

# CHAPTER 1

## AN OVERVIEW OF STEEP ROOFING

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### LEARNING OBJECTIVES

*At the end of this chapter, you should be able to—*

- list three roof functions
- define roof pitch and square
- describe four components of the goal of the roof inspection
- list nine common roof problems
- understand the causes and implications of old and damaged roofing, and
- know the inspection strategies used to identify these conditions
- understand the causes and implications of ice dams and multiple layers, and
- know the inspection strategies used to identify them.

# 1.1 FUNCTION AND GENERAL STRATEGIES

*Functions*

Roof functions may include the following—

1. Roofs are designed to protect the building from rain, snow, wind, hail and, in some cases, fire.
2. Roofs often support some of the mechanical equipment for the house.
3. Some roofs make a strong architectural statement.

Most roofs are not intended to provide insulation for the building.

The roof covering itself has no structural role, although most roofs are installed over sheathing, which does have a structural role. The roof covering materials add to the dead load of a building, which must be carried by the rest of the structure. A dead load is the load of the structure and building materials. The dead load is constant. A live load is a load that varies and is exerted by outside forces such as wind, rain and snow.

The ability of roofs to withstand hurricane winds has been a source of considerable discussion, especially after extensive hurricane damage to Florida roofs in the late 1980s and early 1990s.

There are two fundamental roofing strategies. Steep roofs shed water, relying on gravity and capillary action. They are not watertight. Steep roofs act more like a series of umbrellas than a weather-tight skin.

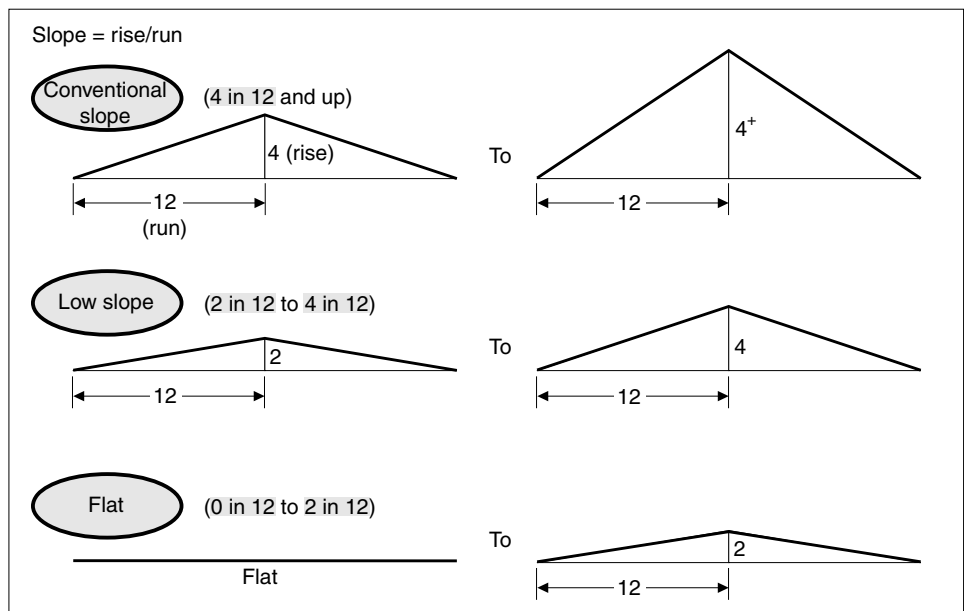
Flat roofs use a waterproof membrane or skin to protect the building. Generally speaking, flat roofs are more expensive to install and less tolerant of minor imperfections.

In this chapter, we will concentrate on steep roofing.

*Roof Pitch or Slope*

We should review a couple of roofing definitions here. The **pitch** is the slope of the roof, expressed as a ratio of the rise over the run (Figure 1.1). The run is usually expressed as 12, and a typical slope might be 4 in 12 or 8 in 12. A 45° roof

**FIGURE 1.1** Roof Slopes



would have a pitch of 12 in 12. Note—Carpenters use a different definition of **pitch**. To avoid confusion, it may be safer to use the word **slope**.

#### Estimating the Slope

You will learn to estimate the slope of a roof with experience. A spirit level held horizontally and a tape measure held vertically can be used to estimate the roof slope fairly accurately. Hold the level so that one end touches the roof, then measure how far the other end of the level is above the roof. If the level is 12 inches long, and one end is 4 inches above the roof, the slope is 4 inches in 12 inches or 4 in 12.

#### Square

A **square** is a 100 square foot area of roofing material installed with its intended exposure. It's important to understand that it is not 100 square feet of the roofing material, but is enough of the roofing material installed with its intended overlap to cover 100 square feet. In 1 **square** of asphalt shingle roofing, all the shingles would cover more than 200 square feet if they were laid side by side. When roofers quote work, they typically quote a job as being so many **squares**. Asphalt shingles are sold in bundles, and depending on the shingle type, there are typically three bundles of shingles per square. With cedar shingles, there are often four bundles per square.

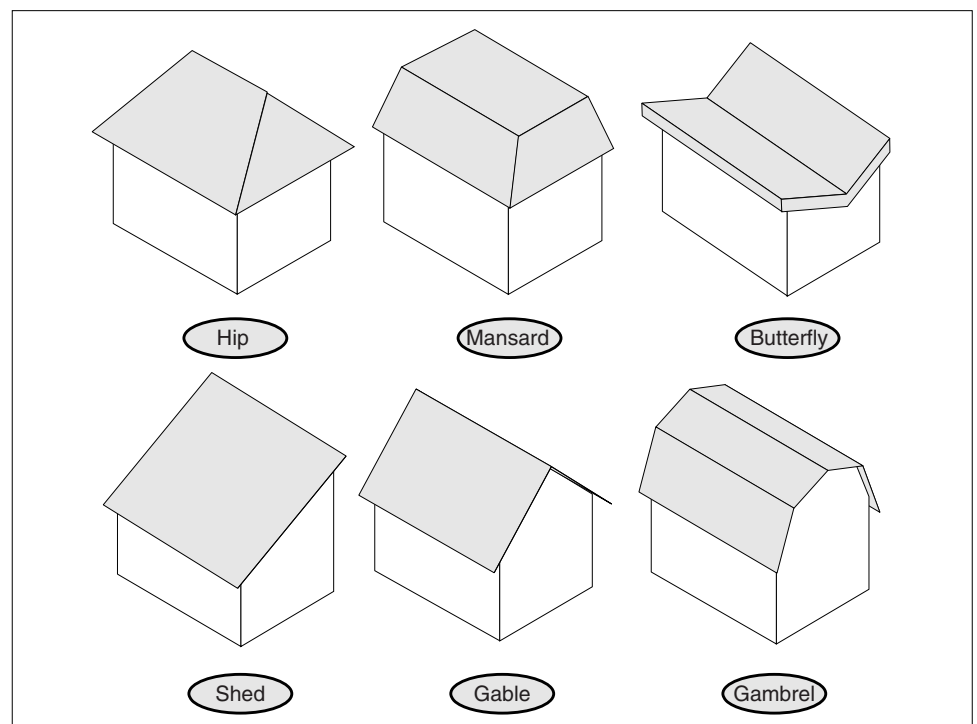
#### The Goal

To recap, our goal is to—

1. Identify the roofing material
2. Determine whether it is installed properly
3. Determine whether it is performing properly or is leaking
4. Determine whether it's near the end of its life

