

### Lesson #4: Introduction to Roof Framing (5 Days)

#### Objectives

##### Students will be able to...

- Find at least three codes in the IRC that govern the construction of wood-framed roofs.
- Describe the difference between a conventionally stacked roof and a truss roof.
- Name and identify the primary members of conventionally stacked and trussed roofs.
- Layout and construct a conventional roof for a 1" scale model home from blueprints.
- Identify the two most widely used truss designs in residential construction.

#### Common Core Standards

LS 11-12.6  
RSIT 11-12.2  
RLST 11-12.2  
Health and Safety 6.0, 6.2, 6.3, 6.4, 6.5, 6.6  
Technical Knowledge and Skills 10.0, 10.2, 10.3, 10.4  
Demonstration and Application 11.1  
Cabinetmaking and Wood Products Pathway A4.1, A4.4, A6.1  
Residential and Commercial Pathway D2.1, D2.2, D2.3, D3.1, D3.2, D3.3, D5.2, D6.10, D6.11, D6.12, D6.13

#### Materials

Roof Framing Power Point  
<https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Ae44bbdfef935-4a45-b78a-d6c1dce54dad>  
Roof Framing Terms Worksheet  
Roof Type Identification Worksheet  
Roof Type Definitions  
Roof Identification Components Worksheet  
Venn Diagram  
Using the Code Book Roofing Worksheet  
Bill of Materials  
20x20 Roof Framing Print (attached PDF)  
<https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Aef6af132-1d0a-4065-aa3c-0bea5a19a7ed>

### Lesson Sequence

- Introduce roof framing terms by using the *Roof Framing Power Point*. Have students fill in the *Roof Framing Terms Worksheet*.
- Pass out *The Roof Type Identification Worksheet* and have students identify the correct roofs by using the *Roof Type Definitions*.
- Review the *Roof Identification Components Worksheet* as a whole class. Answer any questions as needed.
- Compare and contrast a conventionally stacked roof vs. a trussed roof using the *Venn Diagram*.
- Pass out the *Using the Code Book Roofing Worksheet* and have students research the answers to the questions using the internet or the code book.
- Pass out the *Bill of Materials* and *the 20x20 Roof Framing Print* to students. Have students begin filling out their bill of materials by using calculators as needed. Check for understanding complete together as a class as needed. Collect and review sheets when students are finished.

### Assessment

Check for understanding throughout lesson through questioning.  
Observe student work and review worksheets when completed. Reteach concepts as needed.

### Accommodations/Modifications

One on One Support  
Check for Understanding  
Extra Time If Needed  
Visual Models When Needed

## Roof Framing Terms Worksheet

1. Conventional stack:

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2. Truss:

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3. Gable:

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4. Hip:

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5. Rafter:

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6. Ridge:

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7. Bird mouth:

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8. Plumb cut:

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9. Tail:

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10. Ceiling joist / collar tie:

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11. Pitch:

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# **BUILDING INDUSTRY TECHNOLOGY ACADEMY: YEAR ONE CURRICULUM**

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12. Chord:

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13. Web:

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14. Gusset/gang nail plots:

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15. Fink truss:

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16. Scissors truss:

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17. Gable truss:

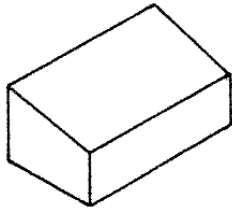
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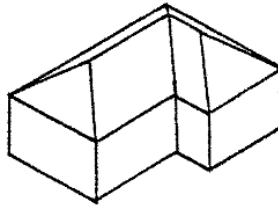
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### Roof Type Identification Worksheet

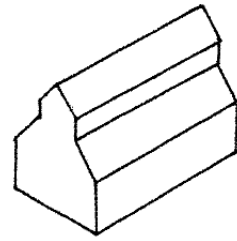
Directions: Fill in the name of roof type.



