What Every Homeowner Needs to Know about Roof Replacement

Successfully Resolving one of the Biggest Maintenance Expenses of Home Ownership

By Christopher Testa

Table of Contents

Introduction

I've written this report because more than 29 years in the roofing and renovation business have taught me a lot. I've personally been involved with thousands of re-roof jobs. I've witnessed first-hand disastrous projects, delightfully successful ones, beautiful jobs, ugly jobs, satisfied customers, indifferent ones, and angry ones. I have collected photos of so many types of roofs both from the ground and on the roof that I have long lost count. I have sued and been sued, and I've been an expert witness in other people's lawsuits concerning their roof projects. I have no doubt you could learn everything I've learned by doing the same things I've done, but if you don't want to spend years working in the industry, I offer this report so you can have the information you need to be a more knowledgeable purchaser of a new roof for your home.

If you're reading this, you're either shopping for a new roof for your home or small business, or you've already bought one and you're curious about the advice you took. You could be a builder, or a designer, or an architect, looking for another perspective on roof materials. You might be a competitor who just wants to know what I'm doing. Whatever the case, I've written this so that my accumulated experience can benefit you, and help the state of my industry too. I'll likely never meet or speak to you personally. This is not an advertisement for my business. There's no pressure on you to respond or act or purchase from my company. My hope is that the analysis here will educate you if you're inexperienced and offer a few challenging observations to those of you in the same industry. Feedback and criticism is both welcome and encouraged.

When you've finished reading this report, you'll have a decent overview of the most common options for roofing materials and a basic idea of their history, value, and function. One caution to readers considering some roof materials that I have neglected to mention or discuss here only briefly– I'm focusing on products that have a well-known track record and are something you're likely to find. There are now, and always will be, new and interesting products coming onto the market. My experience has taught me one thing about new products– *be careful.*

The best example I can think of that illustrates this point happened to my neighbors. They were sold on a new product with an impressive sales story. As a replacement for their shake roof, it was good looking in the brochure and had a fancy technical description including some big company names (GE, for one) associated with both the design and manufacture. It had a 50 year warranty (see my discussions of roof material warranties further on in this report). They decided to use this product, even though it was one of the more expensive materials they examined, because they liked the look. It was an unfortunate decision. Not long after their purchase the manufacturer of this new synthetic roof product closed their doors. And not too much longer after that, my neighbors noticed sections of their roof were fading at different rates. Within a few years, instead of a roof that looked like wood shakes, they had a roof that looked like a checkerboard! On their very expensive home, their very expensive roof looks like a cheap plastic imitation. And the 50 year warranty? Of no value whatsoever. So, if you don't mind being a guinea-pig for a new idea in the business, then be my guest. But if you want some assurance that your new roof is going to be there well into the future, I recommend you pick a material that's been proven in the field to perform for years and years and years.

Defining your Re-Roofing Need

There are three easy ways for a homeowner to determine whether or not they are in need of a new roof: the discovery of leaks, the observation of loose or missing pieces of their roof covering and the fact that homes of the same age in the neighborhood are having their similar roofs replaced.

Leaks

I vividly recall meeting a doctor who decided it was time to replace his roof. He spent some time investigating his options and called me. His research had led him to believe he should take a look at metal. He made a point of telling me at the time, "even though I have no leaks, it's a good time for me to do this. I want to check it off the list of things I have to worry about." You can imagine his shock –and mine– when we removed his not-awful-looking roof and discovered his roof had been leaking slowly in multiple places, and for some time. As a result, a *lot* of his plywood deck had rotted and he was required to replace thousands of dollars worth of decking material before his new roof could be installed. What happened was, in a number of places on his old roof, a small amount of water had got past his roof covering, past the felt underlayment, and had wicked into his plywood deck. It wasn't enough to pour water into his attic and through his ceilings, but it was enough to damage the plywood.

In many cases, it can be hard to assess a roof. I've seen cases where the roof on a home was little more than splinters or pieces of torn cardboard, yet no water was pouring into the house. I've seen literally thousands of roofs and to this day, short of seeing big holes from the front lawn, I can't tell you from a casual glance which older roofs are already causing problems, and which ones are not. I've been in houses where the roof looks fine from the ground, yet there were literally gardens of mold growing in the attic and inside closets. I've also been in houses where the roofs looks awful from the ground, yet not a single evidence of a leak could be discovered in the living areas.

If you have a roof that's more than 10 years old, especially if it's an asphalt composition roof or wood shake, if you see brown spots on the ceiling or smell dampness around interior walls, do yourself a big favor and have your roof inspected by someone who knows what he's doing. I highly recommend you pay someone to do it, for the simple reason that the hundred dollars or so it will cost to have someone spend an hour looking carefully at your roof could save you many, many times that amount if there is something wrong. Remember, even if you pay someone to inspect your roof you're not obligated to buy a new roof from them. So don't wait for a leak. Be proactive and avoid the possibility –and the potential expense– altogether. A leak is always a sign that thing aren't right on your roof.

Loose or missing pieces

If you see loose or missing pieces on your roof or around your house after inclement weather, then you know that there's either some trauma to a particular section that can be repaired, or more likely, the early signs of a deteriorating roof covering. Usually, roofs wear out according to exposure. In other words, one side of a roof –most often the one most exposed to sun or prevailing winds– will wear out before the shady or sheltered side. If you notice loose or missing pieces from the ground, then it's most likely that a careful roof-top inspection will reveal considerably more signs

of deterioration. If the roof looks visibly compromised, it's a strong indication that your roof is at, or near, the end of its service life.

State of the Neighborhood

If you live in a neighborhood where many of the homes were built about the same time and with the same roof coverings, and you see the neighbors replacing their roofs, then it's a good bet that yours is in need, too.

What Exactly is a "Roof?"

The roof of your home has one primary function– to weatherproof the building. It's the first line of defense against rain, snow, sleet, falling debris, sunlight, wind, and pretty much everything else that falls from the sky or blows in the wind. Regardless of what architectural style of building you own, the roof protects some or all of your living and working area. If the roof is compromised, damage to the building and its contents will inevitably occur. This can range from minor staining to major structural damage to damage or destruction of household belongings. It's possible that insurance coverage can be reduced or canceled for failure to maintain a functioning roof and it only makes sense that a fully functioning roof is a vital component of every building.

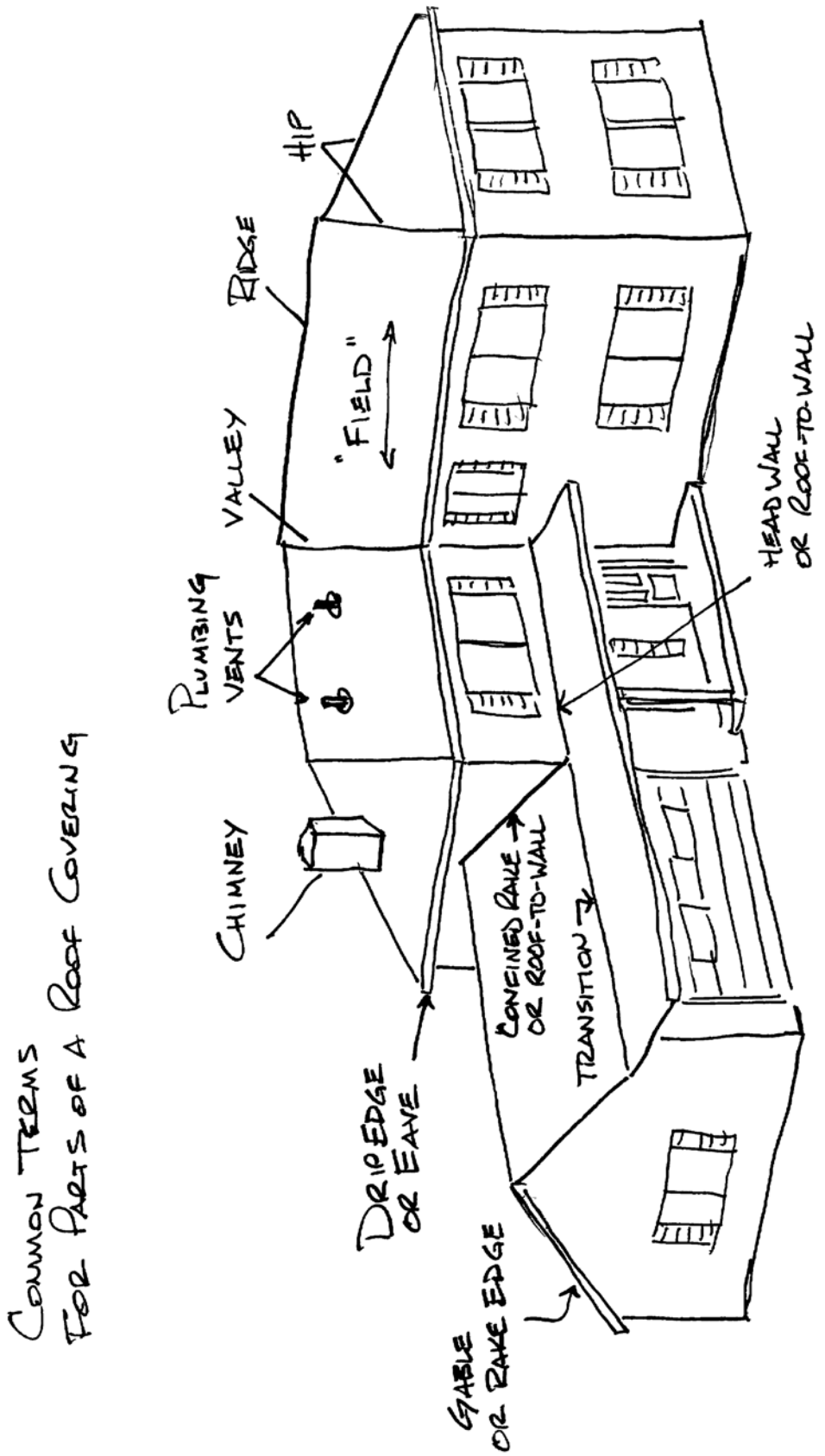
As important, the roof of a home or building is a major architectural element. The shape, texture, and color are key ingredients in the appearance of your home and a major contributor to the curb appeal and pride of ownership. A roof that appears damaged, worn out, unserviceable or just plain ugly is not only an eyesore, but because it's such a visible component of most buildings, it seriously compromises the look and value.

