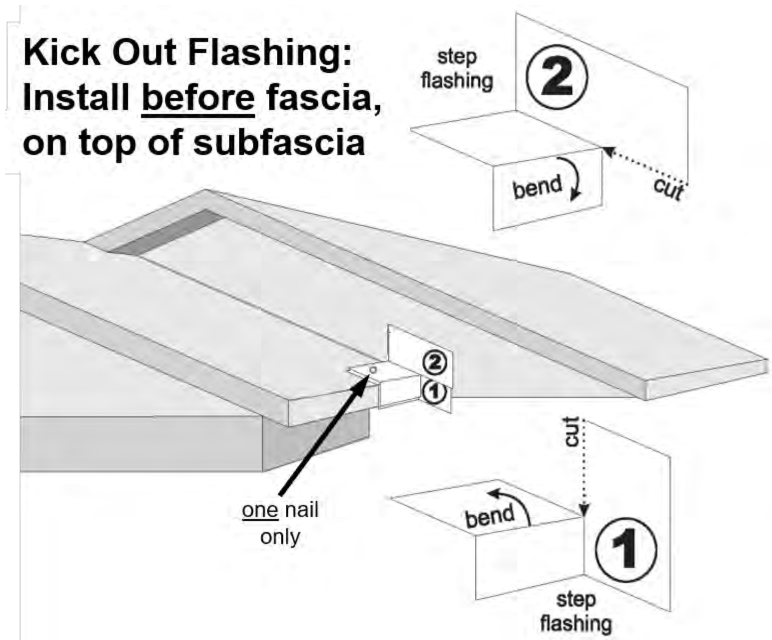


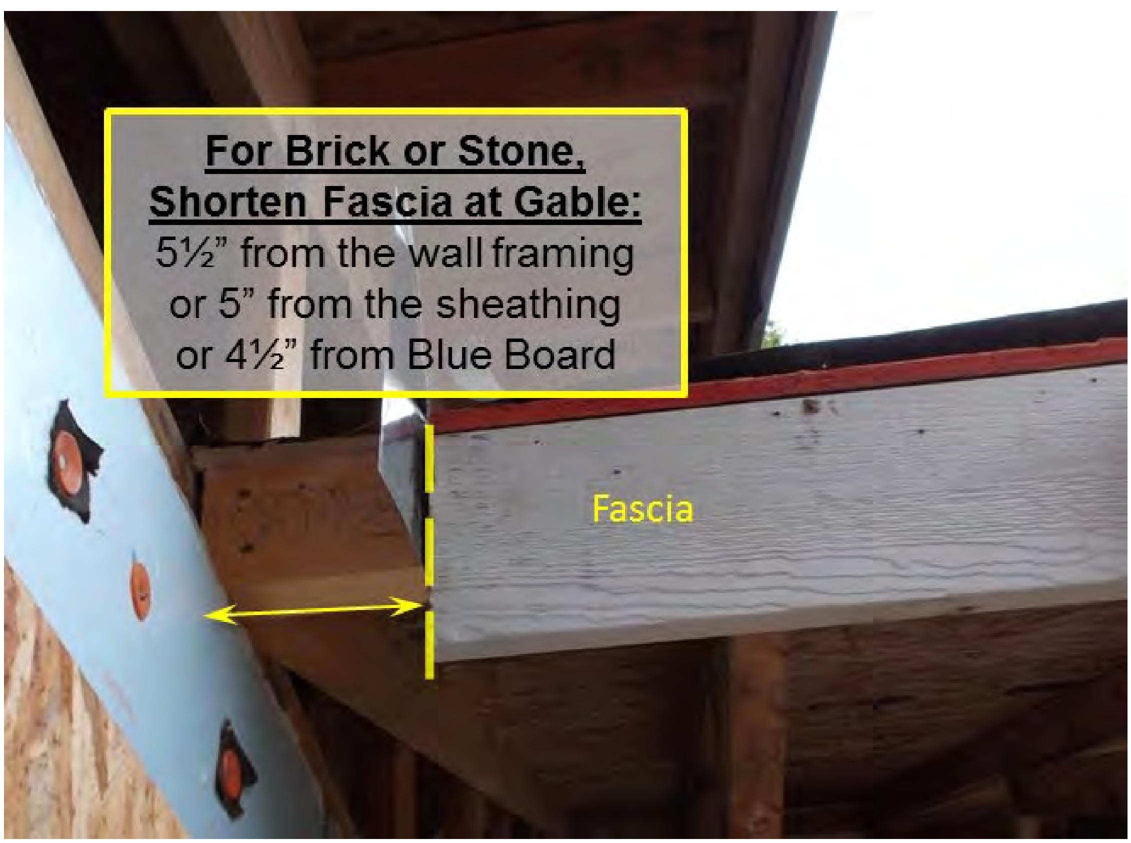
- Place H-clips between each truss on the top edge of decking. H-clips should be installed with the smaller part of the clip open, to receive the next piece/course of decking.
- When the top row of decking requires a narrow piece of decking (e.g., less than 12 inches), use two H-clips per bay and spray paint the ridge to warn people not to step there.