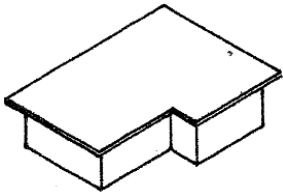
1. \_\_\_\_\_



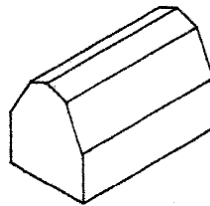
2. \_\_\_\_\_



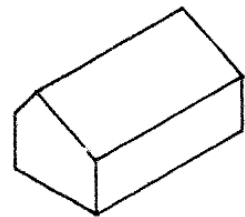
3. \_\_\_\_\_



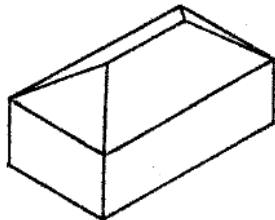
4. \_\_\_\_\_



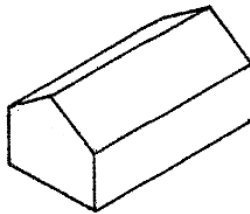
5. \_\_\_\_\_



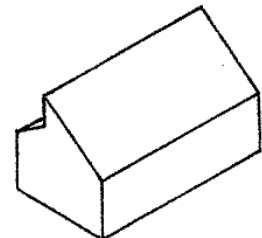
6. \_\_\_\_\_



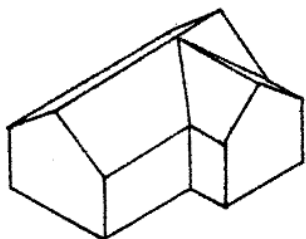
7. \_\_\_\_\_



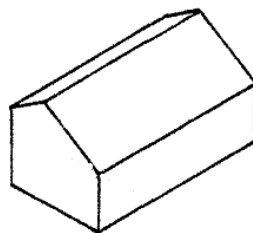
8. \_\_\_\_\_



9. \_\_\_\_\_



10. \_\_\_\_\_



11. \_\_\_\_\_

## Roof Type Definitions

**Flat:** A roof that has not pitch. Popular on the West Coast in the 1960's, but has fallen out of vogue due to its inherent tendency to leak. Interestingly, it is still allowed in some cities.

**Shed:** A roof that has a single slope. Besides the flat roof, it is the easiest roof to frame.

**Gable:** A dual slope roof that terminates in vertical faces at the ends. One of the two most common of all roof types.

**Unequal:** A dual slope roof where the pitch of one side does not equal the slope of the other.

**Arch:** A roof with one continuous slope. Aesthetically reminiscent of the Roman barrel vault.

**(Full) Monitor:** Roofs of equal pitch framed one above the other. Windows and vents installed between the roofs allow for light and ventilation within a structure. Commonly used on farms for outbuilding and/or barn type construction.

**Hip:** A roof that slopes down to walls on all sides of a structure. One of two most common types of roof.

**Clerestory (Half Monitor):** A roof where one slope extends beyond the other. Allows for light and ventilation within a structure. Common roof feature on late 19<sup>th</sup> and early 20<sup>th</sup> century factories.

**Gambrel:** A roof with two slopes per side, terminating in vertical faces at ends like a Gable roof. Very common outbuilding/barn roof framing. Efficient design allows 'attic' to be effectively used as another floor of the building, while maintaining a relatively low building height.

**Gable and Valley:** A roof where T, L, or U-shaped gable roofs intersect. Intersection between two perpendicular gable roofs.

