Introduction

There are many styles, colors, designs, and sizes of finish materials that can be used to finish interior walls and ceilings. The installation of interior finish materials requires careful attention to layout, measuring, and cutting. When installed correctly, interior finish materials add beauty and value to a structure.

On the Internet

You can learn more about interior wall and ceiling finishing at these websites:

Ply*Gem Manufacturing
http://www.plygemmanufacturing.com/

American Paneling, Inc.
http://www.americanpaneling.com/

Celotex Corporation
http://www.celotex.com/

Armstrong Corporation
http://www.armstrong.com/

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.

Wall and Ceiling Finishing Materials and Installation Tools

1. Select materials used to finish interior walls and ceilings.
2. Identify tools, equipment, and accessories used to finish interior walls and ceilings.
Wall Finishes: Types, Materials, and Installation of Paneling

3. Identify styles of paneling.
4. Identify joint treatments for paneling.
5. Identify types of interior trim.
6. Estimate the number of 4’ x 8’ sheets needed to panel a room. (Assignment Sheet 1)
7. Estimate materials needed to trim a room. (Assignment Sheet 2)
8. Install furring strips on a masonry wall. (Job Sheet 1)
9. Install V-grooved paneling, panel wainscot, and trim. (Job Sheet 2)

Ceiling Finishes: Types, Materials, and Installation of Ceiling Tiles

10. Identify where ceiling tile is applied and the application methods used.
11. Identify materials used to fabricate ceiling tiles.
12. Identify factors that influence types of ceiling tile to be used.
13. Estimate the number of ceiling tiles needed to finish a ceiling. (Assignment Sheet 3)
14. Install ceiling tile over a solid surface. (Job Sheet 3)
15. Install furring strips on ceiling joists and ceiling tile on furring. (Job Sheet 4)
16. Erect a suspended ceiling system. (Job Sheet 5)
INTERIOR WALLS AND CEILINGS FINISH
Carpentry Series

Student Name ________________________________
Start Date: _______ Completion Date: ________

1. Study

Information Sheet 1, objective 1.

2. Read

the Student Supplement, Common Methods Used To Install Wall and Ceiling Materials.

Optional View

samples of materials used to finish walls and ceilings.

3. Study

Information Sheet 1, objective 2.

Optional Examine

samples of tools, equipment, and accessories, used to finish walls and ceilings.

4. Take

Quiz 1.
Select materials used to finish interior walls and ceilings.

WORDS YOU SHOULD KNOW

- glazed: a glossy surface coating applied to ceramics
- paneling: a veneer or solid wood interior wall finish
- sheathing: material used to cover walls and roofs to provide insulation and shear strength to the structure
- veneer: a thin surface layer of material

Walls

The following materials are used to finish interior walls.

✓ NOTE: Refer to the Student Supplement found at the end of this Information Sheet for more information.

- **Ceramic tile** – made from a pure clay or a mixture of clay and other materials that may include vermiculite, sand, ground rock, gypsum, and talc. Ceramic tile is commonly used in the kitchens, bathrooms, mud rooms, and laundry rooms. Ceramic tiles come in a variety of patterns, shapes, sizes, and colors and may be glazed or left natural.

- **Hardboard paneling** – paneling made of synthetic materials, wood chips, and wood fiber formed by heating and pressing into panels. The surface finish is usually vinyl or plastic and is available in many different patterns and colors.

- **Plywood paneling** – paneling usually made of layers of veneer over a lumber core.

- **Solid-lumber paneling** – paneling made completely of one wood.

- **Plaster** – made of sand, water, and lime mixtures. Plaster is sometimes used to create a heavy or light texture.
- **Plastic laminate** – usually made of plywood with a layer of plastic bonded to both sides of the board

**Ceilings**

The following materials are used to finish ceilings.

- **Ceiling/acoustical tile** – square or rectangular fiberboard material used throughout a structure for decorative appeal and acoustical purposes. Sizes may differ, as does application method. Always refer to manufacturer’s suggested application method.

- **Exposed roof-deck and beam material** – can be tongue and groove lumber, paneling, laminate, solid lumber, and/or plaster. Exposed roof-deck and beam materials can be special ordered and may require special application. Always refer to manufacturer’s suggested application method.

- **Plaster** – made of sand, water, and lime mixtures. Plaster is sometimes used to create a heavy or light texture.

**OBJECTIVE 2**

**Identify tools, equipment, and accessories, used to finish interior walls and ceilings.**

Using the right tool for specific tasks will improve efficiency and reduce labor costs.

**FIGURE 1**

- **100' Tape** — Used to make measurements
• **Block plane** — Used to smooth small pieces, edges, joint surfaces, and grain, or cross grain when a small amount of change is required

FIGURE 3

• **Caulking gun and adhesive** — Used to apply adhesive

FIGURE 4

• **Chalk line** — Used to snap a straight line on the surface of the material for cutting or placement
- **Circular saw** — Used to cut straight edges on wood, etc.

- **Claw hammer** — Used to drive and pull nails and other fasteners

- **Coping saw** — Used to cut curves and to shape ends of molding and trim for joints
• **Power staplers** — An electric or pneumatic power tool used to fasten staples

**FIGURE 10**

• **Folding rule** — Used to make accurate inside measurements

**FIGURE 11**

• **Framing square** — Used in general framing to lay out walls, partitions, rafters, braces, and stairs
- **Laser instrument** — Used for leveling or verifying horizontal or vertical alignment

- **Levels** — Come in a variety of lengths (30", 3', 4', 6') and is used to align materials along a horizontal plane/line

- **Nail set** — Used to drive a nail head below a surface
• **Pointing trowel** — Used to apply adhesive to ceiling tile

• **Pop rivet gun** — Used to insert pop rivets into predrilled holes

• **Power miter saw** — Tool used to cut material so that the junctions of the pieces are equally divided angles
• **Scribe** — Used for fitting finish material to an uneven surface.