Kick-Out Flashing

Install kick-out flashing must be installed prior to installing the drip edge and fascia.

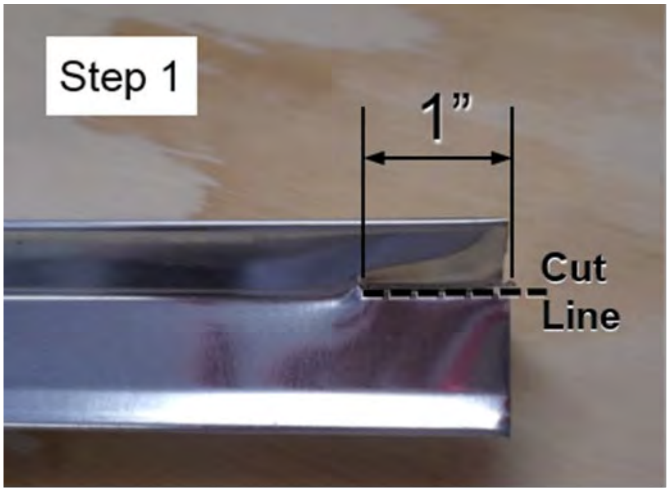
- The decking must be trimmed flush to the subfascia board before installing the kick-out flashing.
- If the gable will be covered with brick or stone, the kick-out flashing needs to be offset from the house to allow for the brick/stone