**Hip and Valley:** Similar to Gable and Valley, except roof slopes down on all sides.

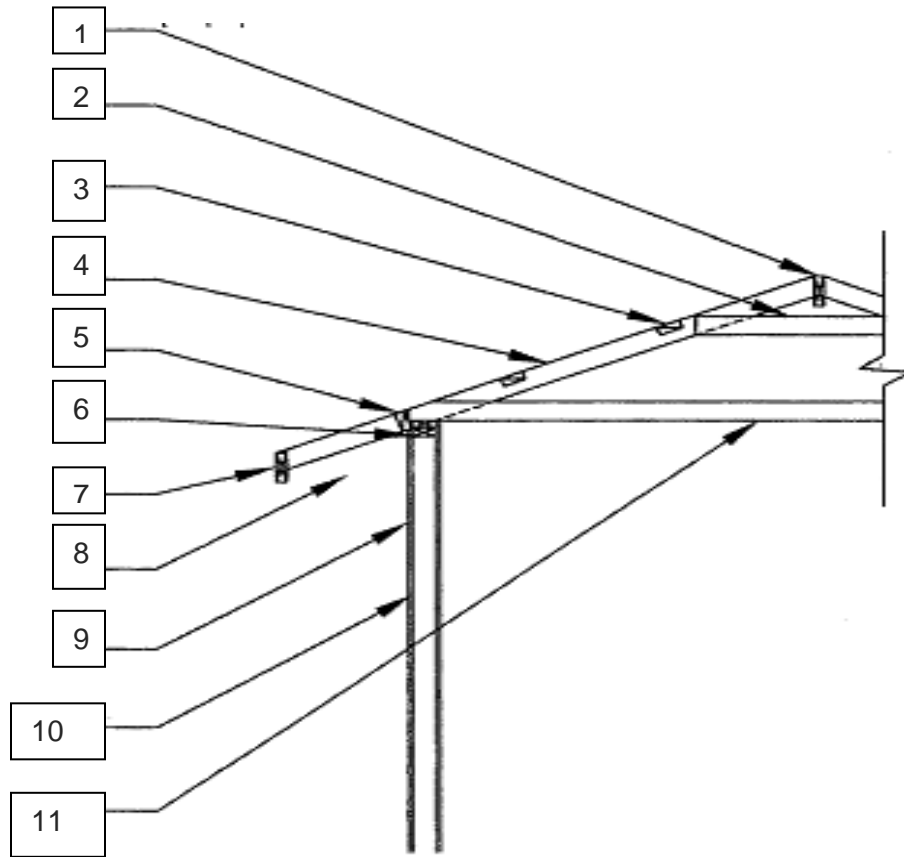
**Mansard:** A cross between a Gambrel and Hip roof, its dual pitches per side slope down to the walls on all sides. Named for its inventor, Francois Mansard who developed the design in 1701.

**Butterfly:** Essentially an inverted Gable roof, with the peak (ridge) lower than the eaves. Very popular roof type of late 1950's and early 1960's coffee shops/diners.

**Dutch Hip:** A roof where a small hip section is constructed near the ridge of a gable end.

### Roof Identification Components Worksheet

Directions: Write the component name on the corresponding line.