• **Side cut pliers** — Used for gripping and cutting various materials

• **Staple gun** — Used to fasten staples
• **Steel tape** — Used to measure irregular as well as regular shapes and to make accurate inside measurements

• **Tin/metal snips** — Used to cut lightweight metal

• **Utility knife** — Used to score and cut material

• **Utility/keyhole saw** — Used to make cutouts in different finish material
## COMMON METHODS USED TO INSTALL WALL AND CEILING MATERIALS

<table>
<thead>
<tr>
<th>Material</th>
<th>Location</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>plaster</td>
<td>wall or ceiling</td>
<td>applied by hand or machine over lath or backing</td>
</tr>
<tr>
<td>solid-lumber paneling</td>
<td>wall or ceiling</td>
<td>nailed with exposed nails or blind nailing directly to framing members, drywall, or furring strips</td>
</tr>
<tr>
<td>ceramic tile</td>
<td>wall or ceiling</td>
<td>applied with adhesive or in a base material such as grout</td>
</tr>
<tr>
<td>acoustical tile</td>
<td>wall</td>
<td>applied directly to drywall with nails, staples, or adhesive</td>
</tr>
<tr>
<td></td>
<td>ceiling</td>
<td>usually attached to furring strips</td>
</tr>
<tr>
<td></td>
<td></td>
<td>laid in a metal framework for suspended ceilings</td>
</tr>
<tr>
<td>exposed roof-deck and beam material</td>
<td>ceiling</td>
<td>applied directly to roof beams</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓ NOTE: Special materials may require a different application method.</td>
</tr>
<tr>
<td>hardboard paneling</td>
<td>wall</td>
<td>fastened to studs, drywall, or furring strips with nails or adhesive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✓ NOTE: Nails may match color of paneling and installation may or may not include molding.</td>
</tr>
<tr>
<td>plastic laminate</td>
<td>wall</td>
<td>bonded to drywall with adhesive or manufactured with fiberboard or particle board base</td>
</tr>
</tbody>
</table>
INTERIOR WALLS AND CEILINGS FINISH
Carpentry Series

Student Name ________________________________
Start Date: _______ Completion Date: _______

1. Study  Information Sheet 2, objective 3.
   Optional Examine samples of paneling.

2. Study  Information Sheet 2, objective 4.
   Optional Examine samples of joint treatments for paneling.

3. Study  Information Sheet 2, objective 5.
   Optional Examine samples of interior trim.

4. Take  Quiz 2.

5. Read  the introduction to Assignment Sheet 1, objective 6.


7. Examine the samples of building plans.

8. Practice estimating materials needed to trim a room.
9. Read the introduction to Assignment Sheet 2, objective 7.


11. Examine the samples of floor plans and practice estimating the number of 4' by 8' sheets needed to panel a room.

12. Read the introduction to Job Sheet 1, objective 8.

13. 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.

14. 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.

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

16. Read the introduction to Job Sheet 2, objective 9.

17. Watch the video "Applying Paneling to Interior Walls."

18. Complete Video Worksheet 1 found at the back of this book.
19. 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.

20. 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.

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

The three basic types of paneling are plywood, hardboard, and solid lumber paneling. A variety of woods, veneers, textures, and patterns are available in all three types of paneling. Some common styles of finished paneling are listed below.

**FIGURE 25**

- **Brushed** — Has a veneer face which is composed of different grains of wood that run in different directions giving the face a "brushed" look

**FIGURE 26**

- **Plain** — Has a solid panel face unbroken by grooves or other decorative features

**FIGURE 27**

- **V-grooved** — Has a V-shaped grooves cut into the panel face for decorative purposes

✓ **NOTE:** The grooves also provides a place to hide the fastener.
Identify joint treatments for paneling.

Study the different joint treatments for paneling below.

FIGURE 28

- **Batten strip** — Narrow strips of wood that match or contrast with the paneling used to cover the joints between pieces of paneling.

FIGURE 29

- **Butt joint with V-groove** — The edges of two pieces of paneling meet or “butt up” against each other and the tapered edges of the paneling form a V-groove.
FIGURE 30

- **Open joint** — An open space between two pieces of paneling. The open space may expose a prefinished furring strip that matches or contrasts with the paneling or the furring strip may be finished to match or contrast.

✔ **NOTE:** Another option is to fill the open joint with a veneer-faced aluminum molding that acts as a divider between panels.

**Identify types of interior trim.**

Interior trim is used to conceal and protect joints and edges as well as add beauty to a room. It can be made from a variety of natural and synthetic materials such as wood, vinyl, or metal and can be purchased with a wide variety of finishes. Study the different types of interior trim below.

FIGURE 31

- Base
FIGURE 32

- Batten

9/16" x 2 1/4"

FIGURE 33

- Cap molding (cap strip)

13/16" x 2 1/8"  
9/16" x 2 1/16"

FIGURE 34

- Casing

Colonial  
9/16" x 2 3/16"

Sanitary  
5/8" x 2 1/4"
FIGURE 35

13/16" x 2 1/8"

- Chair rail

FIGURE 36

9/16" x 2 1/4"  
3/4" x 3/4"

- Cove

FIGURE 37

- Crown

FIGURE 38
• Doorstop molding

FIGURE 39

- 7/16" x 1 3/8"
- 3/8" x 1 3/8"

• Inside corner

FIGURE 40

- 3/4" x 3/4"
- 5/16" x 1"

• Outside corner

FIGURE 41

- 3/4" x 3/4"
- 1/2" x 1/2"
- 1/4" x 1/4"

• Quarter round
• Shoe molding (base shoe)

• T-astragal

• Window stool
Estimate the number of 4' x 8' sheets needed to panel a room.