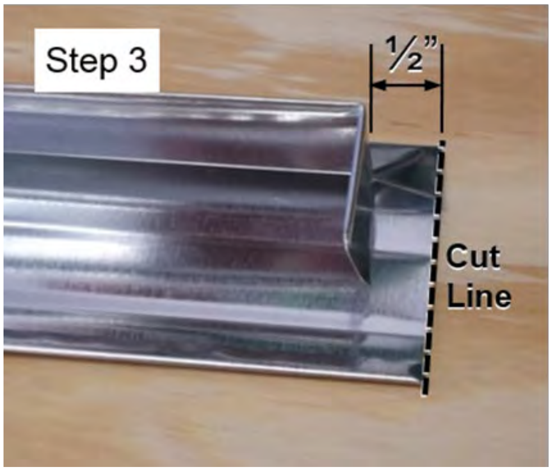


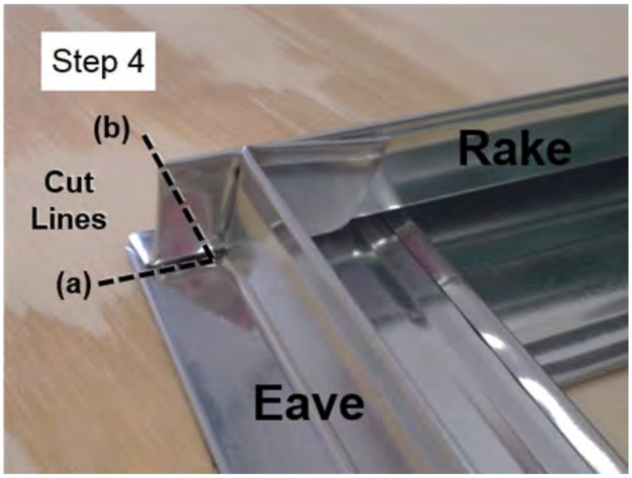


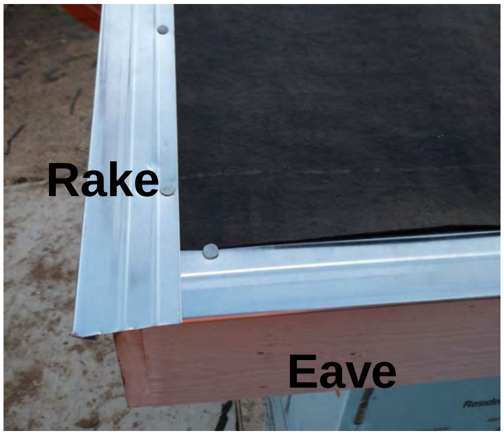
Drip Edge

- Corners are formed by two pieces of drip edge, each a minimum of 12 inches long.
  - Step 1: For the piece along the eave, cut a slit about 1 inch long just under the lip of the drip edge.
  - Step 2: Using a speed square, bend the vertical part of the drip edge back 90 degrees. This creates a small "tab" that allows the drip edge to wrap from the eave to the rake.
  - Step 3: Trim the top portion of the eave drip edge to ½ inch from the bend.
  - Step 4: Interlock the eave piece with the rake piece. (a) Cut the rake piece just deep enough to match the lip of the eave piece. (b) Cut the vertical piece at an angle to match the fascia/ pitch of the roof.





