

ROOFS

Introduction

A **roof** is the top covering of a building, including all materials and constructions necessary to support it on the walls of the building or on uprights; it provides protection against rain, snow, sunlight, extremes of temperature, and wind. A roof is part of the building envelope.

The characteristics of a roof are dependent upon the purpose of the building that it covers, the available roofing materials and the local traditions of construction and wider concepts of architectural design and practice and may also be governed by local or national legislation. In most countries a roof protects primarily against rain. A verandah may be roofed with material that protects against sunlight but admits the other elements. The roof of a garden conservatory protects plants from cold, wind, and rain, but admits light.

A roof may also provide additional living space, for example a roof garden.

Design elements

The elements in the design of a roof are:

- the material
- the construction
- the durability

The **material** of a roof may range from banana leaves, wheaten straw or seagrass to laminated glass, copper (*see: copper roofing*), aluminium sheeting and pre-cast concrete. In many parts of the world ceramic tiles have been the predominant roofing material for centuries, if not millennia. Other roofing materials include asphalt, coal tar pitch, EPDM rubber, Hypalon, polyurethane foam, PVC, slate, Teflon fabric, TPO, and wood shakes and shingles.

The **construction** of a roof is determined by its method of support and how the underneath space is bridged and whether or not the roof is *pitched*. The *pitch* is the angle at which the roof rises from its lowest to highest point. Most US domestic architecture, except in very dry regions, has roofs that are sloped, or *pitched*. Although modern construction elements such as drainpipes may remove the need for pitch, roofs are pitched for reasons of tradition and aesthetics. So the pitch is partly dependent upon stylistic factors, and partially to do with practicalities.

Some types of roofing, for example thatch, require a steep pitch in order to be waterproof and durable. Other types of roofing, for example pantiles, are unstable on a steeply pitched roof but provide excellent weather protection at a relatively low angle. In regions where there is little rain, an almost flat roof with a slight run-off provides adequate protection against an occasional downpour. Drainpipes also remove the need for a sloping roof.

A person that specializes in roof construction is called a roofer.

The **durability** of a roof is a matter of concern because the roof is often the least accessible part of a building for purposes of repair and renewal, while its damage or destruction can have serious effects.

Form

The **shape of roofs** differs greatly from region to region. The main factors which influence the shape of roofs are the climate and the materials available for roof structure and the outer covering.

The basic shapes of roofs are flat, mono-pitched, gabled, hipped, butterfly, arched and domed. There are many variations on these types. Roofs constructed of flat sections that are sloped are referred to as pitched roofs (generally if the angle exceeds 10 degrees). Pitched roofs, including gabled, hipped and skillion roofs, make up the greatest number of domestic roofs. Some roofs follow organic shapes, either by architectural design or because a flexible material such as thatch has been used in the construction.

Types of Roof

1. Gable
2. Hip
3. Mansard
4. Gambrel
5. Flat
6. Skillion
7. Jerkinhead
8. Butterfly
9. Bonnet
10. Saltbox
11. Sawtooth
12. Curved
13. Pyramid
14. Dome
15. Combination

1. Gable Roof

Also known as pitched or peaked roof, gable roofs are some of the most popular roofs in the US. They are easily recognized by their triangular shape.

Pros: Gable roofs will easily shed water and snow, provide more space for the attic or vaulted ceilings and allow more ventilation. Their inherently simple design makes it easy to build them and cheaper than more complex designs.

Cons: Gable roofs can be problematic in high wind and hurricane areas. If the frames are not properly constructed with adequate supports, the roof can collapse.

High winds can also cause materials to peel away from gable roofs. If there is too much of an overhang, winds can create an uplift underneath and cause the roof to detach from the walls.



2. Hip Roof

A hip roof has slopes on all four sides. The sides are all equal length and come together at the top to form a ridge.

Pros: Hip roofs are more stable than gable roofs. The inward slope of all four sides is what makes it more sturdy and durable.

They are excellent for both high wind and snowy areas. The slant of the roof allows snow to easily slide off with no standing water.

Hip roofs can offer extra living space with an addition of a dormer or a crow's nest.

Note: For high wind areas, or strong storms, a pitch of 4/12-6/12 (18.5° - 26.5° angle) is recommended.

Cons: Hip roofs are more expensive to build than a gable roof. It's a more complex design that requires more building materials. Also, with the addition of a dormer, additional seams can make it easier for the water leaks to form in the valleys, if a roofing system is not properly installed.

Note: Proper construction and maintenance is a must to prevent minor issues from turning into major problems.

Suggested materials: Hip roofs, like gable roofs, can be with almost any type of roofing material, such as shingles, metal, or tiles.



3. Mansard Roof



A mansard roof, also known as a French roof, is a four-sided roof with a double slope on each side that meet forming a low-pitched roof.

The lower slope is much steeper than the upper. The sides can either be flat or curved, depending on the style.

Pros: Mansard roofs can help create a great deal of extra living space. Using the space as a full attic or living quarters, called a garret, is very popular. The style lends itself to either open or closed dormers for more aesthetic appeal.

Mansard roofs are great for people wanting flexibility to make future home additions. When first designing and building a home, you can actually save money by having a simple mansard design to start off. – You can then add on a garret or dormers at a later date. This will not only add value to the house, but it also allows homeowners to easily make additions as their needs change.

Cons: A low pitched portion of a mansard roof isn't ideal for areas receiving heavy snowfall.

Mansard roofs cost more than typical roofs because of the embellishments and details that go into them. But, the added space and character can more than make up for the extra cost of initial construction.

4. Flat Roof

As the name suggests, flat roofs appear to be completely flat with no pitch. However, they do have a slight pitch to allow for water run-off and drainage.

