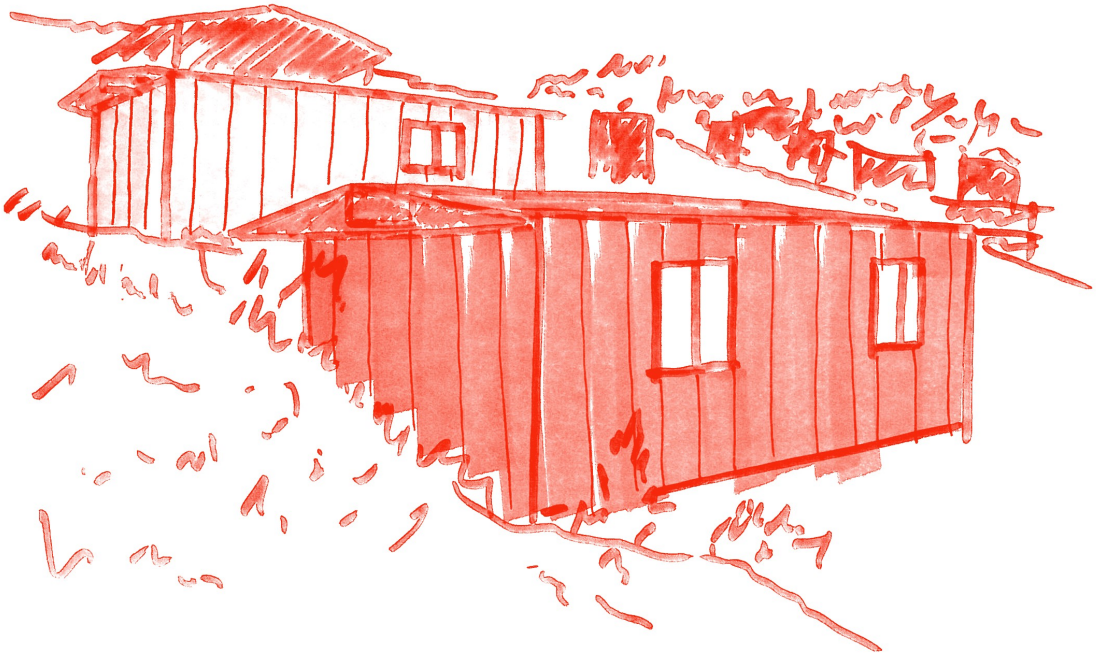
DOXA

HOUSE MANUAL



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IMPORTANT MANUAL INFORMATION

Welcome to DOXA! This manual is designed for all skill levels so there may be information that is a little above your skill level or some information that seems repetitive. Because of this **PLEASE** read through the entire manual so that you can become familiar with this manual and ask any questions prior to your departure.

Remember that there are over a million ways to build this house. **It is more important to focus on engaging with your team and connecting with the family you are building for.** As a leader consider emphasizing inclusion of everyone regardless of skill level. This manual represents some best practices that we have compiled over the many years of building and the helpful feedback from groups. This manual will help to guide you to provide a quality home for a family while building relationships on the site.

Toolkits can be supplied by DOXA. Make sure to contact DOXA prior to your trip if you would like us to supply your toolkit.

QUICK TIPS FOR NAVIGATING THIS MANUAL

1. We recommend printing out **one color copy** for each house site as details can be lost in B&W editions.

2. This manual is full of instructional diagrams. Some of these diagrams fall before or after the related instructional step in the manual. Always flip a few pages ahead to make sure you are not missing a critical diagram. **PAGE 5** lists all the diagrams, which can be used to quickly reference a specific one.

3. Materials for the houses are assigned to a house kit so **PLEASE** follow the inventory lists on **PAGES 6 & 7** so that all groups have enough materials for their build.

4. **PAGES 42 & 43** have photo descriptions of the hardware used in building the house, which can be helpful to identify parts that may be unfamiliar.

5. Most steps are sequential, but there are a few that can be done at the same time or out of order. Painting is one of these steps that can be done earlier on even though it does not show up in the manual until **PAGE 38** under FINISHING TOUCHES. This is another reason why it is helpful to read through this manual before starting to build.

SETTING UP & ORGANIZING YOUR SITE

Many of the sites we work on are tight so keeping an organized site is **important for safety.** An organized site will also help you to build more efficiently and keep track of all your materials and tools. Here are a few tips:

1. On Day #1 designate an area for tools, an area for materials, an area for personal items, setup a trash bag location, **first aid box location** and a water/ food station. Revisit these designated areas each day as your site will change as the house is built.

2. When cutting materials make sure to label the material length with pencil in large numbers. This will allow you to organize according to size and keep track of your cut materials.

3. **Keep your tools clean and in their designate area.** After using paint brushes and rollers wash out the tools with water, wrap in plastic or put in a bucket of water so brushes and rollers do not dry up in the hot sun and can be used throughout the week. You can use two different buckets of water, one for white trim and one for your siding color.

4. Use one of your brooms to keep the slab clean throughout the week and then save one new unused broom as a gift for your family at the end of the week.

GUIDING PEOPLE ON HOW TO RECEIVE A HOUSE

Occasionally, other families or individuals may approach you on the worksite and inquire as to how they can apply for a house of their own. If this occurs, simply connect them with the family that you're building for as they can relay all the necessary information. All interested families need to apply through DOXA.

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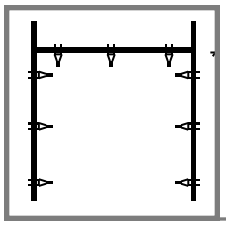
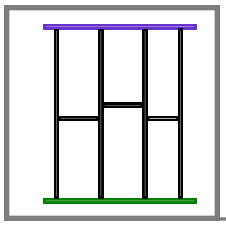
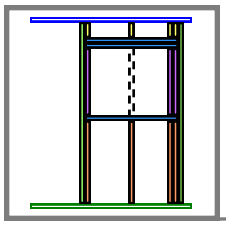
DIAGRAMS AND DRAWINGS







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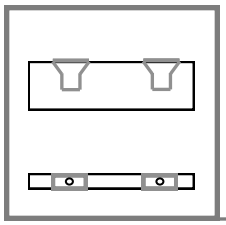

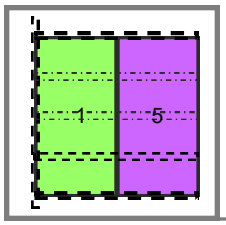

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MATERIAL ALLOTMENT - PER HOUSE

X	MATERIAL	QTY	UOM
	NAILS		
	NAILS: 16D VINYL SINKER (Used for framing and form boards)	5	BOX
	NAILS: 8D GALVANIZED (Used for MAS Anchors, T1-11 siding, trim, and roof details)	4	BOX
	NAILS: 1-1/4" JOIST HANGER (Used with H1 Anchors & PFD24 Hangers)	2	BOX
	NAILS: 3/4" ROOFING (Used for attaching rolled mineral roofing)	1	BOX
	CONCRETE FORMING MATERIALS		
	MAS MUDSILL ANCHOR (used to hold rebar up)	18	EACH
	STEEL STAKE 24" (used to secure forms into ground)	15	EACH
	2x4 FIREBLOCK	6	PIECE
	12-ft 2x4 (**RE-USED for 2nd top plate in framing walls**)	5	PIECE
	14-ft 2x4 (Used for form boards and screed board **RE-USED for fascia board**)	3	PIECE
	FRAMING MATERIALS		
	12-ft 2x4 GREEN PRESSURE TREATED (Used for bottom plate of wall)	7	PIECE
	12-ft 2x4 (Used for top plate)	7	PIECE
	12-ft 2x4 (Used for 2nd top plate - Five will be RE-USED from concrete day)	2 (7)	PIECE
	2x4 STUD (92 - 1/2" long)	74	PIECE
	2x4 FIREBLOCK (22 - 7/16" long)	52	PIECE
	SIDING		
	5/8" T1-11 SIDING PLYWOOD (Used for exterior sides of house)	18	PIECE
	11/32" ACX INTERIOR PLYWOOD (Used for interior wall)	3	PIECE
	ROOF		
	H1 FRAMING ANCHOR (Ridgebeam and rafter anchor)	12	EACH
	14-ft 2x12 RIDGEBEAM	2	PIECE
	RAFTER HANGER (PFD24)	15	EACH
	2x4 93" RAFTER (ANGLE CUT ON ONE END)	30	PIECE
	7/16" OSB ROOFING PLYWOOD	14	PIECE
	2x4 FIREBLOCK	24	PIECE
	14-ft 2x4 (Used for fascia board - Three of the four will be RE-USED from concrete day)	1 (4)	PIECE
	15lb ROOFING FELT/TAR PAPER	2	EACH
	90lb ROLLED MINERAL ROOFING	6	EACH
	METAL DRIP EDGE	10	PIECE
	TAR CARTRIDGE (11oz)	36	EACH
	CAULK GUN	2	EACH
	WINDOW/DOOR/TRIM		
	8-ft 1x4 TRIM	22	PIECE
	8-ft 1x3 TRIM	4	PIECE
	WINDOW	3	EACH
	DOOR	1	EACH
	ENTRY LOCKSET	1	EACH
	WOOD SHIMS	1	BOX
	HOUSE BROOM (Use one for cleanning site and save other unopend for family)	2	EACH
	CURTAINS (THERE WILL BE 3 CURTAINS PER BAG)	1	BAG
	PAINTING		
	WHITE TRIM PAINT (1 Gallon)	2	EACH
	SIDING PAINT (5 Gallon)	2	EACH
	9" ROLLER FRAME	5	EACH
	9" ROLLER COVER/NAP	7	EACH
	PAINT TRAY	3	EACH
	3" PAINTBRUSH	7	EACH

MATERIAL ALLOTMENT - PER HOUSE

X	MATERIAL	QTY	UOM
	ELECTRICAL KIT		
	LAMP SOCKET	3	EACH
	CEILING BOX (Round for lamp socket)	3	EACH
	WALL BOX (Rectangle)	8	EACH
	WALL COVERPLATE FOR SWITCH	3	EACH
	WALL COVERPLATE FOR OUTLET	4	EACH
	LIGHT SWITCH	3	EACH
	ROMEX WIRE	1	EACH
	CABLE STAPLES	1	EACH
	ELECTRICAL TAPE	1	EACH
	WIRE NUT	10	EACH
	OUTLET (Duplex receptacle)	4	EACH
	WALL COVERPLATE - BLANK	1	EACH
	LIGHTBULBS	3	EACH

A TYPICAL TOOL KIT - SUPPLIED BY GROUP OR DOXA

Required Tools

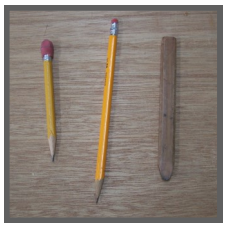
- **2** 30ft or longer Tape Measures
- **2** Less than 30ft Tape Measures
- **1** Chalk Line
- **1** Bottle of Extra Chalk
- **10** Pencils
- **4** Small Squares (Triangle Square)
- **2** Utility Knives (Extra blades)
- **1** Lineman Pliers (Heavy Duty)
- **1** Cat Claw and/or Crowbar
- **1** Philips Screwdriver
- **1** Flathead Screwdriver
- **1** Chisel (wood and/or masonry)
- **1** Roll of String
- **1** Line Level
- **1** Small Sledgehammer
- **1** Nail Punch
- **1** Keyhole Saw (aka drywall saw or jab saw)
- **3** Handsaws
- **1** Tin Snips
- **2** 2ft Level
- **2** Staple tackers and 1/4” or 5/16” Staples

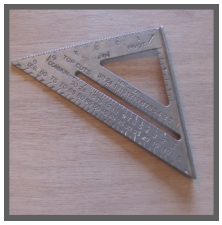
30’ TAPE MEASURE

SMALL TAPE MEASURE


CHALK LINE

EXTRA CHALK


PENCILS


SQUARES


UTILITY KNIVES


LINEMAN PLIERS


CAT CLAW


PHILIPS


FLATHEAD


CHISEL


ROLL OF STRING


LINE LEVEL


SMALL SLEDGE


NAIL PUNCH


DRYWALL SAW

HANDSAW


TIN SNIPS


STAPLE GUN

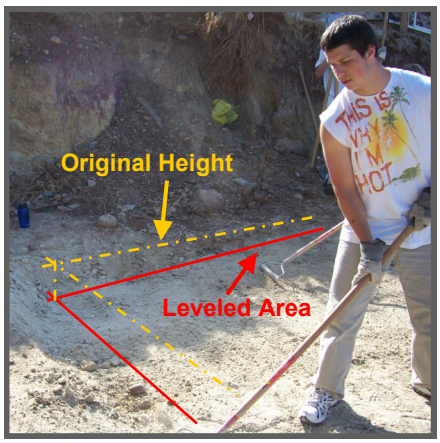
LEVELING THE SITE

Materials and Tools Required

1	Tool Kit
6	Shovels
1	Rake
2	Picks
15	Steel Stakes (LEAVE FOR FAMILY AT COMPLETION)
1	Water Level
1	4' Level

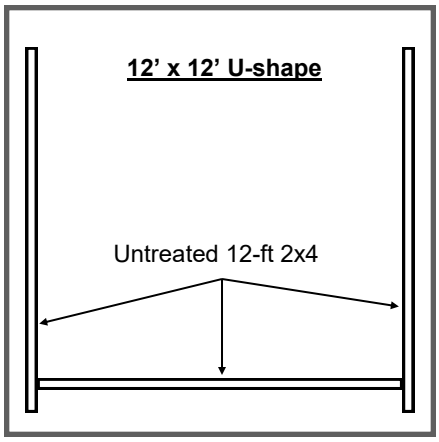
TERMS AND SYMBOLS

FEET = ft or '
INCHES = in or "
PENNY = p
2x4 = Actual dimension is 1 1/2" x 3 1/2"



INTITIAL STEPS

1. Determine where the house will be built.
   - Verify all property lines (**CONSIDER ROOF OVERHANG OF 2'**)
   - The house will cover 16'x28' including the roof overhang
   - Consult with the family for location of the house, doors, and windows
   - Ask the family what color they would like their house painted
2. Mark where the four corners of the house will be using four of the steel stakes.
3. Begin leveling. [HINT: Level a slightly larger area than the foundation to allow room to work with the forms]



TIPS FOR LEVELING

- Determine your lowest point to level to (IF A SMALL SECTION IS DRASTICALLY LOWER USE YOUR 2ND LOWEST POINT)
- Starting at one end of the site work along the 24' side from one 12' side to the other 12' side of the site
- Use a rake and/or a 11'5" bottom plate to smooth out the site and see your progress **(PAGE 10 PHOTO).** IT IS IMPORTANT THAT YOUR SITE IS LEVEL TO THE BOTTOM OF THE FORM BOARDS. Level half of your site and then, without nailing, begin to temporarily set half of your forms to gauge how you are doing (MAKE A 12'x12' U-SHAPE) **(FORM LAYOUT DIAGRAM - SEE PAGE 11)**
- Use the 4' level on the forms to check level

IF USING A WATER LEVEL

- Place the two water level posts next to each other and mark the level of the water on each post
- Keep one post on the lowest spot and move the other post around the site
- If the water is below the mark on the post you are moving around, the ground is too high at that location. Dig down until the water is at the mark and move to a new location
- Locate about 15-20 spots so that you have points to level to (WATER WILL EVAPORATE SO PERIODICALLY CHECK YOUR WATER LEVEL COMPARED TO YOUR LINES TO ENSURE ACCURACY)

PLACING THE FORMS

Materials and Tools Required

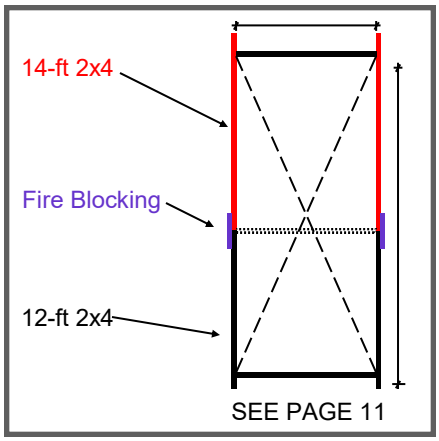
1	Tool Kit	**5**	Untreated 12-ft 2x4 ***(SAVE FOR USE AS 2ND TOP PLATE)***
6	Shovels	**2**	Untreated 14-ft 2x4 ***(SAVE FOR USE AS FASCIA BOARD)***
1	Rake	**6**	Fire-blocks
2	Picks	**1**	Box of 16p framing nails
1	Water Level		
1	4' Level		
1	Framing Square		

1. Make sure that your five untreated 12-ft 2x4 are cut to exactly 12' and your two untreated 14-ft 2x4 are cut to exactly 14'. *The 14-ft 2x4's will be used as fascia boards later on so DO NOT cut shorter than 14'.

2. Use a piece of fire-blocking to join one of the untreated 12-ft 2x4 together with one of the 14-ft 2x4, creating a 26' long piece to make up one of the long sides of your 12' x 24' concrete slab.

   - Make sure that all edges of the two boards line up when joining them together with the fire-block

Repeat step two for the other long side. **(FORM DIAGRAM - SEE PAGE 11)**



3. Place a 12-ft 2x4 piece at one of the 12' short sides of your slab and secure it in place with two stakes on the outside of the form checking to make sure it is level.

