PIECE-EN-PIECE LOG HOUSE CONSTRUCTION

FINAL REPORT

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TIMBER LAYOUT AND FLAT-SIDING

Job 1 -- How to Flat-side a Log Free Hand. -- 2 Methods.

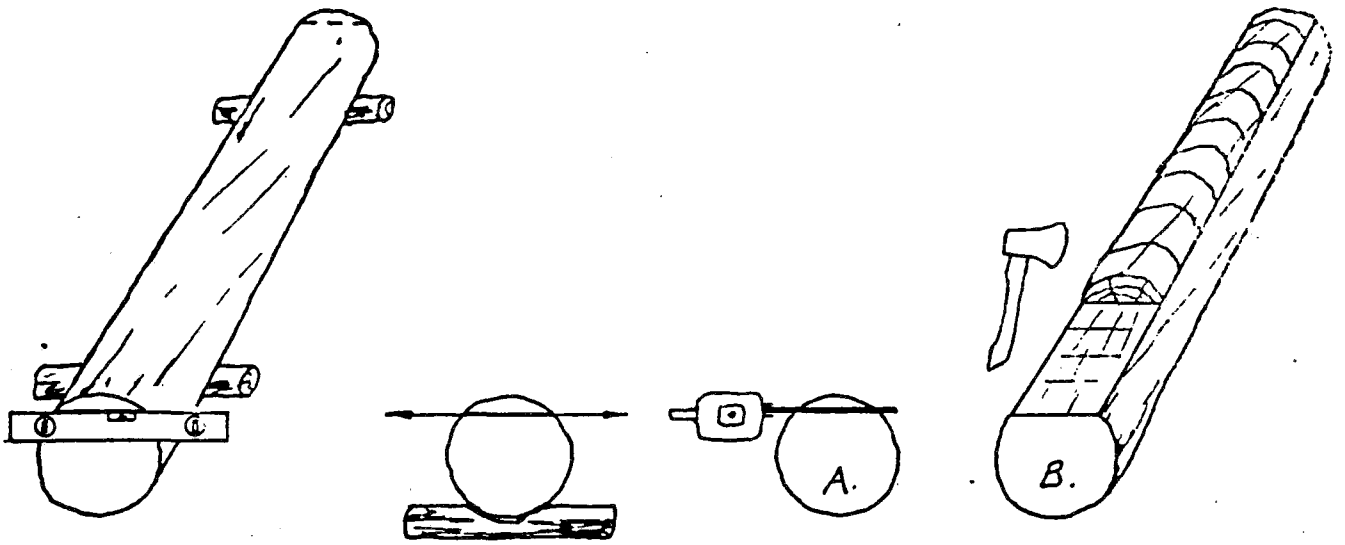
Quick jobs not needing an "extremely" accurate flat-side can be done free hand with the chainsaw.

When only one flat surface is required it is sufficient to keep the log stable and mark off the desired waste wood from each end using a level, then join these with chalked lines. On a long log length the chalk line will sag due to gravity, resulting in an inaccurate cut line. To compensate, simply revolve the log and chalk the line vertically down.

TOOLS: Eye and ear protection, spirit level, pencil, chalk line, chainsaw.

PROCEDURE:

1. Secure the log on a set of skids or on the ground so it does not move. Place the bow of the log to the side.
2. Determine amount of flat surface needed, then mark a level line on either end of log. (See Fig. 1).
3. Join either end of the log with a taunt chalk line and snap a line. ALWAYS SNAP THE LINE ON THE SAME PLANE AS THAT MARKED ON THE ENDS OF THE LOG. (See Fig. 2).
4. Turn the chainsaw bar flat and enter the log at the same plane as Fig. 2. When cutting use a pivoting action, digging the saw dogs into the wood, then leaning over the log to observe the opposite cutting line. (See Methods A, B.)


A.
B.

TIMBER LAYOUT AND FLAT-SIDING

Job 2.. How to flat-side a log using guide rails.

This portable method does an accurate job of milling shorter lengths of logs. It involves attaching a set of pads on your chainsaw bar which will slide along on parallel guide rails:

TOOLS: Eye and ear protection, level, tape measure, hammer, chainsaw, 1/2" socket wrench.

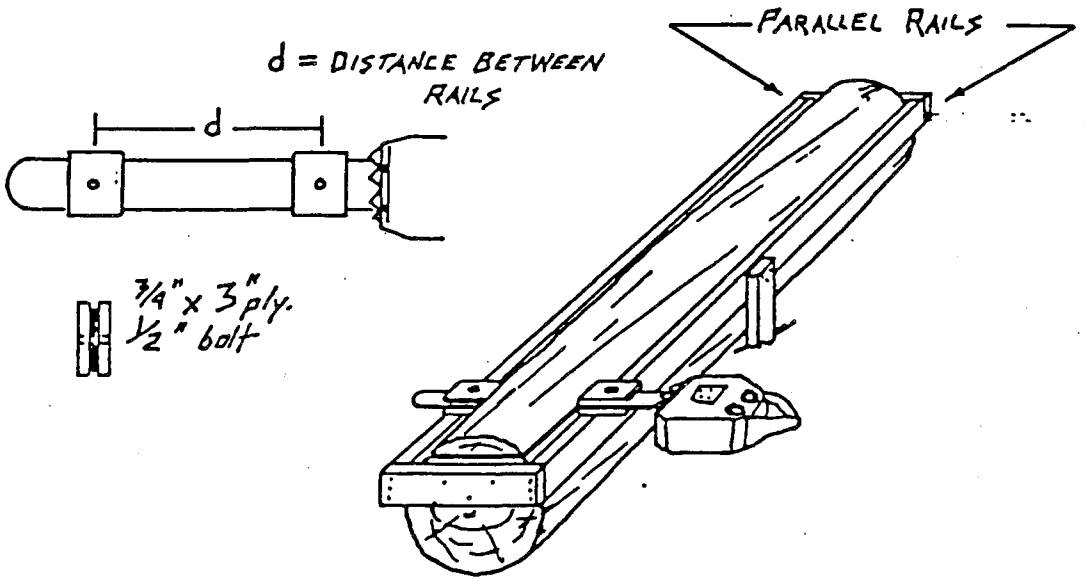
MATERIALS: 3/4" plywood pads, 1/2" carriage bolts with nuts, 2" x 6" rails, nails, 2" x 4" stakes.

PROCEDURE:

1. Secure and set up the log as shown in Fig. 1, making sure the two side rails are equidistance apart.
2. Drill chainsaw bar and install plywood pads as shown in Fig. 2. For infinite adjustment mill two slots in the bar.
3. Proceed to flat-side the log, having someone apply slight pressure on the pads (using two sticks) to keep them in contact with the rails.

QUESTIONS:

1. What is the purpose of the plywood pads attached to the chainsaw bar?
2. Is it necessary, for accuracy, that the pads remain in contact with the guide rails?


PARALLEL RAILS
d = DISTANCE BETWEEN RAILS
d
3/4" x 3" ply.
1/2" bolt

3. What is the purpose of staking the guide rails so they won't move?

4. What type of chain would you use for this operation?

ASSIGNMENT:

Fabricate a portable rail mill and a set of pads for your chainsaw bar. Then layout and flat-side a log.

TIMBER LAYOUT AND FLAT-SIDING

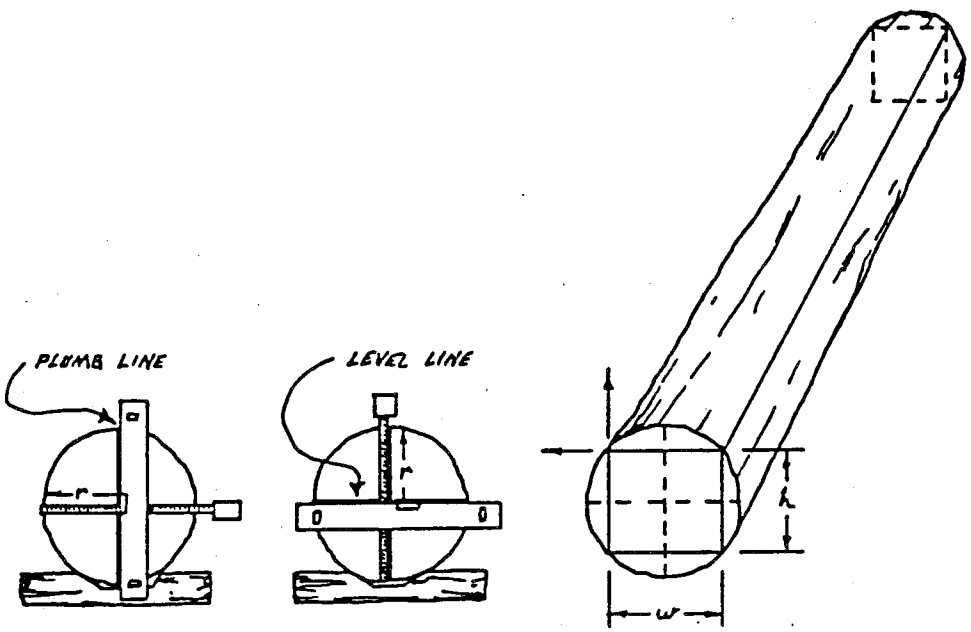
Job 3 -- How to Layout a Log for Squaring or Flat-siding.

There will be many an occasion in log house construction for logs having squared or flat surfaces. Unlike regular frame dimensional materials, a log has no flat surfaces. Therefore all measurements must be taken from a single line. All measurements are initially done on the log ends after which these points are joined together with chalked lines:

TOOLS: Tape measure, chalk line, spirit level, pencil.

PROCEDURE:

1. Place notched skids under either end of the log and secure so it does not move.
2. Using a tape measure and level, find the radius of the log end and pencil a vertical plumb line (see Fig. 1).
3. Repeat procedure and mark a horizontal level line (see Fig. 2).
4. Using either a tape measure and level or a framing square, mark out the squared dimensions, using the center dividing lines as guides (see Fig. 3).
5. Repeat entire procedure at the opposite end of log.
6. Join the two ends with chalked lines.


PLUMB LINE
r
LEVEL LINE
r
h
w

SPECIAL NOTES:

- ALWAYS SNAP THE CHALK LINE IN THE DIRECTION OF THE CUTTING PLANE
- On long length logs a chalk line will droop. Cut the span in half by pressing the line to the log surface, then snap each length separately.
- Have someone site from one end. The string should be in line with the cutting plane marked on the log end.

QUESTIONS:

1. Using the described method could the log have one surface flat-sided as well as squaring each end?
2. What keeps the squared ends in alignment?
3. Why would it be unwise to layout and cut one end before laying out the other end?
4. What would happen if the chalk lines were not snapped in the direction of the cutting plane?

ASSIGNMENT:

Layout a log in preparation for squaring the ends.

TIMBER LAYOUT AND FLAT-SIDING

Job 4. How to square-cut the end of a round log.

Posts are often required in a log building. If the ends of the post are not square then when stood up vertically, the posts will sit on an angle. Outlined below are three methods of squaring a log end:

METHOD A

TOOLS: Heavy tar paper (or similar material) cut square, pencil.

PROCEDURE:

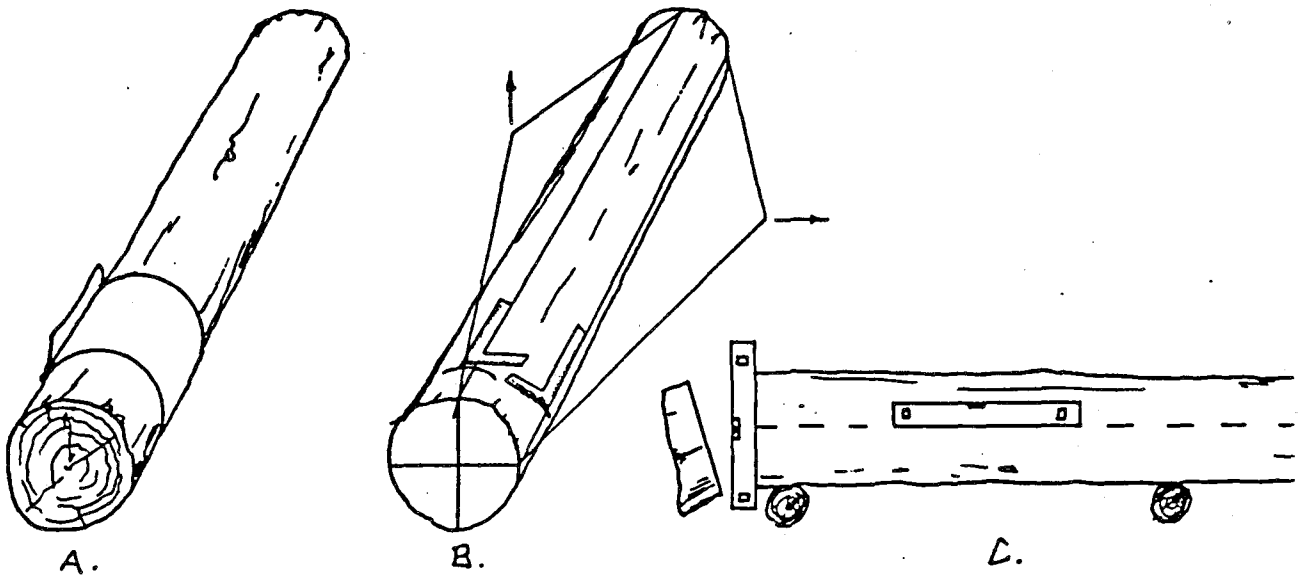
1. Secure the log on notched skids so it doesn't roll.
2. Wrap the flexible square edge material around the log 1 1/2 turns and match the edges together.
3. Scribe a pencil line using the material edge as a guide.
4. Remove material and cut the end square with a chainsaw.

METHOD B

TOOLS: Framing square, chalk line, tape measure, spirit level, pencil.

PROCEDURE:

1. Secure the log.
2. Divide each end of the log into quarters. (refer to procedures in Job 3).


A.
B.
C.

3. Align the body of a framingsquare along the top chalk line and mark a perpendicular line using the tongue as a guide.

4. Repeat the procedure along the side chalk line. The two perpendicular lines must match up.

5. Using the marked line as a guide, cut the end square with a chainsaw.

METHOD C

TOOLS: 4' spirit level, tape measure, chalk line, pencil.

PROCEDURE:

1. Secure the log.

2. Geometrically divide the log ends in half (refer to procedures in Job 3).

3. Join the two end points with a chalked line down the side of the log.

4. Place the level on the chalk line and level the log. Placing the level directly on the top surface of the log will not give an accurate reading.

5. Using the level, mark a plumb line on the end of the log (refer to diagram).

6. Using this vertical plumb line as a guide, cut the end square with a chainsaw.

QUESTIONS:

1. In which of the three procedures must the log be leveled? How is it leveled?

2. Which do you think is the most accurate method of squaring a log end?

3. Why square the log end at all?

ASSIGNMENT:

Square-cut a log end using one of the above methods.

PIECE-IN-PIECE CONSTRUCTION

JOB 1 -- Log Conversion and Size Tables and Specs.

CMHC CONVERSION TABLE (Log-Frame Equivalent)

- 4" (100 mm) diameter log equals 2" x 4" (38 x 89 mm) or 2" x 5" (38 x 114 mm).
- 5" (125 mm) diameter log equals 2" x 6" (38 x 130 mm).
- 6" (150 mm) diameter log equals 2" x 8" (38 x 184 mm).
- 7" (175 mm) diameter log equals 2" x 10" (38 x 235 mm).
- 8" (200 mm) diameter log equals 2" x 12" (38 x 286 mm).

Log Floor Joist Size Table (40 lbs. per sq. ft. main floor)

Joist Dia.	Spacing	Span
5"	4'	6' - 8'
6"	4'	8' - 10'
7"	4'	10' - 12'
8"	4'	11' - 14'
10"	4'	13' - 17'
12"	4'	16' - 20'
14"	4'	19' - 14'

* Based on Canadian Residential Standard Tables, compensation for increased joist spacing included.
* Assumed no major log defects.
* Assumed 2" x 6" tongue & groove flooring

Log Floor Girt Size Table

Girt Dia.	Span
10"	8' - 10'
12"	10' - 13'
14"	13' - 17'
16"	17' - 21'

* Assumed no major log defects.

* Girts include no mid span support.

Additional information available

"Log Span Tables"

by B. Allan Mackie and

Norman A. Read,

P.O. Box 1205, Prince George, B.C.

General Rules for Log Sill Placement

a) Sill logs to have a Flat-sided bearing surface of 4" minimum width.

b) Provide an effective moisture barrier between log and concrete surface. A 1" layer of tarred fiberboard or styrofoam works well and compensates for any irregularities between these surfaces.

c) Sill logs to be anchored to foundation.

d) An effective dripcap shall be provided.

e) Where the sill log is unsupported (i.e. between piers) the floor joist mortise shall be no deeper than the specified structural span thickness needed.

f) Floor joists shall have a minimum of 3" bearing surface at the mortise.

PIECE-EN-PIECE CONSTRUCTION

JOB 2 -- Examples of various floor systems.

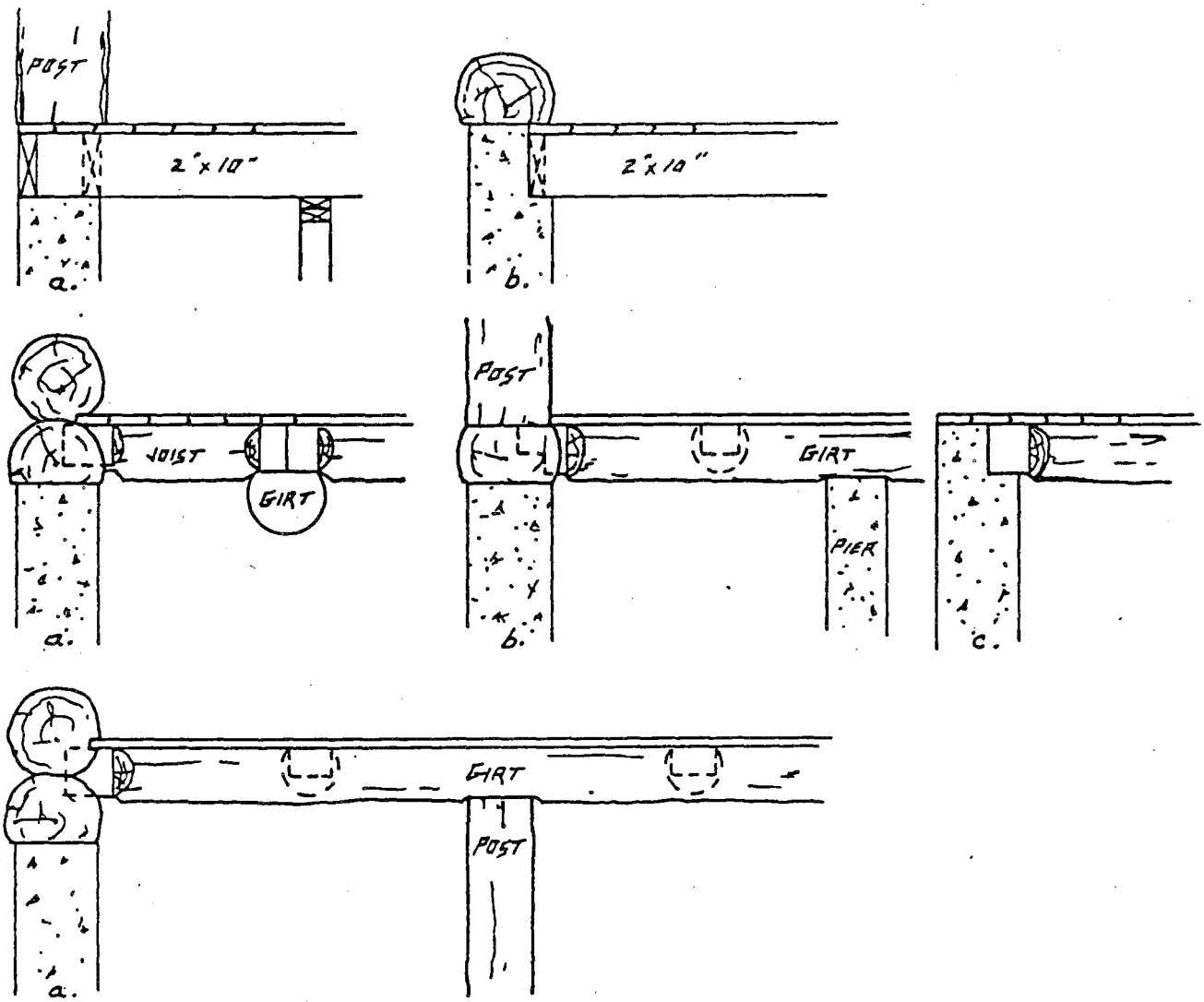
To help identify the floor system which is best suited to your specific building construction a few examples are diagrammed and listed below:

PROCEDURES:

Fig. 1 -- Diagrams a and b show two examples of a frame subfloor. This system provides a very level surface, good for both piéce-en-piéce and long log construction. The joist mid support shown is a frame pony wall.

Fig. 2 -- All of these examples would suit an exposed ceiling basement. Diagram a is suitable for long log construction only; whereas diagrams b and c are good for both. The joist mid support shown in a is a log girt. The girt mid support shown in b is a concrete pier.

Fig. 3 -- This diagram is particularly appropriate if a partial log basement wall is desired. It is, however, only suitable for long log construction. The girt mid support shown is a wood post.


POST
2"x10"
a.
2"x10"
b.
JOIST
GIRT
a.
POST
GIRT
PIER
b.
c.
GIRT
POST
a.

PIECE-EN-PIECE CONSTRUCTION

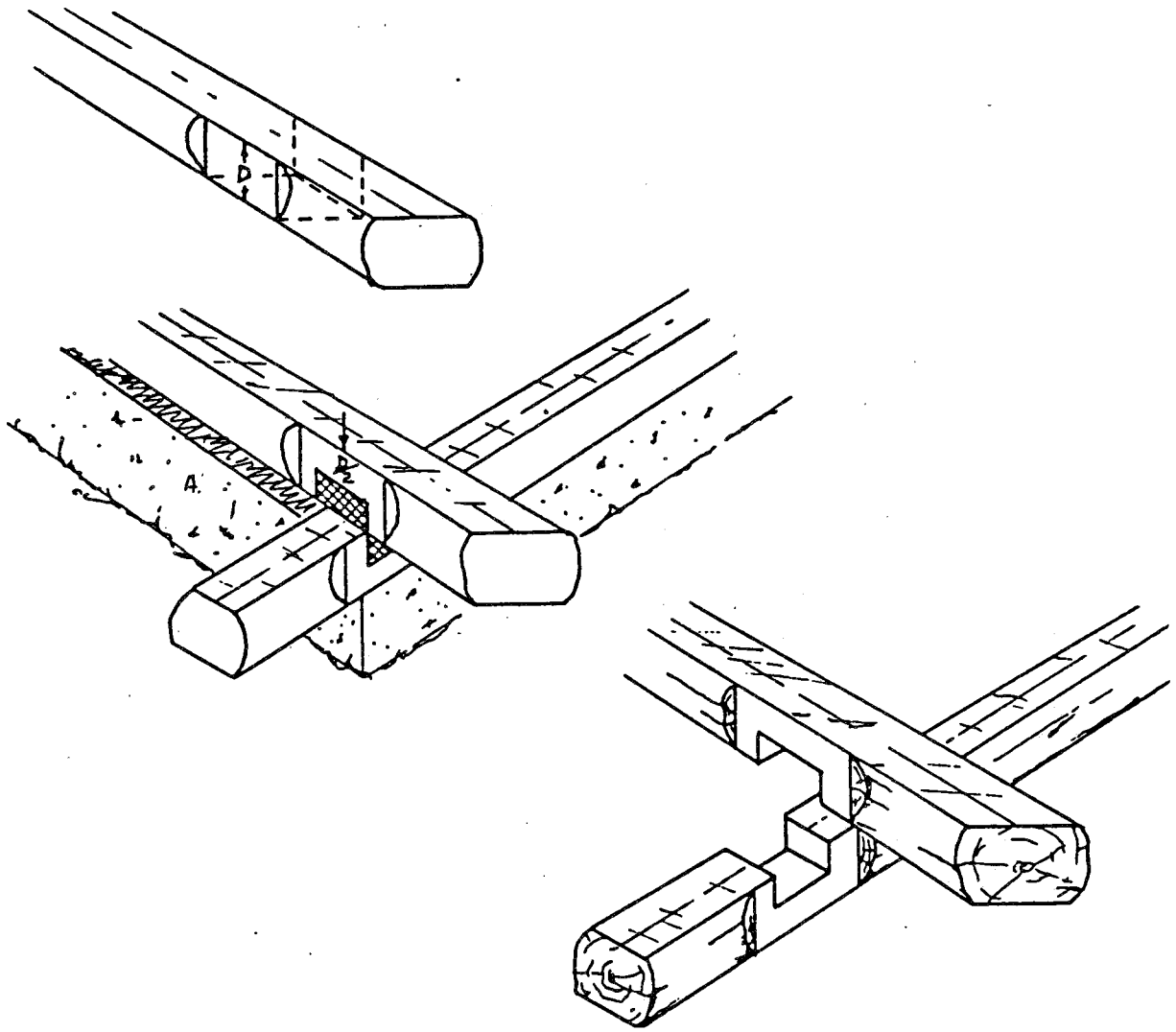
JOB 7 -- Log sill corner joinery -- How to layout and cut a half-lap corner joint.

Once the foundation is in place the next job is to flat-side the sill logs to sit on the foundation and to join these together at the corners of the building. One method employed to produce a level sill plate is to join the logs together at the corners, using a half-lap joint:

TOOLS: Eye and ear protection, chainsaw, tape measure, chalk line, carpenter's square, slick, spirit level.

PROCEDURE:

1. Flat-side the sill logs to a uniform thickness (8" x 10").
2. Place the gable sill logs on the building, slightly overhanging the foundation to provide a dripcap (if flashing is not used).
3. Square the sides of the sill log where it crosses the corner of the foundation (see Fig. 1).
4. Place the sidewall sill logs in position on the foundation so the ends rest on the gable sill logs (see Fig. 2).
5. Trace around each timber at the joints and layout the depth of each half-lap by extending vertical lines at the corners. The depth of the notches are to equal


D
A

half the sill depth (D/2) (see Fig. 2).

6. Roll the sidewall sill logs back and remove waste wood in all notches (see Fig. 3).

7. Join the sill logs together, providing the necessary moisture break between the sills and foundation.

QUESTIONS:

1. Is it more accurate to mate the timbers and trace out a joint, if possible, or to take all the measurements and layout each timber separately?

2. Can this type of sill construction be placed on a pier as well as a continuous foundation?

3. Is it necessary to pin this tight fitting lap joint? Why?

ASSIGNMENT:

Place log sills on the foundation, joining them together, using a half-lap joint.

PIECE-EN-PIECE CONSTRUCTION

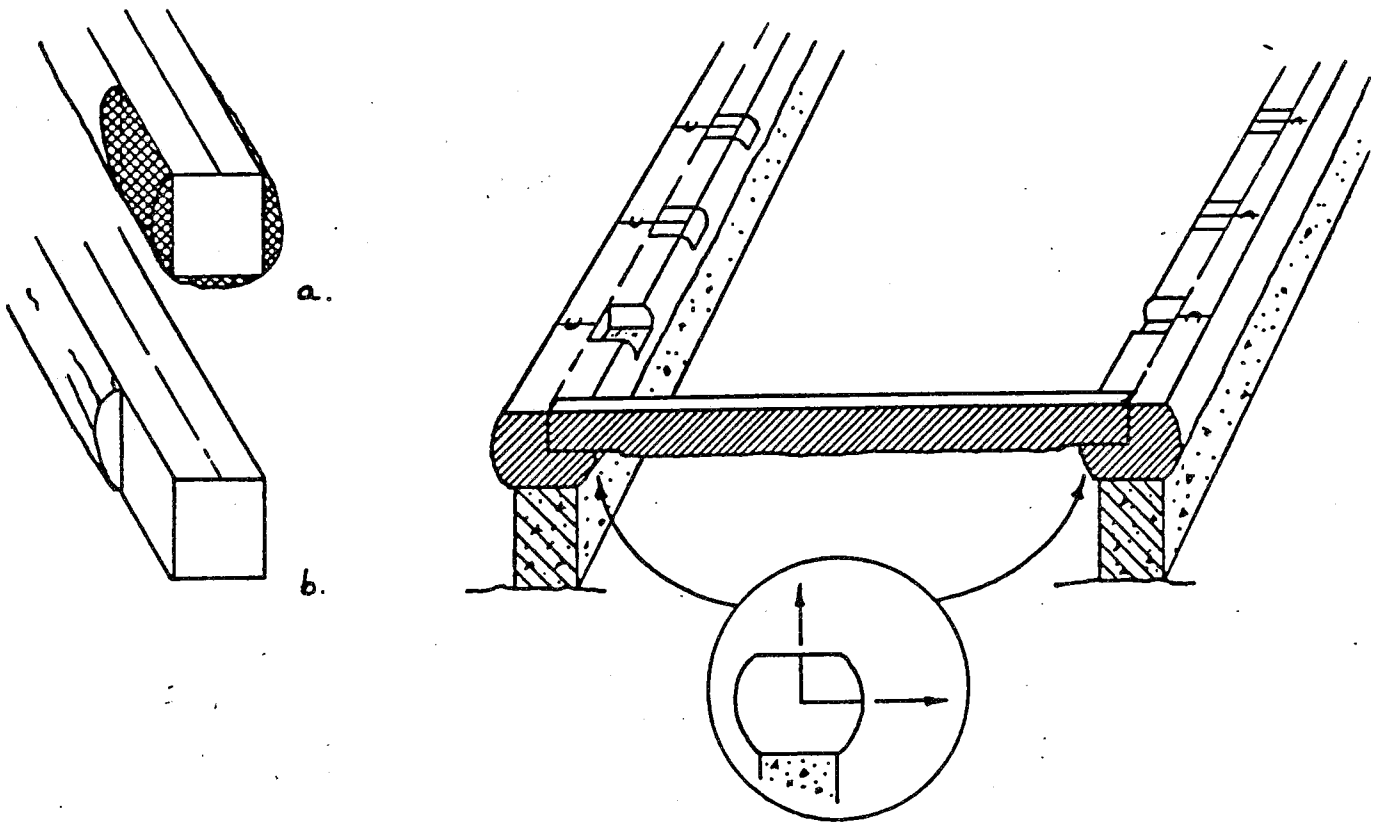
JOB 4 -- Joining log floor joists -- How to layout, cut and place a joist using a squared tenon and mortise joint.

This is the easiest method of constructing and installing a log floor joist. It involves squaring the ends of the joists, then cutting mortises in the sill or girt so the joists can sit level. Once this has been done floor decking can be applied. Refer to the Floor Joist Size Tables for joist sizes for a given span:

TOOLS: Eye and ear protection, chainsaw, chalkline, tape measure, carpenter's square, slick, pencil.

PROCEDURE:

1. Obtain a 2" - 6" flat nailing surface on all the floor joists.
2. Chalk a centerline onto the flat surface. This will ensure that the squared tenons will be in alignment during layout.
3. Cut the joists to length. There should be a 2" - 3" portion of uncut wood remaining between inline joists (see Fig. 3).
4. Layout and cut squared tenons on each end of the joists. Use the carpenter's square for layout by aligning it to the centerline. If possible make all squared tenons


a.
b.

of equal dimensions to simplify joinery procedures (see Fig. 1a). Make the vertical cuts and remove the side waste wood. Then layout the depth of the tenon on the sawn flat sides, turn the timber on its side and remove the bottom waste wood. The completed tenon is shown in Fig. 1'b'.

5. If possible, the best way to lay out the joist mortises is to position the finished joists on the building at their correct spacings and trace around the tenons. Then drop vertical lines and cut the mortise depths so that all the joist top surfaces sit level.

Another method is to place a mark equidistance up from the foundation or floor on each end of the sill and chalk a level line. This line establishes the bottom of the mortise seats. Next chalk a line on top of the sill log, down its full length, providing a 3" minimum joist bearing surface (see inset). Layout the joist spacings. Then, measuring on either side of the spacing's centerline, layout the joist width and drop vertical lines down to the mortise seat chalkline.

6. Remove the mortise waste wood by making a plunge cut at the back to the depth of the mortise. Make the vertical side cuts next to the depth of the mortise. Cut out the remaining portion by making a horizontal plunge cut -- difficult -- or make successive bread cuts to the depth line and remove waste with a slick.

7. Position the floor joist.

QUESTIONS:

1. What is the reason for chalking a centerline down the flat surface of the joist?
2. What would be easier if all tenon dimensions were equal?
3. Give two reasons why it is best to trace around the tenons with the joists in place.
4. What is the reason for leaving a 2" uncut portion of wood remaining between inline joists?

ASSIGNMENT:

Layout, cut and place the floor joists, using the above methods.

PIECE-EN-PIECE CONSTRUCTION

JOB 5 -- Joining log floor joists -- How to cut a flooring ledge.

If flooring is laid after the log walls are in place, then a ledge is needed around the inside perimeter of the building to which the flooring can fit. Log walls placed on a full subfloor do not need a flooring ledge:

TOOLS: Eye and ear protection, chalkline, chainsaw.