Some issues apply to all types of steep roofing. Other problems are specific to the individual materials. In this chapter we will look at the issues and problems

**FIGURE 1.2** Steep Roof Types



that apply to all steep roofing materials. In following chapters we will look at the common steep roofing materials and problems specific to those.

*The Big Picture and the up Close View*

When looking at roofs, first look from a distance. This is an opportunity to look for sagging of the ridge, or dishing of the roof surface. While these indicate structural issues rather than roof covering issues, they may also have an impact on the performance of the covering itself.

*Macro/Micro Approach*

The inspection should include a close look at the roofing surface. This is often done from the edge of the roof on a ladder, and/or by walking on the roof.

We believe the roofing inspection has not been completed until the interior wall, ceiling and attic surfaces below the roof area are examined. Looking at the underside of the roof sheathing is an important part of the roofing inspection.

*To Climb or not To Climb*

If it is your practice to climb on roofs, at each house you will have to decide whether or not it can be done safely and, if so, how you will gain access to the roof. A discussion of all the possible ladder options is beyond our scope, but we should emphasize that safety comes first. No matter how helpful you try to be, you're no help to your client if you injure yourself on the inspection.

*Recognize Your Limitations*

No matter how ambitious your roofing inspection, you should understand that because of the nature of roofing, you cannot see everything that you would like to. On a typical roof, at least half the roofing materials are covered. Most of the fasteners and flashing materials are covered. Remember, your roofing inspection isn't complete until you've had a look at the roof from the underside.

*Resultant Damage*

Be careful drawing conclusions about roof leaks. In many cases, considerable damage to the building interior and structure can be done as a result of a roof leak. In some ways, minor roof leaks are worse than major ones. A major roof leak is usually quickly identified and corrected. A minor roof leak may considerable damage before it is noticed. If you find evidence of leakage, past or present, tell your client that there might be concealed damage.

*Leaks Often Don't Go Straight Down*

Roof leaks often do not appear on the interior surface directly below the problem. Water coming through a roof can run along rafters or ceilings a considerable distance before it drips down, especially if there is a polyethylene air/vapor barrier above the ceiling finish.

## 1.2 GENERAL CONDITIONS

*Common Problems*

In the next section we will look at some of the problems we find on steep roof systems. These include—

1. Old
2. Damaged
3. Patched
4. Missing
5. Exposed fasteners
6. Poor installation
7. Vulnerable areas
8. Ice dam potential
9. Multiple layers

## 1.2.1 Old

<b>CAUSES</b>
<b>IMPLICATIONS</b>
<b>STRATEGY</b>

The causes are obvious.

Worn-out roofs can no longer perform and are prone to leakage.

Roofing materials have varying life expectancies. Modern asphalt shingles may last roughly 15 years. It's not unusual for slate or clay tile roofs to last over 100 years. There is a church in England with a slate roof that is 1,200 years old.

Once you have identified the roofing material, and its normal life expectancy, use any obvious clues to determine the age of the roof covering. On a relatively young house, the roof is often the same age as the house. For example, a 10-year-old house will usually have a 10-year-old roof.

Determine the number of layers of roofing material. In checking this (usually from the lower edge or the rake of the roof), make sure you count starter strips, and allow for the possible removal of old shingles at the edges to create a smoother finished job. You can be fooled looking at the edges of a roof.

The number of nails that penetrate the roof sheathing can be a clue. With asphalt shingles, for example, the nails are typically 12 inches apart moving across the roof with two nails close together every three feet. You might find a single or double nailing pattern indicating one or two layers of roofing, but be careful. The old roof(s) may have been stripped and the old nails simply driven through from above.

The next step is to look at the condition of the roofing materials. It is more important to know how much life remains in the roofing material than how old the roof is.

When looking at the condition of the roof, you have to know the typical signs of aging for the material. You also have to know what causes it to age and fail. The following are issues with many common roofing materials—

- 1. Exposure to ultraviolet light.** This is usually a function of orientation. Are the roof surfaces facing north, south, east or west?
- 2. Color.** While this is a controversial issue, many believe that darker-colored asphalt shingles wear out before light colored shingles. This may be dependent on climate, including issues such as average summer temperatures and number of hours of direct sunlight.
- 3. Ventilation.** Good ventilation helps to keep the roof cool in summer, and in the case of wood shingles, for example, helps the shingles dry after a rain. Poor ventilation can cause rapid aging.
- 4. Exposure to winds.** A house located in a coastal area or at the top of a hill is exposed to different winds than is a house surrounded by tall trees and other houses in a mature neighborhood. Mechanical action of the wind can cause immediate damage if roofing materials are torn off, or can affect the life expectancy of the roof through the abrasive action of wind-driven rain, hail, snow and debris.
- 5. Pitch (Slope).** Generally, steeper roofs last longer than shallow roofs. Water runs off steep roofs more quickly and the roof dries faster.
- 6. Complexity.** The more complex the roof, the shorter the life expectancy. Complex roofs include those with many changes in direction, many valleys, penetrations and or roof-mounted equipment. Every time there is a penetration, or a change in direction or material, there is an increased potential for failure.

*Age of House*

*Number of Layers*

*Fasteners*

*Roof Condition*

*Causes of Aging*

*Butterfly Roofs*

One roof design that does not work well in many climates because of its complexity is the butterfly roof. The butterfly roof has two adjacent slopes meeting at a central valley that is horizontal. Water does not drain to one end or the other very well. Debris tends to accumulate in the valley as do snow and ice in a freezing climate. These roofs generally have a shorter than normal life expectancy.

