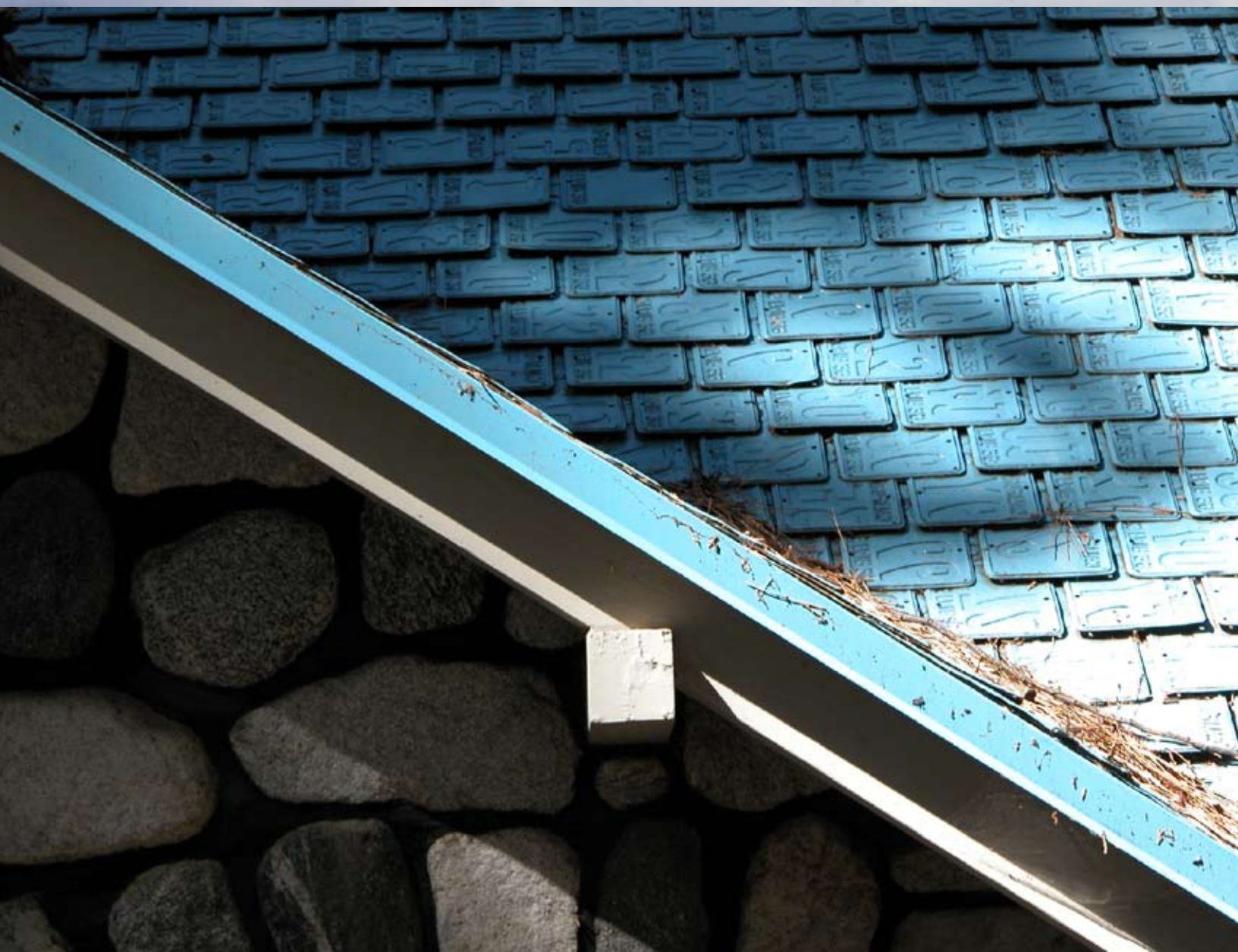
U.S. Department
of Agriculture

Forest Service

**National Technology &
Development Program**

2300—Recreation Management
0723 1812—SDTDC
September 2007

Alternative Roofing Materials: A Guide for Historic Structures



Alternative Roofing Materials: A Guide for Historic Structure

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September 2007

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INTRODUCTION

The task of replacing roofs on historic Forest Service, U.S. Department of Agriculture, structures presents forest heritage and facilities employees with the challenge of identifying possible alternative materials that are historically appropriate, cost effective, easy to install, and functional in wildland fire environments. Forest heritage and facilities professionals are spending increasing amounts of time trying to identify alternative roofing materials for cedar shakes and shingles.

The objective of this guide is to identify alternative roofing materials to cedar shakes and shingles that are available in today's market. The guide discusses the characteristics and qualities of cedar shakes and shingles and identifies look-alike cedar roofing material alternatives that are available. A table compares various roofing materials for cost, fire resistance, weight, and other qualities important when selecting an alternative material. The guide also provides a list of manufacturers who make alternative materials for cedar shakes and shingles and their Web sites and Web links to historic information and preservation requirements, treatments, and other related information. This guide is written for Forest Service engineers, and heritage and facilities staffs involved in reroofing historic structures.

BACKGROUND AND GENERAL GUIDELINES FOR APPROPRIATE SUBSTITUTES

For a Forest Service reroofing project, first determine whether the building is a significant historic structure. If the structure is not significant, any suitable material may be used. Refer to the Forest Service's Built Environment Image Guide for ideas about appropriate roofing materials based on looks and longevity.