PROCEDURE:

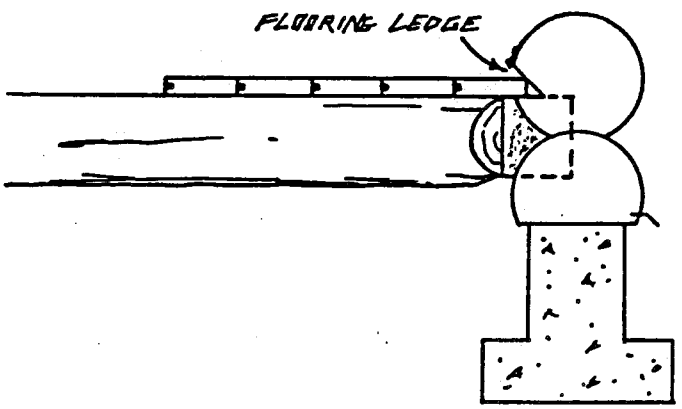
1. Using the level top surface of the joists as a guide, chalk a line the length of the wall. Do so on inside of all walls.
2. Using this line as a guide, chainsaw a kerf 2" - 3" horizontally into the log.
3. Cut diagonally down to meet the first cut and clear waste away (see diagram).

QUESTIONS:

1. Would a second storey floor need a flooring ledge?
2. Why is a flooring ledge not needed when logs are placed on a subfloor?

ASSIGNMENT:

Mark out and cut a flooring ledge.


FLOORING LEDGE

PIECE-EN-PIECE CONSTRUCTION

JOB 6 -- Parts of a piéce-en-piece building.

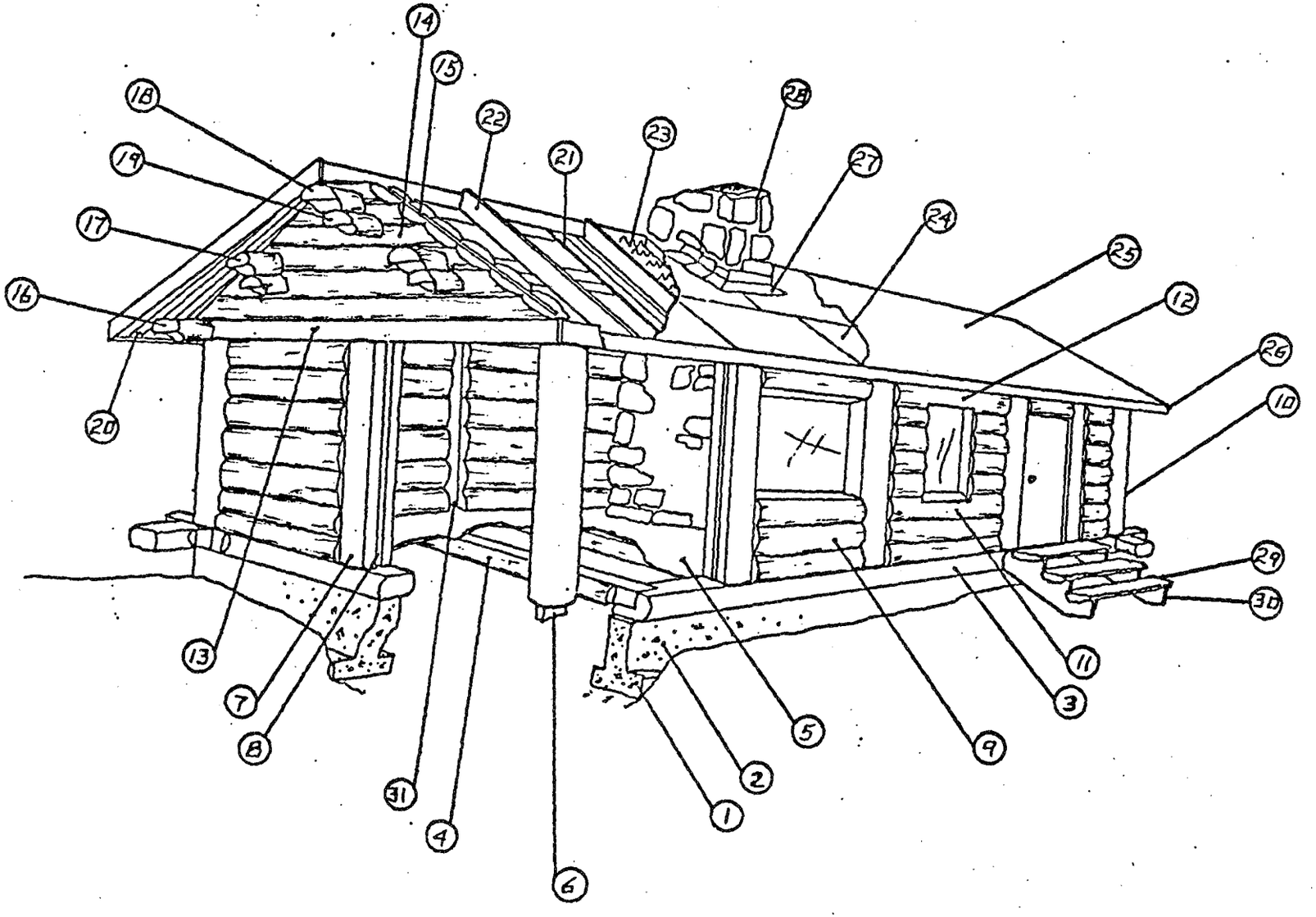
Piéce-en-Piéce building construction can be traced back to its origins in French Canada. Its appearance into Western Canada was largely initiated by the Hudson's Bay Company Trading Posts, many of which are still standing today. Upon examination of a traditional piéce-en-piéce building one sees a heavy timber framework of sills, vertical posts and top plates. The spaces between the posts were filled with horizontal logs, hewn on two sides and tenoned into the vertical posts. The spaces between these horizontal filler logs were chinked to prevent wind and weather from entering.

Today, although the concept has stayed the same the building methods have changed somewhat, or let's just say there are more building options today. The logs are usually left round with the horizontal filler logs joined to the vertical posts by a keyed spline. The spaces between the filler logs are scribed and fitted now to prevent wind and weather from entering. Indeed a little imagination has come up with simple jigs and chainsaw attachments which make wall construction quicker, easier and more weather tight.

In my opinion piéce-en-piéce is an ideal construction method for the home-builder or the student of log building. A few of its inherent advantages are:

a) Greater utilization of log materials, as crooked logs can be bucked into shorter lengths.

b) Easier log acquisition, as a pick-up truck can be used


14
15
18
22
21
23
28
27
19
24
17
25
16
12
26
10
20
29
30
13
11
7
3
8
5
9
2
31
1
4
6

to scrounge many of the short lengths.

c) Less need for elaborate lifting machinery, as the shorter logs can be handled with more ease.

d) Off-site construction and storage possible using jigs.

e) More manpower can be incorporated on one building with the need of less chainsaws and chainsaw expertise.

Place the correct number from the diagram beside the corresponding house part listed below;

Purlin
Soffit
Cornerpost
Facia
Footing
Partition wall channel
Midpost
Plate beam
Foundation sill
Post dado groove
Window header
Roof sheathing
Corbel
Insulation
Chimney
Stair tread
Chimney flashing
Window sill
Foundation wall
Stair stringer
Scribed wall panel
Log gable end
Finished roof
Plate log
Floor joist
Rafter
Post tenon
Ridgepole
Finished floor
Roof decking
Gable end spline dado groove

PIECE-EN-PIECE CONSTRUCTION

JOB 7 -- How to build a wall panel jig.

A log wall panel is comprised of horizontal filler logs, not including posts (refer to house diagram). This jig will enable prefabrication of wall panels as separate from the building foundation. This may be desirable to increase the number of people working on one building or for off-site construction. Below is a jig for 8 foot wall panels, scale for longer or shorter panels as desired:

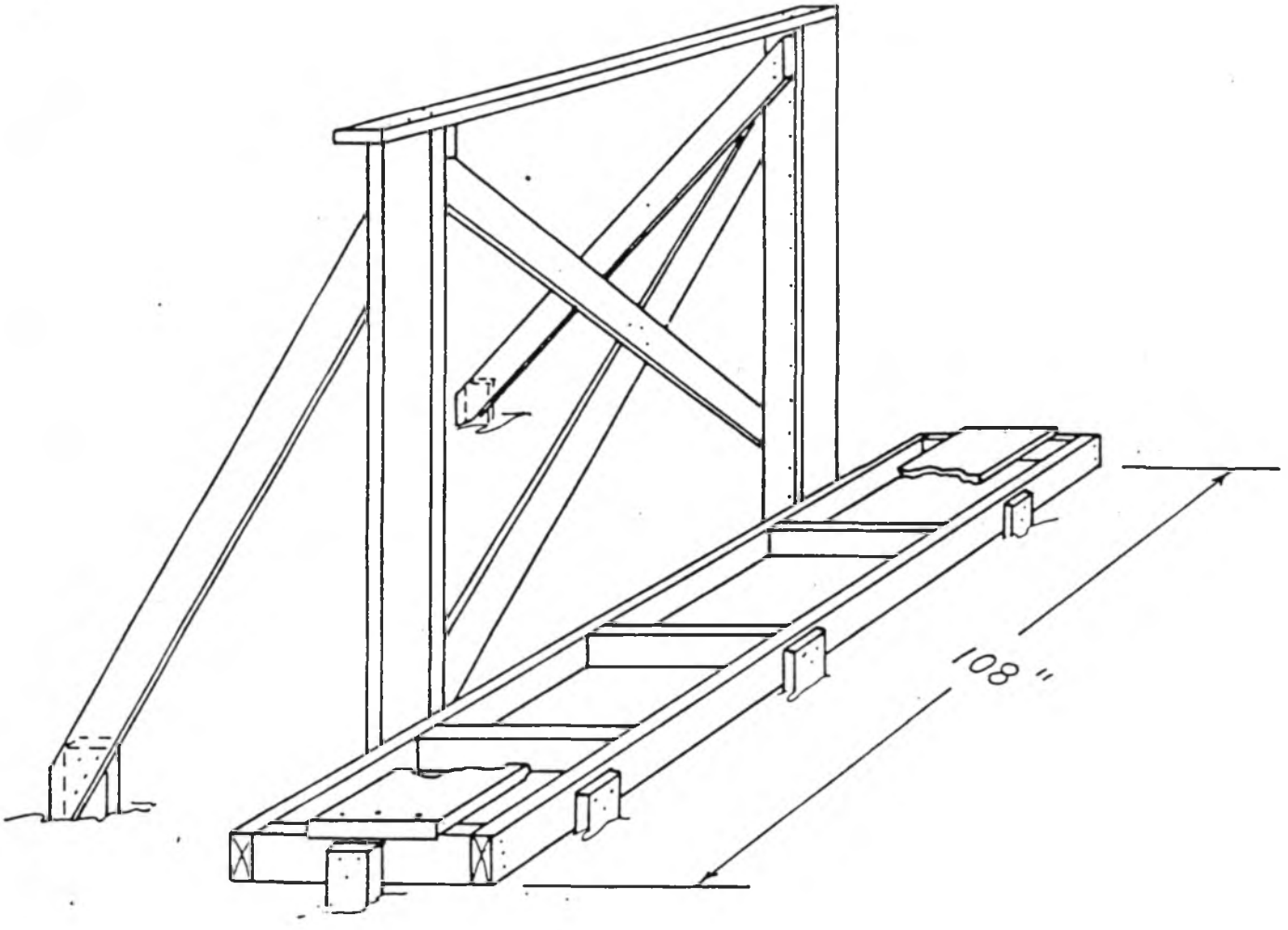
Drawing

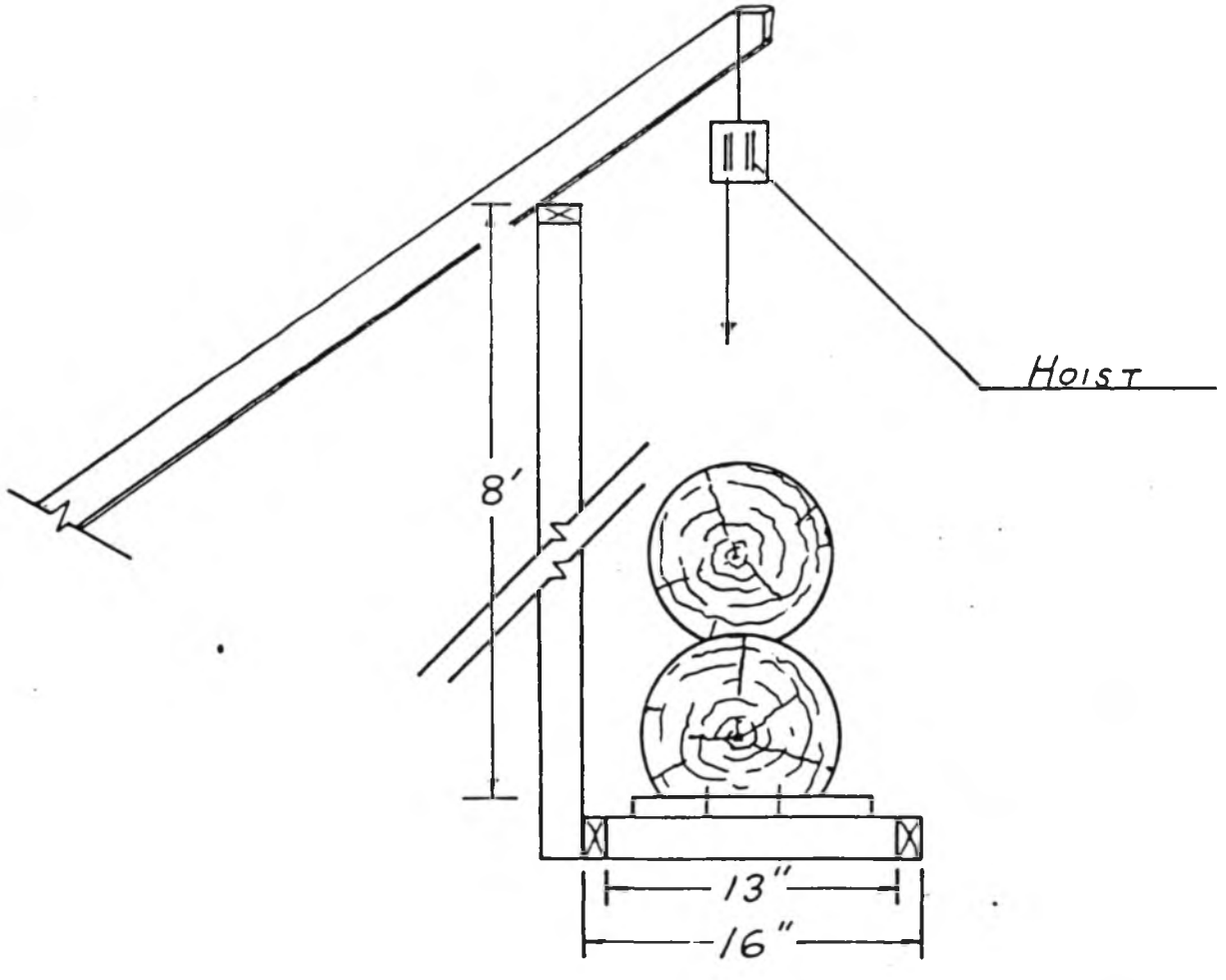
TOOLS: Builder's field level or water level, hammer, hand saw, tape measure, square, pencil, 3" nails, sledge hammer, chain hoist (optional).

MATERIALS: Base: 2"x4"x21" long (5 pcs.)
2"x4"x108" long (2 pcs.)
2"x12"x108" long (1 pcs.)
Stakes: 2'x4"x12" long (10 pcs.)
Braces: 2"x6"x114" long (6 pcs.)
1"x4" cross bracing.

PROCEDURE:

1. Construct base according to diagram.
2. LEVEL THE BASE AND STAKE SECURELY. This is very important as it duplicates the building's subfloor. Check its levelness periodically.


108"


HOIST
8'
13"
16"

3. Nail vertical back-braces to base. Brace and stake securely.

4. Nail the 2"x12" down the center of the base. The first log will rest on this.

5. Build any number of these jigs depending on how many wall panels you want to erect simultaneously.

QUESTIONS:

1. Why is it important to properly level and stake the base down?

2. It is a good safety practice to have a strong back-brace with which to brace the log wall. Name one other safety precaution you could take.

3. Would it be a smart idea to have a few nails slightly protruding thru the 2"x12" so that the first log could not slide as easily if jarred?

ASSIGNMENT:

Make up a jig to accommodate a wall panel.

*Hint -- Any wall panel length over 8' is difficult to manage.

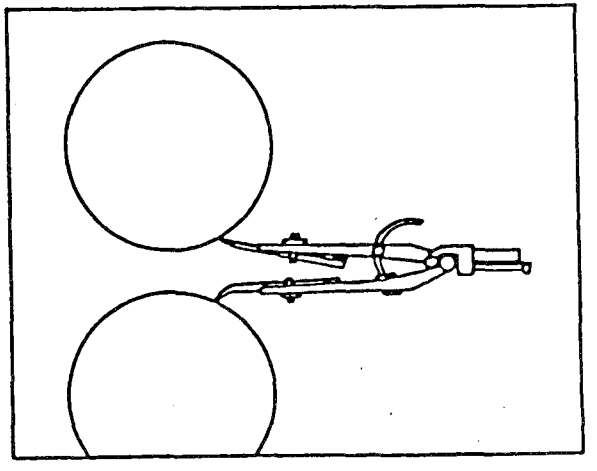
PIECE-EN-PIECE CONSTRUCTION

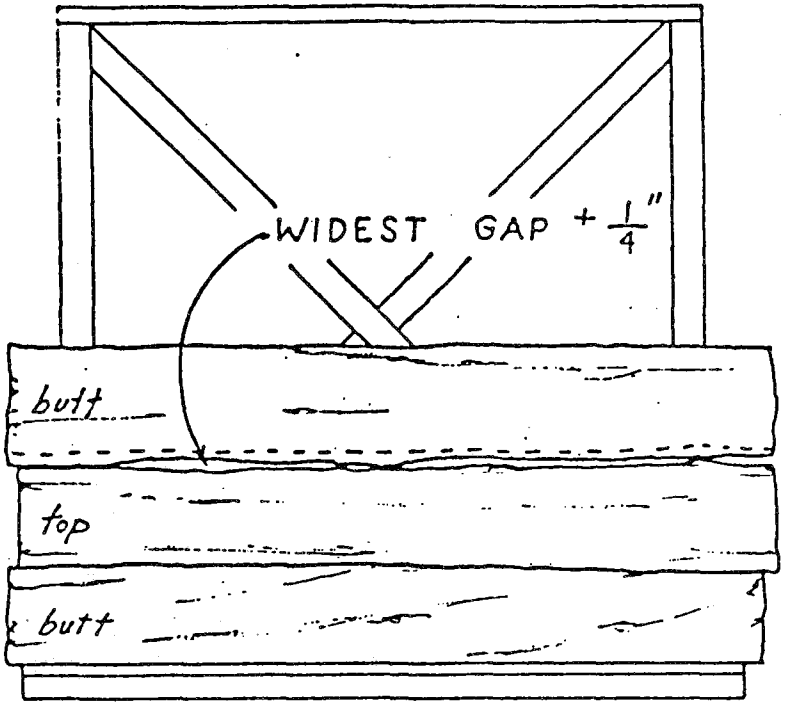
JOB 8 -- How to place and scribe a wall log.

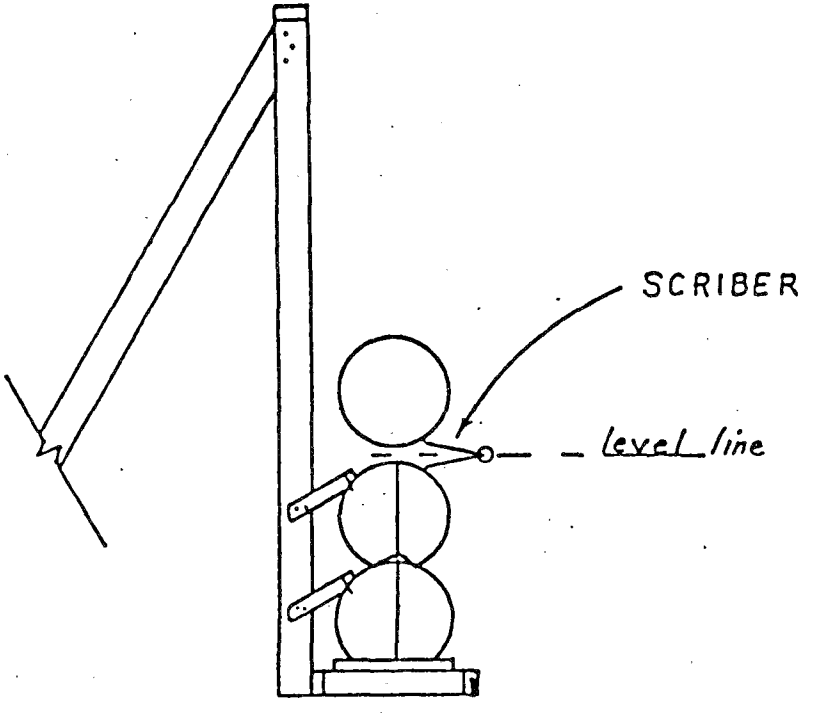
The first log placed on the jig is flat-sided to sit on the building subfloor or sill log. This bottom log should be quite large as it will overhang the foundation edge somewhat to provide an adequate drip cap. If metal flashing is used then this large bottom log is not necessary.

After the bottom log is placed, additional logs will be scribed, one upon the other, to build up a vertical wall. The scribing procedure duplicates the contours of the top surface of the log below onto the under surface of the top log placed. The resulting two scribe lines will appear on the under surface of the top log as a scratched line if using scratch-type scribers, or a penciled line if using pencil-type scribers. The lateral groove of wood between these two lines is to be removed, taking care to leave the scribe line when cutting. If the scribers are held level and the lateral groove has been cut properly, a tight fit joins the two logs together thereby eliminating the need for chinking material. The trick is to try and keep the scriber setting to a minimum as accuracy is lost as the scriber setting is widened.

Drawing




WIDEST GAP + 1/4"
butt
top
butt


SCRIBER
level line

TOOLS: Scribers, spirit level, pencil.

PROCEDURE:

1. Place the new log directly over the log below. Do not merely line up the log ends. Sight the length of the log and position so its weight is over the center of the wall. Bowed logs should be placed with the bow facing the outside of the building. For an 8' wall use a 9' log as there will be waste wood due to later plumb-cutting.
2. Nail bracing into vertical supports and log.
3. Set scribers to widest gap between logs, then add 1/4" to this setting (see Fig. 1). Remove any large knots beforehand so that the log rests quite close to the log below.
4. Scribe both sides of log (ends not necessary). Be sure to hold the scribers level and do not readjust until entire log is scribed! A light spray of water dampening the path of the indelible pencil produces an easily readable line.
5. Pencil a reference mark on both logs to make realignment easier.
6. Remove the log to the ground to cut the lateral groove.
7. Place back on wall, aligning reference marks. Check the plumb line on the log ends to see that you haven't jarred any of the other logs out of alignment --- adjust if necessary.
8. Check the fit closely for gaps and hangups --- if too many rescribe, using a modified screwdriver (refer to Unit on Log Building Tools).
9. Reposition on wall, brace to vertical supports and extend the plumb line up the log ends to quick-check wall alignment.

QUESTIONS:

1. Why are bowed logs placed with the bow to the outside of the building?
2. What would happen if you reversed a log and placed it bow-to-inside?
3. What is the reason for setting the scribers slightly wider than the widest gap between the logs?
4. What would happen to the wall if you failed to adjust jarred logs?
5. Why are butts and tops alternated on each course?

ASSIGNMENT:

Stack and brace two or three logs on your wall panel jig. Scribe these carefully, then cut the lateral grooves and refit. Note advantages and disadvantages to this multiple scribing.

PIECE-EN-PIECE CONSTRUCTION

JOB 9 -- How to cut a lateral groove.

The lateral groove, when properly scribed and cut, provides a self-draining chinkless thermal-break which prevents wind and weather from entering and heat from escaping the building:

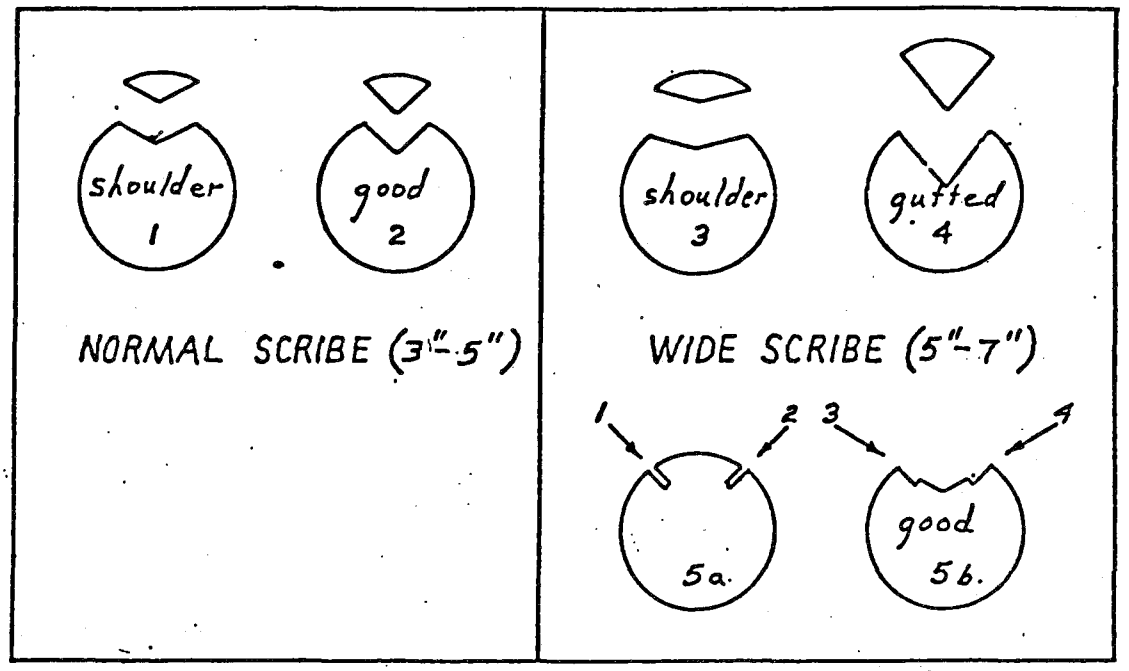
Drawing 1

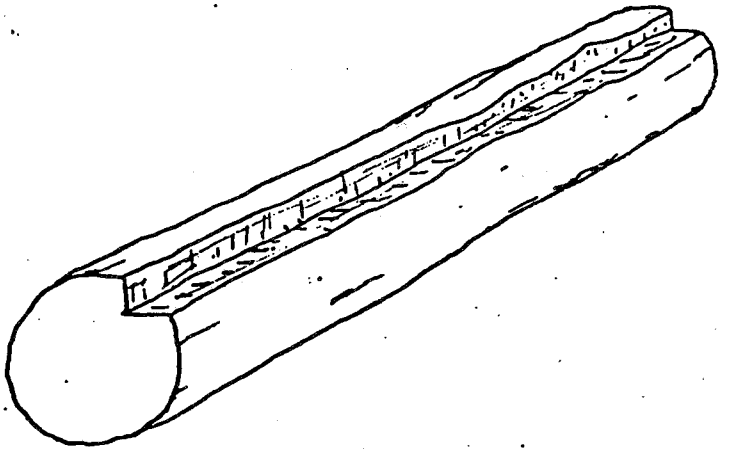
TOOLS: Eye and ear protection, chainsaw, indelible pencil, round axe.

PROCEDURE:

1. Turn log upright and pencil over any light lines. Also pencil the desired angle of cut (depending on normal or wide scribe) on the log end (refer to Fig. 1).
2. Position and wedge or dog the log so your saw blade enters at this angle and depth.
3. Keeping the blade 1/8" - 1/4" inside the line, cut down the length of the log. Repeat for opposite scribe line and remove waste wood.
4. Using a round axe, pare with the grain down to the scribe line. Do not remove scribe line!
5. Explanation of lateral cuts (Fig. 1)

   1) Shouldered - log will not fit properly. Too much inner shoulder rather than edge is riding on lower log.


shoulder
1
good
2
shoulder
3
gutted
4
NORMAL SCRIBE (3"-5")
WIDE SCRIBE (5"-7")
1
2
3
4
5a.
good
5b.



2) Good scribe width and depth. Strong edges with good bearing.

3) Shouldered - same as above.

4) Gutted - too much wood removed causing excessive checking and weak edges.

5) Good procedure for a wide scribe; sharp, strong edges yet not gutted.

QUESTIONS:

1. When you cut the lateral groove you walk backwards pulling the saw as you go. Is it a wise idea to clean your pathway of debris? Why?
2. Dry logs splinter a lot. Should you cut closer or farther from the line if this happens?
3. On a curvy scribe line, lifting the bar and working more with the nose does a better job. Why is this so?
4. Why not cut right on the scribe line?
5. What would be the problem of having weak bearing edges on a lateral groove?

ASSIGNMENT:

Cut a lateral groove and critique it for its good and bad points.

PIECE-EN-PIECE CONSTRUCTION

JOB 10 -- How to level the walls.

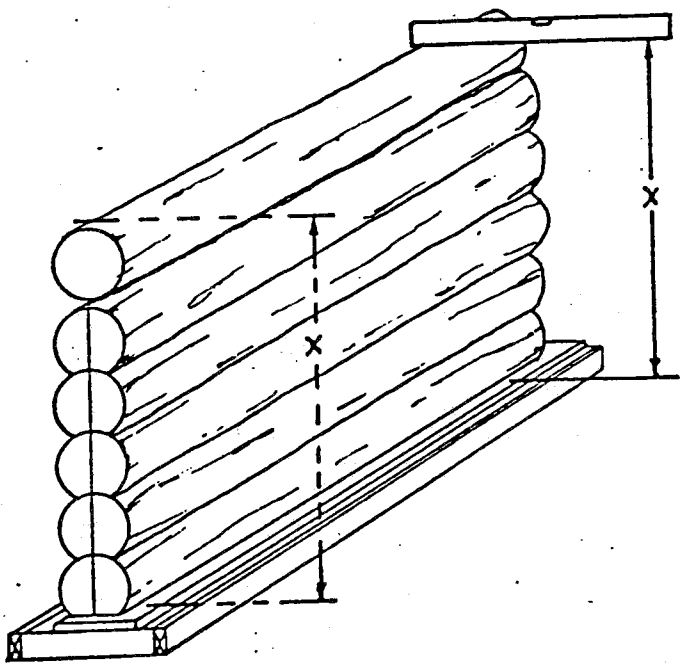
A log is a tapered cylinder. By alternating butts and tops at each course much of the leveling problems will be taken care of. However, it is necessary to take accurate readings and make adjustments so that the wall comes up level, especially when approaching the top plate of the wall. Level readings can only be taken on "even" courses -- there being equal numbers of tops and butts at each wall end:

Drawing

TOOLS: Tape measure, level, scriber, pencil, wooden wedges, hammer.

PROCEDURE:

1. Place and align the log on the wall and brace securely to the vertical supports. Remember you can only level "even" rounds.
2. Placing a level on each end (see diagram), measure the distance down to the jig base and note the difference between the two ends of the wall.
3. If only 1" - 2" difference, block the low end level and scribe the log in place.
4. If more than 2" difference, replace log with a more suitable log to bring the wall near level. Then block the low end and scribe the log in place. Do not readjust or move the log while scribing!


X
X

QUESTIONS:

1. Why level a log wall at all?
2. Why not simply place a level along the top of the log and then adjust accordingly?
3. What does the jig base simulate?
4. What would happen if the base were not level?

ASSIGNMENT:

Take readings and level your wall panel when it becomes necessary.

PIECE-EN-PIECE CONSTRUCTION

JOB // -- How to plumb-cut a wall panel section using a jig.

Remember for a finished 8' wall we used 9' logs. This supplies the necessary holding wood when plumb cutting the wall panel to its final length. In order to have a tight fit against the post it is necessary to have a chainsaw guide to make an accurate vertical cut. This jig is simply an upright version of the post and rail mill:

Drawing

TOOLS: Eye and ear protection, chainsaw, "26" bar with chisel chain, bar pads, hammer, 4' spirit level.

MATERIALS:

2"x6"x114" (4 pcs.)

2"x6"x94½" (2 pcs.)

2"x6"x19" (2 pcs.)

3" rails

1"x4" bracing.