   - If your 2x4 piece bows place it so that it bows to the outside of your slab and use your stakes to remove the bow

4. Lay down each of your two 26-ft 2x4 pieces (CREATED IN STEP #2) to create a U shape. Use a framing square to square your corners.

5. Check how level your three sides are with a 4' level. Use a shovel to level underneath your form boards as needed to make sure the forms are level in relationship to each other. You may find yourself creating a trough that your form boards sit in. If this is the case make sure to level inside your forms as well.

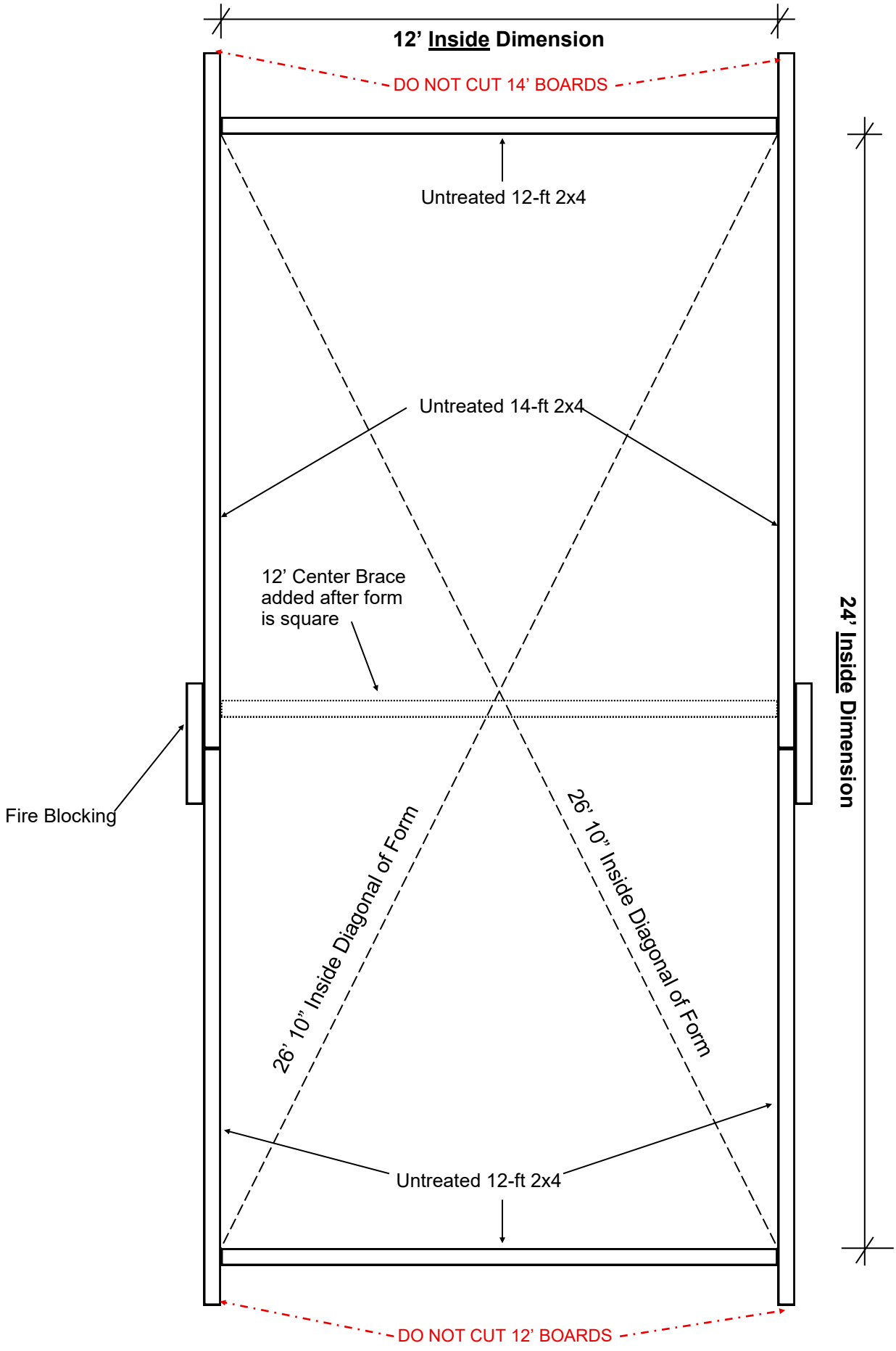
6. Once your three sides are level secure the two 26' pieces to the 12' piece using 16p nails. **(SEE PAGE 11)**

7. Square up the corners of your forms by using a **3-4-5 TRIANGLE** or by **checking the diagonals** using the inside diagonal measurements on **PAGE 11**. Begin securing your forms in place by using stakes on the outside of your forms, continually checking square and level of your forms.

8. Once all three sides are squared, leveled and secured take a 12' piece, starting at the closed end of the U and pull it along the ground inside of your forms scraping out the high spots to make sure your slab is level throughout and 12' in width. (A RAKE AND FLAT NOSED SHOVEL WORK WELL TO REMOVE HIGH AND LOW SPOTS)

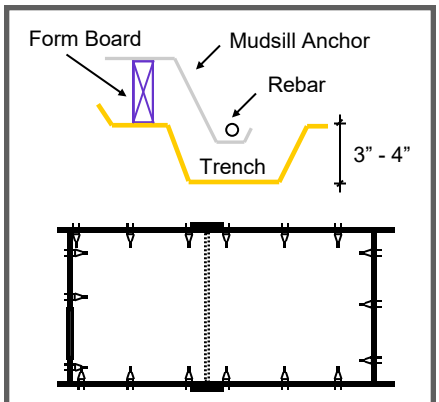
9. Install the 12' piece at the open end to complete your form. Your slab should be 12' x 24' inside of your forms. Place your last 12' piece in the middle of the slab (NO NAILS) to keep it from bowing inwards.

FORM DIAGRAM



Materials and Tools Required

1 Tool Kit	**1** 14-ft 2x4 (DO NOT LEAVE ON SITE. CLEAN CEMENT OFF AND BRING BACK TO BE USED FOR ROOF)
7 Shovels	**6** 15-ft pieces of rebar
2 Hoe	**1** Bundle of bailing wire
1 Trowel	**19** Bags of cement
5 5-gallon buckets (TO CARRY SAND & WATER)	**18** Mudsill Anchor
	1 Pile of Sand & Gravel and water (DELIVERED)



SEE PAGE 13

PLACING THE REBAR

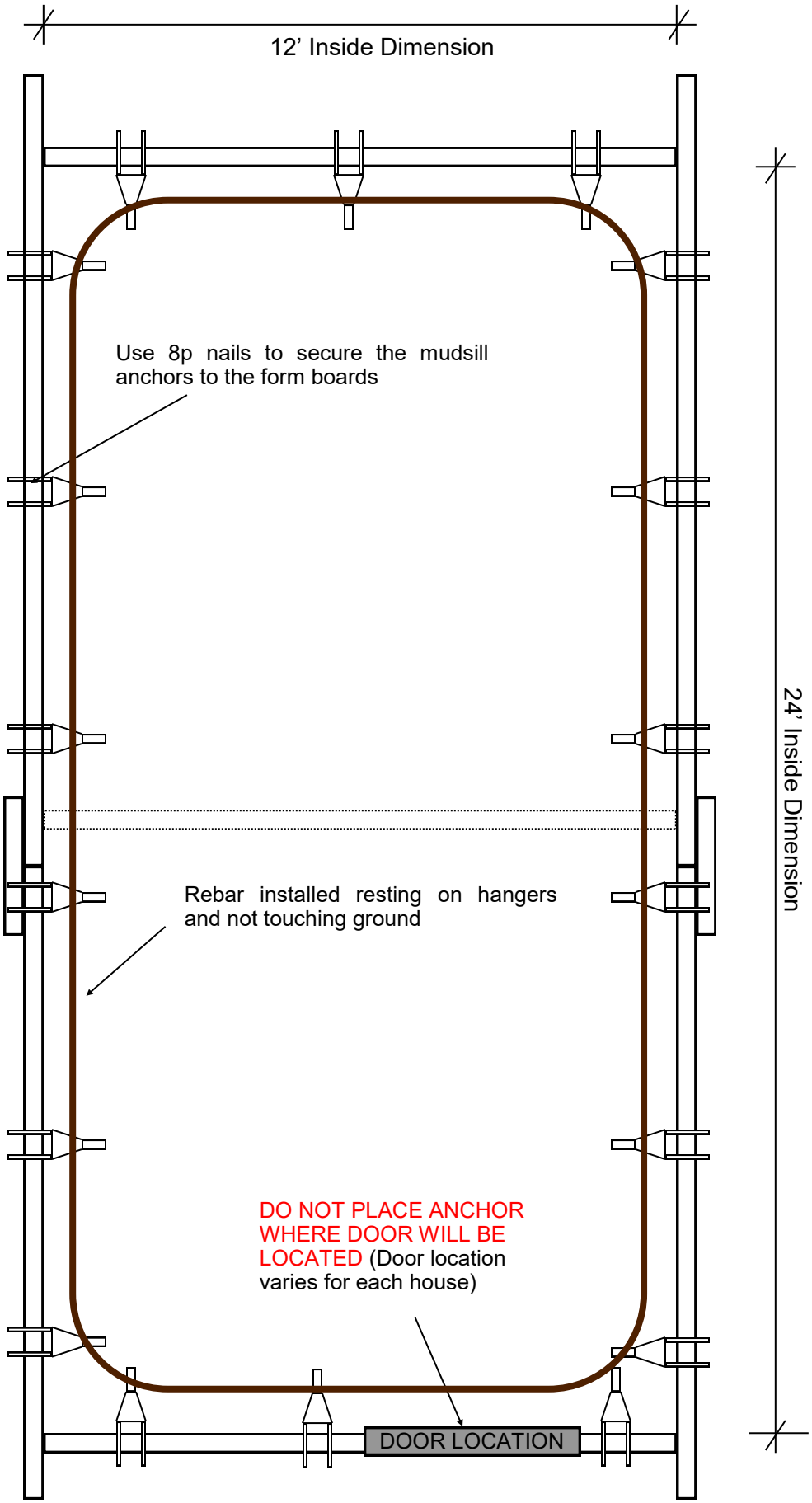
1. Inside your forms create a trench alongside your form boards that is 3" to 4" deep and as wide as a shovel (about 8" wide).
2. Attach your mudsill anchors along your form boards checking to make sure you are not attaching where a door will be located. **(PAGE 13)**
3. Next lay your rebar in the trench using your mudsill anchors to keep it suspended in air. A few rocks spaced out can be used to keep the bar off of the ground. Overlap rebar pieces by 18" attaching the rebar together and to the anchors with bailing wire
4. After your rebar is in place and tied together with bailing wire double check to make sure that your forms are still level, square, and do not bow inward (stakes can be used to correct boards that bow)

CREATING A VOLCANO (make sure to cover mouth and nose)

1. THE RATIO OF SAND TO CEMENT IS **EIGHT <u>COMPLETELY</u> FULL *5 gallon* BUCKETS OF SAND to ONE BAG OF CEMENT** (94 lbs bags)
2. Start at one end of the form. Make a pile of 8 buckets of sand & gravel and add a bag of cement on top. Next add another 8 buckets of sand and gravel and one more bag of cement on top. This is a manageable size. You can create a larger volcano by adding more bags of cement, keeping the ratio consistent. [HINT: The larger the volcano the tougher it is to mix and move, especially with the addition of water]
   - The gravel tends to be at the bottom of the pile so make sure that you are mixing both sand and gravel in and not saving all gravel until the end. It is important to have a 50/50 mix of sand and gravel.

3. Mix this pile of sand and cement by moving it to make a new pile close by. When mixed properly the pile should be a consistent light grey color throughout.
4. Create a crater in the center of the pile by pulling the pile out with your shovels, making sure that the crater does not get so deep you see the ground. Once the crater is formed slowly begin to add water and let the water soak in for 10 - 15 minutes. (MAKE SURE TO WATCH THE VOLCANO)
5. While the water is soaking in another pile can be formed. It works well to have a few teams working each step, rotating the teams to various steps throughout the day.

MUDSILL ANCHOR DIAGRAM



IMPORTANT NOTES:

- Take extra care to make sure rebar and anchors are fully surrounded with cement
- Rake and hoes are other helpful tools to spread and mix
- Multiple passes with screed board WILL be needed.

6. Once the water is 75% soaked in begin mixing the volcano adding small amounts of water as necessary to create a mixture with no dry spots and the consistency of toothpaste. Once a volcano is broken teams must work fast especially on hot days. [HINT: Gradually move dry material to inside wet areas as you are mixing]
7. Spread the concrete out, make sure it goes under and over the rebar, but does not spill over the forms. Start in a corner and work out.
   - If there are spots in the ground that got too deep when leveling you can selectively add rocks to the wet concrete to take up some space
8. When you get to the center of the form make sure to remove the center support bar, always monitoring the form boards to make sure they are not bowing inward. If your forms begin to bow inwards you can use a stake to straighten out the form.

SCREEDING AND LEVELING YOUR CONCRETE

1. As the concrete is moved into place use the 14' 2x4 as a screed board to make sure that you fill the forms to the appropriate level.
2. Two people will be needed to screed, one on each side. Place the 14' board on top of your form boards across the 12' side, so it overhangs the form boards.
3. Start at the end which has been filled with concrete. Using a back and forth motion move the board towards the other end of the slab. As you move the screed board across you will gather concrete in the high spots and see holes in the slab at the low spots. A third person can use a shovel to remove the excess concrete in front of the board to fill in the holes behind. Multiple passes may be needed.

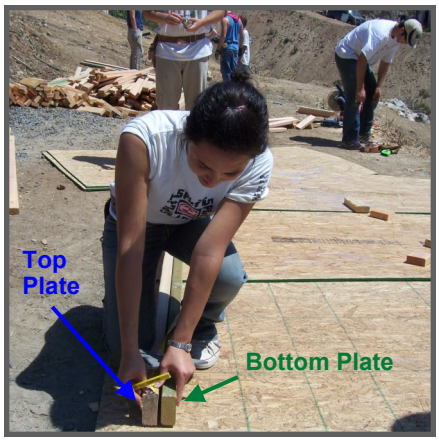
FINAL TOUCHES ON YOUR SLAB

1. After screeding the slab a trowel can be used to smooth out the marks left behind by the screed board.
2. As the concrete cures the water will rise to the top of the slab, which will help smooth the top. If there are large puddles of water forming use the trowel to 'wipe' the water off of the top of the slab as these pools will create dips in the slab when it dries.
3. If the slab is too wet it will be very difficult to trowel and result a poor finish. Wait until the slab begins to lose its shine and becomes dull before smoothing it out, but don't wait too long. SMALL amounts of pure cement can be thrown on the top of the slab as the trowel is being used to smooth the surface (DO NOT USE UP ALL OF YOUR CEMENT IN THIS PROCESS)

BUILDING THE WALLS

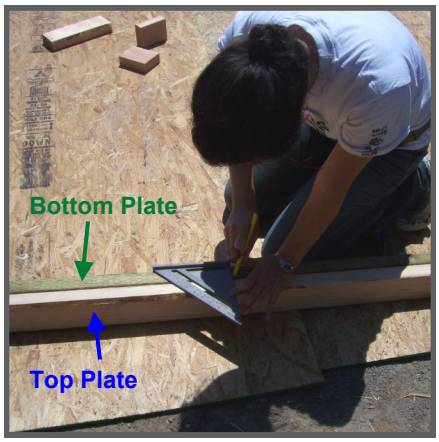
Materials and Tools Required

1 Tool Kit	**74** 2x4 Studs - APPROXIMATELY 92 1/2" IN LENGTH (STUDS DO NOT NEED TO BE CUT EXCEPT FOR WINDOWS AND DOORS)
1 Large framing square	**7** Treated 12-ft 2x4 (BOTTOM PLATE)
2 Hand saws	**7** Untreated 12-ft 2x4 (TOP PLATE)
1 Chalk line	**52** 22-7/16 inch 2x4 fire blocks
	2 Boxes of 16p framing nails



IMPORTANT NOTES

- Make sure that you keep all materials sorted by size especially as you begin to cut pieces for window and door openings. [HINT: LABEL THE LENGTH ON THE CUT PIECES]
- Make sure that you do not accidentally use rafters as studs (RAFTERS HAVE ONE SIDE THAT IS CUT AT AN ANGLE).
- 16p framing nails are used to nail 2x4 materials together.
- MEASURE TWICE - CUT ONCE (MATERIALS ARE SCARCE).
- There will be two sizes of walls that will be built: Four walls = 12' and Three walls = 11'5" (LOCATE WHERE WINDOWS AND DOORS ARE).



BUILDING A 12' WALL (SEE PAGE 18 FOR DIAGRAM)

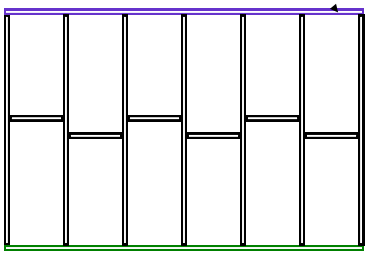
1. Take one 12' 2x4 treated (**BOTTOM PLATE**), one 12' untreated 2x4 (**TOP PLATE**), seven 2x4 studs, and six 2x4 fire-blocks (MAKE SURE THAT THE BOARDS ARE EXACTLY 12').
2. Lay one untreated and one treated 12' board next to each other so that the 3-1/2" sides are sandwiched together and you are looking at the 1-1/2" sides. Make sure that the ends are even **(PAGE 18).**
3. Make a tick mark every 24" on one board **(PAGE 18).** Then make a mark 3/4" on either side of the first tick mark. Using a speed square (TRIANGLE SQUARE), draw a line across both of the boards at each of the 3/4" marks. This creates a 1-1/2" space that your studs will fit in.