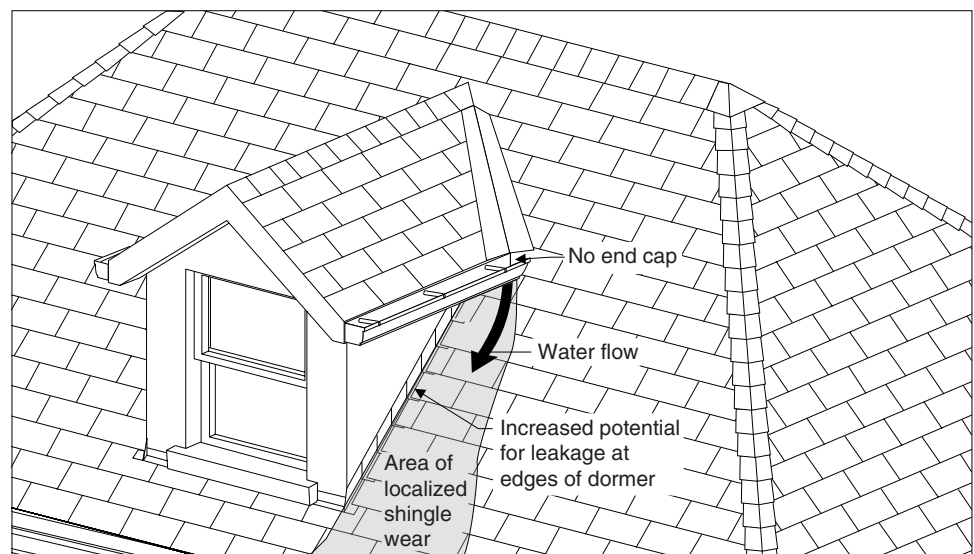
7. **Foot traffic.** Roofs that are walked on regularly will not last as long as other roofs. Some parts of the roof may see a lot of foot traffic and tend to wear out first. This may be an area where it's easiest to get from one part of the roof to another, or it may be an area below a dormer, where people stand to clean the windows, clear the gutters, paint the trim, etc. If there is equipment on the roof that requires servicing, foot traffic from service people may wear out the roof.
8. **Concentrated water on the roof from a drainage system above.** It is common for an upper roof to have a gutter or downspout that discharges onto a lower roof (Figure 1.3). Collecting all the water from the upper roof and allowing it to run across one section of the lower roof will wear out this section prematurely.
9. **Tree Branches.** Branches touching the roof cause abrasion damage and premature failure. Even if the branches don't touch the roof, the overhanging trees drop debris on the roof and shade the roof, slowing the drying process. These factors shorten life expectancy.

*How Does the Roof Look?*

All these factors should be considered in estimating the remaining roof life.

The physical condition of the roof covering, however, is perhaps the strongest indicator. You will have to know what the roof covering looks like when it is new and in good shape. You will also have to know what the roofing material looks like when it is near the end of its life. For some roofing materials, there is more than one failure mode resulting from age, and you will have to know these. We'll talk later about how specific materials wear out.

**FIGURE 1.3** Dormer Gutters-Discharging onto Roof



*Which Sides Wear First?*

In many climates, asphalt shingle roofs wear first on the south and west side—where the ultraviolet light is the greatest. In wet climates, the wear can be caused by moss and vegetation growing on the roof. This will be more pronounced on the north, or any shaded side of the roof where drying is poor.

*A Last Resort—Ask the Owner*

Some inspectors ask the homeowner how old the roof is. While this may provide valuable information, unless invoices are included, the inspector should take the information with a grain of salt. We often find this information unreliable. In some cases, the date given for roof replacement is either a repair, or a partial replacement. Again, the amount of remaining life is more important to your client than the age of the roof.

*Parts of Roof May Be Older*

It is not unusual to find that only part of a roof system has been replaced. On the same house, you can have roofing materials of several ages. This is another argument for getting up and walking the roof surface wherever possible. If you can only see three of four sides of a roof from the ground with binoculars, it is possible that the fourth side is older than the three that can be seen.

## 1.2.2 Damaged

This may include mechanical damage such as broken tiles, holes or tears.

### CAUSES

Roof damage might be caused by—

1. Falling objects
2. People working on the roof
3. Branches from overhanging trees
4. Wind or hail
5. Snow removal activities

### IMPLICATIONS

A damaged roof covering may not keep the weather out and may allow damage to the building systems below.

### STRATEGY

When examining the roof, you have to look at the entire surface for flaws. In many cases, the thing that caused the mechanical damage will no longer be visible.

*Damage from Snow Removal*

In areas that receive a lot of snow, it is common to find mechanical damage to the lower edge of roofs from shovels and scrapers used to remove snow and ice dams from the roof surface. This damage can also be concentrated on roof areas where there is an adjacent wall. Snow tends to drift on roofs where there is a higher vertical surface adjacent. Snow removal is often necessary here to prevent overloading the roof structure.

## 1.2.3 Patched

It is common to find previous repairs that have been made on the roof (Figure 1.4).

### CAUSES

Patches are the result of past damage and/or leakage problems.

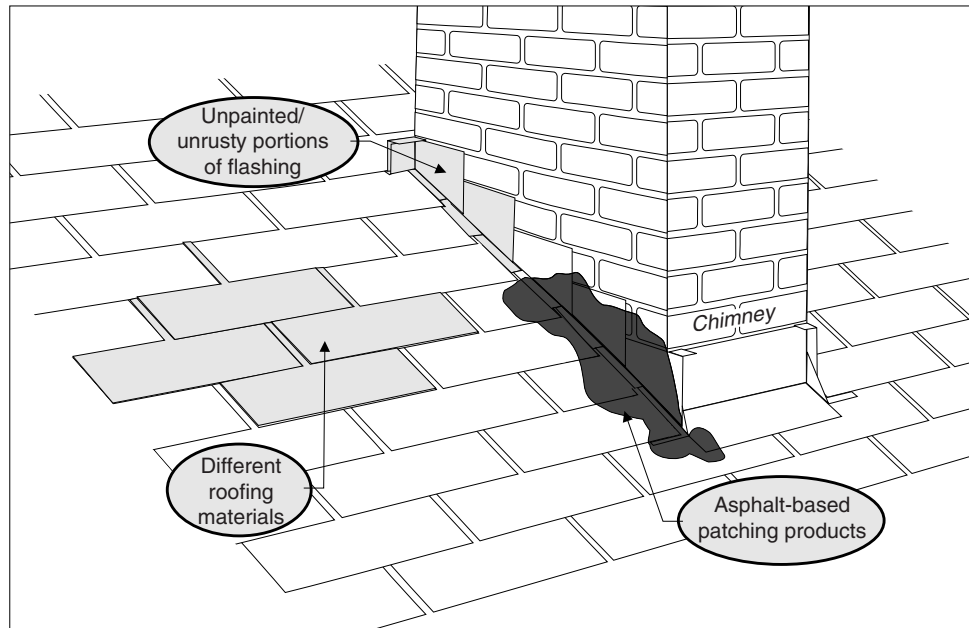
### IMPLICATIONS

Previous repairs present a high risk of future leakage. This is because of the difficulty in making a weather-tight patch, and/or because the substrate (sheathing or building framing) was damaged before the leak was patched, and the roof is spongy in that area.