The procedure described below is a guideline for determining the number of 4' x 8' sheets needed to panel interior walls that are 8' high or less. For panels in other sizes, follow the procedures in steps 1 through 3 and then divide by the coverage of each unit of material.

FIGURE 45

Follow these steps to estimate the number of 4' x 8' sheets needed to panel a room.

1. Check plans or measure walls to determine perimeter length of each wall.
2. Check plans or measure to determine perimeter length of partitions and offset walls, if any.

3. Add perimeters of all walls to find total perimeter.

EXAMPLE: If the perimeters of the walls of a room are 21', 12', 21', and 12' then the total perimeter would be 66'. See Figure 45.

\[ 21' + 12' + 21' + 12' = 66' \]

4. Divide total perimeter by 4' (which is the width of a sheet of paneling) to find the number of 4' x 8' sheets needed; round up to the next whole number if necessary.

EXAMPLE: If the total perimeter of a room is 66 feet, then divide 66 feet by 4 feet to equal sixteen and 1/2 sheets. Rounding the number up to the next whole number would be 17 sheets needed.

\[ 66' \div 4' = 16 \frac{1}{2} \text{ (round up to 17)} \]

✓ NOTE: Allow for additional materials when ceiling height is greater than 8'.

INSTRUCTIONS

Use the living room and master bedroom (including closet) in Figure 46 to answer the following questions.
1. The total perimeter of the living room is _______________.
2. The total perimeter of the master bedroom and closet is
   _______________.
3. The total lineal feet of wall is _______________.
4. The total number of 4’ x 8’ sheets needed is __________.
Estimate materials needed to trim a room.

Part of being a competent carpenter is knowing how to estimate materials quickly and accurately for a specific job. Accurate estimation is cost effective and eliminates needless waste of materials and time. Using building plans and specifications will assist you in making accurate estimations.

Look at the following example.

FIGURE 47
To estimate the materials needed to trim a room follow these steps.

1. Determine the number of lineal feet required from the plans. Don’t forget to include trim around door jambs and doorstop trim inside the door jamb.

2. Estimate each type of trim to the next highest even lineal foot.

NOTE: Schedules and specifications generally list trim requirements. The listing in this example is not intended to represent details or specifications, but is meant only to show an example of material that might be used for the plan shown.

The following materials are required to trim the room in Figure 47.

- **Casing and doorstops**
  - two sets 2' 4" colonial casing (one set each for each side of door)
  - four sets 2' 6" colonial casing (one set each for each side of door x 2 doors)
  - one set 2' 4" x 7/16" x 1 3/8" O.G. doorstop for door jambs
  - two sets 2' 6" x 7/16" x 1 3/8" O.G. doorstop for door jambs

- **Trim**
  - 65 lineal feet 1/2" x 3" colonial base
  - 65 lineal feet 1/2" x 3/4" shoe molding
  - 8 lineal feet 1" x 1" outside corner

**EQUIPMENT AND SUPPLIES**

- 7/16" x 3" sanitary base
- 3/8" x 2 1/4" sanitary casing
- 7/16" x 3/4" shoe molding
- 3/8" x 1 3/8" sanitary doorstops
- 9/16" x 2 1/4" cove molding

Estimate the materials need to trim the room in Figure 48 using the following material.
1. How many 2' 6" sets of sanitary casing are needed? ________

2. How many lineal feet of sanitary casing are needed to trim all of the 2' 6" doors? ________

3. How many 3'0" sets of sanitary casing are needed? ________

4. How many lineal feet of sanitary casing are needed to trim all of the 3'0" doors? ________

5. How many sets of sanitary doorstop are needed? ________

6. How many lineal feet of doorstop are needed to trim all the doors? ________

7. How many lineal feet of sanitary base are needed to trim the room? ________

8. How many lineal feet of shoe molding are needed to trim the room? ________

9. How many lineal feet of cove molding are needed to trim the room? ________
Install furring strips on a masonry wall.

Furring strips are attached to masonry walls with masonry nails, screws, nails driven into shields or wood dowels, nail anchors, adhesive anchors, or bolt anchors. Shims are used to level furring strips in low spots. Sometimes wood shingles are used as shims.

- 1' x 2' furring strips
- Powder-actuated tool, pins, and manufacturer’s instruction manual
- Chalk line
- Circular saw and extension cord
- Hammer
- Masonry nails
- Personal protection equipment
- Shims
- Square
- Steel tape
- Straightedge

WORDS YOU SHOULD KNOW

shims

a piece of wood, metal, or other material used to fill out space or wedge up
1. Put on all the appropriate personal protection equipment.

2. Measure and cut furring strip to fit horizontally on wall at floor line.

3. Nail furring strip in place, using power-actuated tool or hammer and masonry nails.

   **CAUTION:** Do not use powder-actuated tools until you have received your qualified operator’s card. When using the tools, observe all safety rules and precautions.

4. Lay out wall for horizontal furring strips spaced 16” on center starting from the floor line. See Figure 49.

5. Nail all horizontal furring strips in place.

6. Cut and nail vertical furring strips between horizontal strips in all corners and centered every 4’. See Figure 49.

   ✔ **NOTE:** The vertical strips are necessary to support the panel edges.
7. Use a straightedge or string line to check alignment of furring strips; place shims behind furring strips if necessary.