Roof assemblies can be divided into two major categories: flat and sloped. Flat roofs are designed to function even when water "ponds" on them and are most commonly used in commercial and industrial applications. Sloped roofs are intended to shed water and are thus designed to prevent ponding in the first place.

All roofs have two major components: structure and covering. The structure is the major physical construction of wood and/or metal that holds the entire assembly in place over head and allows it to bear the weight of roof coverings, foot traffic, snow, and objects that might be there by design or accident. These structures are most commonly rafters or trusses. The roof covering is what is visible to an observer from the outside of the building. It generally hides the roof structure from view, provides weatherproofing, and defines the architectural theme. In the case of sloped roofs, most coverings are shingles, shakes, tiles, or panels, and they can be made in an enormous variety of materials ranging from leaves or straw to exotic metals like titanium. There are some materials that can perform both structural and waterproofing functions such as "structural metal panels," which are thick and strong enough to span between rafters and can support a load at the same time as they provide weatherproofing.

A note on roof structures: this report is intended for consideration by people planning to replace a roof covering on an existing building where the structure is intact and properly engineered.

Diagram 1


COMMON TERMS
FOR PARTS OF A ROOF COVERING
HIP
RIDGE
"FIELD"
VALLEY
PLUMBING VENTS
CHIMNEY
DRIP EDGE OR EAVE
CONCEALED FLAKE OR ROOF-TO-WALL
TRANSITION
HEAD WALL OR ROOF-TO-WALL
GABLE OR RAKE EDGE

Roof coverings are usually installed over roof structures that have either solid decking (plywood or similar sheeting attached to the roof rafters) or skip sheeting, which are planks fastened perpendicularly to rafters but spaced so that there is an obvious gap between the planks (Figure 2). Skip sheeting is used for some types of wood roof installations and some installations of ceramic or concrete tiles. If you don't know what type of roof deck you have, a quick look on the underside of the roof, especially in the attic, will allow you to make a determination. The type of roof deck –solid or spaced– determines how much preparation you may require to accommodate a new roof covering. If you're unable to make the determination by yourself as to what type of roof deck you have, I recommend you ask a knowledgeable friend or neighbor to look for you. In the event such an ally is not readily available, I suggest you ask the question of anyone inspecting the roof covering. Having them examine the underside of the roof will tell them –and you– precisely what needs to be anticipated as far as preparation for installation of a new roof covering.

Diagram 2: Typical Sloped Roof Construction (What's Under the Roof Covering)

While a complete discussion of roofs might entail volumes of analysis of construction and weatherproofing methods, this report will focus on the particular areas that concern the vast majority of homeowners in the Western Hemispheres – sloped roof coverings. This category of materials is what most homeowners refer to when they say, "I need a new roof."

Common Sloped Roof Coverings: Their Usual Performance and Uses

The most common roof materials can be rated in terms of the following characteristics: green value, warranty, weight, appearance, lifespan, and maintenance. You can decide which of these are most important to you and factor these concerns into your decision.

How "green" are roof materials?

The usual options are often the least friendly

In general, a material is considered eco-friendly if using it leaves a minimal impact on the environment. Needless to say, materials comprised of recycled matter and those with a low probability of ending up in a landfill are the most desirable for this purpose. I'm using this guideline to assign a green value for each of the products reviewed in this report. Technology is certainly advancing in many areas, and what is not recyclable today may become so in the future, but if being ecologically friendly is an important consideration in your buying decision, be certain to pay attention to the material you choose to use. The most common choices are, unfortunately, the *worst* choices for the environment.

What's in a name?

Roof warranties and deliberate obfuscation in the roofing industry and how to sort it out

Warranties are the most confusing aspect of the roofing material study. Many homeowners make the mistake of concluding that the length of the manufacturer's product defect warranty is the same as the life expectancy of the product covered. *This is absolutely not the case* (see photos of "40 Year" and "50 Year" roof materials after less than 20 years of exposure, pp. 14-15).

There is little, if any, connection between the warranty period and the lifespan of most roof materials.

In the case of asphalt shingles, manufacturers currently refer to their various models by their warranty period. Until about 20 years ago, asphalt shingles were classified by weight. The purchaser knew that the heavier a shingle was the longer they could expect it to last. That is no longer the case. Technical changes in the manufacturing processes of asphalt shingles in the last 25 years have led manufacturers in a new direction. They're now reluctant to publish the weights of their products in their sales literature and have replaced the weight designation with *the length of the warranty period* instead. Asphalt shingles that used to be classified as heavy, heavier, heaviest, (good, better, best) are now classified as "30 Year," "40 Year" and "50 Year" shingles. This serves to distract builders and their customers from the technical details of the shingles construction. It implies that the manufacturer is promising many, many years of trouble-free service. This simply is not true, and interestingly enough, recently, almost all the asphalt shingle manufacturers raised the length of their warranty periods on most of their products, while at the same time making *no changes* to the composition of the shingles themselves. Evidence is everywhere that these products will not last.

When I showed a draft of this booklet to the editor for review, two questions came up. "What are you telling me about the real lifespan of a '30 Year' shingle roof?" and "Can I, as a consumer, estimate the real lifespan of a product by examining the technical data supplied by the manufacturer?"

The short answer to both questions is that you can't. There are too many variables. One manufacturer's "30 Year" shingle might weigh 2.2lbs per square foot. Another might weigh 2.6. The fact that there is 18% more material in the heavier shingle is likely to lengthen its lifespan somewhat, but the biggest factors in the lifespan of asphalt shingles relate to, among other things: the ratio of asphalt-to-filler in the shingle construction, the orientation of the roof, how much sun the shingle will get throughout the year, the attic temperature of the house, the color of the shingle, and how much wind exposure it will receive. There can be other factors as well. As you can see, there are many concerns that contribute to the deterioration of an asphalt-shingle roof.

According to a survey of contractors in 1993 by *Western Roofing Magazine*, the average life of "20 Year" shingles was approximately eight years. And while there is *no* hard science behind this, based on the many, many roofs I have examined over the years, I think it's a reasonable estimate.

I'm part of conversations like these on a surprisingly regular basis:

Q: "My neighbor just put on a "40 Year" roof– it looks pretty good and in 40 years neither he nor I will care a hoot! What's wrong with something like that?"

A: Comments like this are heard a thousand times a year by everyone in the roof business. But the problem is, there's nothing of reality in the statement. The fact is that fiberglass-asphalt shingles are made of asphalt and mineral granules (a.k.a. dirt or limestone dust) layered over a thin web of fiberglass strands. The only part of such shingles that's waterproof is the asphalt, *but* the only part of such shingles that *deteriorates as it ages* is the asphalt! The reason that asphalt roads need repaving regularly is that this material ages in heat and sun. As tar ages it loses two important properties– adhesiveness and elasticity. Adhesiveness is the property that allows the material to stick together and hold onto its granules. Elasticity is the property that allows the shingles to flex with the wind and movements of the building. Once the asphalt-based shingle loses these properties two things happen. First, the granules fall off, exposing more of the base asphalt to faster deterioration (a.k.a. "drying out"), and then the shingles blow off in the wind.

In fact, most asphalt shingle warranties are deceptive at best. Reading the fine print yields little gems like:

"...NO LIMITED WARRANTY ASSURES THAT THE COVERED PRODUCTS WILL LAST THE ENTIRE LENGTH OF THE APPLICABLE WARRANTY PERIOD..." (Quoted directly from the Elk shingle warranty).

Q: What? You mean it says in the warranty that these shingles *won't last 40 years?* What's going on? How can they do that?

A: Most people *don't* examine warranties carefully and there is little motivation on the part of anyone in their supply chain to encourage close scrutiny. These warranties are *not* intended to assure a life expectancy but are in fact "limited" product "defect warranties." They're not actually getting away with anything because almost no one ever reads these legalistic documents and simply refers to the big "40 Year" label as if it means something. It doesn't.

Q: But what about that 100 MPH wind warranty stated in the brochure?

A: There is a wind warranty but it has an expiration date. The wind warranties of all fiberglass asphalt shingles expire in short order– the majority in just five years, the longest 10 years

(for some of the most expensive shingles). Remember, the manufacturers of these products are well aware that their shingles are aging from the moment they're exposed on a roof. The warranty is a selling tool and contains disclaimer after disclaimer in the fine print. Warranties are rarely read in full, which means unpleasant surprises can await the unsuspecting buyer of these products. Doesn't it make sense that if the real and expected performance of fiberglass/asphalt shingles were anywhere near the 40-50 year warranty period, these warranties wouldn't need the long lists of explicit disclaimers?

If you read the warranties, you will learn a lot about the real-world performance of these products. For example, compare these asphalt shingle warranties to the best coated steel warranties, which feature these important distinctions in coverage:

- No pro-ration of coverage for the lifetime of the warranty
- No expiration of wind blow-off coverage
- Clauses specifically including coverage of the appearance of the products
- Fully transferable to new owners

This enormous discrepancy in the warranty coverage is a result of the enormous discrepancy in the performance of the different materials in actual use. Because steel tiles and shakes have no tar or other organic materials in their make-up, they aren't aging like asphalt shingles. Consequently, their manufacturers can offer warranties that are truly meaningful, without long lists of exclusions.

If long-term performance is a priority for your re-roofing project, then a careful reading of the warranties will quickly show any serious purchaser of roof material why the premium for quality metal roofing is money well spent.