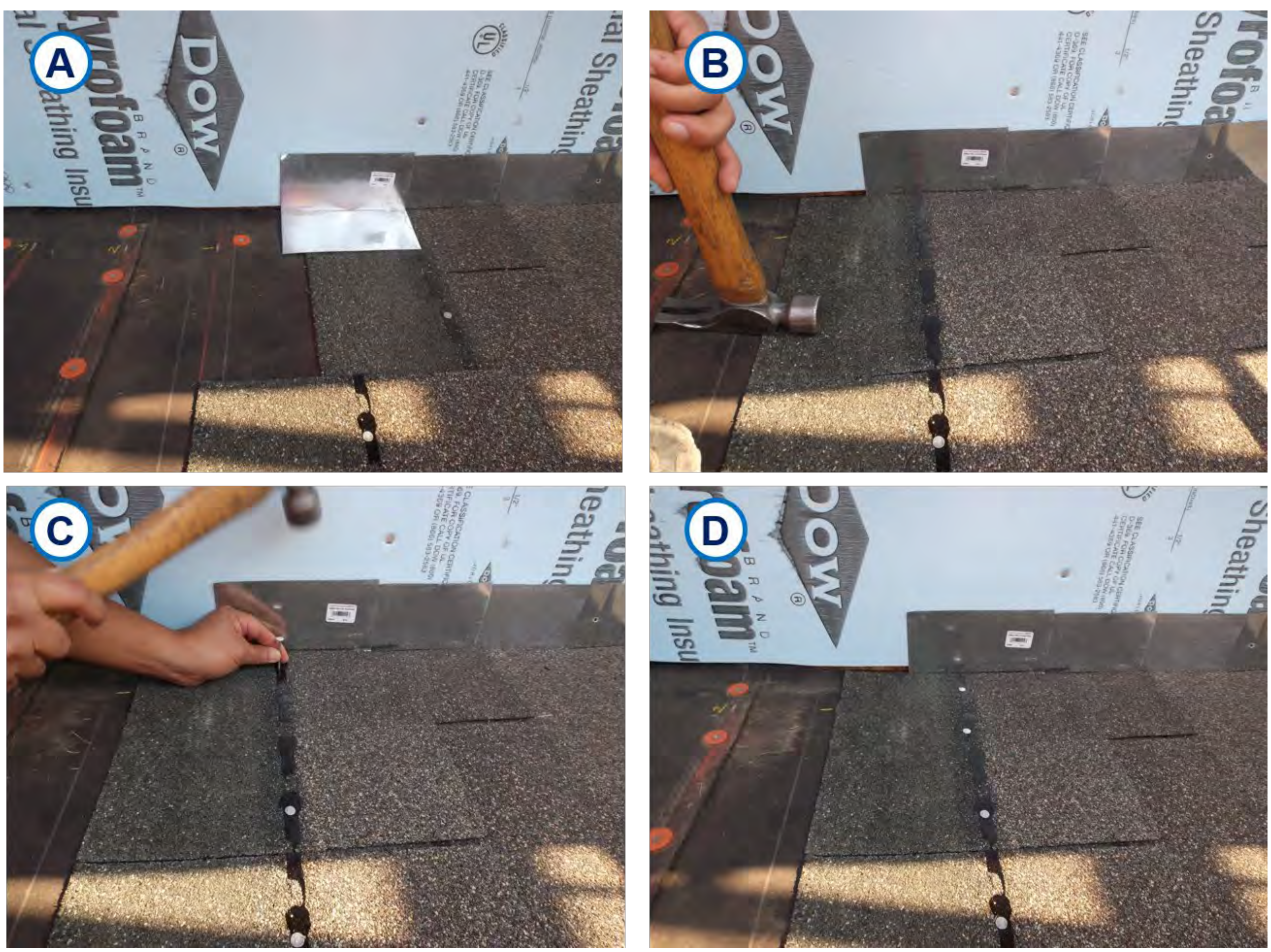




- Install the eave piece of the corner first; this allows the tab to wrap from the eave to the rake. The drip edge should interlock with the rake piece resting on top of the eave piece.

