

October 24th Chula Vista Build Guidelines

Address (Google Maps) - HXXW+C6 Chula Vista, California

Web page <http://projectmercybaja.org/october-24th-chula-vista-build>

WAIVER

Every person must complete an online waiver before entering the build site, NO EXCEPTIONS

TEMPERATURE CHECKS

Every person must be checked for body temperature, NO EXCEPTIONS

COVID-19 PROTOCOLS

Every person must follow the safety protocols, NO EXCEPTIONS

Build Day Overview

NOTE: This timeline is only a guide to provide an idea of how the day will progress. If teams need more time to complete their houses, ending times will be adjusted accordingly.

- **7:30am – 8:00am**
Volunteers arrive in individual cars
- **7:45am – 8:30am**
Temperature check for each volunteer
Verification of waiver submittal for each volunteer
- **8:30am – 2:00pm**
House build – water and lunch breaks determined by team leader
- **2:00pm – 3:00pm**
Load house components onto flat-bed truck
- **3:00pm – 4:00pm**
Site cleanup and departure

Safe Distancing : The outdoor site where we will be working on is a total of three acres and is large enough to support safe distancing both between and within groups. The individual sites, measuring 100 ft x 100 ft, will be marked off. Each individual site will be separated from others by at least 40 ft. Please see the attached site plan as an example of how the area will be divided and all materials positioned within same.

Waivers : Project Mercy will collect a waiver from each volunteer entering the site. The waiver is mandatory in order to be at the event, even if only as a spectator.

Temperature Check : For everyone's safety and reassurance, we will be conducting temperature checks upon arrival at the same time as you hand in the waivers. This is a very short process and we have multiple temperature gages. Anyone with a temperature of 100 degrees F or more will be prohibited from participation or entry onto premises.

Lumber and Paint : All of the lumber and materials needed to support the build will be pre-positioned within each group's designated area.

Project Mercy Leadership : Please advise us at time of confirmation if you need skilled leaders for the build. There will be additional skilled volunteers available to support groups as needed. No-one will enter a group's designated area unless specifically authorized by your group. They will wear face masks any time they are within a designated area.

Face Masks : Face masks are required at all times except when eating and drinking or in a personal vehicle. We ask that each group bring their own masks and gloves as required, but there will be a small supply of these on-site also.

Sanitization : We request that each group bring their own sanitization items, but there will be additional hand sanitizer available on site as needed. All common areas, tools, and equipment will be sanitized prior to and during the event.

Tools : You need to bring your own hand and power tools. We will only have a very limited number of extra tools and equipment on site. Please let us know well ahead of the event if you would like your lumber pre-cut.

Food and Beverages : To maintain safe distancing and avoid common touch points, Project Mercy asks that you provide your own water, lunch, and snacks.

Bathroom Facilities : Flush port-a-potties with hand washing stations will be on the build site.

Garbage Disposal : There will be a garbage disposal bin on site for you to discard all trash. Please clean up after your build.

It is incumbent upon each volunteer and group leader to take personal responsibility and not come to the event if they feel sick or have been in contact with someone who is sick or has tested positive for COVID-19. On the day of the event, you should not come (and

should self-isolate at home until given direction otherwise from your healthcare provider) if you have any of the following signs or symptoms:

- **You feel feverish or measure a temperature of 100 degrees F or higher**
- **Chills**
- **Cough**
- **Shortness of breath or difficulty breathing**
- **Fatigue**
- **Muscle or body aches**
- **Headache**
- **New loss of smell or taste**
- **Sore throat**
- **Congestion or runny nose**
- **Nausea or vomiting**
- **Diarrhea**

If you have any of these signs or symptoms, do not come to the event and we urge you to seek medical attention. Anyone with a temperature of 100 degrees F or more, will be denied participation in the event or entry onto the premises.

COVID-19 workplace leadership guidelines

Project Mercy has put together a list of safety protocols for all participants. You can find a full set of house component plans, our Waiver, including COVID-19 clause, and the list of Protocols on our website www.projectmercybaja.org. Please study these documents prior to construction.

Waiver:

Please note that no individuals are allowed onsite unless they have filled out our simple Waiver form. This is available online and takes just a couple of minutes to fill-in. Each leader will be sent a list of participants who have filled out the form and we ask your help in ensuring that all members of your team are in compliance.

In addition, we ask that all groups prepare to implement and follow the guidelines set out below:

Specify a leader(s) responsible for implementing the guidelines. The leader (s) should take into consideration a risk assessment of how you plan to follow these measures.

An important factor is pre-build training and communication with workers of these plans.

Factors to be taken into consideration:

Following the guidelines – masks, hand sanitization, social distancing, adhering to work boundaries as laid out (see site plan).

Suggested measures to be taken to ensure distancing while working:

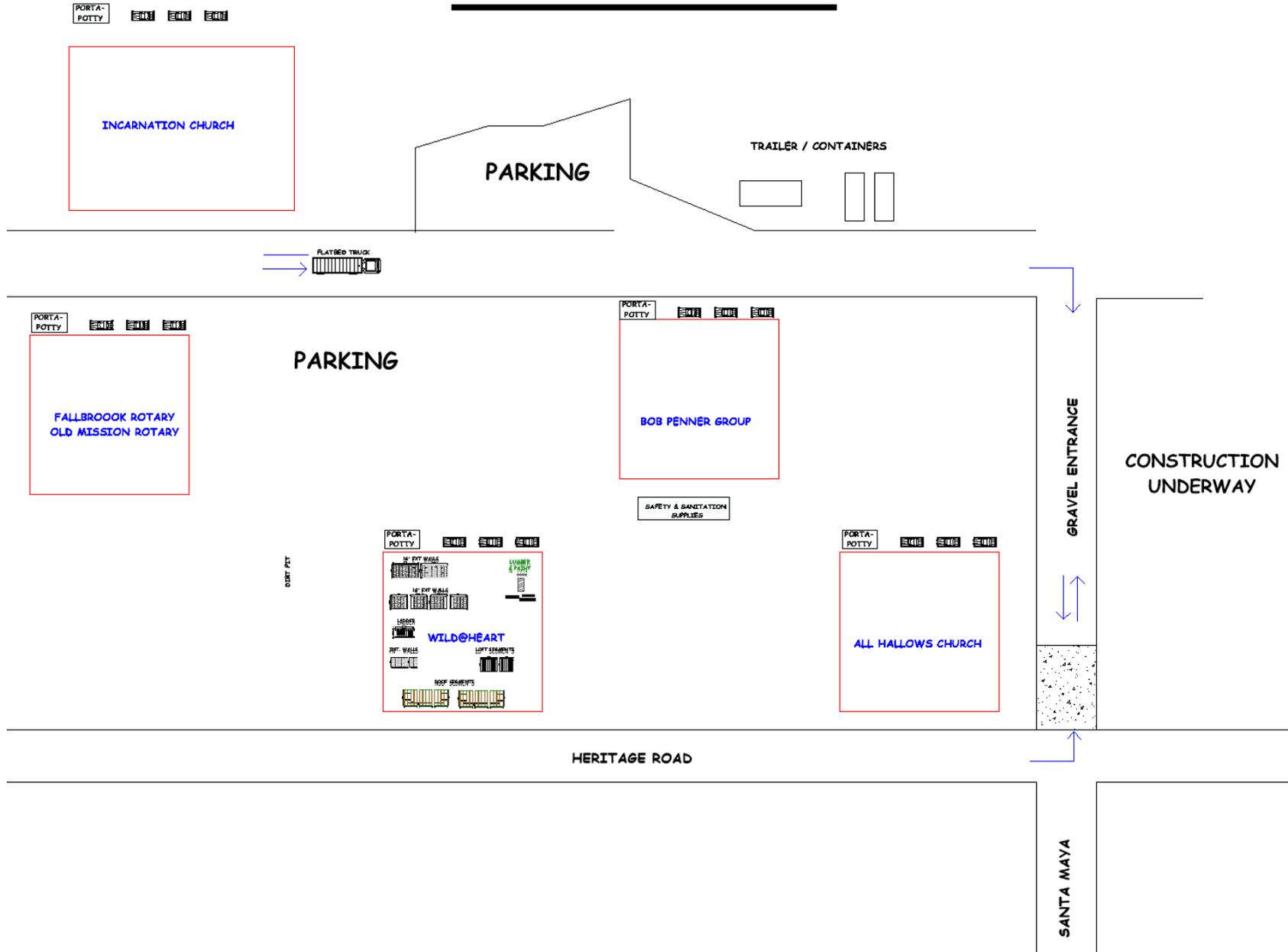
Creation of specific pods of volunteers for specific jobs

Limiting number of workers in each pod

Stagger breaks and areas for same

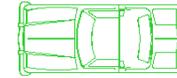
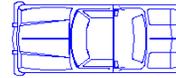
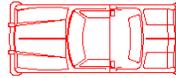
Toilet facilities have been sanitized and have hand sanitizer inside. Individuals are responsible for keeping the facilities clean.

SPECIAL EVENT SITE HERITAGE ROAD & SANTA MAYA CHULA VISTA



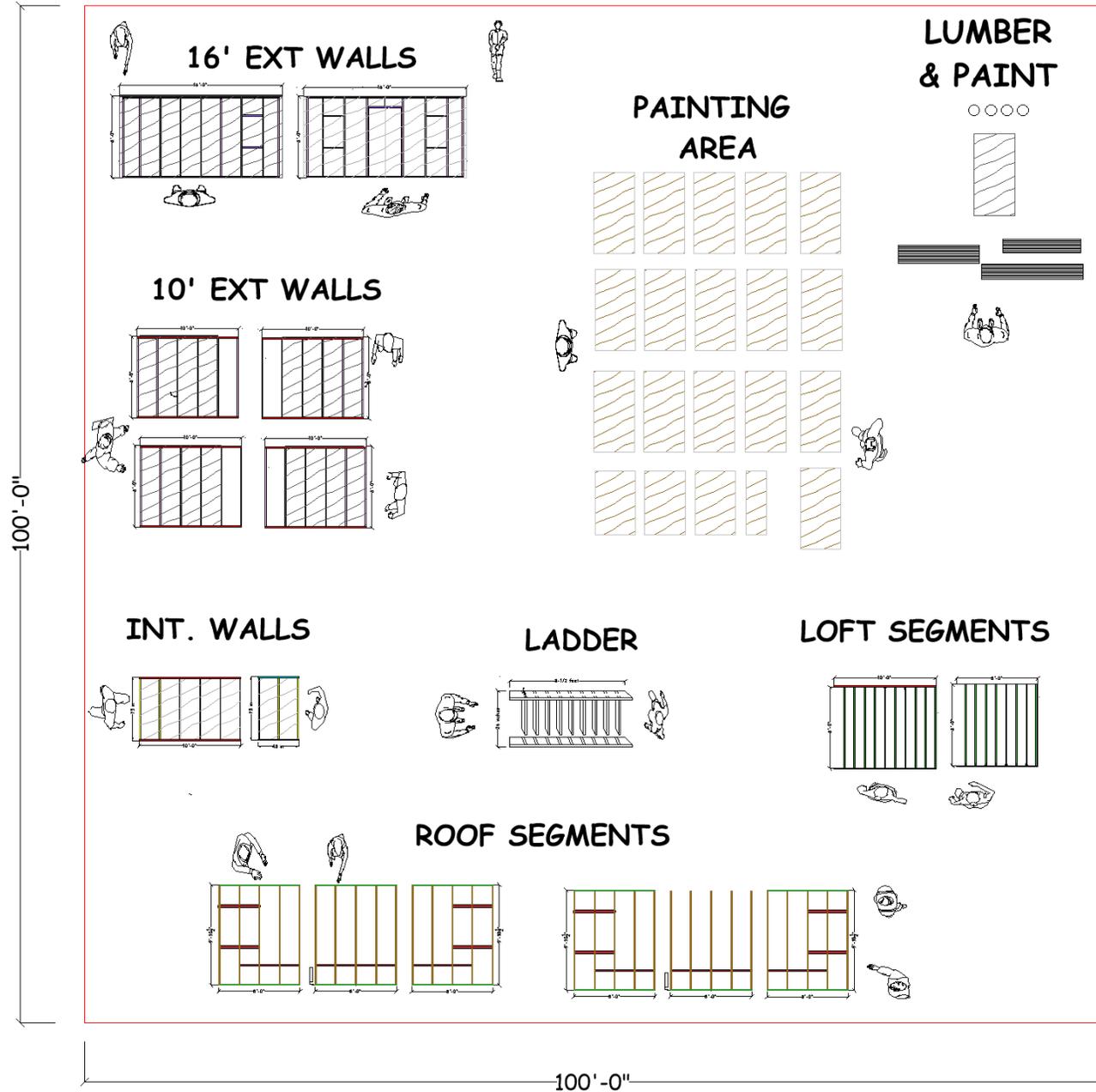


PORTA-
POTTY



GROUP AREA (TYPICAL)

SHOWN WITH 20 PEOPLE



100'-0"

Team Guidelines

What's Being Built

- All Exterior Walls
- Loft Joists
- Stairs
- Interior Walls (x2)
- Roof structure (Six 8-ft segments)

Workflow Suggestions:

Some activities take longer than others, and some are pre-requisites to other, so arranging the workflow is important to have the day go quicker and more efficiently.