Some web links to warranty fine print:

www.elkcorp.com/warranty/warranty_prestique.cfm?CFID=541109&CFTOKEN=68231838

www.certainteed.com/NR/rdonlyres/82092F91-9FC5-475B-9143-54BE6326C0D9/0/2007GeneralAsphaltWarranty.pdf

www.tamko.com/Portals/0/documents/21371.pdf

pabcoroofing.paccoast.com/pabcoroofing/docs/Warranty.pdf

www.owenscorning.com/around/roofing/woodmoor/images/WoodcrestWarranty.pdf

The warranties for concrete products can be equally misleading. I'm certain that any homeowner will be comforted to know that their "Limited Lifetime…Warranty" states their concrete tiles "1) will not burn; 2) will not be damaged by vermin; and, 3) will not allow passage of water due to decomposition or decay…" A few paragraphs down, however, you will find, "Specific Exclusions: damage to the tile caused during installation…acts of God…*color fading, cracking, chipping, or delamination of slurry coated tiles.*" This means, if your roof fades, cracks, or chips it's not a defect covered by your warranty. Have a look at the photos of some older concrete roofs– you'll see that these things are major issues with many such installations, none of which are covered by the warranty.

As I said earlier, warranties are *selling tools*. They're written by companies to give the grandest, most secure view of the future while at the same time limiting the liability of the manufacturer. The simple fact is that very few owners ever read the fine print of a roof warranty until they have a problem, only to discover then, too late, that many of the most common issues with a roof are not things the manufacturer is prepared, or obliged, to remedy.

Consider this when you're thinking about warranties: the piece of paper on which it's written won't keep *one drop* of rain out. *Warranties are the worst reason for choosing one material over another.* If you want to make an intelligent choice about your next roof, start with an analysis of the material options available, and particularly, by answering this question, "What is likely to happen to this particular material over time on my roof?" Answering that in an informed way will provide you with the most realistic expectations.

How much does a roof weigh?
How the weight of a roof material should effect your purchase decision

Determining the weight of the various roof coverings is an important value, as roof structures are designed to support a limited amount of weight and the roof covering is a significant amount of that design load. Most manufacturers publish the weights of their materials in their literature, and it is necessarily included in their technical specifications because it is a critical number for structural engineering purposes. There are, however, a wide variety of materials in each category, and differing product details mean differing weights. What is listed is the typical range of weights in each material category.

Roof covering materials are classified by their installed weight per square foot (or per roofing "Square" in North America). If you're replacing your roof, your choice of a new roof will be limited by the design load of your building. That's unless you're prepared to have a structural analysis done to determine that increasing the weight of the roof covering won't exceed the existing design load. If you're going to dramatically increase the weight of your roof covering then re-building the roof structure may be in order. So, pay attention to the typical weights of materials– it's a major consideration in your decision.

What do various roofs look like?
Choosing the material that suits your tastes and your architectural style

One of the surprising things to me as a roofing insider is that the typical homeowner has a really limited notion of the appearance of the different materials. While it's true that some materials can only be made into certain shapes –by virtue of their physical properties– it's also true that other materials can be made into many different shapes and styles. My point here is that if you do a little research, you may find your preconceptions about the look of the various materials soundly challenged. Flip through the photos in this booklet and read the captions to get an idea. If you need more information, visit our website or one of the many others roofing sites to see photographs of roof styles in materials you may not have imagined.

How long will my next roof last?
The real lifespan of the differing materials

It depends what you buy. I've seen roofs of all materials fail prematurely in the real world, but even the most superficial knowledge of material characteristics would indicate that all materials will generally behave in certain ways. Look carefully at the "raw ingredients" of each product and ask yourself, "What can go wrong with this stuff?" Observing many different types of roof materials installed on roofs for many years has allowed me to draw some conclusions about what happens when this "stuff" is used in roof products.

Will I need to maintain my new roof?
What kind of maintenance you should expect as your roof ages

Again, it depends on what you buy. Today's homeowners more than ever seek low or no maintenance materials for almost every feature of their building. The amount of upkeep a new roof will require will depend on the material you choose, the configuration of your roof, and the environment around your home. In general, the cheaper materials are not roofs that you would normally "maintain." Those are generally replaced by covering the entire layer with new material.

The more expensive materials are generally intended to last the life of the building, but may require some work on the details as they creep into advanced old age. There are many metal, ceramic, and slate roofs that are more than a century old in many parts of the world. What can occur with these old roofs that requires maintenance is often related to accumulation of debris on the roof. The debris (leaves and branches, bird droppings, etc.) trap moisture and can create a soup of acids and corrosive organic materials that can sit on and eat away at a roof. Unless these accumulations are removed, over time they can degrade portions of the roof and require repair.

Repairing a premium roof once every 30 to 40 years is usually less expensive than regularly replacing cheaper ones, and the building has the distinction of a displaying a premium material as a major architectural feature.

The Most Common Roofing Options for Homeowners

Asphalt

Asphalt composition roofs began life in the early 20th century as a way of installing asphalt on sloped roofs. Up until that point, asphalt or versions thereof were used primarily as a hot process flat roof material because of their water repelling properties and cheap price. The process involved rolling out alternating rows of paper and hot mopping asphalt in between before adding crushed stones as the top layer. Asphalt shingles were cooled sections of such a sandwich, which could be nailed to a roof in courses and glued together to stay in place. The basics of that type of material are still made today, although for the past 30 years or so in many market areas, thin fiberglass strands have replaced paper as the binder (thus the term "Fiberglass Shingles"). The composition (hence the common name "comp" shingles) of paper or fiberglass (the "mat"), asphalt (the only waterproof component), filler (mineral filler, a.k.a. "dirt"), which is added to the asphalt in order to increase the size and weight of the shingle, and stone granules (the topmost visible coating providing shade for the asphalt and color to the shingle) has been basically unchanged now for 60 years or so.

All such shingles are mechanically fastened in horizontal rows with the layer above overlapping the nails of the layer below. The overlapping portion of the upper layer stays attached to the lower layer with some sort of adhesive. Shingles with a built-in, heat-activated strip of adhesive are called "self-sealing" shingles. If that's missing, the installer is to apply the layer of adhesive on site as the shingles are installed.

A single layer of asphalt shingles, the simplest type, are called strip or 3-tab shingles (strips with slits cut into the shingle to add visual texture). In order to increase the visual appeal of the products, manufacturers learned how to cut pieces of strips and glue them onto other shingles to build up the exposed portion. Names for this type of cut-out and glued shingle include "high profile," "architectural," "high definition," and similar terms. This method of manufacturing their products has allowed makers to offer a visually diverse selection of products made of essentially the exact same material. By varying the number and thickness of layers and the pattern of the cut-outs, it's possible to make an enormous variety of profiles. Keep in mind, however, that regardless of the shape and weight, there's only one "active ingredient" in asphalt composition shingles– the asphalt. At the same time, there's only one ingredient that is decaying from exposure to heat and sun– the asphalt. This means that regardless of whether the cheapest 3-tab strip shingle is installed or the heaviest and most expensive "high profile, architectural, high-definition" fiberglass version, they all suffer the same fate in time. That is, the volatile petroleum in the asphalt will evaporate from exposure to heat and sun and the shingle will eventually fail to function as a weatherproofing covering.

Asphalt roofs weigh between roughly two and five pounds per square foot. It's not uncommon for there to be multiple layers of asphalt on an older home, as it's a typical way of saving the cost of removing the existing material once it's worn out.

Asphalt Overview

Green Value:	**LOW**
Warranties:	**POOR**
Appearance:	**TYPICAL**
Weight:	**MEDIUM**
Lifespan:	**POOR**
Maintenance:	**Patching as needed until replacement time**

19-year old “40 Year” heavy weight fiberglass composition shingles

17-year old “50 Year” heavy weight fiberglass shingles

8-year old “30 Year” architectural fiberglass shingles

6-year old “30 Year” fiberglass shingles over wood shingles

Concrete and Clay

One of the oldest roof materials, clay tiles date back thousands of years to ancient China, Rome, Greece, and other early civilizations. Made similarly to bricks but formed into shapes that could overlap to shed water, they are considered to this day to be a beautiful, detailed architectural feature.

The original sun-dried clay tiles evolved in different areas as local resources and imagination allowed. Fired clay tiles and those with glazes of different minerals allowed an enormous diversity of colors and shapes. Concrete imitations of clay tiles were developed in the 19th century as an alternative, thanks to process advantages that allowed more efficient mass production. In order to better simulate clay tiles, cement-based tiles use a pigment mixed into the concrete, or a second, thinner layer of colored concrete over the main portions (called a slurry coat). Due primarily to manufacturing efficiencies, the vast majority of "clay tiles" now installed in the Western Hemisphere are actually concrete, with actual clay and ceramic now mostly specialty items.

Still used as a primary roof material in many parts of the world, ceramic tiles are waterproof, colorful, impervious to most chemicals, and permanent in many environments. Best in warm, dry locales, they are a favorite for coastal applications due to their salt spray resistance.

Because of their brittleness, however, they can be damaged by snow and ice accumulation, and foot traffic. Once cracked, clay or concrete no longer remains waterproof and stops functioning as a primary roof covering.

Unlike other roof coverings that are intended to be the primary waterproofing assembly, many clay and concrete roof coverings require a fully intact underlayment layer to remain fully waterproof. That's because of an installation detail in many high-profile assemblies where the intersection of the main parts of the roof with the details such as hip, ridges, and wall, allow wind-driven rain to get past the roof tiles.

As long a history as clay and concrete products have, they have one major downside when considered for re-roofing, and a few minor ones as well. First and foremost is the fact that these tiles are very heavy. In fact, many homeowners considering a ceramic or concrete roof should have their roof structure analyzed by a structural engineer to be certain that the design loads of their roof are not exceeded by the tiles they're considering. It may be necessary to re-engineer their structure and add bracing hardware in order to ensure that the structure can bear the weight of the new roof. This is a critical consideration if planning to replace wood shakes or asphalt shingles, as often the engineers of the original structure never intended it to support significantly more roof covering weight. Even when originally designed for concrete or clay, it's not uncommon to see roof overhangs sagging due to the weight of their tile roof.

Especially in the case of concrete tile, there must be great care in configuring the roof assembly to not only bear the weight of the tiles easily, but also to prevent problems due to accumulations of snow and ice. When concrete tiles are porous (a manufacturing process employed by some makers to reduce weight), they become prone to fracture when imbedded ice moves during heavy snow accumulations. It's not unusual to see concrete roofs replaced prematurely due to damage from such events.