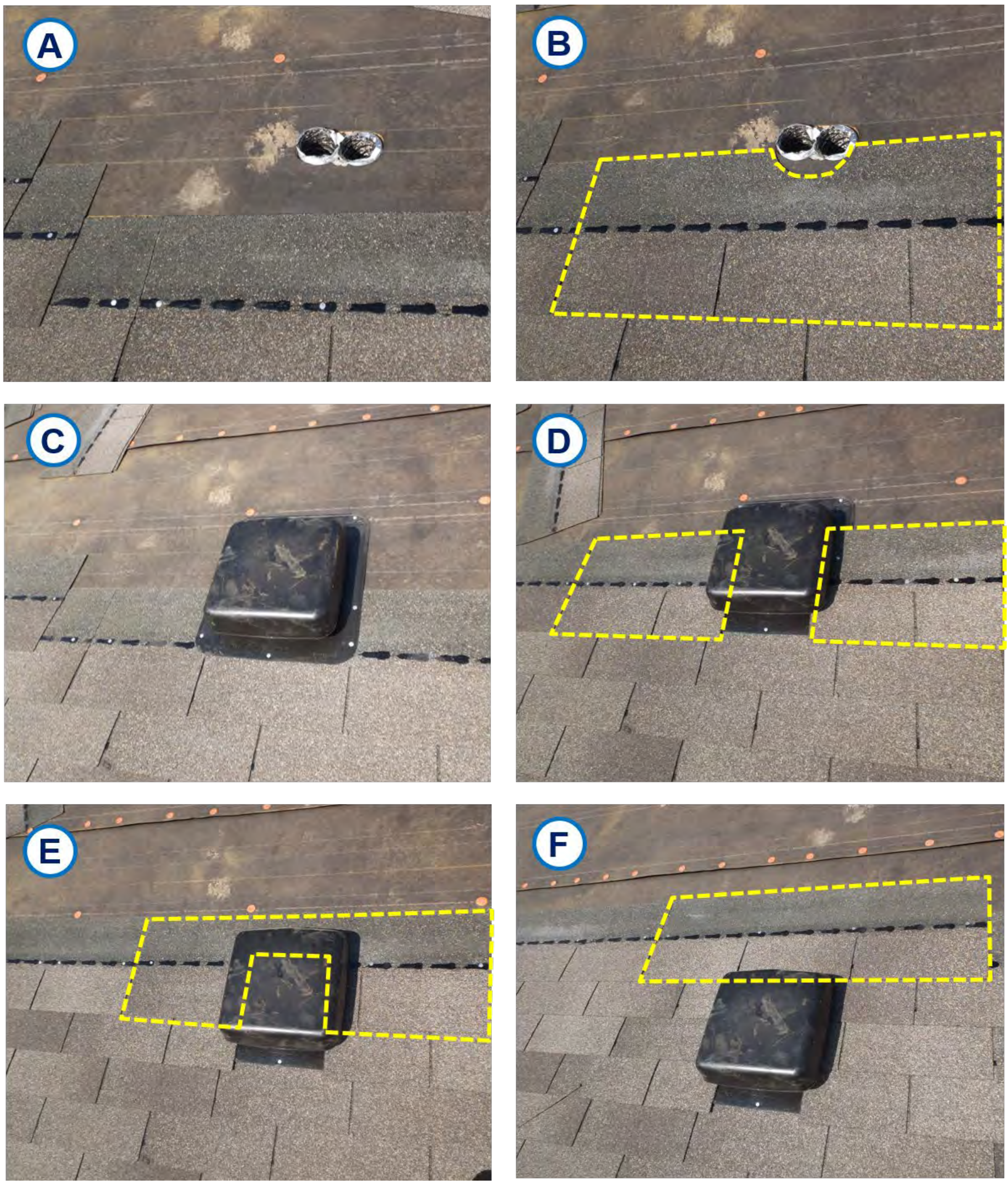
Step Flashing

- Step flashing must be installed as the roof is shingled because each row of shingles overlaps the previous piece of flashing.
- Step A - Set the step flashing in place. Use the orange or white line or tar line of the course below as a guide for the bottom edge of the flashing; flashing should not protrude farther than the bottom edge of the next shingle.
- Step B - Set the shingle in place.
- Step C - Nail the shingle in place.
- Step D - The end nail of the shingle should also go through the step flashing and hold it in place.



Vent Caps

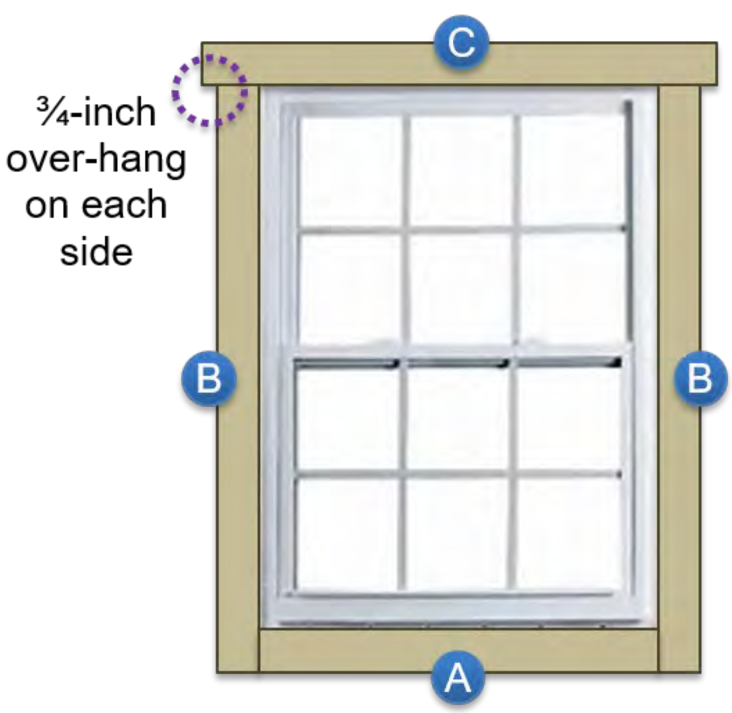
A) Shingle until the top of the shingle is just below the vent pipe. If the bottom edge of the boot will be at or below the nailing line of the shingle, the shingle will go under the boot.
B) The shingle may need to be cut to go around the pipe.
C) Install the boot by nailing at the marks indicated on the vent cap. Before placing the next row of shingles, seal the sides and top of the vent cap with ZIP Tape.
D) Place the next course of shingles over the boot.
E) & F) For the following course(s), it may be necessary to cut the shingle to fit around the boot.



