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After completing this module, you will show the following competencies by mastering the activities on the Assignment and Job Sheets and by scoring at least 85% on the Module Quizzes.
1. Identify and define framing members used in walls, partitions, and ceilings.
2. Identify methods used to construct outside corners of wall frames.
3. Identify methods used to construct partition Ts.
4. Identify types of headers.
5. Select construction details that should be added during wall framing.
6. Select methods used to brace walls.
7. Select nail sizes most often used in framing.
8. Review the procedure to calculate the length of a regular stud.
9. Review the procedure to calculate rough opening (R.O.) dimensions for doors.
10. Review the procedure to calculate the length of trimmers for window and door openings.
11. Review the procedure to calculate the length of headers for rough openings.
12. Review the procedure to calculate the amount of materials for wall and partition framing.
13. Calculate the amount of materials for wall and partition framing. (Assignment Sheet 1)
14. Select considerations to be made before deciding joist size and spacing.
15. Identify methods used to support ceiling joists.
16. Identify methods used to anchor joists to partition walls.
17. Identify methods used to prevent joists from twisting or bowing.
18. Review the procedure to estimate materials for ceiling joists.
19. Estimate materials for ceiling joists. (Assignment sheet 2)
20. Lay out wall partition locations on floor. (Job sheet 1)

21. Cut studs, trimmers, cripples, and headers to length. (Job Sheet 2)

22. Assemble corners, Ts, and headers. (Job Sheet 3)

23. Construct wall sections. (Job Sheet 4)

24. Lay out and install ceiling joists. (Job Sheet 5)

25. Install fiberboard or insulation-panel, drywall, and plywood sheathing. (Job Sheet 6)

26. Install sheathing and plywood siding. (Job Sheet 7)
WALL AND CEILING FRAMING
Carpentry Series

Student Name ________________________________

Start Date: _______  Completion Date: _______

1. Study  Information Sheet 1, objective 1.

2. Discuss  the purposes of the framing members used in walls, partitions, and ceilings.

3. Study  building plans and/or a model while discussing with your instructor how the members fit together to provide the required strength.

4. Study  Information Sheet 1, objective 2.

5. Discuss  methods used to construct outside corners of wall frames.

6. Study  Information Sheet 1, objective 3.

7. Discuss  methods used to construct partition Ts.

8. Study  Information Sheet 1, objective 4.

9. Discuss  the differences in the types of headers.

10. Study  header schedules and span charts and discuss with your instructor how to read them.
Quiz 1.

Information Sheet 1, objective 5.

construction details to consider during wall framing.

details from a construction plan that require special consideration on the part of the framers.

With a framing contractor or carpenter to talk about how the frame construction must coordinate with the other types of construction involved in a job.

Information Sheet 1, objective 6.

methods used to brace walls and the consequences of not bracing walls.

Information Sheet 1, objective 7.

samples of nails most often used in framing while discussing their specific application.

Demonstrations and practice nailing techniques using traditional hammers and pneumatic nailers.

Information Sheet 1, objective 8.
20. Discuss  the procedure to calculate the length of a regular stud.

21. Watch  your instructor demonstrate the calculation steps.

22. Practice  calculating stud lengths using the finished ceiling heights and flooring from your instructor.

23. Study  Information Sheet 1, objective 9.

24. Discuss  the procedure to calculate rough opening (R.O.) dimensions for doors.

25. Watch  your instructor demonstrate the calculation steps.

26. Practice  calculating rough opening (R.O.) dimensions for doors using problems provided by your instructor.

27. Study  Information Sheet 1, objective 10.

28. Discuss  the procedure to calculate the length of trimmers for window and door openings.

29. Watch  your instructor demonstrate the calculation steps.

30. Discuss  with your instructor how to determine the finish opening height from the plans.
calculating the length of trimmers for window and door openings using problems provided by your instructor.

Optional Look at window and door manufacturers literature to determine the rough opening specifications.

Study Information Sheet 1, objective 11.

Discuss the procedure to calculate the length of headers for rough openings.

Watch your instructor demonstrate the calculation steps.

Discuss how header length relates to rough opening size and the use of trimmers.

Discuss the use of span charts and header schedules and solve problems given to you by your instructor.

Take Quiz 2.

Study Information Sheet 1, objective 12.

Discuss the procedure to calculate the amount of materials for wall and partition framing.

Watch your instructor demonstrate the calculation steps.
estimating materials from building plans.

with a materials supplier to discuss the types, dimensions, grades, and cost of lumber used in wall and ceiling framing.

the introduction to Assignment Sheet 1, objective 13.

Assignment Sheet 1.

and have your instructor evaluate your work from the Assignment Sheet. After your work has been evaluated, follow your instructor’s recommendations.
WALL AND CEILING FRAMING
Carpentry Series

Identify and define framing members used in walls, partitions, and ceilings.

Walls, partitions, and ceilings consist of many different framing members to provide strength to the structure. Study the framing members and their definitions below.

FIGURE 1

- **Corner assembly** – consists of a post that forms an inside and outside corner providing a good nailing surface for tying together two wall frames at right angles

- **Cripple stud** – any part of a framing stud that is cut less than full size, as over a door or window or under a window opening

- **Double top plate** – a plate made of two members to allow better stiffening of the wall and for tying together splices, corners, and partitions that are at right angles to a wall

- **Header** – a horizontal structural member that supports the load over an opening, such as a window or door
• **Partition wall assembly** – an assembled wall that subdivides space within a building

• **Regular stud** – main vertical framing member in walls and partitions

• **Rough opening** – an opening in framing formed by framing members, such as for windows and doors

• **Rough sill** – a lower framing member attached to the top of the bottom cripple studs to form the base of a rough opening for a window

• **Sole plate** – lowest horizontal member of a wall or partition to which the studs are nailed; rests on the rough floor

• **Top plate** – an upper horizontal structural member of a wall used to carry the rafters or trusses of a roof

• **Trimmer stud** – vertical framing member that forms the sides of the rough openings for the doors and windows and on which the header rests

**OBJECTIVE 2**

Identify methods used to construct outside corners of wall frames.

Some of the more common methods used to construct outside corners of wall frames are illustrated here. Others may be used. The important considerations are solid corner and nailing surfaces for the interior and exterior wall finishes. Most carpenters try to choose the straightest, least defective studs for corner assemblies.

**FIGURE 2**

- Constructed with three full 2 x 4 studs and blocking
Identify methods used to construct partition Ts.

There are several methods for constructing partition Ts. Some of the more common methods are illustrated here, however, others may be used.

- Constructed with three full 2 x 6 studs and blocking
- Constructed with three full 2 x 4 studs with no blocking
- Constructed with three full 2 x 4 studs and blocking
Identify types of headers.

There are many different types of headers. Some of the most common are illustrated here.

