

## DESIGNING ATTACHED CEILING

### INDAC401 Design attached ceiling

#### Learning unit 1: Identify types attached ceiling

**Learning Outcome 1.1:** Identify different types of roof according to the shapes

#### TYPES OF ROOFS

ROOF is the uppermost part of a building which is constructed in form of a framework to give protection to the building against rain, wind, heat, snow etc.

A roof basically consists of structural elements provided at the top of building for the support of roof covering and ceilings.

Roof may be divided into three categories:

1. Pitched roofs
2. Flat roof or terraced roofs
3. Curved roofs
  1. Pitched roofs have sloping surfaces .they are basically of the following forms:
    - a) Lean-to-roof
    - b) Gable roof
    - c) Hip roof
    - d) Gambrel roof
    - e) Mansard roof
    - f) Deck roof.

**a) Lean-to-roof:** This is the simplest type of sloping roof, provided either for a room of small span, or for the verandah. It has slope only one side

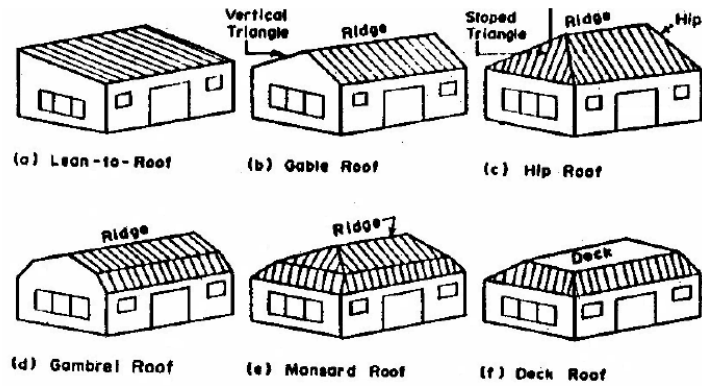
**b) Gable roof:** This is the common type of sloping roof which slopes in two directions. The two slopes meet at the ridge. At the end face, a vertical triangle is formed

**c) Hip roof:** This roof is formed by four sloping surfaces in four directions (Fig. 15.1c). At the end faces, *sloped triangles* are formed.

**d) Gambrel roof:** This roof, like gable roof, slopes in two directions, but there is a break in each slope. At each end, vertical face is formed.

**e) Mansard roof:** Mansard roof, like a hip roof, slopes in the four directions, but each slope has a break,

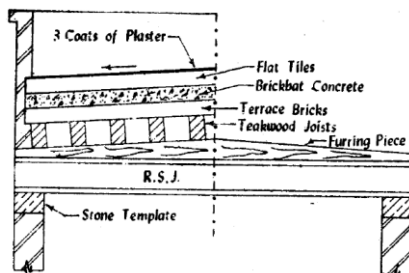
**f) A deck roof:** Have slopes in all the four directions, like a hip roof, but a deck or plane surface is formed at the top.



## 2. FLAT ROOFS

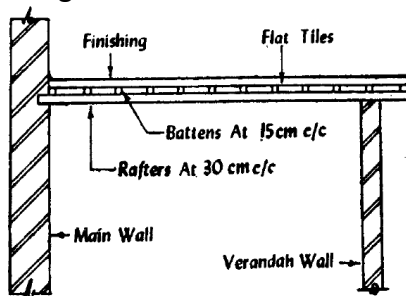
**Flat Roofs:** A roof which is nearly flat is known as flat roof. It should be noted that no roof can be laid perfectly level. The roof must slope in one direction or the other to cause rain water to flow off rapidly and easily. The construction of flat roof is same as that of floors except that the top surface is made slightly sloping in case of flat roofs. The types of flat roofs commonly used are:

### 1. Madras terrace roof



Madras Terrace Roof

### 2. Bengal terrace roof



Bengal Terrace roof

### Advantages of flat roofs:

- (i) The construction of roof is simplified
- (ii) It is easier to make a flat roof fire-proof than a sloping roof
- (iii) The roof are can be utilized as roof garden, drying yards and conveniently be used for sleeping in hot season.

(iv) The construction of work of upper floors can be easily started whereas pitched roof, the entire roof is to be removed and is to be replaced by a new floor under such circumstances

(v) Flat roofs are found to be economical than pitched roof.

### Disadvantages

- 1) Flat roofs cannot be used for long spans without introduction of intermediate pillars and beams
- 2) Cracks are developed on the surface of the roof due to the variation in temperature
- 3) Pockets of water are formed on the surface of the roof if slope is not sufficient and leads to leakage of roof
- 4) Flat roofs are not suitable, where rainfall is heavy
- 5) The dead weight of flat roof is considered and hence it proves to be more expensive, Initial cost is higher than pitched roof.