8. Clean area and put away all 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:

Furring strips horizontal (¼“) 4 3 2 1

Furring strips are secure to wall 4 3 2 1

Furring strips are shimmed when wall surface is uneven 4 3 2 1

Vertical furring strips at panel joints (+ - ¼“) 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.

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
INTERIOR WALLS AND CEILINGS FINISH
Carpentry Series

Follow the guidelines below before installing V-grooved paneling, panel wainscot, and trim.

- Store paneling in the room it is to be applied in for at least twenty-four hours. This allows the paneling to adjust to the temperature and moisture content of the room.

- Whenever possible, store paneling stacked flat on the floor with spacers between sheets to encourage air circulation.

✔ NOTE: If panels must be stored on their edges, place them with the long edge of the panel on the floor.

- Apply waterproofing material to masonry exterior walls before studding for furring is applied to prevent moisture penetration to the panel.

WORDS YOU SHOULD KNOW

leading edge
the edge opposite the starting point

wainscot
a wall finish in which the lower part of a wall is finished with a material (usually a wood paneling) that is different from the upper part
Apply furring strips to masonry and plaster walls before applying paneling, however, it is recommended that a gypsum drywall or plywood sheathing be used as a behind the paneling to provide added strength, soundproofing, and fire resistance to the paneled wall.

✔ NOTE: When installing paneling on a wall that is over 8' high, position a horizontal furring strip so that the top of an 8' panel will be aligned with the center of the strip.

Follow the guidelines below while installing V-grooved paneling, panel wainscot, and trim.

• Measure accurately for a professional finish when installing paneling on a wall.

• Cut the panels so that there is a ¼" clearance at the top and the bottom of the wall.

• When studs are not visible be sure to locate and mark the center of the each stud on the floor and ceiling with a chalk line. This will act as a guide for nailing each panel into place.

• Place nails in the V-grooves whenever possible when nailing into the furring strips or studs.

✔ NOTE: V-grooved paneling is spaced where the grooves will line up with 16" and 24" stud centers.

EQUIPMENT AND SUPPLIES

- 30" or 3' level
- 3d and 4d finish nails
- 4 foot or 6 foot level
- Adhesive and manufacturer's instructions
- Base
- Block plane
- Cap molding
- Chalk line
- Circular saw
- Coping saw
- Folding rule or steel tape
- Framing square or combination square
- Hammer
- Inside corners
- Jig saw
- Miter saw or power miter
- Nail sets
- Panel wainscot
- Personal protection equipment
- Putty stick
- Saber saw
- Sawhorses
- Scribe
- Steel tape
- V-grooved paneling
V-Grooved Panel Installation

1. Put on all the appropriate personal protection equipment.

2. Stand paneling on end around room and arrange so that adjoining panels match as to grain patterns, color, and groove spacing.

   ✓ NOTE: All joints must center on studs.

3. Align one edge of panel at inside corner with leading edge over the center of a stud.

4. Plumb leading edge of panel.

5. Mark the amount of overlap.

6. Set the scribe for the distance the panel overlaps.

7. Tack the panel to the wall and scribe the inside corner edge. See Figure 50.

FIGURE 50
8. Remove panel from wall, place on sawhorses, and trim to scribed mark.

**NOTE:** The scribed lines must be cut from the front side.

9. After trimming, hold panel to wall to check fit.

10. Install panel using nailing or adhesive method.

A. Nailing method

1) Beginning at top and working down, nail paneling with 16" spacing along each stud.

2) Drive nails nearly flush and then set nails. Do no set colored nails, but instead, drive them flush.

3) Fill nail holes using putty stick if required.

B. Adhesive method

**NOTE:** Follow manufacturer’s instructions when instructions differ from following procedure.

1) Apply a continuous bead about 1/2" from edge. See Figure 51.

2) Beginning at the top of the panel, apply a row of four 6" to 8" long beads about every 12" to 14" down panel. See Figure 51.
3) Press panel to wall.

4) Pull panel from wall starting at bottom edge and then press panel firmly back into position.

5) Use a few nails to hold the panel in place while the adhesive dries.

11. Fit remaining panels

A. Measure and lay out the cutouts for switches and receptacles.

1) Measure the cutouts from the top of each panel and from leading edge of previous panel. See Figure 52 and 53.
2) Mark and cut holes on back side of panel.

3) Hold panel to wall to check fit.

**CAUTION:** When power tools are used, cut from the back of the panels. With hand tools, cut from the front.

**FIGURE 53**

4) Scribe and cut panels to fit corners.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

12. Color joints if desired.

**NOTE:** It is a good practice to color the backing material at each joint with a marker, shoe polish, or paint to prevent any of the backing material from showing at the joints.
Panel Wainscot Installation

1. Establish line for top edge of panels.

A. Measure up from the floor 32 1/4” and mark wall at each corner and at edge of each opening. See Figure 54.

✓ NOTE: 32 1/4” will allow for floor irregularities and accommodate plumbing of panels.

B. Snap a chalk line between each of these marks. See Figure 54.

✓ NOTE: It may be necessary to use a dry line to avoid staining finish material.

FIGURE 54

2. Cut all panels to proper height.

3. To complete panel wainscot installation follow steps 2 through 12 from “V-Grooved Panel Installation” above.
Trim Installation

**NOTE:** Paneling is usually trimmed after the doors and windows have been trimmed.

**NOTE:** Horizontal trim such as cave, cape base, and shoe molding are applied first.

1. Beginning in an inside corner, measure to determine length of molding.

2. Cut ends square with miter saw.
   
   **NOTE:** Use single pieces of molding as much as possible. Square cut each end if no splice is required. If a splice is required, miter the two pieces of molding to fit with the splice over a stud.