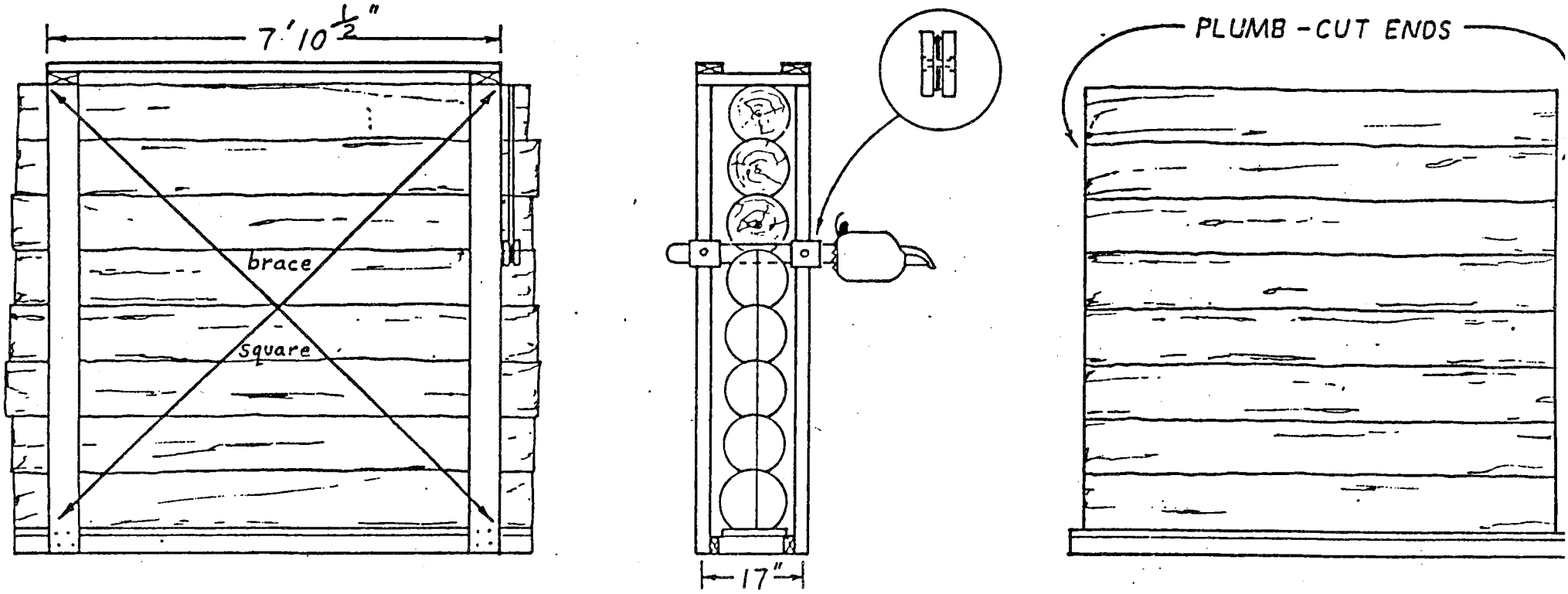
PROCEDURE:

1. Erect the 2"x6" plumb cut jig according to Fig. 1, making sure:

   a) the uprights are parallel to each other.

   b) the uprights are exactly plumb.

   c) the uprights are braced securely to prevent flexing.


7'10 1/2"
brace
square
17"
PLUMB - CUT ENDS

2. Fit a sharp, properly filed (improper filing causes a curved cut) chisel chain to a 26" bar.

3. Attach 3/4" plywood pads to bar. Carriage bolts should be recessed into the wood pads (see Fig. 2).

4. Start the cut from the top, making sure that the pads are always in contact with the 2"x6" rails. Have another person place moderate pressure holding pads against rails by using two sticks.

5. Complete cut.

   If the saw starts to cut crooked STOP!

   By turning the saw upside down and cutting with the back of the bar the cut will correct itself. If the cut does not correct itself, move the guide rails back 3" and cut again. Add 3" to the opposite end.

QUESTIONS:

1. What prevents the saw from cutting the 2"x6" rails?

2. How long would the wall panel be if the rails were positioned exactly 8' apart rather than 7'10½"?

3. What would be the result if the 2"x6" rails were not parallel to each other?

4. What would be the result if the second person did not hold pressure against the pads and rails?

5. Is it important to have straight 2"x6" material?

ASSIGNMENT:

Set up and plumb cut a wall panel. Check your result with a 4' level. Patience and accuracy will produce exacting results.

PIECE-EN-PIECE CONSTRUCTION

JOB 12 -- How to key-dado a wall section.

Key-dadoing produces a straight, uniform groove. When matched with a similar groove in the post a spline may be inserted, keying the horizontal wall panel to the vertical post. This method replaces the laborious tenon and groove method:

Drawing

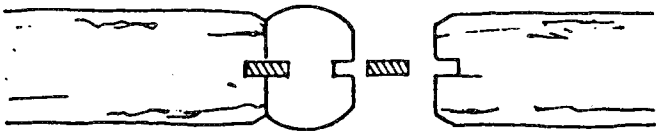
TOOLS: Router, 3/4" straight bit, spirit level, hammer.

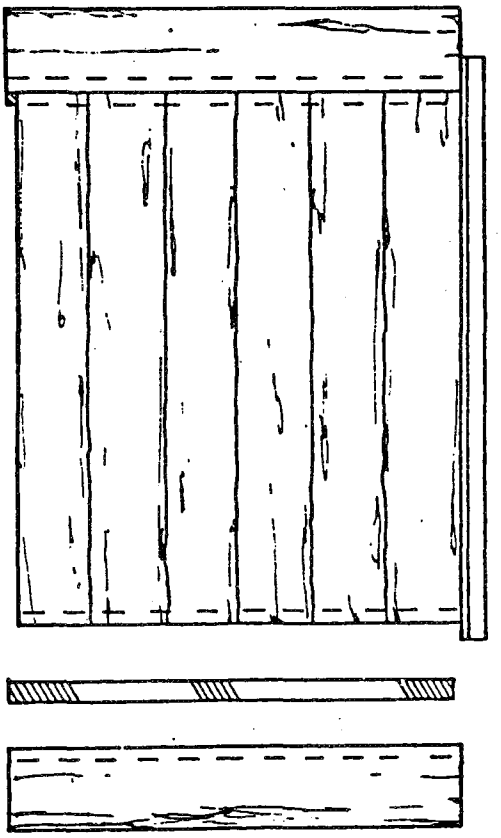
MATERIALS: 1"x4" straight edge router guide, nails

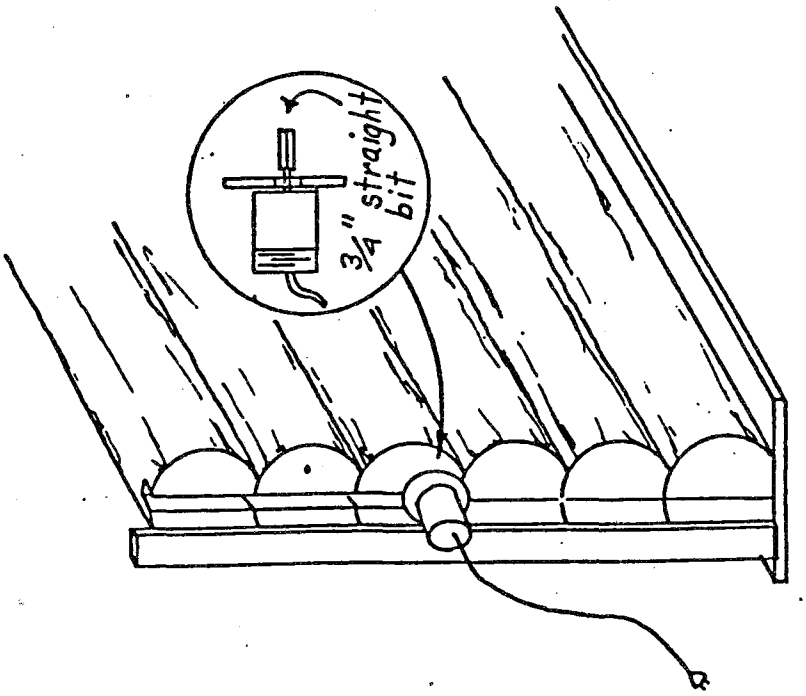
PROCEDURE:

1. Fasten a 3/4" straight bit to a router (see Fig. 1).
2. Nail one straight length of 1"x4" against the outer edge of the log ends --- MAKE SURE IT'S PLUMB! This will act as a guide to router a groove down the center of the log ends.
3. Make two passes with router, extending the bit each time to get the 1 5/8" maximum depth (see Fig. 2).
4. Repeat for opposite end of wall.

*NOTE: This dado groove will accommodate a 3/4"x3" marine plywood key strip which has a great deal of shear strength. Due to the tight fit against the post no other materials are necessary. However, if a 2"x2" spline is desired simply move the guide over to accommodate the extra width.






3/4" straight bit

5. Number the individual logs in each panel before disassembly.

QUESTIONS:

1. What would happen to the wall if the 1"x4" guide were not plumb?
2. If a log was reversed placing the bow-to-inside, it would form a reverse curve. What could this possibly do to the routered groove?
3. Why make two passes instead of one to get maximum router bit depth?

ASSIGNMENT:

Set up and router a 3/4"x 1 5/8" deep groove down the center ends of your wall panel. Check groove with a 4' level for plumbness.

PIECE-ON-PIECE CONSTRUCTION

JOB 13 -- How to store and ship intact log wall panels.

The metal clamping device outlined below enables removal of the log wall from its building jig as one complete unit. The wall can then be stored, ready for shipment without danger of the logs twisting.

Drawing

MATERIALS: 1/2"x4"x5" HRMS plate iron (2 pcs.)

1/2"x4"x20" HRMS plate iron (2 pcs.)

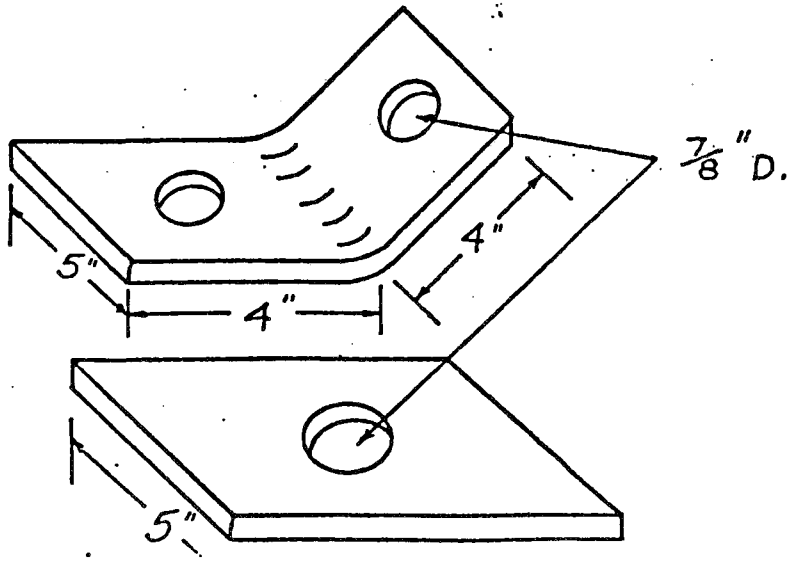
3/4"x8'6" CRMS bar (2 pcs.) threaded at each end.

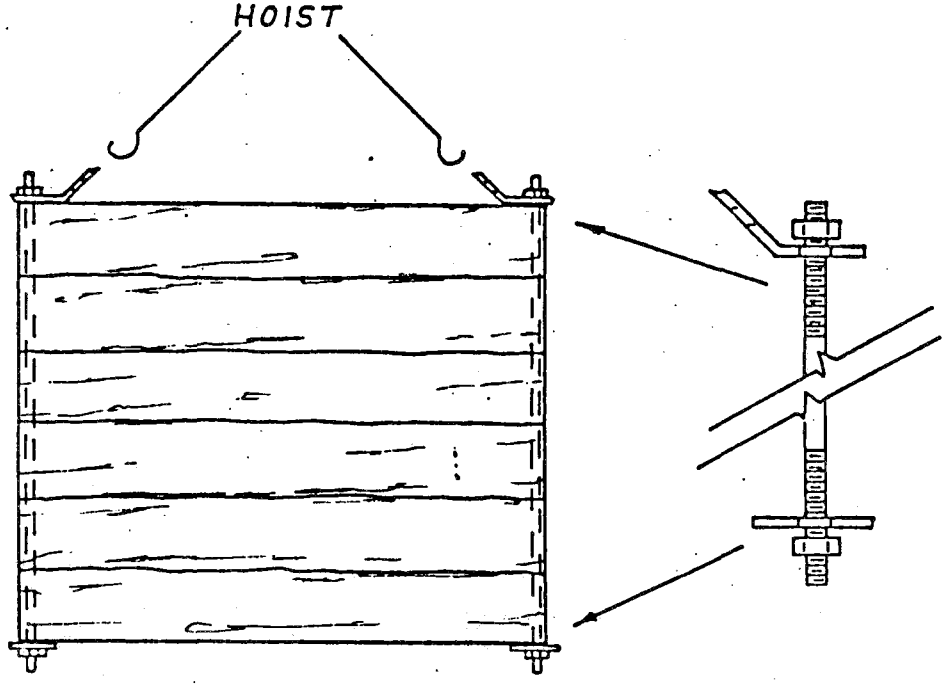
3/4" washers (4 pcs.)

3/4" nuts (4 pcs.)

PROCEDURE:

1. The finished wall panel can be scribed, insulated, and predrilled for wiring, if desired.
2. Fit the threaded rod into routered groove at each end of the log wall.
3. Slip the two 5" pieces of plate iron under each end of the wall so that the threaded rod passes through. Then a washer and nut are attached. (see diagram above). Alterations will have to be made to the jig base in order to fit the metal plate iron in position.
4. Slip the remaining pieces of plate iron over the threaded


7/8" D.
5"
4"
4"
5"


HOIST

rod at the top of the wall. Place a washer and cinch down with a nut.

To remove, slip a hook into each eye at the top, winch clear of ground and remove with derrick truck.

*As wall shrinks, cinch nuts down.

QUESTIONS:

1. Do you think it would be a safe practice to nail the plate iron to the top and bottom of the log wall through predrilled nail holes in the iron? What could this possibly prevent from happening?

2. What is the advantage over this form of storage over simply leaving the scribed wall panel in its jig?

PIECE-EN-PIECE CONSTRUCTION

JOB 14 -- How to construct mid and corner posts.

Posts should be flat-sided just prior to erecting the walls. This minimizes any tendency for the post to twist while drying:

Drawing

TOOLS: Tape measure, spirit level, square, pencil, hammer & nails.

PROCEDURE:

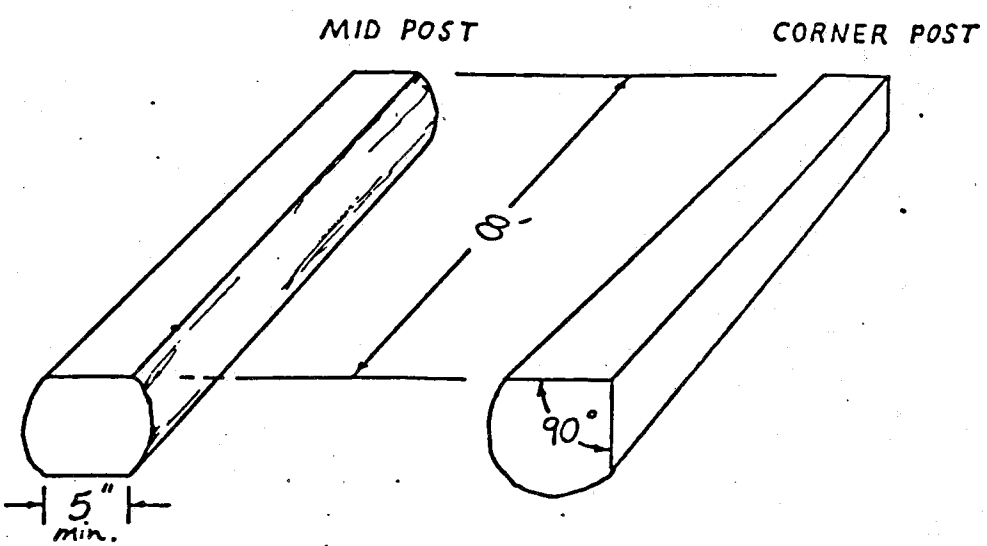
1. Select straight grained, sound logs, dry if possible.
2. Flat side using either of the three mills described in Unit V, removing equal waste from each side of the log. ALL POSTS SHOULD BE MILLED TO THE SAME THICKNESS. Accuracy is the Key!
3. To obtain a corner post, mill a flat side then rotate 90 and mill this surface (see Fig. 1). Check right angle with a carpenter's square.

QUESTIONS:

1. What would happen if you milled a post with spiral grain?
2. Why is it best to use dry logs for posts?
3. Why is it essential to have true, flat surfaces on all posts?

ASSIGNMENT:

Select the appropriate logs and mill a mid and corner post.


MID POST
CORNER POST
8'-
90°
5"
min.

PIECE-EN-PIECE CONSTRUCTION

JOB 15 -- How to Key-dado a post.

Key-dadoing a post means to router a groove down the length of the post. When notched to the wall panel's dado-groove a spline will be inserted keying the two together. This method replaces the tenon and groove method:

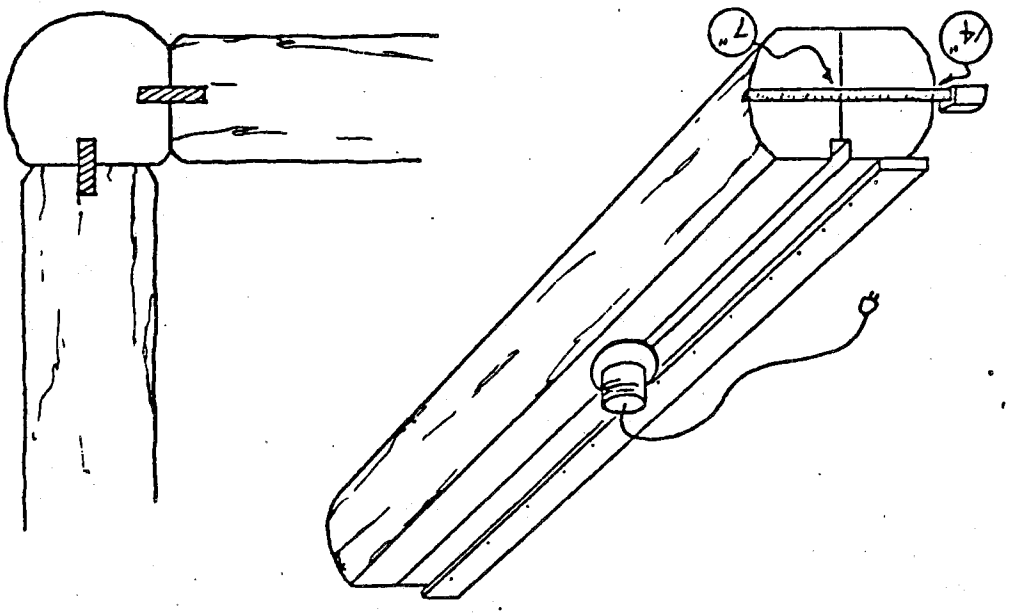
Drawing

TOOLS: Eye protection, router, 3/4" straight bit, chalk line, tape measure, hammer.

MATERIALS: 2" nails, 1"x4" straight edge.

PROCEDURE:

1. Measure the log diameter and find the center at each end of the log. (see Fig. 1)
2. Chalk a line joining these points.
3. Off-set a 1"x4" straight edge to one side of this line, the router base radius distance. Be sure it is parallel to the center line. This will act as a guide to router a groove down the center of the log (see Fig. 2).
4. Make two passes with the router, extending the bit each time to get the 1 5/8" maximum depth.
5. Repeat this procedure where a dado-groove is needed. Fig.3 shows a top view of a corner post with log wall panels keyed in place.


„7"
„4"

*NOTE: This dado-groove will accommodate a 3/4"x3" marine plywood key strip which has a great deal of shear strength. However, if a 2"x2" spline is desired simply move the guide over to accommodate the extra width.

QUESTIONS:

1. What would happen to the wall if the straight edge guide were not parallel to the center line?
2. What would be the result if the 1"x4" straight edge were not straight?
3. The 3/4" plywood spline should be slightly smaller in width than the combined depth of the two grooves. Why?

ASSIGNMENT:

Layout and router a groove down the length of a post for joining to a wall panel.

PIECE-EN-PIECE CONSTRUCTION

JOB 16 -- How to place the prefabricated walls on the foundation.

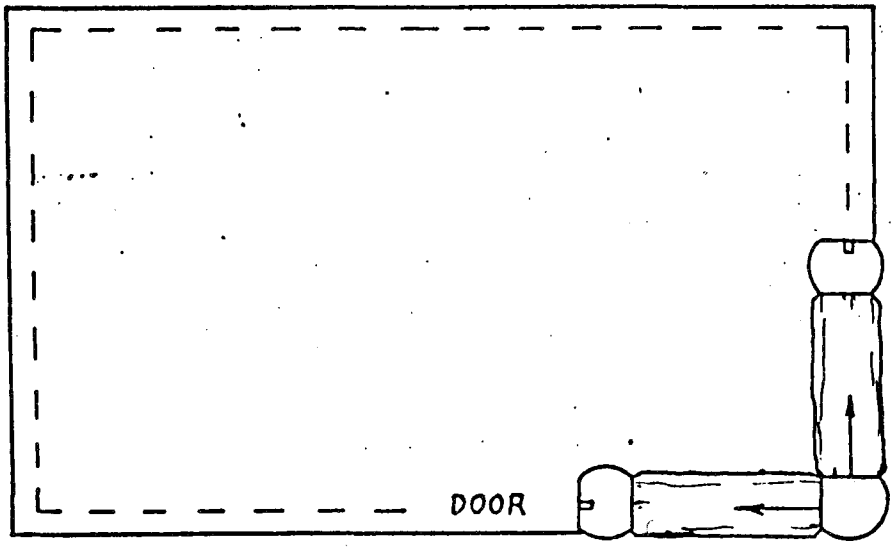
It is important to place the prefabricated wall sections onto a level, even log sill or subfloor. Distortions in the subfloor can cause imprecisions in the quality of joinery between the posts and wall panels. A frame subfloor is recommended for this reason and also for simplicity in joining the posts to the floor system. Later pargeting or rock facing can cover the dimensional sawn wood showing:

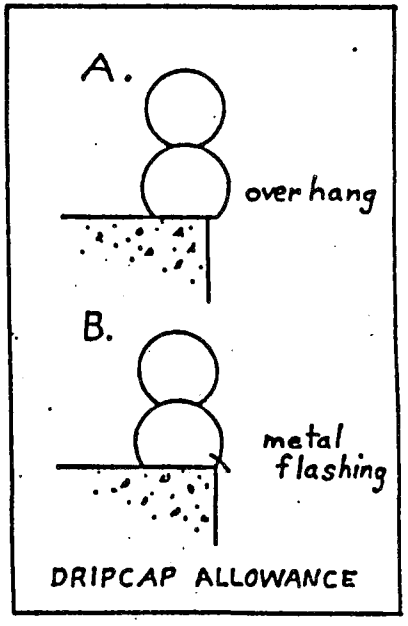
Drawing

TOOLS: Tape measure, chalk line.

PROCEDURE:

1. Chalk a centerline around the building perimeter -- square off by taking diagonals. If the log work is to provide the dripcap allowance (see Fig. 2 A) then off-set this centerline 1" - 2" closer to the foundation edge.
2. Erect and firmly brace a corner post that is nearest a doorway (refer to Job 17 for methods of attaching a corner post to a log sill). Work simultaneously toward the door and around the building, aligning the routered grooves on the centerline. A post is followed by a panel of horizontal filler logs, another post, then another panel and so on around the building until reaching the door again.


DOOR


A.
over hang
B.
metal flashing
DRIPCAP ALLOWANCE

3. The last log wall panel before reaching the door should be left with only one end plumb cut. In this way the panel can be custom cut to exact length, adjusting for any discrepancies before placing the last door post.

4. When assembling a wall panel tight against a post be careful not to knock the post out of plumb.

5. Mid posts should be tight against the wall panel. Two holes drilled into the base of the post with spikes embedded through the post and into the sill works well to snug the post base to the log filler panel. A come-along works well to snug the top until another panel is in place.

QUESTIONS:

1. If placing log work on a frame subfloor, would it be a smart idea to place additional support blocking under each post?

2. What is the purpose of an off-set centerline?

3. What is the purpose of leaving one log wall panel with only one end plumb cut?

4. Where does this last wall panel go on the building?

ASSIGNMENT:

Chalk a centerline on the foundation or sill in preparation for wall assembly.

PIECE-EN-PIECE CONSTRUCTION

JOB 17 -- Methods of joining posts to a log sill -- 3 methods.

Joining posts to a frame subfloor is a simple matter of drilling up from under the floor into the post base and lag screwing firmly. Posts can be joined to a log sill in a number of ways. A few methods of varying difficulty are mentioned below. If the bottom horizontal filler log in each wall panel is drilled and lag screwed or spiked to the sill log there is no need to fasten mid posts as well, for they are secured from any sideways slippage by the keyed splines:

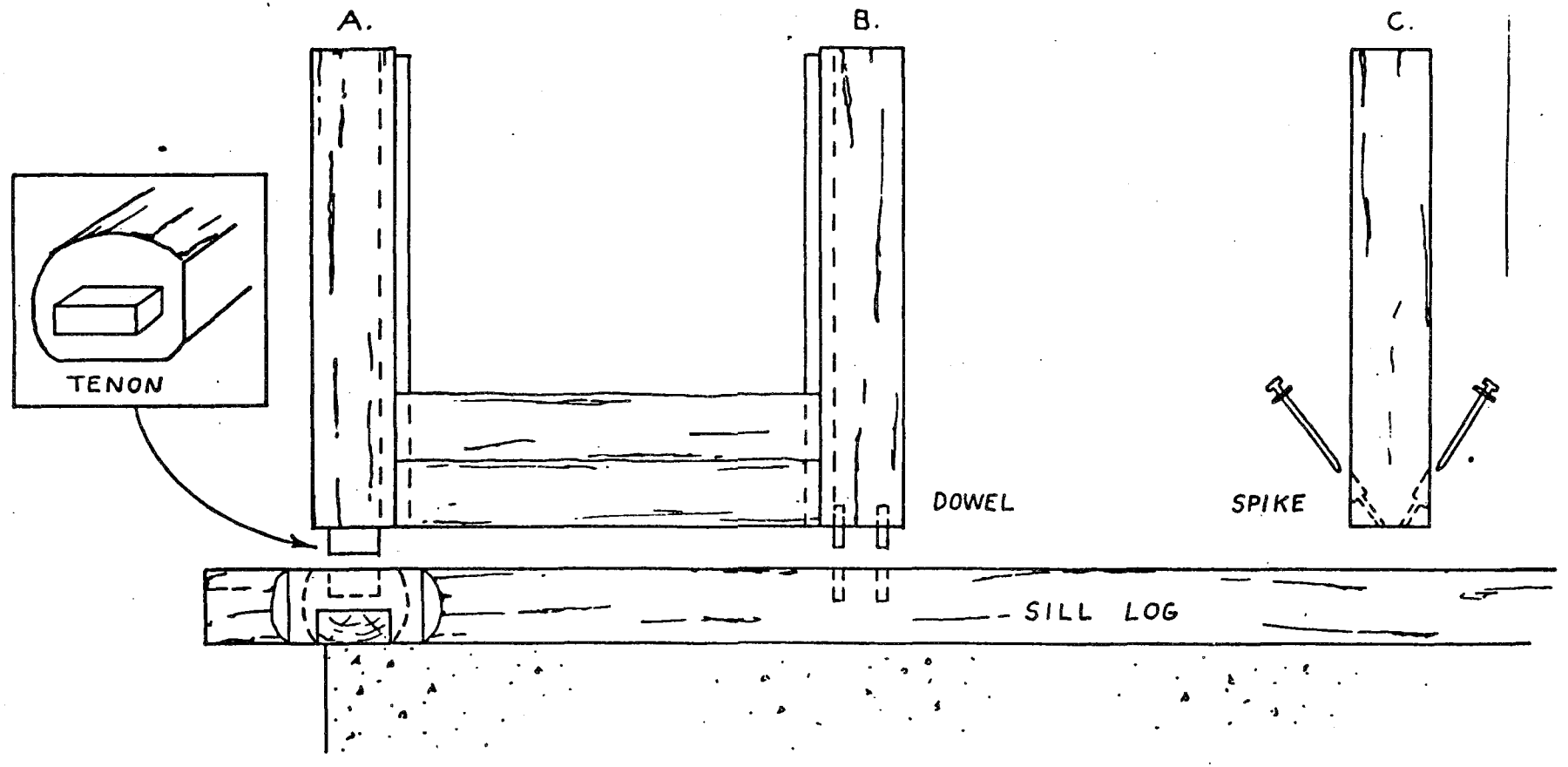
Drawing

METHOD A (Mortise and Tenon)

TOOLS: Eye and ear protection, chainsaw, carpenter's square, slick, 1½" chisel and mallet, 4' spirit level, electric drill with 1 3/4" auger bit, tape measure.

PROCEDURE:

1. Cut all the posts to length, measuring from sill log to plate log plus a 4" tenon.
2. Layout all tenons using the 2" wide body of a carpenter's square as a template and the centerline of the post (see inset).
3. Cut the tenon and chamfer all edges and corners.
4. Layout only the first corner mortise. The other mortises



REFER TO UNIT VII, JOB 7 FOR ALTERNATE POST PLACEMENT.

will be laid out as the wall panels and posts are positioned on the building.

5. Cut the mortise as to the dimensions of the tenon, using the drill and bit and cleaning with the chisel. ~~Alternately, construct a modified electrical box cavity jig as outlined in Unit XI, Job 4.~~

6. Apply a tar coat to tenon and mortise.

8. Position, plumb and brace the post securely.

METHOD B (Dowelled)

TOOLS: Electrical drill with 5/8" bit, tape measure, hacksaw, file, 3 lb. hammer, 4' spirit level, 5/8" C.R.MS round bar.

PROCEDURE:

1. Cut all posts to length, measuring from sill to plate.

2. Bore two 5/8" holes three inches into the bottom of the posts.

3. Insert two pointed 5/8"x3½" steel pins into the holes so the points protrude.

4. Place post in final position and hammer on the top. The pins will indicate drilling spots on sill log.

5. Drill two 5/8"x3" holes into the sill log, using the indicated marks as guides.

6. Insert two 5½" lengths of C.R.M.S. round bar into the post holes.

7. Apply a tar coat to underside of post.

8. Position, plumb and brace the post securely.

METHOD C (Spiked)

TOOLS: Electric drill with 1/2". and 3/4" bits, 3 lb. hammer, drift pin, tape measure 4' spirit level, 10" - 12" spikes, washers, waterproof glue.

PROCEDURE:

1. Apply a coat of tar to underside of post.
2. Position, plumb and brace post securely.
3. Drill two 3/4" countersink holes two inches diagonally into the post base.
4. Change bits and bore a 1/2" hole into each of the countersink holes diagonally through the post base "but not into the sill log."
5. Secure post to sill by driving a spike with washer into each hole embedding it into the sill log. Countersink the head, using the drift pin.
6. Plug the hole using a carved wooden plug and glue.

QUESTIONS:

1. If the posts will be fastened to the sill log using a mortise and tenon joint why don't you lay out and cut all mortises before placing the log wall panels and posts?
2. If the distance between the sill to the plate is 8', what would the length of post with tenon be?
3. Why is a tar coat applied to the bottoms of all posts?
4. What is the reason for securing the corner posts to the sill log?
5. What would happen if the posts were not braced securely after being positioned and plumbed?

ASSIGNMENT:

Secure the first corner post to the log sill, using one of the described methods. Plumb and brace securely in preparation for log filler panel assembly.

PIECE-EN-PIECE CONSTRUCTION

JOB 18 -- How to join filler logs to posts.

With the first corner post nearest a door positioned, plumbed and braced, assembly of plumb cut log filler panels can proceed. Insulating the lateral grooves of the filler logs, pre-drilling for electrical wiring, pinning the logs and cutting of window headers will all proceed as the numbered wall panel logs are placed (refer to respective jobs for detailed information):

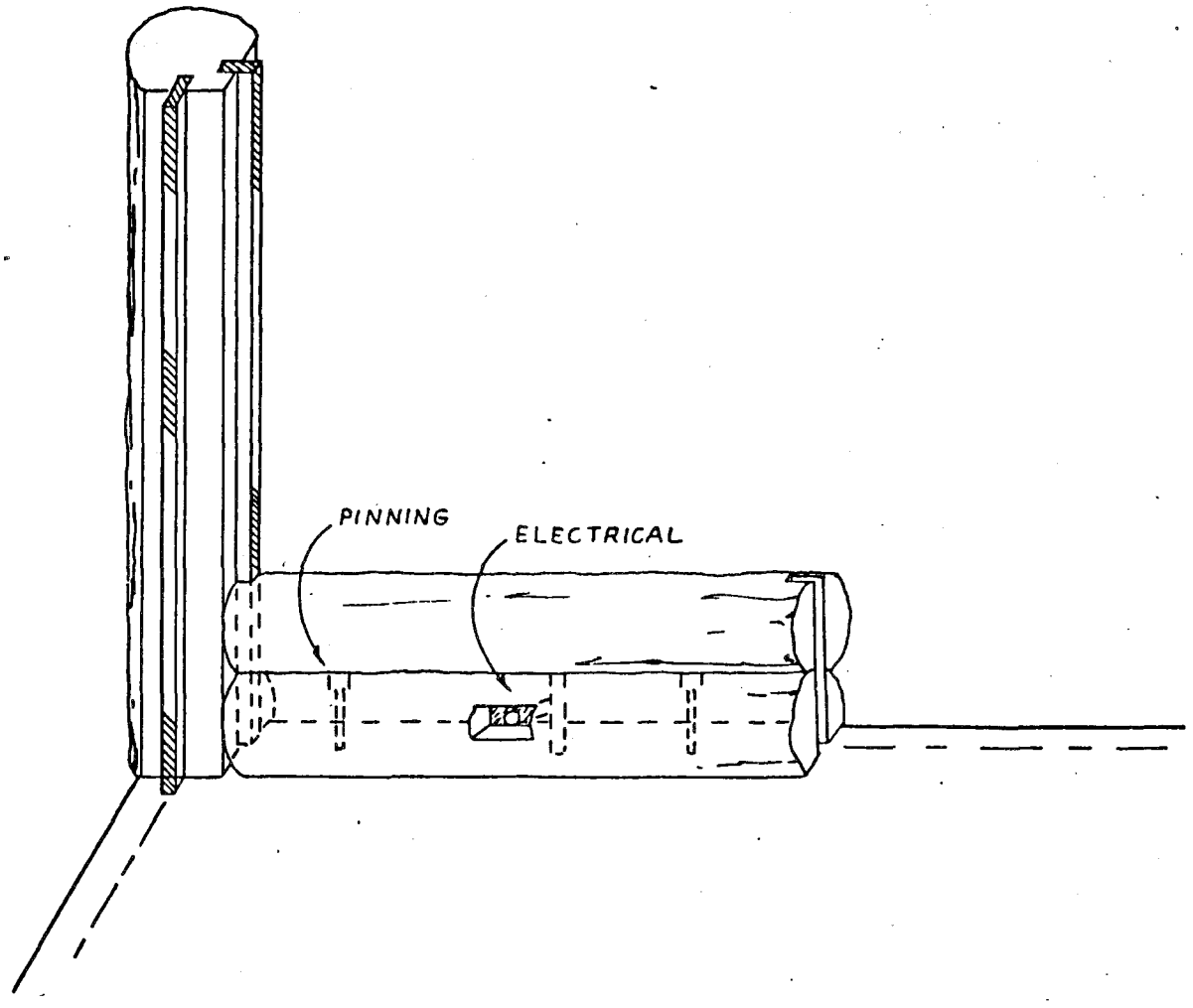
Drawing

TOOLS: Electric drill with 5/8" extended auger bit, hammer, 4' spirit level, sledge hammer, drift pin, come-along, lumberman's crayon.