- It is recommended that painting one side of the plywood with the interior paint be started immediately. This will allow the paint to dry as the walls are being built. (see general Painting guidelines below)
- The exterior walls and roof segments will take the longest to build, so it is recommended they be started early, in parallel with the painting. Both will ultimately require painting after being assembled.
- The roof segments will also take some time to build, so it is recommended they be started early, in parallel with the exterior wall construction if there are enough volunteers or immediately after wall construction.
- The ladder, lofts, and interior walls can follow.
- All building components will ultimately require painting after being assembled so having a few people operate as a paint crew throughout the day would contribute to efficiency.

Quality Control:

The individual instruction sets below include quality control guidelines where it is important to the build. Check all components for “shiners” (nails through one board missing their intended connection point). Remove and replace these nails as they can be dangerous when loading and building.

Breaks and Lunch:

On your own schedule. Please take frequent water breaks and adhere to self-distancing guidelines.

Loading/Staging:

After building and painting are complete, please help move all building components near the flat-bed truck for loading.

Clean-up:

Please help clean up your work area at the end of the day. The construction company has been kind enough to let us use the site and we want to be good neighbors and leave the site as we found it. There are a couple of magnetic nail pick-up tools available to sweep your area for any nails or screws that may have dropped on the ground.

Also, if you've used our tools, return them to the correct bins and empty any nail pouches into the correctly-sized nail box.

Toilet Facilities:

Each site has its own flush porta-potty. Additional disinfecting spray and hand sanitizer will be provided.

Garbage:

A garbage disposal bin will be available on site for any garbage. Please adhere to safe-distancing guidelines.

(The following additional guidance is provided for reference purposes)

Painting

Within each workspace is a pile of 4'x 8' plywood sheeting. Lay it out on the ground or create 'tents' of two sheets nailed together. There is usually one side nicer than the other, put the nice side down (out) and the rougher side up (in).

The side facing up (out) will be painted with the labeled INTERIOR PAINT in the five gallon bucket. DO NOT PAINT THE OTHER SIDE at this time.



There are also four sheets of shorter plywood (4'x 75") for interior walls, these can be painted on both sides with the INTERIOR paint.

The volunteers who are building the walls will be waiting for the paint on the plywood to dry so speed is essential.

When the exterior walls are built the unpainted side of the plywood will be facing up and can be painted with the exterior color located at your site.



The loft segments can be painted with the INTERIOR paint.

The roof segments should be painted with the WHITE KILZ primer in the 2-gallon bucket.



Front 16-FT Wall section (1 Wall)

All walls framed at 24" on center (see framing plan)

Quality Control:

Installing Plywood sheeting correctly is critical for the walls to sit properly on the foundation. Please check walls are square before nailing sheets by aligning the bottom of the plywood carefully along the bottom of the Bottom Plate, along the side of the wall, and along top of wall (3/4" down from top of Top Plate).

Nailing Schedule:

Two 16-Penny Nails (3-1/4") into each stud through Top and Bottom Plates

8-Penny Nails (2-1/2") every 6 inches along edges of Plywood and every 12 inches along studs under the center of the Plywood.

Lumber Color Coding:

92-1/4" Studs for framing are color coded **PINK** on each end.

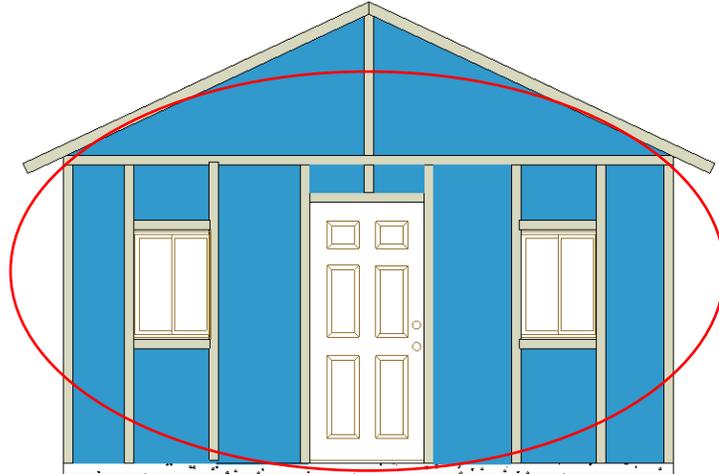
2 x 4 x 15' 5" boards are color coded **BLACK** on each end

2 x 4 x 16-FT King Plate color coded **ORANGE**

Window and Door cuts are pre-made, packaged, marked and color coded **PURPLE**

Lumber Requirement for 16-FT Front Wall Section:

92-1/4" Studs for Framing	8
2 x 4 x 15' 5" boards for Top & Bottom Plates	2
2 x 4 x 16-FT board for King Plate	1
Window & Door Packages	2 Window & 1 Door
Plywood Sheets	4



Rear 16-FT Wall section (1 Wall)

All walls framed at 24" on center (see framing plan)

Quality Control:

Installing Plywood sheeting correctly is critical for the walls to sit properly on the foundation. Please check walls are square before nailing sheets by aligning the bottom of the plywood carefully along the bottom of the Bottom Plate, along the side of the wall, and along top of wall (3/4" down from top of Top Plate).

Nailing Schedule:

Two 16-Penny Nails (3-1/4") into each stud through Top and Bottom Plates

8-Penny Nails (2-1/2") every 6 inches along edges of Plywood and every 12 inches along studs under the center of the Plywood.

Lumber Color Coding:

92-1/4" Studs for framing are color coded **PINK** on each end.

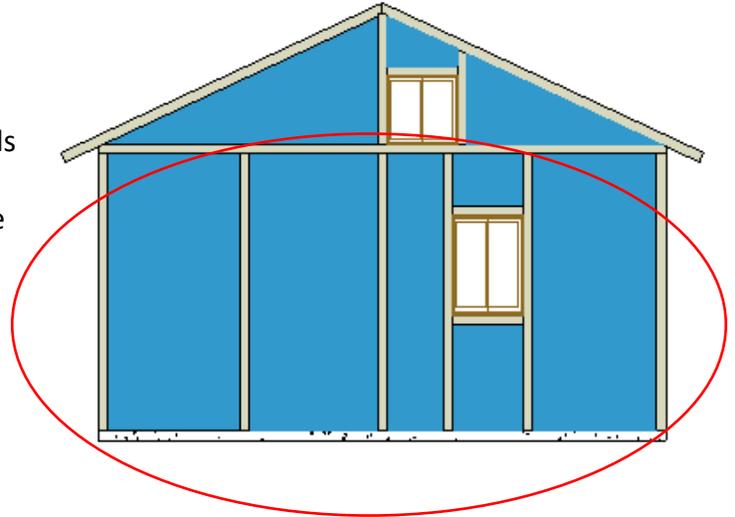
2 x 4 x 15' 5" boards are color coded **BLACK** on each end

2 x 4 x 16-FT King Plate color coded **ORANGE**

Window cuts are pre-made, packaged, marked and color coded **PURPLE**

Lumber Requirement for 16-FT Rear Wall Section:

92-1/4" Studs for Framing	9
2 x 4 x 15' 5" boards for Top & Bottom Plates	2
2 x 4 x 16-FT board for King Plate	1
Window Package	1
Plywood Sheets	4

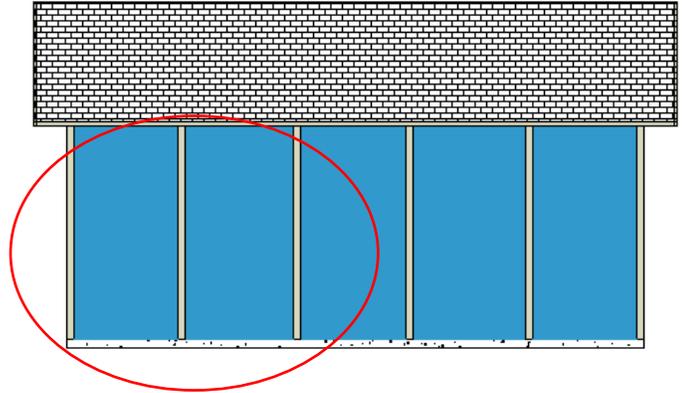


Left Side 10-FT Wall section (2 walls total)

All walls framed at 24" on center (see framing plan)

Quality Control:

Installing Plywood sheathing correctly is critical for the walls to sit properly on the foundation. Please check walls are square before nailing sheets by aligning the bottom of the plywood carefully along the bottom of the Bottom Plate, along the side of the wall, and along top of wall (3/4" down from top of Top Plate).



Nailing Schedule:

Two 16-Penny Nails (3-1/4") into each stud through Top and Bottom Plates

8-Penny Nails (2-1/2") every 6 inches along edges of Plywood and every 12 inches along studs under the center of the Plywood.

Lumber Color Coding:

92-1/4" Studs for framing are color coded **PINK** on each end.

2 x 4 x 10-FT boards are color coded **RED** on each end

Lumber Requirement for Each Left-Side 10-FT Wall Section:

92-1/4" Studs for Framing & King Plate **7**

2 x 4 x 10-FT boards for Top & Bottom Plates **2**

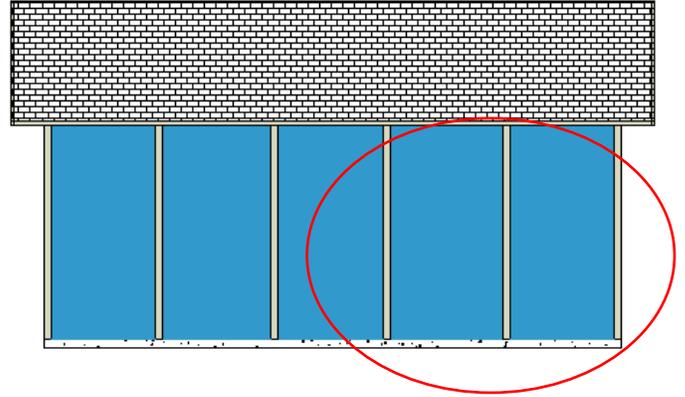
Plywood Sheets **2**

Right Side 10-FT Wall section (2 walls total)

All walls framed at 24" on center (see framing plan)

Quality Control:

Installing Plywood sheathing correctly is critical for the walls to sit properly on the foundation. Please check walls are square before nailing sheets by aligning the bottom of the plywood carefully along the bottom of the Bottom Plate, along the side of the wall, and along top of wall (3/4" down from top of Top Plate).



Nailing Schedule:

Two 16-Penny Nails (3-1/4") into each stud through Top and Bottom Plates

8-Penny Nails (2-1/2") every 6 inches along edges of Plywood and every 12 inches along studs under the center of the Plywood.

Lumber Color Coding:

92-1/4" Studs for framing are color coded **PINK** on each end.

2 x 4 x 10-FT boards are color coded **RED** on each end

Lumber Requirement for Each Left-Side 10-FT Wall Section:

92-1/4" Studs for Framing & King Plate **7**

2 x 4 x 10-FT boards for Top & Bottom Plates **2**

Plywood Sheets **2**

Interior Wall sections (2 walls total)

All walls framed at 24" on center (see framing plan)

Quality Control:

Installing Plywood sheeting correctly is critical for the walls to sit properly on the foundation. Please check walls are square before nailing sheets by aligning the bottom of the plywood carefully along the bottom of the Bottom Plate, along the side of the wall, and along top of wall (3/4" down from top of Top Plate).

Nailing Schedule:

Two 16-Penny Nails (3-1/4") into each stud through Top and Bottom Plates
8-Penny Nails (2-1/2") every 6 inches along edges of Plywood and every 12 inches along studs under the center of the Plywood.

Lumber Color Coding:

72" Studs for framing are color coded **YELLOW** (YELLOW) on each end.

2 x 4 x 10-FT boards are color coded **RED** on each end

2 x 4 x 4-FT boards are color coded **LIGHT BLUE** on each end

Lumber Requirement for Interior Wall Sections:

72" Studs for Framing & King Plate (**YELLOW**) **9**

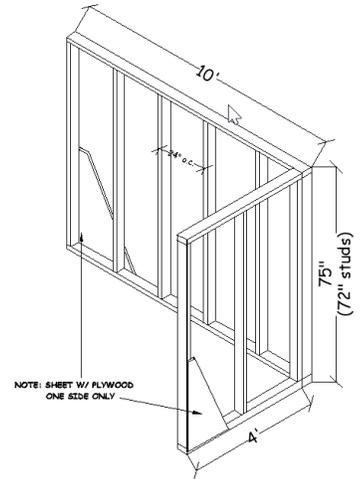
2 x 4 x 10-FT boards for Top & Bottom Plates **2**

2 x 4 x 4-FT boards for Top & Bottom Plates **2**

Plywood Sheets **3-1/2**

Painting:

Once the plywood has been nailed to the studs, paint the top face of the plywood with the interior color (the underside should have been painted earlier).