- Constructed with three full 2 x 6 studs and blocking

- Constructed with a continuous 2 x 6 backer

- Box beam header
• I-beam header

**FIGURE 10**

• Small header with cripples

✓ **NOTE:** The small head with cripples may be used for average size windows and doors and is usually constructed of 2 x 4s or 2 x 6s.
• Solid or full header

✓ NOTE: A full header is used for large openings and fills the area from the rough opening to the bottom of the top plate.

FIGURE 12

• Truss header

✓ NOTE: Truss headers are used when the load is especially heavy or the span is extra wide. The design of the trusses is usually included in the architectural or building plans.

Select construction details that should be added during wall framing.

There are many different construction details that should be added while you are framing in walls. Study the list below of common construction details.

• Backing for the various appliances

• Backing nailers for the ceiling materials

• Corner blocks for the nailing base
• Framing for the chimney and the fireplace
• Framing for the pocket-type sliding doors
• Framing for the recessed cabinets and the electrical panels
• Opening for the heating ducts
• Rough openings for the air ducts, exhaust fans, and disappearing stair units
• Rough openings for the stairwells
• Support for the plumbing fixtures
• Support for the towel bars

Select methods used to brace walls.

Wall bracing is very important for the safety of the workers as well as the stability of the framing members during construction. Study the following methods used to brace walls below.

1. **Permanent bracing**

   ✓ **NOTE:** Be sure the wall is square and plumb before nailing the braces.

   • Let-in corner bracing with 1 x 4 solid lumber

   ✓ **NOTE:** This type of bracing is done by marking and cutting out a recess in each stud the thickness of the brace, and then nailing the brace in place so that the face of the brace is flush with the face of each stud. Let-in bracing is set at 45 degrees when possible. Sometimes because of the openings this cannot be accomplished.

   • Metal bracing
   
   • Plywood sheathing (according to code)

2. **Temporary bracing (wind bracing)**

   • 2 x 4 wall brace (used inside or outside)
   
   • Adjustable metal wall brace
Select nail sizes most often used in framing.

Study the following nail sizes most often used in framing.

- 6d
- 8d
- 16d
- 20d

Review the procedure to calculate the length of a regular stud.

<table>
<thead>
<tr>
<th>WORDS YOU SHOULD KNOW</th>
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<tbody>
<tr>
<td>underlayment</td>
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</table>

✓ NOTE: Precut studs are available.

1. Concrete floors (slab)
   A. Determine the height of the finished ceiling from the finished floor including ½” clearance for finish material.
   B. Determine the thickness of the soleplate plus the double top plate.
   C. Determine the thickness of the ceiling material and the flooring material.

   ✓ NOTE: For carpet or a resilient-type flooring material, the thickness is negligible.

D. Add the thickness of the ceiling and flooring material to the finished ceiling height.

E. Subtract the thickness of the plates from the sum achieved in step D to obtain the stud length.

EXAMPLE: The desired finished ceiling height is 8’, the actual plate thickness is 1½”, the ceiling thickness is ½”, and resilient tile flooring is used. See Figure 13.

- Finished ceiling height: 8’
- Thickness of soleplate and double top plate: 1½” + 1½” + 1½” = 4½”
- Thickness of ceiling and flooring: ½” + 0 = ½”
- Total wall frame required height: 8’ + ½” = 8’½”
- Required stud length: 8’½” - 4½” = 7’ 8” or 92”
2. Wood floor

   A. Determine the height of the finished ceiling from the finished floor including ½" clearance for the finish material.

   B. Determine the thickness of the soleplate plus the double top plate.

   C. Determine the thickness of the ceiling material and the underlayment.

   D. Add the thickness of ceiling and the underlayment to the finished height.

   E. Subtract the thickness of the plates from the sum achieved in step D for the stud length.

   **EXAMPLE:** The desired finished ceiling height is 8'½", the actual plate thickness is 1½", the ceiling thickness is ½", and the underlayment thickness is ⅝". See Figure 14.
- Finished ceiling height: 8'½"
- Thickness of soleplate and double top plate: 1½" + 1½" + 1½" = 4½"
- Thickness of ceiling material and underlayment: ½" + ⅜" = ⅞"
- Total wall frame required height: 8'½" + ⅞" = 8' 1¾"
- Required stud length: 8' 1¾" - 4½" = 7' 9⅛" or 93⅛"

OBJECTIVE 9

Review the procedure to calculate rough opening (R.O.) dimensions for doors.

1. Width
   A. Check the door schedule for the door size.
   B. Add ¼" to the door width for the clearance between the door and the side jambs.
   C. Add 1¼" (⅞" each) for the side jambs.
   D. Add ¾" (⅞" each) for the clearance between the jamb and the trimmer stud.
E. Round to the next larger half-inch to obtain the actual rough opening width.

**EXAMPLE:** To find the rough opening for a 3’ x 7’ door, the correct calculation procedure would read:

Door width: 3’
Door and jamb clearance: ¼”
Side jambs: 1½”
Side jambs and trimmer clearance: + ¾”
Actual rough opening width: 3’ 2¼”

2. Height

A. Check the door schedule for the door size.

B. Add ½” to the door height for the clearance between the door and the header jamb.

C. Add 5⁄8” for the header jambs.

D. Add ⅜” for the clearance under the door.

E. Add ¾” for the header jamb and the rough header clearance.

**EXAMPLE:** To find the rough opening for a 3’ x 7’ door, the correct calculation procedure would read:

Door height: 7’
Door and header clearance: ½”
Jamb header: 5⁄8”
Bottom clearance 5⁄8”
Jamb header and rough header clearance: + ¾”
Actual rough opening height: 7’ 2⅜”

**Review the procedure to calculate the length of trimmers for window and door openings.**

The tops of all windows and doors should be the same height from the floor unless otherwise specified. Adjustments may be necessary if 2 x 12 materials are used.

1. Concrete floor (slab)

A. Determine the height of the rough opening from the finished floor.

1) Determine the door height and add ¼” for the door/header clearance.

✔ **NOTE:** Standard doors are 6’ 8” high
2) Add $\frac{5}{8}''$ for the clearance at the bottom of the door.

3) Add $\frac{3}{8}''$ for the jamb header.

4) Add $\frac{3}{4}''$ for the clearance between the rough header and the jamb header.

B. Subtract the thickness of the soleplate.

**EXAMPLE:** To find the trimmer length for a 3' x 6' 8" door, the correct calculation procedure would read:

Door height: 6' 8"
Door and header clearance: $\frac{1}{6}''$
Bottom clearance $\frac{5}{6}''$
Jamb header: $\frac{3}{8}''$
Jamb header and rough header clearance: $\frac{3}{4}''$
Actual rough opening width: 6' 10\frac{1}{6}''
Soleplate: $-1\frac{1}{2}''$
Trimmer and stud length: 6' 8\frac{5}{8}''

2. Wood floor – Repeat the procedure for the concrete floor remembering to add the thickness of the underlayment to establish the finished floor.