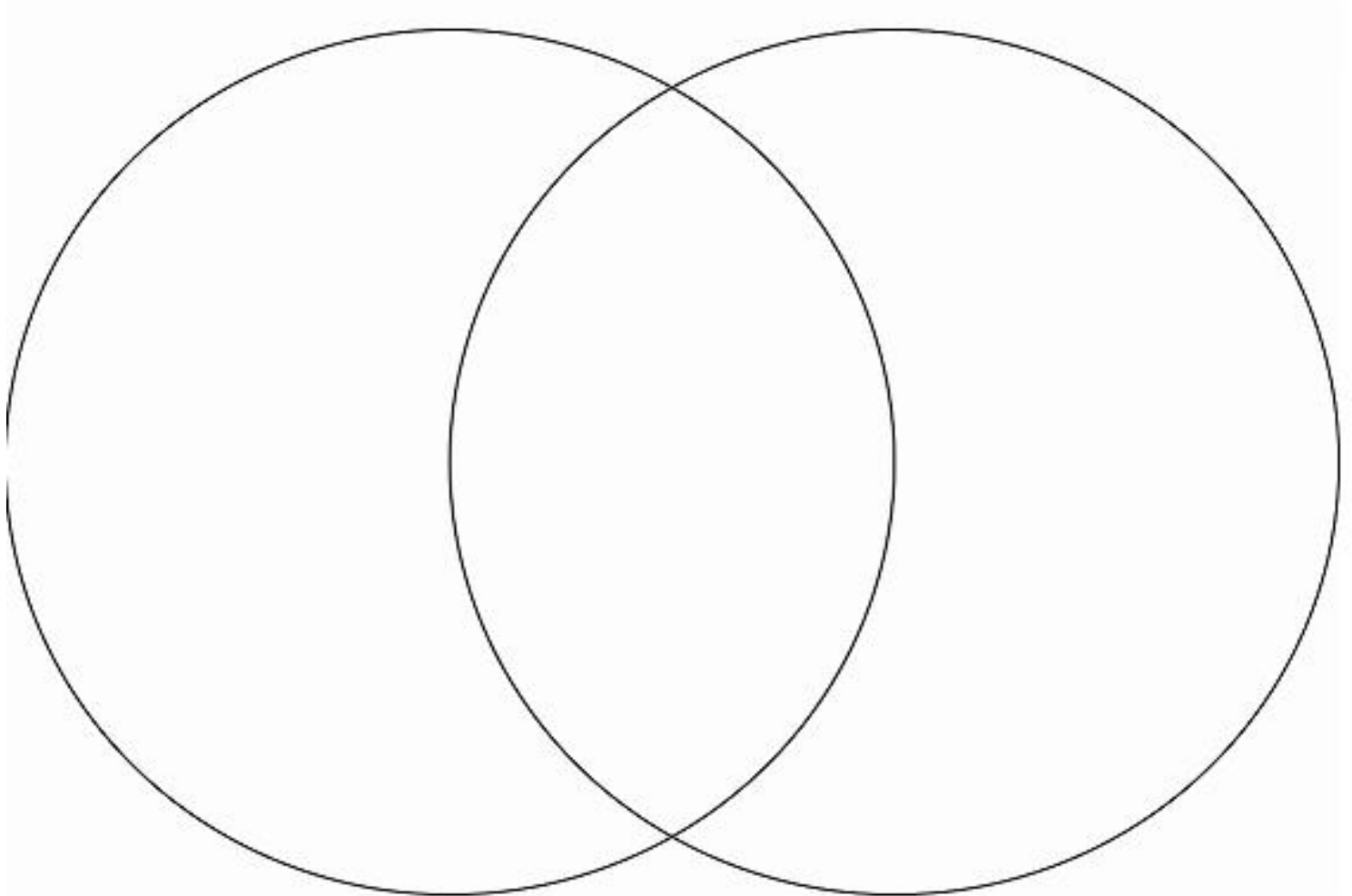


1.	_____	7.	_____
2.	_____	8.	_____
3.	_____	9.	_____
4.	_____	10.	_____
5.	_____	11.	_____
6.	_____		_____



## Venn Diagram

Conventional Roof Stack and the Truss



**Using the Code Book – Roofing Worksheet**

Directions: Using the *IRC for One- and Two-Family Dwellings*, find the answers to the following questions:

1. What chapter and page does roof ceiling construction begin?

Chapter: \_\_\_\_\_

Page: \_\_\_\_\_

2. What is the **minimum lap** between ceiling joist ends?
3. Under what **section number** do we find the code governing wood truss design?
4. Using Table R802.4(1) on page 246 what is the **maximum allowable span** for 1-2x6 Douglas-fir/ Larch ceiling joists placed at 16" on center?
5. Determine the **maximum allowable span** for a Douglas-fir/Larch select structural 2x10 placed at 24" on center that carries a dead load of 20 psf.
6. Write out the first sentence of section R802.10.4 *Alterations to trusses*:
7. What is the minimum "**bearing**" between a rafter or ceiling joist and the top plate?
8. According to figure R802.5.1, what is the **minimum angle** and spacing for 2x4 purlin support braces?
9. What is the **table number** where we find the minimum net thickness of a given sheet of plywood for a given rafter or beam spacing?