### STRATEGY

Patches can often be readily identified. They may be asphalt based products on the roof surface (roofer’s mastic, roofing cement, asphalt cement, plastic cement,

**FIGURE 1.4** Patched Roofing



elastic cement), they may be caulking, or they may show up as roofing materials of a slightly different color, texture, size or style than the original materials. Metal flashings that are unpainted or painted differently from the remainder may indicate patching. If the majority of the metal shows some rusting, but one flashing does not, the flashing has been patched or replaced here.

On some roofing materials, supports for new or patched roofing materials are visible. These may be nail heads, metal hooks or strips of metal, for example.

In some cases, the patches are made with a completely different roofing material. These are easily identified.

Where patches are found, look closely at areas below for evidence of recent moisture. A moisture meter (beyond ASHI Standards) is helpful (although not necessarily conclusive). Patches should be reported as vulnerable areas since it is very common for patches to fail and leak.

### 1.2.4 Missing

Individual pieces of roofing material may be broken off, or the whole unit may be missing altogether.

Missing roofing may be the result of—

- material disintegrating with age
- mechanical damage
- poor installation
- missing or failed fasteners

Leakage and resultant damage are the obvious implications.

Again, an inspection of 100 percent of the roof surface area is necessary to identify partially or completely missing units.

**CAUSES**

**IMPLICATIONS**

**STRATEGY**

## 1.2.5 Exposed Fasteners

### CAUSES

On most roofing systems, nails, screws or other fasteners should not be visible once the work is complete.

Fasteners may be exposed because—

- installation quality was low
- equipment may have been added to the roof in an amateurish fashion
- of repair work

### IMPLICATIONS

In most cases, exposed fasteners present an increased risk of leakage.

### STRATEGY

Some roofing systems have fasteners that are intended to be exposed. Some types of asphalt shingles (Dutch lap and some diamond-shaped shingles, for example), are intended to have exposed fasteners. In addition, some metal roofing has exposed screw heads, by design. Knowledge of proper installation technique is important here.

## 1.2.6 Installation Problems

We will detail the typical installation techniques for each roofing material later in this chapter. Where installation does not follow recommended practices, problems are more likely.

### CAUSES

This is a failure of the installer.

### IMPLICATIONS

Increased risk of leakage.

### STRATEGY

For any given roofing material, you should compare the installation with the recommended practices for—

- minimum slope
- exposure
- fastener type, number and location
- joint alignment
- overhangs at lower edges and rakes
- requirements if any, for underlayment
- the requirement for a waterproof membrane below
- compatible flashing materials
- maximum number of layers recommended

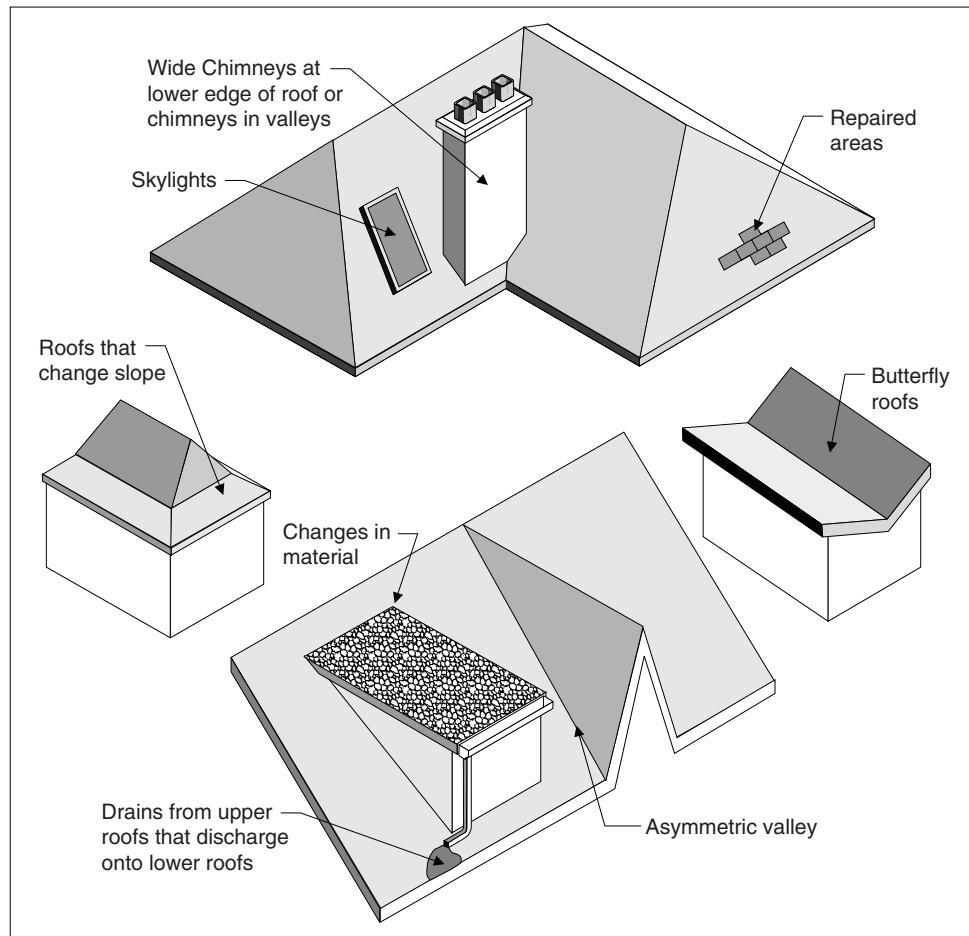
While you won't be able to see everything, installations that clearly deviate from good practice have increased risk of problems, and your inspection should focus on vulnerable areas.

## 1.2.7 Vulnerable Areas

There are many vulnerable areas that may be found, and you should note these (Figure 1.5). Anything that restricts the drainage of water off a roof is a vulnerable area. This would include—

- butterfly roofs
- wide chimneys near the lower edge of a roof
- chimneys in valleys

**FIGURE 1.5** Vulnerable Areas



- skylights
- drains from upper roofs that discharge onto lower roofs
- changes in material
- equipment that obstructs drainage
- complicated flashing details
- asymmetric valleys
- patched areas
- roofs that change slope from top to bottom (typically with a lower slope near the bottom edge)

Valleys that are steeper on one side than the other are vulnerable areas because the water coming off the steep side may have enough momentum to drive up under the shingles on the lower sloped side. This is particularly true if the roof surfaces being drained are large.