**Review the procedure to calculate the length of headers for rough openings.**

1. Rough header length for doors

  ✔ **NOTE:** If prehung doors are used, check the manufacturer’s specifications for rough opening size.

A. Check the door schedule for the door size.

B. Determine the rough opening width.

C. Add 1\frac{1}{4}'' for the side jambs.

D. Add 1'' for clearance to install the jambs.

E. Add 3'' to the rough opening width for the trimmer studs.

**EXAMPLE:**
For a 3' x 6' 8" door:
Door width: 3'
Side jambs: $\frac{1}{4}''$
Side jambs and trimmer clearance: $+1''$
Rough opening: 6' 9\frac{1}{4}''
Thickness of trimmer studs: $+3''$

Header size: 3' 4\frac{1}{4}''
After calculating one header size, subtract the door size from it and use this figure to add to the other door sizes to determine the header size. Generally 5 ¼” may be added to the door width.

2. Rough header length for windows – Check with the manufacturer to determine the rough opening width, then add the thickness of the two trimmer studs, while considering the return on the metal windows is to be drywall or wood. See Table 1.

Table 1 gives the size of the headers normally required by various rough opening widths with several load conditions. It is to be used as a guide only. Refer to the plans and local regulations for additional restrictions.

**TABLE 1**

<table>
<thead>
<tr>
<th>Header Material</th>
<th>Load</th>
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<tr>
<td>(Two members on edge)</td>
<td>Single story</td>
</tr>
<tr>
<td>2 x 4</td>
<td>3' 6&quot;</td>
</tr>
<tr>
<td>2 x 6</td>
<td>6'</td>
</tr>
<tr>
<td>2 x 8</td>
<td>8'</td>
</tr>
<tr>
<td>2 x 10</td>
<td>10'</td>
</tr>
<tr>
<td>2 x 12</td>
<td>12'</td>
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Review the procedure to calculate the amount of materials for wall and partition framing.

1. Wall plates (2 x 4s or 2 x 6s)
   A. Determine the lineal footage of all outside walls, including the openings.
   B. Determine the lineal footage of all the inside walls, including the partitions and openings.

   **NOTE:** There are three plates: soleplate, top plate, and double top plate. The soleplate should be treated if used on concrete.

   C. Multiply the total inside and outside lineal footage by three; by two if on concrete floor.
D. Divide the total lineal footage obtained in step C by sixteen and round up to the next full number to get the number of sixteen-foot 2 x 4s needed for the plates.

✔ **NOTE:** The plate material is usually ordered in sixteen-foot lengths.

2. Studs - 16" on center
   
   A. Determine the lineal footage of all outside and inside walls.
   
   B. Allow one stud for each lineal foot of wall. Round answer up to next lineal foot.

3. Studs for gable ends
   
   A. On buildings with gable roofs, use one-fourth the plate length for determining the number of gable studs needed on 2' centers at each gable end.
   
   B. Multiply one-half the plate length by three-quarters if the gable studs are on 16" centers to determine the number needed.
   
   C. Determine, to the nearest whole foot, the length of the longest gable stud from the double plate to the top of the roof.

   ✔ **NOTE:** One piece of stud material will make a long and a short gable stud; this is why only one-half of the plate length is used.
   
   D. Order the number calculated in step A or B in the next longest length.

4. Headers

   ✔ **NOTE:** The use of 2 x 12 headers require more material but the time saved more than makes up the difference.
   
   A. Determine the size of the doors and windows from the door and window schedule.

   ✔ **NOTE:** List each door and window separately.
   
   B. Add 5' ¼" to each door and window width.
   
   C. Double the length of the header for each door and window.
D. Combine the lengths obtained in step C into convenient lengths for ordering and to minimize waste.

**EXAMPLE:** For three headers of 4’ 10” and 3’ 11” use 14’ 2 x 12s.

E. Order enough ½” CD plywood to cut for spacers.

5. Diagonal bracing (if used)

✔ **NOTE:** Diagonal bracing is required if not using plywood sheathing at each end of all of the exterior walls. These braces run from the bottom plate at an approximate angle of 45 degrees. Walls 8’ high would require material twelve feet long for each brace.

A. Determine the number of outside and inside corners in the exterior walls.

B. Multiply the number of corners by two to determine the number of 12’ 1 x 4s or metal strips needed for the bracing.

6. Ceiling joists on 16” centers

A. Determine the size of the joists needed from the specifications.

B. Determine the length of the longest wall.

C. Order the number of ceiling joists equal to one more than three-fourths times the wall length.

**EXAMPLE:** Wall length = 20’

\[(20 \times 0.75) + 1 = \]

\[(15) + 1 = 16 \text{ ceiling joists}\]
Calculate the amount of materials for wall and partition framing.

Correctly estimating materials is a skill good carpenters must possess in order to save time and money. Use the procedures found in Information Sheet 1, objective 12 to accurately estimate framing materials.

Use the plan found in Figure 15 on the next page to calculate the length and number of ceiling joists needed. Assume a concrete floor is used. Select the correct answer and put it in the blank provided.

✔ NOTE: Do not subtract for door and window openings.

1. Wall plates (2 x 6s, 16' long): Treated _____ Untreated _____

2. Studs (precut 2 x 6s): ________________________________

3. Headers (2 x 12s):
   A. ________________________________
   B. ________________________________
   C. ________________________________

4. Metal strap bracing: ________________________________
WALL AND CEILING FRAMING
Carpentry Series

Student Name ________________________________
Start Date: _______ Completion Date: _______

1. Study Information Sheet 2, objective 14.

2. Discuss the considerations to be made before deciding joist size and spacing.

3. Study the Student Supplement found at the back of the Student Workbook. Pay special attention to joist spacing and allowable spans for different species of lumber.

4. Study building plans and discuss the various considerations for deciding joist size and spacing.

5. Study Information Sheet 2, objective 15.

6. Discuss methods used to support ceiling joists.

7. Study Information Sheet 2, objective 16.

8. Discuss methods used to anchor joists to partition walls and why one method may be chosen over another.

9. Study Information Sheet 2, objective 17.
the methods used to prevent joists from twisting or bowing.

Quiz 3.

Information Sheet 2, objective 18.

the procedure for estimating materials for ceiling joists.

your instructor demonstrate the calculation steps.

estimating materials for ceiling joists using problems from your instructor.

the introduction to Assignment Sheet 2, objective 19.