4. Separate the treated and the untreated boards and place the two outer studs into position to create a rectangle, making sure that the end of the top and bottom plate are flush (EVEN) with the side of the stud. Fasten each end of the stud to the top and bottom plates with 16p nails. After securing both of the end studs insert the remaining five studs at the appropriate marks and nail them into place.
5. On the two outer studs measure up 46" and 50" making a mark at both locations. Use a chalk line to connect the two 46"" marks and then the two 50" marks. Insert the fire-blocks using these lines as guides. The two outer bays of the wall require that the fire-blocks be cut. Measure the size of these fire-blocks by measuring the distance between the studs where they join to the bottom plate.

BUILDING A 11’5” WALL (SEE PAGE 19 FOR DIAGRAM)

1. Take one 12’ 2x4 treated (**BOTTOM PLATE**), one 12’ untreated 2x4 (**TOP PLATE**), seven 2x4 studs, and six 2x4 fire-blocks. Cut the 12’ boards down to 11’ 5”.
2. Lay one untreated and one treated 11’ 5” board next to each other so that the 3-1/2” sides are sandwiched together and you are looking at the 1-1/2” sides. Make sure that the ends are even.
3. Next make tick marks on one board according to the diagram **(PAGE 19).** Make a mark 3/4” on either side of the first tick marks. Using a speed square (TRIANGLE SQUARE), draw a line across both of the boards at each of the 3/4” marks. This creates a 1 1/2” space that your studs will fit in.

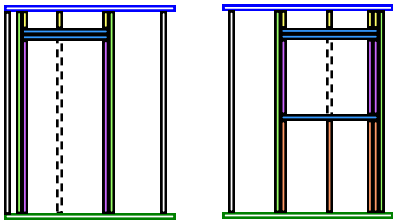
SEE PAGES 17-19



12’ Wall & 11’5” Wall Diagrams

4. Separate the treated and the untreated boards and place the two outer studs into position, creating a rectangle, making sure that the end of the top and bottom plate are flush (EVEN) with the side of the stud. Fasten each end of the stud to the top and bottom plates with 16p nails. After securing both of the end studs insert the remaining five studs at the appropriate marks and nail them into place.
5. On the two outer studs measure up 46” and 50” making a mark at both locations. Use a chalk line to connect the two 46” marks and then the two 50” marks. Insert the fire-blocks using these lines as guides. If you don’t want to use a chalk line you can make marks with a tape measure on each stud. **The two outer bays of the wall require that the fire-blocks be cut. Measure the size of these fire blocks by measuring the distance between the studs where they join to the bottom plate.

SEE PAGES 20-25



Window & Door Diagrams

CREATING A DOOR OR WINDOW IN A 12’ OR 11’5” WALL

1. Determine with the family where the three windows, one exterior door, and one interior door opening will be located.
2. To create a door or window opening remove one stud from the location where you would like to insert a door or window.

   - In the interior middle wall the door opening should be located on one side or the other of the wall

3. Follow the diagrams on **PAGES 20-21** to create the window and door openings. Use diagrams on **PAGES 22-25** for cutting window and door pieces. CHECK TO MAKE SURE OPENINGS ARE CORRECT SIZES

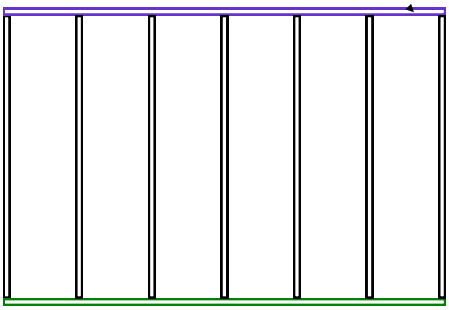
STEP 1

Determine if you are building a 12' or 11' 5" wall. Mark the stud layout using **Pages 18 or 19**.

STEP 2

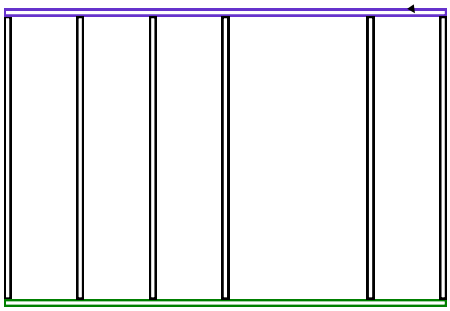
Create a frame and secure it with 16p nails.

STEP 3



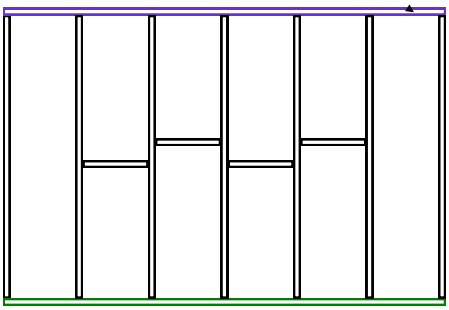
BLANK WALL - Install all interior studs with 16p nails using the marks created in STEP 1.

STEP 4



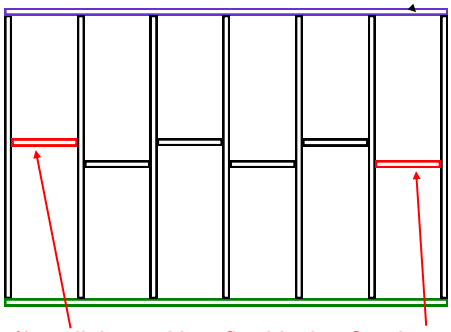
WINDOW or DOOR WALL - Remove the correct stud and use the diagrams on **Pages 20 & 21** to insert pieces.

STEP 5



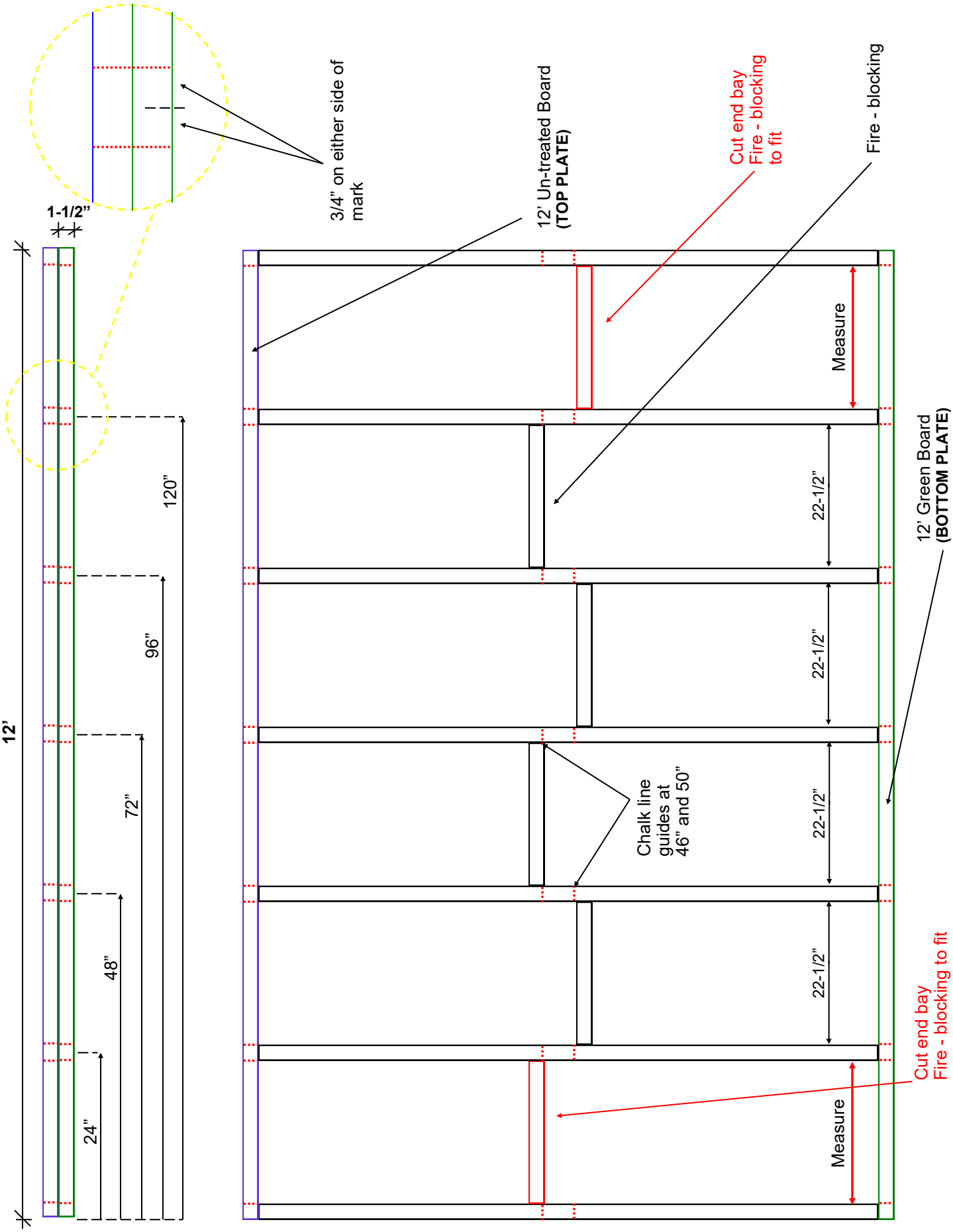
Using a chalk line and the diagrams on **Pages 18 & 19** layout and install your fire-blocks on the interior stud bays.

STEP 6

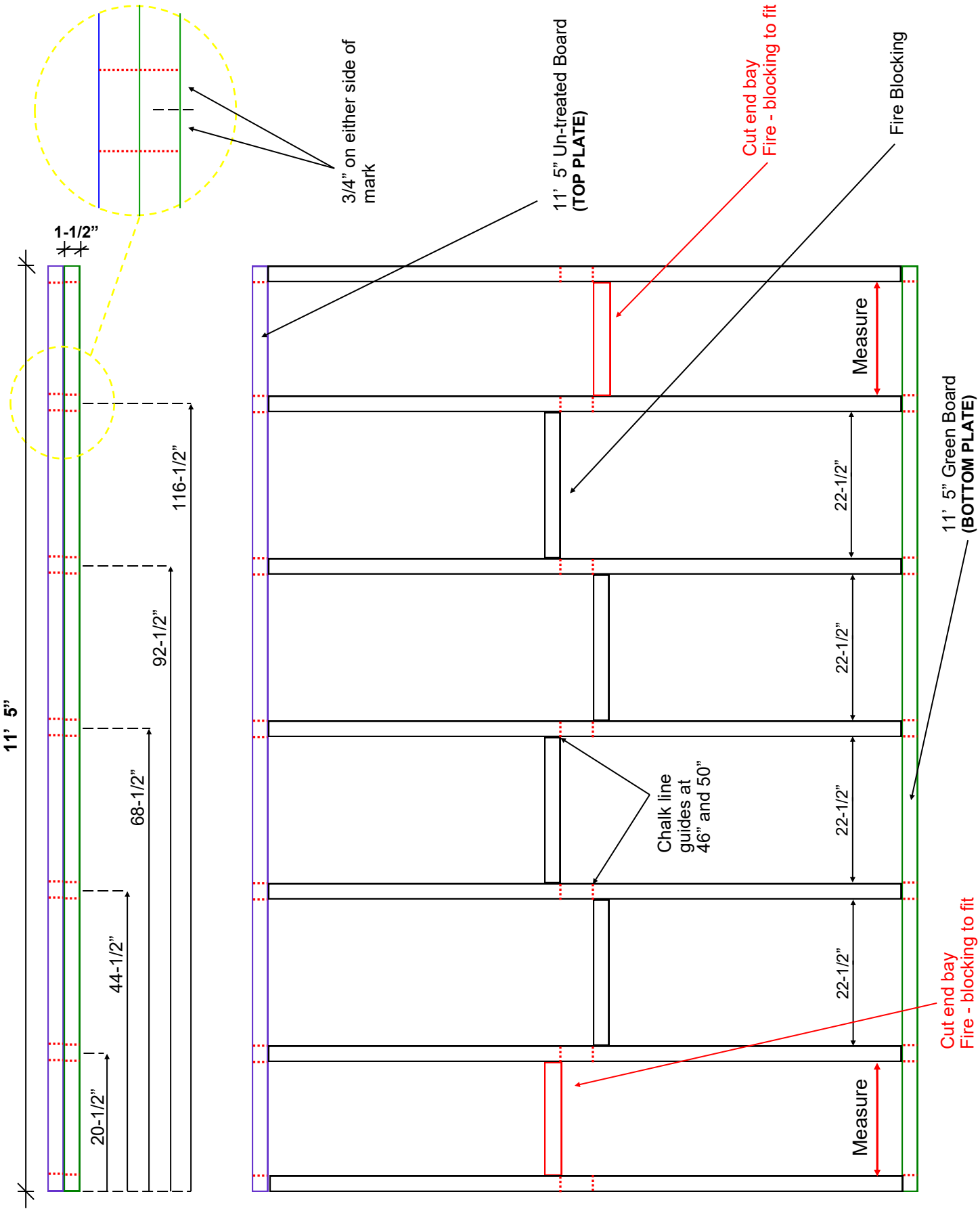


*Install the end bay fire-blocks. Cut the two end fire-blocks to fit. Measure at the bottom of the bay per diagrams on Pages 18 & 19.