EXTERIOR TRIM

Window Trim

- When possible, paint the siding around the window before installing the trim.
- As the trim is installed, caulk in between the joints to ensure a weatherproof seal.
- Some window frames have vinyl seams protruding at the corners, these should be removed with a knife before installing trim.
- Trim is nailed in place using a nail gun with 2½-inch finishing nails.
- Install the bottom piece (A) first, then the sides (B). To help align the side trim with the bottom, use a scrap piece of trim.
- Place the nails where the trim meets the bottom edge of the siding.
- The top piece of trim (C) should extend ¾-inch on either side of the side trim.



Bottom (A) fits tightly between the two "B" pieces of trim

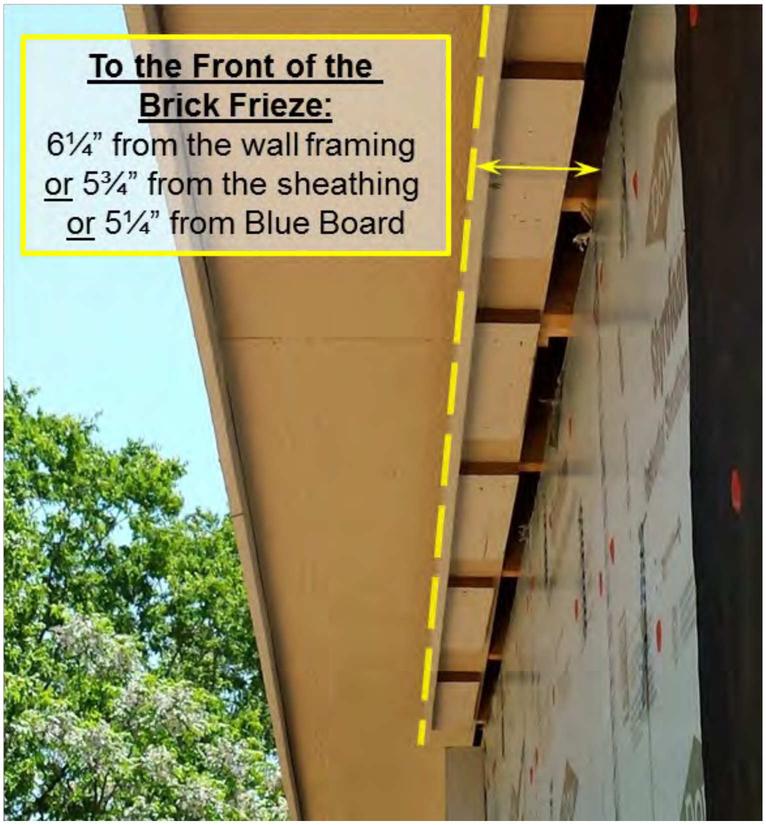
Sides (B) are the window height + width of 1x4

Top (C) is the width of window + width of 1x4 + 1½ inches (¾" over hang each side)

EXTERIOR TRIM

Brick Frieze

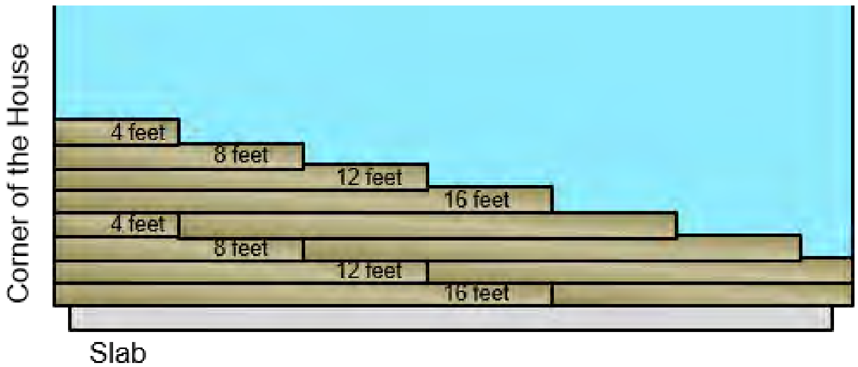
- 1x material is used for the brick frieze.
- The brick frieze is installed 6¼ inches out from the wall framing or 5¾ inches from the sheathing or 5¼ inches from Blue Board.