If the structure is significant (listed or eligible for listing on the National Register), the Forest Service is required to consult with the State Historic Preservation Office (SHPO) under Section 106 of the National Historic Preservation Act. Contact SHPO through the forest or district archeologist or architectural historian whenever making changes to significant historic buildings. The Forest Service INFRA database should show the historic status of buildings, but check with the archeologist to make sure. Also, there may be structural issues with new roofing materials, so check with the facilities engineer.

One reason for consultation is to determine whether there will be an adverse effect on the historic building. If so, work with SHPO to mitigate that adverse effect. This is a legal and sometimes lengthy process that culminates in a Memorandum of Agreement (MOA). One way to avoid an adverse effect and save time and money on developing an MOA is to follow the Secretary of the Interior's Standards and Guidelines for Treatment of Historic Properties, as the Forest Service Handbook 7309.11, Chapter 40–Management. In addition, the Department of the Interior, National Park Service, has published a number of technical guides for maintaining, stabilizing, rehabilitating, and restoring various materials, finishes, and architectural components.

The link to the Secretary of the Interior's Standard and Guidelines for Treatment of Historic Properties is http://www.cr.nps.gov/hps/tps/standards_guidelines.htm.

The National Park Service's Technical Preservation Services' Preservation Brief Number 16 states that "Some preservationists advocate that substitute materials should be avoided in all but the most limited cases. The fact is, however, that substitute materials are being used more frequently than ever in preservation projects, and in many cases with positive results. They can be cost effective, can permit the accurate visual duplication of historic materials, and can last a reasonable time. Growing evidence indicates that with proper planning, careful specifications and supervision, substitute materials can be used successfully in the process of restoring the visual appearance of historic resources." For more information, go to: http://www.cr.nps.gov/hps/tps/briefs/brief16.htm.

Losing the character and patina of an old roof is always regrettable, but there are circumstances when a new alternative roof becomes necessary. Regarding replacement materials in general, the National Park Service stresses that they "be compatible with historic materials in appearance." As outlined in Preservation Brief Number 16, The Use of Substitute Materials on Historic Building Exteriors, the new, substitute material "should match the details and craftsmanship of the original, as well as the color, surface texture, surface reflectivity and finish of the original material. The closer an element is to the viewer, the more closely the material and craftsmanship must match the original." See http://www.cr.nps.gov/hps/tps/briefs/brief16.htm.

Because there is so much useful information on the Web sites listed in the appendix regarding historic information, historic preservation requirements, traditional building materials, contractors, treatments, and other information, this guide will not repeat this information. This information is covered very well by the National Park Service, Heritage Preservation Services, in their preservation briefs. See http://www.cr.nps.gov/hps. For detailed information on the repair and replacement of historic wooden shingle roofs, see http://www.cr.nps.gov/hps/tps/briefs/brief19.htm.

HISTORIC WOOD SHINGLES

For the past 100 years wood shakes and wood shingles have been used for roofing Forest Service structures. The two most commonly used woods are Alaska yellow cedar and western red cedar wood. Other wood alternatives to cedar wood shakes or shingles are white oak and sugar pine. White oak is primarily found in the East; it is amazingly durable and has been know to last 75 to 100 years. Decay-resistant sugar pine is primarily found in the West, particularly in California.

The differences between historic shingles and modern shakes and shingles are discussed in Preservation Brief Number 19, see: http://www.cr.nps.gov/hps/tps/briefs/brief19.htm. This brief also discusses the differences in historic and modern installation methods and structural requirements. While this guide is only about available alternative materials, architects and engineers can assist with identifying appropriate methods for historic buildings.

MODERN WOOD SHAKES AND SHINGLES

Wood roofs are a traditional, beautiful, and rustic look that is appropriate in a woodland setting. Nothing compares to the beauty, earthy colors and texture, flexibility in design, and insulating properties of a natural cedar shake roof (figures 1and 2).

Figure 1—Cedar shake roof.

Figure 2—Cedar shake roof.

The difference between a shake and a shingle is that generally a shingle is sawn on both sides from a block of cedar and is thinner at the butt than a shake. Cedar shingles are sawn on both faces and have a smooth face.

A shake is typically split on one or both sides, which gives a rustic appearance. Hand-split and resawn cedar shakes have a split face, which allows the natural grain to be exposed to the elements. They are thicker than shingles. The exception is the taper-sawn shake, which looks like a thick shingle. Taper-sawn shakes are sawn as well but are thicker than shingles and are applied like shakes. Another difference is the amount of exposure. An 18-inch shingle is applied with a 5 ½-inch exposure to the weather, while an 18-inch shake is applied at 7 ½-inch exposure to the weather. Shingles applied at 5 ½ inches become a 3-ply roof, which means that there are three layers of shingles at any location on the roof. Shakes are 2 ply. Shakes are layered with felt between each layer, thus having two layers of felt at any location. No felt is required between each layer of the shingle application.

Cedar shakes and shingles are hail and wind resistant. Cedar shakes and shingles contain oils that make them naturally decay resistant. Also, wood roofing is a renewable resource. It is biodegradable, pollution minimizing, energy conserving, and 100-percent recyclable.

Wood roofing presents fire resistance problems, especially when the wood is not treated. The Forest Service requires that roofs be fire resistant. Therefore, this guide does not discuss nontreated wood roofing materials. Fire-resistant treated shingles are not available in colors and painting or staining voids the warranty.

The Cedar Shake and Shingle Bureau (http://www.cedarbureau.org) is an association of member mills, distributors, treatment companies, installers, and maintenance technicians. It is the industry "watch-dog" of cedar wood products. The Cedar Shake and Shingle Bureau recommends looking for the Certi-Label™ when selecting cedar shakes and shingles. This label is one way the consumer is assured of the highest possible ratings of cedar wood products.