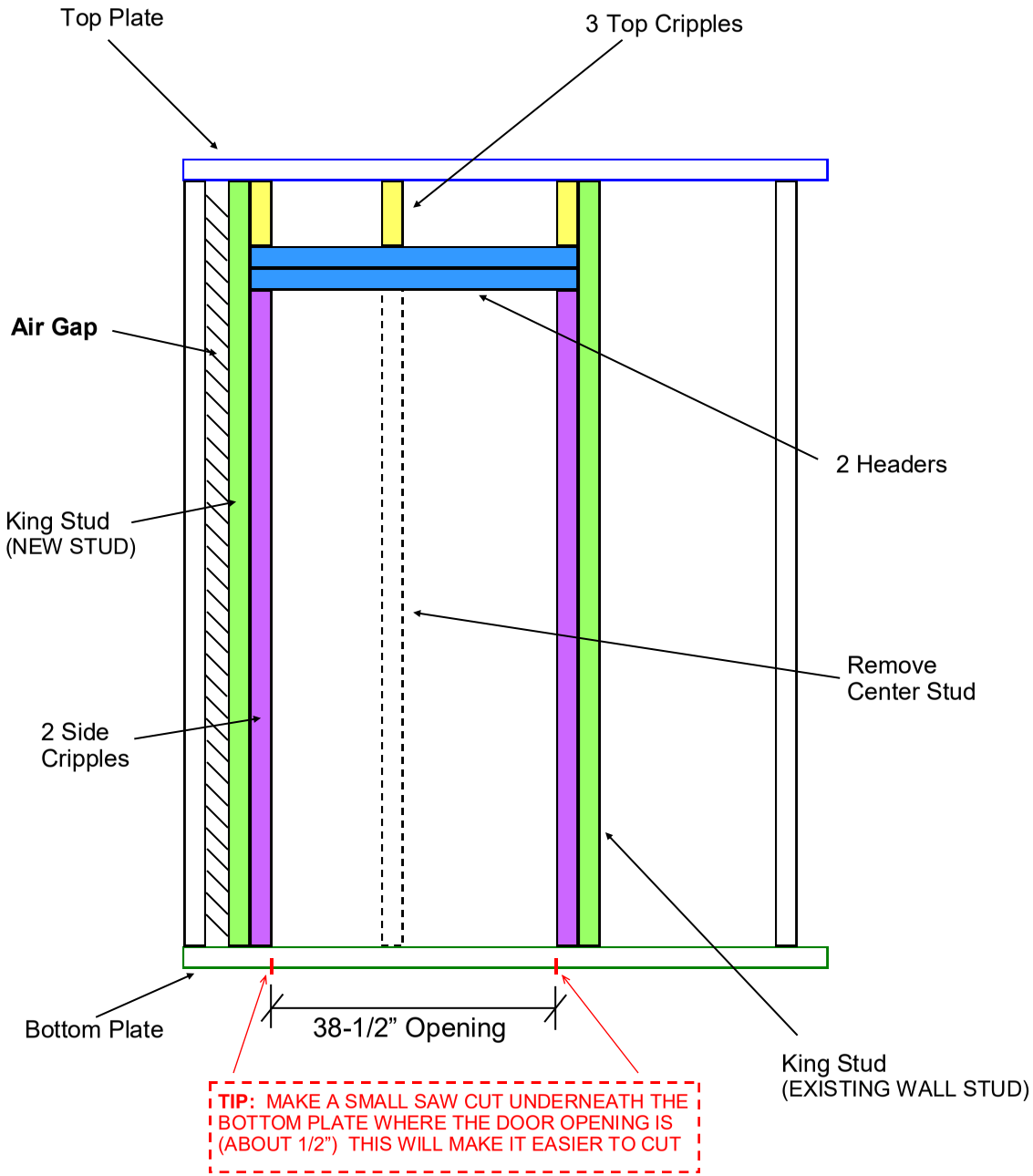
TYPICAL 12' WALL SECTION



TYPICAL 11’ 5” WALL SECTION



TYPICAL DOOR FRAMING



PARTS FOR TWO DOORS

4 Pieces of 41-1/2" 2x4 (HEADERS)

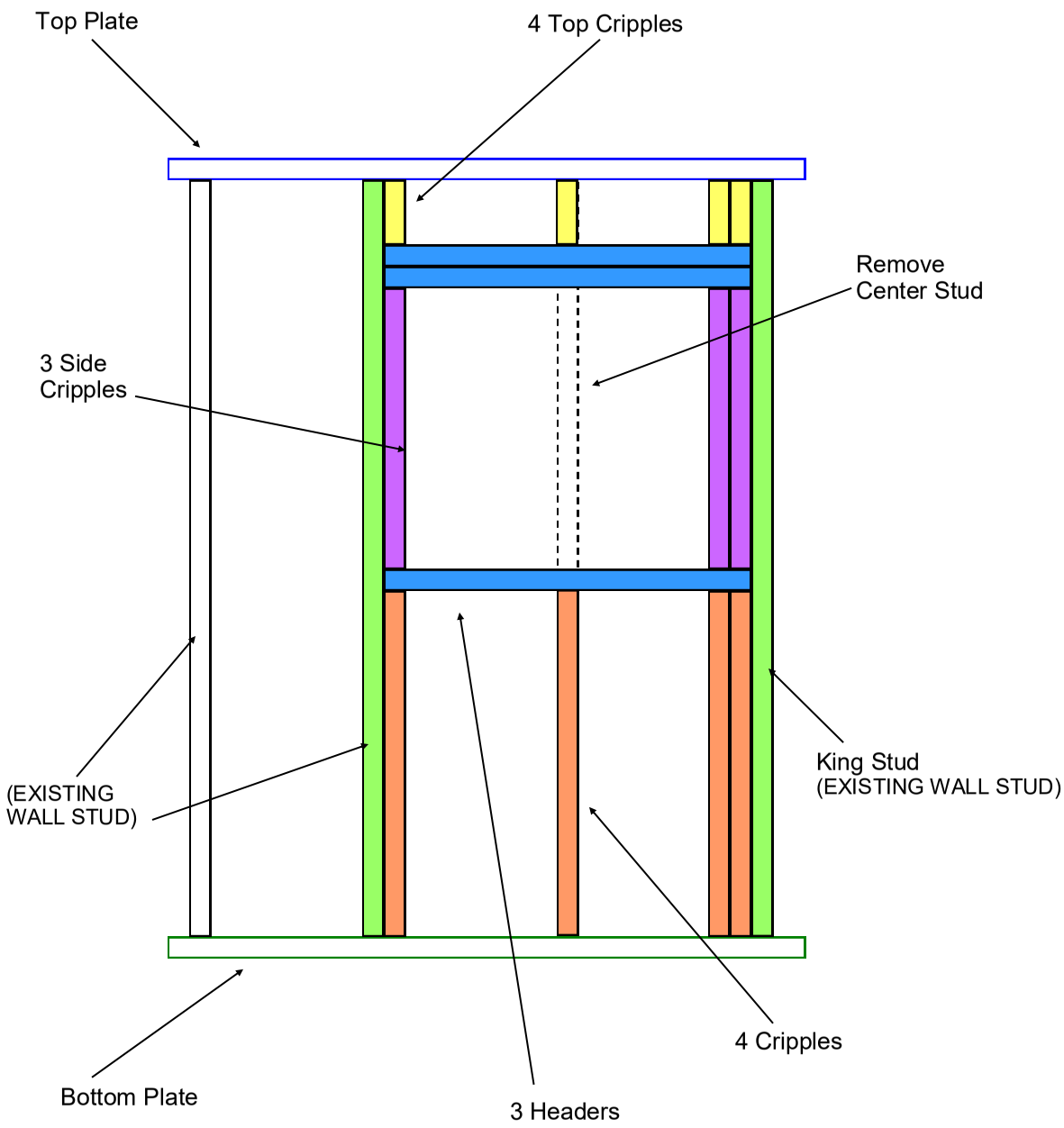
4 Pieces of 80-3/4" 2x4 (SIDE CRIPPLES)

6 Pieces of 8-1/2" 2x4 (TOP CRIPPLES)

NOTE: CUT TOP CRIPPLES LAST AS LENGTH MAY VARY. MEASURE FOR EXASCT LENGTH.

Some King Studs are normal wall studs already in place

TYPICAL WINDOW FRAMING



PARTS FOR THREE WINDOWS

- 9 pieces of 46-1/2" 2x4 (HEADERS)
- 12 pieces of 42" 2x4 (CRIPPLES)
- 9 pieces of 36" 2x4 (SIDE CRIPPLES)
- 12 pieces of 9-1/2" 2x4 (TOP CRIPPLES)

NOTE: CUT TOP CRIPPLES LAST AS LENGTH MAY VARY. MEASURE FOR EXASCT LENGTH.

- King Studs are normal wall studs already in place

DIAGRAM - PARTS FOR TWO DOORS

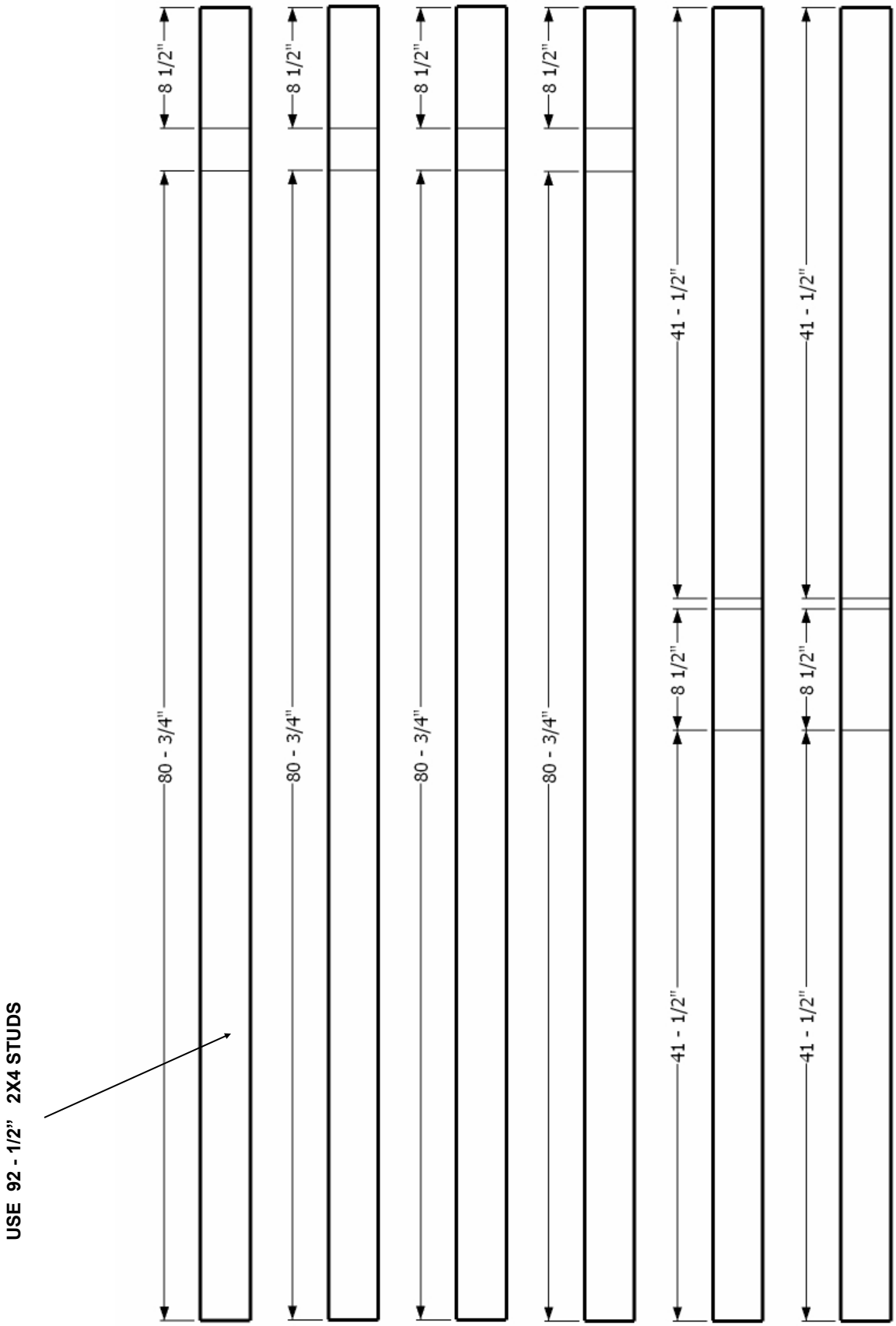


DIAGRAM 1 of 3 - PARTS FOR THREE WINDOWS

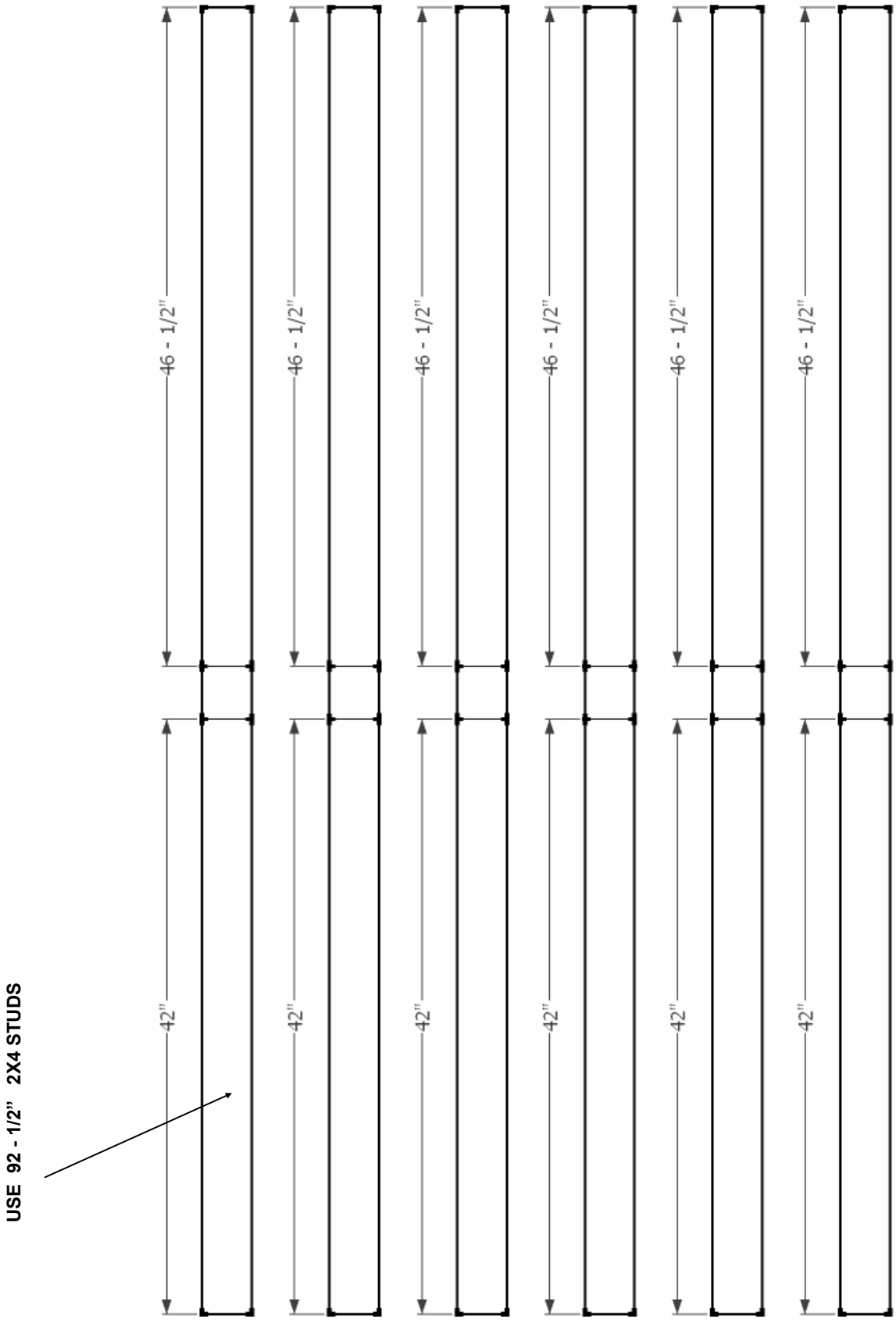


DIAGRAM 2 of 3 - PARTS FOR THREE WINDOWS

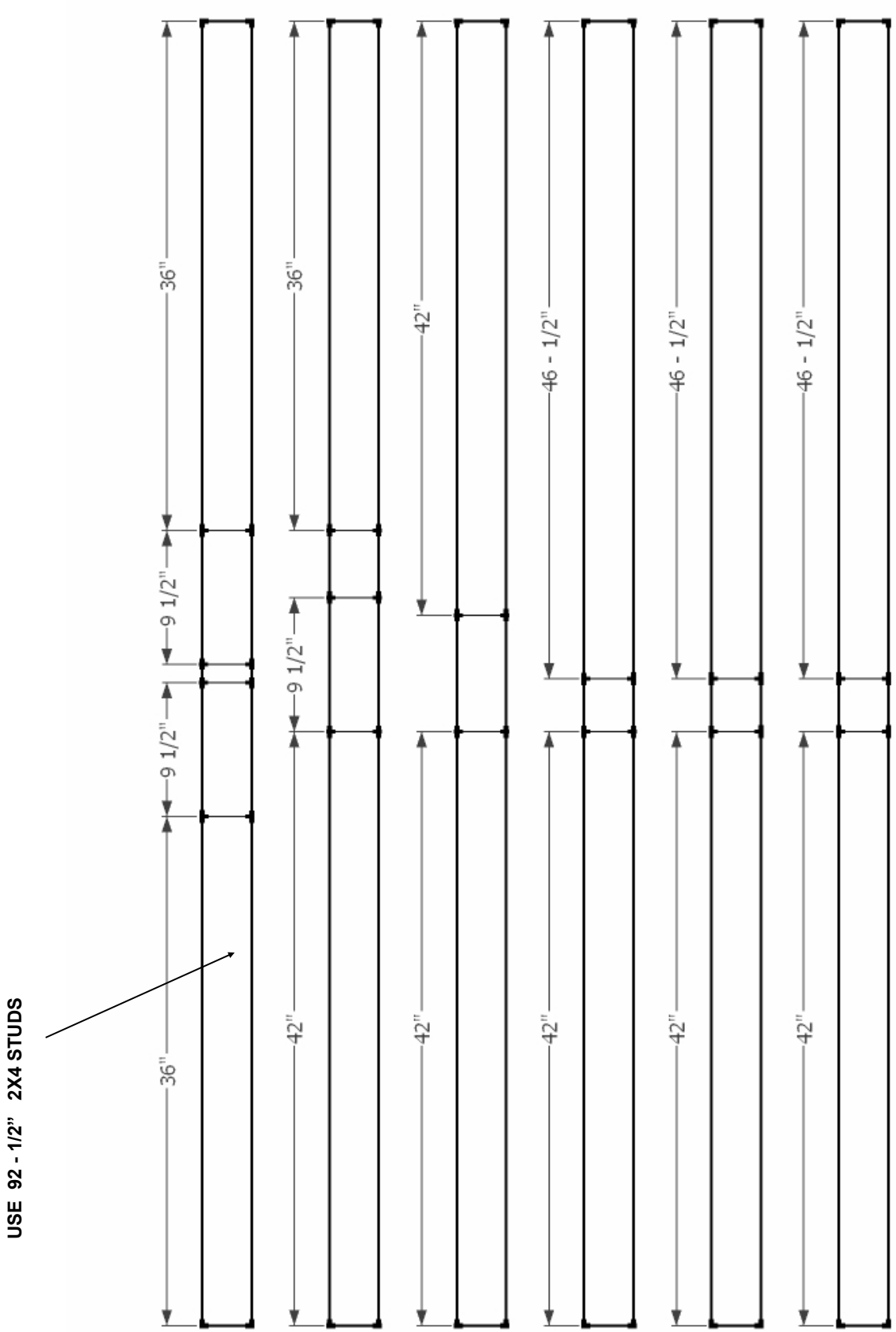
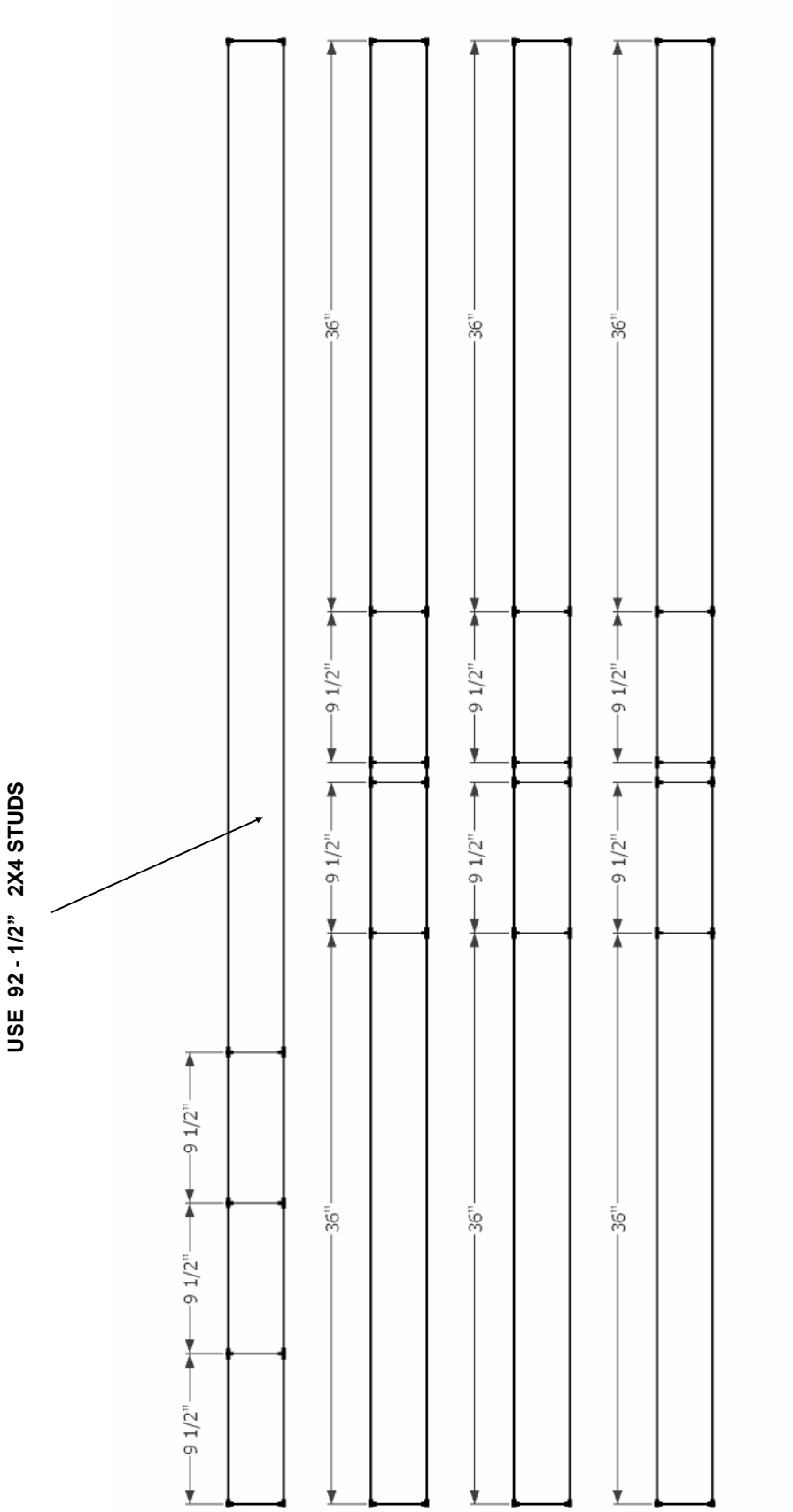