3. Nail molding by placing a nail at each stud and then setting each nail.

   **NOTE:** The size of the nail will depend on the type of molding being used.
4. Miter or cope end of molding piece that will fit against first piece of molding.

✓ **NOTE:** Type of joints used (miter, coped, or square) depends on the type of finish required, job requirements, or installer preference.

5. Cut, fit, and nail remaining horizontal molding.

6. Fit and install vertical trim using the same procedure as for horizontal trim.

7. Clean work area and put away 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:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel plumb to ( \frac{1}{6}'' )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fitted inside corners to ( \frac{1}{6}'' )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of wainscot to ( \frac{1}{4}'' )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutout locations (( \frac{1}{8}'' ))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nail spacing to 1''</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nails set to ( \frac{1}{6}'' )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Overall appearance 4 3 2 1

Trim member horizontal to ¼” 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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Student Name ________________________________

Start Date: _______ Completion Date: ________

1. Study
   Information Sheet 3, objective 10.

2. Examine
   samples of types of ceiling tile.

3. Study
   Information Sheet 3, objective 11.

4. Study
   Information Sheet 4, objective 12.

5. Take
   Quiz 3.

6. Read
   the introduction to Assignment Sheet 3, objective 13.

7. Watch
   the "Applying Ceiling Tile" video.

8. Complete
   Video Worksheet 2 found at the back of this book.

9. Complete
   Assignment Sheet 3.

10. Examine
    samples of floor plans.

11. Practice
    estimating materials and costs using various sizes and styles of ceiling tiles.

12. Read
    the introduction to Job Sheet 3.
the "Applying Ceiling Tile" 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.

the introduction to Job Sheet 4.

the "Applying Ceiling Tile" video if necessary.

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.
22. Read
the introduction to Job Sheet 5.

23. Watch
the "Install Suspended Ceilings" video.

24. Complete
Video Worksheet 3 found at the back of this book.

25. 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.

26. 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.

27. Stop
and have your instructor evaluate your work from the Job Sheet. After your work has been evaluated, follow your instructor’s recommendations.
Identify where ceiling tile is applied and the application methods used.

**WORDS YOU SHOULD KNOW**

**acoustical**
pertaining to sound or the science of sound. When discussing ceiling tiles it refers to the absorption of sound.

Ceiling tiles are commonly used to finish ceilings. Ceiling tiles are used for decorative and acoustical purposes. The tiles are prefinished and come in a variety of colors, designs, and sizes.

**FIGURE 56**

- Ceiling tile can be applied to a solid ceiling with adhesive or fasteners

✓ **NOTE:** The fasteners can be nails, staples, or screws.
Ceiling tile can be attached to furring strips with adhesive or fasteners.

Ceiling tile can be hung in a suspended grid system.

Identify materials used to fabricate ceiling tiles.

Ceiling tiles are fabricated from many different materials. Study the list below of common materials used to fabricate ceiling tiles.

- Fiberboard
- Mineral
- Perforated metal
- Fiberglass
- Mirror
- Cork
- Wood fibers
Identify factors that influence type of ceiling tile to be used.

When deciding what ceiling tile to use take into consideration the following factors.

- Appearance
  — How does the room need to look when finished?

- Ease of installation
  — How easy is the tile to install?

- Fire resistance
  — What fire resistance is required by code?

- Cost
  — What is the cost of the material and labor?

- Insulation value
  — What insulation value is required by code or by the building owner?

- Light reflection
  — How much light should the tile reflect?

- Maintenance cost
  — How easy is the tile to maintain?

- Sound absorption
  — What kind acoustic properties are required by code or the building owner?
Estimate the number of ceiling tiles needed to finish a ceiling.

Part of being a competent carpenter is knowing how to estimate materials quickly and accurately for a specific job. Accurate estimation is cost effective and eliminates needless waste of materials and time. Using building plans and specifications will assist you in making accurate estimations. See the procedure described below as a guideline for determining the number of ceiling tiles needed to finish a ceiling.

1. Check plans or measure the length and width of the room.

2. Round dimensions up to next whole foot, if necessary.

   **EXAMPLE:** If the room’s actual measurements are 13’ 8” x 29’ 4”, then when you are estimating round off the numbers to read 14’ x 30’.

3. Multiply the length times the width to find the square footage of the ceiling to be tiled.

   **EXAMPLE:** If a room’s measurements are 14’ x 30’, then the number of square feet of ceiling to be tiled would be calculated as 14’ x 30’ = 420 sq. ft.

4. Check packaging or measure to determine number of square feet covered by each tile.

   ✓ **NOTE:** To figure out the number of square feet covered by one tile multiply its width by its height.

   **EXAMPLE 1**
   For a 12” x 12” tile:
   A. Multiply 12” by 12” to equal 144”.
   B. Divide 144” by 12” (the number of inches in one foot) to get 12” or 1 square foot.
EXAMPLE 2
For a 24" x 24" tile:
A. Multiply 24" by 24" to equal 576''.
B. Divide 576'' by 12" (the number of inches in one foot) to get 48'' or 4 square feet.

EXAMPLE 3
For a 2' x 4' tile:
A. Multiply 2' x 4' to equal 8 square feet.

5. Divide square footage of ceiling to be tiled by square feet covered per tile to find number of tiles needed.

EXAMPLE 1: If there are 420 square feet of ceiling and each 12'' x 12'' tile will cover 1 square foot, then the number of tiles needed to finish the ceiling would be calculated as:

$$420 \text{ sq. ft.} \div 1 = 420 \text{ tiles.}$$

EXAMPLE 2: If there are 420 square feet of ceiling and each 12'' x 24'' tile will cover 2 square feet, the number of tiles needed to finish ceiling would be calculated as:

$$420 \text{ sq. ft.} \div 2 = 210 \text{ tiles.}$$

Estimate the number of ceiling tiles needed for the following room sizes using the procedure as described above. Write your answers in the spaces provided.