MATERIALS: 3/4"x3"x8' marine plywood key strips, waterproof glue and brush, 12" spikes with washers, 1/2" nylon rope, roofing tar.

PROCEDURE:

1. Glue plywood key strips into dado-groove of posts. Filler logs are free to slide down the keyed spline strips during settling.
2. Apply coat of tar to underside of first flat-sided filler log and snug up against post. The spline should fit into the dado-groove of the filler log.


PINNING
ELECTRICAL

3. Drill, then spike this first log to the subfloor. The holes will be covered by the lateral groove of the following log.

4. Predrill for electrical wiring where appropriate. ~~(refer to Unit VII, Job 14)~~.

5. Place the next filler log and snug up against the post -- check for fit. The ends should be flush.

6. Lift free end of filler log and insulate the lateral groove. ~~(refer to Job 14)~~.

7. Reposition and pin securely ~~(refer to Job 15)~~, mark lightly with crayon indicating where pins are. Do not pin where a window will be placed!

8. Continue placement of filler logs. Check periodically to make sure the post is not knocked out-of-plumb.

9. At window header height it is easier (but not essential) to cut header before final insulation and pinning. ~~(refer to Unit VII, Job 14)~~.

10. Construct wall to top plate height. Place another post, then another wall panel and so on until building walls are erected.

QUESTIONS:

1. What would happen to the fit of the walls if the floor were not level?

2. Would you get the same result if the wall panel jigs were not level? Why?

3. If the plywood key splines were wider than the combined

depths of the dado-groove what would be the result in the fit between the posts and the panel logs?

4. What problems would result if the panel filler logs were not numbered before dismantling from its jig?

5. Why is the plywood spline not glued into the horizontal panel filler logs?

ASSIGNMENT:

Assemble piéce-en-piéce walls on building foundation.

Piéce-en-Piéce Construction

[redacted]

JOB 19 -- How to insulate the lateral groove.

Although the insulation contained in the lateral groove is hidden it plays the important role of a thermal-break and care should be taken that it fills the entire void. Substances as elaborate as polyureathane foam injection and as basic as moss have been used for insulative materials. The most common material used is fiberglass and this is what we shall be concerned with in this procedure:

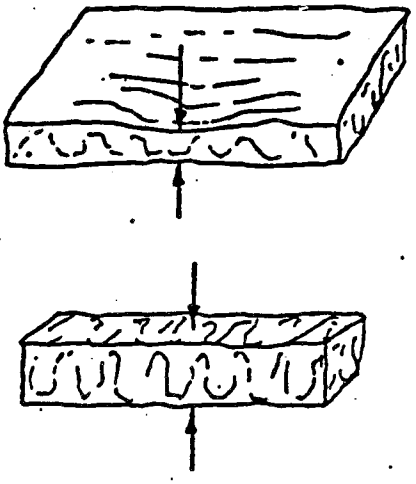
Drawing

TOOLS: Sharp long-bladed knife.

MATERIALS: 3" - 6" thick fiberglass batts (depending on lateral groove width.

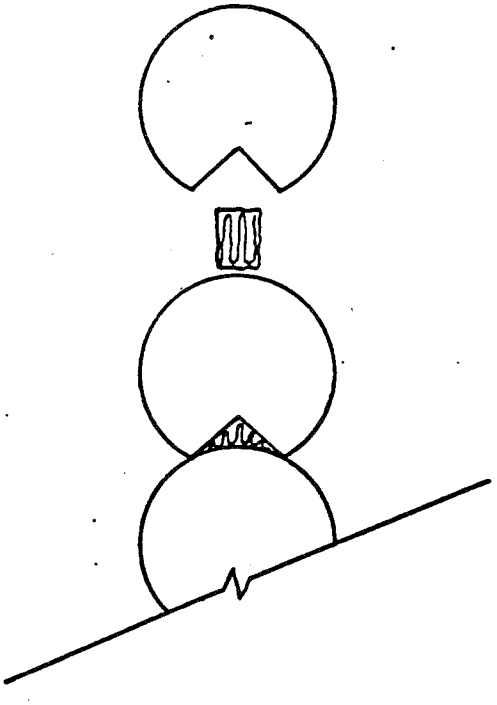
PROCEDURE:

1. Cut the batts into 3" ± wide strips.
2. Check the fit of the log and then suspend it a couple of inches, using a block of wood.
3. Place the insulation in by hand, taking special note of Fig. 1 --- the low squash resilience of "a" makes complete filling of the void less likely as turning the batt on edge.



a. LOW RESILIENCE

b. HIGH RESILIENCE



QUESTIONS:

1. Why is there higher squash resilience when the fiberglass batt is placed on its edge?
2. If there is a tight fit do you need to insulate the lateral groove?
3. Some builders staple the insulation into the lateral "V" groove. Do you think this method will adequately fill the void?

ASSIGNMENT:

Insulate the lateral groove of the log.

Piéce-en-Piéce Construction

[redacted]

JOB 25 How to pin or dowel a log.

Pinning or dowelling a log is usually done on long spans to prevent any sideways slipping of the log. Piéce-en-piéce incorporates shorter lengths of log. Therefore pinning is not necessary provided long walls are adequately braced with intersecting walls. However, pinning is beneficial in providing downward pressure, desirable in closing the gap of a log that is "floating" from too much insulation. Pinning and dowelling methods are explained below:

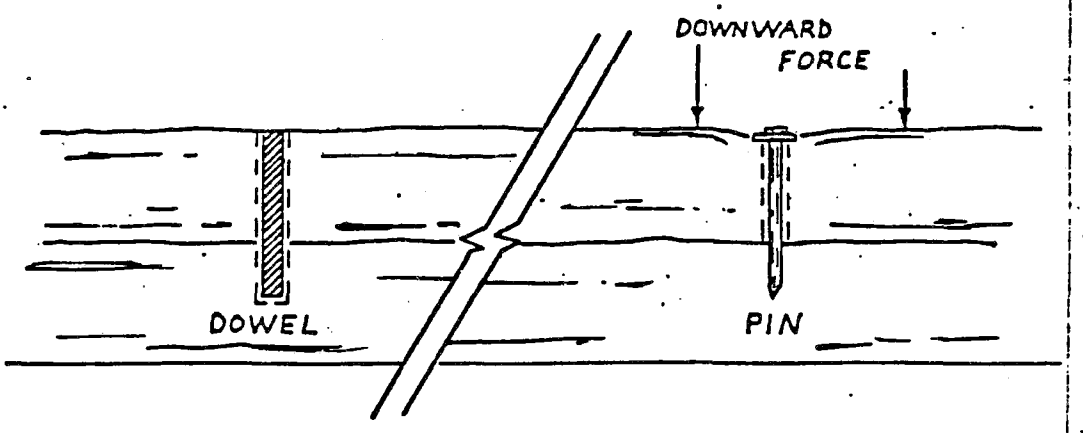
Drawing

TOOLS: Electric drill with 5/8" extended auger bit (for pins), 1 3/4" hand auger (for wood dowels), 3 lb. sledge hammer, drift pin.

MATERIALS: 12" - 14" spikes with washers or 1 1/2" hardwood dowelling.

PROCEDURES:

1. Identify on logs where all windows and doors are situated. Keep well away from these spots with any steel pins.
2. Pinning/dowelling is to be done as each log insulated and placed.
3. Pins/dowels should be installed on the mid line of the log so that the lateral groove of the following log conceals the hole.


DOWNWARD
FORCE
DOWEL
PIN

4. Dowelling/Pinning of horizontal logs.

How to dowel a log -- this method stops any sideways slippage of logs.

a) Drill a slightly oversized hole completely through the logs and half way into the lower log.

b) Wood dowels shall be 1½" diameter.

c) Dowels shall be cut flush with the top surface of the log.

d) Dowels should be staggered.

How to pin a log -- this method stops sideways slippage and also provides downward pressure.

a) Drill a 5/8" hole completely through the top log "but not into the lower log."

b) The 1/2" steel pin (spike) should drop through the top log and be sledge hammered into the log below so the head is pressed into the top surface.

c) Pins should be staggered.

QUESTIONS:

1. Would it be a good idea to identify any steel pins with a mark for later cutting of windows?
2. What are some advantages of using Method B over A?
3. What would happen during log shrinkage if in Method B the top log were not drilled entirely through?
4. Why increase the head size with a washer?
5. Can you think of a way to pin large logs (20" dia.) using Method B?

ASSIGNMENT: Dowel or pin the wall logs using one of the above methods.

Piéce-en-Piéce Construction

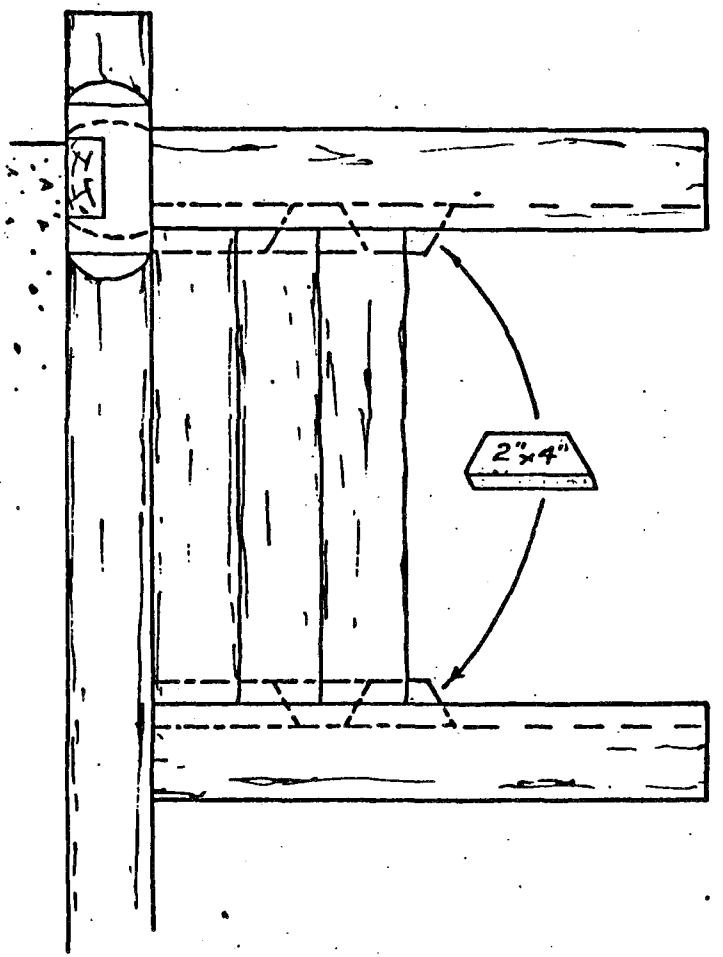
[redacted]

JOB 21 -- An alternate method of wall construction.

Some builders prefer to erect all the posts first and then cut the horizontal filler logs to fit between the posts. It must be noted that with this method it is more difficult to achieve a tight fit between the posts and the filler logs because, a log being a tapered cylinder, it will sit slightly "cock-eyed" causing a gap at either end where the filler log meets the post. Moreover, in an effort to achieve as tight a fit as possible the filler log might be cut a fraction too long and if placed between the posts it will cause the posts to spread apart.

One way of dealing with this "exactness" of fit is not deal with it at all. A few builders have purposely left a 1/2" gap or so between the filler logs and the posts, preferring to fill this gap with insulation and/or oakum and then covering the gap with a moulding strip. Another method of fitting the filler logs between vertical posts is to utilize the wall panel jig. Simply build the entire wall panel, then square and plumb-cut the panel to fit between the posts. I leave the method chosen up to the builder's discretion. Whichever is employed, when building between vertical posts it is necessary to incorporate a pieced spline rather than a continuous one as outlined in the previous jobs:

Drawing


2"x4"

PROCEDURE:

1. Mill posts and cut a dado-groove so a 2"x2" or 2"x4" spline will fit. If a router and bit are not handy the dado-groove can be cut with a chainsaw. Chalk guide lines and make repeated cuts to depth and hone the groove clean using the nose of the chainsaw.
2. Erect all posts, plumb and brace securely.
3. Lay the flat-sided first logs in place around the building.
4. Insert the spline in the matched grooves, locking the post and filler log together. The spline should protrude part way into the next fillerlog as shown in the diagram.
5. Continue placing filler logs by either:
   a) measuring the distance between the vertical posts, fitting the logs in place and scribing down.
   b) building log wall panels in a jig, then plumb cut to fit. Cut the key groove, disassemble and erect between the posts.
6. Insulate the logs and pin as required.

QUESTIONS:

1. What is the purpose of having a pieced spline?
2. What is the difference between this and the method outlined in the previous job?
3. Why does the spline protrude part way into the log above?
4. Is it a good idea to insulate around a spline that fits loosely in a dado-groove?

ASSIGNMENT:

Position, plumb and brace all posts. Then insert filler logs using one of the above procedures.

Piéce-en-Piéce Construction

JOB 22 -- How to install windows and doors between vertical posts.

Windows and doors can be installed either between vertical posts or within the log filler panels. To install windows/doors within filler panels refer to the procedures outlined in ~~Unit VII~~, Jobs ~~21~~ 23 and ~~26~~ 24. Where doors and windows are placed between vertical posts, the distance between the posts is to equal the door or window frame width. The method below incorporates a sectional "floating" spline which allows the window to slide down as the wall panel settles. In this manner no settling space allowance is needed either above or below the window:

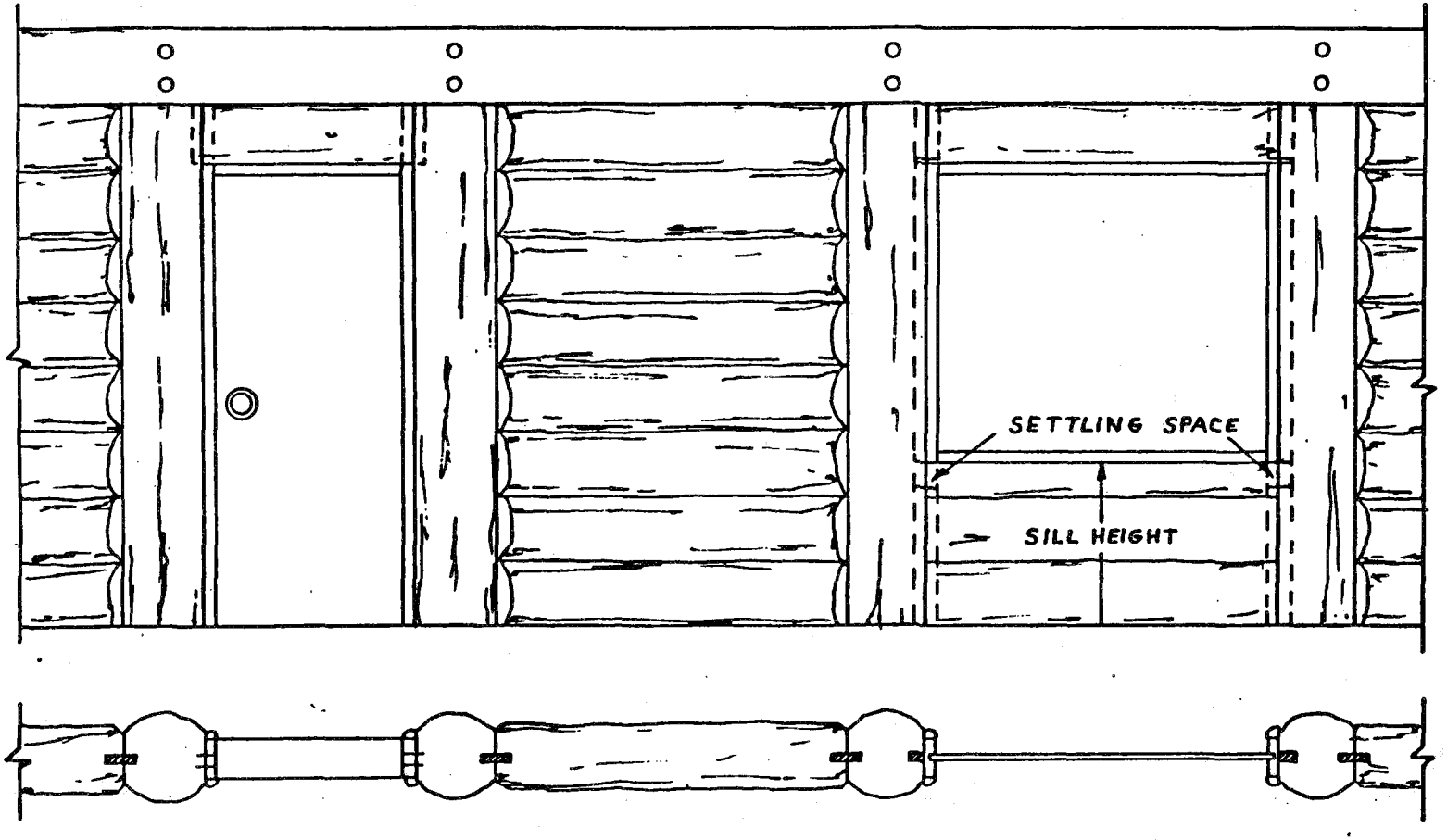
Drawing

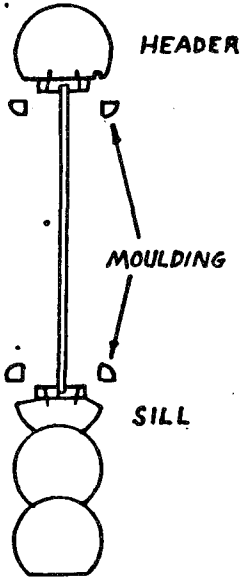
TOOLS: Eye and ear protection, chainsaw, router with 3/4" straight bit, tape measure, spirit level, handsaw, square, hammer, nail set.

MATERIALS: Windows and doors, moulding strip, caulking compound, 3½" x 2½" finishing nails, insulation.

PROCEDURE:

1. Insert the door and frame between the posts, shim, plumb and nail into posts. Insert header logs and nail door frame to header. Insulate the gaps, caulk and apply moulding strips.


SETTLING SPACE
SILL HEIGHT


HEADER
MOULDING
SILL

2. To place the window, assemble the wall panels to sill height. Leave a section of spline out, equal to the calculated settling space between the floor and sill (see diagram).

3. Cut two splines equal to the window length. Insert them into the dado-groove. They should be only half the normal spline width so they fit flush to the flat post surface.

4. Place the window between the posts so it sits on the flat sill, and nail into the spline. There should be a settling space between the window "floating" spline and the fixed post spline (see diagram).

5. Insert the header logs and nail the window frame to the header. Insulate the gaps, caulk and nail moulding strips to the window frame.

QUESTIONS:

1. Why is the window spline able to float in the post groove?

2. The window frame is nailed to the sill and header. Why are the moulding strips on the sides nailed only to the window frame?

3. Why does the door not have a floating spline?

4. Can you use this method to install a window in a filler panel wall?

ASSIGNMENT: Install the windows and doors between posts using the above method.

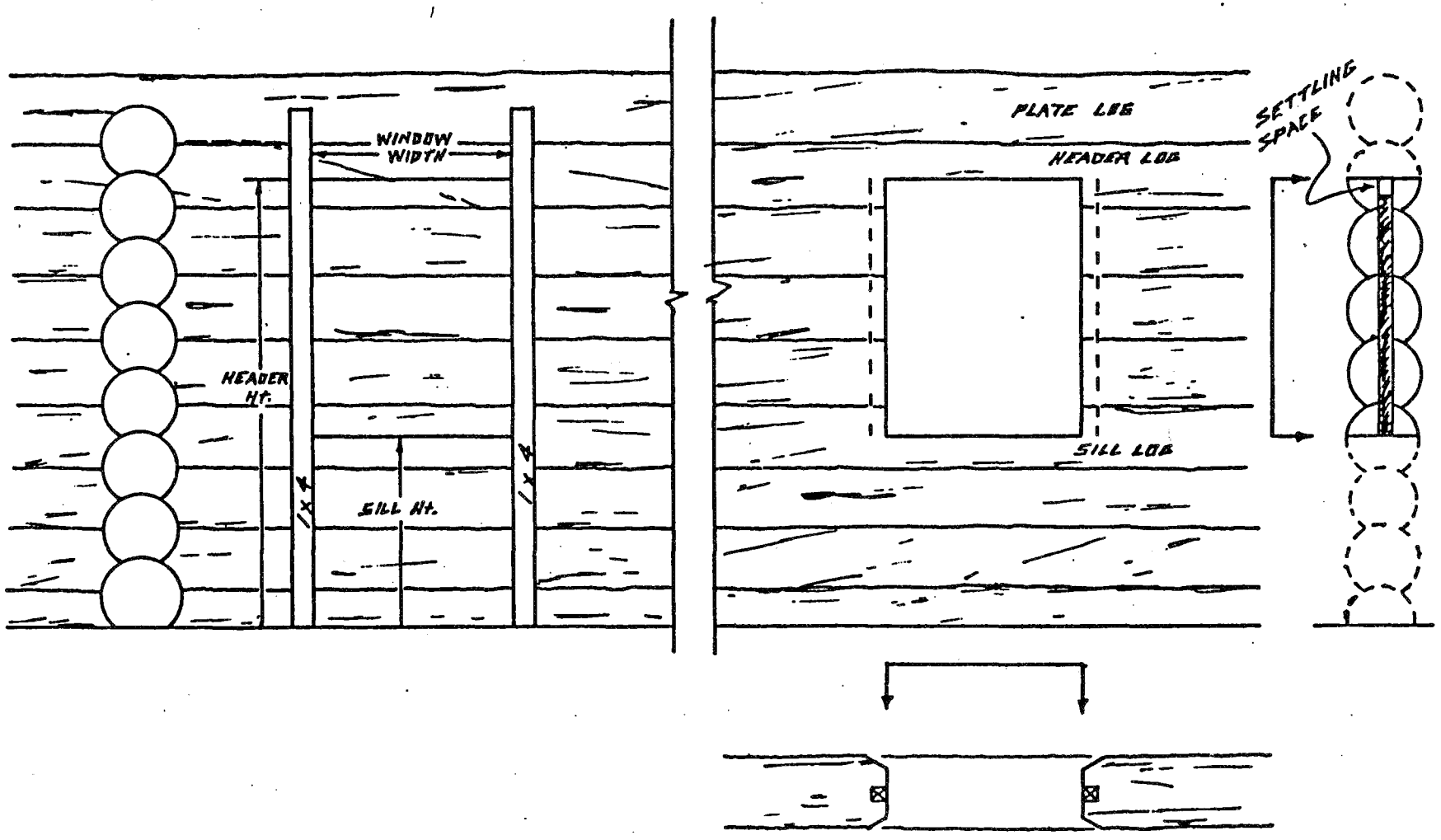
~~Long Log~~ Construction

JOB 23 -- Openings -- How to layout and cut window/door rough openings.

Whether installing a window or door the procedure is the same, the only difference being for doors. The sill is omitted and the settling space is calculated from the floor instead of from the sill. Also the rough opening width is 1" - 1½" wider than the measured frame. This extra width allows for shimming the door plumb. It is advisable to have the doors and windows on hand when cutting the rough opening as frame sizes may vary somewhat between manufacturers. Windows and doors should be installed no closer than 2' from any notched corner and the header log should be cut no more than halfway through. Outlined below are the layout and cutting procedures for rough openings and their key splined grooves, as well as a method of precutting the header log:

Rough Opening Sizes	
Door header height	= frame length + settling space calculated from floor.
Door width	= frame width + 1½" shim clearance.
Window header height	= frame length + settling space calculated from sill.
Window width	= frame width + 1/4" clearance.

NOTE: Windows and doors placed in the same wall should have their headers at the same height.


WINDOW WIDTH
HEADER Ht.
SILL Ht.
1 X 4
1 X 4
PLATE LOG
HEADER LOG
SILL LOG
SETTLING SPACE

TOOLS: Eye and ear protection, chainsaw with long bar, spirit level, tape measure, chalk line, axe, hammer, router with 3/4" straight bit (optional).

MATERIALS: 1" x 4" straightedge, spline material (3/4" marine plywood or 2" x 2" or 2" x 4"), nails.

PROCEDURE:

1. Layout the header height by measuring up from the floor the calculated distance and marking a level line.
2. Layout the sill height by measuring up from the floor. The distance between the sill and header should equal the window frame length plus the calculated settling space.
3. Layout the width of the window/door, then plumb and nail 1" x 4" guide boards (see Fig. 1).
4. Make the vertical width cuts first, using the boards as guides, and the long chainsaw bar for accuracy.
5. Cut the sill by making a horizontal cut close to the line or make successive "bread" cuts to the line and break the chunks of debris clear. ~~(refer to Unit V, Job 1)~~. Final planing down to the line is accomplished with the chainsaw and a chipper chain. Criss-cross your planing cuts for a smoother finish.
6. Cut the header by making a horizontal cut on the line. The cut opening should appear as in Fig. 2.

NOTE: Referring to Job #2.4 Method C, of window/door installation, this requires a smooth, flat header surface. In this case

pre-cutting the header during wall construction is recommended ... to pre-cut the header, scribe and fit the header log ... layout the header height and window/door width ... turn the log upright and remove waste wood.

7. The key splines serve as a nailing surface to attach the window and also help to keep the wall logs from being jarred out of alignment. A 3/4" plywood or 2" x 2" spline can be routered to fit, ~~using the procedures outlined in Unit VIII, Job 7.~~ An alternate spline is a 2" x 4" recessed into a dado cut with a chainsaw (with safety, anti-kickback chain). The latter being much more difficult to execute safely, A settling space must be supplied above or below the spline, equal to that of the calculated settling space for the door/window.

8. Install the window/door as per method chosen in Job 24.

QUESTIONS:

1. Why is it a good idea to have the windows/doors on hand before cutting any openings?
2. What is the reason for not installing any window or door closer than 2' from a notched corner?
3. Why is the settling space for a window calculated from the sill rather than from the floor?
4. Is the length of the spline equal to the length of the window or door frame?

5. What is the reason for having a settling space provided for in the spline?

ASSIGNMENT:

Measuring directly from the windows and doors, layout and cut the rough openings in preparation for installation.

[illegible] Construction

JOB 24 -- Openings -- How to install windows/doors -- 3 methods.

Installation of doors and windows are exactly the same. Therefore to avoid being redundant this job outline will focus on window installation for instructional purposes. The main criteria for installing a window or door to the outside is that;

a) it serves its function.

b) it keeps out drafts and weather.

c) it is not too difficult to install.

d) it has little or no follow up maintenance.

c) it has an appealing style.

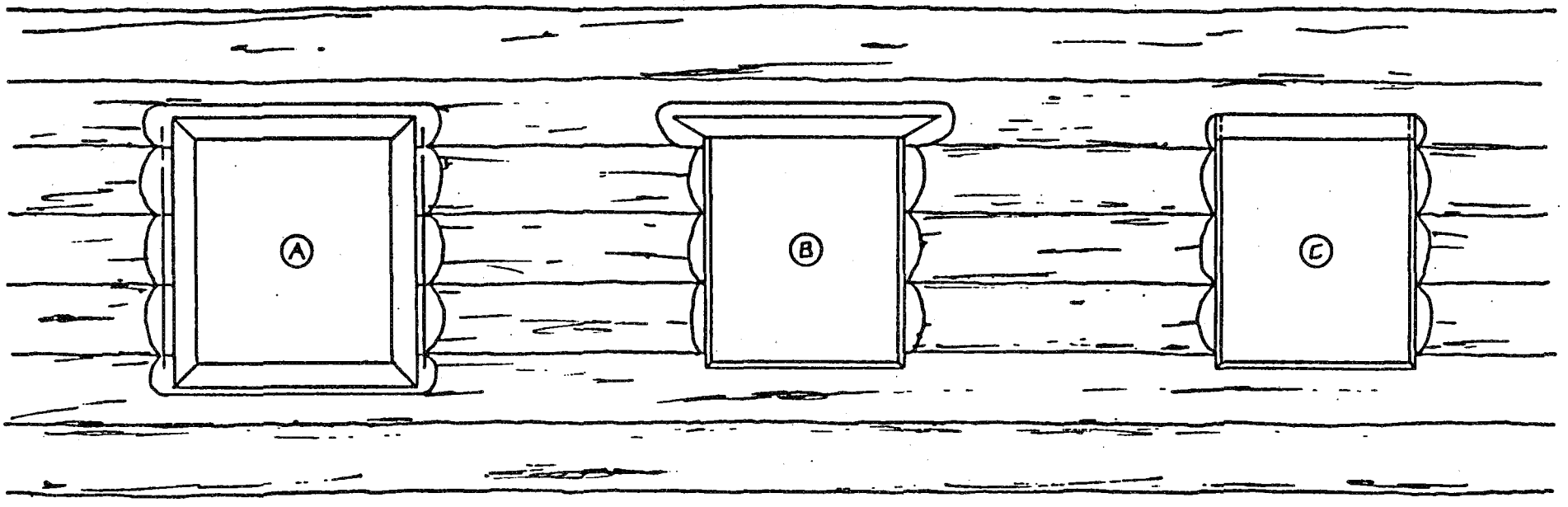
Below are window drawings with corresponding procedural outlines. The main purpose of these examples is to show the pros and cons of various installation procedures. The trim styles may change according to the builder's preference:

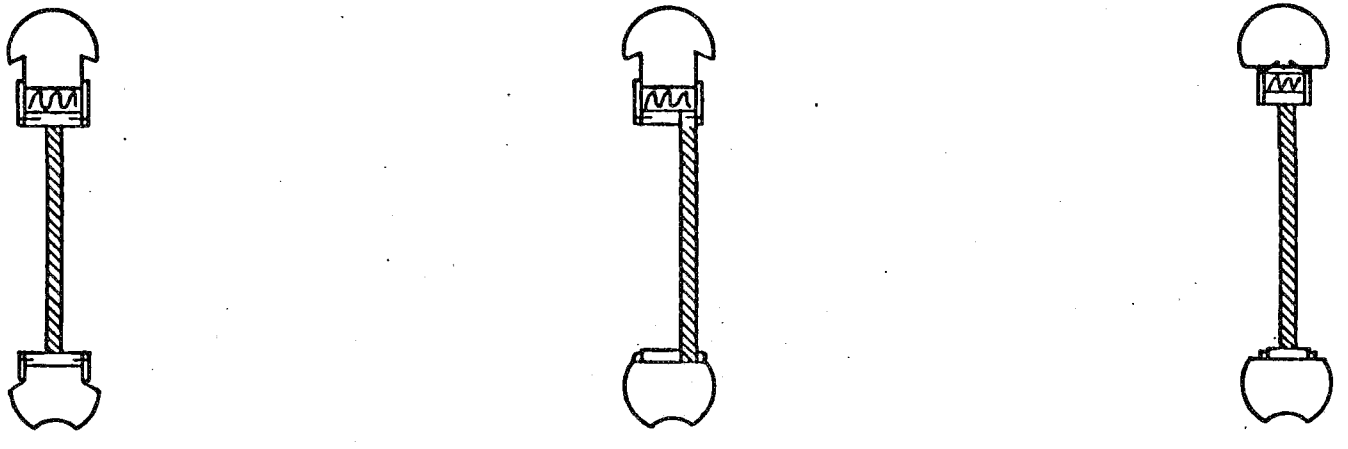
TOOLS: Eye and ear protection, chainsaw, tape measure, chalk line, spirit level, adze, handsaw, square, hammer, nail set.

MATERIALS: Windows and doors, trim boards, insulation, caulking compound, 2½" finishing nails.