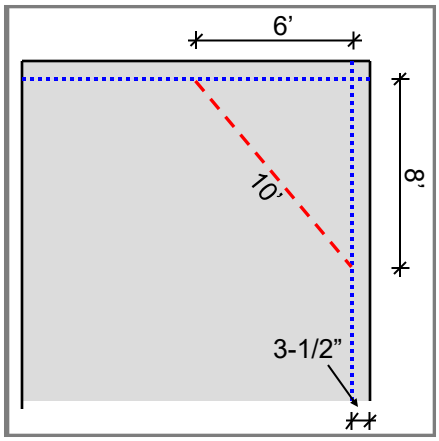
DIAGRAM 3 of 3 - PARTS FOR THREE WINDOWS



RAISING THE WALLS INTO PLACE

Materials and Tools Required

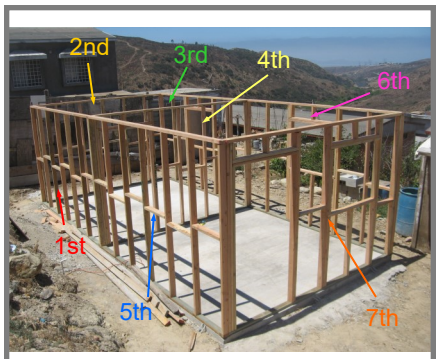
1 Tool Kit
1 2' Level
1 4' Level
1 Framing Square
1 Box of 16p framing nails
1 Box of joist hanger nails



SQUARING YOUR WALLS

1. On one of the 24' sides of the foundation snap a chalk line 3 1/2" in from the edge of the slab. Then repeat this process on one of the 12' sides.

2. Use the inside corner where the two chalk lines intersect and measure out 6' along the 12' side and 8' along the 24' side making tick marks at each of these locations. Measure the distance between the two marks to make sure that it is 10' **(3-4-5 TRIANGLE).** If it is not adjust your lines to make them square checking that your walls will not hangover the slab. Repeat this on the opposite corner.



SEE PAGE 28

3. At your squarest or most accessible corner begin to raise the walls by standing up one of your 12' length walls using the chalk line to guide the location. Next raise up one of the 11'5" walls creating an "L" again using the chalk line as guides (BOTTOM PLATES DOWN).

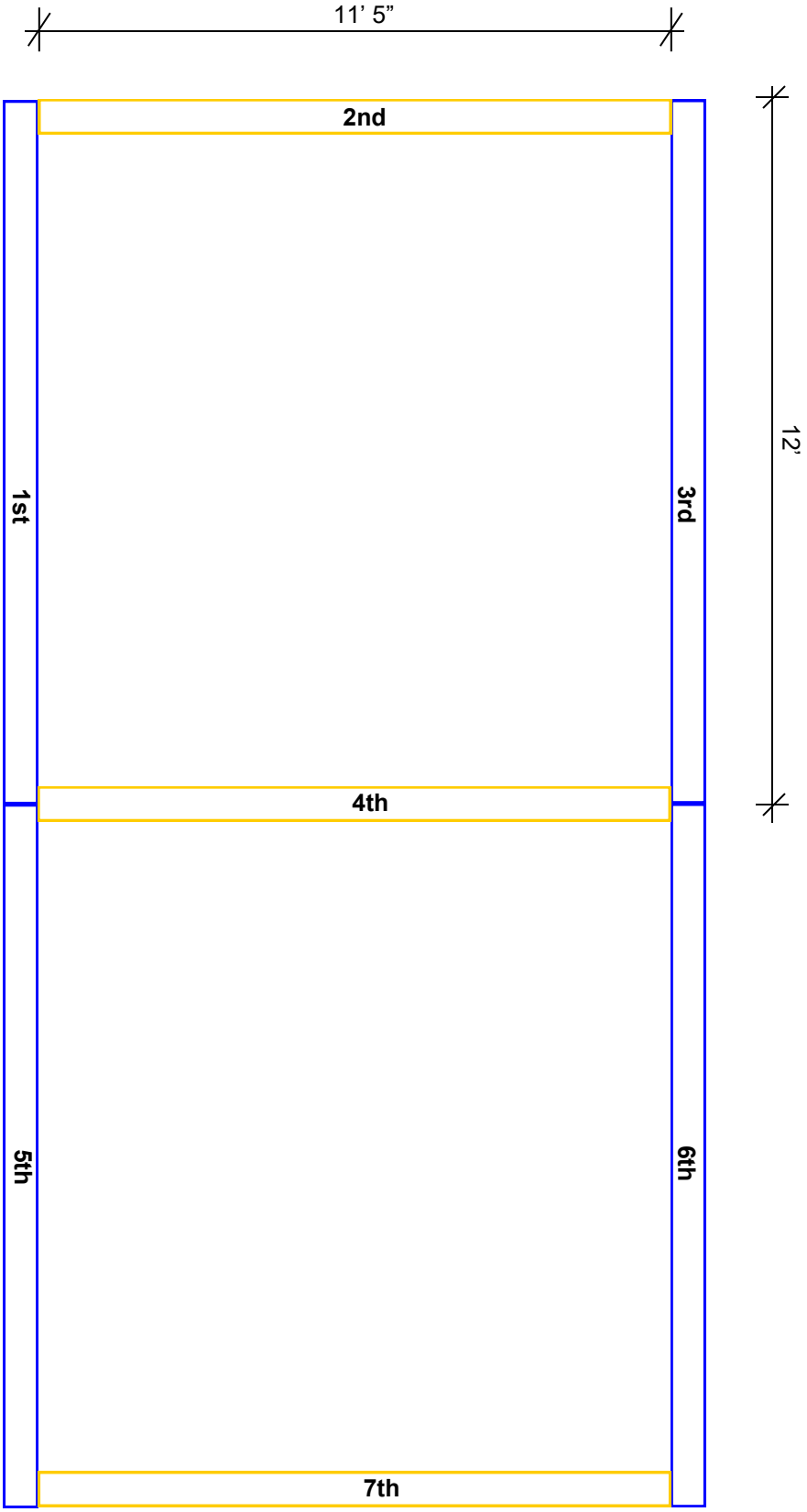
4. Secure these two sections together with four 16p nails making sure that the sides of the 2x4's are flush with each other (DO NOT NAIL THESE NAILS COMPLETELY IN YET).

5. Repeat this process to install a 3rd 12' wall opposite of the other wall creating a "U" shape. Then install the center 11' 5" wall to create a box. At this point the box will be fairly stable. Finish installing the last two 12' sides and finally the last 11' 5" end wall completing the wall installation. (DO NOT NAIL THESE NAILS COMPLETELY IN YET).

6. Check to make sure that the walls are square and sit correctly on the slab. If everything looks correct you can nail all of the 16 penny nails in and add more nails where all of the walls connect, these points need to be very strong. (NAIL EVERY 10" - 12" VERTICALLY).

7. **After all walls are up and square** attach the mudsill anchors to the bottom sill plate by wrapping them over the bottom sill and using joist hanger nails or 16p nail to attach them depending on how hard your slab is at this point. It is tough to remove these anchors once installed. If you angle the nail towards the inside of the house it will pull the anchor tight. Drive a few 16p nails through the sill plate and straight into the slab (IF YOUR SLAB IS TOO HARD/PRE-POURED YOU MAY NOT BE ABLE TO DO THIS SO USE JOIST HANGER NAILS)

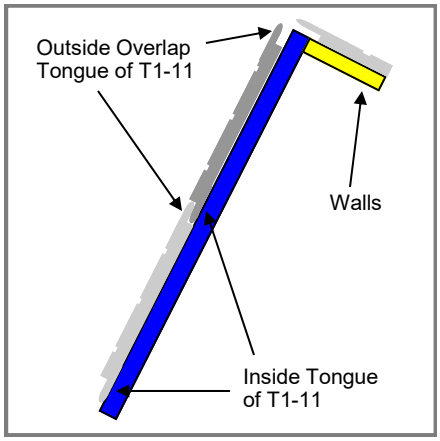
WALL INSTALLATION ORDER



PLUMBING THE WALLS & INSTALLING THE T1-11 SIDING

Materials and Tools Required

1 Tool Kit	**18** Sheets of T1-11
1 2' Level	**7** Untreated 12-ft 2x4's (OLD FORM BOARDS PLUS TWO NEW BOARDS)
1 4' Level	
1 Framing Square	
1 Box of 16p framing nails	
2 Box of 8p galvanized nails	



PLUMBING YOUR WALLS

1. Take one piece of T1-11 siding and place it on the corner of the 11'5" end wall (2ND WALL) you installed making sure that the **OUTSIDE OVERLAP TONGUE** is on the corner and the **INSIDE TONGUE** is lining up on the middle of a stud. Keep the bottom of the T1-11 even with the bottom of the **BOTTOM PLATE** and fasten the bottom corner on the overlap side with an 8p nail (DO NOT NAIL THESE NAILS COMPLETELY IN YET). See the tongue and groove diagram (**PAGE 29**).

2. Next secure the top corner of T1-11 on the **OUTSIDE OVERLAP TONGUE** side above the corner where you attached the first nail making sure that the T1-11 is even with the end of the wall.

3. Put a 4' level on the side of the wall to see if your T1-11 is plum. Push or pull on the wall to plum up your T1-11. When it is level secure the T1-11 with a nail on the top corner of the **INSIDE TONGUE** across from your other nail. Then put a forth nail in the bottom on the last corner. Your house will now be plum in one direction.

4. Repeat this process on the other side of the corner (1ST WALL) to plum your house in the other direction. Your house will now be plum and ready to install all of the T1-11 siding, using this method. Double check plum and then completely nail in the corner nails.

5. To make things go faster you can have one team tack up the siding with 4 - 6 nails and a second team follow adding a nail every 8 - 10 inches along the perimeter and wherever there is a stud. Secure the perimeter of door and window openings (NAIL INTO A STUD).

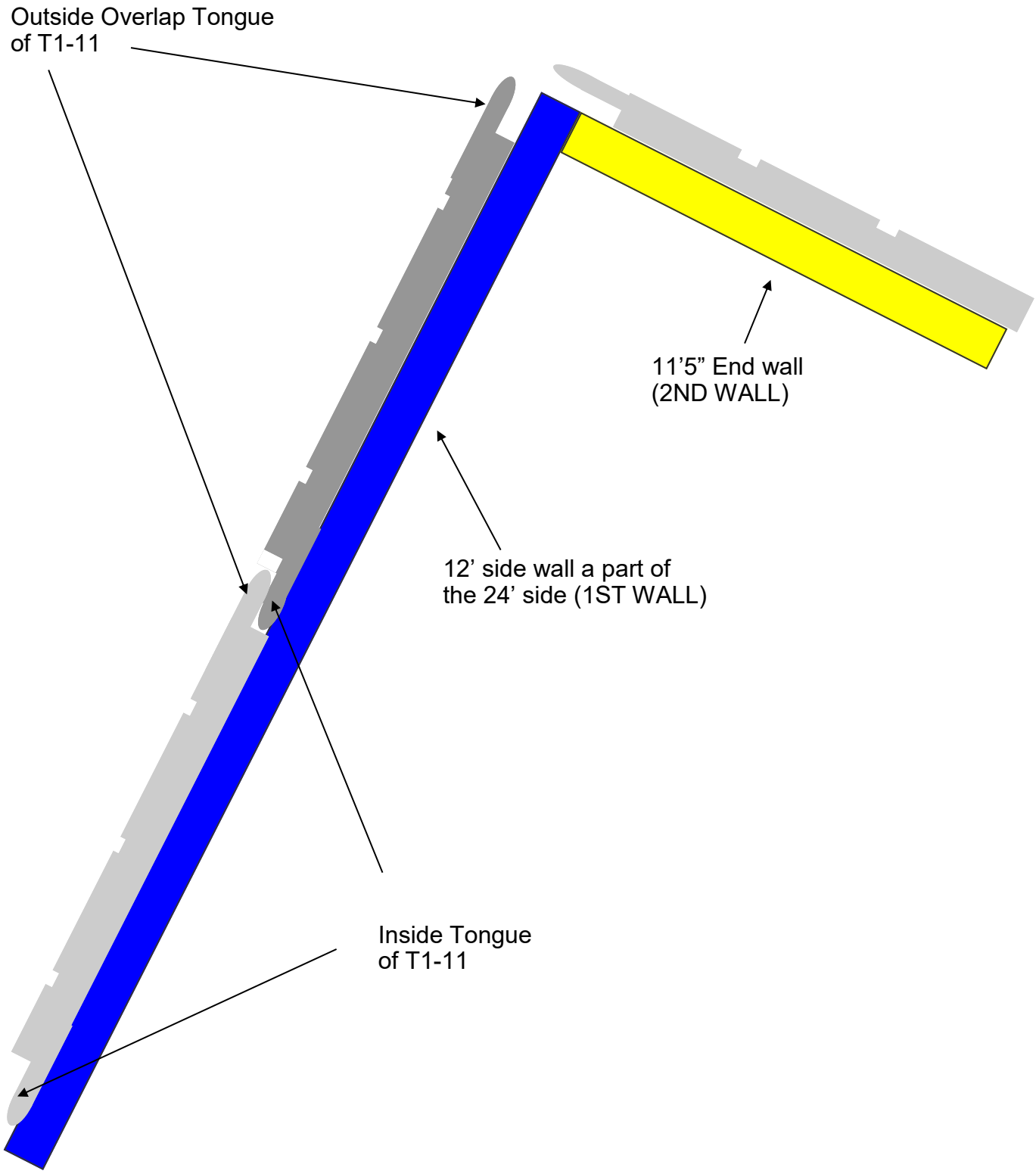
INSTALLING YOUR SECOND TOP PLATE

1. Use the five old 12' form boards plus two new 12' boards as the second **2ND TOP PLATE** (DON'T CUT YOUR 14' BOARDS TO 12'). Once your walls are up and PLUM you can begin to install this **2ND TOP PLATE** to secure your walls together.

2. You will want to use a 12' board on your two 11' 5" end walls and your 11' 5" center wall. This will firmly connect the walls at each corner by overlapping the joints. Nail these 2nd top plates on first with 16p nails.