Areas that show previous repairs are inherently vulnerable. A repair is much more likely to leak than an original roof section, especially a clumsy repair such as roofing cement on a torn valley flashing.

**CAUSES**

The vulnerable areas are usually created by—

- design
- installation
- repair activity

**IMPLICATIONS**

Increased risk of leakage.

**STRATEGY**

Look at the roof for places where water may be hung up as it tries to run down the roof. This can often be done effectively while standing at the ridge and looking down the roof surfaces.

In many cases, you won't recommend immediate repairs, but will alert your client to the fact that leakage is more likely here. Pay attention to areas below these vulnerable spots as you go through the rest of your inspection.

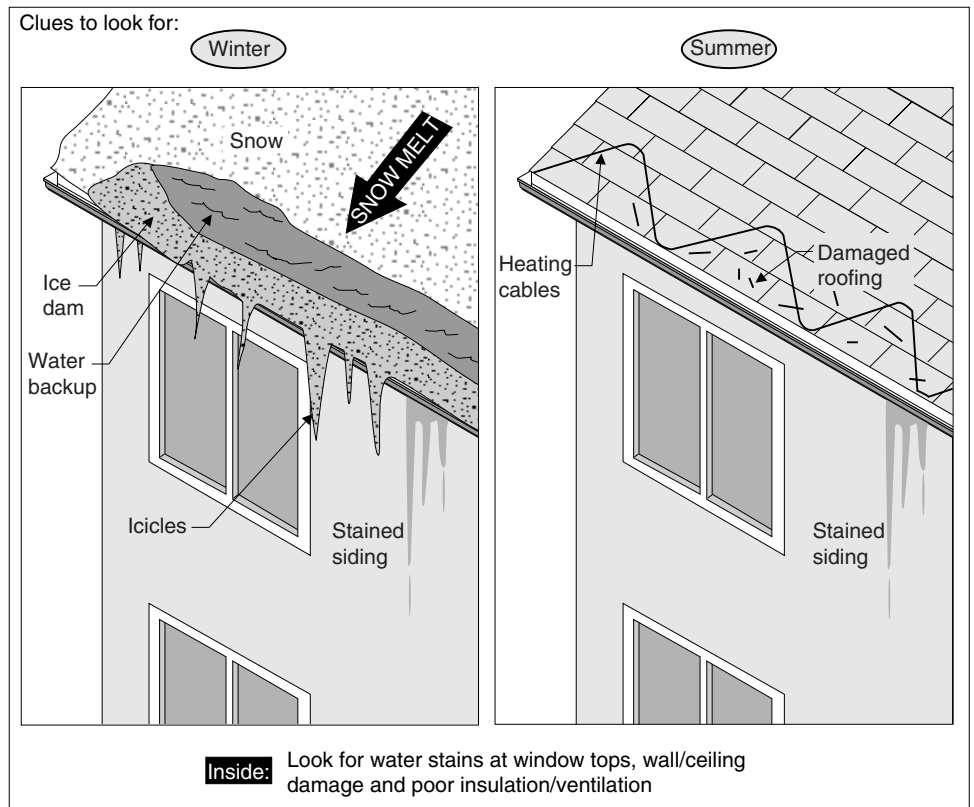
## 1.2.8 Ice Dam Potential

Ice dams only occur in climates where snow accumulates on roofs (Figure 1.6). Ice dams are most common at the lower edge of roofs, but may also occur near party walls (through which there may be considerable heat loss to the roof area) and around chimneys (again, where heat loss may create localized melting of snow and subsequent re-freezing below).

**CAUSES**

The ice dam is caused by heat escaping from the house, and melting the snow on the upper parts of the roof. This melted snow re-freezes when it gets down to the colder eave area where there is no heat loss from the house.

**FIGURE 1.6** Ice Dams



**IMPLICATIONS**

**STRATEGY**

Ice dams allow leakage through the roof into the soffit, fascia and wall systems. Leakage may also develop at the interior of the building, although if it does not, the damage can be concealed and go unnoticed for a considerable period.

Dams are common on low-sloped roofs or roofs which change slope near the eaves. Larger eave overhangs (wide soffits) are more prone to ice dams. Ice dams may also occur where a roof above a heated area extends out over an unheated area such as a porch or balcony.

*Where Dams May Occur*

As discussed above, ice dams can also occur around party walls in attached homes and around chimneys where localized heat escapes from the building. Very often, the northern slope of the roof is more vulnerable to ice damming than the southern section. The heat of the sun helps to melt the snow uniformly across the south roof surface and allow water to run off the edge.

*In Valleys*

Another spot where ice damming frequently occurs is at the bottom of a valley. Melted snow finds its way to the valley and runs down to the bottom. The concentrated water re-freezing in this area can create an ice dam.

*Frequency*

Ice dams don't occur every winter. It takes the appropriate snow accumulations and weather conditions to cause ice dams. Snow that accumulates on a roof to considerable depth, followed by temperatures just below freezing for several days, creates an environment where ice damming is likely.

*Identifying Ice Dams*

It is relatively easy to inspect for ice dams in the winter when there is snow on the roof. You can see what is happening and can find leakage. Icicles hanging off gutters and protruding from soffits or between siding boards, for example, are a dead giveaway that ice damming is taking place. Similarly, water coming through the wall/ceiling intersection inside along the length of the wall, or near a valley, very often indicates ice damming.

*In Summer*

It's much more difficult to identify an ice-damming problem during the summer months. You're less likely to think about ice damming in warm weather. Although some of the physical conditions that allow ice dams to form may exist, it is hard to know whether the problem manifests itself or not. Some of the clues that you can look for include—

*Wall/Ceiling Damage*

1. Evidence of damage along the wall/ceiling intersection on the interior. This looks different from a typical roof leak because it extends along the length of the wall for several feet, typically. A roof leak caused by a puncture or missing shingle will rarely lead to leakage that runs horizontally along the wall/ceiling intersection.

*Stained Siding*

2. Discoloration of siding starting at the soffit and running down the wall. It's unusual for the walls to get wet immediately under the eaves. Where streaking is noticed running down from the wall/soffit intersection, ice damming should be suspected.

*Shingle Damage*

3. Damage to shingles from axes, hatchets, shovels, etc., along the lower edge of the roof. This indicates that attempts have been made to break up ice dams.