Assignment Sheet 2.

and have your instructor evaluate your work from the Assignment Sheet. After your work has been evaluated, follow your instructor's recommendations.

the introduction to the Job Sheet 1, objective 20.

the “Lay Out Wall and Partition Locations on a Floor” video.
21. Ask

your instructor to demonstrate guidelines and procedures in the Job Sheet. Use the Job Sheet to follow along. Pay careful attention to any guidelines, cautions, and warnings.

22. Practice

the procedure demonstrated by your instructor. Use the Job Sheet as a guide. Notify your instructor when you are ready to perform the procedures for evaluation.

23. Stop

and have your instructor evaluate your work from the Job Sheet. After your work has been evaluated, follow your instructor’s recommendations.

24. Discuss

with your instructor the safety issues involved in laying out wall and partition locations on a floor.

25. Study

the introduction to the Job Sheet 2, objective 21.

26. Watch

the “Cut Studs, Trimmers, Cripples and Headers to Dimensions” video.

27. Ask

your instructor to demonstrate guidelines and procedures in the Job Sheet. Use the Job Sheet to follow along. Pay careful attention to any guidelines, cautions, and warnings.

28. Practice

the procedure demonstrated by your instructor. Use the Job Sheet as a guide. Notify your instructor when you are ready to perform the procedures for evaluation.
and have your instructor evaluate your work from the Job Sheet. After your work has been evaluated, follow your instructor’s recommendations.

30. Discuss with your instructor the safety issues involved in cutting studs, trimmers, cripples and headers to length.

31. Study the introduction to the Job Sheet 3, objective 22.

32. Watch the “Assemble Corners, T’s, and Headers” video.

33. Ask your instructor to demonstrate guidelines and procedures in the Job Sheet. Use the Job Sheet to follow along. Pay careful attention to any guidelines, cautions, and warnings.

34. Practice the procedure demonstrated by your instructor. Use the Job Sheet as a guide. Notify your instructor when you are ready to perform the procedures for evaluation.

35. Stop and have your instructor evaluate your work from the Job Sheet. After your work has been evaluated, follow your instructor’s recommendations.

36. Discuss with your instructor the safety issues involved in assembling corners, T’s, and headers.
the introduction to the Job Sheet 4, objective 23.

the “Construct Wall Sections” video.

your instructor to demonstrate guidelines and procedures in the Job Sheet. Use the Job Sheet to follow along. Pay careful attention to any guidelines, cautions, and warnings.

the procedure demonstrated by your instructor. Use the Job Sheet as a guide. Notify your instructor when you are ready to perform the procedures for evaluation.

and have your instructor evaluate your work from the Job Sheet. After your work has been evaluated, follow your instructor’s recommendations.

with your instructor the safety issues involved in constructing wall sections.

the introduction to the Job Sheet 5, objective 24.

the lay out and installing ceiling joists portions of the following videos: “Lay Out, Cut, and Install Ceiling Joists and Erect Rafters for Gable Roofs” and “Lay Out, Cut, and Install Ceiling Joists and Erect Rafters for Hip Roofs”.

LEARNING OBJECTIVES

40. Practice

41. Stop

42. Discuss

43. Study

44. Watch
your instructor to demonstrate guidelines and procedures in the Job Sheet. Use the Job Sheet to follow along. Pay careful attention to any guidelines, cautions, and warnings.

the procedure demonstrated by your instructor. Use the Job Sheet as a guide. Notify your instructor when you are ready to perform the procedures for evaluation.

and have your instructor evaluate your work from the Job Sheet. After your work has been evaluated, follow your instructor's recommendations.

with your instructor the safety issues involved in laying out and installing ceiling joists.

the introduction to the Job Sheet 6, objective 25.

your instructor to demonstrate guidelines and procedures in the Job Sheet. Use the Job Sheet to follow along. Pay careful attention to any guidelines, cautions, and warnings.

the procedure demonstrated by your instructor. Use the Job Sheet as a guide. Notify your instructor when you are ready to perform the procedures for evaluation.
and have your instructor evaluate your work from the Job Sheet. After your work has been evaluated, follow your instructor’s recommendations.

Discuss with your instructor the safety issues involved in installing fiberboard or insulation-panel, drywall, and plywood sheathing.

Study the introduction to the Job Sheet 7, objective 26.

Ask your instructor to demonstrate guidelines and procedures in the Job Sheet. Use the Job Sheet to follow along. Pay careful attention to any guidelines, cautions, and warnings.

Practice the procedure demonstrated by your instructor. Use the Job Sheet as a guide. Notify your instructor when you are ready to perform the procedures for evaluation.

Stop and have your instructor evaluate your work from the Job Sheet. After your work has been evaluated, follow your instructor’s recommendations.

Discuss with your instructor the safety issues involved in installing sheathing and plywood siding.
Select considerations to be made before deciding joist size and spacing.

There are many things to consider when deciding joist size and spacing. Be sure to take into consideration all of these aspects so that the building will be structurally sound and efficiently built.

- Building codes
- Building plans
- Construction above ceiling
- Joist span
- Size and spacing
- Species and grade of lumber
- Type of load to be carried
- Types of ceiling finish
- Use of attic space

Identify methods used to support ceiling joists.

There are many different methods used to support ceiling joists. Study the common methods used to support ceiling joists below.

FIGURE 16

- Beam with a ledger
OBJECTIVE 16

Identify methods used to anchor joists to partition walls.

- Metal joist hangers
- Supported by beam
- Wall supported
- Blocking only
Nail strip and blocking

**Identify methods used to prevent joists from twisting or bowing.**

**FIGURE 22**

- Ribband – Use 1 x 4 ribband nailed across tops of joist at center of span.

**FIGURE 23**

- Strongback – Use strongbacks nailed across the top of the joist at the center of the span with the end tied to solid framing member.
OBJECTIVE 18

Review the procedure to estimate materials for ceiling joists.

1. Determine the size and spacing for the joist from the plans.

2. Determine the number of joists required by multiplying the wall length by the constant for the spacing used.

   A. 12" on center

   1) Multiply wall length by 1.

   2) Add one joist.

   EXAMPLE: Use 2 x 4 joists for a room 12' x 12'
   Step 1: 12' x 1 = 12 joists
   Step 2: 12 + 1 = 13 joists
   Total: 13 2 x 4 joists are needed

   B. 16" on center

   1) Multiply the wall length by ¾" (.75).

   2) Add one joist.

   EXAMPLE: Use 2 x 6 joists for a room 10' 8" x 12'
   Step 1: 12' x .75 = 9.00 or 9 joists
   Step 2: 9 joists + 1 = 10
   Total: 10, 2 x 6 joists are needed

   C. 24" on center

   1) Multiply the wall length by ½ (.50).

   2) Add one joist.