3. Measure and cut your other form boards to fit in between the other top plates and secure them **(PAGE 31)**.

T1-11 TONGUE AND GROOVE LAYOUT



FRAMING THE ROOF STRUCTURE

Materials and Tools Required

1 Tool Kit
30 2x4 Rafters (ONE END OF RAFTERS HAS AN ANGLE CUT)
2 14-ft 2x12 (USED FOR RIDGE BEAM. MEASURE AND CUT TO EXACTLY 14ft)

15 Rafter hangers (PFD24)
4 H1 hangers
1 Box of joist hanger nails

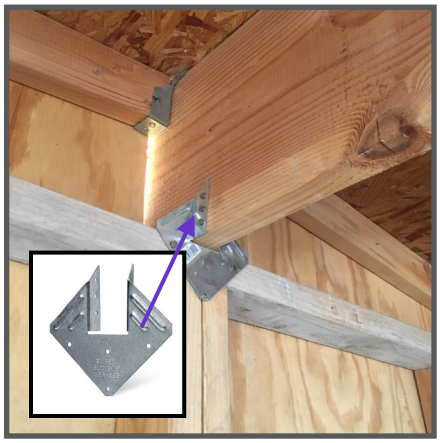
INSTALLING YOUR RIDGE BEAM

1. Use the diagram on **PAGE 30** to layout out the rafter hangers. Since the ridge beam is made up of two pieces make sure to label the ends that will join together to ensure it is installed correctly.

   - If your ridge beams bow line them up so that when you join them together the bows will create a "S" shape

2. Use joist hanger nails to secure the rafter hangers to the ridge beam leaving the three designated hangers off until the ridge beam is installed.

3. Find and mark the center of the two 12' short end walls. Using a chalk line snap a line between the two marks identifying the center of the middle wall.



4. On each wall make a mark 3/4" on each side of the center line to identify the location of the ridge beam.

5. Next install one side of the ridge beam by hoisting it on top of the walls and positioning it between the appropriate marks. Remember that the two beams will connect at the interior center wall meaning that each beam should rest halfway on the center wall.

6. Use H1 Hangers to attach the ridge beam to the top plate of the walls. You will use a total of four H1 hangers one on each outer wall and two on the center wall.

7. Use the same method to install the second beam. Once both beams are installed use a 16p nail to toe nail the top of the ridge beams together.

INSTALLING THE RAFTERS

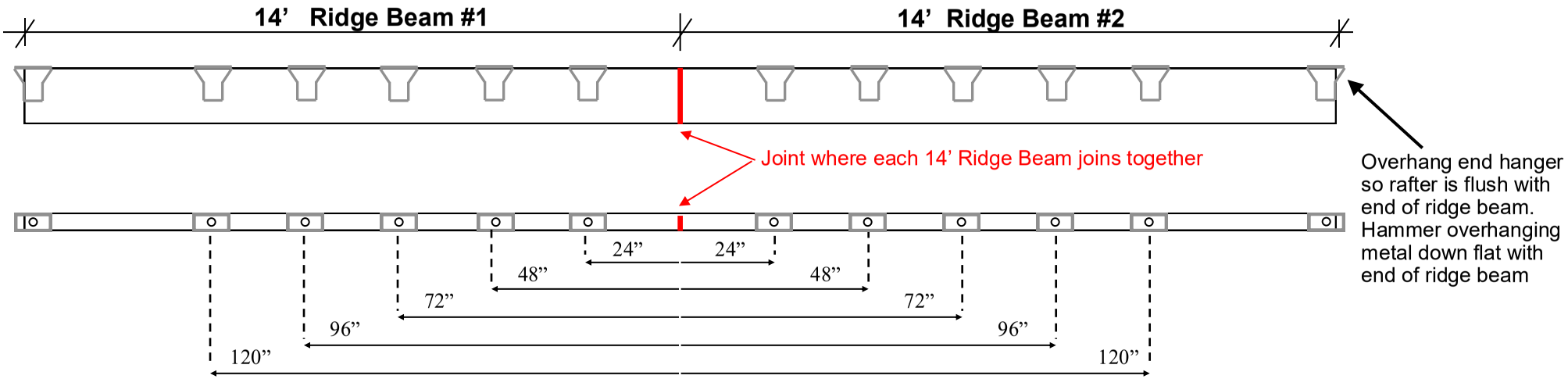
1. First install the last three rafter hangers, one over the center wall straddling the joint between the two ridge beams and one on each outer wall. On the outer walls make sure to install the hanger so that the rafter will line up with the outside of the framed wall.

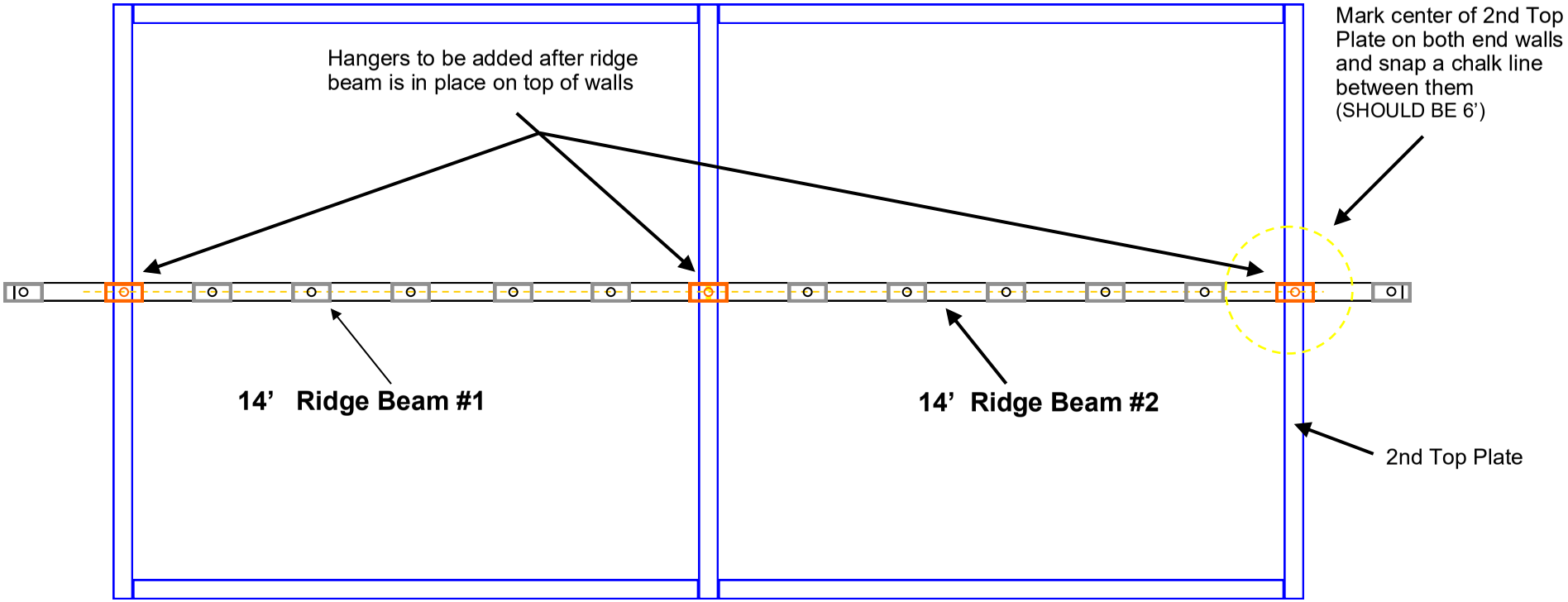
2. Insert all your rafters EXCEPT the four rafters which are outside the perimeter of the walls as the fascia board needs to be installed in order to secure these rafters. Make sure that the angled portion of the rafter goes against the ridge beam.

3. Use a hammer to hit on the top of the rafter close to the ridge beam to make sure that the rafter is sitting down in the hanger completely.

4. On either side hole of the PDF24 hanger use one **16p nail** to secure the hanger to the rafter and the rafter to the ridge beam.

RIDGE BEAM LAYOUT





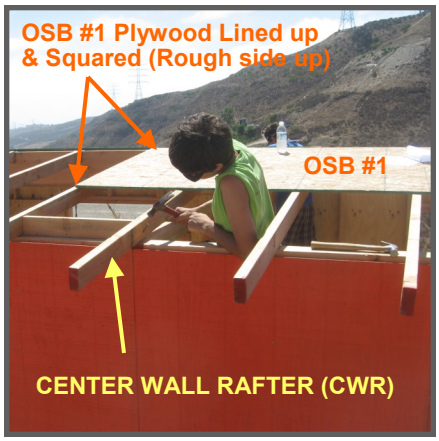
INSTALLING THE OSB PLYWOOD

Materials and Tools Required

1 Tool Kit
1 Box of 8p nails
14 Sheets of 7/16" OSB roofing plywood
4 14-ft 2x4 (USED FOR FASCIA BOARDS - THREE WILL BE RE-USED FROM CEMENT DAY)
24 Fire-blocks

IMPORTANT NOTES

- When installing your OSB Plywood it helps to not nail your 8p nails all the way in until you know your layout is going to line up correctly.

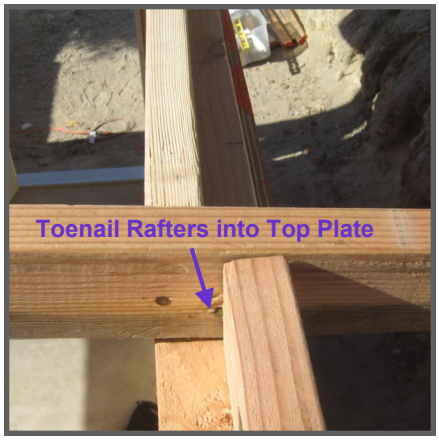


SQUARING UP YOUR RAFTERS (SEE PAGE 34)

1. By making marks at either end of your 28' ridge beam snap a center line down the top of the ridge beam. This will insure that your roof is aligned correctly, even though it may not look like it is going down the center of your beam.

2. You can eventually have two teams working, but start out with one and work slowly on the first installation as this will determine how the rest of the pieces layout.

3. Starting on one side of the roof take **OSB #1** **(ROUGH SIDE UP)** and line the 8' edge of your OSB sheet up with the chalk line on the ridge beam **(PAGE 34).**



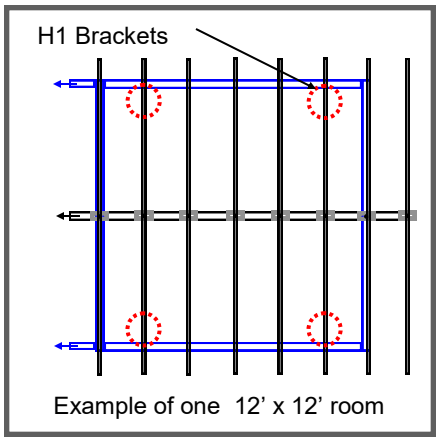
4. Keeping the 8' side lined up with the chalk line slide the plywood until the 4' side lines up directly on the center of the **1ST RAFTER SQUARED (1RS)**. The opposite 4' side of the sheet should line up on the center of the **2ND RAFTER SQUARED (2RS)**. Nail the two corners of the OSB sheet at the ridge beam down first and then the two bottom corners making sure that the OSB sheet and rafters stay in the correct position. Toenail the **1RS** and **2RS** into the **2ND TOP PLATE** with 16p nails **(PAGE 30).**

5. Install **OSB #2** make sure that it follows the chalk line and it is tight to **OSB #1**.

   - Once all the OSB sheets are installed each OSB sheet should be nailed every 8" on the perimeter and wherever there is a rafter underneath (CHECK TO MAKE SURE YOU ARE NAILING INTO A RAFTER)

6. Take a fire-block and set it between the **1RS** and the **CENTER WALL RAFTER (CWR)** push the **CWR** towards the **1RS** until the fire block is tight. Toenail the **CWR** on one side to the **2ND TOP PLATE**. Remove the fire block and nail the other side of the **CWR** to the **2nd TOP PLATE**. Line the fire block on the outside edge of the wall and nail the rafters to it with two 16p nails on both sides.

7. Continue this process all the way to the last rafter at **OSB #2** (THE OUTTER RAFTER HAS STILL NOT BEEN INSTALLED) staggering the fire blocks from the outside of the top plate to the inside of the top plate.



Example of one 12' x 12' room

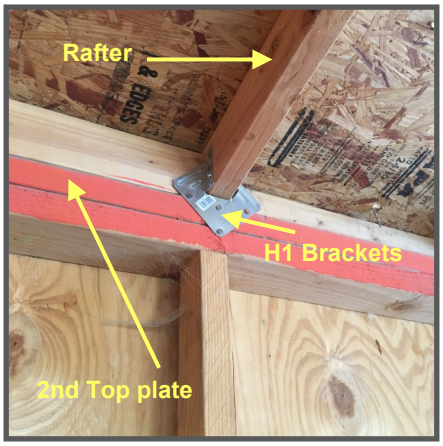
8. Lay **OSB #3** into place lining it up with the chalk line making sure that it is tight against **OSB #1**.

9. Move the rafter on the outer 8' edge of **OSB #3** until it lines up halfway with the edge of the sheet. Mark the **2ND TOP PLATE** where the rafter is. Move **OSB #3** off to the side and toenail that outer rafter into the **2ND TOP PLATE** making sure you are on your marked line.

10. Install the remaining fire blocks & rafters using the method in STEP #6.

11. Install the remaining OSB sheets according to their sequence. Repeat this process for the opposite side of the house.

12. Use a total of eight H1 brackets to attach the corner rafters in each room to the top plate of the wall. (four per room) See left Diagrams



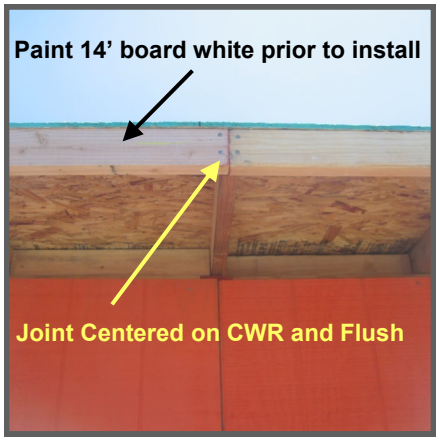
INSTALLING THE 14' FASCIA BOARDS AND THE LAST RAFTERS

1. Prior to install paint the outside of your 14' board and 4 end rafters white. These will be exposed as the final finished trim.

2. Cut your 14' boards to exactly 14'. Start at the **CWR** by lining the end of your 14-ft 2x4 halfway on the end of the rafter. Making sure that the fascia board is still lined up and the bottom of the board is flush with the bottom of the rafter use two 16p nails to secure the board to first rafter in from the **CWR**.

   - Two people on the roof holding the fascia board in position and one person on the ground nailing makes this process go quickly

   - Since the fascia board lines up halfway on the **CWR** you want to wait until the other fascia board that butts up against it is installed before nailing it to the **CWR**, so the end does not split out



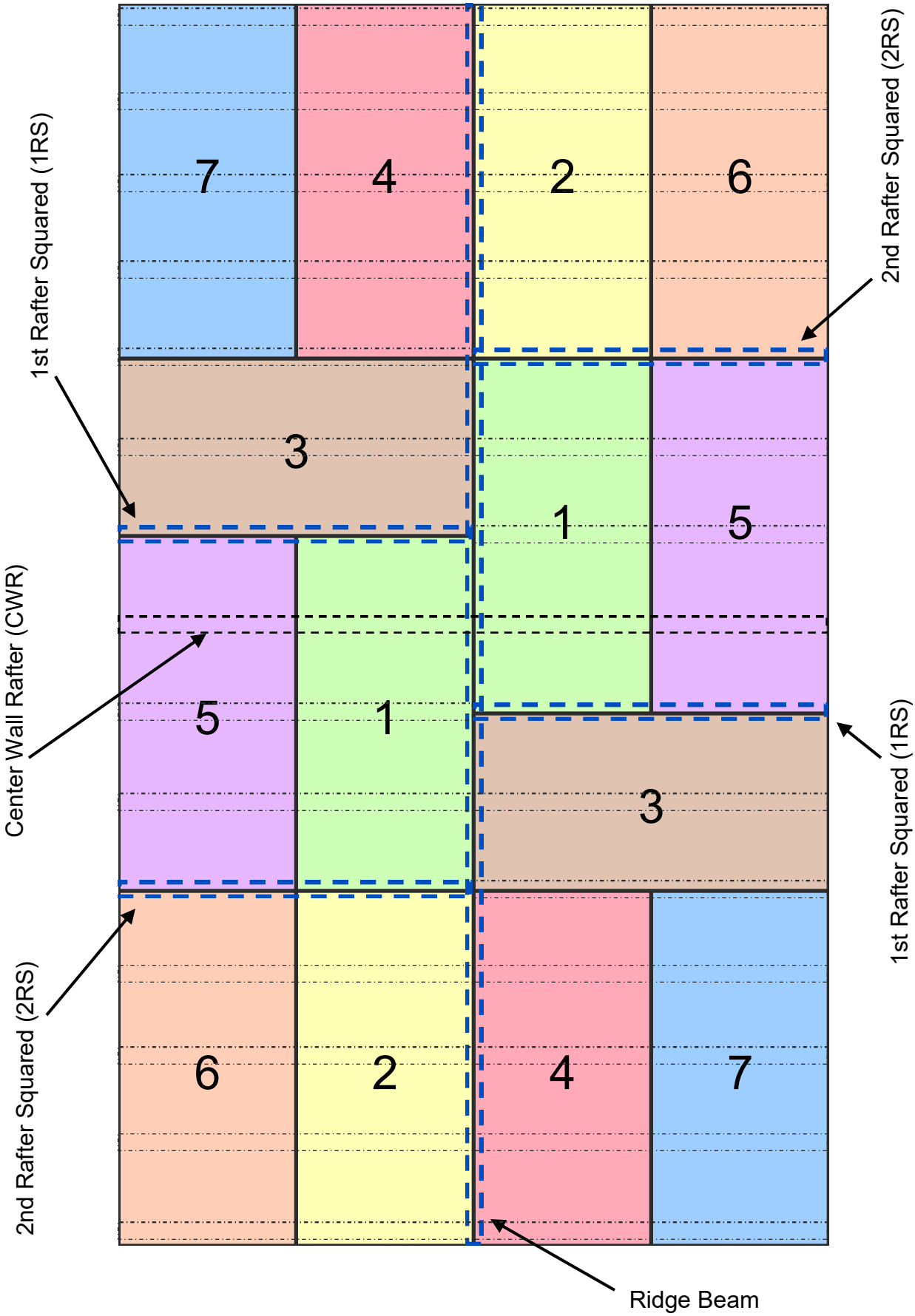
3. Work your way from the center out securing the fascia board to each rafter making sure that the bottom of the fascia board lines up with the bottom of the rafter.