Another consideration concerning the weight of concrete and clay roof products is their performance in earthquakes. While not expressly to blame for problems in a seismic event, you have to ask yourself how comfortable you would be in a structure where 15 tons of concrete are sitting loosely attached to your wooden rafters when a sizable earthquake begins shaking the walls. Below are photos of concrete roofs from the Northridge quake in Southern California a few years ago.

Concrete tile on 1"x6" skip sheeting, collapsed roof structure

Major structure damage; heavy roof with inadequate sheer wall

Displaced concrete tile, inadequate fastening

Concrete tile on 1”x6” skip sheeting; serious roof structure damage

Inadequate fastening; concrete tile slipped

Clay and concrete roofs also rely on their weight as their primary defense against high wind. It's not uncommon to have concrete roofs blow off in unusually high winds.

Concrete and ceramic roofs typically weight between seven and 12 pounds per square foot. Because they tend to last longer than wood or asphalt, and because their manufacturing process uses few dangerous chemicals, they're considered a reasonably green product.

These roofs certainly have their place, but for a homeowner considering upgrading from asphalt or wood, I can think of better and more problem-free alternatives. However, if you decide this type of roof is for you, then my best recommendation is to do lots of homework and make certain you know plenty about the technical requirements of the concrete or clay product you want to use so that none of the many critical details of such an installation are overlooked, leaving you vulnerable to the problems that can arise from their use.

Concrete Overview

Green Value:	**AVERAGE**
Warranties:	**POOR**
Appearance:	**TYPICAL**
Weight:	**HEAVY**
Lifespan:	**AVERAGE, DEPENDING ON ENVIRONMENT**
Maintenance:	**WIND & FOOT TRAFFIC REPAIR until replacement time**

Wind damaged concrete shake

Wind damaged concrete shake

Wind damaged concrete shake

Metal

The first metal roofs date back thousands of years to the beginnings of discoveries that allowed copper and bronze to be made into useful construction materials. One of the early major projects known to employ metal as a roof is the Jewish temple and its copper roof built in the 10th century BC.

Since then, the popularity of metal has varied according to architectural trends and the state of the building industry in various locations. Copper, tin, zinc, iron, steel, aluminum, and other types of metals have all been used for roof coverings. There are a few constants, however. Metal is the lightest of roof coverings, it easily has the highest ratio of weight to strength, it's among the longest lasting, it's the most diverse in appearance, it's the safest in an earthquake, it won't burn, and it's among the most resistant to high winds.

In addition to a long history of use and desirable properties, most metal roofs today contain a significant amount of recycled material. The tin cans you throw away and the cars in the scrap yard contribute significantly to the metal roofs you see being installed today. This conservation of material is extremely important to the environment and a major reason why metal is considered very green.

Another interesting comment I heard some years ago by someone whose powers of observation were clearly beyond my own at that point, was that *every* sloped roof covering, regardless of the material employed, uses the same, reliable material for all of the critical areas– areas like valleys, flashings, penetrations, skylights, transitions, all places where leaks are likely to occur if something fails. The material used for *all* of these important areas? Metal, of course.

Metal roof coverings range in weight from less than one pound per square foot to about two pounds.

What follows is a list of commonly asked questions about metal roofing.

Q: "Is metal for houses?"

A. The fact that this sort of question arises often in certain regions indicates how strongly trends influence people's perceptions of their options. Even though metal has been used all over the world as a roof covering for thousands of years, it's still something of a curiosity to many homeowners.

Let me be unequivocal in my answer to anyone who would question metal roofing as an option for re-roofing their home. Metal is the *best option*. For reasons clearly defined by its physical properties, metal is now, more than anytime in history, something that *every* homeowner should consider when it comes time to replace their roof. Never before have so many types of metal been available in so many styles and profiles with so many finishes. If your home has a roof covering now, then it will easily support the weight of a new metal roof, as the vast majority of roofs that need replacing –asphalt, wood, concrete– are heavier than the vast majority of metal roof systems. In fact, but for reasons of cost and complexity, I would say that almost every building with a sloped roof would use metal if the option were presented.

Q: "Will it rust?"

A. The corrosion rate of modern sheet metals is so low that with the exception of salt spray or constant submersion even steel roofs today can last generations. "Galvanized" steels (a method of plating a layer of corrosion-resistant zinc onto an iron or carbon steel sheet) have been around almost two hundred years. In that time, the process has been dramatically improved with more efficient processes and the addition of other corrosion-resistant alloys to the plating. What that means is that today the best of the steel sheets used for making roof materials have all but eliminated rusting as a problem in well-designed roof covering assemblies.

If your home is in a location where salt spray is a concern, then upgrading to copper, zinc, aluminum, or stainless steel is likely in your best interests. All of these premium metals have properties that make them more capable of long-term corrosion resistance in such an environment.

Q: "Is it noisy?"

A. The quaint notion of the sound of rain on a "tin" roof is no doubt the basis of this common question. When used as a structural element in a roof, such as when metal sheet is made to span between rafters or perlins, it is possible that the metal might reverberate like a cymbal from the sound of rain or hail. However, when used as a roof covering over a solid deck, metal is rigidly affixed with nails or screws, usually over a layer of underlayment and against a solid deck, meaning it has no opportunity to vibrate. As a result, you'll hear no more noise than you would with any other roof material. In fact, it's interesting to note that owners of homes upgrading from wood shakes report consistently that their homes are *quieter* after they install a metal roof. That's because a metal roof is *much more* rigid that a wood shake roof and thus helps hold the structure more tightly together.

Q: "Doesn't it look industrial?"

A. That sort of question usually stems from the preconception that metal roofs all look like the long panel roofs commonly seen on warehouses and other commercial and industrial buildings. Actually, of all roof covering materials, metal can be formed into shapes that compliment any architectural style. See the photos below and you'll be amazed at the number of shapes and styles available in metal, from the simplest shingle or panel to complex diamonds, tiles, and even intricate, custom-made shapes. Simply put, if you *want* an industrial look, then certainly metal is an option, but if you don't, then metal is an option, too!

Q. "But I really like the look of tile. What are my options?"

A. Metal comes in tiles. It's the *best* choice to upgrade your home to the look of a classic tile roof *with a fraction of the weight of concrete.* You can have the appearance of tile with the advantages of metal.

There are simply no good reasons for a homeowner to ignore metal when shopping for a new roof. Metal covers all of the bases of desirable properties, has style and performance unequaled by other materials, and is the longest lasting, safest, and most environmentally responsible choice available.

Metal Overview

Green Value:	**HIGH**
Warranties:	**EXCELLENT**
Appearance:	**DISTINCTIVE, BIG VARIETY**
Weight:	**LIGHTEST**
Lifespan:	**USUALLY INDEFINITE**
Maintenance:	**FASTENER OR FINISHING MAINTENANCE if needed**

Coated steel roof tiles

Coated steel roof tiles

Patinated copper tiles

Patinated copper shingles

Titanium-zinc diamond shingles

Slate

Another roof material with thousands of years of history, slate is a natural stone that forms long, thin pieces due to its structure. Quarrying the slate and cutting it into small, flat pieces allows it to be installed on sloped roofs. It's waterproof, diverse in color and texture, and once installed is impervious to most chemicals. A roof material that is synonymous with many generations of performance, it's been used on castles and estates as a roof covering dating back to the time of the Romans.

Slate roofs have a reputation for being beautiful and permanent. They are expensive to buy and install. The installation is highly dependent on the skill of the craftsman as cutting slate without cracking it requires experience and attention, and installing the individual slates is usually a hand-nailing process. Mechanical nail guns are prone to crack the stone and most slate masons avoid using them. It is rarely used on lower slope roofs. The most common application is on steep roofs where the lower profile (than a typical tile roof) is less noticeable but the variety of tones and the irregularity of the cut pieces gives a distinctive look to the building that is poorly imitated by anything else. Because slate is quarried, it isn't as regular as manufactured concrete or clay.

The downside to slate as a re-roofing product for most homeowners is the weight (similar to concrete or clay), the difficulty in finding experienced installers, and the high price of the material and the installation.

Slate Overview

Green Value:	**HIGH**
Warranties:	**EXCELLENT**
Appearance:	**DISTINCTIVE**
Weight:	**HEAVY**
Lifespan:	**INDEFINITE in right environment**
Maintenance:	**FASTENER AND FOOT TRAFFIC REPLACEMENT if necessary**

Slate shakes

Synthetic

This category includes all products that are "man made," including acrylic blends, plastics, concretes with synthetic aggregates, etc. I have to say that I have a serious aversion to these products. Track record is of paramount importance to me in roofing materials and I don't like to see people effectively being test-cases for a manufacturer. I don't doubt that one day there'll be some type of synthetic roof material that will prove to be the ultimate, but as I write this, the record of this category of roof materials is appalling.

Fiber-cements, polyurethanes, plastic resins, etc., all came into the market with great fanfare only to disappear into obscurity leaving thousands of homeowners with "new" roofs that were ugly, failing, or both. Anyone who has been around the industry for a while can recite the names of discontinued brands – "Cemwood" "Everest" "Mira Vista" "Woodruff" etc, all with 40 and 50 Year warranties, all of them gone from the market– most in only a few years. If you're a class-action lawyer, you might welcome the potential income from such innovations, but if you aren't, I'd have to ask any architect, builder, or homeowner considering any new, synthetic roof material, "Why would you do that? Why would you select a material that has *no track record* as a roof covering for one of the most important functions of a building, when there are so many beautiful, *proven* products available?"

I could understand the lure if these products were a fraction of the price of the more traditional materials– but they're *not*. In many cases, they're as expensive, or more expensive than older and more reliable materials. If a manufacturer can't show me material with 100 years of proven performance, then I have no basis for real world comparison. Without that, I won't recommend using it.

Synthetic roofs weigh typically between two and five pounds per square foot.