   EXAMPLE: Use 2 x 8 joists for a room 9' 10" x 12' 6"
   Step 1: 12' 6" x .50 = 6.25 or 7 joists
   Step 2: 7 joists + 1 = 8 joists
   Total: 8, 2 x 8 joists are needed

   ✔ NOTE: Multiply the full length of the building including fractional feet times the constant for the joist spacing. For any fractions in your answer, round up to the next whole number.

3. Determine the length of the joists.

   A. If the allowable span for the joist is equal to or greater than the width of the building, the joist length will be the same as the building width.
B. If the allowable span for the joist is less than the width of the building, the joist length will be the distance from the outside of the outside wall to the opposite side of the bearing partition plus 6" for the overlap.

**EXAMPLE:** If the distance from the outside of the outside wall to the opposite side of the bearing partition is 9' 8", then the joists would have to be 10' 2" (9' 8" + 6").

C. Use the next longest length of material.

✔ **NOTE:** Generally, joists will not be cut to size where they overlap on the bearing partitions. For instance, in the example above 12' lumber would be used and would not be cut down to 10’ 2” because of the cost in time and labor.

4. Multiply number of joists for each span times the number of spans for that length to determine the total number of boards needed.

**EXAMPLE:** 2 x 6 joists are to be used 24" on center in a building 42' 0" x 28' 4", a bearing partition runs the length of building 11' 6" from the nearer outside wall measured from the outside of the building to the center of the partition.

1. 2 x 6 joists, 24" o.c.

2. Number of joists = \((42 \times \frac{1}{2}) + 1 = 22\)

3. Length of joists
   - Span A = \((11' 6" \times 1\frac{3}{4}) + 6" \) overlap
     - Total: \(11' 7\frac{3}{4}" + 6" = 12' 1\frac{3}{4}"\)
   - Span B = \(28' 4" - 11' 6" + 1\frac{3}{4}" + 6\)
     - \(16' 10" + 1\frac{3}{4}" + 6\)
     - \(16' 11\frac{3}{4}" + 6\)
     - Total: \(17" 5\frac{3}{4}"\)
Estimate materials for ceiling joists.

Accurate estimating of framing materials saves time and money. Use the procedures found in Information Sheet 2, objective 18, to help estimate materials for ceiling joists.

Use Figure 24 to estimate the length and number of ceiling joists needed.

FIGURE 24

1. 2 x 8 Joists on 12" center:
   A. Number of joists: ___________
   B. Length of joists: ___________
2. 2 x 6 Joists on 16" center:
   A. Number of joists: ____________
   B. Length of joists: ____________

3. 2 x 6 Joists on 24" center:
   A. Number of joists: ____________
   B. Length of joists: ____________
Two common types of wall framing are platform framing and balloon framing. Most construction will call for the platform type of framing to be used. Platform framing is a wood frame construction method in which studs are one story high and a platform is built on the plates over the studs and acts as a base for the next floor. Platform framing is also known as western framing. Balloon framing is a residential construction method in which one-piece studs extend from the sill to the roof plate and the joists for the upper floors are nailed to the sides of studs. The most common of the two methods is platform framing.

Partition walls or interior walls are of either bearing or non-bearing. A bearing wall supports ceiling joists, while a nonbearing wall supports only itself. The building plans will provide the sizes of the interior walls or partitions and their locations. A good understanding of the building plans is essential to the overall quality of the finished product.

- 8d nails
- 25' tape
- 8d Chalk line
- 8d Framing hammer
- 8d Framing square
- 8d Personal protection equipment
- 8d Steel tape
1. Lay out the outside walls.

   A. Measure in the width of the soleplate from the outside edge of the floor on each end of the structure and mark this distance.

   ✔ NOTE: On concrete slab construction you must allow for sheathing thickness.

   B. Start a nail at each mark.

   C. Snap a chalk line between the marks.

   D. Check for square of the sub floor by using the 3-4-5 method.

   ✔ NOTE: On longer walls, be sure the line is straight and well marked. Secure one end of the line and have someone hold the other end of the line and pull the line tight. Place your thumb on the line approximately in the center. Be sure to hold the line firmly to the floor. Carefully lift one side of the line with your other hand and let it snap to the floor. Repeat this process on the other half of the line.
2. Lay out the inside walls

✓ NOTE: Check for equal diameter dimensions and ensure overall square.

A. Mark each of the partitions.

B. Repeat this procedure for the other side of the wall.

C. Stretch a chalk line very tightly along the length of the partition and snap a line.

D. If the chalk lines are to be exposed to weather, protect the lines by using a clear protective coating.

3. Have your instructor check your work.

4. Clean up the area and put away the equipment and supplies.
### SKILL TEST RECORD

**Evaluator note:** Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of “3” or higher to demonstrate student mastery. (See Key below.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

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**Evaluator note:** To obtain an average rating for the Profile of Training Mastery, total the points in Product Evaluation and divide by the total number of criteria. Circle the rating on the Key.

- **4 Skilled** — Can perform job with no additional training
- **3 Moderately Skilled** — Has performed job during training program; limited additional training may be required
- **2 Limited Skill** — Has performed job during training program; additional training is required to develop skill
- **1 Unskilled** — Is familiar with process, but is unable to perform job
WALL AND CEILING FRAMING
Carpentry Series

Student name ________________________________ Score _________

Cut studs, trimmers, cripples, and headers to length.

Studs, trimmers, cripples, and headers are made of 2 x 4s or 2 x 6s spaced 16" or 24" on center. The lumber used in wall framing call for stiffness, nail-holding ability, warp resistance, and ease. The length of the framing lumber comes in increments of two feet. Some vertical members are precut and come in standard lengths of 92 5/8 inches and 92 1/4 inches.

When cutting studs it is important to use straight material for the full-length studs. Use the less straight material for the trimmer and cripple studs. Remember that each header requires two pieces. Cut the longest headers first, and plan all your cuts to keep waste to a minimum. Spacers should be cut slightly less than the width of the header, and they should be at least 1 1/2" wide. Three spacers are needed for short headers and more for longer headers.
FIGURE 29

EQUIPMENT AND SUPPLIES
- ⅛" CD plywood
- 2 x 4s or 2 x 6s
- 2 x 12s
- 16d box nails
- Circular saw
- Extension cord
- Framing hammer
- Framing square
- Personal protection equipment
- Steel tape

PROCEDURE

Yes No

1. Put on personal protection equipment.
   - Cut the studs.
   - Determine the number of full studs needed.
   - Determine the length of the full studs by subtracting the thickness of the sole plate, top plate, and double top plate from the wall height.
   - Measure and mark the length of the full studs.
D. Cut the first stud, following safety procedures.