4. Prior to install paint the outside of each end rafter white as this will be exposed as the final finished trim. Insert the last rafter using a hammer to make sure that it sits tightly into the rafter hanger. Nail the rafter to the hanger and the fascia board. (Toenail method is acceptable too for attaching rafter to ridge beam)

5. Repeat this process to install the remaining three fascia boards and three rafters.

6. Once the fascia board and last rafters are installed make sure to nail the OSB into the fascia board and the end rafters.

ROOFING OSB PLYWOOD PATTERN



Materials and Tools Required

1	Tool Kit
2	Caulk Guns
2	Rolls of tar paper (LEAVE EXTRA AT SITE)
6	Rolls of mineral paper (LEAVE EXTRA AT SITE)
1	Box of Roofing nails
36	Cartridges of Tar
2	Garbage bags

IMPORTANT NOTES

- Leave tar guns and opened cartridges of tar with the family
- Collect all of the garbage and tar cartridges in the bags and leave this at the house. DO NOT BRING GARBAGE BACK TO DOXA
- Bring any unused tar cartridges back to the Annex

ROLLING OUT THE TAR PAPER

1. Two teams can be used for each side of the house. Begin at the lowest part of the roof over the outside walls. With a 3/4" overhang line the tar paper up with the edge of the OSB on the fascia board side. Use the staple gun with **1/4" or 5/16" staples** to secure the tar paper to the OSB making sure to follow an even line when rolling out the paper. Use staples about every 8" on the perimeter and down the middle of the tar paper. Make sure the staples are all the way in and use a hammer to nail them all the way in if not.

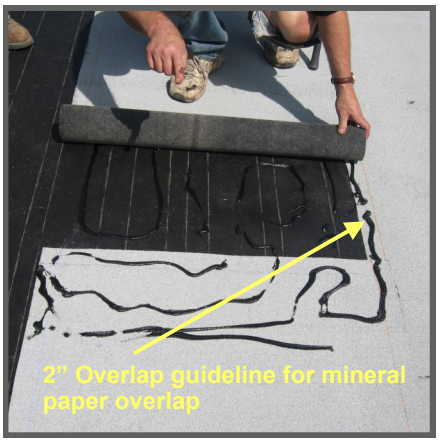
2. Working towards the ridge of the roof overlap your tar paper about 5" each time you start a new row. Use the **GUIDE LINES** on the tar paper for the overlap. When both sides have reached the top with tar paper roll a piece of tar paper splitting it halfway on each side of the ridge beam stapling it down. Roll out one more piece to double it up.

INSTALLING METAL DRIP EDGE ON LONG 28ft SIDES

1. After the tar paper is secure install the drip edge on each of the 28' sides of the roof. On one 28' side of the house install three 10' sections of metal drip edge overlapping them approximately 1'. The metal edges with a 1' overlap should reach from one end of the roof to the other. [HINT: Begin by installing one piece at each end of the 28' run. Flush the end of the metal with the end of the roof. Then install the center piece over the two others creating the approximate 1ft overlap]

2. Secure the metal drip edge with roofing nails every 12 inches.

3. Run a bead of tar at the edge of the metal drip edge where it meets the tarpaper and cover each nail head with tar



INSTALLING METAL DRIP EDGE ON SHORT 8ft ENDS

1. After the drip edge is installed on both 28ft sides take one 10ft section of metal drip edge and lay it out on the short 8' edge of the roof over the tar paper. Flush it out with the edge of the 2x4 fascia board [HINT: It will sit on top of the other metal drip edge already installed on the 28' long side]. The roof is only 8ft long so use the tin snips to cut the front edge of the metal and bend the metal to fit and follow the roof at the ridge line. DO NOT CUT THE TOP OF METAL.

2. Secure the metal drip edge with roofing nails every 12 inches. Repeat this method on the other short 8'ends of the roof.

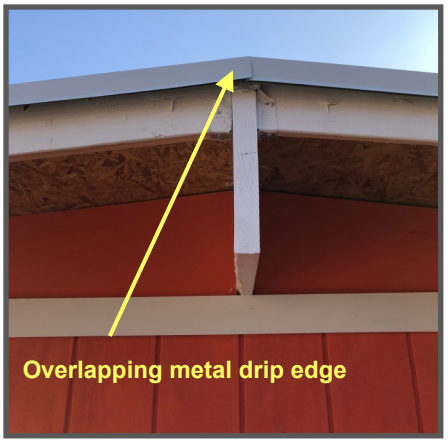
3. Run a bead of tar at the edge of the metal drip edge where it meets the tarpaper and cover each nail head with tar.

Materials and Tools Required

1 Tin snips
10 Metal drip edge flashing

IMPORTANT NOTES

- Refer back to Page 35 for additional roofing install instructions



ROLLING OUT THE MINERAL PAPER

1. Like the tar paper start the mineral paper at the lowest part of the roof overhanging the mineral paper about 3/4" past the edge of the metal drip edge.

2. Roll out the mineral paper, making sure that you are keeping an even 3/4" overhang (YOU CAN SNAP A CHALK LINE AS A GUIDE FOR THE FIRST ROW).

3. Continue to roll the mineral paper out placing tar on the perimeter and in the middle as you go. [HINT: Lay about 3-4ft of tar, roll out the mineral paper and then start again]. When you reach the edge of the roof cut the mineral paper so it is flush with the end of the metal drip edge. [HINT: You can use the metal edge as a guide to cut the mineral paper].

4. Once you have completed the first row go back and nail the top edge of the mineral paper every 12". Put a dot of tar over each nail.

5. Roll out the next row applying tar and making sure to overlap the previous row using the **OVERLAP LINE** as your guide. If your mineral paper does not have an **OVERLAP LINE** use a pencil and make marks at 2" every foot to create your own **OVERLAP LINE** guide. Nail the top like you did on the previous row and cover the nail holes. Continue this process until both sides reach the ridge of the roof. [HINT: If the roll runs out part way through a row make sure to overlap a foot when you start the new roll. Do not have exposed nail heads]

6. At the top roll out a piece that splits halfway on each side of the ridge using just tar to secure it.

7. On the short ends stop the mineral paper with the edge of the metal drip edge and make sure to run a small bead of tar under the edge. ****YOU SHOULD NOT HAVE ANY NAIL HEADS EXPOSED IN THE MINERAL PAPER WHEN YOUR ROOF IS COMPLETE.**

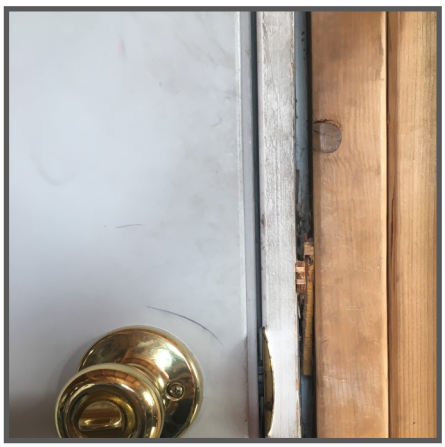
INSTALLING THE DOOR AND WINDOWS

Materials and Tools Required

1 Tool Kit
3 Windows
1 Door
1 Entry lock set for door
1 Bundle of shims

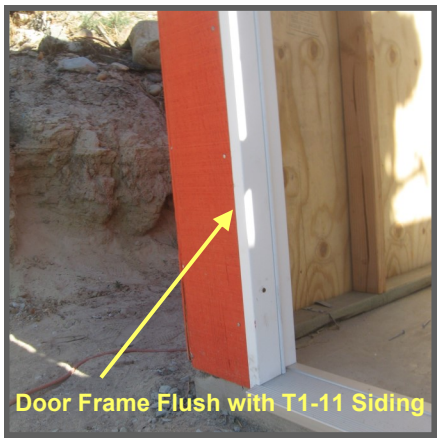
INSTALLING THE WINDOWS

1. From the inside of the house drive 16p nails through the T1-11 at the corners of the window opening. On the outside of the house using the nails poking through and a chalk line mark the opening of the window and cut out the T1-11 from the outside of the house. Check to make sure you are cutting the opening correctly.
2. From the outside of the house place your window in the opening making sure that it is right side up and the latch is on the inside of the house. Put a level on top of the window to position it correctly.
3. Next nail four 8p nails on each side of the window into the nailing flange to secure the window in place. Make sure the window stays level. [HINT: It helps to use a 16p nail first to create a hole in the flange for the 8p nail to go through]



INSTALLING THE DOOR

1. Cutout the door opening as one piece and then cut the **BOTTOM PLATE** out of the doorway and remove all of the packing material from the sides and bottom of the door.
2. Install the lockset in the door making sure that the latch is on the inside of the door.
3. Place the door in the frame. Make sure that the door swings inwards and the outside of the frame is even with the outside of the T1-11.
4. On the hinge side nail a 16p nail three-quarters of the way into the jamb at the top and bottom allowing you to add shims as needed.



5. Next use shims on the latch side of the jamb to hold the jamb in place and see how the door opens and closes. If the space between the jamb and the frame is more than 1” you can use scrap boards in conjunction with the shims instead of multiple shims to shim the jamb. Maintain a plumb jam while shimming and nailing the door. Check the door to see how it opens and closes throughout the process. If the door binds adjust your shims. If the door still binds add shims to the hinge side. Continue this process until your door opens, closes, and latches.

   - If your slab is not level you may have to shim one side of your jamb up. If this is the case, make sure that your latch still lines up and you shim under the threshold of the door so that it does not bend when you step on it

   - KEEP YOUR KEYS IN SAFE PLACE SO YOU DO NOT LOCK YOUR SELF OUT!

Materials and Tools Required

1	Tool Kit	**7**	Roller cover/nap
4	Pieces of 8-ft 1x3 trim (FOR CORNERS OF HOUSE)	**3**	Paint trays
?	Pieces of 8-ft 1x4 trim	7	Paintbrushes
3	Pieces of 11/32" ACX Interior Plywood		
2	Cans of white paint		
2	Buckets of siding paint		
5	Roller frames		

IMPORTANT NOTES

- DON'T LET BRUSHES AND ROLLER DRYOUT. RINSE, LEAVE IN WATER OR WRAP IN PLASTIC. LEAVE ALL OPENED PAINT AND PAINT SUPPLIES WITH THE FAMILY

PAINTING

1. Painting does not have to wait until the end. This step is best started early on in the building process.
2. The 1x3 and 1x4 trim is painted white and should be painted on the ground. Paint all sides for added protection. Once installed the trim can be touched up / painted as needed. Paint 14' 2x4 fascia and end rafters white on outside faces as this will act as finished trim.
3. Depending on the paint color options ask you family what color they would like for their siding. Siding can be painted on the ground or after installation. Use a brush and roller to make sure that the sides get coated thoroughly and evenly.
4. There is not enough paint to paint the inside of the house.

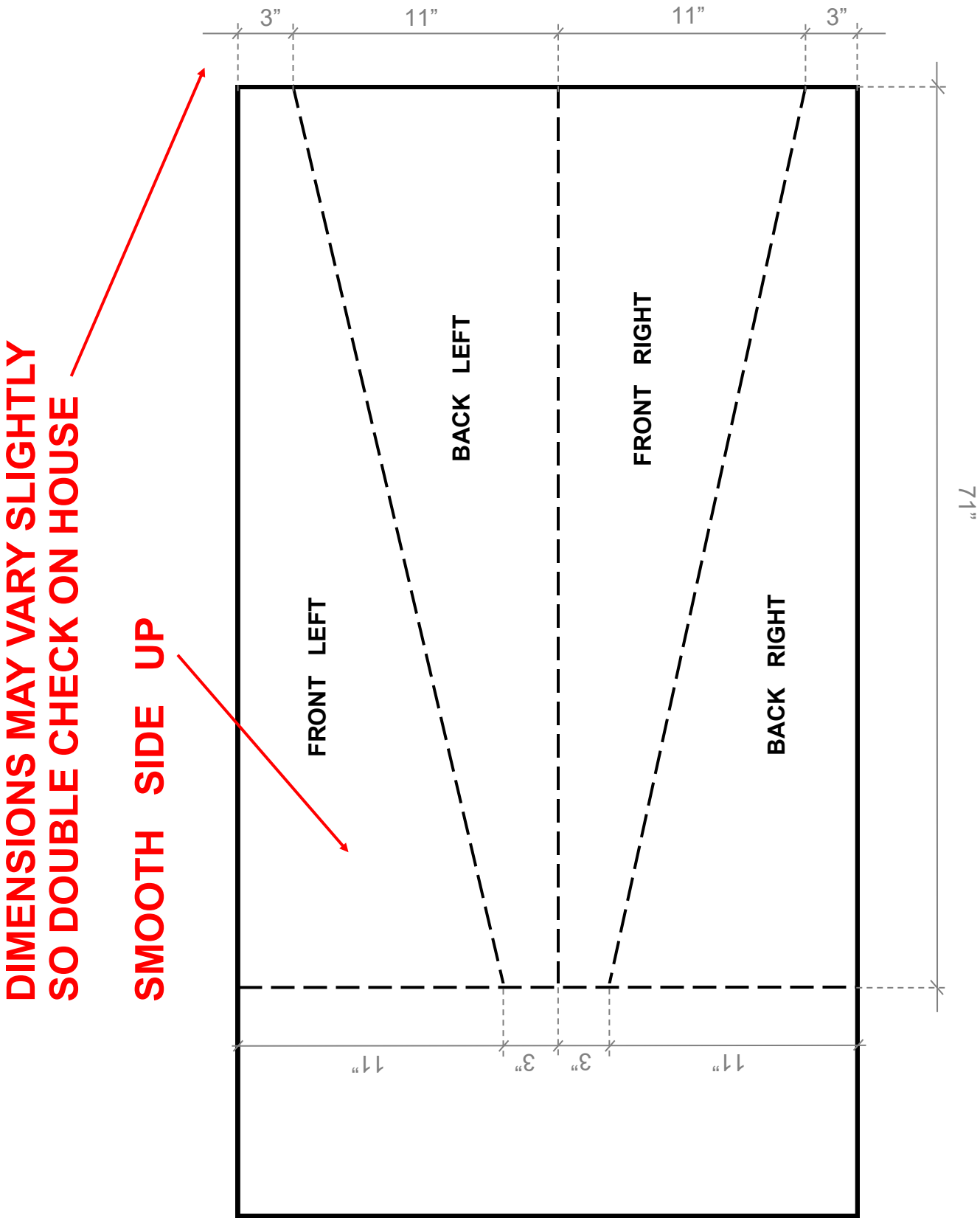
INTERIOR WALL PANELS

1. Start on the opposite side of the door opening and layout where the seam for the two 11/32" ACX wood panels will be. If the seam does not land in the middle of a stud add 2x4 blocking into the wall so that the seam does land halfway on 2x4 material.
2. Use 8p nails to install the first piece making sure it is tight to the wall.
3. Measure the distance from the end of the first piece to the door opening and cut your second piece to fit if needed before installing.
4. Use your third piece to fill in the final parts around the door opening.

EXTERIOR TRIANGLES

1. Use the T1-11 from your door opening to make four triangles for the exterior of the 12' end walls. See diagram on **PAGE 39**
2. **Put the smooth side out.** Make a notch for the hanger at the ridge beam and use 8p galvanized nails to secure it.

UPPER SIDING DIAGRAM FOR EXTERIOR 12’ END WALLS



FINISHING TOUCHES - CONTINUED

Materials and Tools Required

1 Bag of three curtains

TRIM PIECES

1. On each of the four corners of the house use one 1x3 and one 1x4. Start at the top of the wall and work your way down using 8p nails to fasten the trim to the siding. Install both pieces simultaneously to allow both pieces to line up perfectly.

2. On the 24' sides of your house install 1x4 trim right below the rafters.

3. Continue 1x4 trim around the house on the 12' wall side at the same level as the trim under the rafters on the 24' side. This trim will cover up the seam where you installed the triangle pieces above the T1-11 siding.