Synthetic Overview

Green Value:	**LOW**
Warranties:	**POOR**
Appearance:	**TYPICAL**
Weight:	**LIGHT**
Lifespan:	**POOR**
Maintenance:	**UNKNOWN**

4-year old synthetic shake

16-year old synthetic shake

Wood

Another material used as roofing for thousands of years, wood shakes are not the product they used to be. A big problem with wood is that it was never intended to be a permanent part of a building exterior. Just think of the wood used in siding– if it's not painted or oiled regularly everyone knows it will rapidly deteriorate. The same is true for wood shakes and shingles. Yes, it's possible for them to last a long time, but they need regular maintenance and who does major, regular roof maintenance anymore? The days of having someone re-graphite the roof and replace the loose, cracked, and broken shingles have gone the way of the coal furnace. And a wood roof is as good a kindling as any fire could hope to find.

I agree that nothing looks like a real wood shake, but I'm also convinced that nothing looks *worse* than old wood shake. There was a time, back in the days of our grand and great-grandparents, when old growth forests were harvested for wood shakes and shingles. The makers of those shakes and shingles could choose material with good hardness and high grain-density. Those days are gone. We aren't harvesting many old-growth forests these days for many things and the trees used in shakes today have poor grain density. They're very prone to shrinking and swelling as their moisture content changes. The result is a material that has a fraction of the lifespan it did a couple of generations ago.

If there's a good reason other than, "I just love the look of real wood shake" for using this material in the 21st century, I don't know what it would be. Wood products are expensive, not ecologically friendly, they're a fire hazard and they have a lousy life span. These are all good reasons why the market share for wood roofing products is dwindling so fast it's become almost non-existent.

Wood roofs weight about two pounds per square foot.

Wood Overview

Green Value:	**LOW**
Warranties:	**POOR**
Appearance:	**TYPICAL**
Weight:	**LIGHT**
Lifespan:	**AVERAGE**
Maintenance:	**WIND AND CRACKING REPAIR until replacement time**

Typical wood shakes

Graphite coated wood shingles

Re-Roofing Options

Once you've determined that a new roof is a requirement, then you can determine which material to use as a replacement. You do *not* have to replace what you have now with the same material again. For a variety of reasons as you've already read, replacing a roof is a tremendous opportunity to upgrade your entire home by going up-market on this major architectural feature. Instead of putting on another roof of the same kind with a similar lifespan, upgrading to something with an indefinite lifespan can at once increase the beauty and value of your home, while reducing or eliminating a significant maintenance concern.

Q. "I have an asphalt roof now. What are my choices for something new?"

Since the weight of an asphalt roof is typically between two and three pounds per square foot per layer, and asphalt roofs are installed primarily over solid decks, any new roof covering weighing a similar amount or less and intended for installation over a solid deck is a candidate. Your most likely choices are another asphalt roof, a metal roof, or if you wish to do the structural determination, you can consider clay, concrete, or slate.

Q. "I have a wood shake or shingle roof now. What are my options?"

Wood is a very lightweight roof covering in most applications, so in changing to another material it is best to make certain that you choose something of similar weight. Since a lot of wood roof coverings have been installed over skip sheeting, you have a few choices to make. You can pick a product to go over the wood. Surprisingly, there are various ways of doing just that with metal and asphalt roofs, and there are literally thousands and thousands of such installations. You can also opt to remove the wood, and doing so will (depending on the local building code) likely require you to install solid decking, or plywood, over the skip sheeting. This would allow you the option of installing just about any roof covering

Q. "I have a cracking concrete roof. What should I do?"

Your least expensive solution is to find matching tiles and patch the roof. If you have one of the tiles that was originally installed on your roof, most often you'll find the manufacturer's name stamped there. Contacting them would be a good place to start. They'll probably want a photograph of the tile so they can identify the model and color. Be prepared for the fact that it likely won't be available if it's more than five years old.

If you can't locate enough replacement pieces to repair the cracked tiles on your roof, a method of reducing your repair expense is to take all the good tiles from the existing roof and put them on the most visible side. You then purchase new tiles as close to what you already have as possible and put those on the least visible side. If neither of these solutions appeals to you, you can replace the entire roof with something else. Metal tiles would allow you to maintain the tile look, unload the weight of the concrete roof covering, and eliminate roof cracking in the future.

Q. "Can I increase the energy efficiency of my home by choosing a particular material?"

This is quite a common question now that energy prices have risen so dramatically in the last few years. One thing you should know is that your roof is not considered part of the insulation system of your home. Most wood frame homes have cavities between the wall and ceiling framing members (the pieces of wood from which your home is constructed) that are most often filled with a material intended to reduce the transfer of heat through that section. This is called the insulation. When it's doing what it's supposed to do, it helps keep the occupied space– the places with the people– at the desired temperature. The better the insulation, the easier it is to keep that occupied space comfortable.

If your home has an attic, there should be insulation between the occupied space, which you pay to heat and/or cool, and the unoccupied attic, which should stay within 10 degrees F (or so) of the outside air temperature. In fact, your attic should be well ventilated enough so that it stays close to the outside air temperatures as this discourages the accumulation of moisture.

If your home has no attic (the same section of structure serves as both the roof and the ceiling) then there should be some sort of insulation material that reduces heat transfer through that assembly. All of that information to say this– just about everything else that makes up your home, including the roof, has a secondary impact on its energy efficiency. What the roof covering does is conduct more or less heat into the attic area, or more or less heat into the ceiling. As a result, attic ventilation, attic volume, the orientation of the home, the latitude of the home, the prevailing winds, being in the shade of a tree or other building– these all have enormous effects on your home's energy efficiency and energy consumption.

Despite the fact that everything there is to say about energy efficiency and roof covering has to be footnoted with a long list of provisos, there are a few things that are predictable. First, if reducing heat accumulation in the attic is important to you, then a vented roof covering (one where there's some air space between the part that the sun sees and the roof deck) will be a major asset. Types of roofs that are vented include concrete, clay, and metal. Any material that sits tightly to the roof deck will conduct a higher proportion of the heat it receives from the sun directly to that deck on which that material is vented. Asphalt roofs, for example, actually use the roof deck to help keep them cooler and lasting longer.

Even though the roof covering is a relatively minor concern with regard to the energy efficiency of your home, there are a few things that can be done when it's time to re-roof that will help your home be more energy efficient. Use a vented roof covering if possible, and make certain that if you have an attic you upgrade its ventilation so that it doesn't trap air. Trapped air in an attic contributes to heat and moisture buildup.

Q. "What about warranties? If what you say it true, how can the materials you describe as being short-lived have 40 and 50 year warranties?"

Please read the warranty section again if this is still something that confuses you, but ask yourself this. In 10 or 15 years or more from now what would you rather have– a material famous for lasting centuries, or a material famous for requiring replacement?

There are differences between a manufacturer's warranty and a labor warranty from an installation contractor. Labor warranties are typically one to five years and are a written assurance by the contractor that he has installed the roof material according to the manufacturer's specification and the local building codes. He has no liability beyond that. If there is a problem with the material, the contractor is not at fault.

Warranty vs. Lifespan

I can't emphasize enough that the warranty that accompanies a roof material has *little* or *nothing* to do with its lifespan. The warranty is just a piece of paper written by lawyers or salespeople because it's an expected selling tool in the industry. Let me repeat: the warranty is the *worst* reason for choosing a roof covering material. If you want to have some assurance of the lifespan of the roof covering you are choosing, examine the raw materials from which it is made and *then* ask yourself, "What can happen to this material once it's up on my roof?" An educated answer to that question will give you a much better estimation of the performance of a roof material– and that's a much stronger analysis than some piece of paper with a lot of big numbers and even more fine print.

Q. "What about the style of my new roof? Can I change from what I have now to something more appealing?"

Of course! Read on for descriptions.

Tile

The look of tile roofs has been popular and desirable for thousands of years. Associated with higher-end and custom homes, there are few architectural styles that are not complimented by a tile roof. To upgrade from a shingle roof to a tile roof, most homeowners have two choices– either do the work necessary to ensure their roof can handle the dramatic weight increase of converting to concrete or ceramic tiles, or use a metal tile and achieve the same result without the weight penalty and at the same time strengthen the entire roof structure.

Shingles

If the shingle look is your preference, then asphalt, metal, synthetic, or wood are all options for you. Asphalt shingles are the most common and available in many weights and colors. Metal shingles have the biggest variety of shapes and colors and can be made in exotic metals like copper, zinc, rusty steel, or even stainless steel or titanium. Wood and synthetic copies of wood are also available.

Panels

Most panel roofs are made of metal. This look is associated with the "tin roof" or the "barn roof" and is characterized by long, straight, vertical lines. There is a fantastic array of options within this seemingly narrow choice of material. Keep in mind that the differences between the low-end products and the high-end products are all related to three things: type of metal (steel, aluminum, copper, zinc, etc.), thickness of metal (the "gauge" of the metal is the usual measure of its thickness with a *smaller* gauge representing a *thicker* material – for example 24 gauge steel is almost 50% thicker

than 28 gauge steel), and profile detail (with the simplest panels just nailed or screwed through into the deck or framing, and the most sophisticated panels having hidden fasteners for all the parts).

Diamonds

Once a very popular look, this older style was at various times available in asphalt, asbestos, wood and metal. Recently, only a few metal manufacturers offer diamond-shaped shingles as a regular item.

Horizontal Lines

This look can be achieved with concrete or ceramic or metal roofs. Flat concrete tile has been a popular look on a lot of new homes built in the Western US over the last 20 years. Metal panels in painted metal or coated metal are very similar in appearance. All of these types of roof coverings are characterized by strong, consistent horizontal lines and most have a pronounced step from row to row.

Texture and depth

If there's an easily identifiable aesthetic characteristic that makes people love or hate a roof, it's texture and depth. There is something about a roof covering with a pronounced profile that makes it look desirable. Thin, low profile roof coverings usually strike people as "cheap" or "plain." Manufacturers are well aware of this and for some time now have been disguising the actual depth of their products with a pattern of coloring that creates artificial shadows to give the impression of added depth. Notice in the sales literature of many shingle manufacturers that the photos in the brochures are inevitably steep roofs and the angle of the photographs is as perpendicular to the roof surface as possible to highlight this pattern. That's why often the roof that looked so "textured" in the brochure looks just thin and plain on your roof– the pattern was painted on and your roof isn't steep enough to show it off.