E. Measure the stud again to make sure it is the right length.

F. If the stud is the correct length, use the stud as a pattern to cut the rest of the full studs.

**NOTE:** It is important to use straight material for full studs. Use the less straight material for trimmer studs.

3. Cut the trimmer studs.

A. Determine the lengths of the trimmers.

**NOTE:** The trimmer length equals the height of the header less the thickness of the sole plate.

B. Determine how many trimmer studs of each length are needed.

C. Measure and mark the length of the longest trimmer stud.

D. Cut the longest trimmer stud.

4. Cut the cripple studs.

A. Determine how many lengths are needed.

**NOTE:** The upper cripple equals the length of the stud less the length of the trimmer and the height of the header. The lower cripple equals the height of the bottom rough opening less the sill and the sole plate.

B. Determine the number of each length needed.

C. Measure and mark the length of the longest cripple stud.
D. Cut the longest cripple stud.

**NOTE:** Use the shortest material available to cut the cripple stud.

E. Repeat this procedure for each length of cripple stud, cutting the next shorter length with each cut.

5. Cut the material for the headers.

**NOTE:** On some jobs a different type of header may be specified or multiple trimmers.

A. Determine the length of headers needed.

**NOTE:** The header length equals the rough opening width plus the thickness of the two trimmers.

B. Determine the number of the headers needed for each size opening.

**NOTE:** All headers require two pieces. Cut the longest header first and plan all your cuts to keep waste to a minimum.

C. Measure and mark the length of the longest header.

D. Use the framing square to square a line across the header.

E. Cut the longest header.

F. Repeat the entire process for each length of header.

6. Cut spacers for the headers from 1/2" plywood.

**NOTE:** Spacers should be cut slightly less than the width of the header and they would be at least 1 1/2" wide. Three spacers are needed for short headers and more are needed for longer headers.
7. Have your instructor check your work.

8. Clean up the area and put away the equipment and supplies.

**SKILL TEST RECORD**

**Evaluator note:** Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of “3” or higher to demonstrate student mastery. (See Key below.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

Criteria:

- Observed safety procedures
- Used proper equipment correctly
- Performed steps in a timely manner
- Followed instructions
- Provided satisfactory responses to questions asked

**Evaluator note:** To obtain an average rating for the Profile of Training Mastery, total the points in Product Evaluation and divide by the total number of criteria. Circle the rating on the Key.

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Assemble corners, Ts, and headers.

The important considerations are solid corner and nailing surfaces for the interior and exterior wall finishes. In addition, try to choose the straightest, least defective studs for corner assemblies.

**FIGURE 30**

```
12' - 0"
```
**EQUIPMENT AND SUPPLIES**

- ½” CD plywood cut for header spacers
- 2 x 12 header material cut to length
- 16d box nails
- Circular saw
- Extension cord
- Framing hammer
- Personal protection equipment
- Steel tape
- Stock for blocking
- Studs

**PROCEDURE**

1. Put on personal protection equipment.
2. Construct the corners.

   A. Stack the materials in an out-of-the-way but convenient location.

   B. Review the plans to determine the number of corners needed.

   C. Select three of the straightest studs for each corner to ensure that the corners are plumb.
D. Construct the corners as you see them in the Figure 33.

✓ NOTE: Use three blocking pieces that are 10” to 16” long for each corner. Scrap material may be used.

E. Nail two studs together with the blocking in between.

3. Construct the partition Ts. See figures 34 and 35.

A. Decide which material is needed for the type of T you are building.
B. Select two of the straightest studs for the T.

C. Use three blocking pieces that are 10" to 16" long for each T.

D. Nail the two studs together with the blocking in between.

4. Construct the headers. See Figure 36.

A. Mark the crown on the header materials.

B. Arrange the plywood spacers 16" to 24" apart along one of the 2 x 12s.

C. Place the second 2 x 12 on top of the spacers with the edges even with the first 2 x 12.

D. Hold the second 2 x 12 in place with both crowns up, and drive the nails into it.

FIGURE 36

1/2” PLYWOOD SPACER

16d BOX NAILS

E. Cut the rough sills using safety procedures.

✓ NOTE: Determine the measurement for the cut using this formula:
length of sill = width of rough opening.

F. Cut one rough sill for each window.

✓ NOTE: Some very heavy windows may require a double sill.
### 5. Have your instructor check your work.

### 6. Clean up the area and put away the equipment and supplies.

---

**SKILL TEST RECORD**

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**Key**

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WALL AND CEILING FRAMING
Carpentry Series

Construct wall sections.

Interior walls are framed in the same method without regard to the system used for the exterior walls. There are various ways to lay out and erect a framed wall. However, the modified tilt-up method as described in the procedure below is commonly used because of its efficiency and ease.

FIGURE 37
EQUIPMENT AND SUPPLIES

- 4' level
- 6' step ladder
- 8d and 16d box nails
- 25' tape marked 16" on center
- Circular saw
- Corners
- Cripple studs
- Extension cord
- Framing square
- Headers
- Metal strapping brace material
- Personal protection equipment
- Plate material
- Regular studs
- Speed square
- Ts for partitions

PROCEDURE

Yes No

1. Put on personal protection equipment.

2. Plan the sequence for raising the walls.

   ✔ NOTE: Use the most productive and efficient sequence for your situation.

3. Select the materials from stock for the plates.

4. Cut the sole plate and top plate for the first wall to length, following safety procedures.

5. Tack the sole plate and the top plate for the first wall together and lay them on the edge at the wall location.

6. From the plans, lay out the following on the plates:

   A. Rough openings
   B. Corners
   C. Partition T's
   D. Stud locations
7. Mark the plates for the corners.

8. Locate the centers of the openings and lay out the trimmer stud locations. See Figure 38.

A. Determine the distance from the end of the plate to the center of the opening, according to the plan.

B. Measure the required distance and mark it on the plate.

C. Measure and mark 1/2 the header length on each side of the center of the opening.

✓ NOTE: This locates the outside of each trimmer stud.

D. Recheck the dimensions.

E. Mark the trimmer stud locations with a “T”.

F. Mark the cripple stud locations with a “C”.

FIGURE 38

9. Use a tape to lay out all of the full stud locations. See Figure 39.

A. Measure 15 1⁄4” from the end of the outside corner to the leading edge of the first stud.

B. Drive a nail at this point and hook the end of the tape to the nail.
C. Mark 16" centers and place a small “X” to the far side of each mark.

![Figure 39]

D. Use a square to mark the stud locations across both of the plates. See Figure 40.

**NOTE:** Another accepted method is to mark your plates on the edge. Splices in the plate must fall at the center of the stud.

![Figure 40]

10. Build the wall with the inside of the wall facing down.

11. Place the soleplate at the partition line with the marked side up.

12. Move the top plate to the approximate stud length.

13. Place the corner and partition Ts at the appropriate mark.

14. Lay the studs at each “X” mark.
15. Check all the studs and turn them so that the crown is up.

**NOTE:** If the studs are bowed too badly, they should be used for cripples or blocking.

16. Put the headers in place.

17. Place the trimmer studs at each “T” mark.

**NOTE:** The trimmer studs and headers may be assembled prior to the wall assembly.

18. Place the rough sills and cripple studs where the openings are located.

19. Nail the framework together. See Figure 42.
A. Drive two 16d nails through the plate into the end of each 2 x 4 stud or three nails for 2 x 6 studs.