These roofs are generally used on industrial or commercial buildings. However, they can also be installed on residential houses in both high and low rainfall areas.

Most people don't consider the amount of available outdoor living space a flat roof can provide.

So, don't completely dismiss them when building a new home!

Pros: Extra living space on the roof for a patio, garden or partially enclose for a penthouse room. Heating and cooling units can also be placed on flat roofs, keeping them out of sight. – This is especially common practice in commercial roof designs.

The design is also conducive for installing PV solar panels for a more energy efficient and energy independent home.

Flat roofs are easier to construct than pitched roofs and require fewer building materials, keeping costs down.

Cons: The low pitch makes flat roofs more susceptible to water leakage. They are not advised for high rainfall or high snowfall areas.

Although the upfront cost of building a flat roof is less expensive than a pitched roof, they can be more expensive in the long run due to maintenance and ongoing roof repair and replacement costs.

5. Skillion Roof



Skillion is also referred to as a shed roof or lean-to. It is a single, sloping roof, usually attached to a taller wall. – It can be thought of as half of a pitched roof, or as a more angled flat roof.

Skillion roofs are mostly used for home additions, sheds and porches. However, they are also now being used on the entire structure of more modern style homes.

Pros: Skillions are easy to assemble and use much fewer building materials than other roof types. Their steep pitch allow snow and water to easily run off, which makes them excellent for high rain

and snow regions. Skillions can also be used purely for design purposes to add architectural interest and aesthetic appeal.

Cons: If a roof pitch is too high it can result in ceilings being too low. Also, homes using only a skillion roof can have problems in high wind areas.

6. Butterfly Roof



A butterfly is a V-shaped roof constructed of two tandem pieces which are angled up on the outside. The midsection is angled downward where the two pieces meet into a valley. The overall effect is of a butterfly's wings in flight. The butterfly roof is popular for modern, Eco-friendly and tropical home designs.

Pros: The upper angle of the outer edges allows larger windows to be used. This gives the home more natural light, lower heating bills in the winter and brings an open feel to the design.

The valley in the midsection of the butterfly roof allows rainwater to be collected, making it beneficial for high drought areas. A downspout attached to a rain barrel or other type of water reservoir is usually installed for this purpose.

The butterfly roof lends itself to an environmentally friendly home design, as PV solar panels, water collection systems and natural light can all be easily incorporated.

Cons: The complexity of the design makes the butterfly roof more expensive. Not only are the upfront costs higher than with conventional roofs, but the maintenance will also be more expensive.

7. Bonnet Roof



Bonnet roofs, also known as kicked-eaves, are double sloped with the lower slope set at less of an angle than the upper slope. It's like a reverse Mansard.

The lower slope hangs over the side of the house. This overhang is an excellent cover for an open porch.

Bonnet roofs are not commonly used roofs in modern houses. They were mainly used in French Vernacular and can be seen in regions of Louisiana and Mississippi.

Pros: The upper slope provides extra living space for a small attic or vaulted ceilings. It also lends itself to dormers or side windows. The overhanging eaves not only provide protection for porches, but also help to protect walls from water damage.

Water easily runs off the slopes of the roof and the modified hip structure make it more durable than a gable roof.

Cons: The complex design requires more building materials and it's more difficult to construct. This makes the bonnet roof more expensive than other, more simple designs. Although water easily runs off the slopes, valleys are formed where the two slopes meet. This can cause snow and water to pool. Extra precaution is needed to waterproof these areas.

11. Sawtooth Roof



A sawtooth roof is two or more parallel pitched roofs in which the sloped and vertical surfaces alternate. As the name suggests, the roof resembles the side view of a saw blade. Sawtooth roofs were once only used on commercial industrial buildings. However, now they are also used in modern home design.

Pros: Windows are placed in the vertical spaces of the roof, allowing more natural light inside the home.

The higher peaks provide the opportunity for either vaulted ceilings or loft living space. The combination of the various slopes and use of natural light make this design an excellent choice for homes with Eco-friendly conveniences, such as solar panels, geothermal and radiant heating systems.

Cons: The complex design and various building materials needed will make the sawtooth roof much more expensive than other roof types. It's also a high maintenance roof.

Adding windows, valleys and varying slopes creates a higher chance for water leaks. For this reason, sawtooth roofs aren't advisable in heavy snowfall areas.

12. Curved Roof

A curved roof is much like the Skillion, or Shed roof, but the planes are curved. It is very modern and provides a unique, creative roof design. The amount of curve can vary from slightly curved up to an arch shape.

Pros: Curved roofs are aesthetically pleasing and a way to have a home unlike any other. They also provide subtle shapes inside the home as well.

A curved roof can be used to cover the entire home or a single section, such as an arched entrance.

Since curved roofs are designed by the architect or builder, it can be customized to be advantageous to the region the home is being built.

For example, in high wind areas, a roof with a lower slope would be more durable than one with a higher slope. While in areas that receive more snow and rain can have more of an arch to allow water to run-off.

Cons: The cost of a curved roof will depend on the complexity of the design.



14. Dome Roof



A dome roof is polygonal with an inverted bowl shape. Dome roofs are great for adding unique and aesthetically pleasing features to any home. They are excellent choices for cupolas, gazebos or crow's nests.

Pros: Dome roofs are both beautiful in design as well as durable.

Cons: The complexity of a dome roof makes them expensive to construct. However, depending on the structure, a prefabricated one may be available.

Suggested Materials: Dome roofs can be constructed using shingles, metal and even glass. However, for a dome roof that will require less maintenance, metal is suggested.