1. How many 12'' x 12'' tiles will be needed for a room that is 16' 8'' x 20' 6''? ______________

2. How many 12'' x 12'' tiles will be needed for a room that is 17' 6'' x 26'? ________________

3. How many 12'' x 12'' tiles will be needed for a room that is 9' 10'' x 19'? ________________

4. How many 12'' x 24'' tiles will be needed for a room that is 15' x 30'? ________________

5. How many 12'' x 24'' tiles will be needed for a room that is 9' 10'' x 19'? ________________

6. How many 24'' x 24'' tiles will be needed for a room that is 21' 3'' x 25'? ________________

7. How many 2' x 4' tiles will be needed for a room that is 32' 5'' x 40' 10''? ________________
Install ceiling tile over a solid surface.

- 12" x 12" ceiling tiles
- Adhesive
- Chalk line
- Personal protection equipment
- Pointing trowel or caulking gun
- Scribe
- Steel tape
- Straightedge
- Utility knife

**Yes**  **No**

1. Put on all the appropriate personal protection equipment.

**Determine layout of ceiling tile**

2. Determine the number of full tiles you will need.

   A. Measure the width of the room.
   B. Divide this number by the width of your tile.
   C. Ignore the remainder (if there is one) and subtract one from the whole number to determine how many full tiles you will need for one row along the width of the ceiling.
D. Follow the same procedure for the length measurement of the room to determine how many full tiles you will need for one row along the length of the ceiling.

E. Multiply the number of tiles along the width by the number of tiles along the length to determine the total number of full tiles needed for the ceiling.

3. Determine the width of border tiles for width of room.
   A. Add the width of one tile to the remainder (if there is one) from the width equation and divide by two.

4. Determine the width of border tiles for length of room.
   A. Add the width of one tile to the remainder (if there is one) from the length equation and divide by two.

   EXAMPLE: A room installation is 17' 4” long x 15’ wide and uses 12” x 12” tiles.

   **Full Tiles**
   - Width: 15’ divided by 1’ = 15’ with a remainder of 0. Subtract 1 to equal 14 tiles.
   - Length: 17’ 4” divided by 1’ = 17’ with a remainder of 4”. Subtract 1 to equal 16 tiles.
   - Multiply tiles from length (16) by tiles from width (14) to equal 224 total full tiles.

   **Border**
   - Width: width of full tile (1’) plus remainder from width equation above (0) equals 1’. Divide 1’ by 2 to equal 6” border.
   - Length: width of full tile (1’) plus remainder from length equation above (4”) equals 16. Divide 16 by 2 to equal 8” border.
Tile Installation

5. Measure and mark the border tile width away from each wall.

6. Snap a chalk line at these measurements making sure they are at 90-degree angles.

7. Starting at the intersection of the border lines and working out toward the opposite walls, begin installing tiles, keeping tiles aligned to chalk line.

✓ NOTE: Due to variations in shading, you should mix tiles from several boxes.

8. Using a pointing trowel or caulking gun with tube adhesive, place a small dab of adhesive on the backside of each corner of each tile.

9. Install each tile in position by pressing it to ceiling with a slight twist or sliding motion and then pulling back slightly and pushing it back into its proper position.

✓ NOTE: This procedure spreads the adhesive and ensures a good bond to the ceiling.

10. Continue installing tile until there is a border where there is not enough area to place a whole tile. See Figure 59.

FIGURE 59
<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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<tbody>
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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:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tile joints tight ((\frac{1}{16})&quot;&quot;)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Border widths equal ((\frac{1}{4})&quot;)</td>
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<td></td>
</tr>
<tr>
<td>Border widths proper size ((\frac{1}{4})&quot;)</td>
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<td></td>
<td></td>
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<tr>
<td>Tile joints are straight and smooth</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tile edges are straight and aligned ((\frac{1}{16})&quot;&quot;)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tile faces are aligned (\frac{1}{16})&quot;</td>
<td></td>
<td></td>
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<td></td>
</tr>
</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.

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
Install furring strips on ceiling joists and ceiling tile on furring.

- 8d common nails
- Ceiling tile and manufacturer’s instructions
- Circular saw and extension cord
- Dryline
- Spacer blocks
- Furring strips (1” x 2”, 1” x 3”, or 1” x 4”)
- Hammer
- Personal protection equipment
- Power staple gun, staples, and manufacturer’s instructions
- Shims
- Square
- Steel tape
- Chalk line
- Straightedge
- Utility knife

Determine location for furring strips.

**Yes**  **No**

1. Put on all the appropriate personal protection equipment.

2. Determine the number of full tiles needed.

A. Divide the length of the exposed joist by the width of the tile.
B. Ignore the remainder (if there is one) and subtract one from the whole number to determine how many full tiles you will need for one row along the length of the ceiling.

C. Follow the same procedure for the width measurement of the room to determine how many full tiles you will need for one row along the width of the ceiling.

D. Multiply the number of tiles along the length by the number of tiles along the width to determine the total number of full tiles needed for the ceiling.

3. Determine the width of border tiles for length of room.

A. Add the width of one tile to the remainder (if there is one) from the length equation and divide by two.

4. Determine the width of border tiles for width of room.

A. Add the width of one tile to the remainder (if there is one) from the width equation and divide by two.

EXAMPLE: A room installation is 17’ 4” long x 15’ wide and uses 12” x 12” tiles.