Treated cedar shakes and shingles are available in two forms, pressure impregnated, fire-retardant treated wood and pressure treated wood with chromated copper arsenate preservative. Permanent fire protection is provided by pressure impregnating fire-retardant polymers into the innermost cells of cedar shakes and shingles. Select the Certi-Guard™ permanent label if fire-retardant is needed where the threat of fire exists. This treatment results in a Class A rating for fire resistance (figure 3).

Figure 3—Fire-retardant treated wood shingles.

Chromated copper arsenate (CCA) preservative protects wood against fungal decay associated with high heat and humidity conditions. Select the Certi-Last™ CCA label if preservative-

treatment is needed. Certi-Last™, treated for decay, mold, moss, algae, mildew, and fungus, is recommended for high humidity areas.

See http://www.cedarbureau.org for information on how the wood is treated for both fire and rot resistance. See the appendix for definition and further discussion on fire resistance classes.

Maintenance is important for any type of roof. A cedar shake roof should last 25 to 30 years or more when properly selected, installed, and maintained. It is more cost effective to maintain a roof properly at regular intervals than to replace it. To prolong the roof's life, it should be checked periodically for signs of wear and maintenance should be performed to clean loose debris from roofs and gutters.

For further information on caring for wood shakes and shingles, see the following links:

1. Care and Maintenance of Wood Shingle and Shake Roofs: http://extension.oregonstate.edu/catalog/pdf/ec/ec1271.pdf

2. Wood Shakes and Shingles for Roof Applications – Tips for Longer Life: http://www.fpl.fs.fed.usdocumnts/finlines/knaeb98d.pdf

ALTERNATIVES TO WOOD SHAKES AND SHINGLES

There is a wide range of alternative materials available, such as treated cedar shakes and shingles, composition, metals (aluminum, steel, and copper), stone and slate, and concrete and clay tiles. The potential for fire damage to wood roofs and the desire for more durability and longevity highlights the need for cedar shake and shingle alternatives discussed below. Each one has its advantages and disadvantages. In the case of a significant historic structure, the substitute material must be acceptable to SHPO. The final decision also should consider the use, location, and historical aspects of the building, as well as cost, maintenance, and longevity for that particular building.

Composition Shingles

The dictionary defines composition shingles as a type of shingle used in steep-slope roofing and generally comprised of weathering-grade asphalt, a fiberglass reinforcing mat, an adhesive strip, and mineral granules. It also can be defined as a complex material, such as wood or fiberglass, in which two or more distinct, structurally complementary substances, especially metals,

ceramics, glasses, and polymers, combine to produce structural or functional properties not present in any individual component.

Examples of composite materials are asphalt shingles (figures 4 and 5) made from laminated fiberglass that mimic wood shakes. These look similar to the real thing, but generally only from a distance. Some are rated Class A fire resistant, wind resistant, and have up to a 50-year limited lifetime warranty. There also is a super heavyweight-plus product for ultimate durability. Many companies make asphalt shingles.

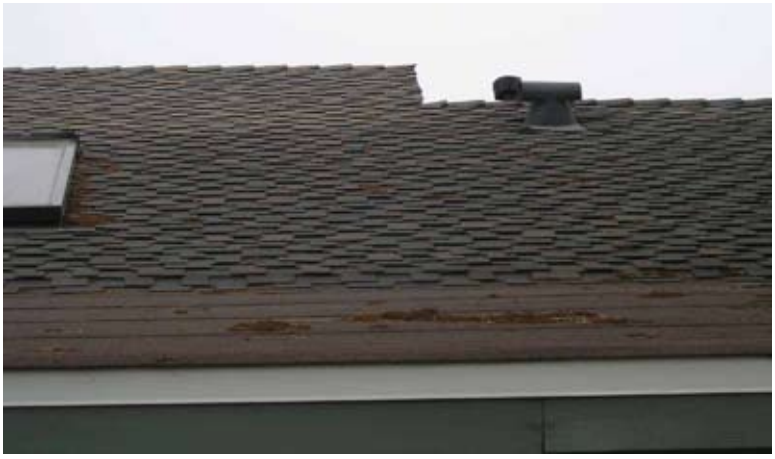

Figure 4—Asphalt shingles.

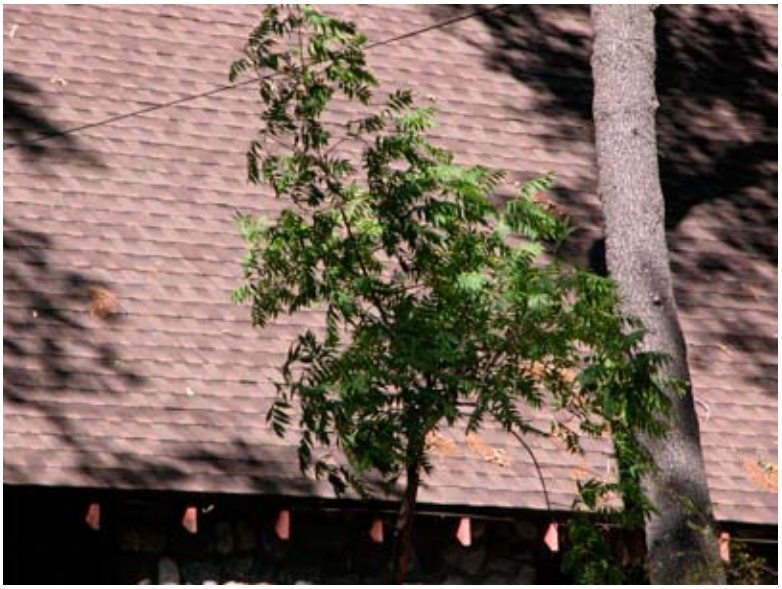

Figure 5—Asphalt shingles.