*Heating Cables*

4. Electric cables running along the lower part of the roof in a zigzag pattern. These heating cables are often used in an attempt to protect against ice damming. These cables are only effective if they are turned on before the snow accumulates. They won't work if there's a foot of snow on the roof before the cables are turned on. These cables, by the way, provide more opportunity for leakage because they have to be secured through the roof coverings.

*Poor Insulation and Ventilation*

5. Roofs with poor insulation and ventilation are more likely to suffer from ice damming problems because their attics will be hotter. A lack of insulation will allow a lot of heat loss from the house into the attic. Poor ventilation

will prevent this heat from escaping from the attic. The heat in the attic will melt the snow on the roof above the attic. This melted snow will run down and re-freeze at the edge, creating the dam.

*Window Tops*

6. The tops of windows may indicate ice damming if evidence can be found of water leakage through the outside or inside of the window top. While it may be leakage, the higher the window and better protected it is by the roof overhang, the more likely it is to be ice damming.

*Check Attic*

7. You might be able to identify an ice-damming problem from the attic space, although this is rare. The water penetration is likely to be near the roof edges and at the bottom of valleys. This area is often obstructed by insulation. Staining, wet areas or rot on the underside of the roof sheathing along the perimeter for any distance may suggest ice damming.

*Stains on Insulation*

8. In some situations, the insulation may be compressed from the dampness, or there may be stains visible in the insulation, indicating water has been dropping onto it. Some old insulation has a kraft paper barrier on the top. Stains on the paper may be visible.

*Sheets or Buckets*

9. In some cases, plastic sheeting, buckets or pans may have been placed in the attic to collect water. This suggests either leakage or ice damming.

*Configuration*

10. Check roof configurations. Roofs with low-slopes and wide overhangs are more prone to ice dams.

*Monitor*

One way to determine whether the problem is ice damming or leakage is to monitor the situation seasonally. If the area is wet after a rain, or when there has been no snow on the roof for some time, it is a leak. If the problem only occurs when there is snow on the roof and icicles hanging from the gutters, it is ice damming.

*Drip Edge Flashing*

We'll talk more about drip edge flashing later, but we wanted to include it here as one of the things that you can look for. Drip edge flashing is used more in some areas than others. This flashing directs water coming off the roof into a gutter or onto the ground. It prevents water from being wicked up into the sheathing or fascia, and is useful in areas susceptible to ice damming.

It typically is a roughly four- or five-inch-wide piece of bent metal that extends about three inches up the surface of the sheathing from the edge. This metal surface is covered by the roofing materials. The rest of the flashing extends down vertically, covering the edge of the sheathing and/or fascia. The bottom half inch or so is usually bent out at a 45° angle so that water will drip off the flashing out away from the fascia. In some areas, drip edge flashing is used along the rake as well as the lower edge.

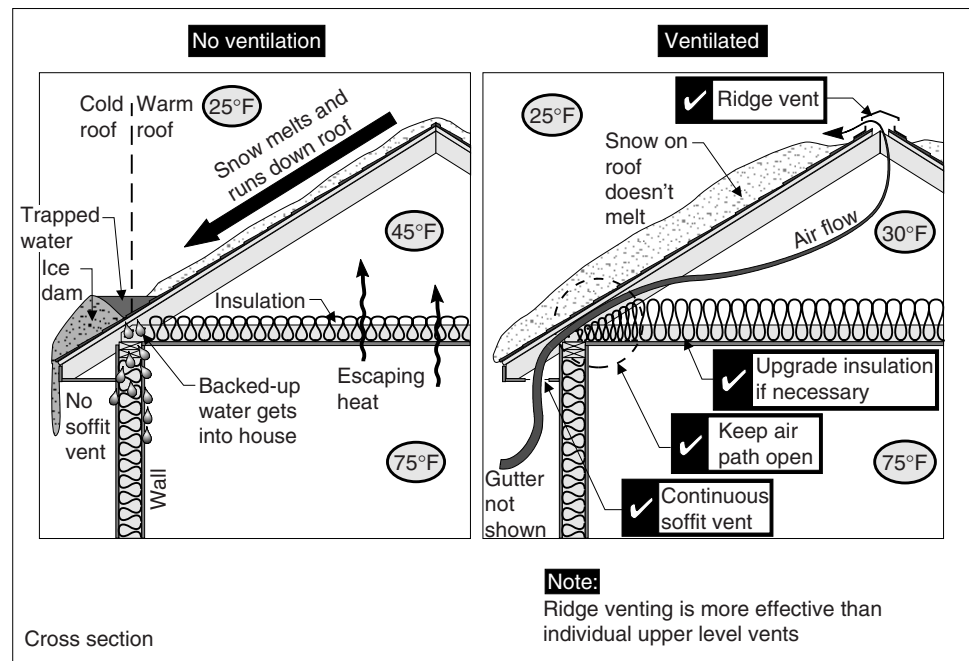
*Drip Edge and Eave Protection*

Where eave protection is used, there are two schools of thought as to whether the eave protection should overlap the top edge of the drip edge flashing, or be tucked under it. If you envision water getting through the shingles and running down across the eave protection, it's better to have the protection extend over the top of the drip edge so water won't be driven in underneath the drip edge.

If, however, you envision water backing up from the gutter as a result of ice dams, for example, or water being blown up under the bottom shingle by wind-driven rains, you might want the eave protection to be tucked under the flashing.

We prefer to have the eave protection extend over the drip edge flashing, and since it is also our preference to use self-sealing modified bitumen as eave protection, the argument becomes moot since the eave protection seals itself tightly to the drip edge flashing.

We should emphasize that the absence of a drip edge flashing is not, in itself, a roofing defect.

**FIGURE 1.7** Preventing Ice Dams with Ventilation

#### Possible Solutions to Ice Damming

There are several things done to minimize ice damming, including—

1. upgrading insulation and ventilation (Figure 1.7)
2. adding eave protection
3. adding electric heating cables

One of the best is upgrading the attic insulation and ventilation to keep the attic as cold as possible. This will minimize the snow melting on the roof surface. Good soffit venting is essential here.

Eave protection is recommended in northern climates where ice damming may be an issue (Figure 1.8). Eave protection is a waterproof membrane laid along the lower edge of the roof or anywhere ice dams may cause water to back up under the shingles. This includes chimneys, skylights, valleys and party walls.