✓ NOTE: The use of a nail gun is common practice. Special training is required to ensure safe use.

B. Install the headers and trimmers, or opening assemblies.

C. Nail the cripple studs in place.

D. Install rough sills and ensure all rough openings are the proper size.

E. Finish nailing the framework together.

20. Measure and cut the double top plate. See Figure 43.

✓ NOTE: Be sure to allow for the overlap of corners and Ts.

A. Cut the double top plate on the exterior walls to accept the plate from the other walls or partitions.
B. Install the double top plates by first driving two 16d nails at one end of each double top plate section.

21. Drive one 16d nail on each side of the stud locations on opposite sides of the double top plate. See Figure 44.

✓ NOTE: Some permanent bracing requires preparation prior to installation of walls.
22. Raise the wall section and nail it in place.

✔ NOTE: To do this on wood floors, use two 16d nails every other floor joist. On concrete slabs, use pre-set anchor bolts or powder-actuated pins where appropriate. The use of powder-actuated tools requires special training to ensure their safe use.

WARNING: Before using a powder-actuated tool, you must be certified and possess a safety certification card.

23. Plumb the corners.


25. Install remaining walls and brace in the same manner. See Figure 45.

FIGURE 45
26. Check the corners and adjust plumb if necessary.

27. Straighten the walls and nail the top of the temporary bracing in place. See Figure 46.

A. Nail a ¾" block on each corner at the top of the walls.

B. String a line from one end of the wall to the other.

✓ NOTE: Be sure to stretch the line very tightly so that it does not sag.

C. Use a ¾" gauge block to check the wall line.

D. Adjust and nail the bracing during the straightening process.

✓ NOTE: Be sure the bracing does not extrude beyond the exterior wall.
28. Install the appropriate permanent bracing.

29. Remove the exterior temporary bracing that is no longer needed.

30. Have your instructor check your work.

31. Clean up the area and put away the equipment and supplies.

---

**SKILL TEST RECORD**

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Lay out and install ceiling joists.

Ceiling joists are normally installed after the walls are erected and before the roof is framed. However, in laying out and installing the ceiling joists, the roof design must be considered. Your instructor may choose to teach this procedure after you have studied roof framing.

Some suggestions to speed up the ceiling joist installation are:

- Cut joist to correct length.
- Trim the outer ends of the joists to the correct roof slope.
- Have a helper hand the joists up to someone on the top.
- Lay out the joists flat across the span at their proper location.
- If spacing is the same as the studs, nail the joists directly above the studs, this allow for pipes, flues, ducts and so on that run through the roof to be installed more easily.
- Use a carpenter on each end when nailing joists in place.

- 16d box nails
- 25' tape with markings at 16” centers
- Circular saw
- Extension cord
- Framing hammer
- Framing square or speed square
- Joists, lengths and sizes as specified
- Personal protection equipment
1. Put on all personal protection equipment.
2. Lay out joist locations on double top plate.

A. For Gable Roof. See Figure 47.
   1) Determine which direction the joist will run.

   ✓ **NOTE:** They are usually placed parallel to the shortest dimension of the structure; however, refer to the plans.

   2) Locate the outside of the first joist flush with the outside corner of the double top plate.

   3) Measure 15 1/4" from the end of the outside corner to the closest edge of the first joist.

   4) Drive a nail and hook the end of the tape to the nail.

   5) Lay out for 16" centers and place an “X” on the side where the joist will be placed and place an “R” on the side where the rafter will be located.

   6) Repeat steps 3 - 6 on the opposite wall or on the bearing partition.

   ✓ **NOTE:** Be sure to reverse the measuring procedure.
B. For a hip roof. See Figure 48.

1) Determine which direction the joist will run.

   ✔ NOTE: They are usually placed parallel to the shortest dimension of the structure; however, refer to the plans.

2) Determine the length of run and transfer this measurement to the double top plate.

3) Measure 15\(\frac{3}{4}\)" from the end of the outside corner to the closest edge of the first joist.

4) Drive a nail and hook the end of the tape to the nail.

5) Lay out for 16" centers and place an “X” on the side where the joist will be placed.

6) Repeat steps 3 - 6 on the opposite wall or on the bearing partition.

   ✔ NOTE: Be sure to reverse the measuring procedure.

7) Establish center of end wall and mark.
8) Measure 15 1/4" from the end of the outside corner to the closest edge of the first joist.

9) Drive a nail and hook the end of the tape to the nail.

10) Lay out for 16" centers and place an “X” on the side where the joist will be placed.

11) Repeat steps 8 - 11 on the opposite wall or on the bearing partition.

FIGURE 48

3. Install ceiling joist

A. Cut the joist ends to the pitch of the roof. See Figure 49.
B. Place one joist, crown up, on each mark that was made on the plate.

C. Splice the joist on the bearing. See Figure 50.

**NOTE:** There should be a minimum overlap of 6".

D. Toenail the joist to the plate with three nails.
4. Have your instructor check your work.

5. Clean up area and put away equipment and supplies.

**SKILL TEST RECORD**

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Criteria:

Observed safety procedures 4 3 2 1

Used proper equipment correctly 4 3 2 1

Performed steps in a timely manner 4 3 2 1

Followed instructions 4 3 2 1

Provided satisfactory responses to questions asked 4 3 2 1

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1 **Unskilled** — Is familiar with process, but is unable to perform job

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Install fiberboard or insulation-panel, drywall, and plywood sheathing.

Sheathing is the inner layer of the outside wall covering on a frame structure that forms a flat layer base upon which the siding or other material is applied. The sheathing adds strength and usually rigidity to the house. However, some sheathing may require bracing if the material is not rigid enough.

The most common types of sheathing are fiberboard, insulation-panel, gypsum board, and plywood. Plywood sheathing is used to cover large areas fast while adding strength and rigidity to the structure. Plywood holds nails well and provides a solid nailing base for the finish material. Plywood comes in 4’ x 8’ sheets and is usually applied vertically or horizontally. When applied horizontally, it will require diagonal corner bracing in the wall framework. The building plans will specify which method should be used to apply the sheathing.

Gypsum sheathing is composed of treated gypsum filler faced on both sides with lightweight paper. Gypsum comes in 2’ x 8’ or 4’ x 8’ sheets and is applied horizontally. The gypsum sheathing may be edged with a tongue and groove finish to ease in its application.