Engineered Molded Shingles

Made of engineered rubber, plastic, polymer, asphalt, or resin, engineered molded synthetic shingles are usually blended with a fire retardant and ultraviolet stabilizers to ensure long life and durability. Some synthetic shingles are composed of recycled materials such as tires, milk bottles, and fiberglass. Some include ground wood or stone and some are 100-percent resin (figures 6 and 7). Molded synthetic shingles are usually fire resistant, durable, and can last up to 50 years. There are many colors available. The molded synthetic material usually will not fade and turn gray with use as will natural wood material. The properties of engineered molded shingles vary widely. Check the manufacturer's literature to be sure the product will work for your application.

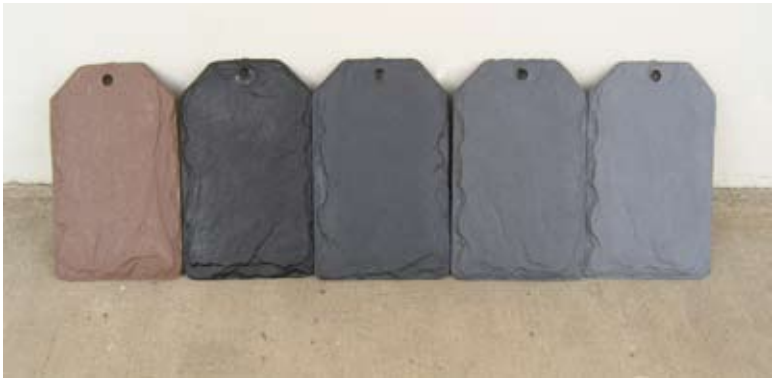

Figure 6—Rubber tiles—EcoStar.

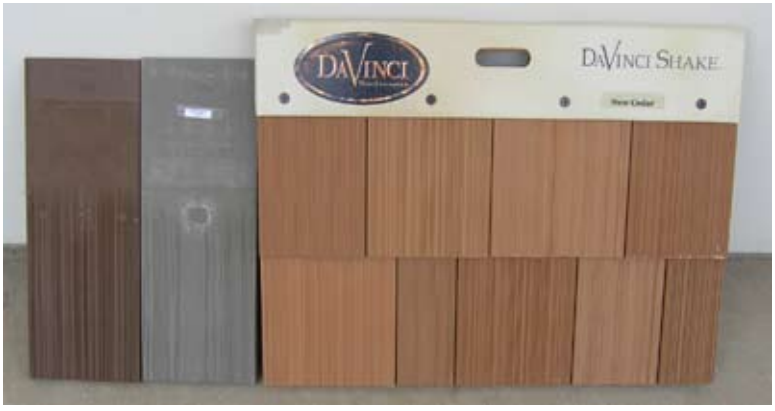

Figure 7—Synthetic molded tiles—DaVinci.

Metal Shingles

Metal roofing has long been used on forest buildings. Now metals also are made to mimic cedar shakes and shingles (figure 8). Metal is rot-proof, lightweight, fire resistant, fairly easy to install, excellent for steep-pitched roofs in heavy snow areas, and available in many colors. Metal roofing can be applied as shingles. Most metal roofing is approved for Class A, B, and C fire ratings and is recognized widely for its resistance to airborne sparks and burning

debris. Metal conducts electricity; consequently, if in a lightening-prone area, the roof should be grounded by a lightening-protection specialist. Insulation in the roof and solid decking reduces noise transmission from rain.

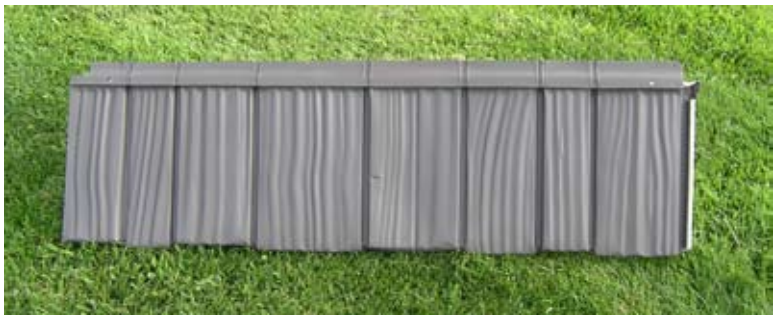

Figure 8—Metal shingle—Classic Products.

Figure 9—Metal shingle with coating—Gerard Roofing Technologies.

Types of metal roofing are steel (available plain or with factory applied paint or baked on colored finishes), galvanized (coated with rust-resistant zinc), Galvalume® (steel coated with aluminum and zinc), stainless steel, aluminum, copper, and zinc alloys (figure 9). The metal can be installed as standing-seam sheets (figures 10 and 11) or made as shingles (figure 9) or shakes to resemble wood shakes, clay tiles, or shingles. Standing seam is the oldest style of metal roofing on traditional and restored buildings.

Metal roofs are durable, offering a high-strength to low-weight ratio. These roofing systems are almost maintenance-free, need no cleaning or pressure washing, and will not lose impact resistance with age. Metal roofs are lightweight and can be installed over many existing roofs. (http://www.tradtional-building.com.) They are energy

efficient, and are made from 60- to 65-percent recyclable material. They can withstand winds over 110 miles per hour. If installed properly, the expected life of metal ranges from 50 to 100 years.