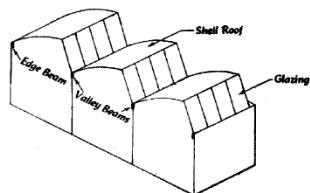
**3. Curved roofs:** These are the just the modifications of pitched roofs and are frequently employed in modern age to cover large areas shed/roofs and domes are the varieties of curved roofs.

They are useful for big structures such as factories, monumental works etc curved roofs may be constructed of timber or R.C.C. the latter material being very common now-a-days. They are two

common forms of a shell roof.

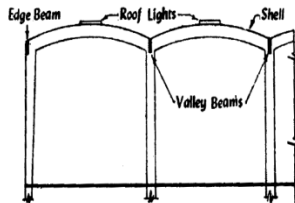
### Building Materials & Construction

- i) A north-light shell roof



North-light shell roof

- ii) A barrel vault shell roof are as shown in fig



Barrel vault shell roof

### BUTTERFLY ROOF???

A dome is a round vault forming a roof. It is useful when roof is to be provided on circular brick work or regular polygon shaped walls. Curved roofs afford pleasing appearance and due to arch action, the stresses are considerably reduced which results in thin sections for a curved roof.

### Advantages

1. It can be constructed in short time
2. It does not require skilled supervision
3. It is cheap in construction
4. It requires less frame work

## **Learning Outcome 1.2:** Identify materials according to the roof structure

Types of material:

Wood.

Wood is a porous and fibrous structural tissue found in the stems and roots of trees and other woody plants.

Types of wood

1. Plywood
2. Mahogany
3. Pine
4. ash,
5. beach,
6. oak,
7. sal,
8. teak,
9. shishum
10. and walnut etc.

Sheet metal.

Metal is a chemical element, such as iron or gold, or a mixture of such elements, such as steel, which electricity and heat can travel through and which is generally hard and strong.

Types of metal

Aluminum

Stainless steel

## **Learning Outcome 1.3:** Identify attached ceiling materials used to construct ceiling structure.

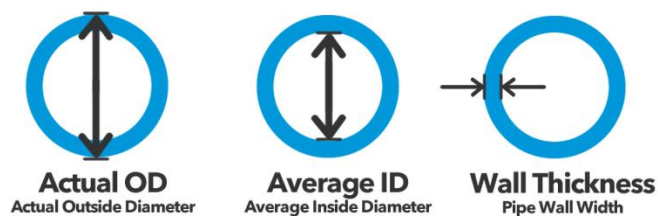
A **ceiling** is an overhead interior surface that covers the upper limits of a room. Now days, people are well aware of the importance of a ceiling in a complete look and feel of the space.

1. tray ceiling
2. exposed beam ceiling
3. domed ceiling
4. coffered ceiling
5. conventional ceiling
6. suspended ceiling
7. beam ceiling
8. shed ceiling
9. cove ceiling
10. cathedral ceiling

## **Learning unit 2: Produce ceiling design structure**

**Learning Outcome 2.1:** Determine ceiling materials to be used in accordance with roof structure requirements, materials availability and affordability as well as environmental factors

- Identification of material:
- PVC: Polyvinyl chloride is the world's third-most widely produced synthetic plastic polymer, after polyethylene and polypropylene. About 40 million tones are produced per year. PVC comes in two basic forms: rigid and flexible.
- Tin: Tin is a silvery metal that characteristically has a faint yellow hue is soft enough to be cut without much force.
- Plaster
- Tile
- Fiber
- Fiber cement
- Wood plastic composition
- straw
- Types of PVC
  - ❖ Rigid
  - ❖ Flexible
- Characteristics of PVC in terms of Density
  - ❖ Economics
  - ❖ Hardness
  - ❖ Strength
- Colors of PVC
  - ❖ White
  - ❖ Black
  - ❖ Grey
  - ❖ Red
  - ❖ Blue
  - ❖ Yellow
  - ❖ Green
  - ❖ Purple
  - ❖ Orange
- Dimensions of PVC
  - ❖ Small
  - ❖ Medium
  - ❖ Large