METHOD A

This method sandwiches the opening between trim boards. It necessitates sawing or axing the logs back 5" from around the opening, both inside and outside


A
B
C



to produce a flat surface for the trim boards. Due to the thickness of the wall, a 2" x 8" (or 2" x 10" depending on wall thickness) is nailed around the window/door frame to increase its frame width. This window/door frame is then placed into the rough opening and nailed to the splines. The settling space above is insulated and trim boards are nailed to the frame and overlap the axed-back logs. This method satisfies all the criteria mentioned.

PROCEDURE:

1. Insert the widened frame into the rough opening and trace around its inside and outside surface.
2. Remove the frame and saw or axe the wood, outside the trace lines, back 5" around the rough opening to accommodate the trim boards. To contour the header log, chalk a level line 1" or so above the allowed settling space. Make successive bread cuts holding the saw as shown in the inset. Remove the bulk of wood with an adze and feather to a smooth curve with the chainsaw. This method is easier than it looks.
3. Replace the frame and nail to the splines only. Insulate the settling space and caulk any gaps between the logs and frame.
4. Finish nail the trim boards to the window/door frame so they overlap the logs.

NOTE: If the logs are of small diameter it may not

be necessary to increase the size of the window sash or door jamb with a boxed frame.

METHOD B

This method is similar to A and can be employed where very large logs are used. In this case the window is nailed to the outside of a frame to increase its width. The header is traced out and ~~contoured~~ cut back ~~as shown~~ using the method described in A. The difference here is that trim boards are not used on the sides or bottom, rather a moulding strip is nailed to the window frame instead. There is less room for error with this method, especially on the sides and bottom where air leaks can possibly penetrate.

PROCEDURES:

1. Insert the widened frame into the rough opening and trace its top inside and outside surface.
2. Remove the frame and cut the header log back to accommodate the trim boards. Bevel the sides of the logs back now (for appearances) as well.
3. Replace the frame and nail to the splines only. Insulate the settling space and caulk any gaps between the logs and frame.
4. Finish nail the moulding strips to the sides and bottom of the window.

METHOD C

This method may look easier to install but, due to a greater possibility of air leaks, there is less room for error and therefore more time is spent cutting and sealing. Here the trim boards covering the settling space at the top are nailed or screwed directly into the header log. They then slide down either side of the window/door casing during settling, opposite to the two methods previously outlined. Any overcutting at either the header or width cuts necessitates filling with caulking. The header cut must be perfectly straight and sanded to receive the straight trim board. This pretty well means precutting the header or scribing the trim board to fit any curves. Any place where two surfaces only butt together instead of overlap, is difficult to completely seal against air leaks. There is follow-up maintenance involved with this method as well, for as the trim boards settle down over the window or door casing they must be removed and planed, or one morning you may find yourself locked inside the house:

PROCEDURE:

1. Ensure that the rough opening has straight, sanded cuts.
2. Bevel the logs on either side of the window back.
3. Position the window and nail to the splines.

4. Insulate the settling space and caulk any gaps between the logs and frame.

5. Nail moulding strips to the bottom and sides of the window. The side strips should be the length of the window.

6. Cut a rabbet at each end of the settling space trim board and nail or screw the board into the header, both inside and outside the house. During settling the trim board will slide down over the vertical moulding strips.

7. Caulk any gaps between the window trim and log work.

QUESTIONS:

1. What is the main criteria when installing a window or door in a log wall?

2. Why, in all cases is the window/door nailed into the key spline rather than the log work?

3. Where can the window frame be nailed to the log work?

4. What is the main difference between Methods A and B with that of C?

5. Which method has the most potential for air leaks and which has the least?

ASSIGNMENT:

Install windows and doors using one of the methods outlined.

Piéce-en-Piéce Construction

[redacted]

JOB 25 -- How to construct a fit a dimensional top plate.

With piéce-en-piéce construction the top plate ties the walls together and provides a level surface for the roof. The top plate outlined below uses heavy structural trim boards to sandwich the posts. In this way the roof weight is supported by the posts and distributed along the heavy trim boards. The setting space created after shrinkage of the horizontal filler logs is concealed by the trim boards as well:

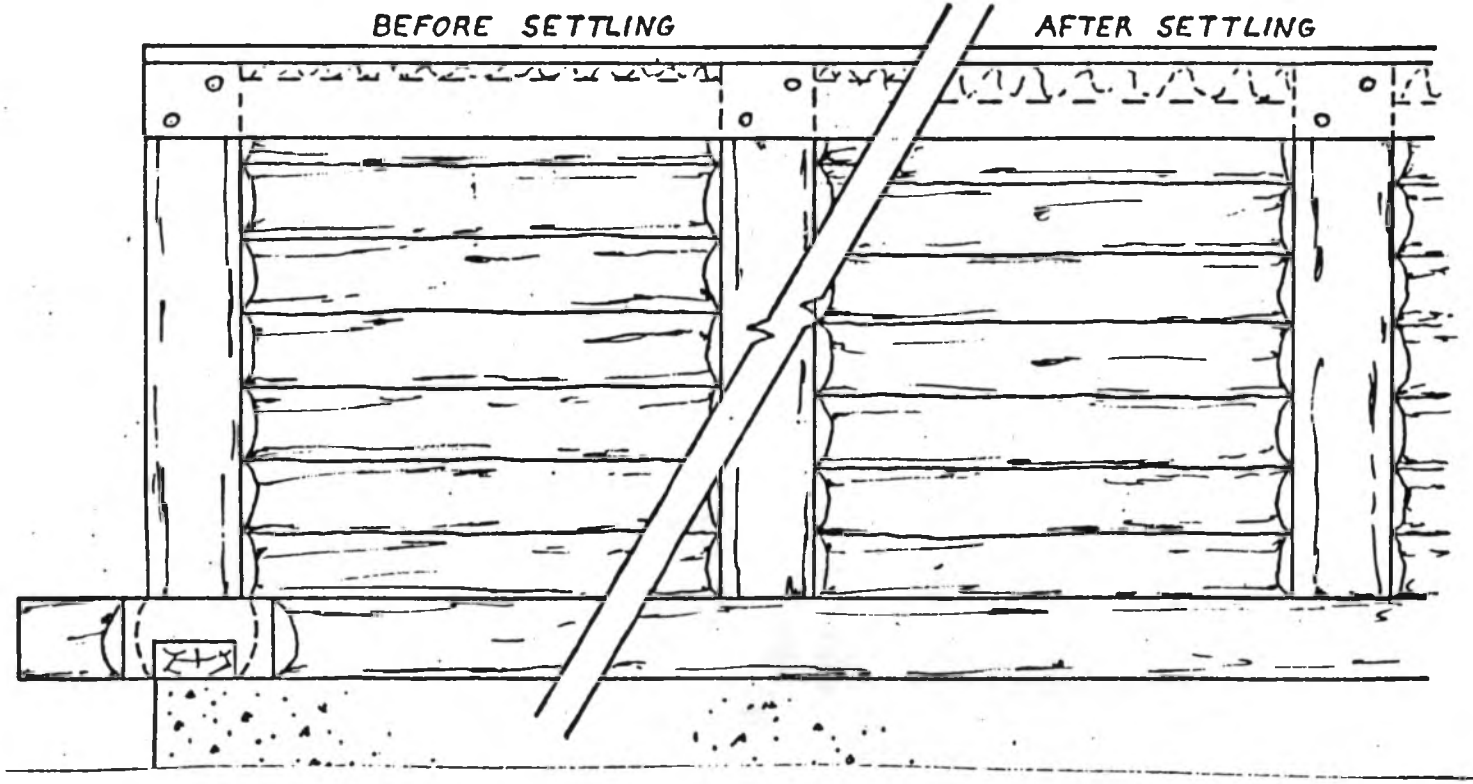
Drawing

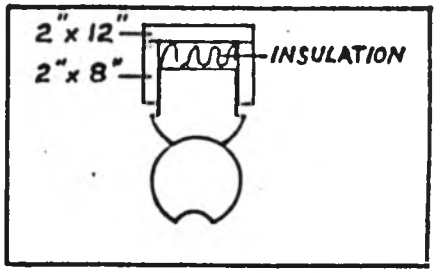
TOOLS: Eye and ear protection, chainsaw, chalk line, tape measure, hammer, handsaw, drill with 5'8" auger bit.

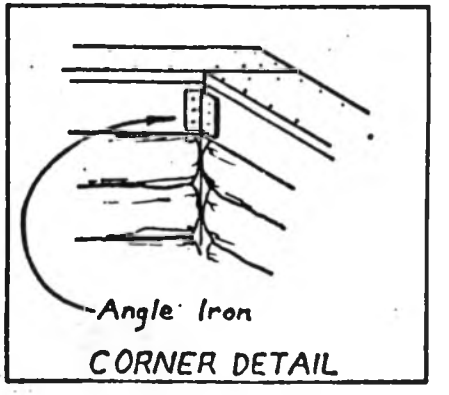
MATERIALS: (2"x 8" / 2"x12") rough fir, 5/8" lag bolts, glue, insulation, corner angle iron, nails.

PROCEDURE:

1. All the posts should be cut off at a level height.
2. Build up all the wall panels so they are at a height of 1" - 2" lower than the top of the posts. Pin the top log to the log below.
3. Square off and chalk a line down the center top of the log walls. It should strike the top of each post.
4. Chalk a parallel line 4" on either side of this center line, leaving a space of 8" between the inner and outer lines.







CORNER DETAIL

5. Using the inside and outside lines as guides, cut a ledge equal to the trim board depth around the inside and outside of the building.

6. Bolt the structural trim boards to the posts on both inside and outside of the building.

7. Run a bead of glue on the top surface of the filler logs -- place an 8" strip of insulation in the space -- run a bead of glue on underside of 2"x12" top plate and nail this plate to the trim boards. As the filler logs settle the insulation will be pulled down to fill the void.

8. Secure the inside corners by half-lapping the structural trim boards, then fixing an angle iron corner brace as shown on inset.

QUESTIONS:

1. Why don't the posts settle along with the filler logs?

2. Why is pinning the top filler log recommended?

   Hint: it is partially buried behind the structural trim boards.

3. Does the roof weight bear directly on the posts or on the filler logs?

4. If the filler logs become wedged during the settling period is it a good idea to tap them once in a while with a sledge hammer?

ASSIGNMENT:

Construct a dimensional top plate on the building.

Piéce-en-Piéce Construction

[redacted]

JOB 26 -- How to construct and fit a log top plate.

With piéce-en-piéce construction the top plate ties the wall together and provides a level surface for the roof. As with the dimensional top plate mentioned earlier, the weight of the roof rests on the vertical posts. The girth of this top plate distributes this weight. To cover the space created as the filler logs settle, a skirting board is used. The problem of hoisting a long, heavy top plate timber is overcome by spanning only the distance between one or two filler panels and splicing over a post. The main advantage of this top plate method is its use in buildings where the roof rests on the horizontal filler panels (refer to Job 27):

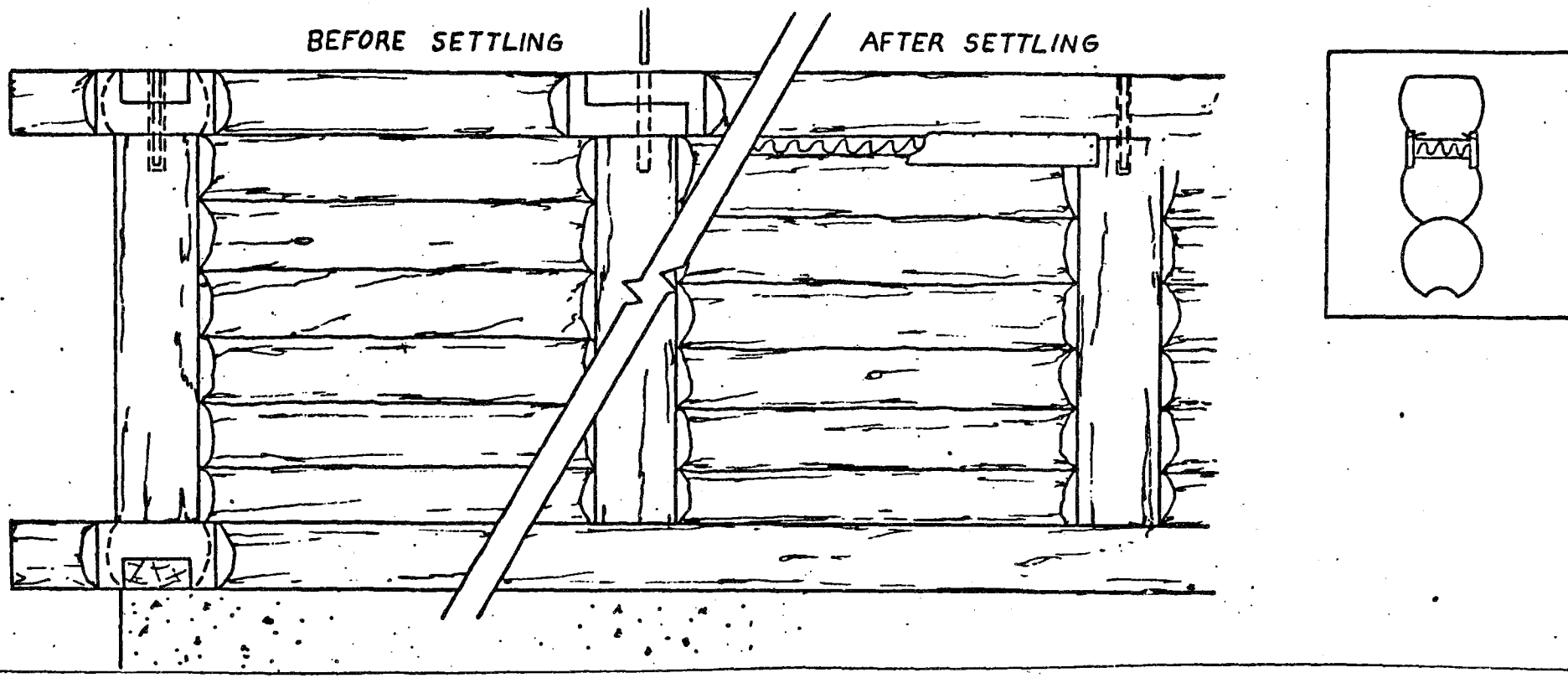
Drawing

TOOLS: Eye and ear protection, chainsaw, tape measure, chalk line, electric drill with 5/8" extended auger bit, handsaw, hammer.

MATERIALS: Plate logs flat-sided on two sides, steel pins, caulking compound, skirting boards, nails.

PROCEDURE:

1. Cut all posts off at a level height.
2. Flat the top surface of all wall panels (4" minimum width) so they are level with the top of the posts. Do so by stretching a taunt chalk line from the tops of the posts


BEFORE SETTLING
AFTER SETTLING

and chalking a line both inside and outside around the building. Make successive bread cuts down to the cut line and remove the waste.~~(refer to Unit V, Job 3 for flat siding details~~.

3. Flat-side the top plate logs, top and bottom to a uniform thickness (refer to the table on Top Plate Sizes).

4. Place side wall top plate logs on the building, splicing over posts where necessary. Allow projection at both front and back of building for roof overhang support (see diagram).

5. Run two beads of caulking between wall and top plate flatted surfaces. Pin top plate to posts.

6. Place gable wall top plate logs on building, splicing over posts where necessary.

7. Half lap top plates at corners.

8. Run caulking beads and pin top plate to posts.

9. Once settling begins it will be necessary to fill the space with insulation and cover with skirting boards (see diagram). Nail these boards to the top plate, not to the filler logs.

QUESTIONS:

1. Refer to the table on Top Plate Sizes and give the top plate depth needed for the following post spacings:

   6'0" spacing = 8'0" spacing =

   7'0" spacing = 9'0" spacing =

2. Why is the skirting board nailed to the top place and not to the filler logs?

Pièce-en-Pièce Construction

[redacted]

JOB 27 -- An alternate method of top plate construction -- A.

In the previous two job outlines, the weight of the roof rested on the vertical posts. With this top plate system the roof weight rests on the horizontal filler logs. This has an advantage of applying pressure on the filler logs and keeping the lateral grooves tighter fitting. The disadvantage is the amount of work required and the lesser degree of wall stability. To arrest the "spreading" forces of the roof onto the walls, tie-beams spanning between and locking the two side wall top plates are recommended, or a truss system which incorporates a tie beam:

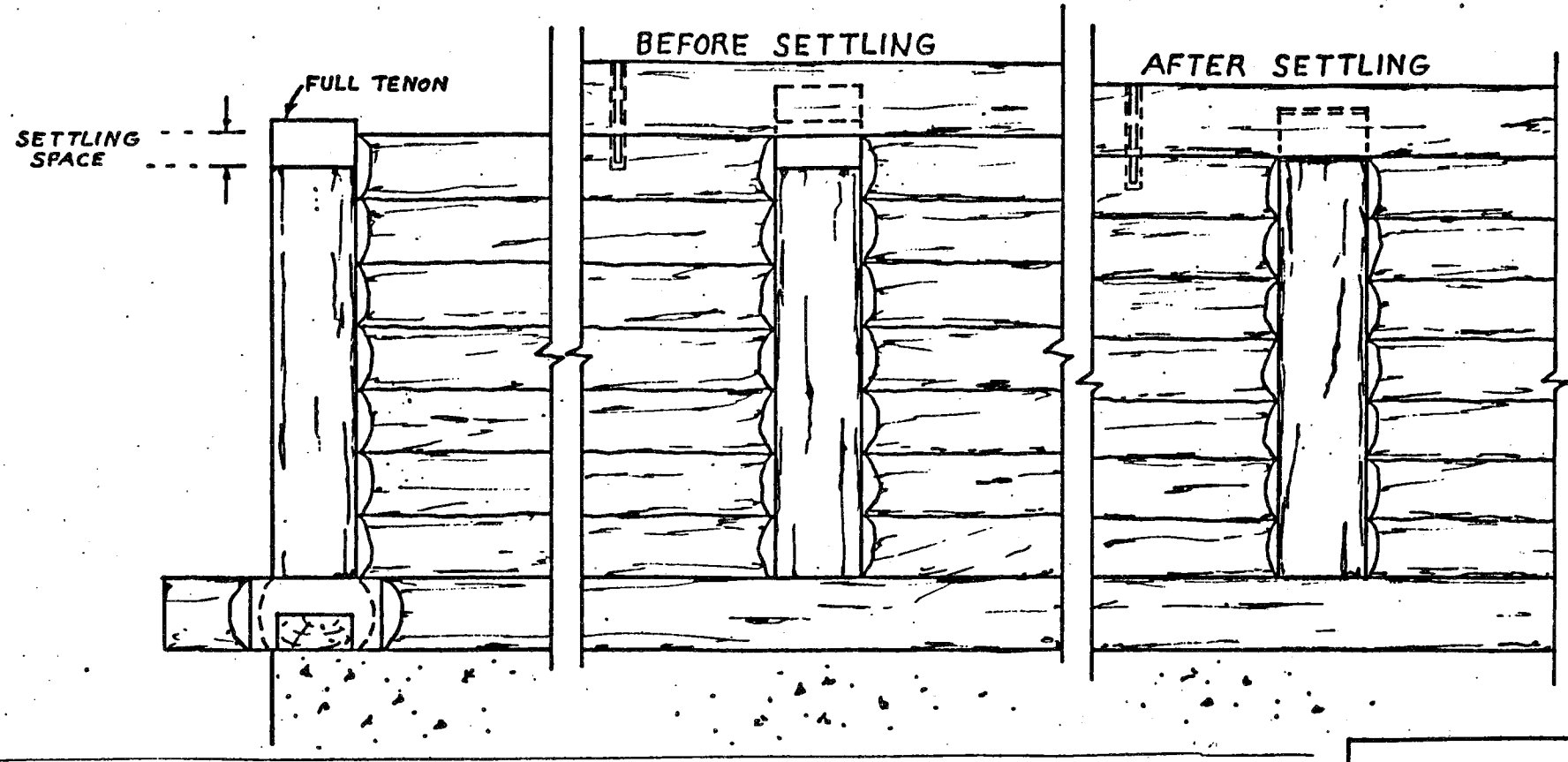
Drawing

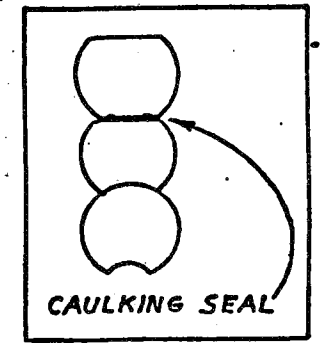
TOOLS: Eye and ear protection, chainsaw, tape measure, chalk line, slick, scribers, electric drill with 5/8" auger bit.

MATERIALS: Plate logs flat-sided on two sides, steel pins, caulking compound, skirting boards, nails.

PROCEDURE:

1. Cut all posts off at a level height.
2. Flat the top log of all the wall panels so they are of a level height 2" below the top of the posts.
3. Calculate the amount of settling the wall panels will incur.
4. Cut full shouldered tenons on all the posts, the depth equal to the calculated settling space plus 2" (see Fig. 1).


BEFORE SETTLING
AFTER SETTLING
FULL TENON
SETTLING SPACE


CAULKING SEAL

5. Flat-side the top plate logs, top and bottom, to a uniform thickness.

6. Chalk a center line on the bottom surface of all top plate logs, then position the two side wall plate logs on the building so that the chalked line centers on each post. If a gable overhang is desired then extend these two side wall plate logs past the wall for overhang support.

7. Trace the post tenons on the underside of the plate logs.

8. Cut the mortises deep enough to handle the settling space, then reposition the plate logs and scribe to fit the filler logs.

   NOTE: After the top plate is scribed to fit the filler logs there should still be enough tenon to adequately take care of the settling.

9. Place the gable wall top plates on the building so that each end rests on the fitted side top plate.

10. Half lap these top plates in place.

11. Trace the post tenons on the underside of the plate logs.

12. Cut the mortises deep enough to handle the settling space, then reposition and scribe to fit the filler logs.

13. Pin the plate logs to the filler logs.

14. Fix skirting boards to cover post tenons.

QUESTIONS:

1. Why is it a good idea to use dry filler logs?

2. Where is the settling space taken care of?

3. Why are tie-beams recommended using this top plate method?

4. Are the skirting boards nailed to the top plate or to the post?

5. When scribing the top plate to meet the filler logs the scriber setting is adjusted to the widest gap (+ 1/4") between the plate log and filler logs. Why is the scriber setting taken in this fashion?

ASSIGNMENT:

Construct a top plate for the building using the above procedure.

Piéce-en-Piéce Construction

[redacted]

JOB 28 -- An alternate method of top plate construction -- B.

The job title here is somewhat misleading for the actual top plate construction is identical with that outlined in Job 27. The difference with this method of construction is that the roof rests on both the posts and the filler logs. The settling space is dealt with at the base of the posts in a modified version of a tenon and mortise joint. The posts are supported on top of either wedges or screwjacks and are lowered as the filler logs settle:

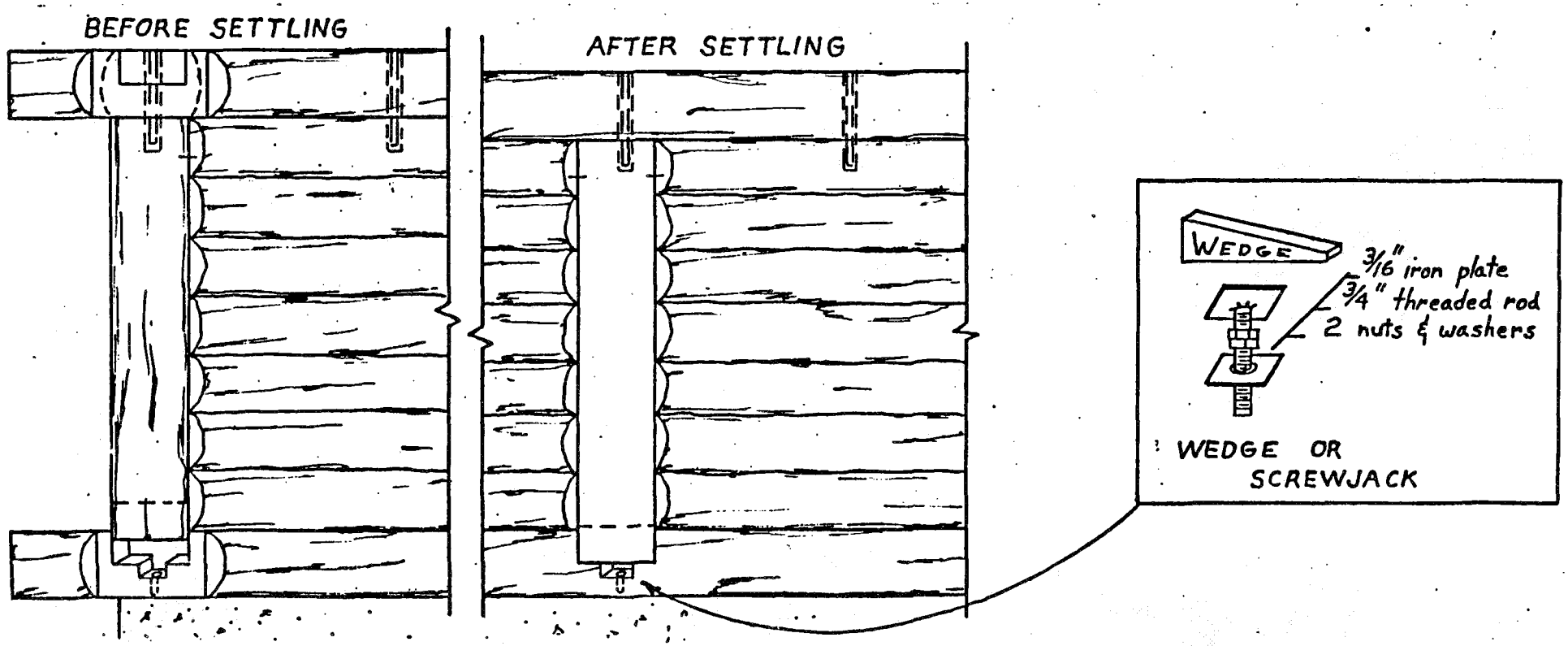
Drawing

TOOLS: Eye and ear protection, chainsaw, tape measure, chalk line, scribers, electric drill with 5/8" auger bit, hammer.

MATERIALS: Screwjacks or wedges, steel pins, top plate logs.

PROCEDURE:

1. Layout and cut full-shoulder tenons on all post bases. Length of tenon to equal calculated settling of filler log panels "plus" two inches.
2. Cut a mortise to fit the post tenon in the corner of the sill log nearest a door. The mortise depth is to equal the post tenon length "plus" an allowance for a screwjack or wedge (see diagram).


BEFORE SETTLING
AFTER SETTLING
WEDGE
3/16" iron plate
3/4" threaded rod
2 nuts & washers
WEDGE OR
SCREWJACK

3. Place a wedge or screwjack into this mortise allowance.

4. Position a corner post so it seats fully into the mortise -- plumb and brace securely.

5. Assemble the filler log panels so they fit snugly up against the post -- keyed together with the spline.

6. Cut another mortise in the sill log to accommodate the wedge or jack and post.

7. Repeat placement procedures until walls and posts are erected on building foundation.

8. Jack or wedge all posts so they protrude only 1 1/2" into their mortises (see diagram).

9. Place the log top plate using procedures outlined in Job #26. However, to obtain a tighter fit between top plate and wall, scribe down after placing flatted surfaces together.

10. Place a reference mark on each post and wall panel adjacent from each other. As the wall panels settle simply lower the posts until the reference lines match up.

QUESTIONS:

1. Why is it a good idea to use dry filler logs?

2. If using screwjacks, why should the threads be well greased?

3. Would a settling allowance be necessary for any support posts inside the building?

4. What is the purpose of reference marks?

ASSIGNMENT: Erect posts, walls and top plates, as shown above, so that the settling allowance is dealt with at the sills.

Piéce-en-Piéce Construction

[redacted]

JOB 29 -- Piéce-en-piéce with round notch corners.

Many people like the construction technique of piéce-en-piéce but also like the notched corners of long log construction. Attempts have been made to combine the two but what frequently happens is a sagging at the corners caused by shrinkage of the horizontal notched logs while the posts remain at their fixed height. Outlined below is a cantilevered method which allows the free floating notched corners to settle while the roof is still supported by the posts. When incorporating notched corners a top plate as outlined in Jobs 25 or 26 is recommended:

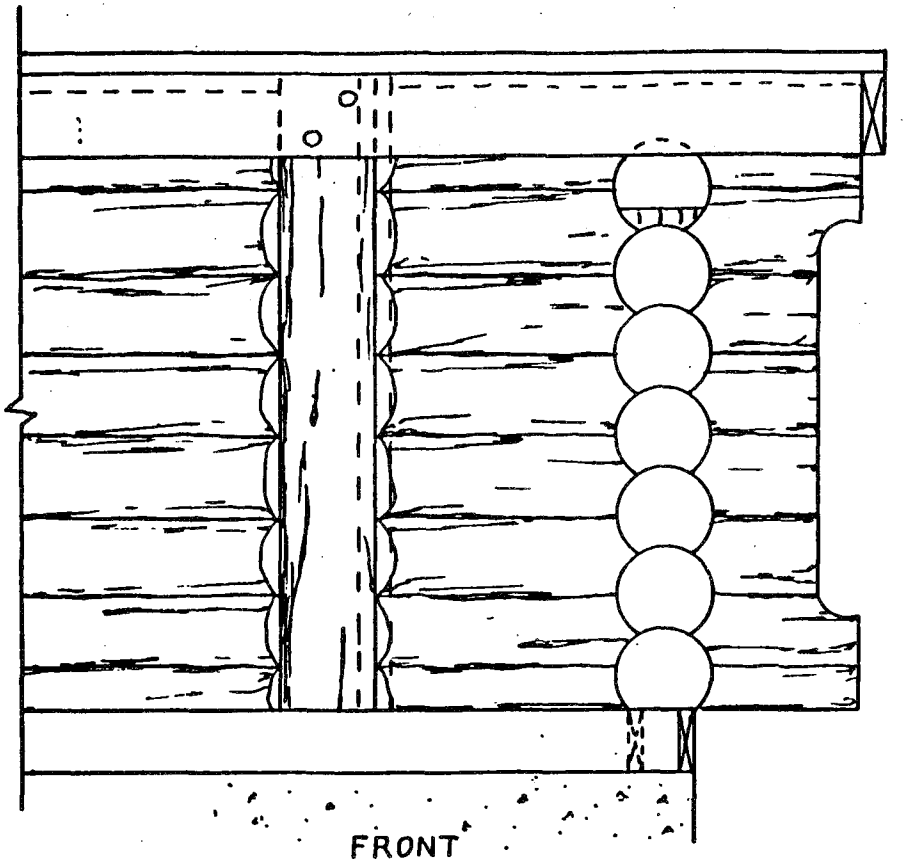
Drawing

TOOLS: Eye and ear protection, chainsaw, scribers, tape measure, level, plumb-cutting jig, hammer.

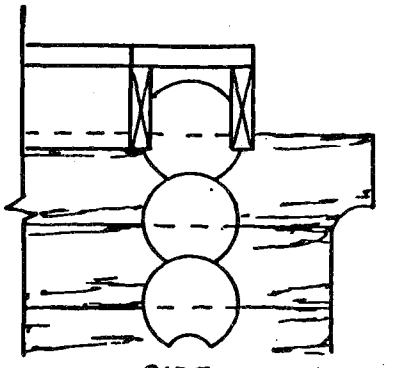
MATERIALS: Glue, nails.

PROCEDURE:

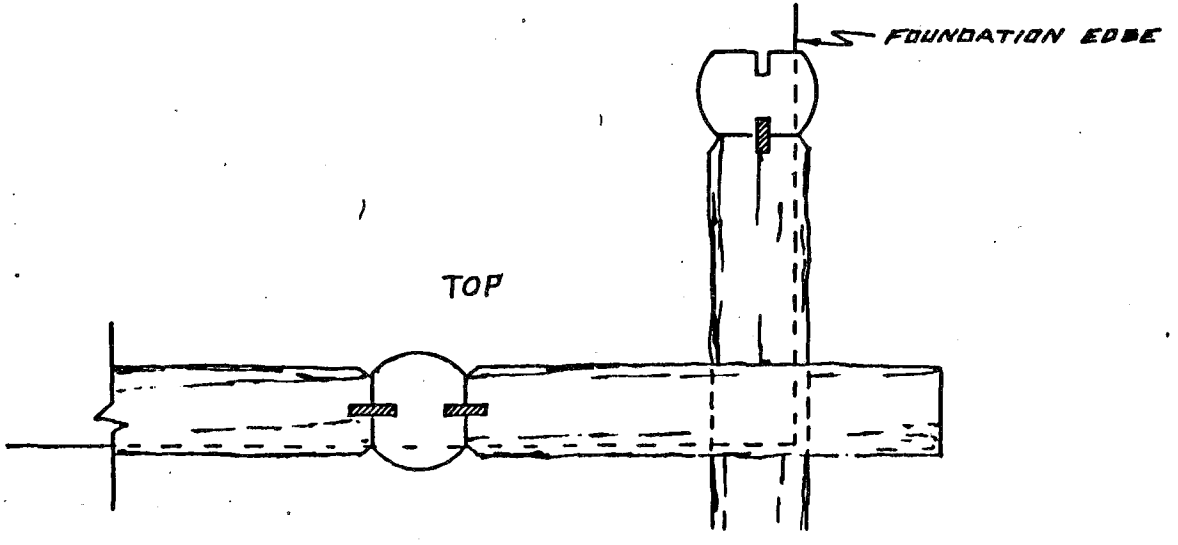
1. Construct a small notched building 5'x5' square.
   Plumb cut into segments to form the building's corners (refer to jig used in Job 11).
2. Router a keyway groove down the center of the notched logs. A spline will join them to the posts. Erect the notched



FRONT



SIDE



TOP

corner segments on the sill support in same manner as with filler logs (insulation is not necessary).