Galvanized steel is coated with rust-resistant zinc. It is the least expensive metal roof. It is affordable, has excellent structural capabilities, and is warranted against corrosion for up to 20 years. The recycled content of galvanized steel is approximately 35 percent. Because of its strength, it is a good option for hail-prone areas, although unusually large hail may dent the roofing or damage colored finishes. “The Metal Roofing Alliance recommends the use of only G-90 for roofing applications.” G-90 is the weight of zinc on steel (90 ounces per square foot), not the weight of the overall metal thickness (http://www.traditional-building.com).

“Galvalume® steel combines metallic coatings of both aluminum and zinc. This combination joins the healing properties of zinc with the superior barrier protection of aluminum” and “offers superior weathering properties”(http://www.traditional-building.com). However, since Galvalume® steel isn’t able to self-protect any scratches or cracks as well as galvanized steel does, it is best used for simple profiles such as standing seam because there is not as much bending in the metal. Recycled content is approximately 35 percent (http://www.classicroof.com).

Aluminum roofing is produced in standing-seam (figures 10 and 11), shake, shingle, tile, and slate-look forms. It is lightweight, durable, and corrosion resistant. It does not require structural reinforcement, and will not split, rot, curl, dry out, lift, or invite insects, mildew, moss, or fungus. Generally, it is wind and wind-driven-rain proof at speeds up to 110 miles per hour. Most aluminum roofing is prepainted. The recycled content is approximately 95 percent (mostly post-consumer), and it is very light—as low as 45 pounds per square foot. When aluminum is heavily formed, it adds to its structural strength. A formed aluminum, such as an aluminum shingle, is more hail resistant than a less-formed aluminum, such as standing-seam.

Terne steel is a zinc-tin alloy coating over base carbon steel. Terne II is often selected for historical retrofit projects because of its dull gray color, which patinates into a weathered gray. It is durable and corrosion resistant. It will last for centuries and costs about as much as copper (http://www.classicroof.com).

TCS II, Terne Coated Stainless, is stainless steel coated with the zinc-tin alloy. It looks very similar to Terne's dull gray color, although it is more durable and costly because stainless steel is considered an exotic metal (http://www.classicroof.com).

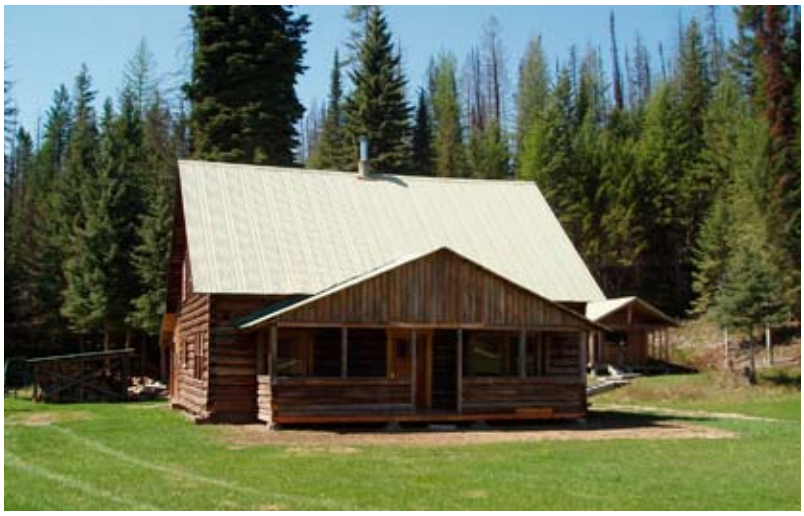

Figure 10—Standing-seam roof.

Figure 11—Standing-seam roof.

Figure 12—Copper and aluminum tiles–Zappone.

Zinc—very soft and malleable—starts out as dull gray and patinates into an attractive charcoal color. It commonly is used in standing-seam applications, but also comes in preformed shingles. It is very expensive, and although it's been used for hundreds of years in Europe, it's relatively new in the United States.

Copper, while beautiful and durable, is used rarely due to its high cost. It is still measured by the ounce because it is considered a precious metal. The cost per 100 square feet is about $1,000 or more. A green patina or crust of copper sulfate or copper chloride is formed on copper after exposure to the elements over a period of time. The patina acts as a barrier against corrosive elements and is part of the reason for copper's extremely long life. Copper can last 100 to 200 years or longer (figure 13).

Figure 13—Copper roof on Chilao Visitor Center, Angeles National Forest.

Concrete Tile Shingles

A roof is always exposed to the elements, and concrete is among the most durable products available. Concrete roof tile does not degenerate or wear out and gets harder with age. It is made of Portland cement, sand, water, with oxide for color. Concrete

tiles— regular and lightweight—are used for roofs. The tiles can be shaped as shakes and shingles (figure 14). Most products have Class A fire ratings, are easily installed, and last for decades. Breakage is a concern with concrete tiles (figures 15 and 16). Only periodic maintenance is required for metal flashings and ventilation systems. It has a 50-year product warranty. See http://www.westile.com/homeowner.asp?img=1&cat=own.