## VC Pipe Dimensions

### Schedule 40 PVC Pipe Dimensions

Nom. Pipe Size (in)	O.D.	Average I.D.	Min. Wall	Nominal Wt./Ft.	Maximum W.P. PSI*
1/8	0.405	0.249	0.068	0.051	810
1/4	0.540	0.344	0.088	0.086	780
3/8	0.675	0.473	0.091	0.115	620
1/2	0.840	0.602	0.109	0.170	600
3/4	1.050	0.804	0.113	0.226	480
1	1.315	1.029	0.133	0.333	450
1-1/4	1.660	1.360	0.140	0.450	370
1-1/2	1.900	1.590	0.145	0.537	330
2	2.375	2.047	0.154	0.720	280
2-1/2	2.875	2.445	0.203	1.136	300
3	3.500	3.042	0.216	1.488	260
3-1/2	4.000	3.521	0.226	1.789	240
4	4.500	3.998	0.237	2.118	220
5	5.563	5.016	0.258	2.874	190
6	6.625	6.031	0.280	3.733	180
8	8.625	7.942	0.322	5.619	160
10	10.750	9.976	0.365	7.966	140
12	12.750	11.889	0.406	10.534	130
14	14.000	13.073	0.437	12.462	130
16	16.000	14.940	0.500	16.286	130
18	18.000	16.809	0.562	20.587	130
20	20.000	18.743	0.593	24.183	120
24	24.000	22.544	0.687	33.652	120

Table: Differences between temporary joining and permanent joining

Temporary Joining	Permanent Joining
A temporary joint can be dismantled without breaking the assembled parts.	A permanent joint cannot be dismantled without breaking parts.
Temporary joining is beneficial where frequent assembly and disassembly are required.	Permanent joining is beneficial where joint is intended to stay fixed for longer period.
Strength of temporary joint is comparatively lower.	Permanent joint offers stronger joining.
Temporary joints are not leak-proof.	Most permanent joining processes provide leak-proof joints.
Temporary joining processes offer easy and cost efficient inspection, repair and maintenance as parts can be dismantled without breaking.	Inspection, repair and maintenance are difficult when structures are joined permanently as disassembly is not possible without breaking.
Examples of various temporary joining techniques: <ul style="list-style-type: none"> <li>• Fasteners</li> <li>• Press fit</li> <li>• Cotter joint</li> <li>• Knuckle joint.</li> </ul>	Examples of various permanent joining techniques: <ul style="list-style-type: none"> <li>• Welding</li> <li>• Brazing and soldering</li> <li>• Riveting</li> <li>• Coupling.</li> </ul>

### Joining techniques

- ✓ Overlap
- ✓ Tongue and groove
- ✓ fixing etc.

**1. Butt Joint.** A simple joining of two pieces of wood, either at a corner or edge to edge. Make it stronger with glue blocks or screws.

**2. Dado Joint.** You'll see this joint on bookcase shelves. A dado cut in one piece receives the end of the other.

**3. Dowel Joint.** Drill aligning holes in each piece of wood, then glue dowels in place for a tight joint. Perfection requires a centering tool.

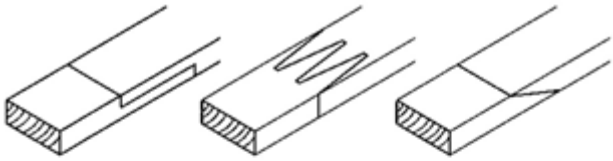
**4. Lap Joint.** Add gluing surface and strength to a butt joint by cutting a rabbet in the overlapping piece.

**5. Miter Joint.** Create this corner joint by sawing one end of each piece to 45°. It demands accurate cutting

**6. Mortise-and-Tenon Joint.** A strong, traditional joint that can be made even tougher by adding a peg. Not all mortises go all the way through.

**7. Through-Dovetail Joint.** There's not a better-looking joint, nor one that requires more patience and accuracy to cut. The interlocking feature makes it really strong, but adds visual interest.

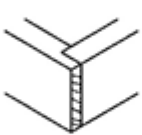
**8. Tongue-and-Groove Joint.** This joint allows for wood shrinkage. Cut a groove in the edge of one piece and a tongue on the other to fit into the groove.