10-FT Loft Floor (1 total)

Framing is 12" on center (see framing plan)

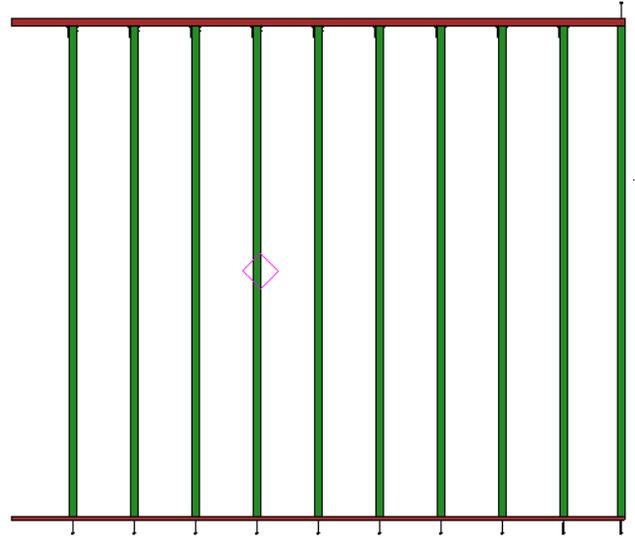
Quality Control:

Please take your time during layout to ensure the joist hangers are located in the right place and that they are mounted correctly (see the diagram). This is key to proper installation of the loft in Tijuana.

Description:

The loft floor consists of a number of 8-ft 2x4 joists nailed on one end to a ledger (10-ft 2x4) with metal joist hangers, using joist hanger nails. There is one sample ledger with joist hangers attached.

The other end of the joists will be nailed to a 1x4 board. This board is temporary to aid in transportation and will be removed when the loft floor is assembled in a house in Tijuana.



Nailing Schedule:

Use 1-1/2" joist hanger nails to nail joist hanger to ledger, and to joist. Use 4 joist hanger nails per hanger. Nail two 16-Penny Nails (3-1/4") into each joist through each joist hanger (see drawing). Nail the opposite end of the joist to a temporary 1 x 4 ledger using a single 8-Penny Nails (2-1/2") through the ledger and into each joist.

Lumber Color Coding:

2 x 4 x 8-FT boards are color coded **GREEN** on each end

2 x 4 x 10-FT boards are color coded **RED** on each end

1 x 4 x 10-FT Temporary Ledger boards are not color coded and are located near your station.

Lumber Requirement for 10-FT Loft Section:

2 x 4 x 8-FT Joists	10
2 x 4 x 10-FT Ledger	1
1 x 4 x 10-FT Temporary Ledger	1

Painting:

Flip the loft floors over and paint the joists with the Interior Paint provided. This will result in having the ceiling joists painted. We do not paint the top of the joists because they will be covered by plywood when the house is put together in Mexico.

Extra plywood:

After all the walls are built, there will be four extra sheets of plywood which will be used to complete the houses in Mexico. Please attach two of those extra sheets on the 10-FT loft floor using 8-penny nails at the 4 corners of each sheet.

8-FT Loft Floor (1 total)

Framing is 12" on center (see framing plan)

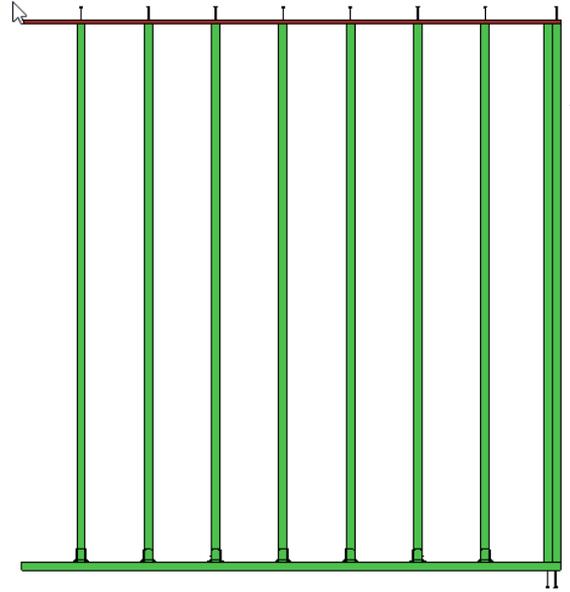
Quality Control:

Please take your time during layout to ensure the joist hangers are located in the right place and that they are mounted correctly (see the diagram). This is key to proper installation of the loft in Tijuana.

Description:

The loft floor consists of a number of 8-ft 2x4 joists nailed on one end to a ledger (10-ft 2x4) with metal joist hangers, using joist hanger nails. There is one sample ledger with joist hangers attached.

The other end of the joists will be nailed to a 1x4 board. This board is temporary to aid in transportation and will be removed when the loft floor is assembled in a house in Tijuana.



Nailing Schedule:

Use 1-1/2" joist hanger nails to nail joist hanger to ledger, and to joist. Use 4 joist hanger nails per hanger. Nail two 16-Penny Nails (3-1/4") into each joist through each joist hanger (see drawing). Nail the opposite end of the joist to a temporary 1 x 4 ledger using a single 8-Penny Nails (2-1/2") through the ledger and into each joist.

Lumber Color Coding:

2 x 4 x 8-FT boards are color coded **GREEN** on each end

2 x 4 x 10-FT boards are color coded **RED** on each end

1 x 4 x 10-FT Temporary Ledger boards are not color coded and are located near your station.

Lumber Requirement for 8-FT Loft Section:

2 x 4 x 8-FT Joists	10
2 x 4 x 10-FT Ledger	1
1 x 4 x 10-FT Temporary Ledger	1

Painting:

Flip the loft floors over and paint the joists with the Interior Paint provided. This will result in having the ceiling joists painted. We do not paint the top of the joists because they will be covered by plywood when the house is put together in Mexico.

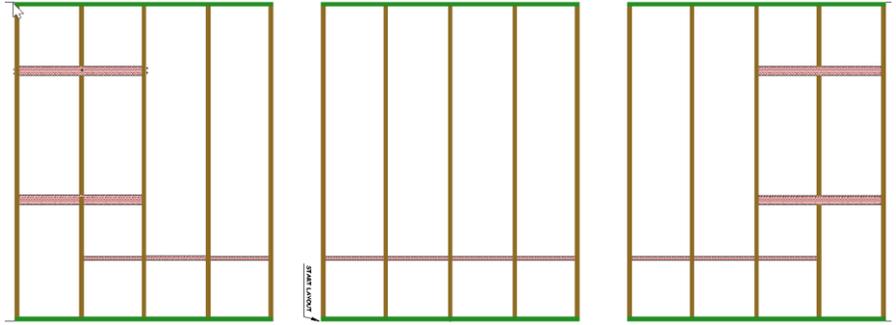
Extra plywood:

After all the walls are built, there will be four extra sheets of plywood which will be used to complete the houses in Mexico. Please attach two of those extra sheets on the 8-FT loft floor using 8-penny nails at the 4 corners of each sheet.

Roof Segment (6 segments total)

Quality Control:

Layout out and construction of the roof segments is important to ensure proper installation of sheathing in Mexico. Six segments are needed, two right, two center and two left. **Please refer to the roof diagram and roofing guide for specific layout and placement.** Ask one of the skilled volunteers for guidance if you are unsure.



There are 3 different configurations of rafters and placement with a segment is important.

Please ensure that nails are installed correctly, i.e., fully nailed flat against wood. We do not want nails sticking out into open air. These can cause serious cuts.

Nailing Schedule:

Two 16-Penny Nails (3-1/4") into each rafter through Ridge (Top) and Eave (Bottom) boards.

Two 16-Penny Nails into each outlooker through rafter and one in center of outlooker into rafter below.

Two 16-Penny Nails into each block through rafter on both ends. End-nailed or Toe-nailed.

Lumber Color Coding:

2 x 4 x 8-FT boards are color coded **GREEN** on each end

2 x 4 x 10-FT rafter material is color coded **RED**

2 x 4 x 10-FT rafters are color coded **BROWN**

45-5/8" outlookers are not color coded, but labeled with size

21-5/8" and 22-5/8" blocks are not color coded, but labeled with size

Lumber Requirement for six roof segments:

2 x 4 x 8-FT boards for Ridge & Eave boards

12

2 x 4 x 10-FT rafters

30 (four barge, four notched, twenty-two common)

Outlookers @ 45-5/8"

8

Blocks

20 (twelve @ 21-5/8" & eight at 22-5/8")

LADDER (1 total)

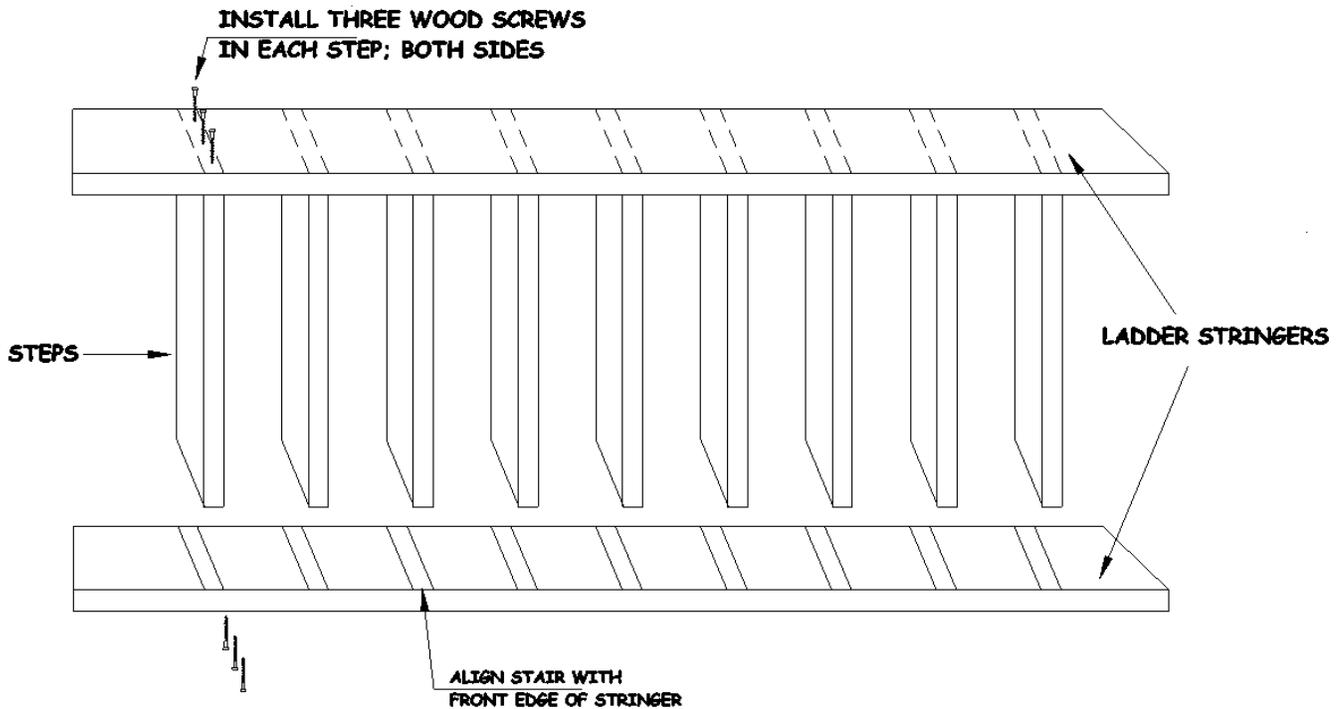
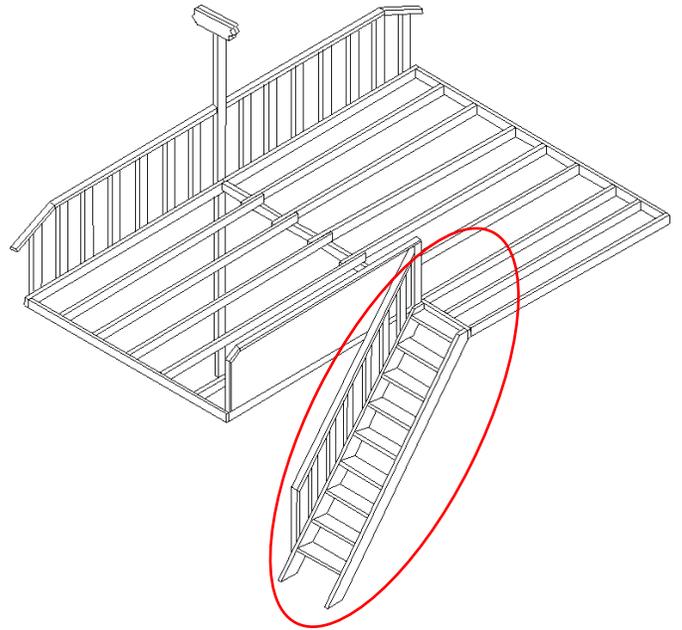
Ladder Set consists of:

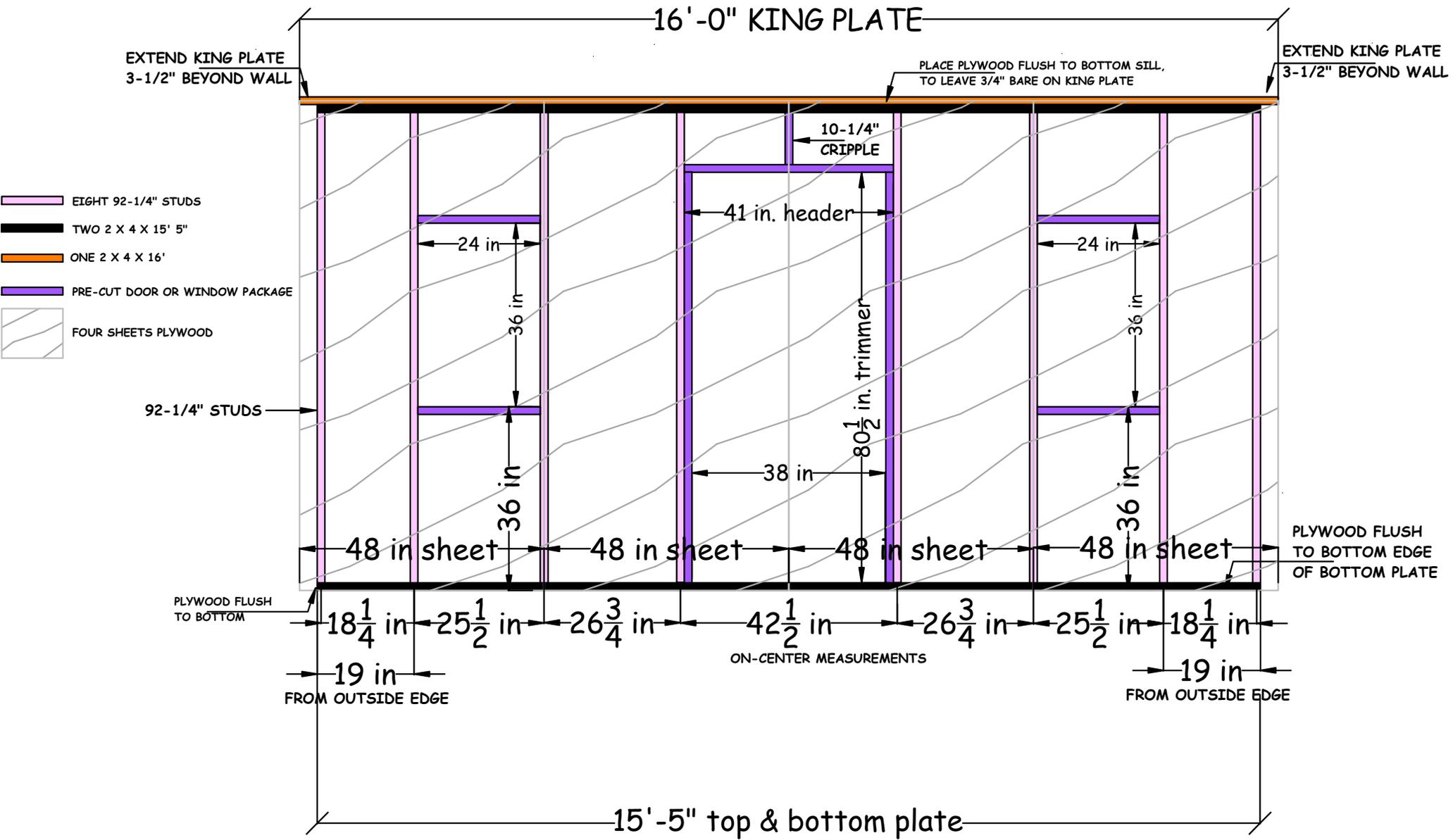
- Two 9-FT 6-IN stringers
- 9 stair steps

Use the 3 inch screws, 3 per step side, to assemble the ladders.

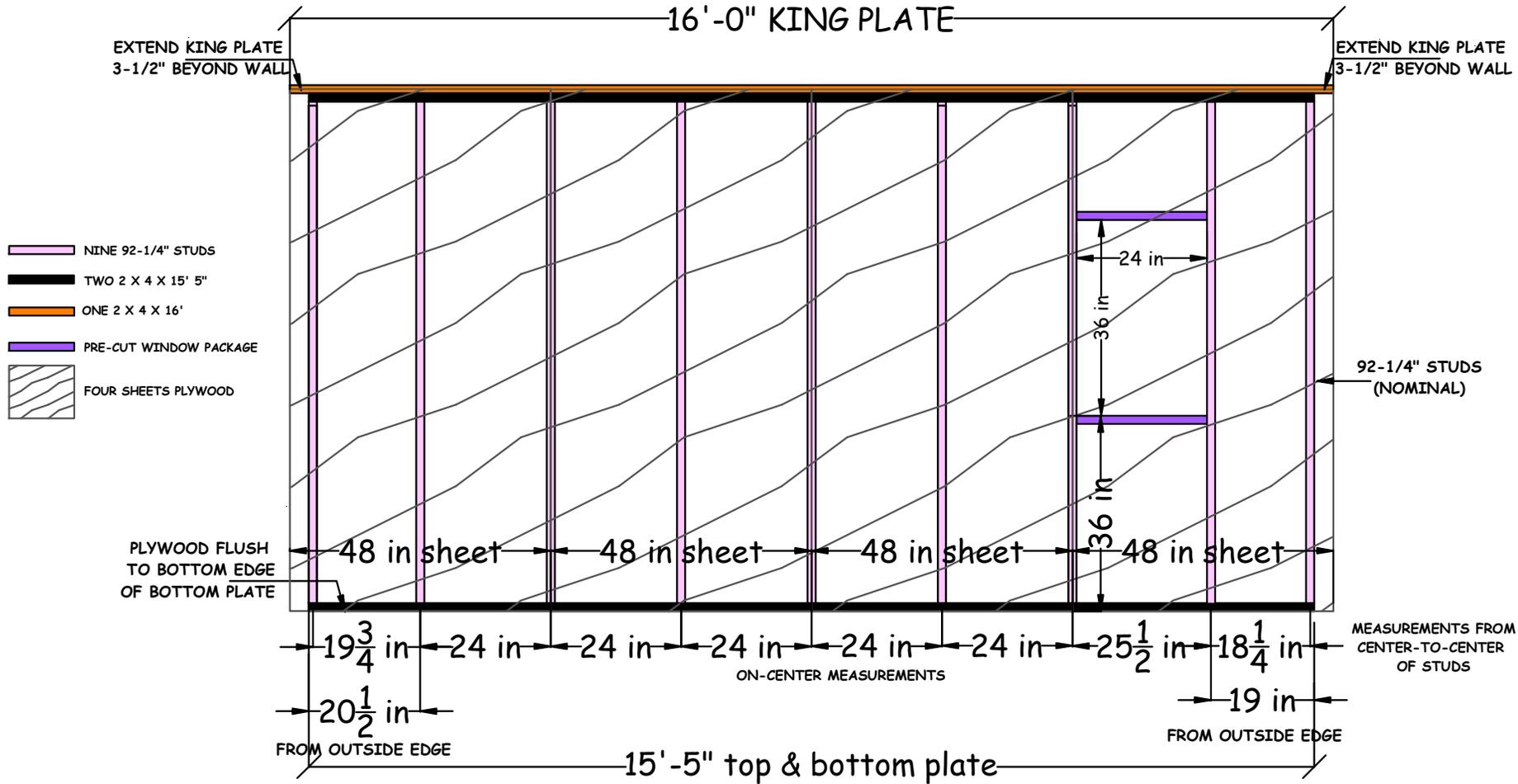
Drill 1/8" holes for the screws in the stringers first, for ease of assembly.

Paint the ladders with the interior paint.

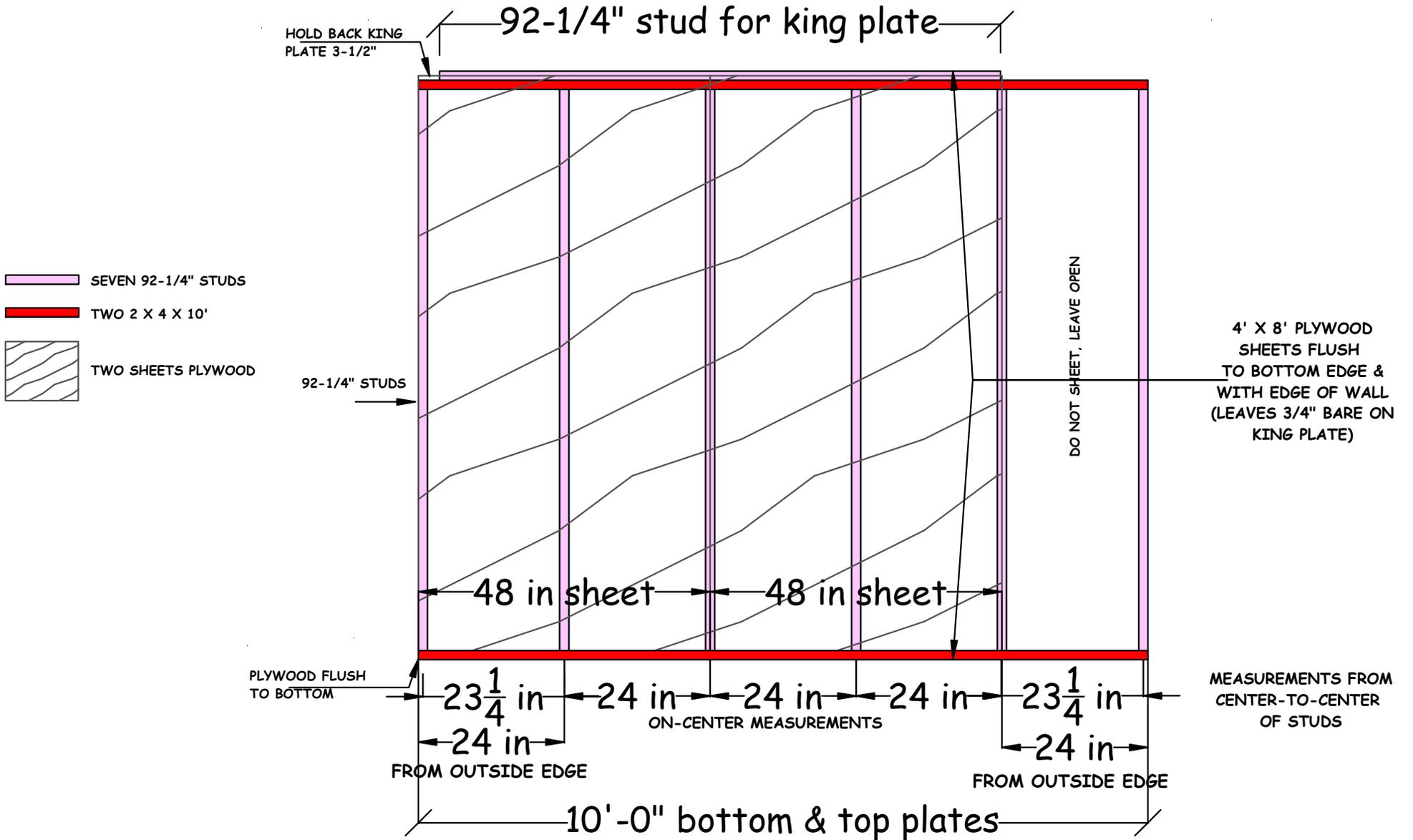




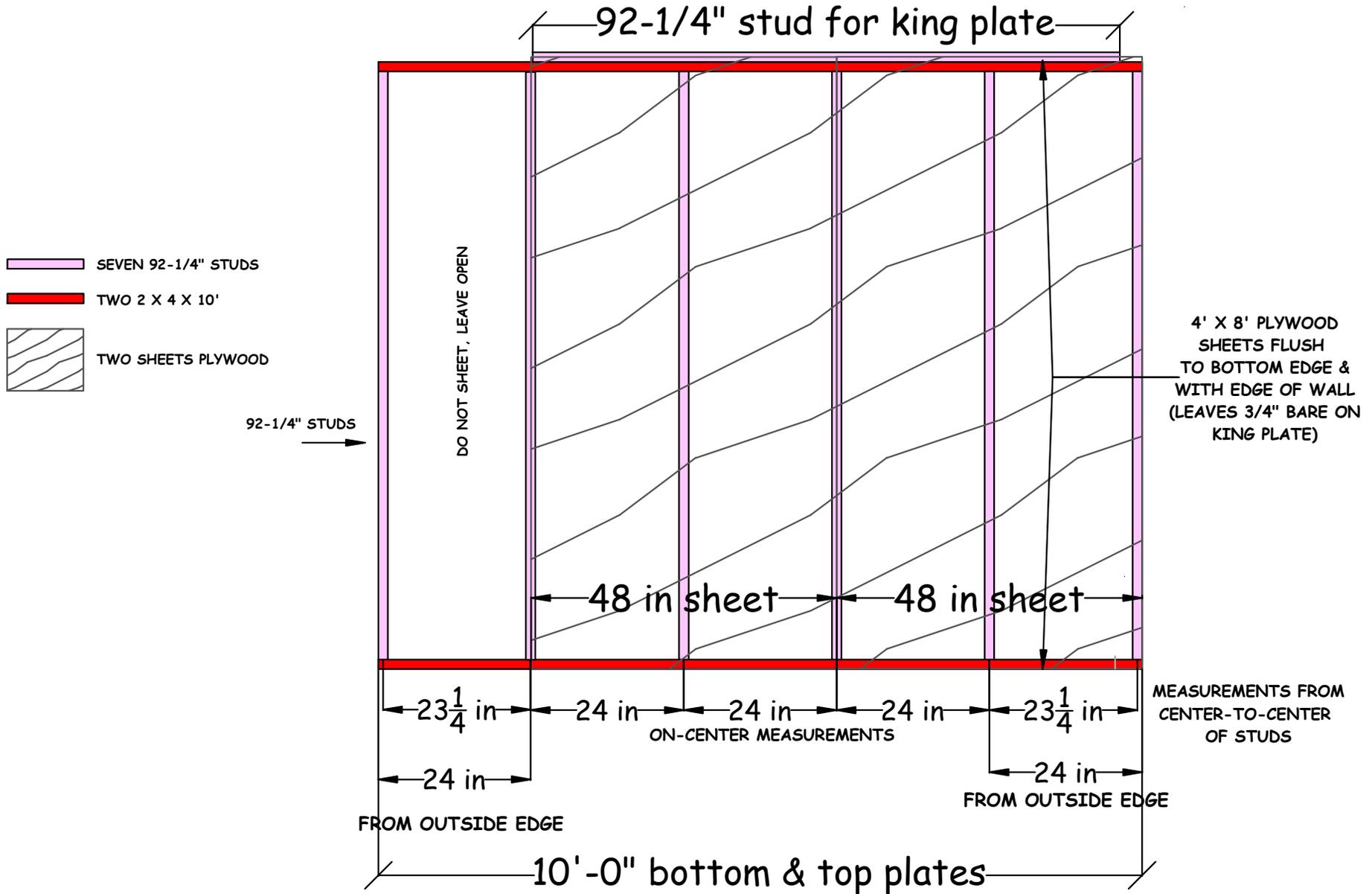
- EIGHT 92-1/4" STUDS
- TWO 2 X 4 X 15' 5"
- ONE 2 X 4 X 16'
- PRE-CUT DOOR OR WINDOW PACKAGE
- FOUR SHEETS PLYWOOD