Full Tiles
- Length: 17’ 4” divided by 1’ = 17’ with a remainder of 4”. Subtract 1 to equal 16 tiles.
- Width: 15’ divided by 1’ = 15’ with a remainder of 0. Subtract 1 to equal 14 tiles.
- Multiply tiles from length (16) by tiles from width (14) to equal 224 total full tiles.

Border
- Length: width of full tile (1’) plus remainder from length equation above (4”) equals 16”. Divide 16 by 2 to equal 8” border.
- Width: width of full tile (1’) plus remainder from width equation above (0) equals 1’. Divide 1’ by 2 to equal 6” border.

**Install furring strips**

✔ **NOTE:** It may be necessary to install nailing blocks along side walls if joists do not run along walls.

**Yes** □ **No** □

5. Install first furring strip perpendicular to the joist along one wall.

6. Snap a chalk line the width of the border tile plus one half the width of the furring strips.

7. Cut furring strips so that splices are centered on joists.

8. Use two nails in each joist and at the end of each furring strip.

✔ **NOTE:** Use a dryline, spacer blocks, and shims to ensure straight furring strips and a flat plane.

9. Install remaining furring strips centered on intervals the width of full tiles.

10. Finish by applying the last furring strip against the opposite wall in the same manner as you did the first furring strip.

**Lay out tile installation.**

□ □

11. Determine width of border tiles along end walls, using procedure described above.

12. Mark width of end border tile plus width of tile flange out from end wall at each end of furring strip.

✔ **NOTE:** The flange is used to nail the tile to the furring strip.
13. Snap a chalk line between marks.

14. Mark width of side border tile plus width of flange.

15. Snap a chalk line at this mark at a 90-degree angle to first chalk line.

**Tile Installation**

16. Begin installation in corner at intersection of chalk lines.

17. Cut first border tile to fit in corner with flanges aligned with chalk lines.

18. Fasten tile in place following manufacturer’s recommendations regarding size, number, and placement of fasteners.

19. Continue installing tiles using a stair-step pattern frequently checking alignment. See Figure 60.

FIGURE 60
Yes ☐ No ☐ 20. Measure and trim border tiles as required during installation.

☐ ☐ 21. Clean work area and put away 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:

- Furring strips installed at proper border spacing (to \( \frac{1}{2}'' \))
  - 4
  - 3
  - 2
  - 1

- Furring strips straight, horizontal, and plumb (\( \frac{1}{8}'' \))
  - 4
  - 3
  - 2
  - 1

- Tile installed tightly (\( \frac{1}{16}'' \))
  - 4
  - 3
  - 2
  - 1

- Border width correct (\( \frac{1}{4}'' \))
  - 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.

- **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
INTERIOR WALLS AND CEILINGS FINISH
Carpentry Series

Student name _________________________________ Score _______

**Erect a suspended ceiling system.**

- 100' tape
- 12' main runners (main tees)
- 12 gauge hanger wires
- 2' cross tees
- 2' x 2' ceiling panels
- 4' level
- Chalk line
- Claw hammer
- End cut nippers
- Laser instrument and rod
- Metal snips
- Nails
- Personal protection equipment
- Pop rivet gun and rivets
- Side cut pliers
- Square
- Steel tape
- Wall angles (wall molding or L molding)

**Yes**  **No**

1. Put on all the appropriate personal protection equipment.

2. Check your plans to determine the height of the ceiling and the size of the panels.
3. Use a laser instrument to establish the ceiling height around the perimeter of the walls and mark.

**NOTE:** Be sure to follow all safety precautions according to the laser manufacturer's instructions.

4. Snap a chalk line approximately 1" above these marks to align with the top edge of the wall angle or “L’s”.

5. Recheck your lines to be sure they are all level and at the proper height.

6. Install the wall angles by attaching the top of the angle along the chalk line. The angles should overlap at the inside corners. The angles should be mitered where they meet at the outside corners. On the inside corners, cut a miter on the bottom angle so that it looks mitered.

7. Measure the length of all the walls.

8. Measure and mark the centerline of the two end walls.

9. Measure and mark the centerline of the two side walls.

10. Transfer the centerline marks from the wall to the wall angles.

11. Determine the number of full tiles you will need and the size of the border tiles.

   Number of full tiles needed

   A. Divide the length of the exposed joist by the width of the tile.
B. Ignore the remainder (if there is one) and subtract one from the whole number to determine how many full tiles you will need for one row along the length of the ceiling.

C. Follow the same procedure for the width measurement of the room to determine how many full tiles you will need for one row along the width of the ceiling.

D. Multiply the number of tiles along the length by the number of tiles along the width to determine the total number of full tiles needed for the ceiling.

Width of border tiles for length of room

A. Add the width of one tile to the remainder (if there is one) from the length equation and divide by two.

Width of border tiles for width of room

A. Add the width of one tile to the remainder (if there is one) from the width equation and divide by two.

EXAMPLE: A room installation is 17' 4" long x 15' wide and uses 2' x 2' tiles.

Full Tiles
- Length: 17' 4" divided by 2' = 8' with a remainder of 10". Subtract 1 to equal 8 tiles.

- Width: 15' divided by 2' = 7' with a remainder of 6". Subtract 1 to equal 6 tiles.

- Multiply tiles from length (8) by tiles from width (6) to equal 48 total full tiles.

Border
- Length: width of full tile (2' or 24") plus remainder from length equation above (10") equals 34". Divide 34" by 2 to equal 17" border.
- Width: width of full tile (2' or 24") plus remainder from width equation above (6") equals 30". Divide 30" by 2 to equal 15" border.