#### Eave Protection

There are several eave protection materials that are used. These include—

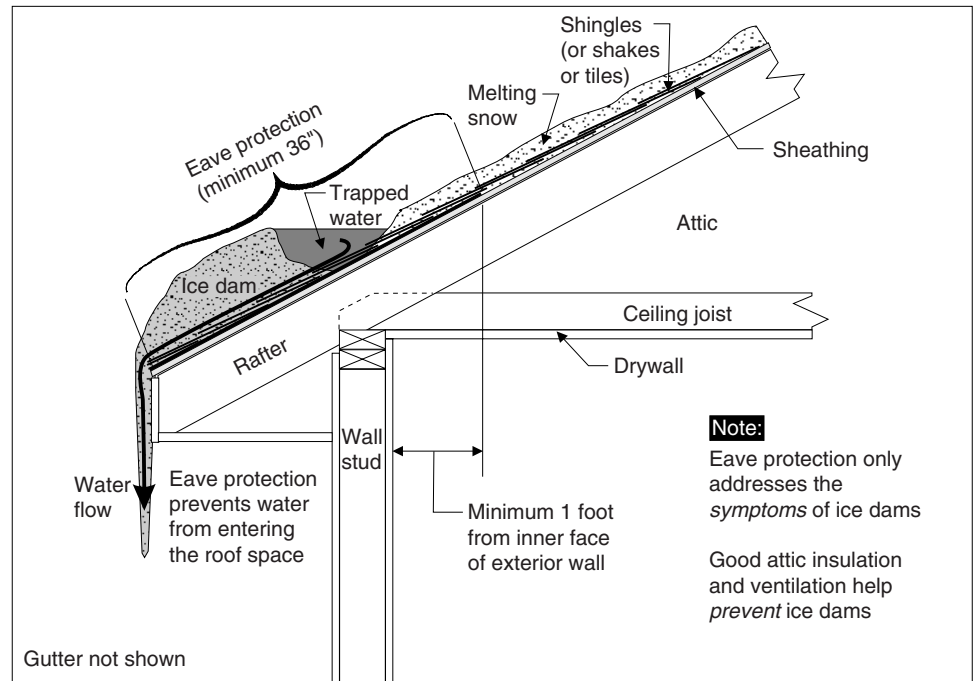
1. Modified bitumen
2. Polyethylene
3. Roofing felts
4. Roll roofing
5. Metal sheets

#### Modified Bitumen

The self-healing, peel-and-stick modified bitumen products are among the best. These typically come in 3-foot-wide rolls and provide good protection. This material is sometimes generically called Ice and Water Shield, although this is a brand name of W. R. Grace & Co.

#### Polyethylene

Polyethylene sheets (6 mil) were used as eave material in several areas, but this has been disallowed in some, since it is not terribly effective. Polyethylene, with nails driven through it to secure the overlying shingles, will not be watertight. Polyethylene also degrades over time. Joints are often not well sealed.

**FIGURE 1.8** Eave Protection Against Ice Dams*Roll Roofing or Felts*

Roll roofing or two layers of #15 felt paper, cemented together are sometimes used as eave protection material. These are better than polyethylene, but not as good as modified bitumen.

*Metal*

In some areas, the bottom several rows of shingles are replaced with metal. The metal allows snow and ice to slide off the roof, discouraging the formation of dams. The metal is also watertight.

Metal is occasionally used as eave protection under the shingles. The drawback to this is that if the shingles are nailed on over the metal, the nail holes allow leaks in the metal sheet.

*Location*

Building codes have changed over the years as to how far up the roof the eave protection should extend. It is common to find recommendations to carry the eave protection up at least 12 inches past the interior face of the exterior wall. Eave protection should extend at least 3 feet up from the roof edge.

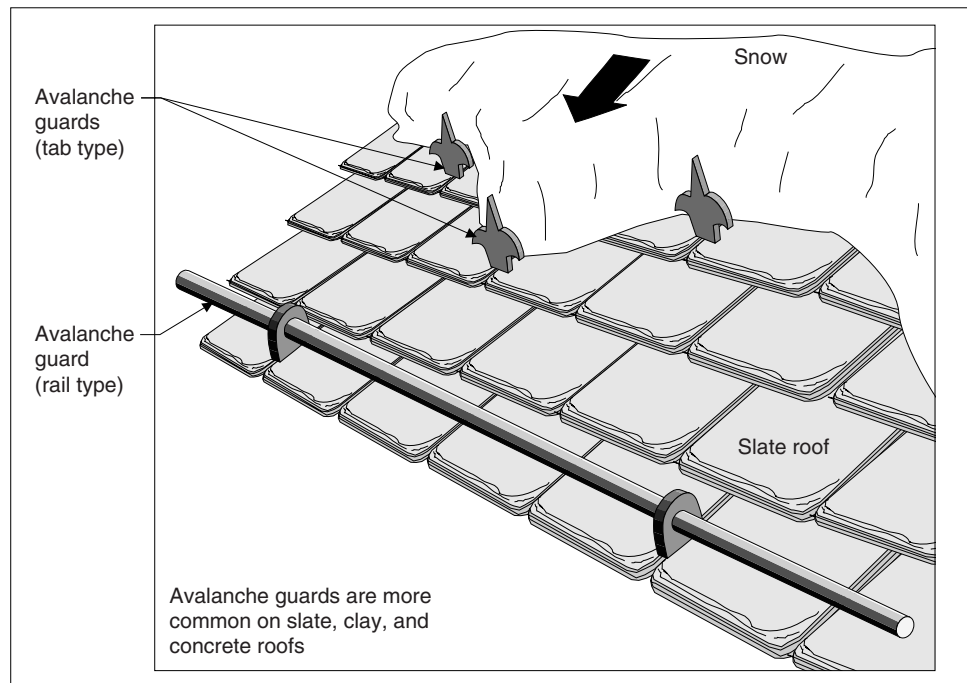
A common problem with eave protection is failure to extend the protection down to the roof edge. If the material stops just short, water may be deposited on the roof sheathing just above the bottom edge.

*Not Needed*

Eave protection is not usually provided if the roof is over an unheated area, such as a garage or porch with a roof extending out more than 3 feet from the house wall. On low-slope roofs (less than 4 in 12) a watertight membrane is usually laid under the shingles in any case, and eave protection is not necessary. If the roof slope is greater than 8 in 12, eave protection isn't usually provided. The thinking here is that the steepness of the roof will prevent ice dams from allowing water to back up under the shingles.

*Identifying Eave Protection*

You can identify eave protection from the lower edge of the roof or the bottom part of the rake. If you are in a climate subject to ice damming and see no eave protection on a roof where you'd expect to find it, you may want to note this as a condition that should be monitored, rather than something that must be added.