One of the advantages and desirable features of the concrete, ceramic, or metal tiles is that they often have a very pronounced "step" form row to row or from side to side and their texture and depth is a real feature of their profile and not a painted illusion. This means that the thickness of profile is readily visible from the ground even if your roof isn't as steep as the ones in the brochures. Keep that in mind when choosing your next roof, and try to view the materials you're considering on a roof that has the same slope as yours. That way you'll have a much more accurate idea of what effect you'll be creating on your own home.

Color

Since this is a completely personal matter and one man's pride and joy might repulse the neighbor, I'll stick to a very general discussion of this topic. I think that the single most important color consideration you can make is to stand back, look at your home, and decide if there are any permanent features, such as brick, stone, siding you'll never paint, etc. Always in my experience, the owners that pick a roof color that harmonizes with such a feature are the happiest and everyone comments on how lovely is their new roof. If there are no such permanent features, and painting or residing is in the future, then your color choices are endless and your only concern would be to pick the new exterior colors so that they harmonize with your new roof.

There are a few materials that are color neutral and can be used with about any color scheme. These would be the natural metals like copper or zinc. Because they are their own feature, the colors that make up the trims, walls, and other details on the job can stand on their own. Much like stainless steel appliances in a kitchen impose no limits on what other colors are chosen, the same is true about a natural metal roof.

Q. "Now that I know my options, how can I know what to expect to spend?"

The price of a new roof is dependent on two major things: material and labor. The price of the material will be determined by the type of material, the size and complexity of the roof, along with delivery and logistical concerns. The cost of the labor to install a new roof can be calculated by knowing the size of the roof, the slope (or pitch), the type of material to be installed, the preparation required, the details of the roof, the height above the ground, and the type of access that is available.

Prices for various types of materials

Like every other industry, the roofing industry has its own jargon. In North America, roofers use the term "squares" to refer to the amount of material consumed on a job. A square equals 100 square feet of material used. In other parts of the world, the term has little or no meaning, but here it's the most common measurement of roof material.

Prices for material and labor within the industry are regularly quoted in terms of squares. So, if your home will use 2,572 square feet of material to complete its new roof, the typical roofer will say that is a "26 square roof."

For the purposes of this booklet, I'm going to assume that you're going to hire someone to install your new roof and that you're not an "expert" on roof materials or installation.

The prices I'm quoting here are typical prices for typical roofs, but please remember that these numbers are for use as a guideline only. The regional differences in building styles and techniques have a dramatic impact on price. While a square of a given shingle or tile will likely be similar in price in most areas, there are *very big* differences in what the finished job will cost. A building in downtown San Francisco compared to a similarly sized roof on a farm house in Wyoming will not cost the same. Variables like steepness of the roof, roof access, preparations, permit requirements, necessary equipment, building codes and inspections, insurance costs, etc., vary dramatically. They're much bigger factors in the final costs of any project than the price of the material being used.

When doing an investigation of roof prices, don't make the mistake that so many outsiders make of multiplying the size of the home by the average installed price of a given material from Home Depot and concluding, "My home is 1,800 square feet, that's 18 square, right? The contractor says he can install those tiles for $400 a square, so 18 times 400 is $7,200– that's not bad for a new roof!" It doesn't work like that, I'm afraid. Attached garages and other structures can add considerably to the area, most homes have overhangs around the perimeter, there's a slope to the roof increasing the surface area, a percentage of the material required will be cut off for valleys, dormer, hips, and other details. There'll likely be some sort of underlayment required, accessories like drip edges, valley flashings, hip and ridge pieces, nails or screws, penetrations, caulking or sealant, touch up paint, delivery, sales tax, etc. These extra considerations are costly.

A more realistic formula is something like this:

Square footage of home PLUS attached garage MULTIPLIED by 1.4 for walkable pitches and 1.6 or more for steep pitched roofs. Recalculating from our trip to Home Depot, we discover that our 1,800 square foot, single-story home with a double attached garage actually has closer to:

(1,800 + 500) x 1.4 = 3,220 square feet of material usage, or almost 33 squares. Now the price at $400 a square is $13,200– a very large difference. So, unless you're savvy at estimating roofing usage, be open-minded about the actual size of your job.

Usual Prices for Composition or Fiberglass Composition

Material prices range from roughly $30 per square up to about $130 for the shingles alone. Roughly double those numbers to account for all the other appropriate accessories that would be necessary to finish the job.

Hiring your own installer for a walkable pitch roof (a roof pitch of 3:12 up to 7:12), as if you were acting as your own contractor and you are buying your own insurance, should cost from about $20 per square for simple installations up to $100 per square or more hiring a contractor to install your material on a steep pitch roof (8:12 up to 12:12). Complex or steeper roofs would increase those numbers– sometimes significantly.

Usual Prices for Concrete and Ceramic Tiles

Again, the same variations for slope and complexity must be considered in your analysis of total cost for a job. The low numbers are for the cheapest versions and simplest jobs, the high numbers are for the more exotic examples and most complex installations:

Material - from approximately $50 per square up to approximately $350 or more
Labor - $50 up to $300

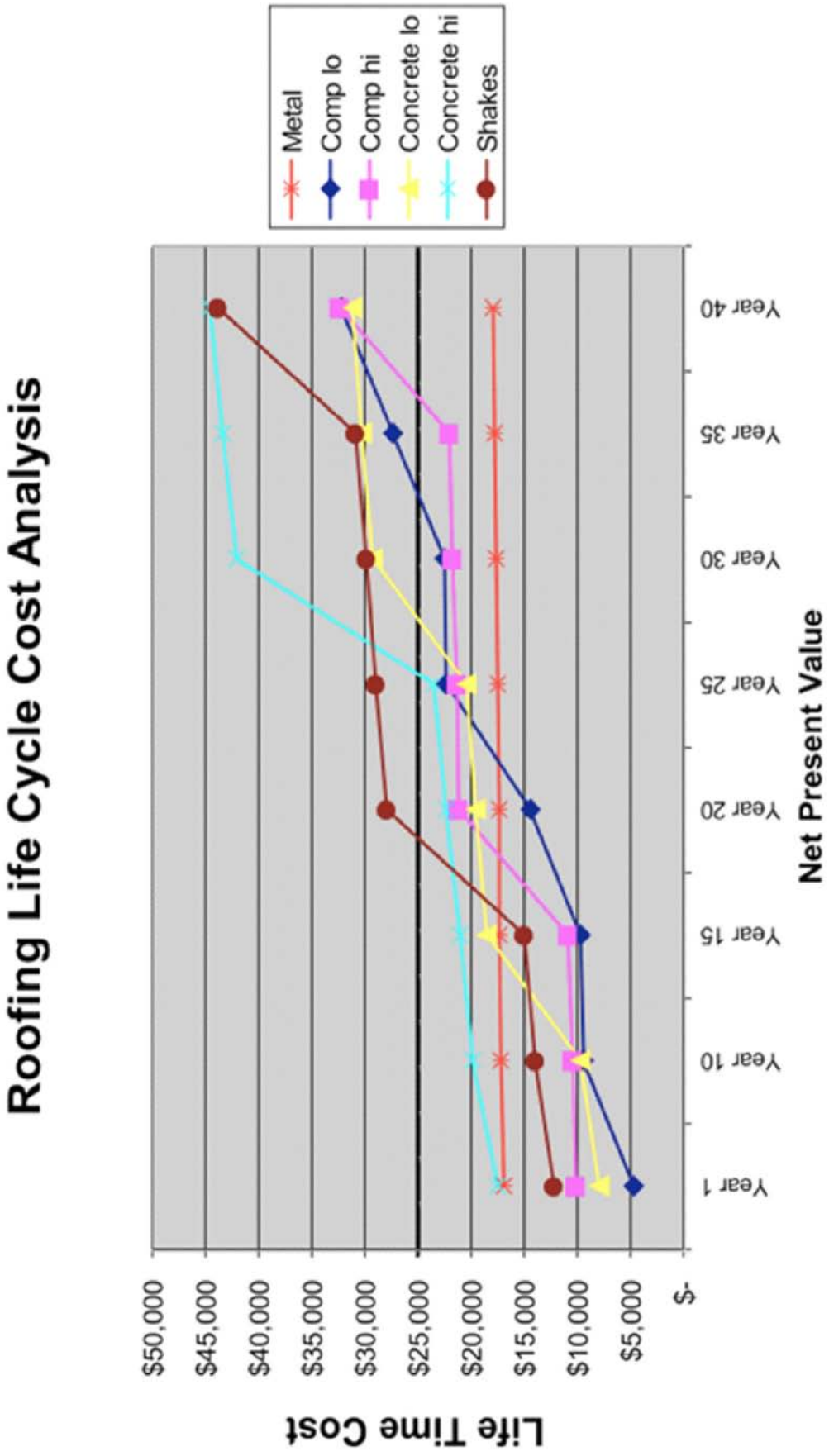
Usual Prices for Metal
Material - $75 for the basic steels up to $2000 for the exotic metals
Labor - $50 up to $350

Usual Prices for Synthetic
Material - $140 up to $300
Labor - $50 up to $300

Usual Prices for Slate
Material - $200 up to $1500
Labor - $75 up to $350

Typical prices for labor associated with work that may accompany your new roof that will likely add costs to the above ball-park numbers.

Figure 3


Roofing Life Cycle Cost Analysis
Metal
Comp lo
Comp hi
Concrete lo
Concrete hi
Shakes
Life Time Cost
$50,000
$45,000
$40,000
$35,000
$30,000
$25,000
$20,000
$15,000
$10,000
$5,000
$-
Year 1
Year 10
Year 15
Year 20
Year 25
Year 30
Year 35
Year 40
Net Present Value

Getting on with the Job

Preparation

Removal and dumping: Will vary in cost according to the pitch of the roof, the number of layers or material being removed, the access to the roof for dump trucks or trailers, and the cost of dumping in your particular area. Costs can range from roughly 40 cents a square foot ($40 a square) to several hundred dollars a square.

Roof top equipment: This means air conditioning units, swamp coolers (know collectively by the acronym HVAC, meaning Heating, Ventilating, and Air Conditioning), antennae, solar panels, or any other hardware that might be mounted on your roof and serve as a potential complexity of your new roof installation. It may be a non-issue, but be prepared for items like these to add to the total cost of your job. In some cases it's just a matter of flashing around or under the object, in others it may need to be completely removed and decommissioned, then reinstalled and recommissioned after the new roof is installed.