Note that the top log is very large. This is to accommodate notching over the log below with a squared portion left between the trim boards for settling. If the log is too small then flat the top and laminate a squared beam on top.

When placing the top plate (refer to Job 25 or 26) run it out over the notched corners. It is this top plate that will bear any roof weight applied.

QUESTIONS:

1. What is the purpose of constructing a small notched building?

2. Why are only the top plates outlined in Jobs 25 or 26 adequate for round notch corners.

3. What would be the result after settling if the roof weight was directly on the notched corners?

ASSIGNMENT:

Following placement of the building's walls, but prior to placing the top plate, join round notch corner sections to the building's corners.

Piéce-en-Piéce Construction

JOB 30 -- Piéce-en-piéce for a basement wall.

Often a basement for a house will be constructed so that one wall has a direct ground access from outdoors. A piéce-en-piéce wall can add continuity to the entire building with no worry of settling problems. Below is a diagram showing log basement wall with both dimensional and log top plates and both dimensional subfloor and log sills. This basement foundation is good for supporting a long log constructed building as well:

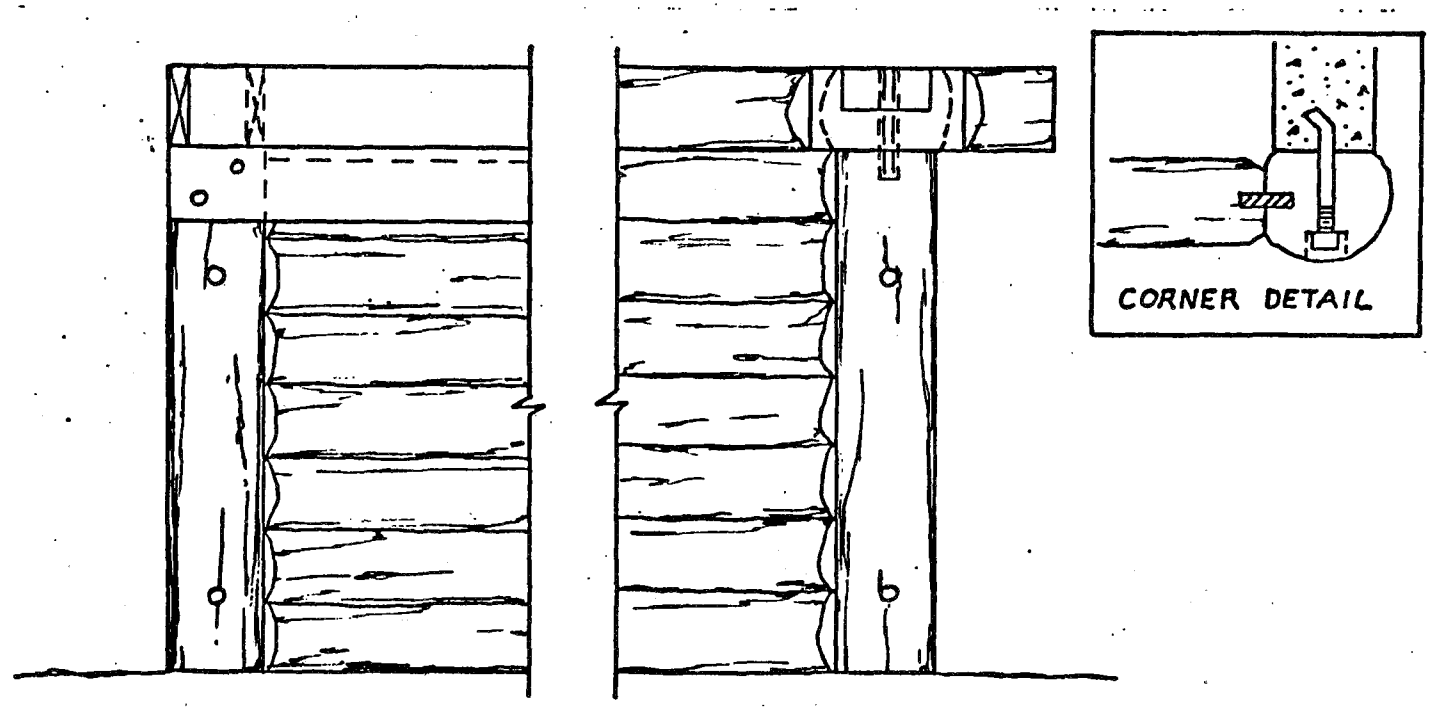
Drawing

TOOLS: Eye and ear protection, chainsaw, electric drill with 5/8" auger bit, framing tools.

MATERIALS: 5/8" lag screws, threaded bolts, 1/2" steel pins.

PROCEDURE:

1. Construct the concrete side wall 8" - 10" shorter than planned dimensions and embed two 5/8" threaded bolts into the wet concrete face (see inset). A 10" thick post will bolt onto the concrete face to make up the difference in perimeter wall dimension.
2. Apply a coat of tar to concrete face and bolt corner posts in place.
3. Assemble filler log panels, working toward the door.


CORNER DETAIL

4. Place dimensional or log top plate (refer to appropriate jobs).

5. Place dimensional subfloor or log sills (refer to appropriate jobs).

6. Construct long log or piéce-en-piéce walls on building's floor system (refer to appropriate Units).

QUESTIONS:

1. Why would the top plate systems mentioned in Jobs 27 and 28 be wrong for this job?

2. Will the vertical posts shrink in size and cause the floor to sag?

ASSIGNMENT:

Construct a piéce-en-piéce basement wall.

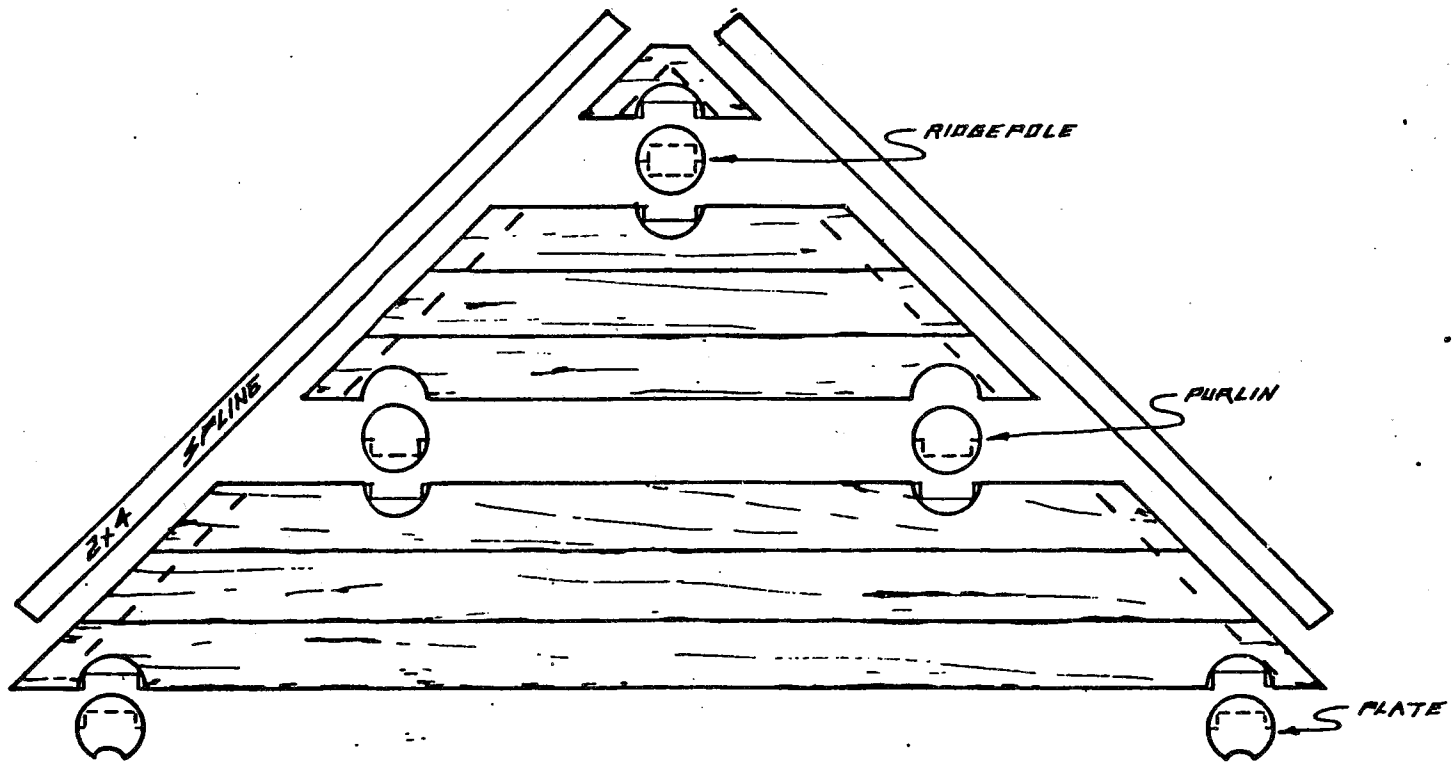
Roof Systems

JOB 1 -- Parts of a log gable end.

It is assumed that to this stage the builder has completed all the necessary jobs relating to ceiling joist and tie-beam placement and the top plates are in place and level. Since most roof styles are dictated by the gable end shape, and it is the gable ends which support the structural roof support members (ridgepole, purlins, rafters) and roof coverings, it is logical that we concern ourselves first with the construction of the gable ends.

This job outline displays the diagram of a log gable end illustrating its component parts. Log gable ends are usually built for aesthetic and economic reasons -- looks good and materials are cheap. However, there are disadvantages to this style of construction --- log lengths unsupported on the ends are difficult to manage and work with; vertical columns of logs at a substantial height off the ground are a potential danger; well seasoned logs should be used or else the heat accumulation near the roof peak (heat rises) causes rapid drying of the short log lengths which result in excessive checking; also the settling of the log gable ends causes a slight change in the roof pitch making preventive measures necessary. With the builder aware of these few disadvantages he/she can easily work them out -- even in some cases completely construct the gable ends with fitted purlins and ridgepole right on the ground. All the information needed for safe, simplified construction of log gable ends are contained in the job procedures following:

Drawing


RIDGEPOLE
PURLIN
2x4
SPLINE
PLATE

Roof Systems

[redacted]

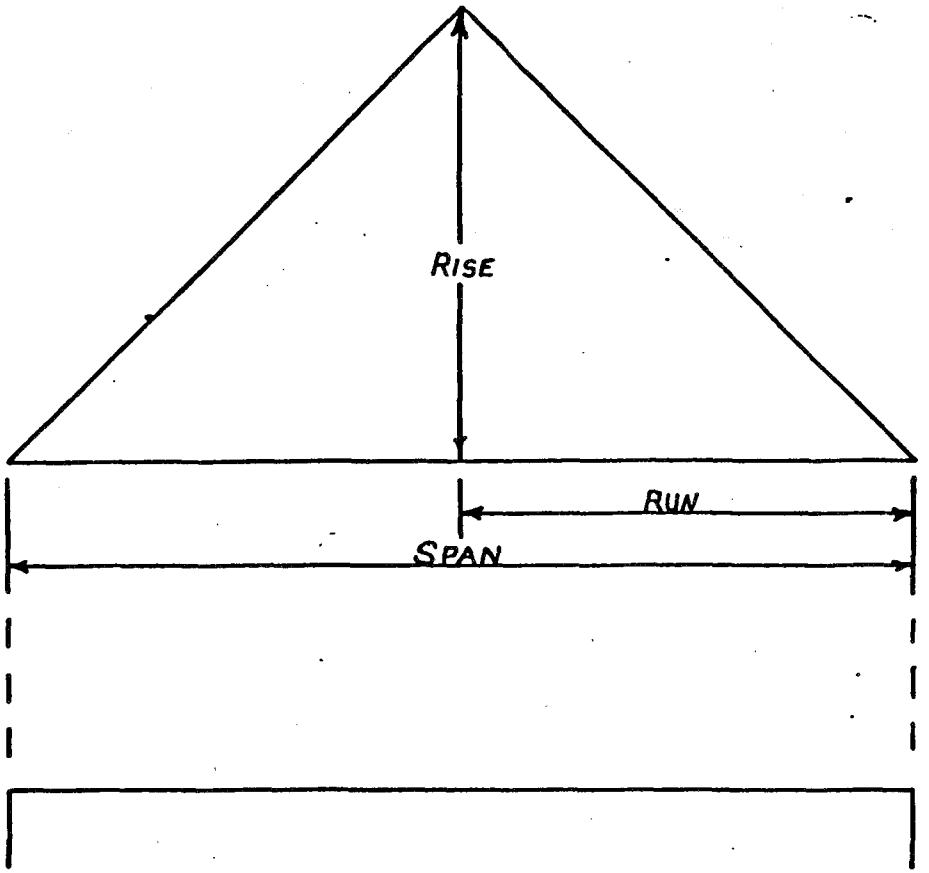
JOB 2 -- How to calculate the building's span, run, rise, purlin and ridgepole locations.

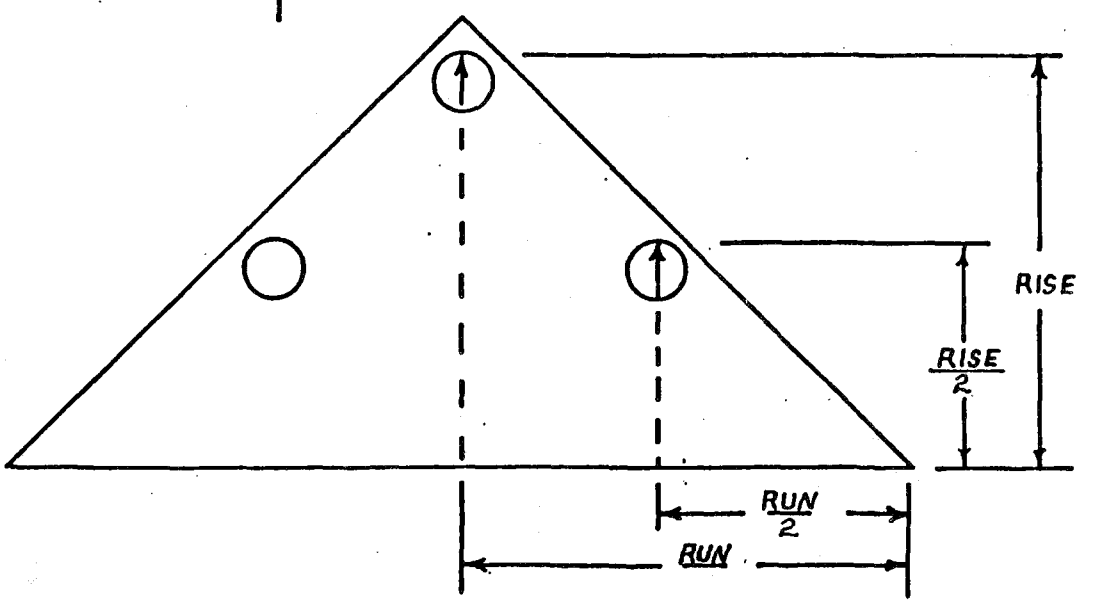
There should be a set of working blueprints which act as a guide in the construction of your building. For purposes of instruction let's take an example building 30' x 40' with a roof slope of 5/12. Depending on the size and roof of your particular building project, the figures above might change. However, the method of calculation remains the same. To locate the plate line refer to the methods outlined for the type of gable end desired:

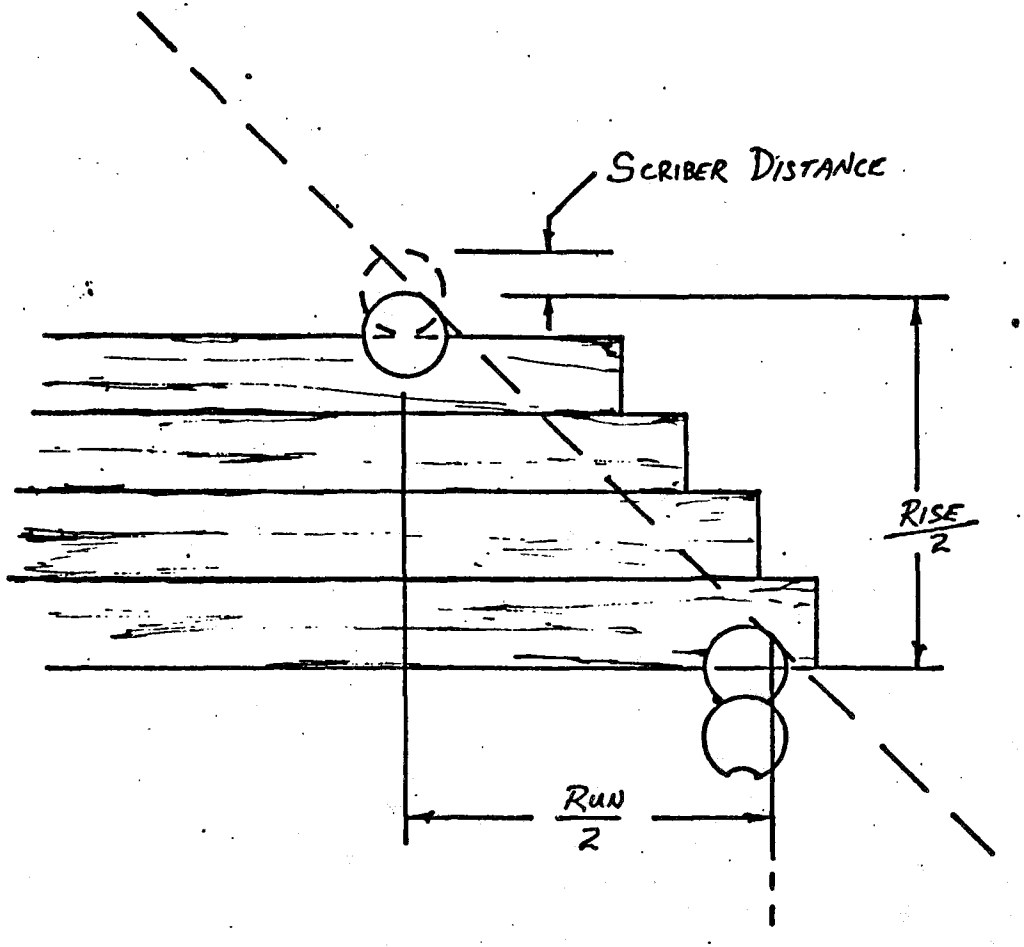
Drawing

PROCEDURE:

1. Span is calculated from the width of the building. Because a log wall has no squared surfaces the foundation outer edges provide this measurement (example bldg. span = 30'). Be aware that some commercial log house plans use wall log centerlines to measure distances from. If measured from these centerlines the span would be less than that of the foundation. The correct span measurement is taken from the foundation.
2. Run is half the span. Therefore Run = $2\overline{)30}$ = 15'.
3. Rise is the distance measured from the plate line to the peak. To find the rise a calculation must be made from


RISE
RUN
SPAN


RISE
RISE/2
RUN/2
RUN


SCRIBER DISTANCE
RISE
2
RUN
2

the given roof slope 5/12. Standard carpentry is still based on the imperial system of 12" units. A 5/12 slope means for every unit of 12" run the roof slope rises 5".

With our example building the run is 15'. Therefore:

15 (units of 12") x 5" = 6'3" rise.

4. Location to the top of the ridgepole is the distance of run = 15' plus the vertical distance of rise - 6'3".

5. Location to the top of the purlins are the distance of $\frac{\text{run}}{2}$ = 7'6" plus the vertical distance of $\frac{\text{rise}}{2}$ = 3' 1½".

6. To determine the size of ridgepole and purlins needed for a given span refer to the Span Table in the diagram.

QUESTIONS:

1. Given a building 26' x 35' with a roof slope of 6½/12;

   a) What are the building's span, run and rise?

   b) What are the ridgepole and purlins exact locations to its top surface?

   c) Determine the midspan sizes of ridgepole and purlins needed to span 16'.

ASSIGNMENT:

Calculate the span, run, rise and the ridgepole and purlin locations from the blueprints on your building.

Roof Systems

JOB 3 -- How to build log gable ends on a long log building -- with and without pole rafters.

It is assumed that the building has been constructed with fairly level side plate logs and the necessary span, run, rise calculations and ridgepole and purlin locations are established. Below are examples of two buildings. Note how the plate line varies when pole rafters are added:

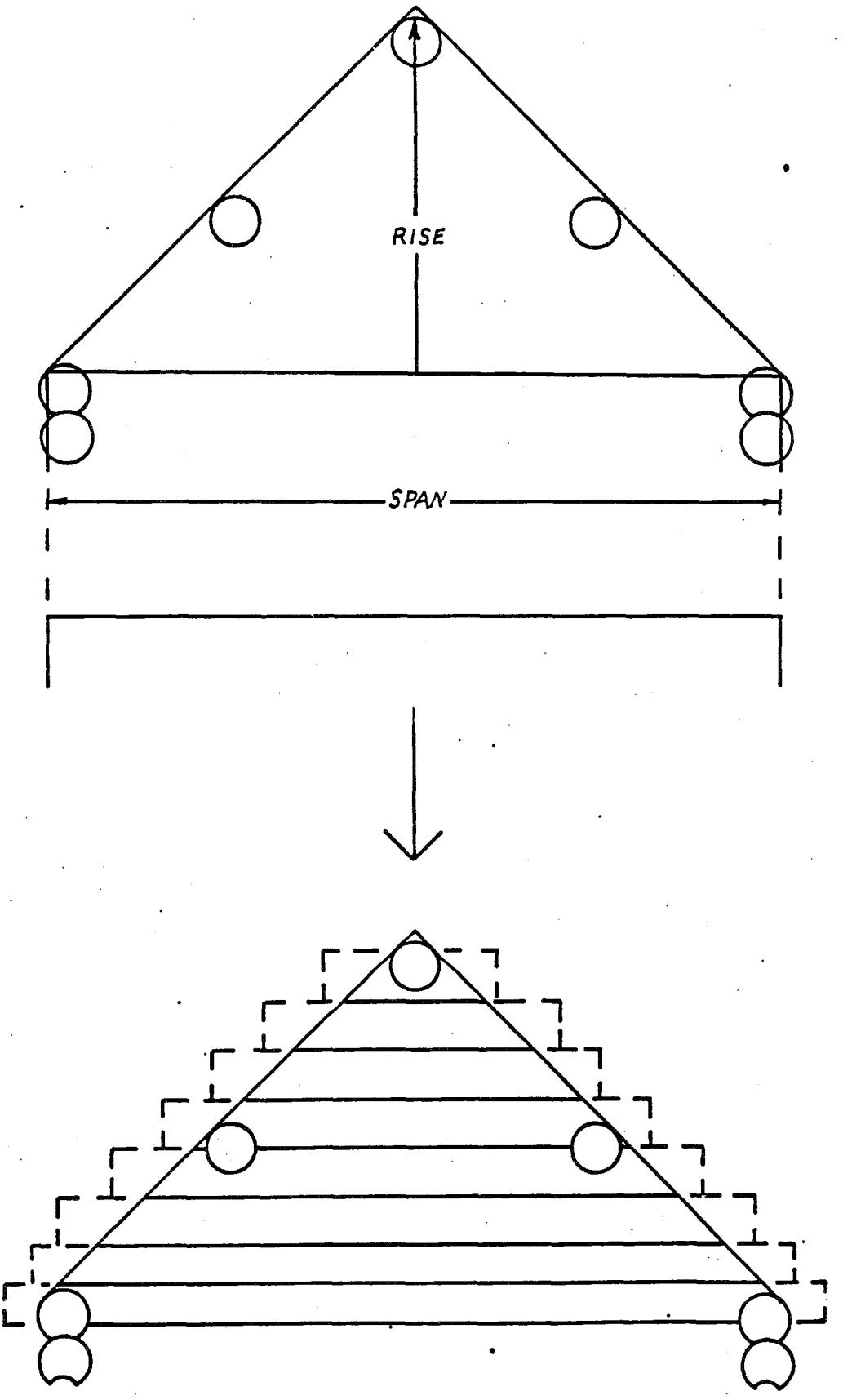
Drawing

TOOLS: Eye and ear protection, chainsaw, tape measure, chalk line, scribers, spirit level, hammer, drill with 5/8" auger bit.

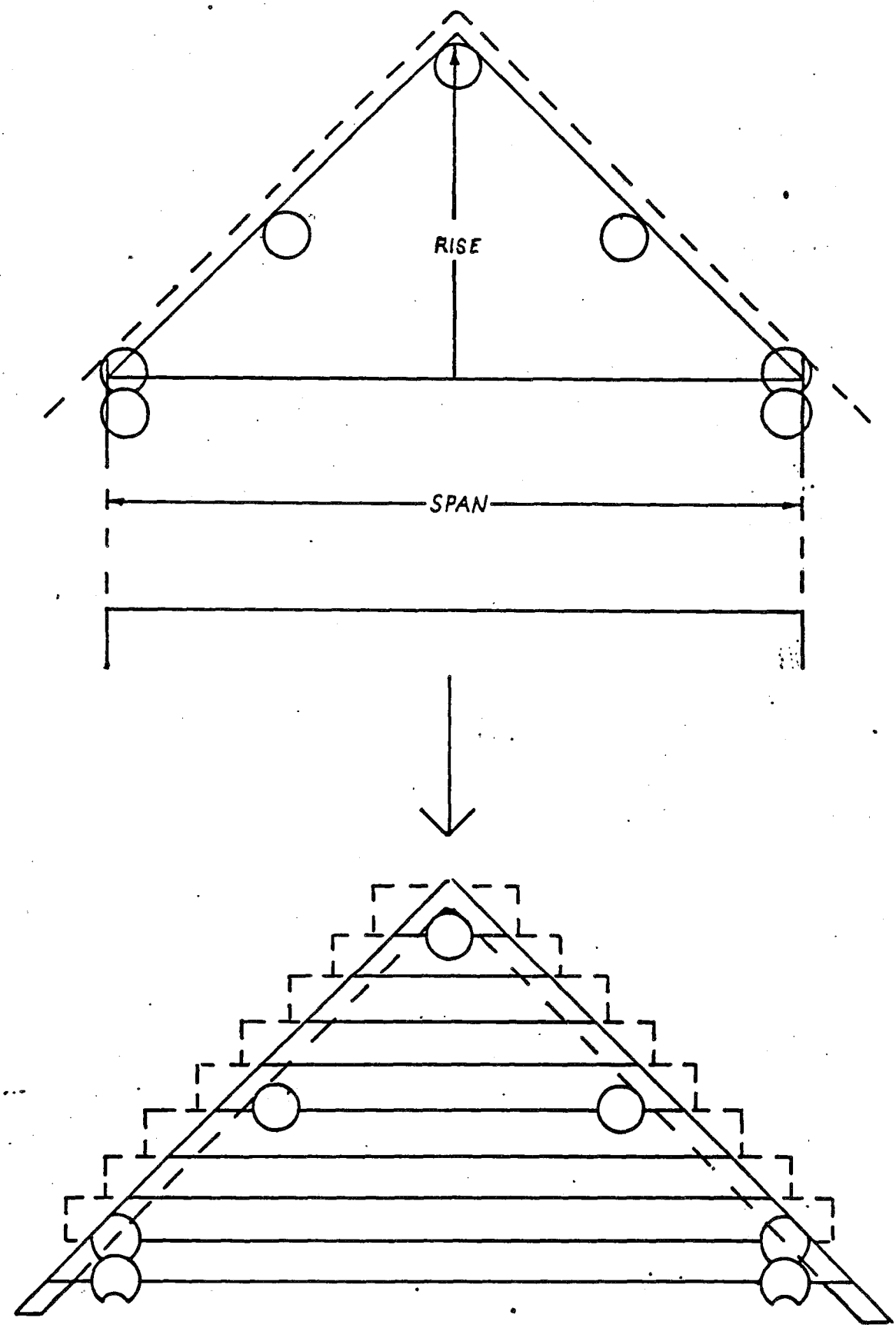
MATERIALS: Steel pins, insulation, bracing.

PROCEDURE:

1. Transfer the building's width from the foundation corners onto the log ends on the two gable sides. Chalk vertical lines (see A & B). This establishes the building's span.
2. Building A is without pole rafters. Therefore establish a "level" plate line (measure up from floor) near the top height of the two wall plate logs (see A). Repeat for the opposite gable end. It is important to have these two plate lines at a level, equal height from the foundation or floor.



A (no pole rafters)



B. (with pole rafters)

3. Establish the building's run and rise. Then calculate the ridgepole and purlin locations.

4. Build up the log gable ends, pinning and sway bracing as you go. Place corbels if needed or desired.

5. Once the gable end has been built up to receive the purlins (see Fig. 3), square notch in place, ~~(refer to Unit VI, Job 10 for procedure).~~ Repeat procedure for ridgepole. This system is constructed to receive 2" tongue & groove decking nailed to the ridgepole purlins and plate log. The decking continues past the plate log to provide eve overhang.

6. Building B has pole rafters. Therefore, establish a "level" plate line at the mid point height of the two wall plate logs (see B). Repeat for the opposite gable end. It is important to have these two plate lines at level, equal height. Lowering the plate line allows for "burying" the pole rafters at the plate log. In this way eve blocking is not necessary.

7. Construct gable ends in the same manner as outlined for building A. This method is constructed to receive horizontal decking nailed to the pole rafters and continuing down past the plate log to provide eve overhang.

QUESTIONS:

1. Why does the plate line lower when pole rafters are used?

2. What provides the eve blocking when constructing with pole rafters?

3. What provides support for the gable overhang?

4. What could happen if extra length for trimming was not allowed for in placing the log gable ends?

ASSIGNMENT:

Construct log gables with ridgepole and purlins (pole rafters optional).

Roof Systems

[redacted]

JOB 4 -- How to cut the gable end roof slope using a jig.

Cutting the gable end roof slope is quick and accurate using the guide jig outlined below. The procedure described is for a roof using pole rafters. If rafters are omitted simply piece the guide rails between the ridgepole, purlins and plate:

Drawing

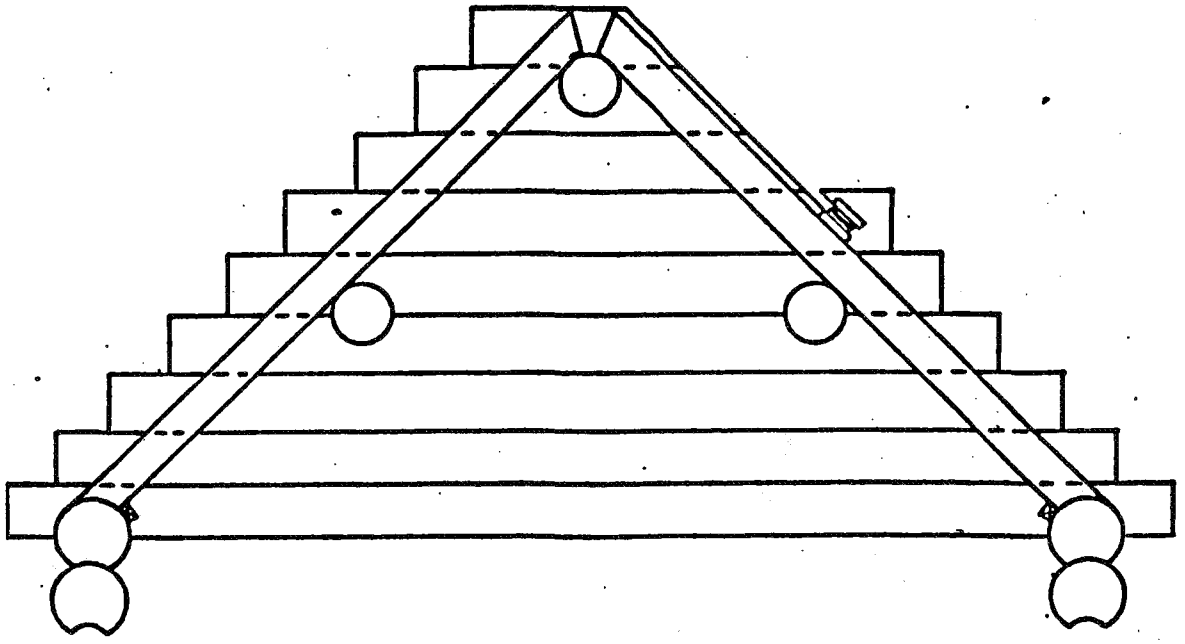
TOOLS: Eye and ear protection, chainsaw, hammer.