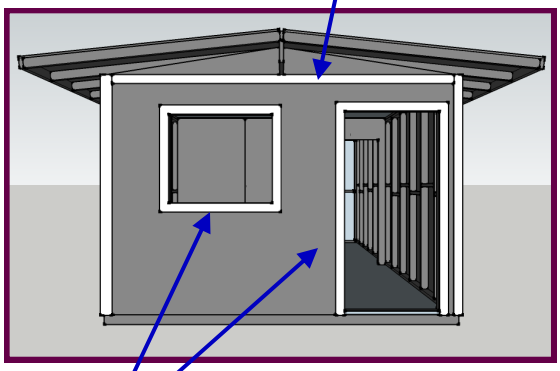
4. Use 1x4 trim for the exterior door and window trim. Feel free to be creative with the style you choose, but remember that trim is limited so make sure you have enough to complete it all.

SEE DIAGRAM ON PAGE 40 FOR EXAMPLE LAYOUT

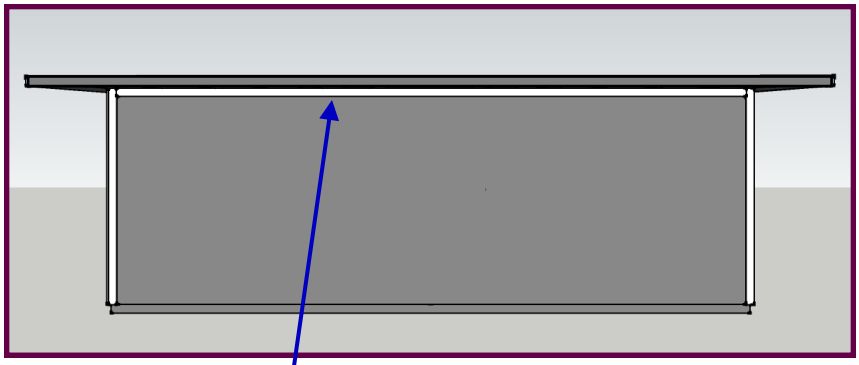
CURTAINS

1. Using 8p nails install curtains at each of the windows on the inside of the home

Use 1x4 trim to cover T1-11 seam



Use 1x4 trim around window and door openings

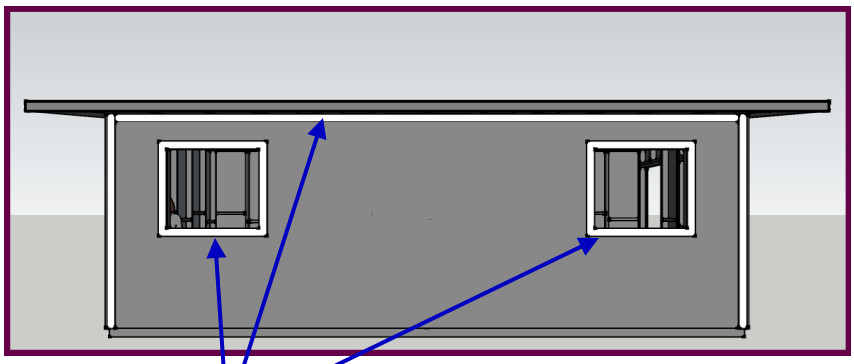


OPTIONAL - Use 1x 4 trim under rafters along 24' side of house (Only if you have extra)

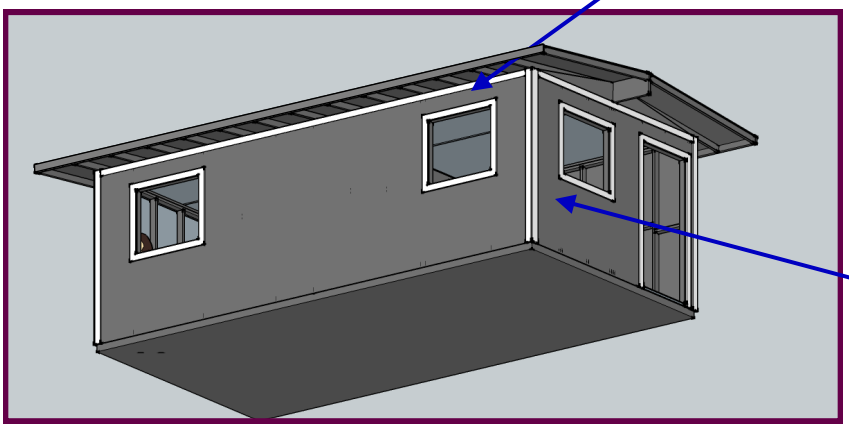
TOTAL TRIM NEEDED:

22 - Pieces of 8-ft 1x4 trim

4 - Pieces of 8-ft 1x3 trim



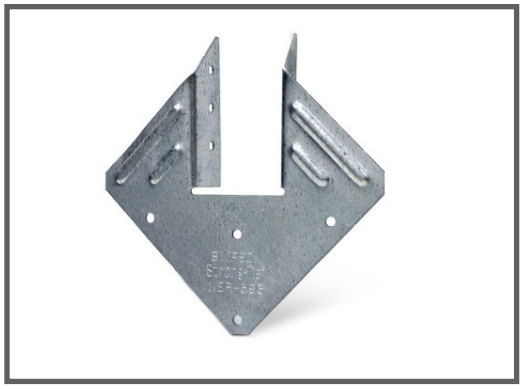
Use 1x 4 trim on windows and under rafters



Use one 1x4 trim and one 1x3 trim on each corner of the house

HARDWARE DESCRIPTION PHOTOS

MAS MUDSILL ANCHORS (REBAR HANGER)



H1 HANGERS (HURRICANE ANCHOR)

METAL STAKE

PAINT PAN - ROLLER CAGE - ROLLER

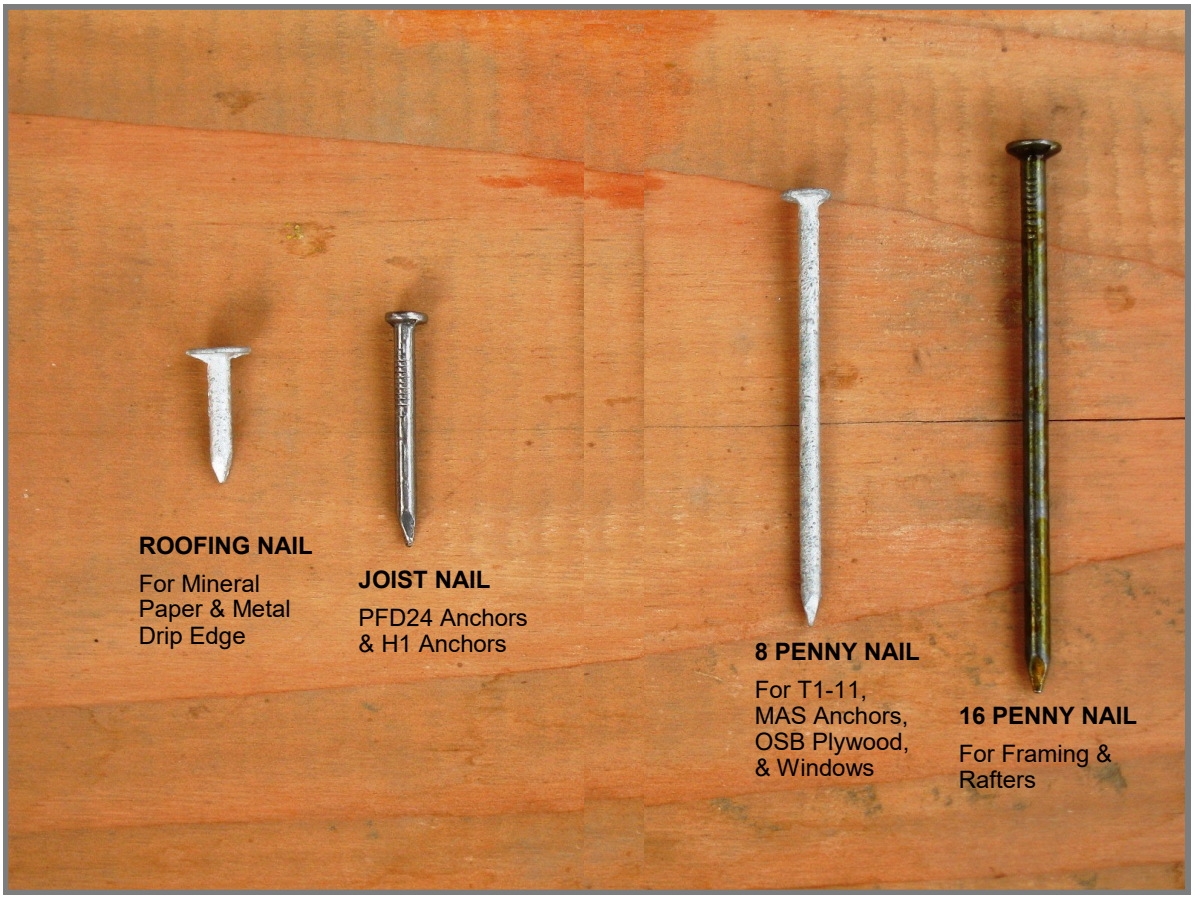
BOX OF SHIMS

CAULK GUN AND TAR CARTRIDGE

PDF24
(RAFTER HANGER)

ANGLED END OF RAFTER

(GOES AGAINST RIDGE BEAM IN RAFTER HANGER)



NAIL CHART

CONSTRUCTION TERMS

El barrote	=	board (ex. 2x4)
El cable	=	cable
El cielo	=	ceiling
El cemento	=	cement
La raja	=	chip or crack
La esquina	=	corner
La cortina	=	curtains
La puerta	=	door or gate
La chapa	=	doorknob
El tape gris	=	duct tape
La caída	=	eaves (roof edge)
El tape negro	=	electrical tape
La llave	=	faucet
La tabla	=	flat piece of wood
El piso	=	floor
El cuadro	=	frame
Galvanizado(a)	=	galvanized
El vidrio	=	glass
El pegamento	=	glue
El suelo	=	ground
El canal	=	gutter (canal)
La ferretería	=	hardware store
La chapa	=	bisagra
La manguera	=	hose
El fierro	=	iron
La llave	=	key
La fuga	=	leak
Está tirando agua	=	leak
La luz	=	light
El foco	=	lightbulb
La roseta	=	light socket
La chapa	=	lock
El material	=	material
El metal	=	metal
Metálico(a)	=	metal
El arenado	=	mineral paper
El clavo	=	nail
El conexión	=	outlet
El tubo	=	pipe
La tubería	=	plumbing
El triplay	=	plywood
El própano (gas)	=	propane
La minita	=	propane tank (small)
La varilla	=	rebar
El rollo	=	roll
El techo	=	roof
El clavo chico	=	roofing nail
El cuarto	=	room
El óxido	=	rust
Oxidado	=	rusty
El tornillo	=	screw or bolt
Vidrio Quebrado	=	shattered glass
La hoja	=	sheet of paper or material
El yeso	=	sheetrock
La cuña	=	shim
La escalera	=	stairs or ladder
La grapa	=	staple, clip, or clamp
El fierro	=	steel
La estructura	=	structure
El apagador	=	switch (el switch)
Tape	=	tape
La brea	=	tar
La felpa	=	tar paper (felt paper)
La pared	=	wall (of a house)
El muro	=	wall (retaining wall)
La tapadera	=	wallplate
La ventana	=	window
La reja	=	window bars
El alambre	=	wire
Inalámbrico(a)	=	wireless
El tapón	=	wire nut
La madera	=	wood

TOOLS

La barra	=	bar or crowbar
La cubeta	=	bucket
La escoba	=	broom
El formón	=	chisel (wood)
El taladro	=	drill
La broca	=	drill bit
La lima	=	file
El martillo	=	hammer
El cuchillo	=	knife
La escalera	=	ladder
El nivel	=	level
La cinta	=	measuring tape
La pintura	=	paint
La brocha	=	paintbrush
La pinzas	=	pliers
El pico	=	pick
La navaja	=	pocketknife
El trapo	=	rag
El rodillo	=	roller
La cuerda	=	rope
La serrucho	=	saw
El desarmador	=	screwdriver
La pala	=	shovel
El marro	=	sledgehammer
La escuadra	=	square (la cuadra)
La engrapadora	=	stapler
La lona	=	tarp
La herramienta	=	tool
La charola	=	tray
La carretilla	=	wheelbarrow
La llave	=	wrench

USEFUL VERBS

Armar	=	to assemble
Sujetar	=	to attach or hold
Romper	=	to break
Sobornar	=	to bribe
Construir	=	to build
Cobrar	=	to charge
Conectar	=	to connect or hookup
Cortar	=	to cut
Diseñar	=	to design
Fraccionar	=	to develop land
Escabar	=	to dig
Desarmar	=	to disassemble
Escurrir	=	to drain
Dibujar	=	to draw
Manejar	=	to drive or operate
Secar	=	to dry
Erosionar	=	to erode
Excavar	=	to excavate
Multar	=	to fine
Encajar	=	to fit (inside)
Caber	=	to fit (contain)
Aplastar	=	to flatten
Voltear	=	to flip over
Fluir	=	to flow
Reparar	=	to fix or repair
Doblar	=	to fold or bend
Enmarcar	=	to frame
Funcionar	=	to function
Juntar	=	to join
Durar	=	to last
Fugarse	=	to leak
Nivelar	=	to level or grade
Levanter	=	to lift or raise
Aflojar	=	to loosen
Agarrar	=	to grab
Martillar	=	to hammer
Colgar	=	to hang
Endurecer	=	to harden
Aguantar	=	to hold or support
Meter	=	to insert or put in
Instalar	=	to install or assemble
Medir	=	to measure
Mezclar	=	to mix
Clavar	=	to nail
Estorbar	=	to obstruct
Deber	=	to owe
Pintar	=	to paint
Pavimentar	=	to pave
Recoger	=	to pick up
Aplomar	=	to make plumb
Echar	=	to pour or throw
Jalar	=	to pull
Arrancar	=	to pull up (uproot)
Empujar	=	to push
Llover	=	to rain
Techar	=	to roof
Oxidarse	=	to rust
Aserrar	=	to saw
Firmar	=	to sign
Rajar	=	to slice, chop or split
Excuadrar	=	to square
Apoyar	=	to support (not structurally)
Quitar	=	to take away
Tumbar	=	to tear down
Tirar	=	to throw
Atar	=	to tie
Apretar	=	to tighten or squeeze
Girar	=	to twist
Lavar	=	to water
Server	=	to work (not broken)
Mojar	=	to get wet

MATH AND MEASUREMENT

Un decimosexto	=	1/16
Un decimo	=	1/10
Un octavo	=	1/8
Un cuarto	=	1/4
Un tercero	=	1/3
Dos tercero	=	2/3
Tres octavos	=	3/8
El ángular	=	angle
El centímetro	=	centimeter (cm)
Curva(o)	=	curved
El diseño	=	design
Entre	=	divided by
El dibujo	=	drawing
La orilla	=	edge
Nivelado(a)	=	flush or even
La pie	=	foot (ft)
Medio(a)	=	half
La mitad	=	half or middle
Pesado(a)	=	heavy
La altura	=	height
La pulgada	=	inch
Kilómetro	=	kilometer (km)
La longitude	=	length
El nivel	=	level
Luz	=	light
Línea	=	line
El metro	=	meter (m)
La medida	=	measurement
La milla	=	mile
Menos	=	minus
Mas	=	more

La parte	=	part
El pedazo	=	piece
Punto	=	point
A plomo	=	plumb
El ángulo recto	=	right angle
El tramo	=	section
La talle	=	size
El tamaño	=	size
El cuadrado(a)	=	square
Derecho	=	straight
El grueso	=	thickness
Por	=	times
El tríangulo	=	triangle
El peso	=	weight
El ancho	=	width

MONEY

El banco	=	bank
La cuenta	=	bill (restaurants)
El soborno	=	bribe
El efectivo	=	cash
El créditto	=	credit
Tarjeta de crédito	=	credit card
La deuda	=	debit
El descuento	=	discount
El tipo de cambio	=	exchange rate
La multa	=	fine
La cuota	=	fee
Los seguros	=	insurance
La nota	=	receipt (common)
El recibo	=	receipt
La caja fuerte	=	safe
La venta	=	sale
La firma	=	signature
El impuesto	=	tax
La propina	=	tip
El importe (total)	=	total

USEFUL WORDS

El aire	=	air
La línea	=	border
La frontera	=	border
Desigual	=	bumpy
La planta	=	bush or shrub
El panteón	=	cemetery
El arroyo	=	channel (created by runoff)
El barro	=	clay
La pila	=	cistern or reservoir
La delegación	=	city district office
La tierra	=	dirt
La cuneta	=	ditch (side of road)
La zanja	=	ditch or trench
El dompe	=	dump
El polvo	=	dust
La erosión	=	erosion
El campo	=	field
El flujo	=	flow
La basura	=	garbage
El césped	=	grass or lawn
La grava	=	gravel
El cerro	=	hill (implies being barren)
La colina	=	hill (implies being pretty)
El hoyo	=	hole
La fraccionamiento	=	housing development
El lodo	=	mud
El ruido	=	noise
El pavimento	=	pavement
El bache	=	pothole or rough spot
La lluvia	=	rain
El retén	=	roadblock (police)
La piedra	=	rock
La roca	=	rock (large boulders)
El arena	=	sand
La fosa (séptica)	=	septic tank or baño pit
El drenaje	=	sewer
El sonido	=	sound
El semáforo	=	stoplight
La tormenta	=	storm
La torre	=	tower
El otro lado	=	USA (the other side)
El servicio público	=	utility service
El viento	=	wind