✔ NOTE: The border tile will be at least half the width of a full tile.

Yes  No

12. Measure from the centerline of the first short wall to the centerline of the first main runner.

13. Transfer the centerline to the wall angle.

14. Attach a string line to the wall at this mark, and stretch it tight to the mark on the opposite wall. See Figure 61.

FIGURE 61

15. Install the hanger wires along the main supports, within 6 inches of the ends of the main supports. Let the wires hang straight down.

16. Establish the proper ceiling height on the wires allowing for the height of the main runner. Bend the wires at this point.
17. Install the main runners by positioning the first main runner at the proper ceiling height and securing it with the hanger wires.

18. Align the runner with the string line so that it is against the edge of the main runner.

19. Be sure the main runners are fitted so that the cross tee slots are properly aligned.

20. Fasten one end of the main runner to the wall angle to maintain proper position.

21. Work from the first main runner, and install the rest of the runners, centered on two-foot centers.

22. Install the cross tees.

**NOTE:** Pop rivet a cross tee near the center of the room to maintain alignment.

23. Fit the ends of the cross tees into the slots of the main runners. Be sure the ends of the cross tees are inserted properly and locked in place.

24. Install the rest of the cross tees until the grid is completed. See Figure 62.
25. Check the grid with the level to make sure the runners and tees are level and straight.

26. Remove the string line.

27. With grid in place, install the first ceiling panel.

**NOTE:** Before installing make sure all building codes are met and other trades are complete. Due to variations in shading, mix the tiles from several boxes.

28. Measure and cut the border panels.

29. Install the first border panel.

30. Follow the same procedure to install the rest of the panels. See Figure 63.
FIGURE 63

Yes  No
☐  ☐ 31. Clean work area and put away 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:

Proper layout of runners and tees  4 3 2 1

Wire hangers installed  4 3 2 1

Ceiling height and center established properly  4 3 2 1

Cut and installed panels properly  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

________________________________________

________________________________________

________________________________________
Carpentry Series

Student Name ________________________________

Applying Paneling to Interior Walls

1. How long should paneling be stored in the room before it is installed?
   A. 15 hours
   B. 24 hours
   C. 2 days
   D. 1 week

2. Be sure all the paneling joints fall on ________.
   A. corners
   B. edges
   C. studs
   D. 90 degree angles

3. When nailing paneling, work from the ________.
   A. bottom up
   B. leading edge across
   C. top down
   D. corner down diagonally

4. When using power tools to make cutouts for receptacle boxes you should cut from the ________ of the panel.
   A. back
   B. front

5. When using hand tools to make cutouts for receptacle boxes you should cut from the ________ of the panel.
   A. back
   B. front
6. When installing paneling in corners you should scribe and cut the __________.
   A. inside corner
   B. outside corner
   C. top
   D. bottom

7. When installing wainscot paneling you should measure up how far from the floor?
   A. 24 \( \frac{3}{4} \)"
   B. 36 \( \frac{1}{2} \)"
   C. 34"
   D. 32 \( \frac{3}{4} \)"

8. Which trim is applied first?
   A. horizontal
   B. vertical
Applying Ceiling Tile

1. Border tile should be at least ________ the width of a full tile.
   A. 1/3
   B. 5/8
   C. 1/2
   D. 1/4

2. You should begin ceiling tile installation _____________.
   A. halfway down the chalk line
   B. along the north wall
   C. in the center of the room
   D. at the intersection of border lines

3. When determining the location for the first furring strip you should measure _____________.
   A. the width of the border tile plus 1/2 the width of the furring strip
   B. the width of the border tile
   C. the width of the border tile plus 1/4 the width of the furring strip
   D. 1/2 the width of the border tile plus 1/4 the width of the furring strip

4. Cut the furring strips so that the splices are _____________.
   A. perpendicular to the longest wall
   B. centered on the joists
   C. parallel to the joists
   D. centered in the room

5. Use ________ nails in each joint and at the end of each furring strip.
   A. one
   B. two
   C. three
   D. four

6. After the first furring strip is applied the remaining furring strips are applied centered on intervals _____________.
   A. the length of the first furring strip.
   B. the width of the border tiles
C. the length of the room
D. the width of a full tile

7. Due to variations in shading you should _________.
   A. use tiles from one box only
   B. mix tiles from several boxes
   C. paint the tiles
   D. use tiles from different manufacturers

8. You should apply tiles in a ________ pattern.
   A. triangle
   B. corner
   C. stair step
   D. diagonal
Install Suspended Ceilings

1. Check the plans to determine
   A. the amount of time it will take to install the tile
   B. the height of ceiling and size of panels
   C. the tools needed to install the tile
   D. the cost of the tile

2. Use a __________ to mark where the ceiling will go.
   A. level
   B. folding rule
   C. screwgun
   D. laser instrument

3. The wall angle should overlap at the ____________.
   A. long wall
   B. center point
   C. outside corners
   D. inside corners

4. The wall angle should be mitered at the ____________.
   A. long wall
   B. center point
   C. outside corners
   D. inside corners

5. Install hanger wires along the main supports within _________ of the ends of the main supports.
   A. 6"
   B. 1'
   C. 15'
   D. 20'
6. Hanger wires should hang __________.
   A. at 45 degree angles
   B. diagonally
   C. straight down
   D. 2' below the runners

7. Be sure the main runners are fitted so the cross-T slots are aligned with __________.
   A. the length of the border tiles
   B. the width of the border tiles
   C. the length of the room
   D. the width of a full tile

8. Before installing tile be sure __________.
   A. the tiles are the correct weight
   B. the temperature is at least 75 degrees
   C. other trades and inspections are complete
   D. the grid has been painted