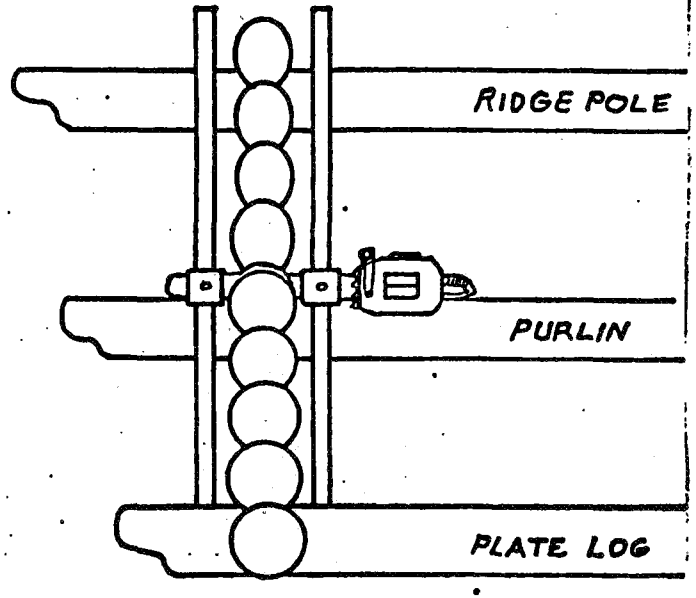
MATERIALS: 1/2" carriage bolts, 3/4" plywood pads, guide rails (rafter thickness less 3/4"), nails.

PROCEDURE:

1. Attach plywood pads to chainsaw bar as shown in Fig. 1. The spacing may vary according to the size of building logs.
2. Space and nail guide rails parallel to each other on either side of the gable end as shown in Fig. 2. The guide rail spacing will be the same as the bar pad spacing.
3. Starting at the peak, cut the gable ends down to the plate (see Fig. 1). Have someone apply moderate pressure to the pads, using two sticks.

QUESTIONS:




RIDGE POLE
PURLIN
PLATE LOG

1. Why are the guide rails the thickness of the pole rafters less 3/4"?

2. What can happen if the pads slip off the guide rails?

3. What is the purpose of the plywood pads bolted onto the chainsaw bar?

ASSIGNMENT:

Cut the log gable ends roof slope using the outlined jig.

Roof Systems

JOB 5.-- How to insert a log gable end nailing spline.

The nailing spline is an essential part of a log gable end. The roof decking should be nailed into this spline when it passes over the gable ends, so as to not inhibit the settling process of the gable end. Below is outlined two examples of a nailing spline:

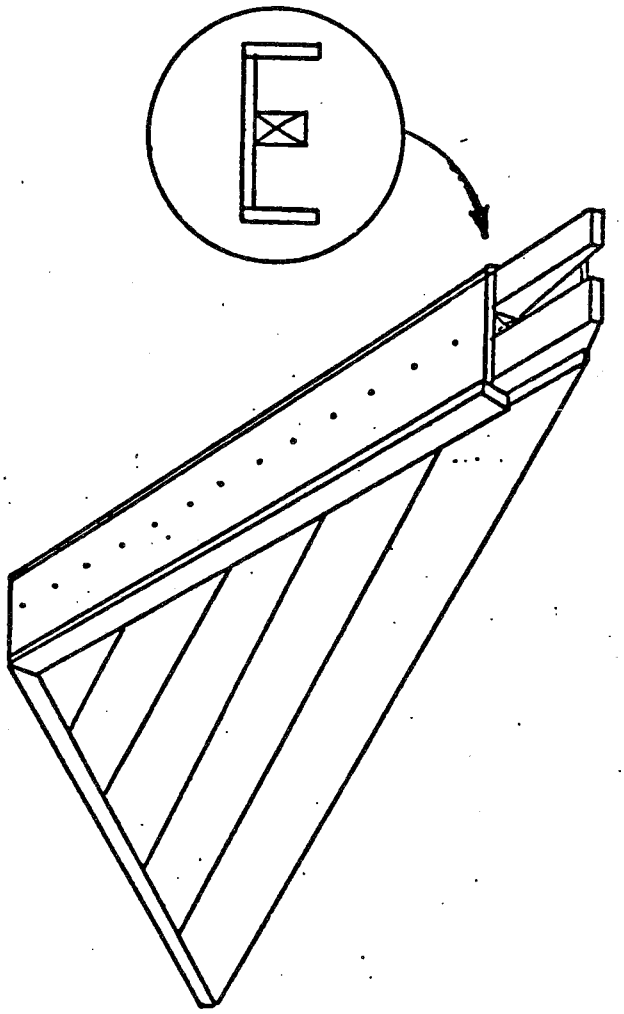
Drawing

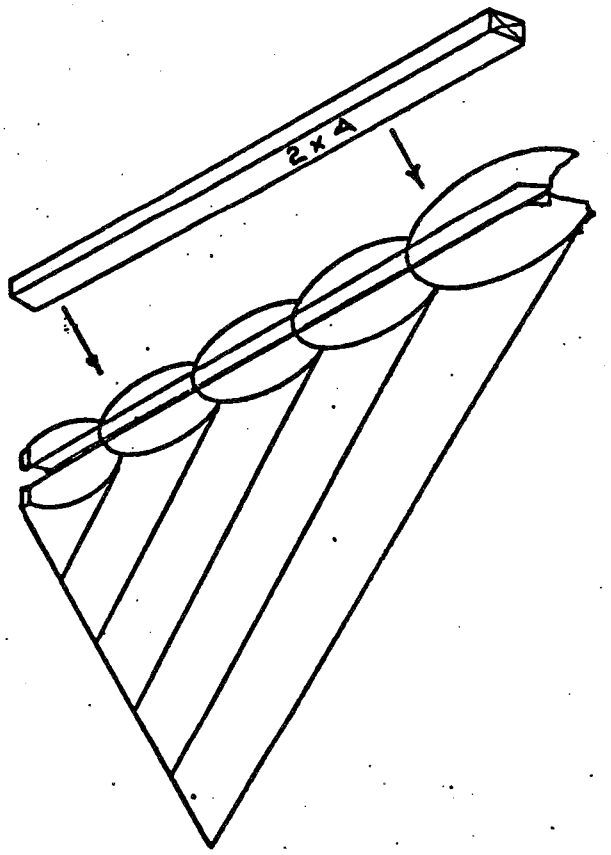
TOOLS: Eye and ear protection, chainsaw, chalk line, hammer, tape measure, handsaw.

MATERIALS: 2" x 4"s, 1" x 8"s, 1" x 6"s (rough cedar), nails.

PROCEDURE:

1. Fig. 1 shows a 2" x 4" spline. Chalk lines down the center of the sloped surface and cut a groove so that the spline comes flush with the surface. Making repeated chainsaw cuts to depth, then honing the groove with the bar nose works well.
2. Fig. 2 shows a boxed spline. This method necessitates cutting the central groove and ledges as well so the box fits the length of the gable slope. Although more work this has a better finished appearance and covers any shrinkage discrepancies.




2 x 4

QUESTIONS:

1. What are two purposes of the spline?

2. When inserting a boxed spline should the guide rails be:

   a) the same thickness as the rafters?

   b) 3/4" less than the thickness of the rafters?

   c) 1½" less than the thickness of the rafters?

   d) 3/4" more than the rafter thickness?

ASSIGNMENT:

Insert a nailing spline into the log gable ends.

Roof Systems

[redacted]

JOB 9 -- How to construct log gable ends on a piéce-en-piéce building.

Placing gable ends on a piéce-en-piéce building is very similar to that of a frame building in that all measurements may be taken from a flat top plate. Given the flat, squared-up top plate surface it is easy to erect log gable ends. And it's even easier to construct the gable ends on the ground, and afterwards dismantle and assemble on the building:

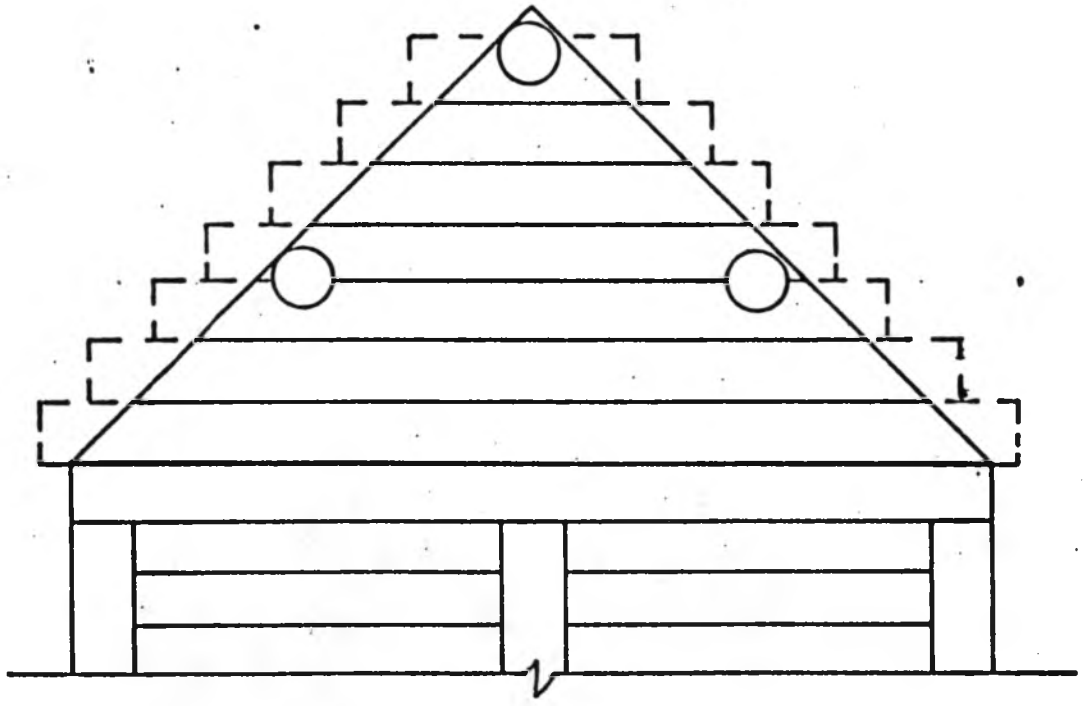
Drawing

TOOLS: Eye and ear protection, chainsaw, tape measure, chalk line, scribers, spirit level, hammer, electric drill with 5/8" auger bit.

MATERIALS: 5/8" lag screws, insulation, tar or tar paper, bracing, 1/2" steel pins, roof slope cutting jig.

PROCEDURE:

1. Establish the building's run and rise. Then calculate the ridgepole and purlin locations as outlined in Job 2.
2. Flat the bottom surfaces of the first gable end log, leaving extra length for later trimming.
3. Pin or lag screw this first log to the top plate. Provide an adequate moisture barrier of tar or tar paper between the top plate and this first log. A thin strip of fiberglass



insulation will also help to fill any irregular voids between these two surfaces.

4. Provide adequate flashing between these two surfaces.

5. Build up the log gable ends, pinning and sway bracing as you go. ~~Place corbels if needed as desired (refer to Unit VIII, Job 11 for procedures).~~

6. Once the gable end has been built up to receive the purlins, square notch in place. Repeat procedure for ridgepole.

7. Cut roof slope and insert nailing splines.

*NOTE: a) Run the decking past the plate log to provide an overhang.

b) It is possible to construct both log gable ends with purlins and ridgepole on the ground and later disassembling and erecting on the building. Simply construct each gable end on leveled posts, embedded in the ground, and adhere to the building's perimeter dimensions.

QUESTIONS:

1. What could happen if extra length for trimming was not allowed for in placing the log gable ends?

2. Why is it a wise idea to sway brace?

3. What are two reasons for square notching rather than round notching the purlins and ridgepole in place?

4. Is it a wise idea to use dry logs for the gable ends? Why?

ASSIGNMENT: Construct log gables notching the ridgepole and purlins in place.

Roof Systems

[redacted]

JOB #7 -- How to layout and frame gable ends with ridgepole, purlins and windows for a piéce-en-piéce building.

This procedure of laying out and framing gable ends on a subfloor is almost identical with that of a long log building. What you don't have to deal with here is the separate side and gable wall plate levels. Instead you have only one top plate level:

Drawing

TOOLS: Rafter square, adjustable T bevel, chalk line, tape measure, pencil, hammer.

MATERIALS: Framing materials, window, tar or tar paper, nails.

PROCEDURE:

1. Layout on the subfloor the building's span, run, rise and roof slope lines (see Fig. 1).
2. Aligning the body of a framing square on the roof slope line, measure down the tongue the specified thickness for the purlins. Mark in several locations and chalk these lines (see Fig. 2).
3. Locate ridgepole and purlins between these two lines.
4. Frame the entire gable end on the subfloor, using these lines as guides as shown in Fig. 3.

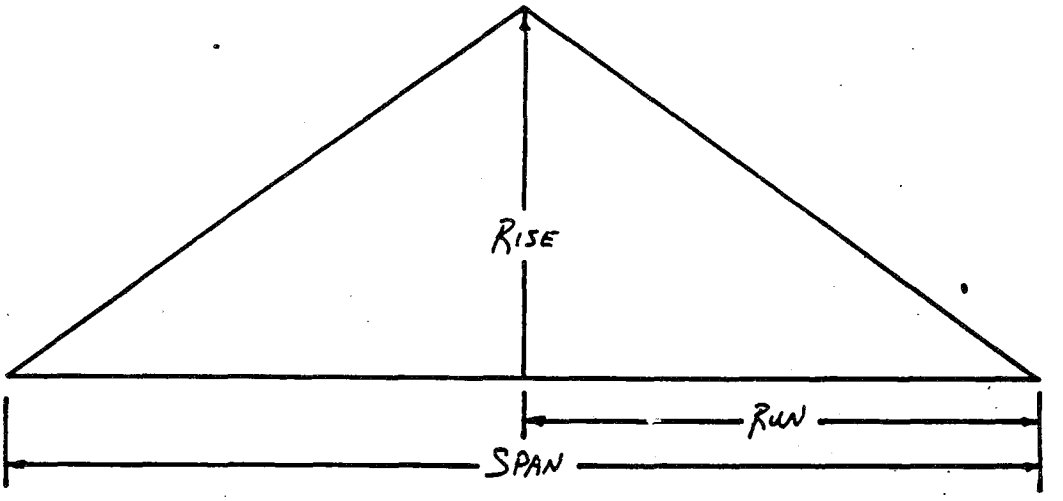
5. Flat-side the ridgepole to the angle given. The purlins need only be flat sided and squared where they pass through the gable end pockets.

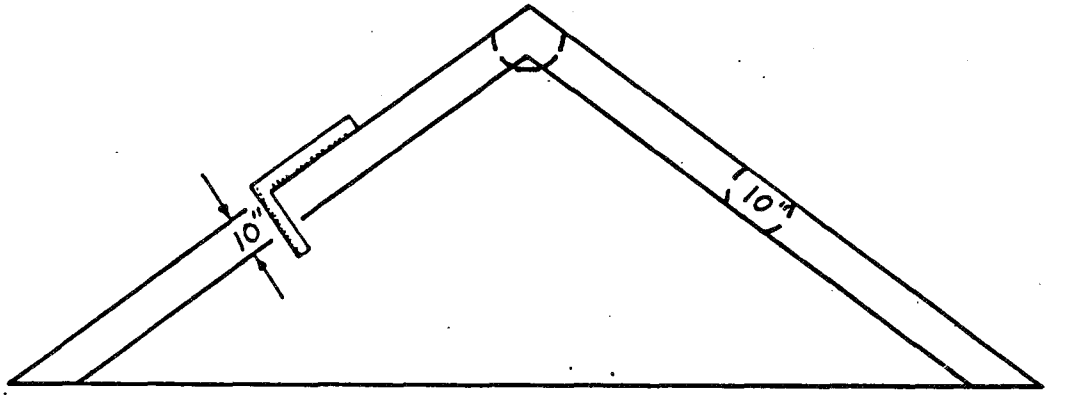
QUESTIONS:

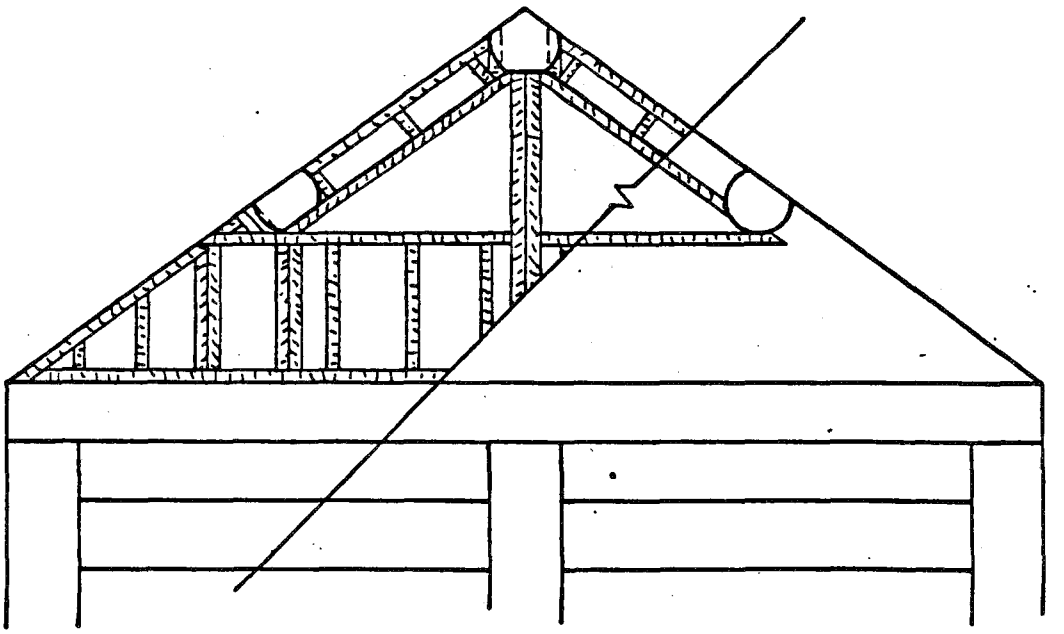
1. What advantages are there in using frame rather than log gable ends?
2. Why are the purlins and ridgepole squared where they pass through the gable end pockets?

ASSIGNMENT:

Layout and construct frame gables with ridgepole and purlins for your building.


RISE
RUN
SPAN


10"
10"



Building Services and Finishing

JOB 1 -- Electric Wiring -- How to layout and pre-drill for electrical receptacle outlets.

It is essential to preplan for the electrical to avoid unsightly exposed wiring. This planning should be done in consultation with an electrician and should comply with the Residential Standards Building Code (refer to "Electrical Code Simplified) by P.S. Knight). Most of the electrical wiring runs under the floor to feed the receptacle outlets as the majority of outlets are located in the first or second wall log. This job procedure will outline the layout and pre-drilling necessary to install electrical wiring:

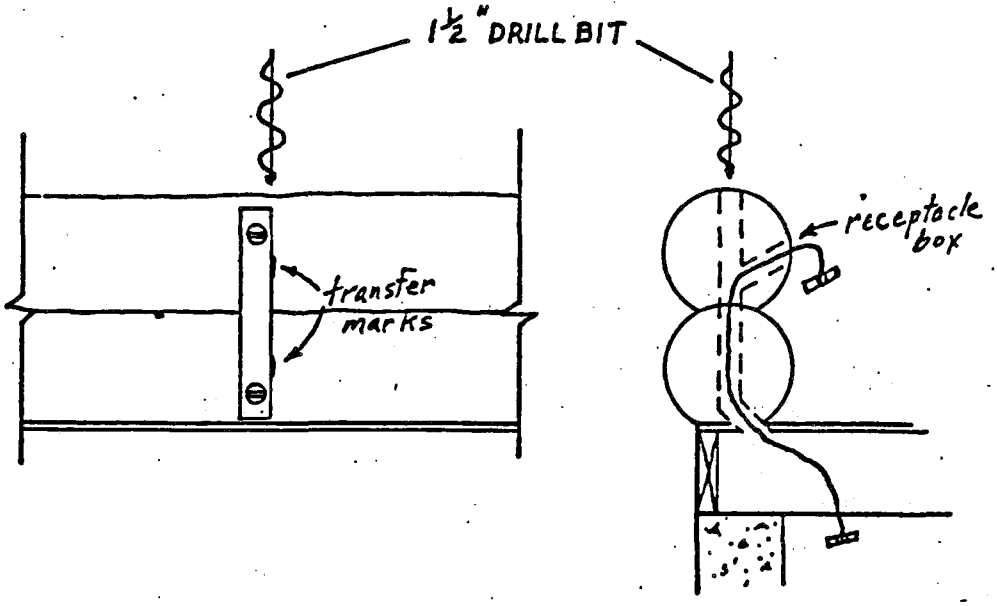
Drawing

TOOLS: Eye protection, electric drill with 1½" auger bit or 1½" hand auger bit, spirit level, pencil.

MATERIALS: Strong cord or string, coathanger wire.

PROCEDURE:

1. Place the first log on the subfloor and mark out drilling locations. Locate wall receptacles no more than 12' apart and within 6' from doors or other openings.
2. Drill down through the center of the first log to gain access to the crawl space.
3. Using a level, mark on the side of the log where the hole is, then fit the second log in place.


1½" DRILL BIT
transfer marks
receptacle box

4. Using a level, transfer this mark onto the second log (see Fig. 1) and drill down to meet the hole beneath. Note the lateral groove covers the hole if drilled on the centerline of the log.

5. On the second log, drill in to meet the vertical hole (see Fig. 2). The receptacle box will be located here.

6. Using the coathanger wire, fish a length of cord from under the floor out the receptacle hole. Tie a stick on either end so the cord won't pull through (see Fig. 2). Later the electrical wire will be tied onto the cord and pulled through to service the receptacle.

7. Alternatively feed the wire in place now but do not connect until an inspection has been made.

QUESTIONS:

1. Why should an electrical wire not run down the lateral groove to service a receptacle downstream?

2. Is conduit necessary?

3. By locating the drill hole down the centerline of the log, how is the hole covered?

ASSIGNMENT:

Mark out and drill for all receptacle outlets, inserting the cord to pull the wiring through.

JOB 2 -- Electrical Wiring -- How to run switch and overhead wiring.

Nearly all electrical switches are located near doorways, making pre-drilling unnecessary as the wire may run up the door's spline groove. In archways and other areas where wires must be contained within the log, pre-drilling is necessary. Make use of frame partitions for housing switches as well. Most overhead wiring is centralized to the kitchen and dining room. Again it is best to use frame partitions to gain access above the ceiling. If frame partitions are unavailable follow the procedure to gain access into the roof cavity:

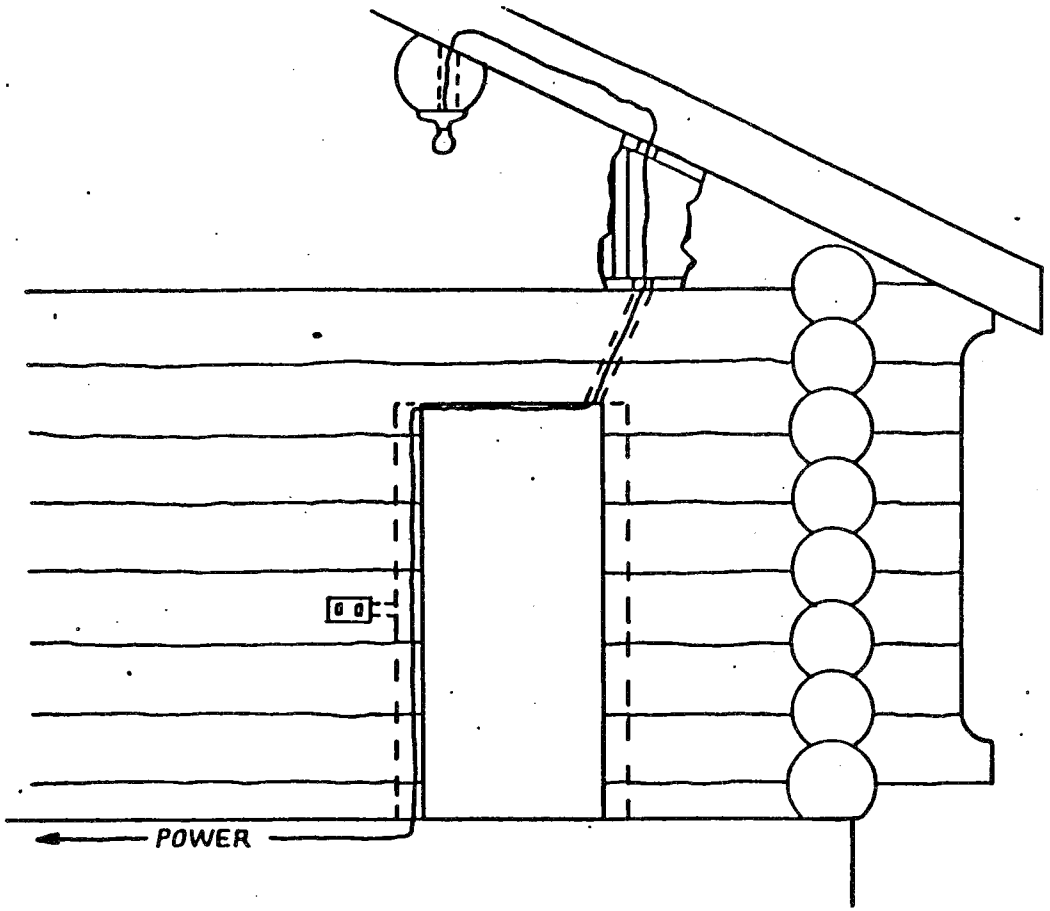
Drawing

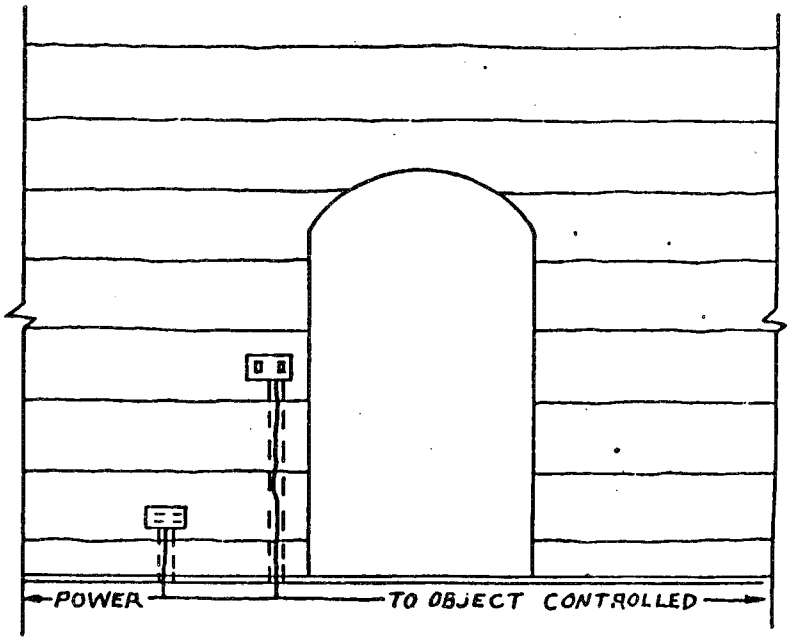
TOOLS: Eye protection, electric drill with 1½" auger bit or 1½" hand auger bit, spirit level, tape measure, pencil.

MATERIALS: Electrical wire (approved), string cord, coat hanger wire.

PROCEDURE:

1. For a switch located beside a doorjamb, drill in from the spline groove to meet the switch box cavity (see Fig. 1).
2. Run electrical wire up the spline groove to the switch. With piéce-en-piéce, run a chainsaw groove up the post so that the wire is hidden behind the jamb.


POWER


POWER
TO OBJECT CONTROLLED

3. To control overhead lighting continue the wire up the spline groove to the settling space above the door, then drill through into the roof cavity. (see Fig. 1).

4. To supply a switch beside a log archway you must pre-drill the logs one by one and insert a strong string with which to pull the wire into place (see Fig. 2).

5. Alternatively feed the wire in as each log is placed and drilled.

QUESTIONS:

1. If a frame wall were located near the archway would it be simpler to locate the switch there? Why?

2. What is the height above the floor at which switches are installed?

3. What is the easiest method of supplying electrical wiring to the second storey, assuming the wire is not to be seen?

ASSIGNMENT:

Run wiring to switches and overhead lighting and have an electrician check your work.

JOB 3 -- Electrical Wiring -- How to supply kitchen counter receptacle and sink lighting.

Some builders erect a false wall behind the kitchen counter and run electrical wiring in back of this. The procedures explained here are for log walls:

Drawing

TOOLS: Eye protection, electric drill with 1¼" auger bit or 1½" hand auger bit, tape measure, pencil, adze.

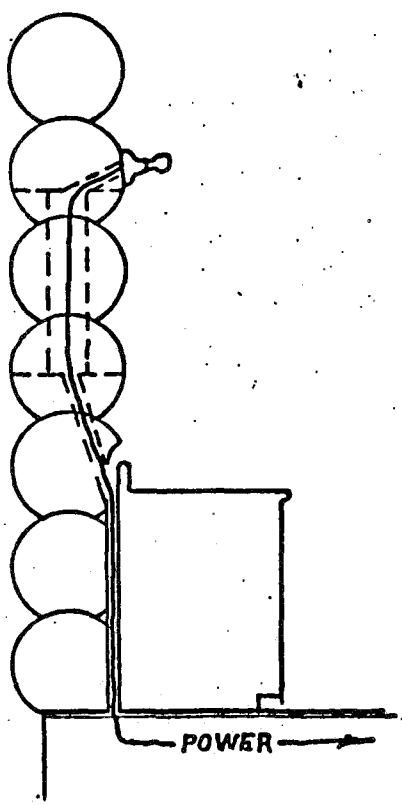
MATERIALS: Electrical wire, tape, strong cord, coat hanger wire.

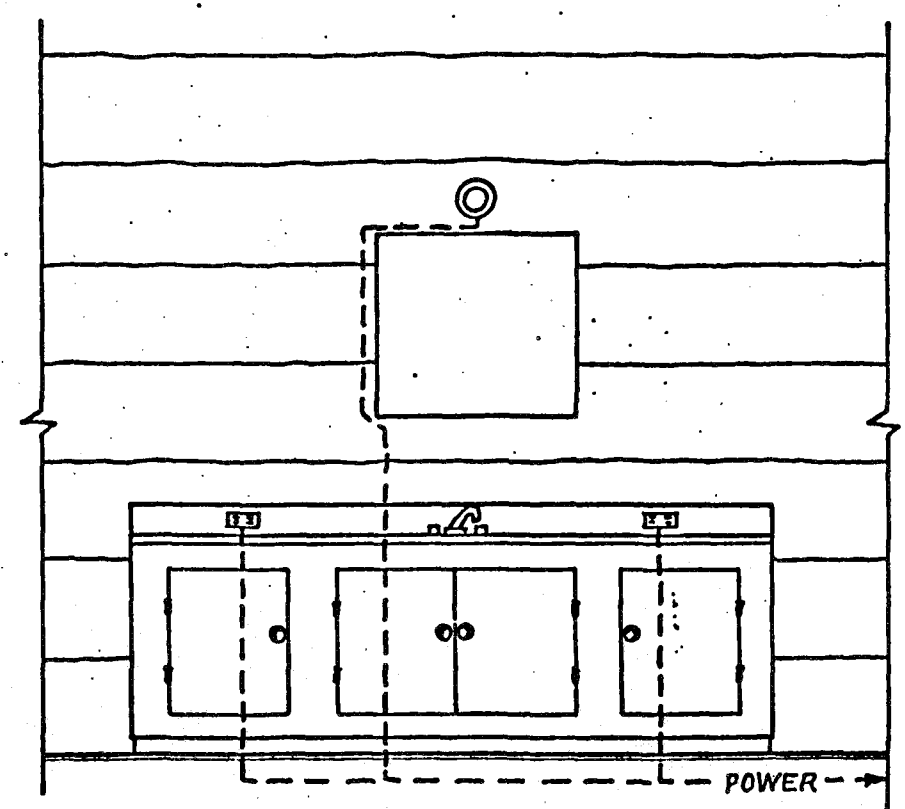
PROCEDURE:

1. Adze the logs back so that the counter will be slightly recessed into the wall. Be sure to allow settling space above the counter.
2. Wires run behind counter and supply receptacles mounted in splash or recessed into the wall.
3. To supply power to the sink light, drill diagonally from the window sill into the space behind the counters. Run a wire around the window and through a pre-drilled hole to power the light (see diagram).

QUESTIONS:

1. If a length of electrical wire has to be changed and


POWER


POWER

it is hidden within a pre-drilled leg, explain how you would change the length.

2. When the wire to the sink light protrudes into the window opening, how is it hidden from view?

ASSIGNMENT:

Run wiring to the kitchen counter receptacles and the sink light then have an electrician check your work.

Building Services and Finishing

JOB 4 -- How to attach frame partitions to a log wall -- 2 methods.