Wall sheathing may be applied at any one of three stages; when the wall is lying on the sub floor, completely framed and squared or when the wall and ceiling frames have been erected, plumbed, and braced. Most carpenters will apply the sheathing as quickly as possible to add strength and provide a solid surface for the ceiling members.
EQUIPMENT AND SUPPLIES

- 1 x 4 for diagonal braces
- 1½” barbed roofing nails for gypsum board
- 2” ring shank roofing nails for fiberboard
- 6d box nail for plywood
- 8d box nail for braces
- Chalk line
- Circular saw
- Claw hammer
- Extension cord
- Framing square
- Fiberboard
- Gypsum board (Gyplap)
- Personal protection equipment
- Plywood
- Straightedge
- Steel tape

PROCEDURE 1

Install fiberboard or insulation-panel sheathing with plywood corner bracing

✓ NOTE: Follow manufacturer's recommendations for nailing, joints, and installation.

Yes | No
---|---

1. Put on all personal protection equipment.

2. Apply a full sheet of plywood to each exterior corner of the structure.

A. Chalk a line vertically on the sheathing at each stud.

B. Start at the bottom of the corner of one wall and tack the panel in place.

C. Complete the nailing.

✓ NOTE: Space the nails 6” on the center of edges and 12” on the center for each stud.

D. Continue the procedure, lapping the edges of the plywood at the corners until all the plywood bracing has been installed.
3. Apply the fiberboard sheathing. See Figure 52.

**FIGURE 52**

- A. Chalk the lines vertically on the sheathing at each stud.
- B. Tack the panels in place.
- C. Complete the nailing.

**NOTE:** Space the nails 3” inches on the center at the edges and 6” on the center at each stud.

4. Have your instructor check your work.

5. Clean up the area and put away the equipment and supplies.

**Installation of gypsum-board sheathing with metal diagonal bracing**

1. Put on all personal protection equipment.

2. Starting at the bottom of the corner of one wall tack the panel in place with the topside up. See Figure 53.

3. Complete the nailing procedures as described above.

**NOTE:** Nail as required for the type of exterior finish to be used.
4. Continue the installation, working up from the bottom and staggering the joints. See Figure 53.

FIGURE 53

5. Have your instructor check your work.

6. Clean up the area and put away the equipment and supplies.

PROCEDURE 3

Installation plywood sheathing.

1. Put on all personal protection equipment.

2. Install a plywood panel at each corner for bracing. See Figure 54.

   ✔ NOTE: No additional bracing is required with plywood is used.

3. Install intermediate panels.
4. Have your instructor check your work.

☐ ☐ 5. Clean up the area and put away the equipment and supplies.

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**SKILL TEST RECORD**

**Evaluator note:** Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of “3” or higher to demonstrate student mastery. (See Key below.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

Criteria:

- Nail spacing for plywood corners $\frac{1}{4}”$
  - 4 3 2 1

- Nail spacing for sheathing $\frac{1}{4}”$
  - 4 3 2 1

- Sheathing attached soundly
  - 4 3 2 1

- Gypsum-board staggered
  - 4 3 2 1

**Evaluator note:** To obtain an average rating for the Profile of Training Mastery, total the points in Product Evaluation and divide by the total number of criteria. Circle the rating on the Key.
**KEY**

4 **Skilled** — Can perform job with no additional training

3 **Moderately Skilled** — Has performed job during training program; limited additional training may be required

2 **Limited Skill** — Has performed job during training program; additional training is required to develop skill

1 **Unskilled** — Is familiar with process, but is unable to perform job

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**EVALUATOR’S COMMENTS**

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Install sheathing and plywood siding.

Plywood siding comes in many grades, textures, and designs giving a greater variety of choices to the builder and architect. It is commonly applied vertically but it may be applied horizontally. However, all the edges of the panel siding should be backed with framing members. In addition, galvanized, aluminum, or other non-corrosive nails should be used to attach it to the framing members or blocking. It may have with flush joints, V-grooves, or other end treatments.

- 4 x 8 exterior plywood siding
- 4 x 8 fiberboard sheathing
- 6d and 8d galvanized box nails
- 48" level and straightedge
- Building paper for underlayment
- Caulking gun and caulking
- Chalk line
- Circular saw
- Claw hammer
- Extension cord
- Framing square
- Handsaw
- Personal protection equipment
- Sawhorses
- Staples or T-nails
- Steel tape
1. Check the corner for plumb, as it may be necessary to scribe and cut the first sheet of sheathing and siding. See Figure 55.

✔ NOTE: Use a level, as in Figure 55, or a plumb bob to check for plumb.

FIGURE 55

2. Install a 32" wide sheet of sheathing at the corner.

✔ NOTE: This narrow piece is necessary to avoid having the joints of the sheathing and siding on the same stud. If the plywood bracing is used, install a 32" wide sheet of siding as the first piece of siding.

3. Tack the first piece of sheathing in place.

4. Cut and install a band of sheathing to cover the rim joist if necessary. See Figure 56.
5. Install the next sheet of sheathing.

6. Install the underlayment.

7. Plumb and install the first sheet of siding. See Figure 57.

**NOTE:** Space the nails every 6" on the edges and every 12" on intermediate studs. Place the nails about ⅜" from the edge of the panels. Cut the siding from the unfinished side. When the corner trim is used, it may not be necessary to scribe and cut the siding.
8. Continue installing the sheathing and siding, leaving \( \frac{1}{6} \)" spacing at all edges and ends of siding for the shrinkage. See Figure 58.

9. Caulk all of the vertical joints.

✓ **NOTE:** When installing the horizontal siding, use the flashing and caulking. Z flashing is recommended.
10. Install flashing over windows and doors. See Figure 59.
<table>
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11. Caulk over the window and doors. See Figure 60.

**FIGURE 60**

![Diagram showing siding, flashing, caulk line, and casing.](image)

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12. Continue fitting and nailing until siding is completed. See Figure 61.

**FIGURE 61**

![Diagram of a wall with siding and a window.](image)
13. Have your instructor check your work.

14. Clean up the area and put away the equipment and supplies.

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**SKILL TEST RECORD**

Evaluator note: Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of “3” or higher to demonstrate student mastery. (See Key below.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

Criteria:

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<tr>
<td>Corners are plumb 1⁄8”</td>
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<tr>
<td>First sheet of sheathing is 32&quot;</td>
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<td></td>
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<td></td>
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<tr>
<td>Underlayment installed</td>
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<td></td>
</tr>
<tr>
<td>Nail spacing in side panels correct 1⁄4&quot;</td>
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<tr>
<td>Correct spacing of siding panels and sheathing 1⁄32&quot;</td>
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</tbody>
</table>

Evaluator note: To obtain an average rating for the Profile of Training Mastery, total the points in Product Evaluation and divide by the total number of criteria. Circle the rating on the Key.

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