Masonary chimneys and walls: If these are old enough or in poor condition, it is possible that the flashings that are affixed by mortar between the bricks or stones may have to be reinstalled when your roof is done. As a matter of fact, if there is any doubt about their condition it *should* be done when you're installing a new roof.

Attic Ventilation: Venting of the attic is something that should be investigated at the time your new roof is installed. It was very common at one time to disregard or undervalue the importance of adequate attic ventilation in a building. Many building departments insist at the time of a re-roof that the attic ventilation be upgraded to modern standards when a new roof is being installed. It's rarely a big issue, just a matter of cutting a few holes in the deck and installing metal vents over the holes. Roughly $100 each for the job should be in the ball park for most roofers. What a roofer will NOT do is check to make certain that your soffit venting is functioning properly, and it's the combination of roof top (or gable vents) along with soffit vents that contributes to a useful amount of air flow through the attic. If the roofer doing your job is not willing or able to verify the function of your soffit vents, then it may be a good idea to hire an insulation contractor to check them at the same time you're having the roof replaced. That way you can have the attic ventilation properly addressed once and for all.

Structural work: Something that you're unlikely to encounter during a re-roof project unless you're planning to upgrade to a roof heavier than the design load of your home, or there is something damaged in the roof structure. If upgrading from asphalt shingles or wood to a heavy roof like concrete, clay, ceramic, or slate, then you probably need to do your homework and have a structural analysis of your structure done by an engineer and have them approve the roof you've chosen. *Do not* rely on the OK of the manufacturer or a roof contractor's casual approval because if you have a problem down the road those folks will most likely run for the hills and leave you holding the (very expensive) bag. "Well, it *should* have been able to support that roof, but I'm not an engineer!" will not give you any comfort if problems arise.

Other reasons for structural work can include broken or cracked rafters, adding new HVAC equipment to the roof at the time of the job, or re-sloping a roof that was poorly designed or built. These types of changes are most often beyond the scope of work of the roofer and typically require a framing carpenter or building contractor.

Rotten wood in the deck, if there is any, should be replaced when a new roof covering is installed. There are two ways to determine rot in roof decking. You can do it visually when the existing roof covering is removed, or by looking up under the deck from the attic to see if there is any black or obviously splintered or rotten wood. It's also possible for an experienced roof installer to walk on the existing roof and check by feel for soft spots, which can be detected by paying attention to excessive movement or "give" in the roof deck. If it feels like the deck is about to collapse under foot, it's likely something is wrong. Unless you've done it before, leave it to an expert.

Plumbing: Plumbing vents are common in roof areas, and depending on where you're living, it's not uncommon to have plumbing pipes on top of a roof running to swamp coolers or A/C units. Anything that looks like a leak in these pipes should be checked during the re-roof process. As a rule it makes sense to replace all flashings around plumbing details at the time your roof is replaced. Having roof top mounted solar hot water panels will often necessitate the removal, draining, re-mounting, and re-filling. Most roofers are not equipped for this type of work and so you should expect to hire a plumber separately to work with the roofer for this procedure.

Q. "So, I know what type of material I want and about what I should expect to pay. Since I'm not going to do it myself, where do I purchase what I want and how do I choose a contractor or installer?"

Specialty sources vs. lumber yards

If you want an average roof, an average lumber yard will happily sell you one. Home Depot, Lowes, the local roof or farm supply dealer– they'll be glad to supply you with the same material that the average roof contractor in your area installs as a matter of course. Someone there will offer you well-intentioned advice. But is it good advice? Remember, the people working in the lumber yard are *not* experts about roofing. They don't know the industry and they promote the products that they stock. So, if you're looking for advice on what kind of cover you should buy for a light switch or need new filters for the furnace, a lumber yard is a great place to be. But if you're looking for information about roof materials because you're planning to spend many, many thousands of dollars on a new roof, there are much better sources for you to reference.

If you want an expert perspective regarding roofing – consult a roofing expert.

While I was writing this, a friend recounted his experience purchasing a roof material package from a local, established, roofing supply distributor– business strictly related to selling roof materials of all types, usually to roof contractors. (If you pay such a business a visit yourself, you'll find all manner of inventory of the most commonly used materials in your area, plus the brochures from every manufacturer who has ever sent a representative by to make a sales call.) Anyway, my friend visited this particular distributor some years back, hoping to get good advice on replacing his roof. After looking around for a while, he was drawn to a display of a then-new material being promoted as the ideal replacement for his old wood shakes. It looked a lot like wood shakes. It was composed of concrete and light-weight aggregate and the brochure was beautiful, full of photos. Best of all it had a "50 Year" Warranty and everyone in the show room was buzzing about it. Confidant he was getting good advice (he was in the showroom of the biggest roof distributor in town, a place where roof contractors bought materials) he made his purchase and found a contractor willing to handle the installation. The roof ultimately failed and the product was withdrawn from the market a few years later.

I doubt you're surprised by the failure of the product but what might surprise you is my friend went back to the roofing supply distributor– *they were no help at all.* They didn't make the product. They didn't install it. They weren't under any obligation to compensate him for his disastrous purchase. All they would do– all *any* distributor can be expected to do under such circumstances– was direct him to the manufacturer to make a claim.

This illustrates that the places where "roofers buy their stuff" is not a guaranteed source of wisdom. Businesses like this make their money supplying products. They inventory what most roofers are buying and offer to order and resell any product of any description if it looks like there might be a chance to make a dollar doing so. They can tell you what roofers like to buy and what's been selling well lately, but don't expect them to be a source of great knowledge about most of what is going on in the roofing industry. They don't know. Their information comes out of the same sales literature that you read yourself.

If you want to know about a particular type of roof material, seek the advice of someone who deals with that material every day. These people who have the experience– good and bad– with a given material. They're the best sources of information.

When you're choosing a roof material, do your homework. Find out about the particular material you want to buy and seek out a source that *specializes* in that material. The more experience they have with that product, the better for you.

Match the contractor to the material. It seems obvious, but it's surprising how often I've witnessed roof-top bumblings where an enthusiastic, poorly equipped, ill-trained, or sometimes just plain bad roofer is making a hash of someone's new roof material. My father must have said to me a thousand times, "There's no substitute for experience." Roofing is no exception. If you take *none* of the advice I've offered, take this: make sure the roof material you choose is installed by someone who knows how to install it. Don't let someone learn how to install a product on your roof.

Hiring a contractor vs. hiring an installer. It's the rare jurisdiction these days that doesn't have some government agency overseeing about everything we do, and the same is true for most construction trades, including roofing. You'll have to check the local laws to make certain of your rights and obligations, but in most places there are a few options for having your new roof installed on your home, once you've decided what material you wish to use:

- Option 1: You can purchase the material from a manufacturer or distributor and install it yourself.
- Option 2: You can purchase the material from a manufacturer or distributor and hire an experienced installer as your employee to provide the labor to install your new roof.
- Option 3: You can purchase the material from a manufacturer or distributor and hire an experienced contractor to provide the labor to install your new roof.
- Option 4: You can hire an experienced contractor to supply the material you've chosen AND provide the labor to install your new roof.

If you're competent enough to choose option one, my instinct is you won't be reading the rest of this section. Good luck to you and good luck with your project.

Option two makes sense if you're comfortable in the role of employer, and know and understand, the risks and benefits of being in such a position. Acting as the employer means that you are responsible for coordinating the material supply, providing the required insurance, complying with government regulations regarding your project (depending on your locale there may be a lot of them), and making certain that there are clear instructions with regards to the scope of the work. It also means that you have complete control of the job and the money, and you can save the costs of a contractor's overhead and profit. The simpler the job, the more desirable this option is. If you are considering this, be sure that the installer and the material supplier have a comfortable, open relationship. Any conflict between them and/or you could result in an incomplete or unsuccessful job with accusations flying in every direction. *I recommend this option only if you have a clear understanding of construction and a high degree of confidence in all the parties involved.*

Option three makes sense for many homeowners. If you buy the material yourself, you get precisely what you want. You save costs because you do not pay the mark-up on the material that a contractor will impose. You don't have to worry about compliance with labor laws and insurance concerns as most contractors deal with these issues as a condition of maintaining their contracting status. Another benefit is that you avoid the potential pitfall of having a job completed only to discover that a contractor has not paid for the materials he has used on your project. I*f you choose this option, make certain that the supplier and labor contractor have a working relationship before you proceed. Any disagreement between them can unnecessarily complicate your project.*

Option four is the most common way to replace your roof. It's the most expensive and usually the most problem-free. The contractor takes full responsibility for the entire project and so deserves to make a profit for all his effort, capital, and risk. For people with little or no confidence in their understanding of construction, or for people who just want the least number of variables in the equation, this is a great solution. I have three provisos: (1.) The contractor normally issues a warranty for his labor. It is not a material warranty. The long-term performance of the material is not within the scope of most contractor warranties. This is a *critical* consideration if long-term performance is important to you. (2.) The contractor buys the material from a distributor who purchases the material and its warranty from a manufacturer. Neither the contractor nor the distributor warrants the material performance. Don't be fooled by the "40 Year" shingles in the contract. The contractor is not promising you an expected roof life span of forty years on your roof. *If you're still wondering about this, read the warranty section again so you'll be clear on this point.* (3.) Unless you have a paid receipt for the material used on your home or a lien release from the contractor, your full payment for the job does not guarantee that the contractor has paid for all of the material. In many places it is possible that an unpaid material bill could result in a lien on your property if that is where the material is used.

Q. "What are the best ways to finance a re-roof project?"

Since a well-chosen new roof is a significant improvement to most homes, it's common to finance such a project with a loan using the property as security. The value you are adding to the property offsets the reduction in equity resulting from such a "home improvement" loan. In many parts of the country, roof contractors and suppliers have little or no interest or ability in providing or assisting in the financing of your new roof. However, there are those who understand the average homeowner may not have, or want to use available cash when the time comes to replace the roof. Aside from a home equity loan through your bank, there are personal loans, credit cards, UCC loans, and refinancing options. If you're not comfortable with the idea of conventional financing, you

might take a look at some of the less conventional payment plans that I've seen. They're extremely convenient and very quick to put in place most of the time. These include loans from vendors of the material, or financing packages offered by installation contractors. Ask your supplier and contractor about financing, as they are often very motivated to provide a way to finance your project.