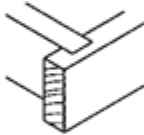
half lap

finger joint

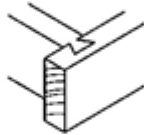
scarf



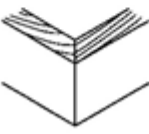
rabbet



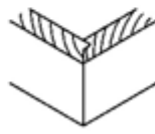
dado



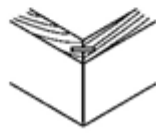
dovetail dado



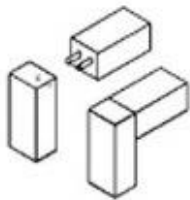
miter



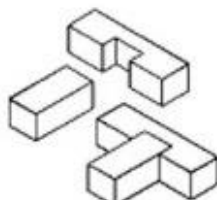
shoulder miter



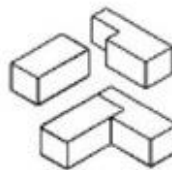
splined miter



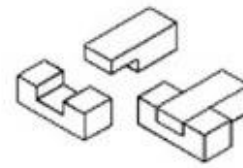
DOWELED BUTT JOINT



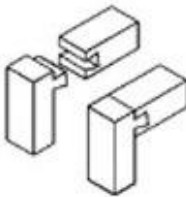
DADO



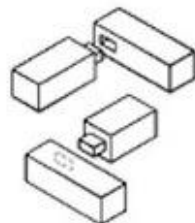
RABBET



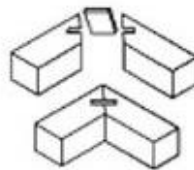
LAP JOINT



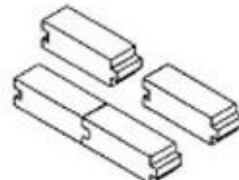
DOVETAIL



MORTISE AND TENDON



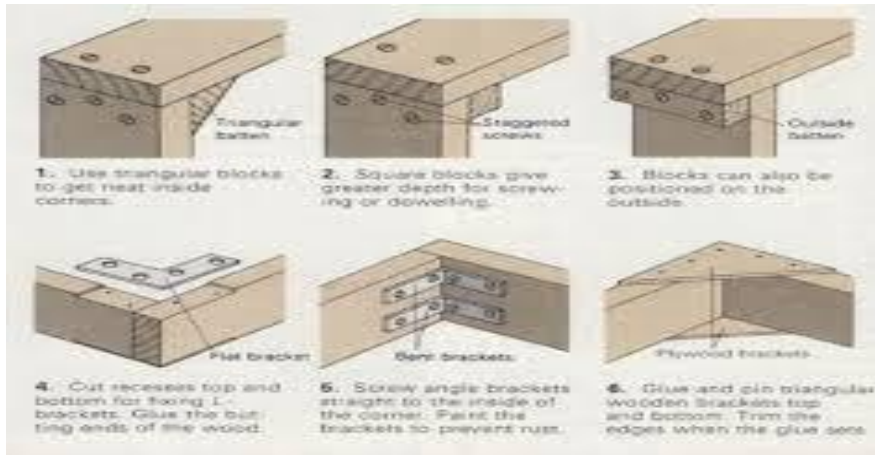
MITER WITH WOOD SPLINE



TONGUE AND GROOVE

- ceiling joining methods
- ✓ jointless
- ✓ fixed



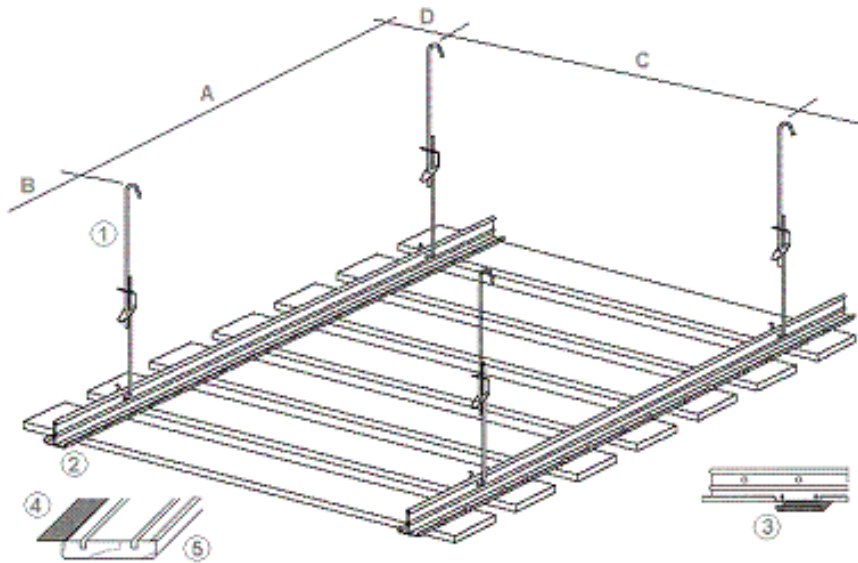


**Learning Outcome 3.3:** Maintain the ceiling structure according to covering materials

- ✓ Tips on ceiling maintenance
- ✓ Repainting materials
- ✓ Materials renovation

System

overview



- |   |         |        |      |            |    |  |        |
|---|---------|--------|------|------------|----|--|--------|
| 1 |         |        |      |            |    |  | hanger |
| 2 |         |        |      |            |    |  | rail   |
| 3 | special | fixing | clip | (pre-fixed | on |  | rail)  |

4  
5 wood panel

acoustic

felt

strip