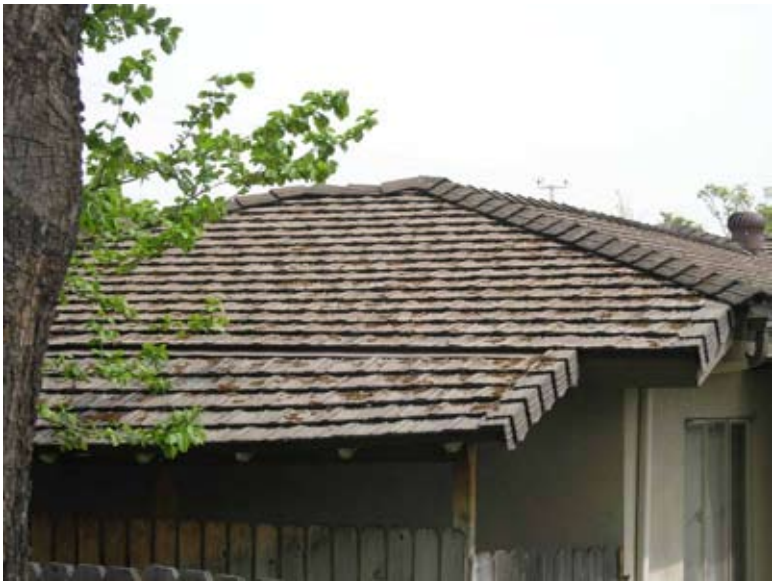

Figure 14—Concrete tile roof.

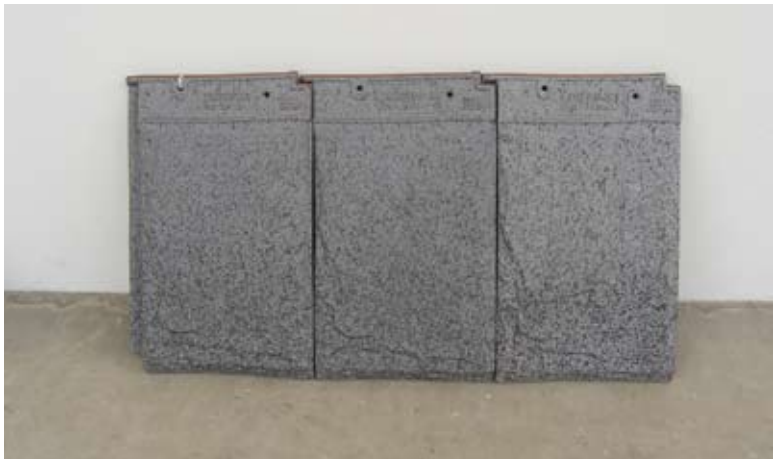

Figure 15—Concrete tiles.

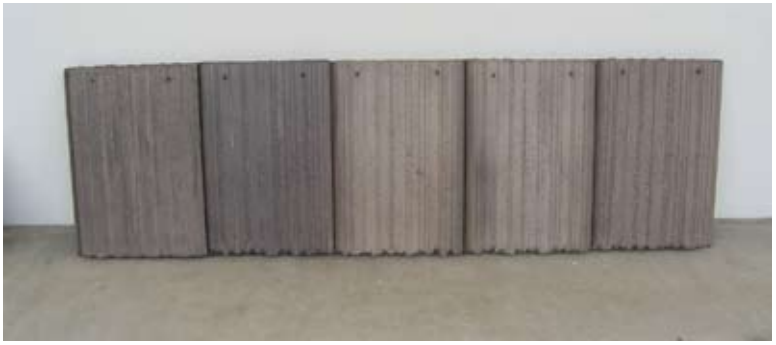

Figure 16—Concrete tiles.

Clay and Stone

Clay tiles are one of the most distinctive and decorative historic roofing materials because of their great variety of shapes, colors, profiles, patterns, and textures. Traditionally, clay tiles were formed by hand, and later by machine extrusion of natural clay, textured or glazed with color, and fired in high-temperature kilns. The unique visual qualities of a clay tile roof often make it a prominent feature in defining the overall character of a historic building. The significance and inherently fragile nature of historic tile roofs dictate that special care and precaution be taken to preserve and repair them. Clay tile has one of the longest life expectancies among historic roofing materials—generally about 100 years and often several hundred (figure 17).

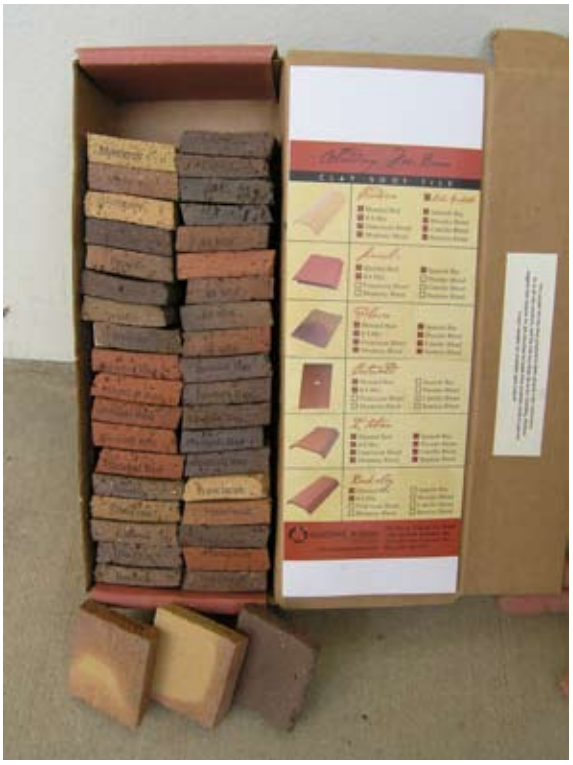

Figure 17—Clay tiles, Gladding McBean & Co.

Slate is one of the finest roofing materials available. It is fireproof, resists hail damage, possesses unquestionable beauty, and often has a service life of 100 years or more (figure 18).

Figure 18—Slate tiles, Tru-Slate.

Installation techniques are fairly standard for most alternative roofing materials. Some materials may require specialized knowledge by an installer. This is a consideration when selecting material. Most manufacturers' Web sites provide detailed information on installation procedures.