Q. "After it's done, how can I tell if it's been done well?"

This is probably one of the toughest things for homeowners. Unless you're up on the roof with the installer, it's usually just a glance from the ground that you'll use to determine whether or not your roof has been done well. Rest assured though, you're not helpless. There are few ways you can affect the outcome of your project.

Visual inspection is the most commonly used method of evaluation. I suggest you use a pair of binoculars in lieu of climbing up on the roof yourself. Take a good look. A well-installed roof is usually characterized by clean, straight lines around all of the rows and details. If you see something that doesn't look right to you, *ask* about it *before* the installer leaves for the day. There may be reasons for what you're worrying about. Installers can occasionally make mistakes. Hearing something sooner is better than later. You'll also save a lot of time and aggravation for everyone by insisting on a "walk about" on the day the job is finished. Anything that doesn't look right to you should be explained or fixed as soon as possible, if not immediately. You do not want put yourself in the position of having to wait for men and equipment to return from elsewhere later.

There are a couple of things to consider when you're viewing your roof from the ground. I've seen many installations on older buildings where the rows did not look like they even covered the entire roof, yet there was *nothing* wrong with the install. In these instances (not common, but something every installer will cope with from time to time) the ridge and the eave are not completely parallel. Most manufactured roof coverings– the *vast* majority– are intended for installation on roof structures based on regular geometric shapes (squares and triangles mostly) with the occasional arc. If the ridge and the eave are not parallel (a result of framing mistakes, movement of rafters over time, movement of eave trim boards, or movement of a foundation affecting the wall above) the installer will have to make some correction somewhere to fix the discrepancy. He'll do this by adjusting the width between rows and this may cause a visual convergence of lines in the roof. Unless you are prepared to re-frame your roof, or initiate other significant structural changes, there is nothing else the installer can do. If you see something irregular in the horizontal pattern of the roof, ask what it is you're seeing and be prepared to ask the roofer to check for this parallel condition before accusing him of incompetence.

Sometimes rafters sag or bow after years of functioning on a roof. When this occurs, the horizontal lines may look a little wavy after the new roof is installed. Again, there aren't too many options available to a roofer. He may not even notice as it's rare for it to be visible from anywhere *other* than the ground. Such a rafter condition is not the fault of the roofer and may not be correctable without major work to the rafters.

Barring such complications, let's assume that the job is complete and passes the initial visual inspection or the binocular test. Then you should look at and ask about the following details before finally signing off on the job. If you ask the installer if and how he attended to these details, he'll review his handling of each. It may serve to remind him that he needs to have another look at them.

Detail inspections (See Diagram 1 on p. 5 for an illustration of the parts discussed here)

Chimneys are one of the biggest issues for a roofer. There are two things that need to be addressed on each chimney. One is the domain of the roofer and the other is the chimney itself. The roof installer is responsible for ensuring that the intersection of the chimney with the roof is properly assembled to prevent water from intruding. By the use of flashing, the usual way to waterproof a chimney is to make certain that water falling on the roof above the chimney is diverted around it, and that water falling on the sides of the chimney above the roof flows onto and over the roof. What your chimney is made of (brick, stucco, wood, etc) will determine the method of flashing to accomplish this goal. Ask the roofer how the chimney was flashed in the back, front, and sides, and if at all possible, have a look yourself just to see if it makes sense.

The other concern for chimneys, and most commonly for masonry chimneys, is that the top of the chimney itself is not properly sealed, or "grouted" to use the masonry term. This means water falling on the top of the chimney– and not the roof– needs to be stopped from entering the chimney chase. I've been on many roofs where an owner insists that his roof is leaking only to discover that it's the chimney itself where water is entering and has nothing to do with the roof area. Your chimney may need repair and this is not part of the roof installation.

Roof to wall flashings are the same as chimney wall flashing details. Again, the purpose is ensuring that water hitting the wall is diverted onto and over the roof covering wherever an intersection of a wall and a roof occur. These are all common-sense details, so if they don't look right to you, they probably aren't.

Valleys, or the intersection of two roof planes forming a trough, are problem-prone areas. They tend to collect debris on lower sloped roofs. Make certain that whoever installs your new roof pays attention to the valleys to ensure that they are using all new material, and the valleys are free of obstructions so that water and debris have the lowest possibility of accumulating in these areas.

Penetrations are the points where plumbing pipes, vents, skylights, antennae, etc., penetrate the roof deck or are anchored to it. These areas must be specially treated so that they do not become sources of water infiltration. Generally, there is a specialty flashing material for every type of penetration, and you should insist that any new roof installation be accompanied by all new flashings for each existing roof penetration. I have no doubt that there are other specific things I could include in the discussion of details, but these are the highlights. You only need to ask the question, and have the installer answer honestly. You'll have some assurance that the areas of a roof most prone to problems have been attended to and the installer will think about what he has done regarding each of these details. Attached is the checklist you should give to your roof installer. Have him answer every question and keep a copy of it for your records.

You now have an overview of some of the materials, methods, and terminology that are involved in the process of choosing and installing a new roof for your home. Reading this certainly has not made you an expert, but you probably know more than you knew before you, and you're certainly a more educated consumer when it comes to roofing products and services. With even a "cheap" roof costing thousands of dollars today, I am confident that the more you can learn in advance of the expenditure, the higher the likelihood you'll invest in something that will meet your requirements and keep you smiling for many years to come. Good luck with your project and if you want some help in reaching a decision, if you'd like more information on any topic I've discussed here, please contact me. I'm always happy to hear from you.

Concrete-Based Tile & Shake vs. Metal

	Concrete Tile & Shake	**Metal**
Lightweight	*Poor* 9-15 lb/square feet Average roof 36,000 lbs	*Excellent* 1.4 lb/square feet
Fire	*Excellent*	*Excellent*
Wind	*Fair* Requires nails, slips and/or wiring in high winds	*Excellent* 120 mph wind warranty
Hail	*Good*	*Excellent* Hail warranty
Snow & Ice	*Poor*	*Excellent* Resilient interlocking design that resists ice damming
Earthquake	*Poor*	*Excellent* Lightweight, added shear strength
Weathering/Warranty	*Good*	*Excellent* Limited lifetime warranty
Environment	*Fair*	*Excellent* No tear-off required Recyclable
Re-sale Value	*Excellent*	*Excellent*

Ratings based on comparison with metal as determined from manufacturers' specifications, independent testing laboratories and published industry studies/statistics.

Fiberglass Composition (Asphalt) vs. Metal

	Fiberglass Composition	**Metal**
Lightweight	*Good* 2-5 lb/square feet Average roof 10,500 lbs	*Excellent* 1.4 lb/square feet
Fire	*Excellent*	*Excellent*
Wind	*Fair*	*Excellent* 120 mph wind warranty
Hail	*Fair*	*Excellent* Hail warranty
Snow & Ice	*Good*	*Excellent* Resilient interlocking design that resists ice damming
Earthquake	*Good*	*Excellent* Lightweight, added shear strength
Weathering/Warranty	*Poor* Asphalt degrades in heat and sun	*Excellent* Limited lifetime warranty
Environment	*Fair* Weathering and wind damage after 10 years not covered	*Excellent* No tear-off required Recyclable
Re-sale Value	*Poor* Ends up in landfills	*Excellent*

Ratings based on comparison with metal as determined from manufacturers' specifications, independent testing laboratories and published industry studies/statistics.

Wood Shake vs. Metal

	Wood Shake	**Metal**
Lightweight	*Good* 2-4 lb/square feet Average roof 10,500 lbs	*Excellent* 1.4 lb/square feet
Fire	*Poor*	*Excellent*
Wind	*Fair*	*Excellent* 120 mph wind warranty
Hail	*Fair*	*Excellent* Hail warranty
Snow & Ice	*Fair*	*Excellent* Resilient interlocking design that resists ice damming
Earthquake	*Good*	*Excellent* Lightweight, added shear strength
Weathering/Warranty	*Poor*	*Excellent* Limited lifetime warranty
Environment	*Fair*	*Excellent* No tear-off required Recyclable
Re-sale Value	*Fair*	*Excellent*

Ratings based on comparison with metal as determined from manufacturers' specifications, independent testing laboratories and published industry studies/statistics.

Homeowner's Re-Roofing Checklist
Questions to Ask your Roofer

1. What I have now:

Asphalt Composition Wood Shakes Concrete or Clay Other

2. What's underneath:

Layers of Roof Material Solid Deck Spaced Purlins Other

3. Is it necessary to remove the existing roof? _____

Why and how much will it cost?_____

_____

4. After we remove the existing, what is required to install a new roof? _____

_____

Do I need a new roof deck? _____

Do I need structural work? _____

Do I have roof-top mechanical (a/c, swamp cooler, solar panels, etc.)? _____

If so, do they need to be removed and re-installed? _____

If so, who will do so? How will this work be performed? _____

_____

5. What is the cost of the new roof you recommend? _____

6. How long will the job take? _____

7. Is a permit necessary? _____ Who will obtain and pay for it? _____

8. Will you be blocking access to my home or garage? _____

If so, when and for how long? _____

9. Who inspects the completed job to ensure proper technique? _____

10. Are you replacing any of these flashings?

Valley Chimney Roof to Wall Skylight Plumbing Penetrations Other

12. With what are you replacing them? _____

Will the color match the new roof? _____

13. Who cleans up? _____

14. Who do I call if I have a problem with the new roof? _____

_____

15. Will I need any wood fascia or trim replaced? _____

_____

16. If you replace some, who paints it? _____

_____

17. Will the roof you're proposing interfere with my existing gutters, skylights or roof-top equipment? _____

_____

18. Are there any building details on my roof that require maintenance or repair?

Chimneys Antennae Skylights Pipes and hardware Other