LEFT SIDE OF 20 FT WALL

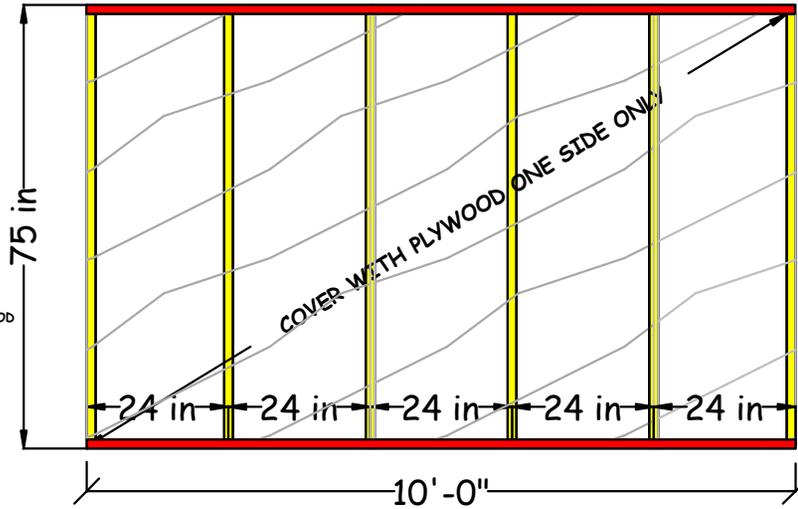


RIGHT SIDE OF 20 FT WALL

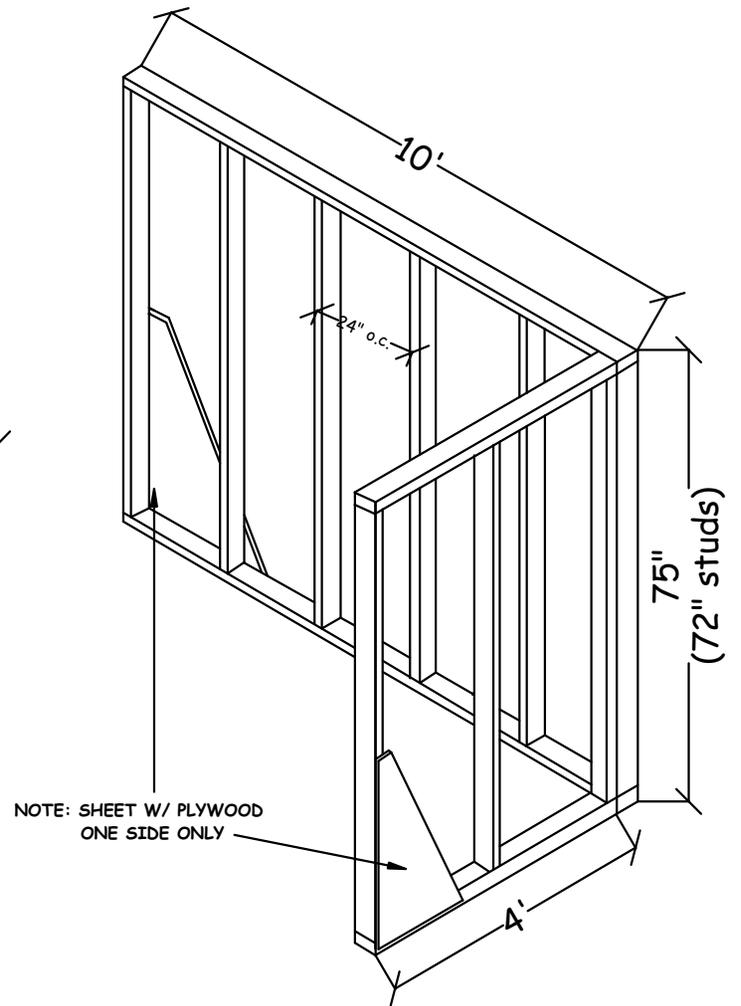
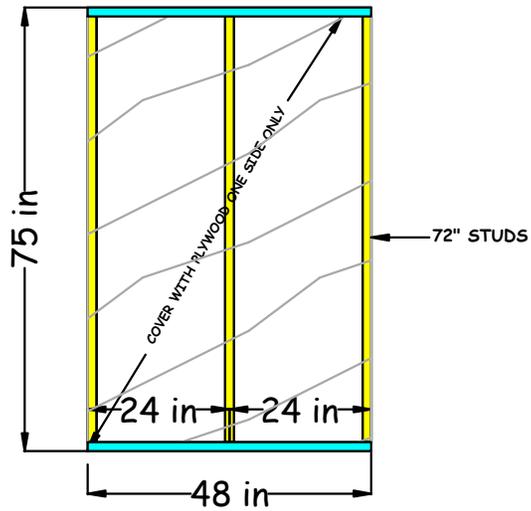