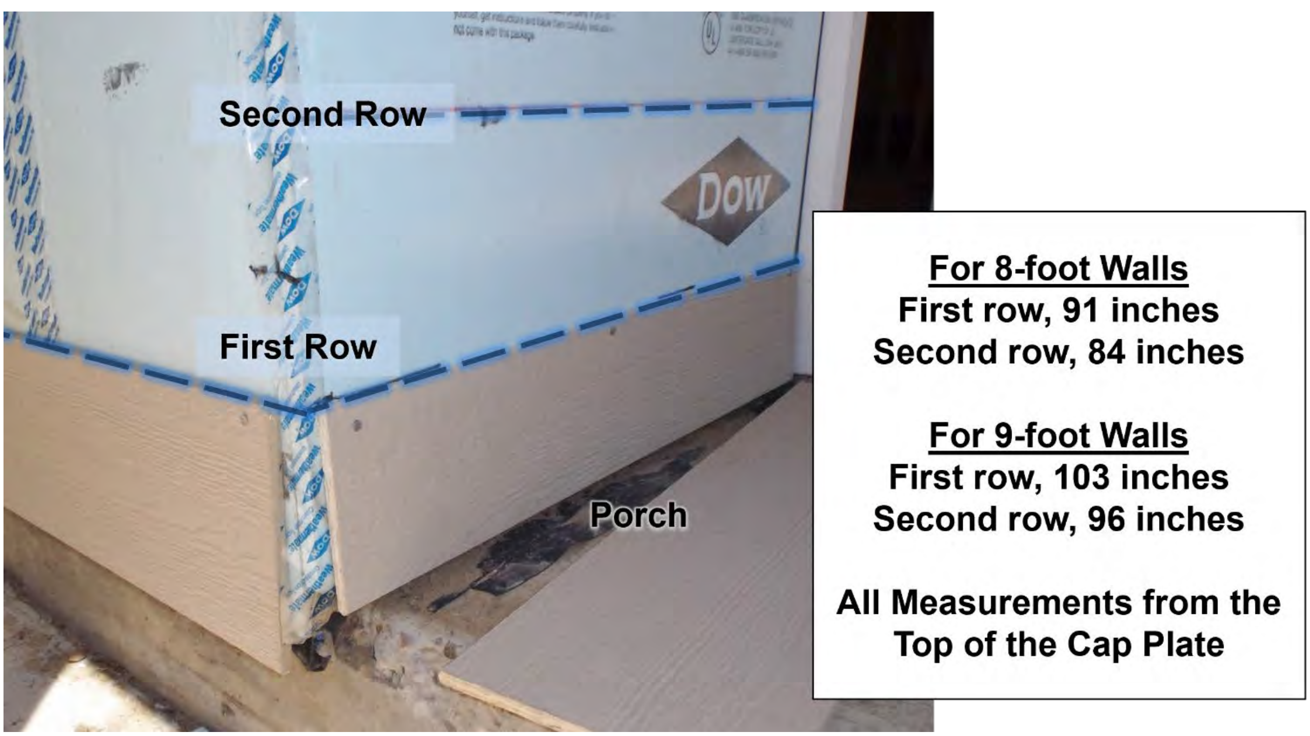
- To mount brick frieze, install a 1x4 board lying flat to provide a nailing surface.
- Install the narrow side of the frieze against the soffit and use a nail gun and 2½-inch finishing nails to nail through the brick frieze into the mounting board.

Siding Rules

- Use spacers to ensure a consistent 7-inch reveal.
- Seams must be staggered. There should be a minimum distance of 4 feet on either side of the seams from the row below. Create a pattern of seams that repeats every fourth row.



- There should be no joints immediately above or below windows or doors or near the corners of windows and doors.
- The bottom edges of the siding should align in the field and around corners.
- Siding seams in the middle of the field should be butted together with no gap.
- The cut edges of siding in the field should be primed.
- Use 8d ring shank nails and nail into studs. Nails should not show.
- At all of the house corners, measure first row and second rows of siding.



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