NOTE: The prices listed in the following table are estimates only. Actual pricing is dependent on specific material, shipping costs, and manufacturer. These alternative selections, while not exhaustive, are based on the manufacturers' claim that the product looked similar to wood shakes or shingles.

Table 1. Roofing materials and specifications

Roofing Material	Fire Resistant	Wind Resistant (mph)	Impact Resistant	Freeze-Thaw Resistant	Low Maintenance	Special Skills Required for Installation	Recyclable	Durability (years)	Fade Resistant	Price ($) Per Square	Weight (pound per square 1 square = 100 ft²)
Cedar											
Treated Shakes	Class A	245	Class 3- 4	Yes	Yes	No	Yes	25 to 30	Weathers to a silver-gray	170 to 200	260 to 450
Treated Shingles	Class A	173	Class 3- 4	Yes	Yes	No	Yes	25 to 30	Weathers to a silver-gray	170 to 200	260 to 450
Metal											
Aluminum											
Zappone Shingles	Class A,B,C	110	Yes	Yes	Yes	No	Yes	50 to 100	Yes	196	42
Classic Metal	Non-combustible	120	Class 4	Yes	Yes	No	Yes	Lifetime	Yes	250 to 400	50
Coated Steel											
Gerard Stone	Class A	120	Class 4	Yes	Yes	No	Yes	Lifetime	Yes		140
Copper											
Zappone Shingles	Class A	110	Yes	Yes	Yes	No	Yes	100 to 200	Patinates	1,120	124
Composition											
DaVinci	Class A	80 to 90	Class 4	Yes	Yes	No	Yes 100% pure resin	50	Yes	370 to 420	304 to 342
Enviroshake®	Class C	87	Class 3	Yes	Yes	No	Yes	50	Lightens to a silver/ grey	330 to 350	325

Table 1. Roofing materials and specifications *(continued)*

Roofing Material	Fire Resistant	Wind Resistant (mph)	Impact Resistant	Freeze-Thaw Resistant	Low Maintenance	Special Skills Required for Installation	Recyclable	Durability (years)	Fade Resistant	Price ($) Per Square	Weight (pound per square 1 square = 100 ft²)
Asphalt											
CertainTeed Presidential Shake TL	Class A	110	Not rated yet	Yes	Yes	No	Fiberglass composition	50	Yes	140	480
CertainTeed Presidential Shake	Class A	110	Not rated yet	Yes	Yes	No	Fiberglass composition	50	Yes	100	355
CertainTeed Centennial Slate	Class A	110	Not rated yet	Yes	Yes	No	Fiberglass composition	Lifetime	Yes	130	355
CertainTeed Landmark TL IR	Class A	110	Class 4	Yes	Yes	No	Fiberglass composition	Lifetime	Yes	85 to 90	340
CertainTeed Landmark Special IR	Class A	110	Class 4	Yes	Yes	No	Fiberglass composition	40	Yes	75	260
Clay											
Ludowici	Class A	150	Class 2	Yes	Yes	No	Clay tile	75	Yes	300 to 800	900 to 1,200
Gladding, McBean	Non-combustible	Not rated	Yes	Yes	Yes	No	Clay tile	75	Yes	350 to 375	1,120
Stone											
TruSlate (nautral)	Non-combustible	100	hail resistant	Yes with special under-layment	Yes	Special system	Yes	Lifetime 75 years for inter-layment	Yes	275	650 to 750

Table 1. Roofing materials and specifications *(continued)*

Roofing Material	Fire Resistant	Wind Resistant (mph)	Impact Resistant	Freeze-Thaw Resistant	Low Maintenance	Special Skills Required for Installation	Recyclable	Durability (years)	Fade Resistant	Price ($) Per Square = 100 ft²)	Weight (pound per square 1 square
Polymerica											
EcoStar Majestic Slate TPO and EPDM synthetic rubber	Class A	70 to 120	Class 4	No issue	Yes	No	Yes	50	Minimal	544 to 752	220 to 290
EcoStar Seneca Cedar Shake Tiles	Class A	70 to 120 w/Gold Star Warranty	Class 4	Yes	Yes	No	Polymer-rubber and recycled industrial plastic	50	Minimal	562 to 712	220 to 251
EverShake	Class A		Class 3	Yes	Yes	No	Polymer	40	Minimal		300
Re-New Wood Eco-Shake	Class A	70 to 110	Class 4	Yes	Yes	No	Recycled PVC and wood fiber	40 to 50	No	240	244
Crowe Building Products Authentic 2000 (Slate look-alike)	Class A, B, or C	110	Class 4	Yes	Yes	No	Yes Recycled plastic and rubber and TPO	40 to 50	Yes	300	223 to 260
Concrete											
Westile	Class A	85 to 100	Class 4	Yes	Yes	No	Yes	50	Yes	55 to 100	6 to 10
Eagle Roofing Products	Class A	80 to 110	Not rated yet	Yes	Yes	No	Concrete	Lifetime	Lightens slightly	300 to 400	720 to 1,000

APPENDIX

FIRE CLASSES

Fire resistant classes, A, B, and C measure roof assemblies' relative resistances to external fire exposures. See http://www.professionalroofing.net/past/nov99/qa.asp.

Class A uses a class B fire retardant product plus an Underwriters Laboratories (UL)-rated fire retardant fiberglass cap sheet underlay. It is not readily flammable, has a high degree of protection, does not slip, and does not have a flying-brand hazard.

Class B provides a moderate degree of protection, is not readily flammable, does not slip from position, and poses no flying-brand hazard.

Class C provides light fire exposure protection, is not readily flammable, and there is a measurable degree of fire protection.