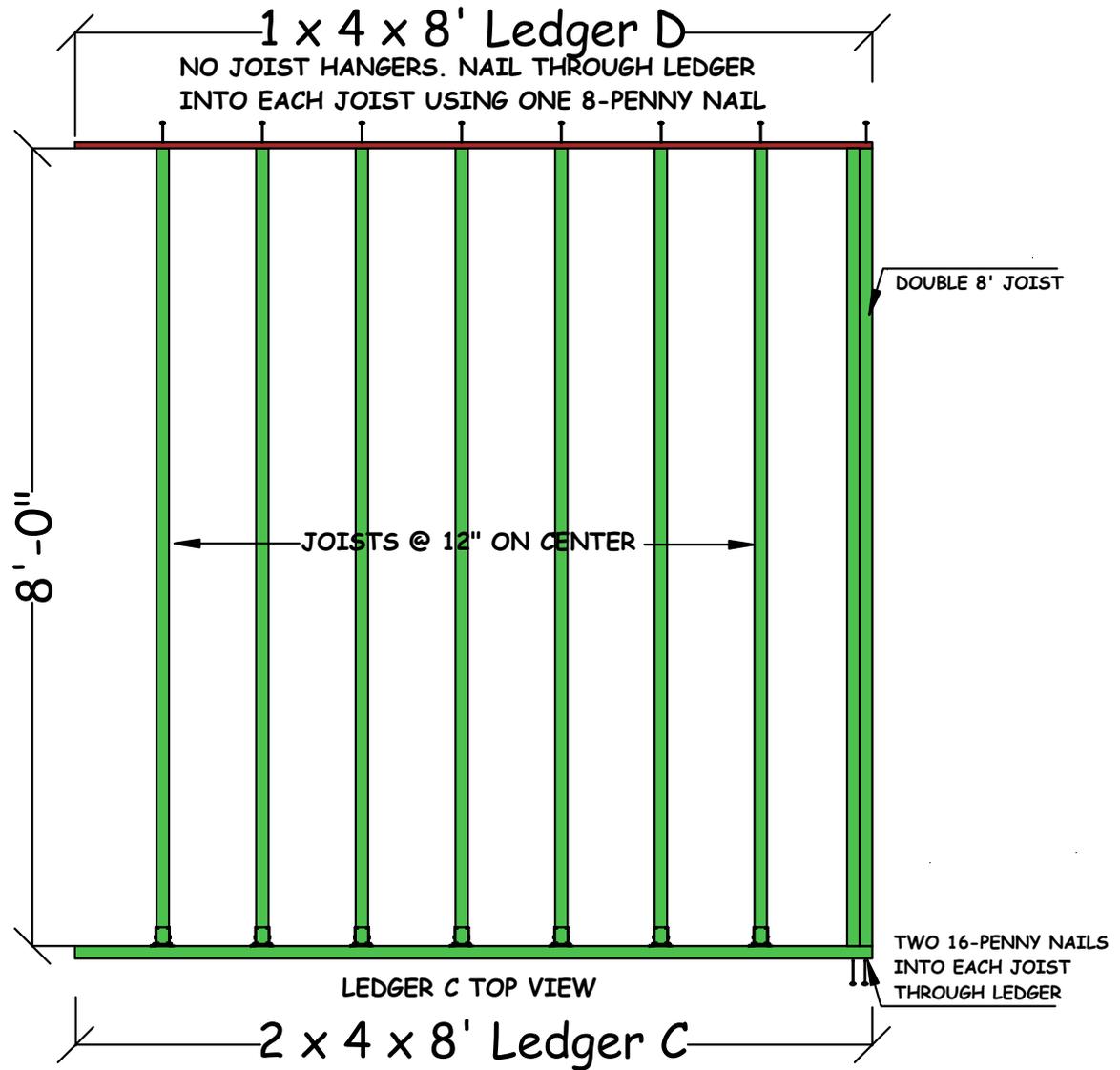
INTERIOR WALLS

-  SIX 72" STUDS
-  TWO 2 X 4 X 10'
-  TWO & ONE HALF SHEETS PLYWOOD

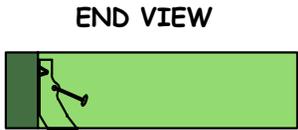


-  THREE 72" STUDS
-  TWO 2 X 4 X 4'
-  ONE SHEET PLYWOOD





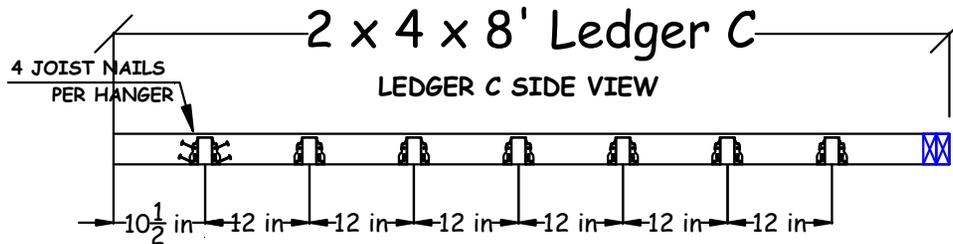
INSTALL HANGER SO THAT TOP OF LEDGER AND JOISTS ARE FLUSH



NAIL JOIST THROUGH HANGER WITH ONE 16D NAIL BOTH SIDES

ISOMETRIC VIEW

NAIL 2X4 JOIST THROUGH HANGER WITH ONE 16D NAIL ON BOTH SIDES





END VIEW

INSTALL HANGER SO THAT TOP OF LEDGER AND JOISTS ARE FLUSH

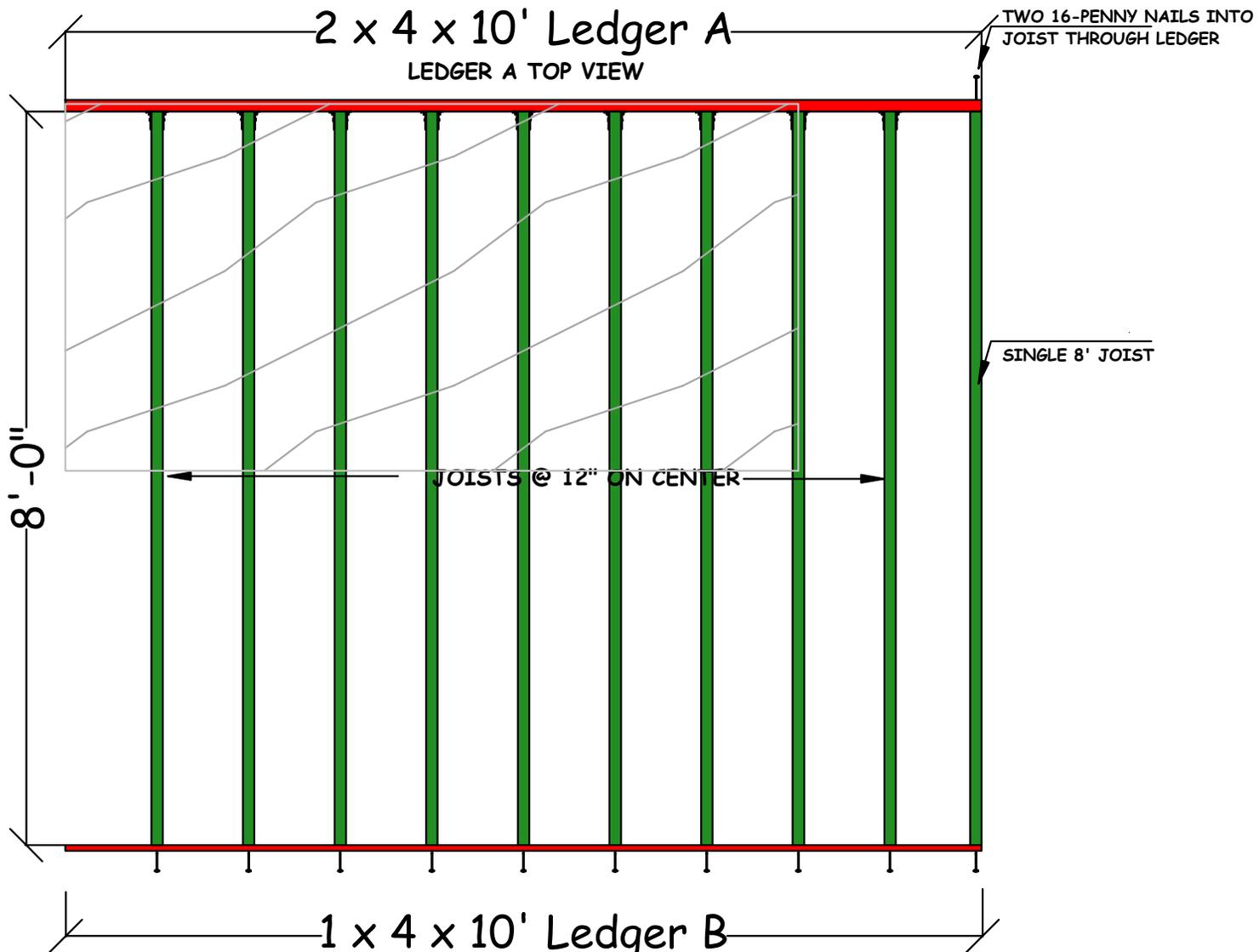
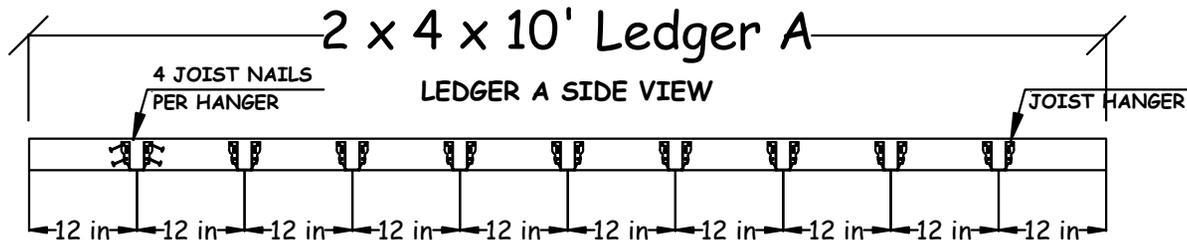


END VIEW

NAIL JOIST THROUGH HANGER WITH ONE 16D NAIL BOTH SIDES

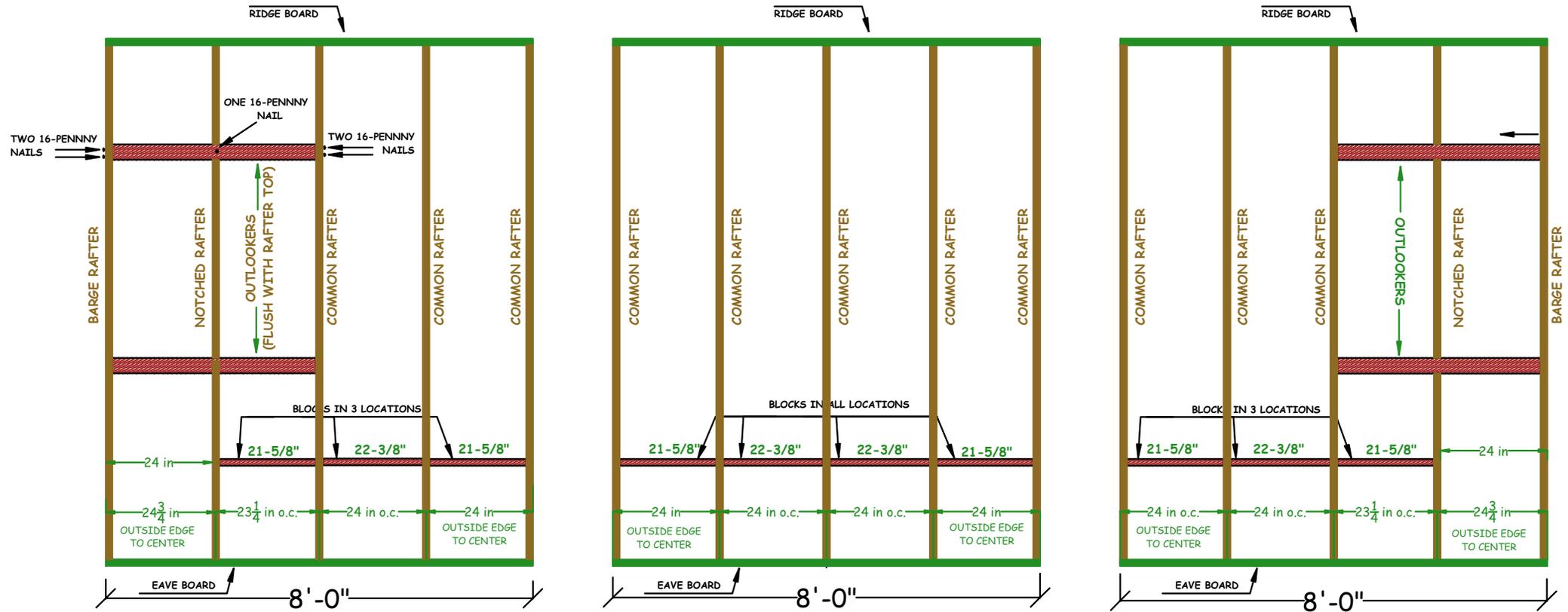
ISOMETRIC VIEW

NAIL 2X4 JOIST THROUGH HANGER WITH ONE 16D NAIL ON BOTH SIDES



NO JOIST HANGERS. NAIL THROUGH LEDGER INTO EACH JOIST USING ONE 8-PENNY NAIL

16' X 20' HOUSE: ROOF SEGMENTS (TOP DOWN VIEW) (2 EACH FOR A TOTAL OF SIX SEGMENTS)



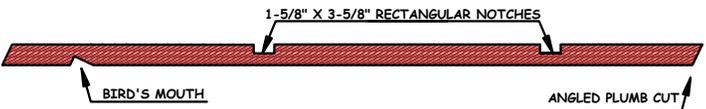
SIDE VIEWS



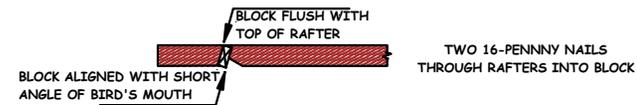
COMMON RAFTER (BIRD'S MOUTH ONLY)



BARGE RAFTER (NO BIRD'S MOUTH OR CUTOUTS)



NOTCHED RAFTER



SPECIAL EVENT CUT LIST

This cut list is provided to guide you in the most efficient use of lumber. There is no extra material.

Recommended that one person be designated to cut all lumber so that control can be maintained on available material.

USE 8' (96-IN) 2X4'S FOR ALL CUTS; Write cut dimension on each piece for easy identificaion.

USE 16' and 20' 2x4's for WALL PLATES ONLY. May be cut by lead builder at his/her discretion.

DO NOT CUT 92-1/4" STUDS OR 10' 2x4's FOR ANY REASON EXCEPT FOR THEIR INTENDED PURPOSES (SEE BELOW)

Material Needed	Stock to use	Purpose	Notes
<u>Long Walls:</u>			
Eight 2x4 @ 10'	cut from 10' 2x4s	4 sets of wall top & bottom plates	10' 2x4's measure slightly longer than 20', so cut to exact length
<u>Short Walls</u>			
Four 2x4 @ 15' 5"	cut from 16' 2x4s	2 sets of wall top & bottom plates	
Two 2x4 @ 16'	cut from 16' 2x4s	upper top plate for 2 Short walls	16' 2x4's measure slightly longer than 16', so cut to exact length
<u>Interior Walls</u>			
Two 2x4 @ 10'	Cut from 10' 2x4s	long interior wall top & bottom plate	10' 2x4's measure slightly longer than 20', so cut to exact length
Two 2x4 @ 4'	Cut from one 8' 2x4	short inter. wall top & bottom plate	
Nine 2x4 @ 72"	Cut from 8' 2x4s	Interior wall studs	Save cut pieces for window sills
3.5 plywood sheets	Cut to 75" length	sheet one side only	rip sheet to 2'x8' before cutting to 75"
<u>Window Sills and Headers</u>			
Six 2x4 @ 24"	Use int wall cutoffs	3 sets of window sills and headers.	use six 24" cutoffs from interior walls
<u>Door Opening</u>			
Two 2x4 @ 80.5"	Cut from two 8' 2x4s	Door Trimmers	
2x4 @ 41"	Use scrap (see note)	Door header; measure actual door width and add 3-1/2"	Use remaining 55" piece for blocking
2x4 @ 10-1/4"	use trimmer scrap	Door cripple above header	
<u>Loft Ledger</u>			
One 2x4 @ 10'	Use 10' 2x4s	Loft joist ledger for joist hangars	10' 2x4's measure slightly longer than 20', so cut to exact length
One 2x4 @ 8'	Use 8' 2x4s	Loft joist ledger for joist hangars	
<u>Roof</u>			
twenty-two 10' 2x4's	Use 10' 2x4's	Common Rafters	Use template
four 10' 2x4's	Use 10' 2x4's	Barge Rafters	Use template but no bird's mouth
four 10' 2x4's	Use 10' 2x4's	Notched Rafters	
eight 2x4 @45-5/8"	Cut from two 8' 2x4	Outlookers	
Twelve 21-5/8" 2x4 blocks	Use scraps from other cuts (see note); cut remainder from 8' 2x4s	Blocking between rafters at wall	3 pieces from interior wall studs, door header
Eight 22-3/8" 2x4 blocks	Use scraps from other cuts (see note); cut remainder from 8' 2x4s	Blocking between rafters at wall	3 pieces from interior wall studs, door header

Rafters & Roof Structures

Note: This set of detailed instructions is provided for those not familiar with building the roof on the ground (one of Project Mercy's two methods). Skilled helpers will be available to assist as desired.)

Note: If your group has requested that your lumber be pre-cut, you can skip the cutting steps and just refer to the layout and assembly steps

Materials Needed

- Twenty-eight rafters
 - a. 22 Common
 - b. 4 Notched
 - c. 4 Barge
- Eight outlookers @ 45-5/8"
- Frieze Blocking
 - a. 12 @ 21-5/8"
 - b. 8 @ 22-5/8"
- Twelve 8-ft 2x4's
- 16d framing nails



Tools Needed

- Rafter Template (if rafters not pre-cut)
- Hammers
- Mitre saw or Circular saw (if components not pre-cut).
- Reciprocating saw or jig saw (if rafters not pre-cut)
- Tape Measure
- Pencil

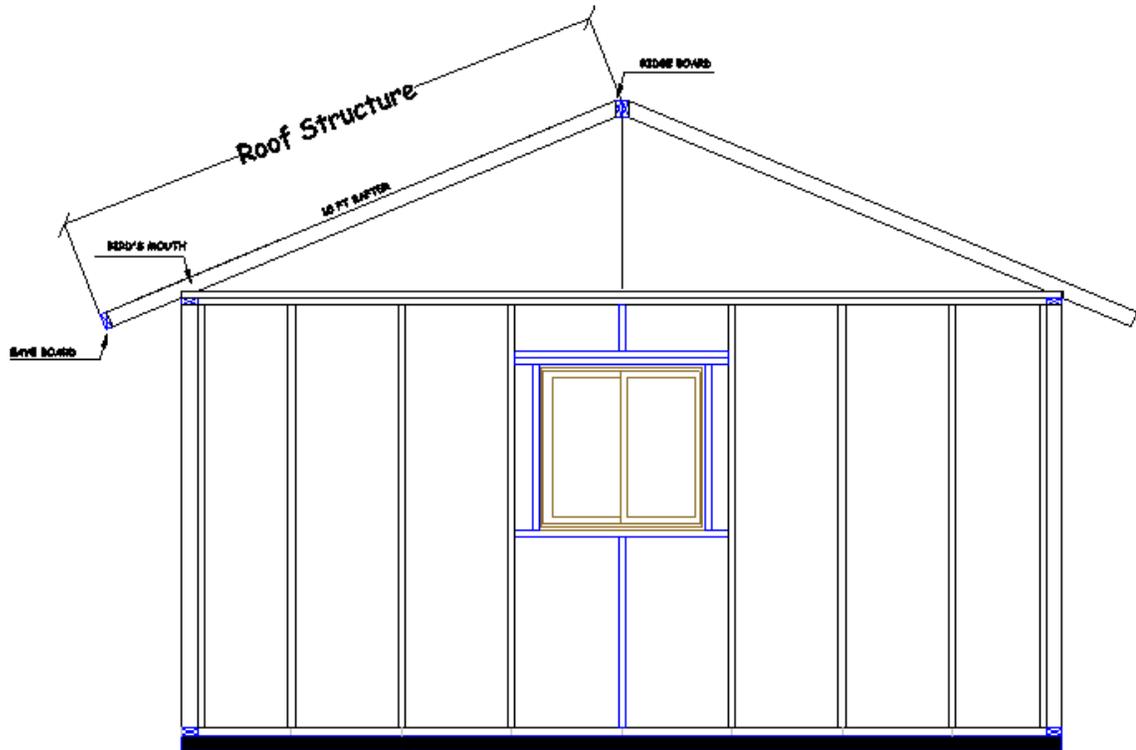
Most Common Mistakes

- Not nailing rafters flush with ridge and 3/4" down at eave.
- Not nailing blocking flush with rafter tops & at wrong angle.
- Not nailing rafters on layout.
- Nailing rafters upside down.