Other than a log show wall for design purposes, having all log interior partitions is discouraged. Log partitions exposed to a constant 70° F shrink faster than the outer walls, leaving an unsightly gap until the outer walls finish settling. Frame partitions can be painted or a wall papered, thereby enhancing and accenting the log work. Moreover it is easier to conceal electrical and plumbing fixtures in frame walls. Outlined below are two methods of attaching frame partitions to log walls which are going to settle. When attaching a frame partition to a vertical post as with piéce-en-piéce construction, you will need only flat the surface of the post and nail the partition solidly to it:

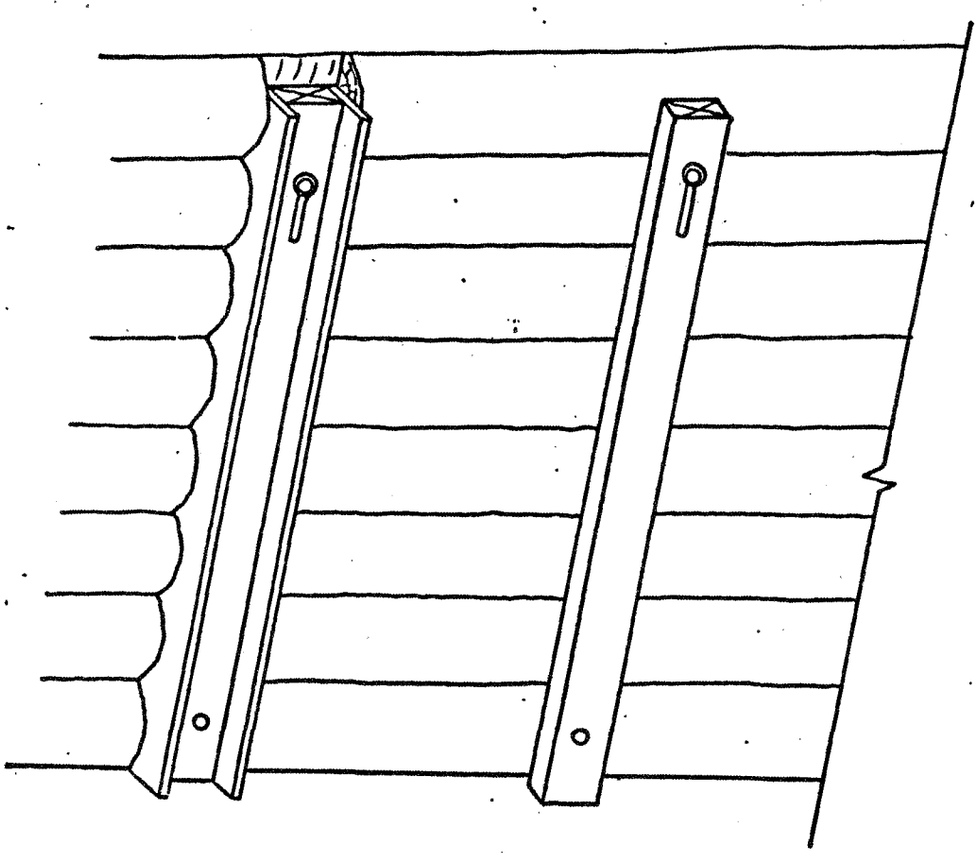
Drawing

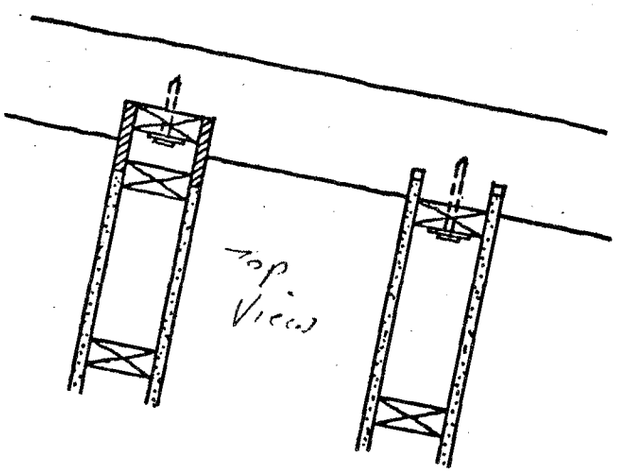
TOOLS: Eye and ear protection, chainsaw, adze, chalkline, spirit level, tape measure, hammer, handsaw.

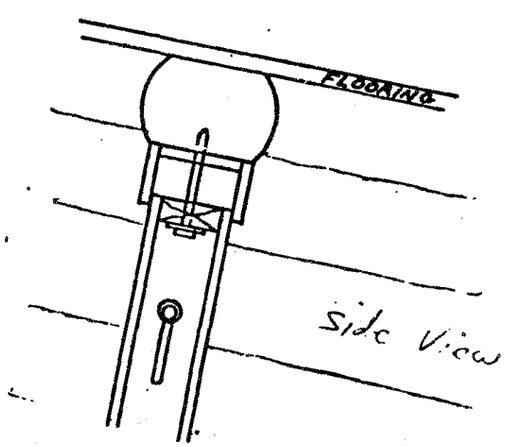
MATERIALS: 2" x 4"s, 2 x 6" blocking, 1" x 6" rough cedar, 3" common nails, 2" finishing walls, 6" spikes with washers, 1" x 4" straight edge guide.

PROCEDURE:

1. Fig. 1 'a' shows a wall channel and slip joint in place. Make up a slip joint by nailing a 1" x 6" on either side of a 2" x 4".




Top
View


FLOATING
Side View

2. Plumb the slip joint and temporarily tack in place. Place a 1" x 4" straight edge on either side to be used as chainsaw guides.

3. Remove the slip joint and make three or four chainsaw cuts the length of the partition to a depth nearing the lateral groove. Use an adze to remove waste. The result should be a plumb, vertical channel.

4. Position the slip joint and nail top and bottom to the logs, using a spike with washer slipped through a slot in the 2" x 4" (see Fig. 1'a'). This allows the log walls to settle unimpeded.

5. Fig 2'a' shows a top view of the slip joint. Note the gyproc butts to the 1" x 6" and nails into a 2" x 4" stud.

6. Fig. 1"b" shows an alternative method of attaching a frame partition. This is mostly used in closets, etc. Plumb and nail a 2" x 4" to the log wall, using a spike and washer inserted through a slot cut with the chainsaw.

7. Run a chainsaw kerf down either side of the 2" x 4" providing a groove for the gyproc to fit into (see Fig. 2'b' for a top view).

8. Fig. 3 shows the method of attaching these frame partitions to the underside of a beam or ceiling. Remember that a settling space must be provided above the partition. Nail 2" x 6" blocking to underside of beam, directly over the partition.

9. Secure the partition wall to the beam with a spike and washer inserted through snug fitting hole in the top

plate and nailed solidly into the 2" x 6" blocking (see Fig. 3). Nail the partition solidly to the floor.

10. Apply gyproc to the partition wall and cover the settling space by finish nailing the facia to the 2" x 6" blocking.

QUESTIONS:

1. In Fig. 1'a' why is there settling space left above the slip joint?
2. What is the purpose of inserting a spike with washer through a slot in the 2" x 4" and nailing solidly into the log work?
3. What would happen to the free settling of the log wall if the spike were nailed straight through the 2" x 4" and into the log wall?
4. Does it matter if the spike is placed to the top or bottom of the slot? Where should it be placed?

ASSIGNMENT:

Locate and place frame partition walls using the methods outlined.

Building Services and [redacted] Finishing

[redacted]

JOB 5 -- How to install frame bearing walls.

A frame bearing wall is attached to the log wall in the same fashion as outlined in Job 4. The only difference being, when the partition is placed beneath the beam, screwjacks are spaced on top of the partition to support the weight. Access to the screwjacks must be available to lower the jacks during the settling phase:

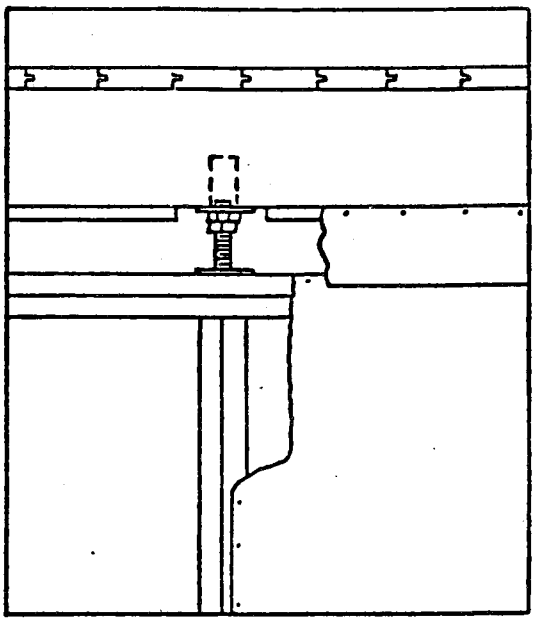
Drawing

TOOLS: Eye protection, electric drill with 3/4" bit, chalkline, tape measure, spirit level, hammer, crescent wrench.

MATERIALS: Screwjacks, 2" common nails.

PROCEDURE:

1. Fabricate the screwjacks by welding a length of threaded 5/8" rod to a 1/8" plate. Thread two nuts onto the rod and slip another 1/8" plate over top. The exposed threaded rod below the nuts should be greater than the calculated settling space.
2. Place the screwjacks at four foot spacings so they are directly over top vertical partition studs.
3. A 3/4" hole should be drilled so that, as the walls settle, the screw portion will recess into the drilled hole (see above diagram).



4. Place the facia as previously mentioned, providing access to the screwjacks.

QUESTIONS:

1. Why is it necessary to provide access to the screwjacks?
2. Why locate the screwjacks over a double vertical partition stud?

ASSIGNMENT:

To cut the floor joist span of the second storey in half, locate a frame bearing wall as outlined.

JOB 8 -- How to install bearing posts.

When settling of the walls is a factor it is necessary to provide a settling space above any vertical support posts. While the usual procedure is to provide the settling at the top of the post there is no reason why it can't be placed at the bottom. Outlined below are two methods of providing the bearing support between the post and beam:

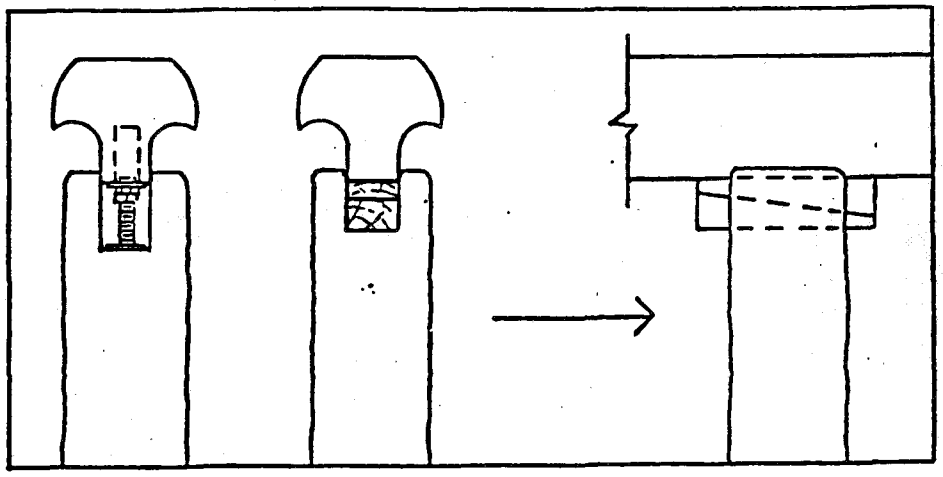
Drawing

TOOLS: Eye and ear protection, chainsaw, tape measure, chalkline, adze, slick.

MATERIALS: Screwjacks or wood wedges, posts.

PROCEDURE:

1. Cut the post to length. It should reach just past the bottom of the beam.
2. Layout and cut a "U" shaped fork at the top of the post. The depth will equal the calculated setting of the log wall plus 1". Remove the waste wood (see diagrams).
3. Layout and cut the corresponding tenon on the underside of the beam, in the support position desired. The tenon width and length will equal the fork width and length (see diagrams). To remove the waste wood and produce



a curved portion at the top of the tenon refer to the cutting procedures of the window header outlined in [redacted], Job #23.

4. Place a screwjack or wooden wedge in the settling allowance space and lower as the walls settle.

QUESTIONS:

1. Why is there a recess hole drilled in the beam tenon to receive the threaded shaft of the screwjack?
2. If using a screwjack why is extra space allowance needed between the beam and post than just that of the calculated settling?
3. Why are two wedges used instead of just one?

ASSIGNMENT:

Install bearing posts where needed, providing a settling allowance space and proper support.

Building Services and Finishing

JOB #7-- How to install cabinets and counters -- 2 methods.

The first method outlined involves slightly recessing the cabinets and counters into the log wall. The electrical wiring and plumbing is hidden behind the counters with the main stack contained within a stub wall located in the kitchen.

The second method involves building a false frame wall up against the log wall. The cabinets and counters are attached directly to the false wall with the wiring and plumbing hidden behind its cavity:

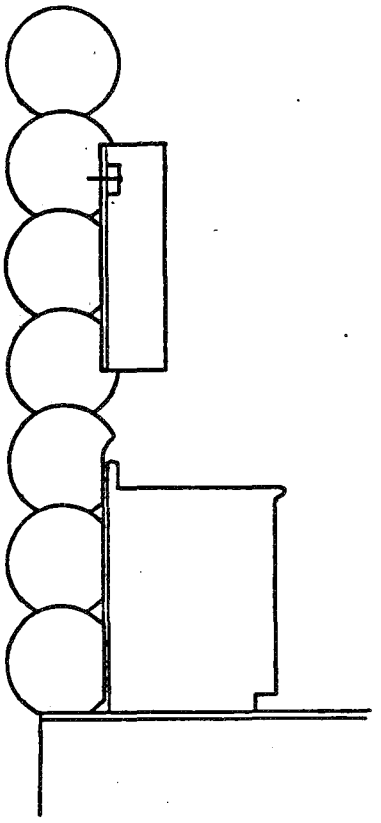
Drawing

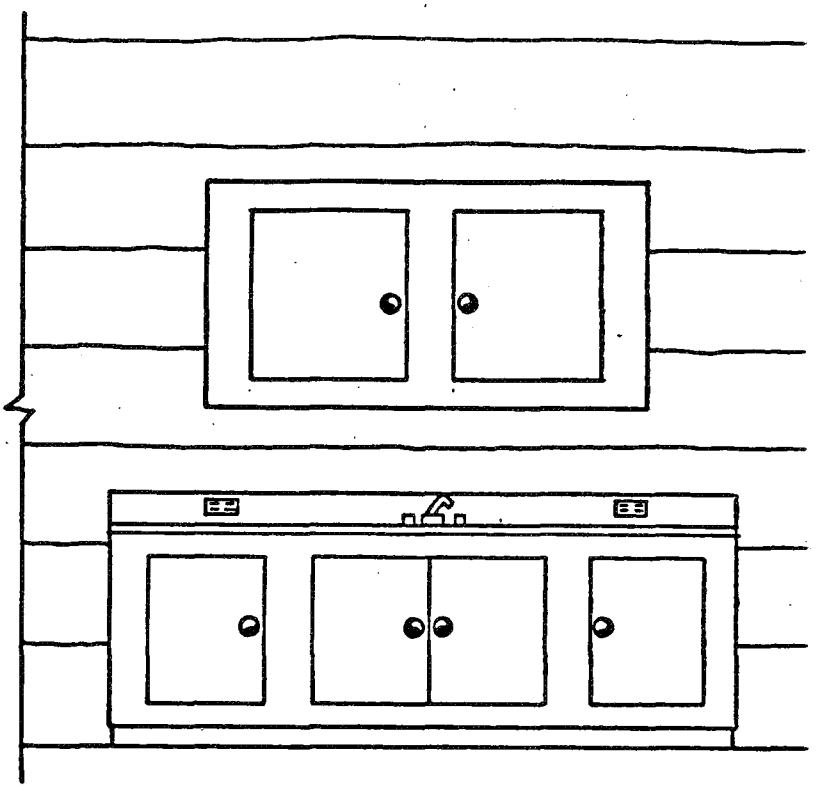
TOOLS: Eye and ear protection, chainsaw, adze, spirit level, handsaw, hammer, electric drill with wood bits, Robertson screwdriver (red).

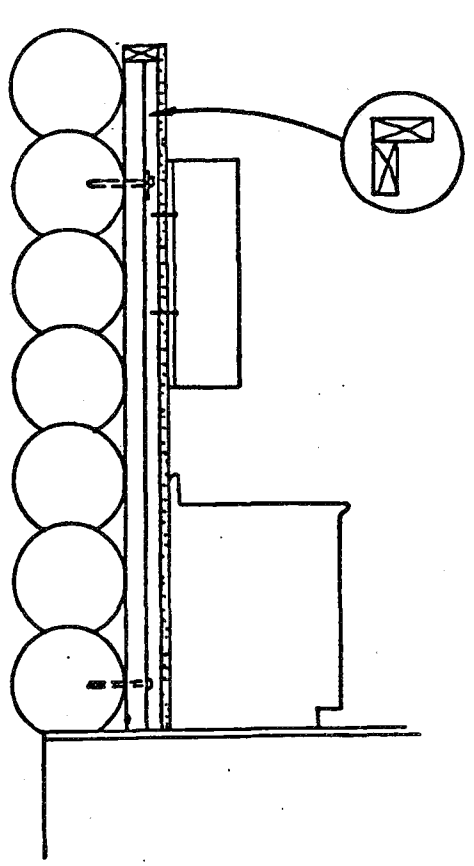
MATERIALS: Cabinets and counters, framing materials, gyproc, 6" spikes with washers, 3" common nails, plaster nails, 2½" x #10 Robertson wood screws.

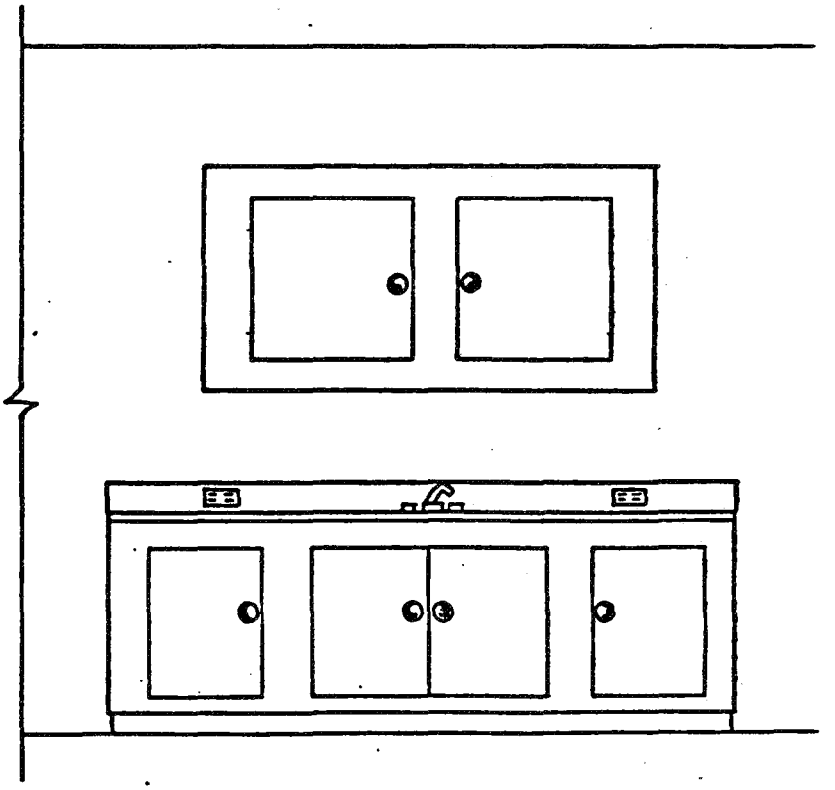
PROCEDURE:

1. Fig. 1 shows the cabinets and counters recessed into the log wall. Layout on the log wall where the cabinets and counters will be situated.
2. Recess the cabinets and counters by making vertical chainsaw cuts 2" - 3" deep into the log wall, removing the waste with an adze.









3. Hang the cabinets by screwing into one log only (see Fig. 1, sideview also). The counters are usually screwed to the floor only. Allow a settling space above the counter splash board.

4. Locate a stub wall near the sink to contain the main plumbing stack. Attach to the log wall using a slip joint.

5. Fig. 2 shows the cabinets and counters attached to a false frame wall. Attach vertical studs to the log wall using method 'b' in Job 1.

6. Attach the wall frame to these vertical studs and cover with gyproc, locating wiring and plumbing in cavity.

*NOTE: The window should be framed in so the sill is lower than the log sill. This will compensate for the settling of the log wall.

7. If there is a second storey a space is required between the frame wall and the second storey floor.

8. Attach the cabinets and counters to the frame wall.

QUESTIONS:

1. What is the purpose of recessing the cabinets and counters as explained in the first method?

2. When hanging cabinets what could possibly happen, during the settling process, if they were screwed into more than one log?

3. What is the purpose of allowing a settling space above the counter splash board?

4. How do you calculate this settling allowance?

5. When attaching a false frame wall to a log wall what do you have to be particularly care of?

6. What would happen during the settling process if the false wall were nailed solidly to the log wall?

ASSIGNMENT:

Install the kitchen and bathroom cabinets and counters, using one of the methods outlined.

Building Services and [redacted] Finishing

[redacted]

JOB 8 -- How to treat wood against mildew -- bar graph.

The simplest of all natural finishes for wood is natural weathering. After a time all woods become gray in colour and, at a degeneration rate of 1/4" per century, it is not imperative to apply a wood finish to preserve the longevity of the building.

Most people however, do not want the dark gray, blotchy appearance the fungi or mildew create. For this reason fungicidal preservatives have been formulated to retard the growth of mildew, thereby retaining the golden tan colour of the freshly peeled wood. When treating the wood against mildew it is important to apply the preservative (thinned with solvent or diesel) before the mildew growth begins. This time period may range from a month or two if building in the cold winter, to the day after peeling the log if building in the warm, moist spring. If mildew growth has already begun it can be removed by cleaning the log with detergent and bleach solution. Thinned preservatives may be applied by either brush or spray. Two common fungicidal preservatives are pentachlorophenol (P.C.P) and cupric napthenate, the latter being not quite as effective but not nearly as toxic. For the effectiveness of these preservatives on Ponderosa pine and Douglas fir, refer to the Vertical Bar Graph:

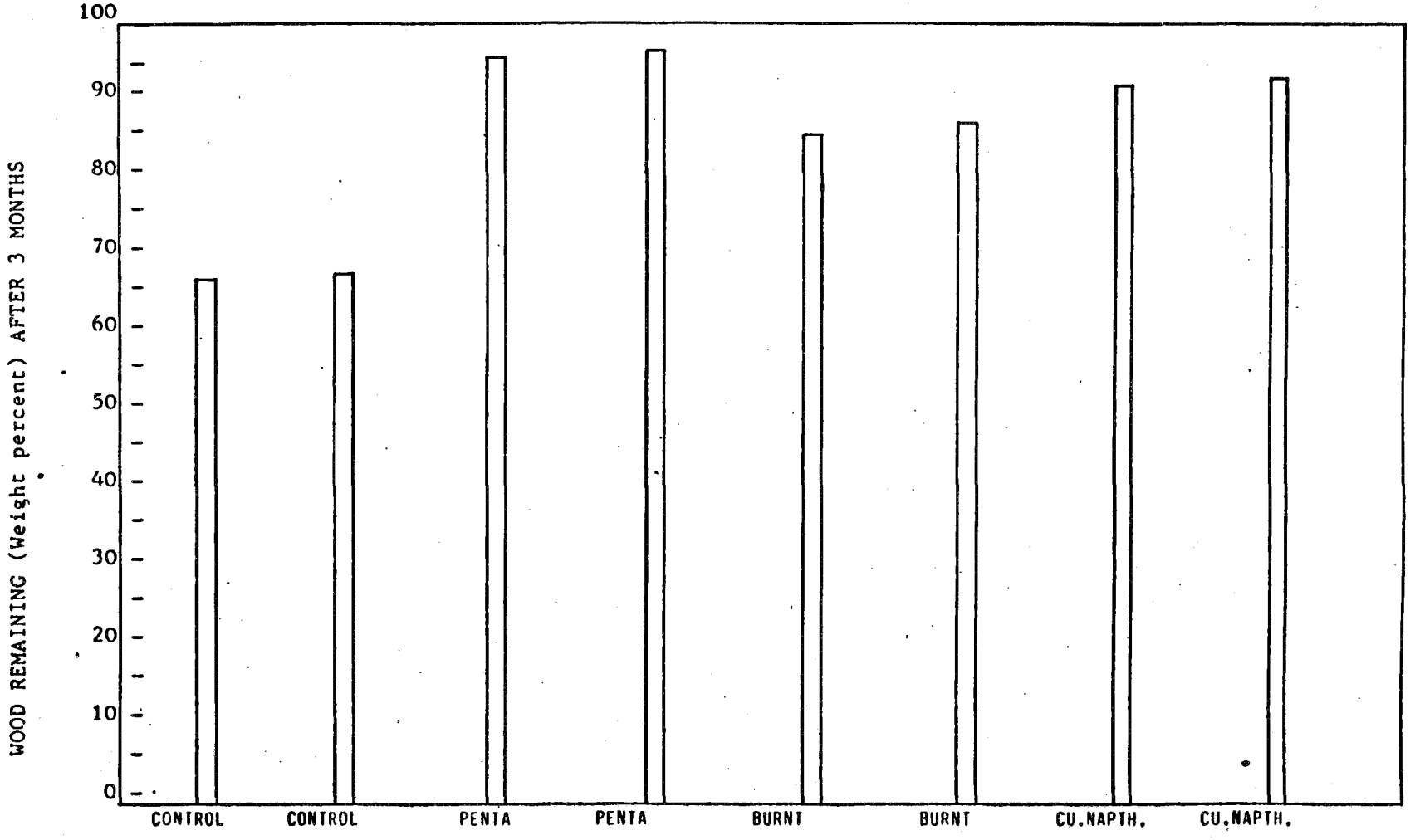
Basic Fungicidal Preservative -- mix 1 - 3 pounds of fungicidal preservative with 12 gallons of water. Brush or spray (weed sprayer works well) on logs within one day of peeling.

VERTICAL BAR GRAPH - PERCENTAGE OF WOOD REMAINING PER FUNGI TYPE

FUNGI: 47-D

WOOD SPECIES: PINE

Preservative: Indicated below

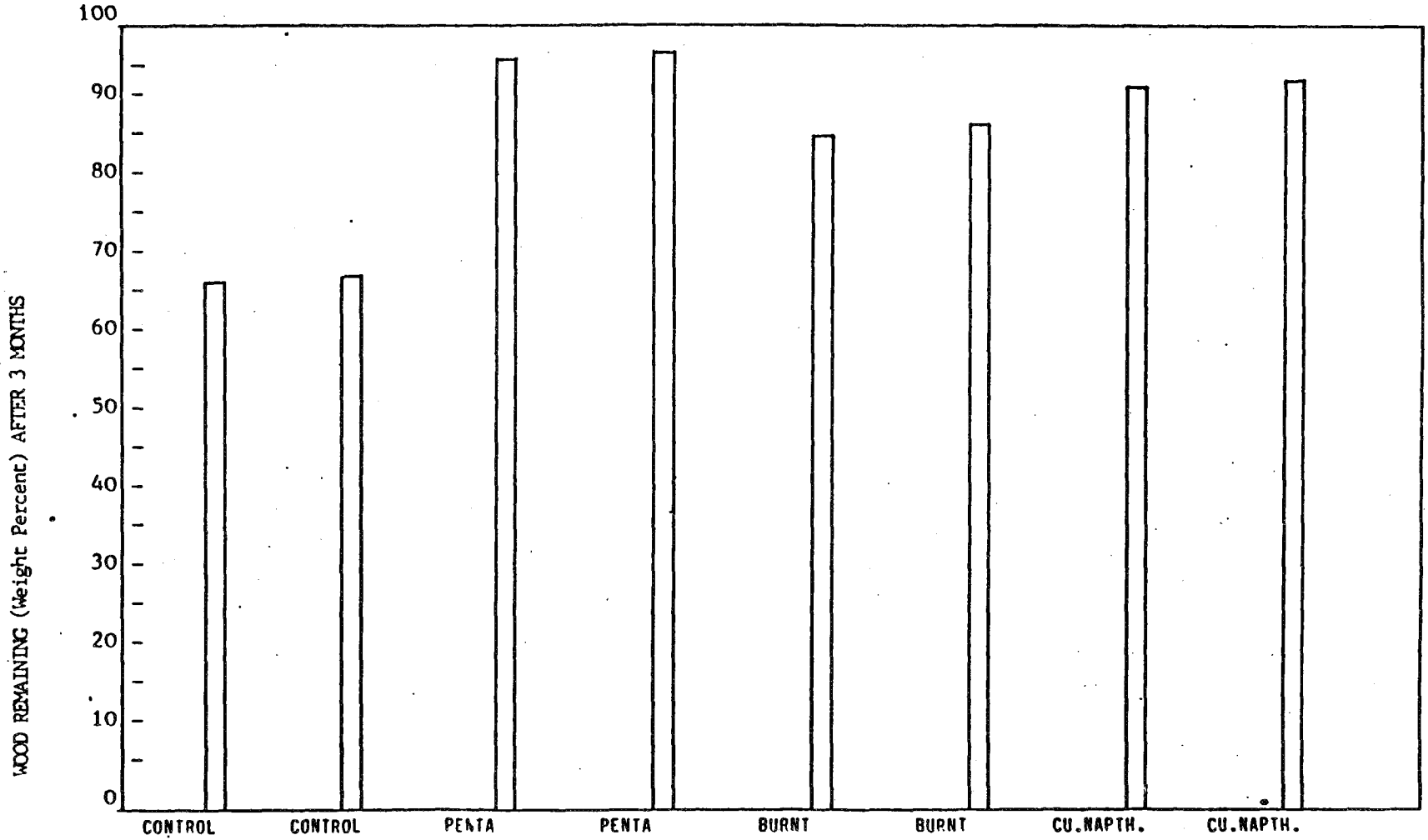


VERTICAL BAR GRAPH - PERCENTAGE OF WOOD REMAINING PER FUNGI TYPE

Fungi: 47-D

Species: Fir

Preservative: Indicated below



Conclusions:

1. Penta was the most effective on both series followed by cupric napthenate and burning.
2. All three preservatives were more effective than the natural resistance of the species.
3. Douglas Fir has greater natural resistance than Ponderosa pine to 47-D.

Building Services and [redacted] Finishing

JOB 9 -- Exterior finishes and application -- chart.

After the initial treatment of fungicidal preservative, the natural appearance of wood may be retained by regular application of a water-repellent preservative. The finishes generally incorporate a boiled linseed oil vehicle; a fungicidal protecting the oil from mildew; and paraffin wax to protect the wood from excessive water penetration. A semi-transparent pigmented stain can also be added to a water-repellent preservative solution. The addition of pigment helps to stabilize the wood colour as well as increase the durability of the finish by diffusing the sun's harmful ultaviolet rays. Below are some recipes of water-repellent finishes as well as an accompanying chart of pigment additives. Application of these finishes may be done by brush or spray (I have found a weed sprayer works well):

WATER-REPELLENT PRESERVATIVES:

1. Ingredients	Quantity
40% fungicidal (10:1 concentrate)	2 quarts
Boiled linseed oil	1 3/4 quarts
Paraffin wax	4 - 5 oz.
Stearate Acid (keeps wax in suspension)	6 oz.
Solvent (mineral spirits, paint thinner)	add to 5 gallons

Melt wax in a double boiler. With the solvent at room temperature pour in hot wax and mix vigorously. Add boiled linseed oil, fungicide and stearate acid. Stir and apply above freezing temperatures.

2.

Ingredients	Quantity
40% fungicidal (10:1 concentrate)	2 quarts
Boiled linseed oil	3 gal.
Paraffin wax	1 pound
Stearate acid	6 oz.
Solvent	1 gal.
Tinting pigments (see chart)	1 -2 quarts
Zinc stearate (reduces caking of pigment)	8 oz.

*Refer to "Protecting log cabins from decay" Technical report #FPL - 11 1977
U.S. Dept. of Agric.
Forest Service, Forest Products Lab,
Madison, Wis.

3.

Ingredients	Composition weight %
Chemical Fungicide	0.13 - 10.0
Boiled linseed oil	60.1
Paraffin wax	18.4 - 28.4
Solvent	10.3
Yellow iron oxide pigment (in oil)	

4. Refer to supplement of Sikkens Wood Finishes.

Pigment Chart

Desired Colour	Pigment Required	Quantity for 5 gallons
Cedar	burnt sienna	1 pint
	raw umber	1 pint
Light Redwood	burnt sienna	1 quart
Choc. Brown	burnt umber	1 quart
Fruitwood Brown	raw sienna	1 pint
	raw umber	1 pint
	burnt sienna	½ pint
Tan	raw sienna	1 quart
	burnt umber	3 fluid oz.
Green gold	chrome oxide	1 pint
	raw sienna	1 pint
Forest green	mid. chrome green	1 quart
Smokey Gray	white house paint	1 quart
	raw umber	6 fluid oz.
	lamp black	2 fluid oz.

Application rate of 150 square feet per gallon.

Apply second coat before first dries.

Stir frequently.

Building Services and [redacted] Finishing

JOB 10 -- Interior finishes and application.

Besides the logs being clean and free of dirt, any jagged knots or splinters should be sanded. If the logs are badly discoloured by mildew (too much for a detergent-bleach solution) scrub them down with a solution of oxcillic acid. A "road map" effect can be achieved on the log surface if the bark is left on the logs for a year. Bark beetles get between the bark and wood and create harmless tracks.

Once an initial application of fungicidal preservative is applied after peeling, the interior of a log house should not be treated with any more toxic preservatives. Indeed with the moisture content less than 20% inside the house no mildew will grow. Below is a list of commonly used finishes for the interior log surfaces applied with a brush or spray:

1. Boiled linseed oil and thinner.
2. Boiled linseed oil and Res-in-stain.
3. Spar Var
4. Super Var
5. Satin varathane
6. Sealer (thinned out varnish or lacquer) and wax.
7. Liquid rawhide.