IMPACT-RESISTANT CLASSES

UL 2218 classifies the resistance of roofing products to impact damage. In the test, steel balls are directed at roof samples, and damage is observed. Products that receive a Class 4 rating from UL 2218 are the most resistive to hail damage.

Several standards set by the American Society for Testing and Materials (ASTM International) and Underwriters Laboratories (UL) test impact and wind resistance including: ASTM D 3161: Standard Test Method for Wind-Resistance of Asphalt Shingles; UL 997: Wind Resistance of Prepared Roof Covering Materials (for wind ranging from 55 to 63 miles per hour); and UL 2218: Impact Resistance of Prepared Roof Covering Materials. See http://www.toolbase.org/Technology-Inventory/Roofs/wind-resistant-asphalt-shingles.

USEFUL WEB SITES

The following Web sites provide historical information:
http://fs.web.mtdc.wo.fs.fed.us/toolbox/his/his02.htm
http://www.cedarbureau.org
http://www.cr.nps.gov/hps/tps/recentpast/
http://www.cr.nps.gov/hps/tps/standguide/
http://www.oldhousejournal.com
http://www.oldhouses.com
http://www.recentpast.org
http://www.traditional-building.com
http://www.watkinsawmills.com

Consumer Reports magazine has tested shingles. You can sign up for a subscription and see the ratings on composition shingles.
http://www.consumerreports.com
http://www.oldhousejournal.com
http://www.roofsandroofing.com/index.html

Below are some links to roofing manufacturers that make alternatives to rustic roofing products:

Polymer

http://www.davinciroofscapes.com

Composites

http://www.alltheindustrials.com
http://www.atlasroofing.com
http://www.buildinggreen.com
http://www.elkcorp.com
http://www.enviroshake.com
http://www.greenbuilder.com
http://www.owenscorning.com
http://www.premiumroofs.com
http://www.stonewayroofing.com
http://www.traditional-building.com

Wood

http://www.askthebuilder.com
http://www.bcfshake.com
http://www.cedarbureau.org
http://www.stavelake.com
http://www.wescocedar.com
http://www.woodroof.com

Rubber

http://www.redwoodrubber.com
http://www.rubberconcepts.com

Metal

The Metal Roofing Alliance "is a not-for-profit coalition of metal roofing manufacturers, paint companies, coil coaters, associations, and contractors formed to introduce homeowners to the many value benefits of metal roofing." See http://www.metalroofingalliance.com for more information on metal roofing.

http://accelroofing.com/
http://atas.com/
http://www.bethsteel.com
http://www.classicroof.com
http://www.custombiltmetals.com
http://www.duralock.com
http://www.hometips.com
http://www.kasselandirons.com

http://www.mbci.com
http://www.metalroofing.com
http://www.metroroofproducts.com
http://www.perfectionusa.com
http://www.wbdg.org
http://www.zappone.com

Clay

http://www.gladdingmcbean.com
http://www.ludowici.com
http://www.oldhousejournal.com

Concrete

http://www.cement.org/homes/ch_bs_roofing.asp
http://www.monierlifetile.com/
http://www.thetileman.com

Fasteners for clay and concrete tile

http://www.newportfastener.com
http://www.wire-works-inc.com

Underlayments

http://www.carlisle-syntec.com
http://www.cetco.com/BMG/
http://www.fieldscorp.com

Vendors for roofing products

http://www.alliedbuilding.com

Asphalt Roofing Manufacturers Association (ARMA)
ARMA is a trade association representing the majority of North America's asphalt roofing manufacturing companies, plus their raw material suppliers.
http://www.asphaltroofing.org/

Auburn Tile, Inc.
909–984–2841
http://www.auburntile.com

Certainteed
800–782–8777
http://www.certainteed.com

Columbia Concrete Products Limited
877–388–8453
rooftile@crooftile.com

Crowe Building Products
905–529–6818
http://www.authentic-roof.com

DaVinci Roofscapes
800–328–4624
http://www.davinciroofscapes.com

EcoStar
800–211–7170
http://www.premiumroofs.com

Elk
800–354–7732
http://www.elkcorp.com

Follansbee Steel
800–624–6906
http://www.follansbeeroofing.com/

GAF Materials Corporation
973–628–3000
http://www.gaf.com

Gerard Roofing Technologies
http://www.gerardusa.com/

Gladding, McBean
800–964–2529
http://www.gladdingmcbean.com

IKO
888–456–7663
http://www.iko.com

Ludowici Roof Tile
800–699–9988
http://www.ludowici.com

Monier Lifetile
800–598–8453
http://www.monierlifetile.com/

Owens Corning
1–800–GET–PINK
http://www.owenscorning.com

Richmond Precast Concrete Products
Richmond, VA
804–231–0100

Royal Building Products
866–852–2791
http://www.royplas.com

Tamko
800–641–4691
http://www.tamko.com

Vande Hey-Raleigh
800–236–8453
http://www.vhroof-tile.com

For additional information on alternative roofing materials contact Marty Willbee at 909–599–1267.

SDTDC's national publications are available on the Internet at: http://www.fs.fed.us/eng/pubs/

Forest Service and U.S. Department of the Interior Bureau of Land Management employees also can view videos, CDs, and SDTDC's individual project pages on their internal computer network at:
http://fsweb.sdtdc.wo.fs.fed.us/

About the Author...

Martha Willbee, Outdoor Recreation Planner, came to the San Dimas Technology and Development Center in 1991 and served as Administrative Assistant. Marty joined the Recreation Program in 2002. She holds a B.A. in Recreation Administration from Chico State University in California. Her prior work background was in banking and insurance.