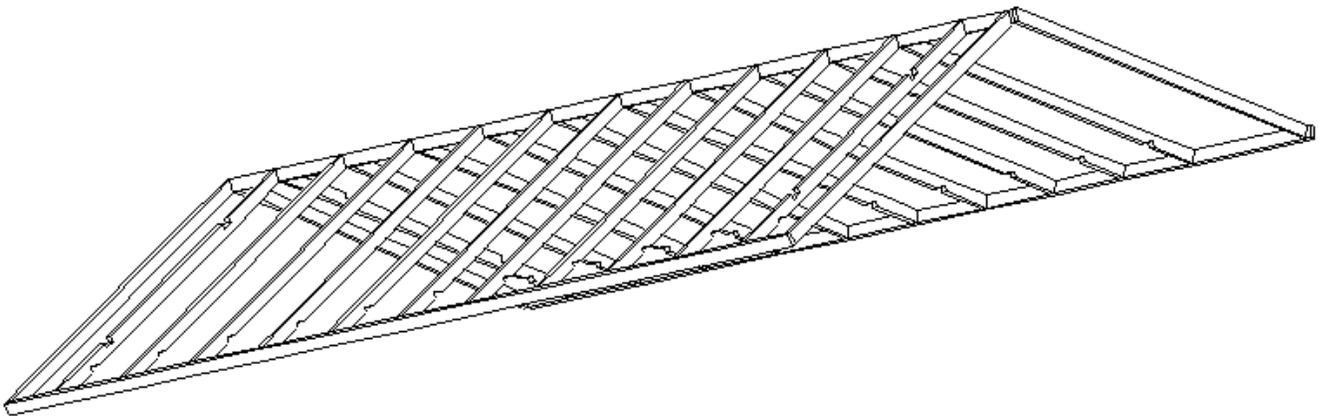


Introduction

The roof structure is built in six 8-ft segments to be combined at a later date on the house to form the roof. Put simply, the six roof assemblies, when lifted and mounted onto the tops of the long walls, create a sequence of wooden triangles that form the roof of a house. More precisely, they are assemblies consisting of a number of 10' long, rafters, held together in the roof structure by eave and ridge boards. Blocking is installed between the rafters to aid in attaching the roof structure to the walls. Three sets of two identical structures are built to create the triangular shape of the roof, each of which is lifted onto the top plates of the house's long walls separately, and joined together once is the proper location and securely nailed to the walls. These assemblies overhang the walls to form eaves. The rafter structure is designed to handle the various loads a roof will experience. Our rafters are made out of 2x4 framing lumber that are fastened together with 16-penny (3-1/4") nails.



Basic Roof Design



Pre-Construction

1. Locate an area away from other activities that is relatively flat and a minimum 10' by 12'. Preferably, two such areas are needed in order to work on the roof structures simultaneously. Once started it is difficult to move a roof structures until it is completed,
2. Once a work area has been identified, move all of the roof structure material to that area to avoid interference with other activities.

Rafter Layout and Cutting (rafters may be pre-cut)

Rafters are laid out using a Rafter Template provided by the Project Mercy staff. Each of the six roof structures consists of 5 rafters in various configurations and each receives an angled (plumb) cut at each end.

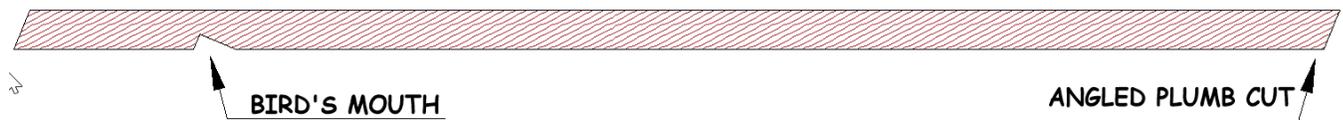


The following cuts are made for each roof segment.

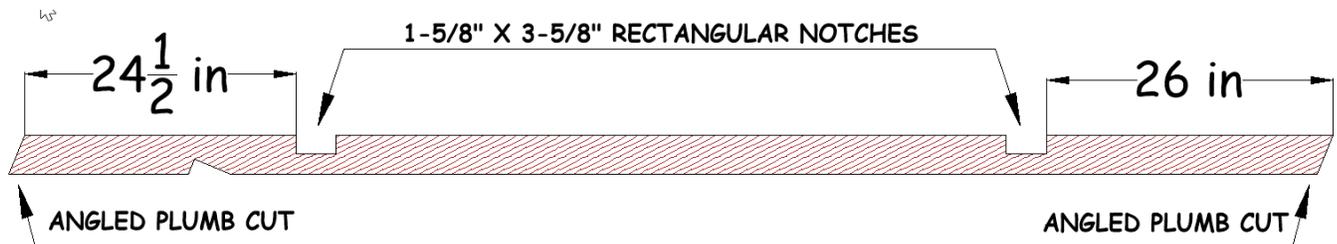
Barge rafters form the ends of the roof and extend beyond the walls forming an overhang. Cut angled plumb cuts on each of the 8 Barge rafters and set aside.



Each of the remaining rafters receives an additional notch cut called a 'Bird's Mouth'. When installed on the walls, the bird's mouth rests on the top plate of the wall, providing a nailing surface for the rafter into the top plate. These are referred to as Common rafters.



Four of the rafters that have the bird's mouth cut each receive two additional 3-5/8" x 1-5/8" rectangular notches that are used to support the overhang extension of the roof at the front and back of the house. Utilize the measurements in the diagram below to lay out these notches.



Cutting the Rafters

Rafters are normally cut using a skill saw (circular saw), although the angled plumb cuts can alternatively be cut using the miter saw.



If the rafters have not been pre-cut for you, cut the angled plumb cut on 28 rafters. Once cut, set four of these boards aside as Barge rafters. These are the end boards of a single roof assembly and they receive no other cuts.

Make the two cuts for the bird's mouth in the remaining 24 rafters. Since these cuts are being made with a circular saw, the top (visible part of the cut) will be further advanced than the lower part of the cut (because of the curve in the blade). This can be compensated for by over-cutting (extending the cuts beyond the intersection of the two lines). However, this method further weakens the board at the location of the cut, it is preferable to stop the cuts at the intersection of the lines, and then use a reciprocating saw or jig saw to finish the cut. (see photos below)



Four of the rafters that have receive the bird's mouth cut receive additional rectangular notches. These notches can be cut in one of two methods.

Method 1: Stand the four boards on end and aligned so that the pencil marks for the two notches are directly opposite each other. Set the table of the skill saw to 1-5/8" and cut across the four boards at one of the pencil marks. (Note: this is a good time to check the depth of the cut with a tape measure to ensure you have properly set the table at 1-5/8".) Cut across the boards at the other pencil line. Once you've made these two boundary cuts, make multiple cuts across the boards between these two boundary cuts at approx. 1/2" spacing. Repeat these steps for the second rectangular notch.



Lay the boards flat and tap the cut areas with a hammer. The 1/4" - 1/2" pieces should break out easily. Clean the bottom of the notch with the reciprocating saw or jig saw and test the depth with a scrap piece of 2 x 4 lumber.

Method 2: The alternative method is to cut the notch with a skill saw. Lay the rafter flat and cut along the two shorter lines first and then us a plunge cut (Lifting the back end of the saw table above the line and slowly lowering the running blade into the wood.) Overcuts beyond the line intersections are unavoidable with this technique, but minimize the overcuts as much as possible. Using a reciprocating saw or jig saw to finish the cuts in the same manner as the bird's mouth cut described above which will help minimize overcuts.

Eave & Ridge Board Layout and Cutting

The roof assembly is formed by nailing rafter ends to an eave board and ridge board oriented at right angles to the rafters. The spacing of the rafters is defined by the lay out (pencil marks) on a pair of eave and ridge boards.

Lay two of the 8-foot 2x4's on edge and temporarily nail them together using 8 penny nails. The nails should be started at an angle in the center of on one of the boards and driven about half way in such that the nail point penetrates the second board, holding the two boards firmly together. One nail should be located about 8" from each end and if needed because the boards are bowed, one in the approx. center of the board between those two nails. Don't use any more nails than are necessary to hold the two boards securely together and remove any bows between them.



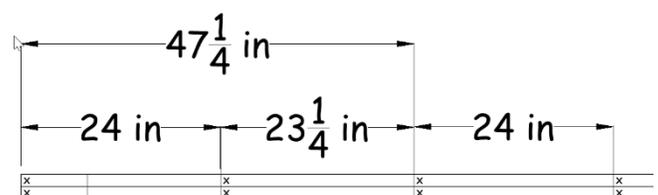
The layout of the roof segments differs depending on which segments are being built. See the roof diagram and mark the layouts.



Hook a tape measure to the end of the board set identified as layout direction and place a pencil mark at the first measurement on the diagram. Reposition the tape measure on the first line and place another pencil mark the second measure on the diagram. Continue this process for the remaining two rafters. Extend these marks straight across the two boards at a right angle, and mark an X at the end of the board and on the correct side of each line. (a speed square, if you have one, can be used to quickly draw straight lines.)



Instead of repositioning the tape each time, you can just add the dimensions together and simply mark that cumulative value on the boards.





Set this set of boards aside and repeat the layout on the second set of boards.



Alternatively, you can mark two sets of boards at one time since you will need two segments of each type by aligning both sets together. Although this method is quicker, care must be taken to keep the ends aligned and the two set of boards held tightly together in order to avoid marking errors. Also, note that the left and right side roof segments are mirror images of each other, and can be marked together as well.

Roof Structure Rafter Assembly

Assembly and nailing of the roof structure can begin once the lay out is complete of at least one segment and the rafters have been cut.

Remove the temporary nails from one set of eave and ridge boards and separate them by about 10 feet on the ground, keeping them roughly parallel to each other.



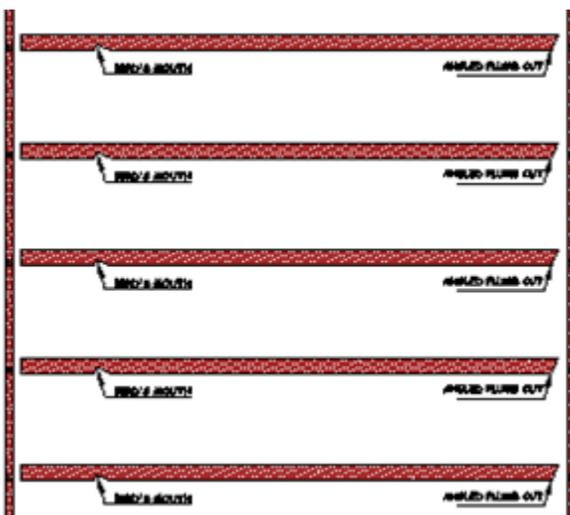
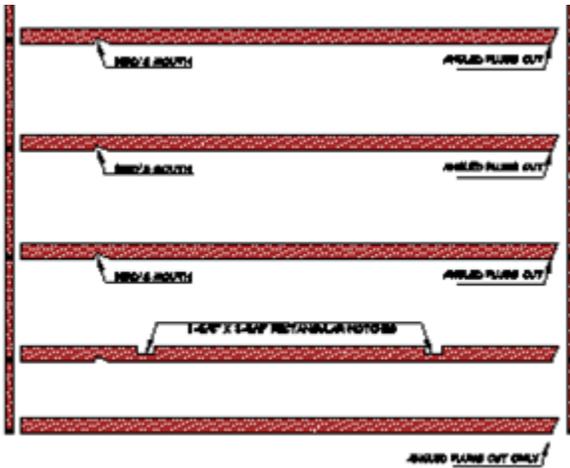
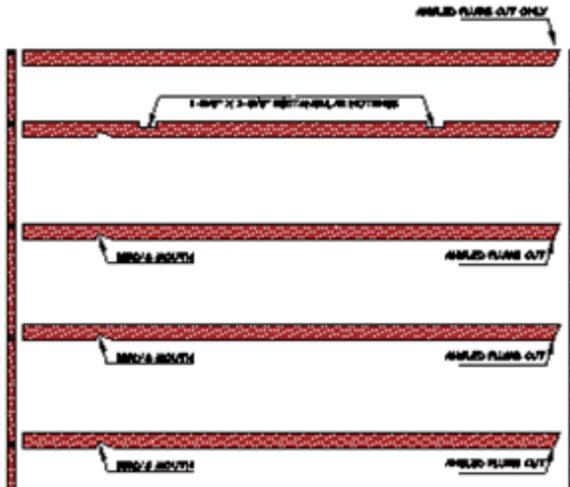
If saw horses are available, placing the 8-ft ridge board across the horses and nailing the rafters to the ridge board (which will be at an angle) from a standing position is easier on the back.