**FIGURE 1.9** Avalanche Guards

If the house is 25 years old and has an original roofing material with no eave protection, yet you can find no evidence of damage from ice damming, it is difficult to justify a recommendation to add eave protection. It might make sense for the next roof, but it does not make sense to tear up an existing roof to add eave protection when there is no evidence of damage.

#### *Avalanche Guards*

Avalanche guards are tabs, spikes or rails that project above the roof surface (Figure 1.9). They are usually found along the lower parts of the roof, often over entrances. Some people think that avalanche guards help to prevent ice dams. Their real function is to prevent large quantities of snow from falling off the roof at one time. They are common on large roof areas such as churches, municipal buildings or large homes. They are also more common on slate, clay and concrete roofing surfaces.

The guards hold the snow onto the roof, so heavy single blocks of snow and ice do not fall off the roof, causing damage or injury to persons below. Avalanche guards are more important on tall buildings where the snow and ice develop considerable momentum as they fall.

Avalanche guards do not eliminate ice dams.

### 1.2.9 Multiple Layers

New roofs are often added without removing the old roofing material. This reduces the cost of re-roofing.

Multiple layers of roofing may mean faster wear and a shorter life expectancy for the new roofing materials, because of the uneven surface that is created with the second layer lying over the first.

1. Multiple roof layers increase the dead load on the roof and make the structure work harder. In some cases, this causes roofing deflection.

**CAUSES**

**IMPLICATIONS**

2. Multiple roof layers often have nails that are too short to penetrate the roof sheathing. Roofing materials are more inclined to be blown off in heavy winds when multiple layers are used.
3. Adding new roofing over old often means that old flashings are not replaced. These critical components then become the weak link in the “new” roof.
4. Over-roofing prevents an inspection of the roof sheathing. Roofs are typically only replaced after leakage has occurred. In many cases, the homeowner doesn’t know how long the leak has been going on and how much concealed damage may have been done. Putting new shingles over old ones sheds no light on this issue.
5. Multiple roof layers inhibit the ability of the roof covering materials to dry after a rain. This is particularly important with wood shingles or shakes. This can accelerate deterioration of the roofing.

### STRATEGY

With many roofing materials, the recommended maximum number of layers is one. Asphalt shingles are often installed with two layers. Most consider this acceptable. Three layers are not recommended, although you will find it more frequently than you might suspect. Look at each case on its own merits.

#### *Count the Layers*

Part of your roof inspection should be to determine the number of layers of roofing materials. You have to know how the roofing is applied to verify the number of layers. In most cases, there is a starter of some sort and then the shingles or panels are laid. You can determine the number of layers either from the lower edge of the roof or from the rakes, if there are gables. Understand that, in some cases, roofers will cut off the old roofing material around the edges so that it will look like only one layer when there are really two.

#### *Count the Flashings*

In some cases, you can get a look at the number of roofing layers at flashing details, because flashings are often not replaced when new roofing is applied over old. This, incidentally, is one of the weaknesses of re-roofing. The flashing materials are often durable enough to outlast the roofing covering material. Many flashings, however, are not durable enough to last through two roofing lives, and flashing problems are common when there are multiple layers of roofing.

#### *Check Nails from below*

In some cases, you can determine that there have been two layers of roofing by the nail pattern protruding through the sheathing from below. You have to be careful, however, because as discussed earlier, the shingles may have been removed, but the old nails were driven down into the sheathing. Nails should not be driven through the sheathing where there are open eaves (there are no soffits). This is unsightly from below and makes painting difficult. Sheathing boards often splinter where the nail heads protrude through the underside.

#### *Different Materials?*

Asphalt shingles are often installed over wood shingles and, in some cases, over slate. In many cases, this has been done successfully, although you will have to evaluate each case on its own merit.

#### *Cost To Strip*

If you provide ballpark cost estimates for your clients, understand that re-roofing is much more expensive if you have to strip the old shingles first. The stripping cost is also increased if there are three layers rather than two, for example.

## CHAPTER REVIEW QUESTIONS

Answer the following questions on a separate sheet of paper, then check your results against the answers provided in Appendix D. If you have trouble with a question, refer back to the chapter to review the relevant material.

1. List the three main functions of roofs.
2. The roof covering is typically part of the structure of the home.  
True False
3. What is the fundamental difference in strategy between a flat roof surface and a sloped roof surface?
4. Is a sloped roof waterproof? Explain.
5. What is a dead load on a roof structure?
6. What is the pitch of the roof and how is it usually expressed?
7. What is a square of roofing material?
8. What is the overall goal of the roof inspection? (List four points.)
9. It is wise to inspect the roof first from a distance and then up close. What kinds of things do you look at from a distance? How about up close?
10. Even if you walk on the roof and inspect every inch, there are limitations to your inspection. Explain.
11. Why can a minor leak be more of a problem than a major one?
12. List nine common roof problems you'll find.
13. On a 10-year-old house, how old would you expect the roof surface to be?
14. What are the causes of aging? Try to recall as many as you can.
15. Why is there an increased potential for failure with a complex roof?
16. Which side of a roof will wear faster in climates where ultraviolet light is the main aging factor?
17. List five common causes of roof damage.
18. In general, is there a higher risk of leakage at a patched area of roof?
19. There are many installation problems on roofs. List as many as you can.
20. Anything that restricts the drainage of water is a vulnerable area. Give as many examples as you can.
21. What things might you see that suggest patching has been done on a roof?
22. What do exposed fasteners usually suggest? (List three possibilities.)
23. Once a roof is installed, can you see all of the important installation details?
24. What is an ice dam?
25. What causes an ice dam?
26. Which of the following roofs are most prone to ice dams?
  - a. A steep sloped roof with a wide soffit
  - b. A low-slope roof with a narrow soffit
  - c. A low-slope roof with a wide soffit
27. What areas of the roof are most prone to ice dams?
28. List the clues that a house may have had or may be prone to ice damming. These clues may be evident in the summer as well.
29. Give two ways that you may be able to distinguish ice damming from roof leakage.
30. What are three possible actions to minimize ice damming?

31. Which is the best of the three options above?
32. What is eave protection?
33. List three of the five materials typically used for eave protection.
34. What is the function of an avalanche guard?
35. What are the drawbacks to adding a second layer of roofing over a first?
36. Where can you look on a roof to determine the number of layers?

## KEY TERMS

roof coverings	ventilation	sheathing
flashings	exposure	modified bitumen
skylights	complexity	soffit
penetrations	foot traffic	polyethylene
leaks	layers	overhang
pitch	fasteners	roll roofing
square	patched	fascia
resultant damage	flashings	avalanche guards
macro/micro	exposed fasteners	eave protection
limitations	vulnerable	insulation
aging	valleys	
ultraviolet	ice dam	