Caution: Do not pick up the one of the separated ridge/eave boards previously marked and turn around. This will change the orientation of the marks. Simply pick up one of the boards (one person on each end) and walk it forward about 10 feet.



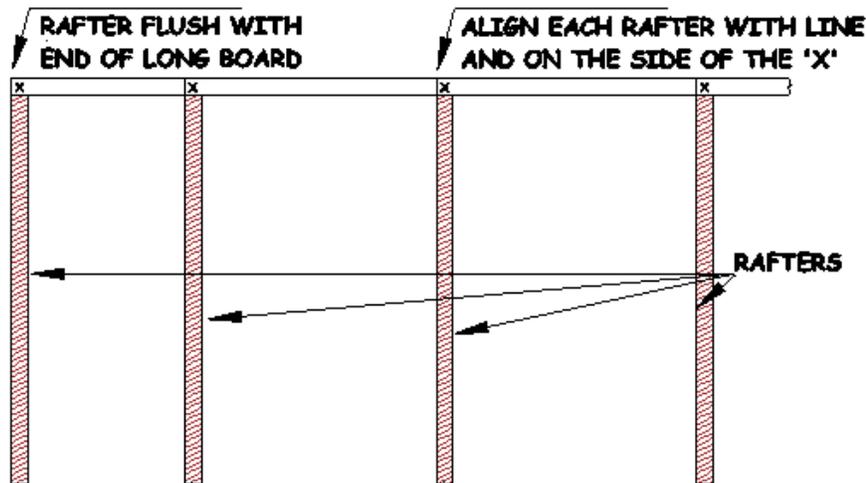
Lay the rafters in between the eave and ridge boards, roughly in the location of each X on the boards. For the outer rafter segments, the outside board on one end receives a rafter with only the plumb cut (barge rafter). The second board in receives a rafter with the extra rectangular notches in them. All the remaining rafters (with angled plumb cut and bird's mouth, called common rafters fill in the empty spaces between the two ends.

For the two inner rafter segments, all rafters are common rafters.

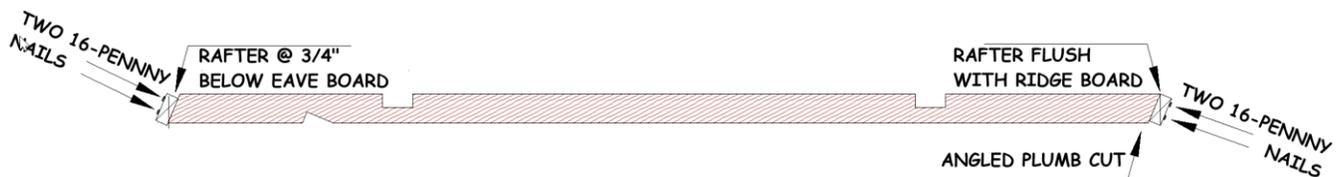


Each rafter end is nailed to the eave board and ridge board with two 16 penny (large) nails, one above the other.

Note: it is important to align the rafter so that one edge is on a previously drawn lay out line, and the rafter on the side with the X. It is equally important that the top of the rafter and top of the ridge board are flush with each other. The eave board should be dropped 3/4" below the rafter tail.



Position each rafter with the tops (side that will receive the sheathing) up. That means the angled end of the rafter (with the plumb cut) will be oriented with the longest edge up and the shorter bottom edge towards the center of the roof structure. The second rafter in from the ends with the rectangular notches, should be facing up with the notches visible on top.



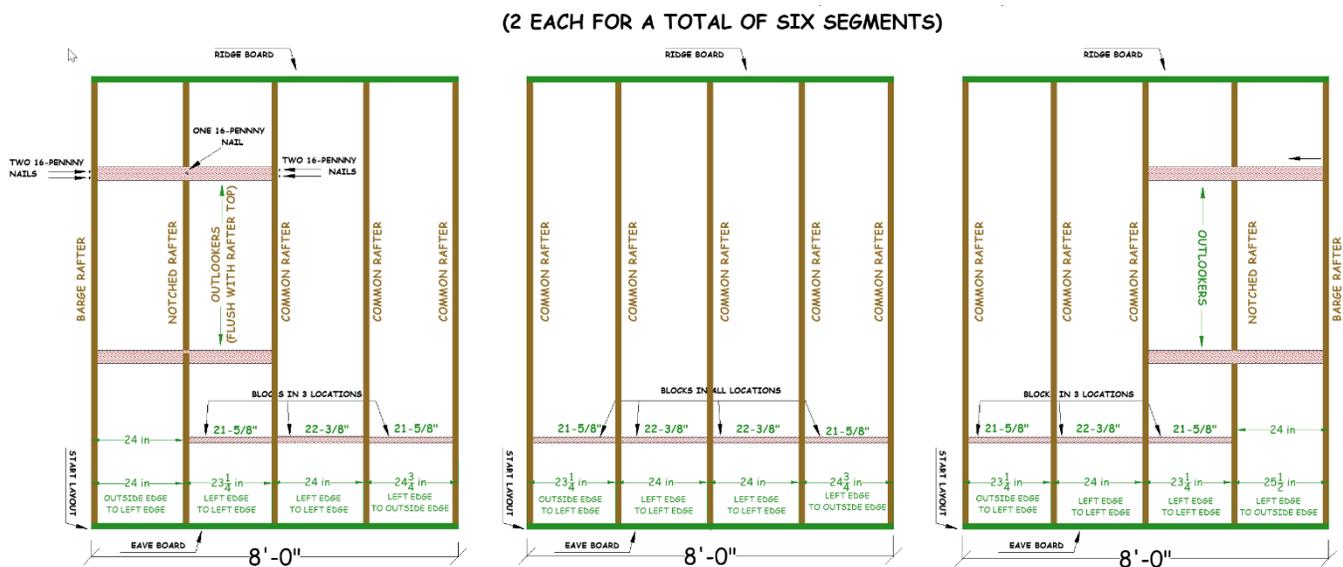
Tip: It is easier and less error prone to nail all the rafters to the ridge board first, especially when multiple volunteers are nailing. This will prevent people trying to move both ends of a rafter at the same time and will result in a more coordinated build. Starting with the angled ridge board also eliminates the possibility of nailing a rafter upside down.

Frieze Blocks and Outlooker Installation

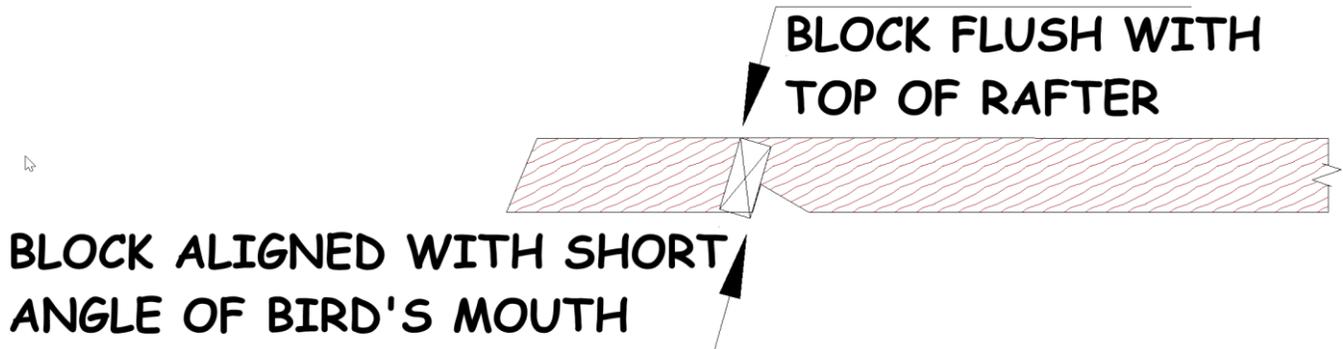
Frieze Blocks

Frieze blocks (short pieces of 2x4's) are placed between each rafter except for the outer rafter on either end. The purpose of this blocking is to allow solid nailing of the roof structure to the walls of the building.

There are two sizes of blocks: 21-5/8" and 22-3/8 inch. The size of the blocks should be written on each pre-cut block. If not pre-cut the blocks out of 8-ft 2x4's and install according to the roof diagram.

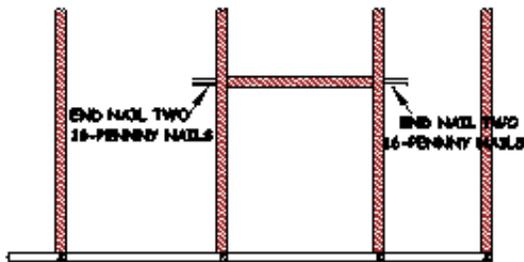


Blocks should be oriented at an angle between the rafters, aligned with, and at the same angle as, the short cut on the bird's mouth. Ensure that the top of the block is flush with the top of the rafter.

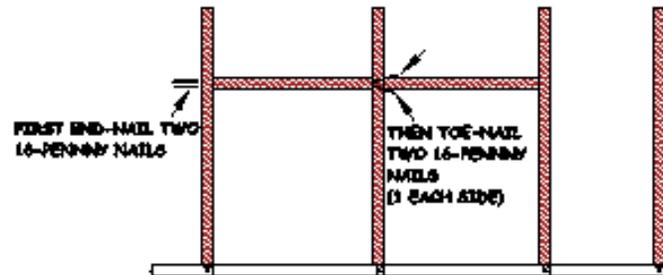




Tip: It is easiest to work sequentially from each end of the roof segment. The first block can be end nailed on each end. Each subsequent block can be end nailed on the side away from the previous block but has to be toe-nailed on the other end. (End nailing is easier to accomplish than toe-nailing). The center block will then have to be toe-nailed on both ends. Starting blocking at random locations will result in more toe-nailing.



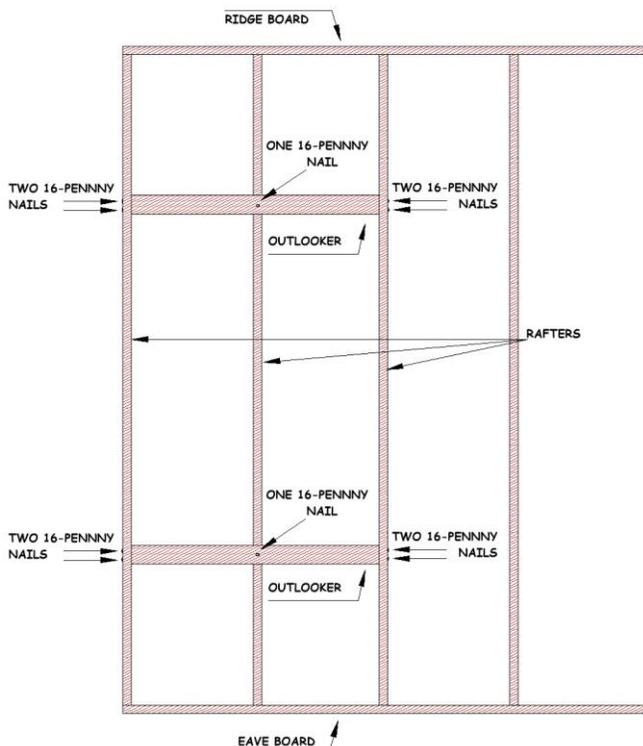
First Block



Subsequent Blocks

Outlookers

Four 45- 5/8" 2x4's are installed at right angles to the rafters between the 1st and 3rd rafters on the ends. These outlookers (or lookouts) cross the 2nd rafter and fit into the rectangular notches cut earlier. Their purpose is to provide some additional strength for the portion of the roof that extends beyond the plane of the walls. The outlookers should be end nailed with two 16 penny nails through the first and third rafter, flush with the top of the rafter. A single 16 penny nail should be face nailed through the top of the outlooker and into the 2nd notched rafter.



Painting

Once all nailing is complete, the roof assembly is ready for painting. However, it will have to be flipped over so that the top of the roof structure is facing down (bird's mouths facing up). Be careful when flipping the roof segments because they can be a bit heavy and unstable.



Get some scrap 2x4 pieces from the cut crew and elevate roof assembly off the ground by several inches to make it easier to paint. Paint the roof segments with the white Kilz primer.



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Congratulations, the roof structures are complete & ready for installation on the walls!

